Canon of Medicine

Book I

General Principles of Medicine
Assessment
Regimen in Health and Disease

by Hakim Ibn-Sina

English translation of the critical Arabic text

Canon of Medicine
Book I General Principles of Medicine
Hakim Ibn Sina

This English translation is based on an Arabic critical edition compiled by a team scholars at Hamdard University, India, by comparing early copies of original Arabic source materials. This is the first translation appearing in English or any European language based on an Arabic original. For the translation into English, the scholars prepared a glossary of 15,000 Arabic words appearing in the *Canon,* with 50,000 English equivalents. The task of preparing the critical edition and the glossary took the team more than 5 years, under the supervision of Hakeem Abdul Hameed of Hamdard University. After compiling the full five volumes of the Canon in Arabic, he and his team completed English translations of Book I and Book II. This English text of the Hamdard translation, as well as Arabic and Persian versions for side-by-side comparison are available at this Persian website

The five-volume *Canon* is one of the most influential medical books in history, and its medical theories, observations, materia medica, and formulary, which inspired physicians throughout Europe, the Middle East, and South Asia for half a millenium, are of great potential interest to contemporary practitioners of natural medicine and medical herbalism. The potential benefits are practical, not simply of historical curiosity. The ancient system of Chinese and Ayurvedic medicines are currently influencing the health care throughout Europe and the Americas, the practical information from Greco/Unani medicine may do the same.

This Book I of the *Canon* covers the principles of Four Humors (Greek/Arabic/Unani) medicine, as well as an overview of anatomy from the point of view of that system. It is a practical book, with sections on pulse diagnosis and urinalysis, and on therapeutic regimens for various ages and conditions, in health and in disease.

Recently the full five volumes of the Canon have been translated by Laleh Bakhtiar and are available on the book market in North America. Bakhtiar states that she based her translation of Book II on the Hamdard version, and expresses gratitude for for the efforts that produced it. In only a few cases, the Bakhtiar version of Book II assigns different Latin binomials to the plants in the Hamdard version.

You can find a copy of the Hamdard translation of Book II: Materia Medica here:
http://naimh.com/canon/CANON-Book-II-Hamdard.pdf

Paul Bergner

Director

North American Institute of Medical Herbalism

AL-QĀNŪN FI'L-ṬIBB

AL-SHAIKH AL-RA'ĪS ABŪ 'ALĪ AL-ḤUSAIN
BIN 'ABDULLĀH BIN SĪNĀ

BOOK I

ENGLISH TRANSLATION OF THE CRITICAL ARABIC TEXT

DEPTT. OF ISLAMIC STUDIES
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CONTENTS

BOOK I

GENERAL PRINCIPLES OF MEDICINE IN FOUR PARTS

PART I

DEFINITION AND SUBJECT MATTER OF MEDICINE AND PHYSIOLOGY

comprising six Lessons

Lesson I

DEFINITION AND SUBJECT MATTER OF MEDICINE

comprising two Sections

Lesson IV

HUMOURS

comprising two Sections

Lesson V

ORGANS

Clause I

BONES

comprising thirty Sections

Clause II

MUSCLES

comprising thirty Sections

Lesson VI

Lesson II

GENERAL CAUSES

Things happening on account of general causes considered one by one

consisting of nineteen Sections

Clause II

SPECIAL CAUSES OF BODILY AILMENTS

conisting of twenty-nine Sections

Lesson III

consisting of eleven Sections and two Clauses

SIGNS AND SYMPTOMS

Lesson III

REGIMEN FOR THE AGED PERSONS

consisting of six Sections

Lesson IV

REGIMEN FOR EACH ABNORMAL TEMPERAMENT

comprising five Sections

Lesson V

CHANGES (OF SEASONS)

Having one Section and one Clause

Clause

INSTRUCTIONS FOR THE TRAVELLERS

consisting of eight Sections

PART IV

VARIOUS MODES OF TREATMENT WITH REGARD TO GENERAL DISEASES CONSISTING OF THIRTY ONE SECTIONS

PREFACE

Abū ʿAlī al-Ḥusain Bin ʿAbdallāh Bin Sīnā, known to the West as Avicenna, was born at Bukhara in A.D. 980 and died at Hamadan in A.D. 1037 From his childhood, he gave promise of outstanding achievements. At the early age of eighteen, Ibn Sīnā's reputation as an outstanding physician culminated in his appointment as the court physician to the Samanid Prince, Nūḥ Ibn Manṣūr. Consequent on the overthrow of the Samanid rulers, Ibn Sīnā wandered through Persia and braved hazards to continue his unquenchable quest of knowledge and power. The first period of his travails was ended by Prince Shams ad-Dawlah of Hamdān when he appointed Ibn Sīnā as his court physician. It is here that he wrote his monumental work, *al-Qānūn fī'l-ṭibb,* the 'Canon of Medicine'.

In Ibn Sīnā's days, knowledge did not recognize any barriers. He considered all sciences as his domain and he transmuted into gold whatever he touched. His was a very powerful intellect and an encyclopaedic mind. Although his genius produced outstanding works in prose on different subjects, he was no stranger to poetry which also marginally claimed his creative attention. The versatile genius of Ibn Sīnā mastered and transcended astronomy, physics, chemistry, medicine, mathematics, natural sciences, logic and Qurʾanic exegesis. After making lasting contributions to all these, he still had energy to pursue arts of war and peace. He assisted his patrons not only in civil administration but also in military campaigns, during one of which he died of colic and exhaustion. He combined with his creative pursuits, administrative responsibility and love for good things of life. Judged by the most exacting standards he is a towering figure as a scientist and philosopher and a prolific writer.

Ibn Sīnā acquired great distinction in science, medicine and philosophy. His contributions to these disciplines won recognition and admiration not only in Middle East but also in Europe. Apart from science, medicine and philosophy, his works include religious tracts and stories with a mystical significance. He shaped philosophy into a powerful force that gradually penetrated Islamic theology and mysticism and Persian poetry in Islam and gave them universality and theoretical depth. He evolved an original system based on Aristotle's philosophy. Part of Ibn Sīnā's contribution lay in making Aristotle's philosophy more systematic and coherent. Expanding on Aristotle's theory of the three fold soul, viz., vegetative, sensitive and intellectual, he developed a psychologybased on external and internal senses. Although greatly influenced by the then Neo-Platonists, Ibn Sīnā drew directly both on Plato and Aristotle.

Ibn Sīnā's greatest contribution, however, is in the field of medicine where he is rated among the all-time great. His *magnum opus* is *al-Qānūn fi'l-ṭibb*. It exceeds one million words and contains all about medical science that was known up to the 10th century. *al-Qānūn* soon rose to the position of primacy in medical literature. It was taught as a text in the universities in Europe and Middle East until the 17th century. It is the most authoritative and comprehensive codification of the Greco-Arab system of medicine. It is a compendium that not only distilled medical knowledge inherited from Greece but added significantly to it in the light of subsequent thinking, experience and experimentation. It is the one book that influenced European medical thought profoundly for over half a millennium and still continues to be studied by thousands of scholars in the East and West.

Al-Qānūn is divided into five books. The first book is on general principles of medicine, physiology, pathology, etiology, hygiene, symptomatology, general rules and methods of treatment, regimen and anatomy; the second book is concerned with *materia medica;* the third book deals with particular diseases; the fourth relates to general therapy and the fifth book is a formulary of compound drugs.

Written originally in Arabic, *al-Qānūn* was first translated into Latin by Gerard of Cremona (A.D. 1114-1187). This Latin translation introduced *al-Qānūn* to the West. A study of this translation however, leads one to the conclusion that the manuscript on which it is based was defective. Quite a few words appeared out of context; diacritical marks were used incorrectly and at many a place complete passages found in other manuscripts appear to have been omitted. Moreover, the translation, being a medieval language and containing many abbreviations, has presented difficulties in comprehension to the modern reader. This appears to have led Prof. E.G. Browne to remark that the translation "swarms with barbarous words" and is "almost unintelligible".

A Russian translation was published at Tashkent during 1954 and 1960. Between these two (Latin and Russian) translations, a number of whole or part translations of *al-Qānūn* appeared in French, German, Hebrew and Greek, besides such oriental languages as Persian and Urdu.

The Latin translation, however, is the only European version based directly on the original Arabic. An English translation of the first book of *al-Qānūn* was prepared by Dr. O. Cameron Gruner and published in 1930. Dr. Gruner's English translation is based on the Latin versions published at Venice in 1595 and 1608. Dr. Gruner removed many of the defects of the Latin translation: he numbered paragraphs, explained the more abstruse theories and essayed the solution of certain problems in the light of modern medicine. His translation, however, can at best be called a free translation. It contains a mixture of philosophy, medicine, physics and mysticism. Dr. M. H. Shah of Pakistan translated the first volume of *al-Qānūn* into English. It was published in 1964. This translation avoids many shortcomings of earlier translations and reads well. But he based his translation on an Urdu translation. A doubly translated book does not fully conform to the original one.

Al-Qānūn contains a large number of philosophical, theological, astronomical, meteorological and geographical terms which puzzled its Latin and English translators. Consequently distortions crept into the translation particularly with regard to the technical terms.

Keeping these facts in view, it was decided to get an English translation of this great work directly from the original Arabic text. The first task, however, was to prepare a critical edition of the book. Several manuscripts and printed editions were obtained and a number of other works consulted to arrive at a definitive reading. It took five years to complete the job. Reference was made to the following sources.

Sources for the edition

1. Photocopy of the Aya Sofia (Istanbul) manuscript of *al-Qānūn*, transcribed in 618. A.H. A sentence in the manuscript:

   هذا الفصل فى نسخة الذى قيل انوا قوبلت على نسختہ الاصل الذى للمصنف

   [This section is reproduced from the copy which is said to have been compared with the author's own copy.]

   conclusively establishes its antiquity and significance. Here and there variant readings have been noted on the margins of this manuscript.
2. Manuscript of *Shāh Amānī* (second and fifth books) transcribed at Delhi in 1133 A.H. The first, third and fourth books could not be found.
3. *Al-Qānūn* printed at Rome in A.D. 1593.

4. *Al-Qānūn* printed at Tehran in 1295 A.H.
5. *Al-Qānūn* Bulaq edition (Egypt) 1294 A.H.
6. *Al-Qānūn* printed at Nāmī Press, Lucknow (India) in 1324 A.H.

The Aya Sofia manuscript was made the basis of our critical edition and for corrections the four printed editions were given the following rating.

(1) The Nāmī edition
(2) The Būlâq edition
(3) The Tehran edition
(4) The Rome edition

Wherever the text in Aya Sofia manuscript is at variance with the text of other manuscripts or printed editions, but can be construed as correct, the text of the Aya Sofia manuscript has been kept undisturbed. Where the texts of other copies appeared more appropriate, they were incorporated in the critical edition in place of the original text of Aya Sofia manuscript and texts substituted have been indicated in the footnotes.

After preparing an authentic and complete critical edition of *al-Qānūn,* my team set about producing a faithful English translation of all its five books direct from the Arabic text. The editors and translators have done their best to put forth Ibn Sīnā's medical theories in appropriate and readable language. To facilitate the work, a comprehensive glossary of *al-Qānūn,* comprising about 15,000 Arabic terms and their 50,000 English equivalents, was compiled and published at the outset.

I am very happy to acknowledge the hard work and labour that my colleagues have done in the translation and revision of this historical and classical medical book, particularly Mr. S.A. Ali, Head, Deptt. of Islamic Studies, Jamia Hamdard, Mr. A.H. Farooqi, Reader, Deptt. of Islamic Studies, Jamia Hamdard and Dr. Hameedullah, Department of English, Aligarh Muslim University. These scholars have completed their job under my personal supervision.

Hakeem Abdul Hameed
Chancellor
JAMIA HAMDARD

New Delhi-110062
April, 1993

بسم الله الرحمن الرحيم

In the name of Allah, the Beneficent, the Merciful

All praise is due to Allah, the praise which is His right because of His exalted position and the abundance of His favours and His blessings be upon His Prophet Muhammad, his family and his associates.

In fact some of my sincere brethren and those whom I feel bound to serve to the best of my capability requested me to write a book on *Ṭibb* (Medicine) which should cover the general and particular principles of Medicine explained in a concise manner and meet the necessary requirement to the utmost yet with essential brevity. It is in deference to their desire that this book has been written. I think it is proper that I should first discuss the common general principles of both theoretical and practical aspects of *Ṭibb* and then discuss general principles concerning the actions and properties of simple drugs, followed by the details of them. Next, I shall describe diseases occurring memberwise beginning with an account of its anatomy and physiology.

The anatomy and physiology of the simple members have been dealt with in the first book of general principles. Having completed the account of the anatomy of the individual member I shall discuss in several places how the health of that member is maintained. Afterwards, I shall show by means of general statement all its diseases, their causes and the methods of their diagnosis and also the treatment in a general way. These general matters having been completed, I shall proceed to the particular diseases and there also I shall first point out, in most cases, the general principles concerning their scope, causes and symptoms. Then I shall be free to describe their particular principles and then I shall come down to the general rules of their treatment and the particular treatment by simple and compound medicines. Excepting a few, those simple drugs will not be discussed again and again, which have been mentioned with their uses in different diseases with the help of tables and coloured charts in the book on Simple Drugs. I think that the use of tables and coloured charts in that book is quite proper as will be realized by the student when he has an access to them.

17

And out of the compound medicines there are some which should be properly described in a Formulary on which I think it proper to work. I shall mention such medicines, their beneficial effects and how to compound them in the last Book.

After completing the volume on diseases of the individual members I shall write another volume, which though descriptive, will be confined to the diseases which when they occur are not the specific diseases of any particular member. It will also include a discourse on beauty culture. My approach in that volume will be the same as in the previous Book on particular diseases. And when, by the grace of God, the Books are completed, a Formulary will be added to it. And it is not permissible for one who claims knowledge of this art and practices it that most of this Book should not be known to him and preserved in his memory because it contains the minimum of what is indispensable for a physician and whatever is other than this is something which cannot be determined.

If God extends my life-span and fate favours me, I shall try to write a more detailed book on this subject. For the time being these five books should suffice:

BOOK I

General Principles of the Science of Medicine

BOOK II

Simple drugs

BOOK III

Particular internal and external diseases considering each member separately, from head to toe

BOOK IV

Particular diseases which, when they occur are not confined to one member and it is also on Beauty Culture

BOOK V

Preparation of drugs, i.e., Formulary

BOOK I

General Principles of Medicine in four parts

PART I

Definition and subject matter of Medicine and Physiology consisting of six lessons

LESSON I

Definition and subject matter of Medicine
Comprising two Sections

Section I

Definition of Medicine

I say: *Ṭibb* (Medicine) is the science by which the states of the human body, regarding health and decline in health, are identified: its purpose is to preserve health if it is already attained and to restore it when it is lost. A person may say that medicine is divided into theory and practice but you have made it totally theoretical by calling it a 'Science'. And now, in reply to this I say that it is said that arts and philosophy have theoretical and practical sides and similarly medicine has its theoretical and practical aspects. But in all these classifications the significance of the words "theoretical" and "practical" is different. It is not necessary for us to consider here the difference in significance in all cases except that in medicine.

So, when it is said that medicine has both a theoretical and a practical aspect, you should not suppose, as most of the researchers on this topic have fancied, that one of the two aspects of medicine is to acquire knowledge and the other is to practise it. Rather, it is incumbent on you to know that the significance of this division is something else and this means that each of the two aspects of medicine is knowledge. But one of them is the knowledge of principles and the other is the knowledge of the mode of practice. The first is called 'Knowledge' or 'Theory' and the second, 'Practice'.

By the theory of medicine we mean the learning of that which is useful for mere belief (theoretical assent) but does not concern with the description of the mode of practice. It is said in medicine that there are three types of fevers and nine varieties of temperaments. And by practical aspect of medicine we do not mean actual practice or performance of physical activities. Rather, this aspect of the medical science is something the learning of which provides opinion—an opinion which pertains to the description of the mode of practice. For example, it is said in medicine that in the early stages of inflammatory swellings, restorative, cooling and thickening medicines should be used and later on, relaxants mixed with the repellants and finally, when the process is subsiding only resolving relaxants would suffice except in the mode of swellings which result from the matter expelled by principal members. Thus this learning provides you that knowledge which deals with the practice. So, when you know both these kinds, in fact, you have achieved theoretical and practical knowledge even though you never practise it.

It is not proper for anyone to assert that there are three states of the human body—health, disease and a state which is of neither health nor of disease and that you are content with only two because this person, after a careful consideration, will realize that neither this triplicity (three-fold grouping) nor our rejection of it is necessary. If this triplicity is necessary, truly our statement 'decline in health' includes disease and the third state which has been invented by the people. But this third state neither falls under the definition of health nor it is opposed to it unless they define health as they like and include in it such (superfluous) conditions as are not required by them, whereas health is a trait or state which results in normal functioning of its subject (human body).

There need be no conflict with the physicians in this respect and they also are not among those who dispute such matters. Moreover, this sort of controversy with them or with the persons contradicting them does not further the cause of Medicine—while to discover the real truth in this case is really among those matters which are the concern of other arts dealing with their fundamentals.

Section II

Subject Matter of Medicine

Medical science deals with the human body in health and decline in health; and since knowledge of any thing is acquired and completed by learning about its causes, provided such causes are there, it is necessary that the causes of health and disease are determined. Health and disease and their causes are sometimes obvious but at times are hidden and are discovered not by senses but by means of deductions from various conditions. Hence, it is also necessary, that those conditions which manifest themselves in health and disease, should be determined.

It has been acknowledged in basic sciences that the knowledge of an object is attained only when its causes and origins are known, *provided its origins and causes are within* the reach of observation. When it is not so, knowledge may be obtained only by an understanding of its conditions and the intrinsic concomitants.

There are four kinds of causes:

1. Material Causes
2. Efficient Causes
3. Formal Causes
4. Final Causes.

Material Causes: Material causes are the substances on which health and disease depend. So far as substances are concerned, they may be divided into immediate substances and distant substances. Immediate substances are organs and pneuma. Distant substances are humours and under this category are the more distant substances, the elements. These two kinds of substances have a definite composition accompanied by changes. What gives effect to health and disease can, in accordance with the composition and changes, be reduced to a unity. Diversity reduced to unity yields temperament and composition: Temperament is related to change and morphology to composition.

Efficient Causes: Efficient causes are those which alter or maintain the states of human body, namely:

1. Airs and what is related to them
2. Foods, waters and drinks and what is related to them
3. Depletion, retention, countries and residence and what is related to them
4. Physical and psychic movements and conditions of rest
5. Sleep and wakefulness
6. Change and differences in ages
7. Variations of sex
8. Occupations
9. Habits
10. Objects coming into contact with the human body, whether contrary to nature or not.

Formal Causes: These are the following:

1. Temperaments
2. Faculties which follow temperament
3. Compositions

Final Causes: Final causes are the functions. It is obvious that a knowledge of the functions necessitates the knowledge of faculties and pneumas which are the bearers of the faculties, as we shall describe presently.

These, then, are-the subjects with which the art of medicine is concerned because they deal with the health and disease of the human body. But regarding the object of this discourse, which is preservation of health and eradication of disease, other things according to the means and methods of these two states, should also be the subject matter of medicine. These means are:

1. Regimen for food and drink
2. Choice of air
3. Regulation of movement and rest
4. Treatment with drugs
5. Operation.

The physicians treat these conditions according to three groups of persons: those who are in health, those who are diseased and those being in an intermediate state. We shall describe persons belonging to the intermediate group and state how they are considered to occupy a middle position whereas, in fact, there is really nothing intervening between them. Now that we have mentioned these things in detail, we may sum up what medicine deals with: The elements, temperaments, humours, simple and compound organs and their faculties; physical, vital and psychic functions, the states of the body in regard to health, disease and the intermediate state, and the means thereof such as foods, drinks, airs, waters, countries, residences, depletion, retention, occupations, habits, physical and psychic movements, age, sex; such foreign matters as find access to the body, and preservation of health and treatment of each and every disease by means of regimen for foods, drinks, choice of air, regulation of movement and rest, use of drugs and manual operations.

With regard to some of these matters a physician as such should only conceive their nature theoretically and verify their reality on the basis that they have been postulated for him and approved by the physicists. On the other hand, there are some matters which the physician may prove by reasoning from his art. The physician must follow the fundamental principles, for they are taken for granted in the secondary sciences. It is only in the primary sciences, called Metaphysics, that they can be reasoned out.

If a physician undertakes to prove the existence of the elements, the temperaments and other postulates taken from Physics, he is committing two mistakes: first he is bringing into medicine matters which do not belong to it and secondly, he thinks that he has explained something in medicine while he has not explained anything at all. Thus matters, whose nature is necessary for a physician to consider and to accept even though they are not obvious, are these:

1. The existence of elements and their number
2. The existence of temperament and their number
3. The existence of humour, their number and their states
4. The existence of faculties, their number and their location
5. The existence of pneumas, their number and their location
6. The general law that a state cannot exist or alter without a cause and the number of such causes.

As regards the organs and their functions, it is necessary that they should be known through observation and dissection. Matters which have to be borne in mind and argued about are:

1. Diseases
2. Their particular causes
3. Symptoms
4. Methods of preserving health and eradicating disease.

This is necessary for the physician to argue about matters that are not manifest by going into the details and determining their quantity and time. If Galen were to attempt a proof of the matters of the first group, he would do so not in the capacity of a physician but as one who loves to become a philosopher discussing questions of Physics. Similarly if a jurist tries to justify the validity of the obligatory compliance with the consensus of opinion, he will not be doing so in the capacity of a jurist but in the capacity of a scholar. However, it is not possible for either a physician, as such, or a jurist in his own right, to argue about such matters. If he tries to do so, he will be arguing in a circle.

LESSON II

Elements comprising one Section

Elements are simple bodies. They are primary substances of human and non-human bodies. They cannot be subdivided into bodies which have different forms. Their intermixture results in different forms[1] in nature. The physicians must learn from Physics that elements are only four and no more: two of these are light and two heavy. Fire and air are light: earth and water are heavy.

1 'Form' here means *ṣūrat nau'iya* which is philosophical term denoting the origin of all the specific properties of a matter.

Earth is a simple body the natural position of which is in the centre[1] of other elements. In that position, it remains stationary by virtue of its nature, but when it is displaced it returns to its original position. This is the explanation for its absolute heaviness. Earth is, by nature, cold and dry, that is, left to its natural form without outside influences, it makes it cold and dry nature palpable. In nature, earth serves the purpose of making the objects firm and stable, and maintains their forms and figures.

Water is a simple body which, in its natural position, surrounds the earth and is, in its turn, surrounded by the air provided that both of them are in their natural position. This is the explanation for its relative heaviness. Water is cold and moist, that is, left to its natural form without outside interference, it manifests its cold and moist quality. Moisture in water means that water is in its nature such as it gets easily dispersed and gathered again and assumes any kind of shape but is incapable of retaining it. It has its being in the universe so that moulding of forms, shaping of contours and attempering may become easy for its components. This is because moist bodies can easily dispense with its configurations and easily accept new ones. Similarly dry bodies accept configurations with difficulty and also leave them in a similar manner. And whenever a dry body is mixed with a moist one, the dry one gains from the moist one a tendency to expand and accept new shapes easily and the moist body gains from the dry one a strong protection for the firmness and equipoise that occur in it. Thus a dry body does not disperse because of moisture and a moist one does not flow because of dryness.

Air is a simple body, the natural position of which is above water and below the fire. This is the explanation for its relative lightness. Under the aforementioned conditions, its nature is hot and moist. In the creation, the purpose of air is to impart porosity, lightness, thinness and the ability to rise upwards.

Fire is a simple body, the natural position of which is above all the elements. In nature, it is located in the concave surface of the heavens, free from integration and disintegration.[2] This is the explanation for its absolute lightness. Fire is hot and dry in its nature. The purpose of its existence in the creation is to produce maturation, lightness and intermingling. It penetrates the aerial substance and breaks the sheer coldness of the two heavy cold elements (earth and water) and thus it forces their elementariness to integrate into compounds. The two heavier elements are more helpful in the formation

[1] According to Ptolemaic geo-centric system of Astronomy.

[2] According to the ancient philosophy, the process of integration and disintegration extends only to that surface of heavens, which is nearest to us. (Anabolism, catabolism)

and rest of the organs while the lighter two are more helpful in the formation and movement of pneuma as well as the movement of the organs. However, the prime mover is the soul (*nafs*, i.e., Psyche). These then, are the elements.

LESSION III

Temperament comprising three Sections

Section I

Theory of the Temperament

Temperament is a quality resulting from the interaction of opposite qualities present in elements consisting of minute particles so that most of the particles of each of the elements may touch most of the others. Thus when these particles act and react on one another with their properties, there emerges from their total properties, a uniform quality which is present in all of them. This is the temperament. Since the primary properties in the aforesaid elements are four, namely, hotness, coldness, moistness and dryness, it is obvious that the temperaments of integrating and disintegrating bodies are the products of these very properties. A rational classification of temperament, if it is considered absolutely on theoretical basis without a reference to anything, must be of two kinds. One of them is that the temperament be equable in the sense that the quantities of opposite qualities combine in equal degrees of potency and the temperament becomes a quality which is exactly their mean. In the second kind the temperament is not exactly centred in the opposite qualities but is inclined towards one of them—either towards one of the opposite sides as coldness or hotness, and moistness or dryness, or to any two non-opposite qualities. But in medical practice, a temperament does not admit of being equable or non-equable. The physician should learn from physics that, what is equable in this sense really does not exist, much less in the temperament and organs of human beings.

It must be known that 'equable' a term used by physicians in their discussion does not mean a balance in weight but equitable distribution. That is, the elements mix up qualitatively and quantitatively in the human body as a whole or any of its organs, so as to produce an equipoise in relation to the human temperament. It so happens that the equitable disposition of human beings with which they are endowed is very close to the absolute and real equability described in the beginning.

This equability in respect to the human bodies too is one which is considered in relation to non-human bodies, having neither this equability nor that closeness to equability which the human beings have as mentioned under the first kind. Equability may be divided into eight different forms:

1. Equability with respect to one genus as differentiated from the others.
2. Equability with respect to differences within the genus.
3. Equability with respect to one species against the others in the same genus.
4. Equability with respect to differences within the (sub) species.
5. Equability in relation to an individual member of a species as differentiated from the other individual members within the same species.
6. Equability considered by virtue of states within the individual.
7. Equability within an organ as differentiated from other organs in the same body.
8. Equability in an organ considered in relation to its own states.

I. It refers to the human beings as considered in relation to the entire creation. It is very wide and is not confined within any limits, but it is not at random. It has its limits both in excess and deficiency. When it goes beyond these limits it ceases to be the human temperament.

II. It is midway between the two extreme ends of the wide temperament (i.e. first). It is found in a most balanced person in an species with the most balanced age when growth has attained its height. Such a temperament too is very exceptionally found though it is not the real equability which has been mentioned in the beginning of the section because its existence is impossible. And this person too is, in fact, close to the real equability not at random but because his hot organs such as heart, cold organs such as brain, moist organs such as liver and dry organs such as bone balance one another. When they are balanced and proportioned, they are close to the aforementioned real equability. But in respect to the individual organ itself, temperament is never equable except in one organ, the skin, as I shall describe later. Again in respect to pneuma and the principal organs also it is not possible for the human temperament to be close to real equability rather it will be deviating from it towards heat and moisture because the source of life is heart and pneuma. Both of them are very hot inclined to excess. And life depends on heat and growth on moisture. Indeed, heat is maintained by moisture and also nourished by it.

The principal organs, as we shall describe later, are three. Of these only one is cold and that is the brain, but its coldness is not such as to attemper the heat and the liver. One is dry or almost so, and that is the heart. But its dryness is not such as to attemper the moisture of brain and liver. However, neither the brain is too cold nor the heart too dry. Indeed, the heart in relation to the other two is dry. Similarly the brain in relation to the other two is cold.

III. The third kind of equability is narrower in extent than the first kind—equability with respect to the genus, yet it is fairly wide. And this temperament is suitable for a particular race inhabiting a particular region with a particular climate. For example, Indians have a tempermanet which is common to them and which keeps them healthy. The Slavs, too, have a temperament which keeps them healthy. Each of these temperaments, considered in relation to its own variety, is equable but inequable if considered in relation to the other. If an Indian were to acquire the temperament of a Slav, the Indian could fall ill or even die. Similar is the case of a Slav. If he acquires the temperament of an Indian, he could fall ill or may even die. This shows that every race has a particular temperament appropriate to the climate of its country ranging between the two extremes of excess and deficiency.

IV. The fourth kind of equability lies in the centre of the two extremes of the temperament of a country. And that is the most equable of the various temperaments of that variety.

V. The fifth kind of equability is much narrower in range than the first and the third kinds. It is a temperament which necessarily pertains to a particular person, keeping him alive and healthy. It ranges between the two extremes. It should be known that every individual possesses a temperament peculiar to himself, and it is quite rare or impossible for any other person to have an identical temperament.

VI. The sixth kind of equability is in the centre of the two limits (mentioned in the fifth kind). When a person has this kind of temperament, he is the best in his appropriate circumstances.

VII. The seventh kind of equability governs a particular kind of organ from amongst the organs, and owing to which it differs from the others. The equability for bone has more of dryness but that of the brain has more of moistness. Similarly, the tempermanet of the heart has more of hotness and that of the nerve, more of coldness. This variety of temperament too has a range between the two extremes. But it is narrower than all the ranges mentioned in the preceding varieties of temperament.

VIII. The eighth kind of equability is in the centre of the two extremes (in the seventh kind). It is the temperament which pertains to and is most suitable for a particular organ.

When the various classes (of living creatures) are considered, it is man who is found to be nearest to the perfect equability. Coming to the races of mankind, we hold it valid that the inhabitants of equinoctial circle resemble the other races in perfect equability so long as geographical factors like mountains and seas do not restrict it. The belief that there is deviation in equability in that circle because of the nearness of the sun, is, in fact, wrong. In that equatorial region, even though the sun is overhead, it is less harmful and causes less atmospheric changes than it does here or at higher altitudes where it is not overhead. Moreover, their conditions as a whole are good and uniform. They do not experience any noticeable variation in the climate which always agrees with their temperament. We have already written a tract on the vindication of this opinion.

Next to the equatorial region are the inhabitants of the fourth zone, who are a most equable race. The reason being that the sun, when it reappears does not shine over their heads long enough to scorch them, as happens with peoples in the second and third zones nor does its long absence make them immature and raw as the inhabitants in the fifth zone and beyond. Among the individuals, the one with perfect equability to real equipoise, is the one who belongs to the perfect equability both as regards the genus and the species.

In respect to the organs, it has been shown that the principal organs are not very close to perfect equability. But it should be known that of all the organs the flesh comes nearest to perfect equability and more so the skin, because it remains unaffected by cold and hot water mixed in equal quantities. The skin remains attempered because the heat from the vessels, the pneuma and the blood is counter-balanced by the coldness of the nerves. Similarly it is not affected by a body in which the most dry and wet (elements) are mixed well in equal parts. It is known that the skin is not affected when it does not perceive that which is equal to it (in property). The fact is that the skin is not affected by it because it is similar to it. Had it (skin) been opposed to the body, it must have been affected by it. Things similar in elements but contrary in nature react upon one another. It is a fact that a thing is not affected by another similar object when they participate in the same condition.

The skin which is more attempered is that of the forearm. The skin of the forearm which is even more attempered is that of the hand; even more attempered of it is the skin of the palm. Even more attempered is the skin which is over the fingers; even more attempered is the skin of the index finger; even more attempered is the skin which is on the distal segment; and for this reason distal segments of the index finger and of other fingers naturally happen to be highly sensitive in measuring tactile qualities. For a judge should be equally disposed towards both the sides so that he may perceive a deviation from equability.

With all that you have learnt, it should also be remembered that when we say that a medicine is equable we do not mean that it is really equable because this is impossible. Nor do we mean that in its temperament it is as equable as human temperament. Otherwise it would have been exactly as the human body. What we mean is that when it is acted upon by the innate heat in the human body, it develops a quality which does not deviate from the human quality, and does not incline towards extremes from equality and equipoise. Thus it does not produce in the body any effect removed from equipoise, and on the assumption of its actions in the human body, it is called attempered.

Similarly, when we say that a certain drug is hot or cold, we do not mean that its substance is extremely hot or cold nor that it is, in its substance, hotter or colder than the human body. Otherwise an attempered medicine in its temperament would necessarily be like the human temperament. We mean that through the drug hotness or coldness comes to the body in a degree over and above that degree of heat or cold which is already in the body. It is for this reason that a drug may be cold with reference to the human body but hot with reference to the body of a scorpion; it may be hot with reference to human body but cold with reference to the body of a snake. In fact, sometimes, the same drug may be hotter for one person than for another. This is why physicians are advised not to insist on the same drug when it is of no avail in altering the temperament.

Now that we have fully described the equable temperament, we pass on to the inequable. Inequable temperaments, whether you consider them so in respect to race or group, an individual or organ, are of eight kinds, all of which are counterparts of the equable temperaments. These eight kinds are:

The inequable temperament is either simple and its deviation (from the equable) is only in relation to one contrary quality, or it is compound and its deviation is in relation to two contrary qualities at the same time.

The simple inequable which is inclined towards only one contrary quality occurs as under:—

A. Deviation in relation to active contrary quality. It is of two kinds:

   (a) It is hotter than what it should be, but neither moister nor drier than what it should be.

   (b) It is colder than what it should be, but neither moister nor drier than what it should be.

B. Deviation in relation to passive contrary quality. It is also of two kinds:

(a) It is drier than what it should be, but neither hotter nor colder than what it should be.
(b) It is moister than what it should be, but neither hotter nor colder than what it should be.

All these four kinds, however, are not stationary and do not last for long because too much of heat makes the body drier than what it should be, and too much of cold makes the body moister than what it should be, by extraneous moisture; too much of dryness very quickly makes the body colder than what it should be, and too much of moisture cools the body more quickly than too much of dryness; if it is not in excess, it preserves the body for a longer time but ultimately makes it colder than what it should be. You learn from the above that equability and health are in conformity with heat rather than with cold. Thus these are the four simple intemperaments.

The compound intemperament is that in which deviation from equability is towards two contrary qualities at the same time and they are:

1. The temperament (may be) at the same time hotter and moister than what it should be.
2. The temperament is at the same time hotter and drier.
3. The temperament is at the same time colder and moister.
4. The temperament is at the same time colder and drier.

It is not possibe for a temperament to become at the same time hotter and colder, not to become at the same time moister and drier.

Each of the above eight intemperaments must exist either (1) without matter in which case that temperament produces in the body merely a quality but the body does not acquire that quality owing to the preponderance of any humour and alters the body towards that quality as, for example, heat in a (person affected by the hectic fever) and cold in a frost bitten one; or (2) with matter, in which case the body acquires the quality of that temperament owing to the proximity with the humour which enters it and in which that quality is dominant, as for example, the body is cooled by vitreous phlegm and heated by leekgreen bile or verdigris green bile.

In the Third and Fourth Books you will find examples for each of these sixteen temperaments. It should be known that the intemperament (associated with matter) occurs in two ways and that is because an organ is sometimes soaked in matter and is wet with it and sometimes matter is retained in the channels and cavities of the organ. Therefore sometimes the retention and interference of matter produces swellings and sometime it does not. So this is the discussion of temperament and whatever is not clear to the physician should be received from the physicist.

Section II

Temperaments of Members

It should be known that the Creator, the Most High, has bestowed upon every animal and each of its organs a temperament which is the most appropriate and best suited for its functions and condition according to its power of endurance. The investigation of this fact is a matter for the philosophers and not for physicians. The Almighty has bestowed upon man the most equable temperament, possible in this world, as well as compatible with his faculties with which he acts and reacts. Similarly, He has given every organ what is appropriate to its temperament. So He has made some of the organs hotter, some colder, some drier and some moister.

The hottest of what is in the body are the pneuma and its source, the heart, the fountainhead of heat. Next is the blood which, though produced in the liver, derives because of its contact with the heart more heat than the liver. Then comes the liver which resembles coagulated blood. Next is the flesh which is less hot than the blood, or the liver as the cold nervous tissues mixed with the flesh reduce its heat. The next are the muscles which are less hot than the simple flesh because of their nerves and ligaments; then comes the spleen, on account of the blood sediment in it; then the kidneys because they do not contain much blood. Next are the layers of arteries, not because of their nerve-like substances, but because they receive heat from blood and pneuma which they contain. Then come the layers of veins which owe their heat to the blood alone, then the skin, and then the equable skin of the palm.

The coldest of what is in the body is the phlegm, then the hair, bones, the cartilage, the ligaments, tendons, membranes, nerves, spinal cord, brain, fat, liquid fat and the skin.

The most moist of what is in the body, is the phlegm, then the blood, liquid fat, fat, brain, spinal cord, flesh of mamma and testicles, lungs, liver, spleen, kidneys, muscles and the skin. The order given here is that of Galen. It should be noted that the lung in its substance and nature is not so moist because every organ in its natural temperament is similar to its nutriment, while in its temporary temperament it is similar to its excreta. The lung is nourished by the very hot blood which contains much bile. This is exactly as taught by Galen. But a great deal of excretory moisture accumulates in the lung from the vapours of the body which move towards it and from the catarrh which flows down to it. This fact goes to prove that the liver, on account of its innate moisture, is more moist than the lungs and the lungs are very much soaked, though the constant moistening infusion makes the lungs more moist in their substance also.

One should understand the phlegm and blood, in a similar way, that the moistening by phlegm, in most cases, is by way of wetting and moistening by blood is by way of fixing moisture in the substance. Moreover, a natural aqueous phlegm in itself is sometimes moister than blood, because while the blood has acquired its full share of coction, the greater part of its moisture, which was present in the natural aqueous phlegm undergoing transformation into it, is absorbed. You will know later that the natural phlegm is blood which has undergone imperfect transformation.

The driest of what is in the body is hair because it is formed of smoky vapours, the moisture of which evaporates and the pure fumes are solidified. Next to the hair is bone because it is the hardest of all the organs. The bone is moister than hair because it is formed of blood and takes the place of an absorber for the fluids innate in the blood. This is the reason why bones do not provide nourishment to many animals whereas hair does not give nourishment to any of them, or perhaps to only one—the bat, which some think, digests and relishes it. When we take bone and hair in equal quantity and distil them in an alembic, comparatively more water and oil flow from the bone and there is little residue. Thus the bone is moister than hair. Next to the bone in dryness are cartilage, ligaments, tendons, membranes, arteries, veins, motor nerves, heart, sensory nerves and skin. Motor nerves are at the same time much colder and drier than the equable, while the sensory nerves are not much colder and drier than the equable, and may be they are not far removed from the equable.

Section III

Temperament according to age and sex

There are four periods in all:

1. The period of growth. It is denominated as the early period and lasts about thirty years.
2. The period of stability, which is the period of youth and lasts upto thirty-five or forty years.
3. The period of decline with continuing vigour. It is the period of the middle-age and extends to about sixty years.
4. The period of decline with the appearance of weakness in vigour. It is the age of the old to the end of life.

The period of growth is divided into:

1.	*Infancy:*	It is the period during which the limbs of the infant are not fit for walking and standing.
2.	*Babyhood:*	It begins when the child begins to stand and ends before the limbs become firm and lasts from the period when the deciduous teeth have completely fallen to the permanent dentition.
3.	*Childhood:*	It begins after the limbs have become strong and permanent dentition has taken place, and ends before puberty.
4.	*Juvenility and Puberty:*	It lasts upto the appearance of facial hair.
5.	*Youth:*	It continues till the growth is over.

The temperament of the children from infancy to youth is almost equable in regard to heat, but in regard to moisture it has an excess. Again, regarding the heat in children and in youth, there is a difference of opinion among the ancient physicians. Some of them hold that the heat in children is greater and for this reason they grow rapidly and their natural functions of appetite and digestion are greater and more enduring. Moreover, their innate heat which is derived from the semen is more copious and reinforced.

And some of them think that the innate heat in youths is far greater because their blood is more plentiful and thicker and for this reason they suffer from frequent and severe epistaxis. Moreover their temperament is more inclined to bile, while the temperament of children is more inclined to phlegm. Since movement is dependent on heat, the energetic movement and greater assimilation and digestion in the youth proves the (abundance of) heat. So far as the appetite is concerned it is not caused by heat but by cold. For this reason, in most cases, bulimia (lit. bovine appetite) is due to cold. The proof of the fact that they (youths) have greater assimilation is that they do not suffer from nausea, vomiting and dyspepsia so much as children do due to indigestion. The proof of the fact that their temperament is more inclined to bile is that most of their diseases are hot like tertian fever and their vomiting is bilious, whereas most of the children's diseases are moist and cold and their fevers are phlegmatic, and most of what they emit by vomiting is phlegm. As to the growth in children, it is not due to the power of their heat, but due to excess of moisture in them. Moreover, their excessive appetite indicates the diminution of their heat.

There are, then, doctrines of two schools and their arguments. Galen refutes both the schools and holds that the heat in both (children and youths) is actually equal, though in children the heat is quantitatively more and qualitatively less; in the youths it is quantitatively less and qualitatively more.

The explanation of what he says is this: let us imagine that a single measure of heat by itself or a rarified hot body with one unit of heat in quality and quantity is spread first into much moist substance, such as water, and then it is spread into less dry substance, such as stone. The result is that we find the heat of water is more in quantity but less in intensity and the heat of stone is less in quantity but more in intensity. In a similar way, you should consider the presence of heat in children and youth. In fact, children are generated from the semen which has much heat but in whom the causes as may quench that heat have not developed. In fact the child grows steadily and passes through various stages of development which knows no stopping, not to speak of retrogression. The youth has not developed a cause which would either increase or extinguish the innate heat which is preserved in him in a moisture which is both quantitatively and qualitatively less (than in children) at last (at the end of youth), it begins to decline. This deficiency of this moisture cannot be reckoned a deficiency in relation to the preservation of heat but is in relation to growth. In the beginning, this moisture is sufficient for two purposes, for preservation of heat and what is left over is for growth. Then only so much remains of it that it is not sufficient for both or even for one. Thus a period must come when it is sufficient for only one of the two. It cannot be argued that it suffices for growth but not for the preservation of innate heat, when it is not possible for a thing to preserve the original source how can it add to it something else. The only possibility, then, is that it (moisture) suffices for the preservation of innate heat but not for the growth. It is known that this period is the period of youth.

The statement of the second school that the growth in children is really due to the fluid but not to heat, is wrong, because the fluid is a matter that helps growth, but by itself it can neither create nor undergo a change. For this it requires an active force, the active force in this case being the psyche or nature bestowed by Allāh, the Most High. Even the psyche or the nature does not operate without a tool, and it is innate heat.

Similarly, the statement that the strong appetite in children is due to their cold temperament is also wrong because the morbid appetite which results from cold temperament, is not associated with assimilation and nutrition. Assimilation in children is often at its best. Had it not been so, they would not have been replenished with nutriment greater than that assimilated for growth. But sometimes they suffer from indigestion due to irregularity in meals, eating unwholesome moist things, over-eating and erratic movements after it. For this reason much of what accumulates in them is superfluous matter and often they need depuration, particularly of the lungs. For this reason their respiration is more frequent and rapid, but is not deep because respiratory power has not yet developed fully. This is the statement on the temperament of children and youths, as described by Galen and by us.

One should know that after the period of stability (youth) the heat begins to decrease because the ambient air dries up the moisture of the body. The innate heat also helps to dry up this moisture. Various physical and psychic activities which are an integral part of human life, also reduce this moisture.

Nature is incapable of resisting these factors for ever, as all bodily faculties are limited, as it has been proved in Physics. They cannot function perpetually in supplying food. And even if the supply were unlimited and had been perpetually compensating for what is destroyed, while the destruction is not of a fixed quantity but goes on increasing continuously day by day, compensation could not counteract the destruction and the latter would annihilate the moisture.

So what will happen when both the factors (less compensation and more destruction) are mutually helping in the process of decline and regression? When such is the case, it necessarily follows that the matter (moisture) should perish and consequently heat be extinguished, particularly when, besides the need of matter, another cause helps in its extinction, and it is the extraneous moisture which always arises because the food does not undergo digestion and thus helps the extinction of the innate heat in two ways:

1. by smothering and submerging;
2. by the contrary quality, because this extraneous moisture is phlegmatic and cold.

This is, then, the natural death to which every individual is destined and which varies according to his primary temperament and the limit to which his faculties are capable of preserving the moisture. And for everyone of them is a fixed time and it is different for different individuals owing to the difference of temperaments. These then are the natural deaths. And besides these there are unnatural deaths which happen through other causes. But all are in accordance with Divine Decree.

To sum up, the bodies of children and youths are moderately hot and the bodies of the middle-aged and the old, are cold. But bodies of the children are moister for growth as is shown by experience because their bones and nerves are soft, and it is also proved by deduction because it has not been long since they developed from semen and vaporous pneuma. Though the middle-aged and particularly the old, are colder, they are drier too. It is known by experience because their bones are hard and their skins dry; and also by deduction because it has been long since they developed from semen, blood and vaporous pneuma.

Again, the fieriness in youth and children is equal and the airiness and wateriness are more in children and earthiness in the middle-aged and the old is more than in children and youth but it is more in the old than (in the middle-aged). The youth have a temperament more equable than that of children. But in comparison with children, they have a drier temperament, and in comparison with old and middle-aged, they have a hotter temperament. The old, according to the temperament of their essential organs, are drier than the youth and the middle-aged and more moist than they because of the moistening by extraneous moisture.

If sex is considered with reference to the difference of temperament, it is found that the females are colder than the males. That is why females in their build are shorter than the males. They are also moister. On account of their cold temperament, there is an excess of excreta in them. Because of this, and little exercise, the substance of their flesh is more flabby. If the flesh of men is loose it is because of its composition, the interlacing of nerve fibre and vessels which produce denseness and extreme cold.

People of the northerly countries are more moist; as are the people whose occupation involves contact with water, but the people who live in different circumstances, have different temperaments. We shall describe the signs of temperaments while dealing with the general and special signs and symptoms.

LESSON IV

Humours comprising two Sections

Section I

Nature and types of Humours

Humour is a moist and fluid substance into which aliment is first transformed. There are two types of humours—good humour and residual or bad humour. Good humour is such as has the capacity of becoming a part of and similar to the substance of the recipient of nourishment either singly or in combination with something else. In short, it provides compensation for what is destroyed by the recipient. Residual and Bad humour is one which does not have this property and rarely changes into good humour. It is proper that it should be removed and expelled from the body (before undergoing a change into good humour).

We say that fluids of the body are of two kinds—primary and secondary. The primary fluids are the four humours which we shall describe. Secondary fluids are of two kinds:

(a) Superfluous.
(b) non-superfluous.

We shall now describe the superfluous. Those which are not superfluous are such as have changed from the initial state and have penetrated through the organs but they have not yet become a part of any one of the simple organs in actuality. These are of four kinds:

1. Enclosed fluid: It is enclosed in the cavities of the extremities of minute vessels in proximity of the principal organs which they irrigate.

2. Dewy fluid: It is the fluid which is diffused in the principal members like dew. It is ready for being transformed into nutriment when the body lacks it and also for moistening the organs when any cause, as severe movement or something else, makes them dry.

3. Fluid nearing the period of congealment: It is a nutriment which has been transformed into the substance of the organs with regard to temperament and similarity, but has not been yet transformed with regard to complete consistency.

4. Seminal fluid: The fourth humour is that which exists within the principal organs from the beginning of growth, on account of which there is the integration of the constituents of these organs. Its origin is in the sperm and the origin of sperm is in the humours. And we also say that the humoural fluids—both beneficial and superfluous—are confined to four kinds:

1. Blood, the best of all
2. Phlegm
3. Bile
4. Atrabile (*Sauda*).

Blood

It is hot and moist by nature. It is of two kinds—normal and abnormal.

Normal Blood is red in colour, has no odour and is very sweet. Abnormal blood is of two kinds:

1. that which had deviated from good temperament not because of something mixing with it but because its temperament has in itself become vitiated as, for example, when it turns cold or hot;
2. that which has changed because a vitiated humour has entered into it, and this is of two kinds:
   - (a) either the bad humour might have found access to it from outside then penetrated into it and corrupted it;
   - (b) or the bad humour is generated in the blood itself, as for example, some portion of it gets putrefied. So its rarefied portion changes into yellow bile and the dense portion into black bile and either both or one of them remains therein. This second variety of the two varieties varies according to what is mixed with it, and also according to the variety of phlegm, black bile, yellow bile and wateriness. Thus sometimes it becomes thick and sometimes thin, sometimes very black and sometimes white. Similarly, it varies in its odour and taste and becomes bitter, salty or sourish.

Phlegm

As to the phlegm it may be normal or abnormal. The normal is that which is fit for becoming blood at any time because it is blood which has undergone imperfect coction. And it is a sort of sweet phlegm and is not very cold. But with reference to the body it is less cold, and with reference to blood and bile it is cold. There is a variety of sweet phlegm which is abnormal: it is the phlegm which has no taste as we shall explain—if per chance normal blood is mixed with it. It is often felt in catarrh sputum. And as to the sweet normal phlegm, Galen assumes that nature has not provided any special receptacle for it unlike the two bilious humours. It is because this phlegm, which has close resemblance with blood, is needed by all the organs, and flows through the blood vessels.

We say that this need is for two reasons: necessity and utility. It is necessary for two reasons: one of them is that it (phlegm) should be close to the organs so that it may be readily available (as a substitute) when the organs lack nutriment, i.e., healthy blood, because of the break in supply from stomach and liver. In such an emergency, the organs utilize it through their innate heat, maturating and digesting it to nourish themselves. Just as the innate heat matures it and shapes it into blood, extraneous heat putrefies and corrupts it. There is no necessity for the two bilious humours as they cannot, like the phlegm, be transformed into blood by the innate heat, though they share with the property of becoming putrid and corrupt by abnormal heat.

The second reason for the presence (of phlegm) in blood is that it may mix up with blood and thus prepare it for the nourishment of the organs of phlegmatic temperament as in the brain. It is necessary that phlegm should be present in the nutrient blood in a definite proportion, as is the case with both the biles.

As to the utility (of the presence of phlegm in the blood), it is that it moistens the joints and the organs involved in frequent movement so that they may not become dry because of the heat generated by movement and friction. This is such a utility as to fall almost within the limits of necessity.

The abnormal phlegm is of different excessive consistencies: one which can be felt, and is called mucoid; and that which is perceptible as having homogenous consistency, but is actually hetrogenous and crude; Kind which is very thin and watery; the other which is very thick and white and is called calcareous. It is the rarefied part which gets dissolved because of its prolonged retention inside the joints and the passages, and is the thickest of all the varieties.

There is a variety of phlegm which is salty. It is hotter, drier and lighter than all other varieties of phlegm. The cause for all saltiness lies in aqueous humour which is insipid or of slight taste, mixing up with burnt earthy parts having dry temperament and bitter taste in moderate proportion, because if the earthy parts were in excess, they would make (the mixture) bitter. This is the way the salt originates and water becomes salty. Sometimes salt from ash, alkali and lime etc., is produced by boiling them in water and straining. The strained water is boiled again till it thickens into salt, or it is left to itself and gets thickened. This is the case with aqueous phlegm which either has no taste or has a slight taste which does not predominate. When the burnt bitter bile having dry temperament mixes up with this phlegm in moderate proportion, it makes the phlegm salty and hot. This is the bilious phlegm.

Galen says that this phlegm becomes salty because of putrefaction or because of aquosity which mixes with it. We say that the putrefaction makes it (phlegm) salty because of ignition and (the resultant) ash mixing with the fluid. But aquosity which mixes with the phlegm does not by itself cause saltiness which requires the second factor. It is likely that (Galen's statement) may have contained 'and' which is conjunctive, in place of 'or' which is alternative, and thus the statement becomes perfect.

There is a variety of phlegm which is sour and just as there are two kinds of sweet phlegm, sweet owing to an intrinsic factor and sweet owing to the admixture of extraneous factor—sour phlegm is also of two kinds: that which results from the admixture of an extraneous substance and is sour atrabilious humour, as we shall describe, and the one which results from an intrinsic factor and it is that firstly fermentation and secondly acidity occur in the fermented sweet phlegm or the phlegm in the process of becoming sweet, as happens with all the sweet juices.

There is also a variety of phlegm which is acrid and it is similar (to the previous one). Its acridity sometimes occurs due to the admixture of acrid atrabilious humour, and sometimes because of its being very cold when its taste changes towards acridity because of the congealment of its aquosity and of its partial change into earthiness owing to dryness. So neither the weak heat ferments it and makes it sour, nor the powerful one maturates it.

One of the varieties of phlegm is vitreous, viscous and thick and resembles molten glass in viscosity and density. It is sometimes sour and sometimes insipid. Perhaps the thick part of the insipid phlegm is the raw one itself or it changes into the raw. This variety of phlegm is that which is aqueous and initially cold and is not putrefied and nothing is admixed with it, but it remains shut up till it thickens and increases in coldness. It is now clear that there are four varieties of decayed phlegm according to taste—salty, sour, acrid and tasteless—and four varieties according to consistency: aqueous, vitreous, snotty and plastery. The immature phlegm is considered as snotty.

Bile

As for bile it is also of two kinds (a) Natural (normal), and (b) Superfluous (abnormal). As for natural one, it is the foam of blood being bright-red in colour, light and pungent; the hotter it is, the more red is its colour. So when it is produced in the liver it is divided in two varieties, one of them goes with blood and the other becomes tenuous moving towards gall-bladder. The part of the bile which goes with the blood penetrating it has two reasons (a) Necessity (b) Utility.

As for Necessity, because it is to mix up with blood in providing nourishment to those members which deserve a sound part of bile included in their nourishment, as, for example, the lung.

As for utility it lies in the fact that it attenuates the blood and makes it penetrate narrow canals. As for purified part of bile moving towards the gall-bladder it also has two reasons (a) Necessity and (b) Utility.

As for necessity it has two purposes (a) with reference to the whole body, that is, to purify it from superfluity, (b) with reference to a particular member, that is, to nourish the gall-bladder.

As for utility it is of two kinds (a) to wash out intestines to remove food-residues and viscous phlegm, (b) to irritate the muscle of anus, so that it could feel the necessity, to move for natural call. This is why sometimes colic arises because of an obstruction taking place in the duct proceeding from gall-bladder (bile duct) towards the intestine.

As for abnormal bile it is of two kinds (a) its being abnormal is due to an alien cause which comes to fuse and (b) its being abnormal is intrinsic, i.e., it is in its own abnormal substance. The first kind also is of two varieties (a) one that is familiar and well-known. It is one in whose case the alien cause mixes up with its phlegm, in most cases it is produced in the liver, (b) one that is less familiar is the one in whose case the same cause becomes black bile, the familiar and well-known kind would either be yellow bile or vitelline bile. This division may be explained in this way that the phlegm mixing up with bile may be sometimes tenuous and this would cause the production of the first (yellow bile) whereas at other times it may be dense in which case it would produce the second variety (bile similar to egg yolk).

The less familiar kind is the same as the burnt bile, and its origin takes place in two ways: (a) the bile itself is burnt out with the result that ashness emerges and its tenuity can hardly be distinguished from its ashness which is inseparable, and this is a bad kind; (b) black bile having come from outside mixes up with bile. This kind is good and the colour of this particular kind of bile is red, though not bright and shining, but resembling blood, though thinner than it. Its colour changes due to various reasons.

The bile that is abnormal in its substance is of two kinds: (a) that which originates in the liver in more than usual quantity and (b) that which originates in the stomach in an unusual quantity. The bile formed in the liver in more than usual quantity is of one kind only and this bile is the tenuous part of the blood when it is burnt while the dense part of the same is black bile. The bile formed in the stomach in more than usual quantity is of two varities: (a) leek-green and (b) verdigris and it is likely that leek green originates from the burning of vitelline bile. When it is burnt it produces a kind of blackness which mixes up with a kind of yellowness resulting in greenness as to the verdigris-green biles. Perhaps it is generated from the leek-green bile when its burning is so severe that its moistures are destroyed and it begins to tend towards whiteness because of its dryness. It is because heat first produces blackness in the moist body and later diverts it to the blackness as it begins to destroy its moisture. And as the heat intensifies, it makes the body white. Think of (moist) wood. It is first charred; then it becomes ash. It is because heat produces blackness in the moist body and whiteness in its opposite (dry body). Coldness produces whiteness in the moist body and blackness in its opposite.

Both these remarks of mine about the leek-green and verdigris-green biles are conjectures. The verdigris-green variety of bile is the hottest and worst of all lethal varieties. It is said to be one of the poisonous substances. Black bile is of two kinds: (a) normal; and (b) excessively abnormal.

The normal bile is the residue of good blood, sediment and its turbidity. Its taste lies between sweetness and acridity. When it is produced in the liver, it gets divided into two parts. One part of it goes with blood and the other is directed towards the spleen. The part that goes with the blood is out of necessity and also utility. It needs to mix up with the blood in a required quantity for the nourishment of each of those organs in the nutriment of which there must be a suitable portion of black biles as for example in the bones.

The utility is to make blood compact, more powerful and more dense. The part which passes to the spleen is that which the blood does not need. It also does so out of utility and the necessity. It is either in relation to the whole body and purifying it of superfluous matter or in relation to one particular organ, that is the spleen, for its nourishment.

In so far as the utility is concerned it appears at the time of its being attracted to cardiac orifice. It is useful in two ways:

(a) It tones up the cardiac orifice and makes it dense and strong.
(b) It stirs the cardiac orifice by its acidity and thus generates a sense of hunger and stimulates appetite.

You should know that the bile which is attracted to the gall-bladder is something which the blood does not need; and the part drawn to the gall-bladder is something which the gall-bladder does not require. Similarly the black bile drawn to the spleen is something which the blood does not need and the part drawn away from the spleen is something which is not needed by the spleen.

And just as this last variety of yellow bile excites the expulsive power from below, so this last variety of black bile also excites the attracting power from above. Wherefore Hallowed be Allah, the Best of Creators.

The abnormal black bile is not obtained by way of precipitation and sedimentation but by way of ashy property and combustion. It is because when the moist things blend with earthy ones, the earthy parts are separated in two ways:

(a) by way of precipitation, an example of this being normal black bile in the blood;
(b) by way of combustion so that the rarefied portion is dispersed and the dense portion remains, an example of this is the superfluous black bile called *mirrah sauda* in the blood and humours.

Actually a precipitated part is obtained from blood only because nothing is precipitated from phlegm as from oil, because of its viscosity. Nothing in a marked degree precipitates from the yellow bile because of its thinness, deficiency of earthy matters, its perpetual movement and its meagre quantity which gets separated from the blood in the body. But when something gets separated, it is not long before it putrefies or is expelled. When it putrefies, its rarefied part gets dispersed and the denser part remains behind as black bile resulting from combustion and not from precipitation.

The abnormal black bile has the following varieties:

1. That which is the ashes of yellow bile and the product of its combustion. It is bitter. The difference between this and the bile which we have called burnt bile is that its ashes are admixed with the burnt bile, whereas the ashes of the black bile stand out by themselves and the rarefied portion of which has dispersed.
2. That which is the ashes of phlegm and the product of its burning. So if the phlegm is very thin, aqueous, its ashy product will be saltish and if it is otherwise, it will tend to sourness or acridity.
3. That which is the ashes of blood and the product of its combustion. It is salty, with slight sweetness.
4. That which is the ashes of the normal black bile. When it is thin, its ashes and the product of its combustion are extremely sour like vinegar. It effervescences on the surface of earth with a sour smell from which the flies and other similar insects fly away. If it is thick, it is less sour, and also slightly acrid and bitter.

Thus the varieties of morbid black bile are three: The yellow bile when it gets burnt and the rarefied portion of it is dispersed, and the two varieties which have been mentioned after the yellow bile. As to the phlegmatic black bile, it is less injurious and is slow to act. The more injurious and rapid in action is the bilious variety. But this is more amenable to treatment. Of the remaining two varieties, that one which is more sour is more harmful. Still it is amenable to treatment while it is in early stage. The third variety effervesces less on earth which adheres little to the organs and is slower in its lethal action. But it is obstinate in dissolution, coction and response to medication. These then are the varieties of the normal and abnormal humours.

Galen says that whoever supposes that the normal humour is only blood and nothing else, and that all other humours are superfluous and not needed at all, is not correct. If only blood had been the normal humour to nourish the organs, they would have been similar in temperament and consistency, and bones would not have been harder than the flesh, and brain softer than the bone. If the bone is harder, it is because its blood is the blood with which a hard and atrabilious substance has mixed. And if the brain is softer, it is because its blood is the blood with which a soft phlegmatic substance has mixed.

Moreover, you may find that blood is actually mixed with all other humours. So when blood is taken out and allowed to settle in a vessel, it obviously separates out one part, which is like foam, is the yellow bile; another part, looking like sediment and lees is the black bile: yet another part resembling the white of an egg is the phlegm, and there is watery part, the excess of which flows out in urine.

Wateriness is not a humour, since it is a drink with no nutritional value. It is needed only to dilute the aliment and enables it to permeate through the channels, whereas the humour is derived from nutritive food and drink. When we say that a certain thing is nutritive, we mean that potentially it resembles the human body and the thing which potentially resembles the human body must be a compound body, not a simple one. Water of course is a simple body.

Some people think that the strength of the body depends on the abundance of blood and its weakness is caused by its paucity. But it is not so. It rather depends on how the body assimilates it.

Again some think that regardless of whether the humours are increased or decreased, healthy ones will be maintained if the relative quantities of humours are in the proportion which the human body requires. But it is not so. It is also necessary that each of the humours should have a certain fixed quantity, not merely in relation to another humour but by itself. Nevertheless its proportion in relation to others must also be maintained.

There remain some other discussions on the humours but they are not the concern of the physicians but of the philosophers. So we have omitted them.

Section II

How Humours are generated

It should be known that food undergoes a certain amount of digestion through mastication. It is because the mucous membrane adjoins that of mucosa of the stomach as if both were a single surface in which the digestive power lies. When the masticated food comes in contact with the mucous membrane, it is slightly changed. This change is helped by the saliva which acquires innate heat because of digestion. That is why wheat chewed in mouth acts effectively in the maturation of fruncles and abscesses, but has no such effect when it is grounded, moistened with water and boiled in it. Some hold that the proof of the fact that some digestive change is already beginning in the masticated food is that neither the first taste nor the first smell remains.

Again, when the food enters the stomach, it is digested completely not by the heat of the stomach alone but also by the heat of the surrounding organs—such as liver on the right and spleen on the left. The spleen is warm not because of its substance but because of the numerous arteries and veins which are in it. In front of it there is the fatty omentum which, owing to its fat, receives heat quickly and sends it to the stomach and upward is the heart which warms the stomach through warming the diaphragm.

When food undergoes digestion for the first time, it becomes chyle in many animals by itself and in most of them with the help of the admixture with water that has been taken. It is a fluid substance resembling thick barley water. Its rarefied portion is later drawn from the stomach and also from the intestines, and is pushed forward through the vessels called mesenteric veins. These are thin and tough veins all adjoining the intestines. When the rarefied portion is drawn into these viens, it enters the vein called porta hepatis(portal vein). Then in the liver it penetrates into the filaments and branches of the portal vein, which are very minute and delicate like hair and their mouths meet the mouths of the branches of the roots of the vein which emerges from the convex side of the liver. Nothing can enable the chyle to penetrate these narrow channels except with the aid of mixture with water that has been taken in a quantity greater than that needed by the body. When the chyle spreads to the filaments of these veins, it becomes coextensive with the liver. For this reason the function of the liver becomes more vigorous and quick and at this stage coction begins. Coction, a thing like chyle always produces foam and a thing like sediment. Often both of them together produce a thing inclined to burn in high heat, and an immatured one if the heat is low.

Thus the foam is the yellow bile and the sediment is the black bile. Both of them are normal. The rarefied portion of the burnt out thing is the bad yellow bile, and the thick part of it is the bad black bile. Both of them are abnormal. The immature portion is phlegm, while what comes out purified through maturation out of these is blood.

But as long as the blood remains in the liver, it is thinner than it ought to be because of excess of aquosity which is needed owing to the aforementioned cause. But as soon as this thing, i.e. blood, leaves the liver, it becomes purified and is purged of the excessive aquosity which was needed owing to a cause. But since the cause has disappeared, the aquosity is drawn from the blood into the vessel descending towards the kidneys and carries with it as much of blood as is, quantitatively and qualitatively, suited to the nutrition of the kidneys. So the fattiness and the sanguinity of this aquosity nourish the kidneys and the remaining portion of it passes to the bladder and urethra.

The blood of good consistency passes to the big vein (superior *Vena Cava*) rising from the convex side of the liver and then enters the veins which ramify from it. Again it enters the mesenteric vessels, then the smaller veins, then the channels of the smaller veins, then the capillaries and then percolates from the mouths of these vessels into the organs as destined by the Almighty, the Wise.

The efficient cause of blood is moderate heat; its material cause is the attempered (portion) of excellent food and drinks; its formal cause is the excellent coction; and its final cause is nutrition of the body.

Normal Bile which is the foam of blood, as its efficient cause, is its moderate heat, and the efficient cause of the burnt bile is the excessive fiery heat, particularly in the liver. Its material cause is the light, hot, sweet, greasy and pungent (ingredients) of aliment; its formal cause is over-coction; and its final cause is the aforementioned necessity and utility. Phlegm has, as its efficient cause, insufficient heat; its material cause is the thick cold, moist and viscous portion of food; its formal cause is the insufficient coction; and its final cause is the aforementioned necessity and utility.

Sedimentary Black bile has, as its efficient cause, normal heat; and that of the burnt black bile is the heat exceeding normalcy. Its material cause is the very thick and less moist ingredients of foods, the hotter of them being more potent in this respect. Its formal cause is that sediment which has precipitated in either of the two ways and which neither flows nor gets dispersed. Its final cause is the aforementioned necessity and utility.

Black bile is produced in excess due to—

(a) heat of the liver; (b) weakness of the spleen; (c) excess of freezing cold, prolonged stagnation; or (d) frequent and prolonged diseases which burn the humours to ashes.

When the black bile is in excess and stays between the liver and the stomach, the generation of good blood and humours is diminished. So there is shortage of blood.

It should be known that heat and cold are among the causes of the generation of humours. But temperate heat produces blood, high heat produces yellow bile, and excessive heat produces black bile through excess of burning. Cold produces phlegm, but excessive cold produces black bile through excess of solidification: But the passive faculty should also be kept in view along with the active faculties.

It is not proper to hold the belief that every temperament gives rise to its like and never, whether directly or indirectly, to its opposite. Sometimes it so happens that a temperament indirectly produces its contrary. Consequently, cold and dry temperament occasionally produces moisture that is alien to it. It is so not because there is some resemblance of extrinsic moisture with the cold and dry temperament but because coldness and dryness impair digestion. A person with such a temperament is lean, with loose joints and less hair and cowardly. His skin is cold and greasy and veins thin. An example is the production of phlegm in the elderly people whose temperament is basically cold and dry.

What is left out in the first digestion that takes place in the stomach is eliminated through the intestines. What is left in the second digestion occurring in the liver mostly passes through the urine, the rest going to the spleen and the gall-bladder. What is left in the other two digestions (i.e. third and fourth) is eliminated through dispersion which is not felt: sweat; excreta (filth), some of which secrete either from the visible orifices, such as nose and ear, or from invisible ones such as pores, or through unnatural ways such as bursting abscesses, or through overgrowth, such as hair and nails.

It should be known that the elimination of the humours (easily) debilitate a person whose humours are thin. Their strength is impaired if the pores are wider, because of the weakness that follows greater dispersion. What is easy to disperse and be eliminated, enables the pneuma to disperse with it. So thin humours carry the pneuma with them where they are dispersed and eliminated.

It should be known that as there are causes of the generation of these humours, so there are causes of their movements. Movement and hot articles stir blood and bile and often strengthen and activate black bile, whereas repose strengthens phlegm and some varieties of black bile. Fancies by themselves stir the humours. Looking at red objects activates blood. This is why a person suffering from epistaxis is prohibited from looking at things that are bright red. This is all that we have to say about the humours and their production; the controversies of the rival schools about the correctness of these statements belong to the circle of philosophers, not to that of physicians.

LESSON V

Organs

Section: Nature and different kind of organ

Organs are bodies generated from the primary admixture of sound humours just as the humours are bodies generated from the primary admixture of elements.

Organs are of two kind: simple and compound. Simple organs are those of which whatever perceptible part you take, it carries the same name and definition as a whole, such as flesh amidst its parts, bone amidst its parts, and nerve amidst its parts and all that resembles them. This is why they are called homogeneous organs.

Compound organs are those of which if you take any part it does not carry the same name and definition as a whole, such as, hand, foot and face. So a part of the face is not face and a part of hand is not hand. They are also called instrumental organs because they are the organs of psychic actions and movements.

Bone is the first of all the homogeneous organs. It has been made hard because it is the base of the body and support for movements. Then comes the cartilage. It is softer than the bone. So it can be bent but it is harder than all other members. It has been created for these uses:

It connects well the bones with the soft organs so that the hard and the soft organs are not joined without an intermediary, otherwise the soft ones would be injured by the hard ones, particularly at the occasion of any blow and stumbling. But the joining is gradual just as what is in scapula epigastrium in false ribs and xiphoid cartilage under the sternum. It favourably helps the juxtaposition of the rubbing joints, so they do not get abraded because of their hardness. When some of the muscles extend to a boneless organ which may support and strengthen them, for instance, the muscles of the eyelids, the cartilage serves there as the support and pillar for their tendons. In many places such a support is needed as is obtained from only a firm thing which is not very hard, just as in the case of the larynx.

Then there are the nerves. They are the bodies which originate from brain or spinal cord. They are white, elastic, soft to bend and hard to break. They are created to subserve sensation and movement of the organs.

Then there are the tendons. They are bodies which arise from the ends of some of the muscles and resemble nerves. They meet the movable organs. At times they pull the organs by being pulled themselves through contraction, shrinkage and retraction of the muscles. At times they let them relax with their looseness for the extension of the muscles. Thus the organs either return to their position or they become longer than they are in their natural position as we see in some of the muscles. The tendons are, in most cases, composed of the nerves which starting from the organs proceed to the muscles. Hence they and the muscles are divided into fibres. Then their part which is close to the nerve is filled with flesh and the part which separates from the muscle proceeds to the joints or the movable organs and is concentrated and interwoven as tendons.

Then there are the ligaments which we have mentioned. They too are bodies similar to the nerves. Some of them are called ligaments and some fascia. That which extends to the muscle is simply called ligament, and that which does not extend to it but either connects the ends of the two bones of the joint or joins other organs or firmly binds a thing with another can also be called ligament, but (because of its resemblance) it is specifically called fascia. Ligaments are insensitive so that they may suffer from the excess of movement and friction which are so necessary to them. The use of ligaments may be known from the preceding description.

Then there are the arteries. They are the bodies which arise from the heart. They are elongated, hollow throughout, nerve-like and ligamental. Their movement consists of expansion and contraction with pauses. They are created to supply penuma to the heart to expel smoky vapour from it and to distribute pneuma to the organs of the body.

Then there are the veins. They are similar to the arteries, but they arise from the liver and do not pulsate. They are created to distribute blood to all organs of the body.

Then there are the membranes. They are bodies interwoven by imperceptible nerve-like-fibres which are thin and spread out. They cover the surfaces of other bodies and surround them for the following purposes:

(a) to preserve the form and shape of all that they enclose;

(b) to suspend the enclosed organs from other organs and attach them by means of the nerves and ligaments which split into fibres and thus get interwoven with the membranes such as kidneys from the spine;

(c) to impart the organs, which are in themselves insensitive, a surface which by itself is sensitive to what meets it, and indirectly sensitive to what happens in the enclosed body. Such organs are lungs, liver, spleen and kidneys.

These are essentially insensitive, but are sensitive to the colliding factors, because of the membranes enclosing them. Whenever there is wind or swelling in them, it is perceived by them. If it is wind, the membrane perceives it indirectly because of the tension occurring in it; if it is swelling, it is indirectly perceived at the source and the place of its suspension because of its leaning downwards by the weight of the swelling.

Then there is the flesh. It fills up the gaps inside the organs in the body. They derive their strength from it.

Classification of the organs according to their faculties

Every organ has an innate power which accomplishes its own nutritive function, which is the attraction of the aliment, its retenion, assimilation and adhesion, and expulsion of the superfluous matter. Beyond this, the organs differ. Some of them have, in addition to this faculty, a faculty which passes from them to another organ while certain others have no such faculty. This structure produces:

(a) Recipient-cum-donor organs
(b) Donor, non-recipient organs
(c) Recipient, non-donor organs
(d) Non-recipient, non-donor organs

There is no doubt about the existence of recipient-cum-donor organs. Physicians have agreed that the brain as well as the liver receive the faculty of life, innate heat and pneuma from the heart. Each of them is also the source of the faculty which it donates to another organ, the brain being the absolute source of sensation, according to some, and not absolutely according to others. Similarly the liver is the absolute source of nutrition according to some and not according to others. Nor is there much doubt about the existence of recipient non-donor organ. As for instance, flesh is recipient of the power of sensation and life, but is not on any account the source of power which it donates to others.

As to the two kinds just described, the physicians differ from the great philosopher (Aristotle) with regard to one of them (the donor non-recipient organ). He says that such an organ is the heart. It is the primary source of all the faculties. It gives all the organs the faculties of nutrition, vitality, perception and movement. On the other hand, physicians and a school of ancient philosophers attribute these faculties to various organs and do not believe in an organ which might be the donor but not the recipient. A careful inquiry and scrutiny of upholding his view, while on the face of it, the physicians' view appears plausible.

Again, there is a difference of opinion among the physicians themselves as well as among the philosophers with regard to the last kind (non-recipient, non-donor organ). Some of them hold that bones, insensitive flesh and all similar organs continue to live by their own particular faculties—which do not come to them from another source. Their own faculties are sufficient for them when the aliment reaches them. Thus neither do they impart any faculty to any other organs, nor they receive it from any one else.

Another school holds that these faculties are not particular to the organs, but at the very formation they flow to these organs from the liver or the heart and get settled in them. It is not for a physician to participate in this controversy and try to pursue the point through arguments. The physician, as such, has nothing to do with this controversy, and it does not affect him adversely in any way in his practice.

But with regard to the first controversy, the physician must know and believe that it is not his concern whether the heart is or is not the source of sensation, and whether or not the brain is the source of voluntary movement and the liver that of nutritive faculty. The fact is that the heart in relation to all other organs, is the source of psychic actions whether in itself or from the heart and similarly liver, with reference to all other organs, is the source of nutritive physical actions.

Again with regard to second controversy, the physician must know and believe that it is not his concern whether the natural faculty of an organ, like bone, is derived from the liver at the very start, or whether it accrues by virtue of its temperament, or if neither is true.

The physician must bear in mind that this faculty is not derived from the liver, for unlike the brain whose sensation and motion cease when there is obstruction of the cerebral nerve, there is no disruption in the function of the bone as long as it gets ready nutriment even if the passage between the bone and liver is blocked. But this faculty is innate as long as it retains its own temperament.

Now the nature of the classification of vital organs, auxiliary organs, recipient non-auxiliary organs and non-vital and non-recipient organs will have become clear to the physician.

Vital organs are the organs which are the source of primary faculties in the body, and are indispensable for the existence of the individual or the species.

There are three vital organs for the survival of the individual: the heat which is the source of vital faculty, the brain which is the source of the twin faculties of sensation and motion, and the liver which is the source of nutritive faculty.

For the survival of the species, the vital organs are these three plus a fourth which is particular to the species, the testicles. They are necessary for a particular purpose and have also a utility: the necessity being the production of semen and the preservation of species, and the utility being the bestowal of perfect masculine and feminine shape and temperament which are among the necessary phenomenal features of the animal species but are not among the essential constituents of life as such. Of the auxiliary organs, some play a preparatory role and some serve as supply lines.

The preparatory service is called 'utility' and the supply service is called service in general. The preparatory service precedes the functioning of a vital organ and the supply service follows it.

Heart

Organs that render preparatory service to the heart are, for instance, the lungs and those that serve as supply lines are the arteries. The organs that are auxiliary to the brain are liver and all those organs that have to do with nutrition and preservation of the pneuma while the nerves serve as supply lines.

Liver

The preparatory auxiliary organs are such as stomach, and the ones that serve as supply lines are such as the veins.

Testicles

The preparatory auxiliary organs of the testicles are the organs producing semen before they do and the supply lines are, in the male, the urethra and the channels between the testicles and the urethra, and in the female, the channels through which semen passes into the uterus. The female, in addition, has the uterus in which the preparatory service with regard to semen is completed.

Galen says that some of the organs have only a function, some have only a utility and some have a function and a utility at the same time. The example of the first is the heart, of the second, the lungs and of the third, the liver.

I say that we should mean by a function which is completed by the organs alone and is included among those functions which maintain the life of an individual and perpetuate the species, as for example, the function of heart in producing pneuma.

We should mean by 'utility' the preparation (made by one organ) for another to receive action, till at last the action becomes complete for giving life to an individual or for perpetuating the species, as for example the preparedness of the lungs for the air.

The liver first completes the second digestion occurring therein and then prepares for the third and fourth digestions. When the first digestion is completed, healthy blood is produced which provides nutrition to (the liver) itself for it has a function to perform. Since the liver performs an action which subserves a future action, it is called utility.

Classification of organs according to their formation

Let us point out at the outset that all organs are formed from semen and they are homogeneous, except flesh and fat, which are formed from blood. All the organs, excepting these two, are formed from both male and female semen.

But, according to the investigation of one of the philosophers, the semen of the male acts in the generation of organs in the same way as the rennet acts in the formation of a cheese, and the semen of the female is used in the generation of the organs in the same way as milk is used in the preparation of cheese. And as the rennet has the coagulating power, so the semen of the male has the power of coagulating into a shape. And as the milk has the property of being coagulated so the semen of the female has the property of being coagulated into a shape, i.e., the reactive power. Just as both rennet and milk are components of cheese, so the semen of both male and female are components of the embryo.

This view differs vastly from that of Galen. He considers that each of the semens has both a coagulative faculty and a receptive capacity for coagulation. Besides, he asserts that the coagulative faculty is stronger in the male semen, but the receptive capacity of coagulation is stronger in the semen of female. The established view in this matter is given in our books on fundamental sciences.

During pregnancy, the blood which is otherwise discharged from the female at the time of menstruation becomes nutriment. One portion of it changes into the likeness of the substance of semen and of the organs to be shaped from it. Thus it becomes the nutriment which causes their growth. There is another portion of it which does not become nutriment for them, but is capable of being coagulated inside it which fills up the interstices in the principal organs and becomes fat or flesh. Yet another portion of it is superfluous and not usable for either of the two purposes. It stays till childbirth, and then is expelled by nature. When the child is born, the blood which is produced by the child's liver takes the place of the (maternal) blood and begins to produce what was being produced from that (maternal) blood.

Flesh is formed from thick blood, the heat and dryness coagulate it, while fat is formed from wateriness and greasiness of the blood and cold coagulates it. This is why heat dissolves it.

Whenever the organs, which are formed from the two kinds of semens, are separated, they do not really reunite, except in very rare cases during childhood, for example, bones, small branches of veins—but not the big ones—and the arteries. When any part of such organs is removed, nothing grows as its substitute. The organs which are formed from blood, such as flesh, grow and reunite if breached. Organs formed from blood, which have not broken away completely from their seminal state, can grow again when they die like the teeth of a child. But when the blood (of an organ) takes on a different temperament it cannot grow again.

We have to add that sometimes for all the sensory motor organs the source of both sensation and movement is one single nerve and sometimes not. That is, the source of each of these faculties is a separate nerve.

We have also to say that the membranes of all such viscera as are enveloped by them grow from either of the pleura or peritoneum. The membranes of the organs in the chest, such as diaphragm, veins, lungs and arteries, arise from the pleura ribs, while the membranes of the organs and the vessels of the abdomen arise from the peritoneum lining the muscles of abdomen.

Again, all the fleshy organs are either fibrous, such as the flesh of the muscle, or non-fibrous such as the liver. No movement is possible without the help of the fibres. Voluntary movements are caused by the fibres of the muscles while involuntary ones, such as the movement of the uterus and the vessels and the movements, both voluntary and involuntary, such as the movement of deglutition are caused by the fibres characterized by their longitudinal, transverse and oblique formation. Thus the longitudinal fibres are for attraction, the transverse and the constricting for expulsion and the oblique for retention.

Those of the organs which possess only one layer, such as the veins, have all the three kinds of fibres interwoven with one another. And those which possess two layers have the transverse fibres in the outer layer and the other two in the inner layer. But the longitudinal fibres are inclined to the inner surface. They are so created that the fibres of attraction and expulsion may not intermingle though the fibres of attraction and retention have a greater claim to intermingle except those of the intestines because their need for retention is not as great as it is for attraction and expulsion.

We may also mention that the nerve-like organs surrounding the bodies which are alien to their substance are of two kinds:

(a) Those having one layer

(b) Those having two layers.

Those having two layers are created for certain purposes: first, making their structure firm with great precaution so that they may not rupture owing to the force of the movement of their content such as the arteries. Secondly, greater precaution is needed so that the contents are not dissipated or expelled. In respect of a single layer, there is risk of dissipation or expulsion of the tenuous matter because of the thinness and delicacy of that layer in response to protection being subject to rupture and loss. The pneuma is lost through dissipation and blood through rupture and this poses a great danger. Thirdly, every organ needs the same propensity for expulsion as it has for attraction, which is brought about by the separation of the (two kinds) of fibres, as is the case with the stomach and intestines. Fourthly, each of the layers of an organ is meant for a particular function, and when each of the two action takes place from a temperament contrary to the temperament of the other, their separation is quite appropriate. Thus in the case of stomach, there is the need of both sensation and digestion. Sensation is possible only through a nerve like organ and digestion only through a fleshy one (muscular). Thus for each of the two purposes there is a separate layer. The nerve-like layer is for sensation and the fleshy one for digestion. The inner layer is made nerve-like and the outer one fleshy. It is so because the digestive faculty may have an access to what is digested without contact with it, whereas the perceptive faculty cannot find access to what is perceived and by perception I mean the tactile sensation.

I say that some of the organs have a temperament so close to that of blood that the latter does not require to undergo many changes in order to be used in their nutrition, such as flesh. For this reason it has no cavities and recesses wherein the exceeding nutriment may stay for a time and then the flesh be nourished by it. On the contrary, as soon as the nutriment reaches the flesh it changes into it.

Then there are organs having a temperament dissimilar to that of the blood. Therefore the blood, in order to change itself into organs, must undergo many stages of change to become like them in substance, such as the bone. For this purpose one or several cavities have been made in the structure of bones. These cavities contain the nutriment of the bone for a certain period during which the nutriment changes into their likeness. Example of the bones having one cavity is tibia and humerus and of those having several cavities is lower maxillary bone.

Organs like the latter are in need of storing more nutriment than their immediate requirement so that it may transform gradually into their own likeness.

Stronger organs pass on their superfluous matter to the weaker organs. Thus the heart passes on its superfluous matter to the axilla, the brain, the auricular glands, and the liver towards the groins.

CLAUSE I

Section I—Bone

Comprising thirty Sections

Description of Bones and Joints

We say that there are bones which provide a foundation to the body, e.g., vertebral column. This column provides a foundation to the body in the same manner in which the central beam provides the foundation to the boat whose other parts are joined to this beam. There are bones which act as a shield and support for the body, e.g., the parietal bones. There are bones which serve as weapons of defence for the body and protect it from blows and injuries, e.g., the spinous processes which are on the vertebral column like thorns. Then there are small bones which fill the spaces between the joints, e.g., sesamoid bones which exist among the phalanges. Some bones are attached to the parts requiring support, e.g., hyoid bone which keeps the larynx and the tongue suspended.

Thus all the bones provide a foundation and support to the body. The bones which merely serve as a support to the body do not move the organs. These bones are solid, although they do have necessary pores, spaces and interstices. The bones meant for movement possess more cavities and a central cavity so that it does not stand in need of different kinds of nutriment. Were it not so, the bone would become flexible, whereas it is hard. The nutriment accumulates in the cavities to form marrow. The use of increased cavities in a bone is that it might be lighter, while the use of a single cavity is to make the bone harder. The hardness of the bone serves to prevent it from breaking due to vigorous movements. The use of bone-marrow is to provide nutrition to the bones as we have mentioned before. Moreover, it keeps the bone constantly moist so that it might not break into fragments as a result of desiccation caused by movement. With marrow, the bone, in spite of its cavity, becomes almost solid. Where there is greater need for strength, cavity has been narrowed, and where lightness is needed more, it has been made wider.

Spongy bones have been structured for the purpose of nutrition, as described earlier, and further for allowing what is necessary to penetrate into them, as the inhaled smell along with the air goes into the ethmoid bone. Moreover, the superfluous matter of the brain is expelled through them.

All the bones are inter-related and inter-connected. There is no much distance between any of the bones. However, in some of them there is a little intervening space which is filled with cartilaginous appendages. These are created for the same function as that of the cartilages. But where consideration of this function is not necessary, a joint has been created between the two bones without any appendage, as in the case of lower jaw.

The inter-connection between the bones is of various kinds. One kind of it is that of the freely movable joints (diarthrosis). Another kind of it is that of the joint which is not fixed and moves with difficulty (amphiarthrosis). The third kind of it is that of a fixed, sutured and cohering joint (synarthrosis).

Diarthrosis

It is the joint in which one of the two articular bones moves freely while the other remains stationary, e.g., the joint of the wrist with forearm.

Amphiarthrosis

It is a joint in which only one of the two bones moves with difficulty and slightly, e.g., the joint between the carpal and metacarpal bones or the joint between the two of the metacarpal bones.

Synarthrosis

It is a joint in which neither of the two bones is able to move, e.g., the joints of sternum.

Fixed joint (gomphosis) is one in which one of the bones has a process and the other a cavity and the process of the one is inserted into the cavity of the other in such a way that there is no movement, e.g., the teeth fixed in the jaw.

Sutured joint is one in which each of the two bones has sharp saw-like teeth and notch. The teeth of one bone are fitted into the notches of the other as the coppersmith joins copper plates. This attachement is called suture as in the case of the joints of skull bones. Cohering joint is the one in which bones are joined to each other in the long axes as between the two bones of forearm and in the transverse axes as in the joints between the lower vertebrae of the spine. Joints between the upper (lumbar) vertebrae are partially movable.

Section II

Anatomy of the Skull

All the bones of the skull are a shield for the brain. They cover the brain and protect it from injuries. The skull has several bones with one at the top, the use of which we shall describe in two parts. One regarding matters with reference to the bone itself and the other with reference to the contents of the bones.

The first has two advantages:

(a) A casual fracture or putrefaction in a part of the skull does not affect the whole skull as it would had there been only one bone.

(b) A single bone could not provide variation of hardness, softness, porosity, density, thinness and thickness. This variation is required by the skull, as will be shortly described.

As to the second part, some of the advantages accruing from sutures are with reference to the brain itself. When the thick vapours are unable to penetrate into the bones because of the thickness, they get a way out through these sutures and thus the brain is purified through dispersion. The other advantage is with reference to the nerve-fibres which are spread through organs of head. These nerve-fibres come out of the brain through these sutures.

There are two advantages common to the brain and other two things. The first is that the veins and the arteries entering the head find a passage in-between the bones and the second is that the parts of the thick, heavy membrane are attached with the sutures. Thus it rises above the brain and does not press upon it.

The normal shape of the skull is spherical and it is so for two purposes. One of them is concerned with the interior of the skull. It is because a spherical figure occupies a greater area than any other rectangular figure provided both have equal perimeters. The other is concerned with the exterior because a spherical figure is not so much affected by the shocks and blows as a rectangular one. The skull is not completely spherical but oval. This is because the roots of cranial nerves are necessarily placed lengthwise, so that they might not be compressed. The skull projections are both in front and at the back. They enable the nerves arising from the front and the back of the brain to be properly protected. For a shape like this the skull has three true and two 'false' sutures. Among the first kind is the bow-like suture which joins the forehead and has a shape like this . It is called coronal suture. The second is straight and bisects the skull longitudinally. Considered alone, it is called sagittal suture. But when it is considered with respect to its connection with the coronal suture, it is called skewerlike suture. Its shape is that of a bow having a straight line as perpendicular in the middle of it like this

The third suture is common between the occiput and the base of the skull (sphenoid bone). It has the shape of a mason's square the apex of which is joined to the end of the sagittal suture. It is known as the lambdoid suture because it resembles the Greek letter Lambda . When it is connected with the two aforementioned sutures it becomes like this . There are two false sutures. They run through the length of the skull on both sides of the bow-like suture and are parallel to it. They do not penetrate the bone completely. Hence they are known as squamous sutures. When they meet the former three true ones, they take the shape like this . This is the normal shape of skull having all the sutures.

The skull has three abnormal shapes. In the first one the frontal eminence diminishes so there is no coronal suture. In the second the eminence at the back diminishes so there is no lambdoid suture. In the third both the eminences disappear and the skull is then round with length and breadth being equal.

The great physician Galen says that when the length and breadth of this shape are equal, equity in distribution requires the sutures also should be equal. But the division is such that in the first kind of suture there are one longitudinal and two transverse sutures.

If Galen's statement is true there should have been one longitudinal and one transverse suture, the transverse suture running from ear to ear, and the longitudinal suture running in the middle. The learned Galen says that the skull cannot possibly have the fourth abnormal shape, because if the skull becomes shorter in length or breadth it will make either the brain itself or its ventricles too small and that would not be compatible with life, and he endorsed the opinion of the topmost physician, Hippocrates, that the shapes of the skull are only four (one normal and three abnormal).

Section III

Anatomy of Bones other than Skull

The skull has five additional bones. Four of these serve as walls and the fifth as the base. These walls are made stronger than the parietal bones because they are more exposed to injuries and impacts. Moreover, the need for the porosity in the parietal bones and the skull is greater for two purposes: first to allow intervening vapours to diffuse through them, secondly that the vault might not be too heavy for the brain. The strongest of the walls is the one which is at the back because it conceals and protects the sensory organs.

The first wall is the frontal bone. It is bounded from above by the coronal suture and from below, by a suture (transverse suture) which starts from the end of the coronal suture, and passing through the orbit below the eyebrows, joins the other end of the coronal suture. The two walls in the right and left are the two bones which contain the two ears. They are known as petrous bones for their hardness. Each of the two is bounded, from above, by the squamous suture and from below, by the suture which starts from the end of the lambdoid suture and passes on till it ends at coronal suture and from front and behind, by a part of coronal and lambdoid sutures respectively. The fourth wall is bounded from above, by the lambdoid suture and from below, by the suture which is common between the skull and the sphenoid bone and joins the ends of the lambdoid suture. The base of the brain is the bone which supports all the bones and is known as the sphenoid bone. It has been made hard for two reasons: it is helpful in supporting the skull and is less liable to putrefaction by superfluous matter. This bone has been placed right under the continuously pouring excretions. Hence care has been taken to make it hard. In each of the two sides of the temples, there are two hard bones. These bones cover the nerve going to the temple. These are placed obliquely along the length of the temple and are known as zygomata.

Section IV

Anatomy of Bones of the Jaws and Nose

We shall describe the number of maxilla with the description of the suture of the jaws. Let us observe that the maxilla is bounded from above by a suture common to the maxilla and frontal bone. It runs beneath the eyebrows from one temple to another. From below it is bounded by the beds of teeth and from the two sides, by the suture which comes from the region of the ears and is common to the maxilla and the sphenoid bone which is behind the molar teeth. Then its other end, which is the extreme limit, turns slightly for the second time towards the interior and thus becomes that suture which separates this suture from the suture to be described next. This is the suture which divides the upper part of the palate lengthwise. These are boundaries of the maxilla.

Of the sutures inside the boundaries of maxilla there is one which divides the upper part of the palate lengthwise. This second suture starts from a point between the two eyebrows and runs towards the space between the two incisors. Another suture starts from a point near the origin of the second suture and coming down turns away from the second suture and descends towards the space between the lateral incisors and canine tooth on the right. And there is a similar suture on the left. Bounded by these three sutures the central and the two lateral and the roots of the teeth are two triangular bones. The two bases of the two triangles are not near the roots of the teeth. There intervenes between them a suture crossing transversely near the base of the nostrils. Since the three sutures go beyond the transversely crossing suture upto the aforementioned positions so two bones are found below the two triangles. These bones are completely bounded by the bases of the two triangles, the roots of the teeth and the two branches of lateral sutures. And the descending part of the middle suture separates one of the two bones from the other. Thus each bone forms two right angles at this separating suture, an acute angle at the two canine teeth and an obtuse angle at the two nostrils.

Of the sutures of maxilla there is one which descends from the upper common suture and goes in the direction of the region of the eye. When it crosses the orbit of the eye it divides into three branches. One branch passes beneath the suture common to frontal bone and the upper part of the orbit till it joins the eyebrow. The other suture near it similarly joins the eyebrow without entering the orbit. The third suture similarly joins (the eyebrow) after entering the orbit. Each of these three sutures is placed lower than the suture which is below the eyebrow. Thus it is farther from the place which is touched by the maxilla. But the bone which is separated by the first of these three sutures is the largest one; next to it in size is the bone which is separated by the second suture; then is the one which is separated by the third suture.

Nose

The functions of the nose, which are obvious, are three:

It assists inhalation by means of its cavity till a large quantity of air is collected in it and also becomes conditioned before passing to the brain. Though the major portion of the inhaled air goes to the lungs, a suitable quantity of it goes to the brain also; it also stores suitable air in one place, in front of the olfactory organ, for inhalation which governs smell, so that perception might be best and more suitable. These three uses constitute one function.

It helps in the articulation of letters and facilitates their pronunciation and prevents the air from accumulating at the place wherein articulation is attempted with the help of a certain quantity of air. These two uses constitute one function. The example of what nose does in regulating air for letters is that of the hole at the back of glottis which is not plugged.

The third function is that it keeps the superfluous matter from the head hidden from the sight, and also serves as a helpful instrument for blowing off the superfluous matter.

Nose is formed of two bones which are like triangles. Their angles meet at the top and their bases touch each other at an angle and are separated by two angles. Each of the two bones partakes in forming the two lateral sutures mentioned under the sutures of the facial bones.

On the two lower ends of these two bones, there are two soft cartilages. In between the two, along the length of the middle suture, there is the cartilage the upper part of which is harder than the lower one. It is, on the whole, harder than the other two cartilages. The function of the middle cartilage is to divide the nose in two nostrils so that when any descending superfluous matter descends from the brain, it often turns towards one of the nostrils. Thus it does not obstruct the whole passage of inhalation which supplies to the brain the air which is refreshing for the psychic pneuma. The functions of the two lateral cartilages are three:

> The first function is that which is common to the cartilages at the ends of all bones. We have already dealt with them.
> The second is that they might widen and expand if there is greater need for inhalation or blowing.
> The third function is that they might assist in expelling vapours at the time of blowing by their shaking, propelling and vibrating movements.

The two nasal bones are made thin and light because here the need for lightness is greater than their need for firmness, and particularly because they are not joined to the organs which are susceptible to injuries and because they are within the direct approach of the sensory organs.

The shape of the mandible and its function are well-known. It consists of two bones which are joined under the chin by an immovable joint, i.e., synarthrosis. The other two sides of these bones rise near the end of each of them in the form of a curved projection consisting of a socketed process. This process grows from the bone which is at the end of each of the two sides. Being situated one above the other they are tied together by means of ligaments.

Section V

Anatomy of Teeth

There are thirty-two teeth in all. Sometimes the wisdom teeth are absent in some persons and there are four terminal teeth. Then there are only twenty-eight teeth.

Out of these there are two central incisors and at their sides two lateral incisors in the upper jaw and the same number is in the lower jaw. These teeth are for cutting. Again there are two canine teeth in the upper jaw and two in the lower. They are used for biting. On each side, both above and below, there are four or five molars for grinding. Thus the total is thirty-two or twenty-eight: 4 central incisors, 4 lateral incisors, 4 canine, 16 molars, and 4 wisdom teeth. The wisdom teeth mostly grow during the middle of the period of growth, that is between adolescence and the age of stability which is about thirty years. That is why they are called the wisdom teeth. Teeth have roots with sharp ends, firmly fixed into the cavities of the bones of the two jaws which hold them. On the margin of each cavity there grows a bony circular process which contains the tooth and makes it firm, and at that place there are strong ligatures. Every tooth, excepting the molars, has only one root. Each of the molars fixed in the lower jaw has at least two roots, and sometimes three, particularly the two wisdom teeth, whereas each of the molars fixed in the upper jaw has at least three roots and sometimes particularly the wisdom teeth, four. The roots of the molars are many because they are big and have to do much work. The upper molars have a larger number of roots because they are suspended and their weight is against their roots. As for the lower molars, their weight is not against their roots. No bone is sensitive excepting the teeth.

Galen says and observation confirms that the teeth have sensation which is assisted by the power which comes to them from the brain so that the teeth might distinguish between hot and cold.

Section VI

Functions of Spine

Spine has been made for four functions:

First, it gives passage to the spinal cord which is essential for living beings. We shall describe the function of the spinal cord in detail in its proper place.

Here we shall briefly state that if all the nerves had arisen from the brain, the head would have been necessarily much bigger than what it is and its load would have been too heavy for the body to bear; and nerves would have then to traverse a longer distance till they reached the end of the extremities and thus be exposed to injuries and severance. Besides, their length would enfeeble their strength in attracting their heavy organs towards their origins. Magnificent is the Creator, Who sends the spinal cord, which is a part of the brain, down to the lower part of the body, like a canal from a spring so that the branches of the nerves extend to the extremities and the spinal cord becomes equidistant and in proximity with the organs. Moreover, the vertebral column forms a protected track for the spinal cord.

Secondly, the spine is shield and protection for noble organs which are in front of it and for this reason thorns and spines have been made for it.

Thirdly, the spine has been made hard so that it might serve as the base for the bones of the body, like the plank which takes precedence in the carving of a boat, then all other planks are joined and fitted together. For this reason spine has been made hard.

Fourthly, the spine serves as a pillar and imparts stability to the upright posture of human beings and enables them to move in different directions through flexing and stretching. For this reason spine has been made of many vertebrae strung together and not for a single bone or many bulky bones. The joints between the vertebrae are made neither so freely movable as to enfeeble the structure, nor so immovable as to prevent bending.

Section VII

Anatomy of Vertebrae

A vertebra is a bone with a hole in its middle. The spinal cord passes through this hole. It has four processes with two at the right and two at the left sides of the hole. The upper ones of these are said to be upward processes, and the lower ones are said to be 'downward processes', also called inverted processes. Sometimes there are six processes—four on one side and two on the other—and at times eight. The function of these processes is to provide articular connection between the vertebrae by means of the cavities of some and the condyloid projection of the others.

Again, the vertebrae have the processes not simply for the sake of the above function, but also for protection, shelter and resistance against impact and for the purpose that the ligaments might be woven over them. These are broad and hard bones placed lengthwise along the vertebrae. So those which are placed at the back of vertebrae are called spinous processes and those which are placed at the right and the left are called lateral processes. They protect the nerves, vessels and muscles which are placed farther in the interior along the length of the body.

Some of the lateral processes closed to the ribs, have a special function—to produce cavities with which the convex tips of the ribs fit in. Each of the lateral processes has two cavities and each rib has two convex processes. Of the lateral processes, there are those which have two heads and thus appear to have double processes, they are found in cervical vertebrae. We shall be describing their function. In addition to the central foramen, the vertebrae have other foramina also, for the outgoing nerves and the incoming vessels.

The work of some of these foramina is obtained completely from a single hole in the vertebra, and of some by two vertebrae jointly when they are juxtaposed. Sometimes it is from two directions simultaneously, i.e., upper and lower and sometimes from only one direction. Sometimes each of the two vertebrae forms a full semi-circle and sometimes one of them is larger and the other smaller. These foramina are placed on both the sides of the vertebra and not at the back because then there would be no protection for what emerges and enters through them and they would be exposed to friction and collision. Again, they are not placed in front of the vertebrae, otherwise they would be located where the force of the natural gravity of the body and its voluntary movements are directed. This would weaken them and they would not be firmly connected and bound together. Also the force directed towards the source of the nerves would compress them and enfeeble them.

Ligaments and tendons surround these processes which are meant for protection. Fluids which provide smoothness and facilitate movement, flow on them and prevent the flesh from being injured by contact. The same condition is found in articular processes also, because they are tied from all sides with one another very firmly by means of ligaments and tendons. Their anterior connection is more firm and the posterior one is more flexible because the need for leaning and bowing towards the front is greater than that of bending and turning towards the back. The ligaments at the back are loose, necessarily creating space which is reduced by viscid fluids. Thus the vertebrae of the spine, being more firmly connected on one side, are as if they were a single bone, and impart stability and firmness; on the other side, because of their being loose, they are as if they were multiple bones made for movement.

Section VIII

Functions the of Neck and Anatomy of its Bones

The neck has been created for the sake of trachea and trachea has been made for the functions which we shall describe in the proper place. And as the cervical vertebrae, in general the upper ones, are borne by the lower ones of the spine, they must be smaller. It is because the object borne must be lighter than the bearer, especially when the movements are intended to be according to the natural system. Since the upper part of the spinal cord, as that of a canal, should be the thickest and biggest, because what pertains to the upper part from where the nerves branch out is bigger than what pertains to the lower, the foramina of the cervical vertebrae must be wider. And since the smallness of vertebrae and the wideness of the cavity are among the factors which make the substance of the vertebrae thin, there must be some means of firmness which might compensate for the weakness caused by the aforementioned two factors. Hence they must be made hardest of the vertebrae.

Since the substance of each of these vertebrae is thin, their spines have been made small. Had these been made long, the vertebrae would easily break and be injured whenever things would forcibly collide against their spines. Since their spines are small, their transverse processes have been made large and bifid, and since they need movement more than stability, as they do not have to bear as many bones as those beneath them have to do, for this reason too, the joints of upper cervical vertebrae have been made more loose and mobile in comparison with the joints of the lower ones. The firmness which is lost by the cervical vertebrae for their being mobile is restored to them in equal or even greater measure because the nerves, muscles and vessels which surround them and pass over them. As such, the joints do not need much strengthening, and only a small number of ligaments suffice. That is why the upper and lower articular processes are not made as large and wide as those in the lower part of the neck. But their bases are made longer and their ligaments more loose, and the outlets for the nerves, as we have already mentioned, have been made with the help of two adjoining vertebrae. Each vertebrae, owing to its thinness, smallness and width of the passage of the spinal cord, is unable to bear special foramina except the one which we have excluded from it. We shall now describe it.

Cervical vertebrae

Let us say at the outset that cervical vertebrae are seven in number. This is, in fact, the appropriate number and length. Each of these, except the first, has all the aforementioned eleven processes: one spinous, two transverse, four upper and four lower articular processes. Each transverse process has two branches. The circular passage for the nerves is divided into two halves by the two vertebrae. The first and the second vertebrae have such characteristics as are not found in other vertebrae. It must be known first that the movement of head towards right and left is carried out with the help of the joint which is between the head and the first vertebra while the forward and backward movements of head take place with the help of the joint which is between it and the second vertebra. We must deal first with the first joint.

Let us observe that on the two upper articular processes of the first vertebra, there have been created on the upper side two cavities in which two processes of the occipital bone enter. Since one of them is elevated and the other depressed, the head tilts towards the depressed one; since it was not possible to have the second joint on this vertebra, a separate vertebra was provided for the second joint, which is the second (vertebra). From its frontal side proximate to the interior, there grows a long, hard process which forms the axis and enters in front of the spinal cord, the foramen of the first vertebra. The foramen common to both of them, and by that I mean to say, the foramen from back to front, is longer than it is from right to left. And it is because in between the front and the back there are two entrants occupying greater room than that occupied by a single one. As to the extent of the width, it is according to the greater one of the two entrants that is the spinal cord. The other entrant is odontoid process. The spinal cord has been protected from the process by means of strong ligaments which are made to separate the region of odontoid process from that of spinal cord so that the process might neither break the cord by its movement nor compress it. Again this process ascends from the first vertebra and enters the cavity of the occipital bone; and the depression which is in the occipital bone rotates upon it, and with it the head, from back to front. The odontoid process has been made towards the front for two purposes: that it should provide more effective protection to the first vertebra, and that the thinner side of the vertebra should be inside and not outside.

The peculiarity of the first vertebra is that it has no spinous process as it would make the vertebra heavy, exposing it to injuries. In fact, the process which defends the stronger is also liable to break and injure the weaker. Also (the spinous process) would break the muscles and nerves which are placed plentifully around it, though here there is little need for a defending spinous process, as this vertebra is, as it were, buried deep in shelters which are far from the reach of injuries. And for the same reason it is devoid of the lateral processes, particularly when most of the muscles and nerves located on both the sides are delicate and close to the source, there remains no room for the lateral processes. One of the characteristics of this vertebra is that nerves emerge neither from its sides nor from the intervertebral foramen but from two foramina which are close to its two upper sides towards the back. If the passage of the nerves had been where the two processes of head enter and where their forceful movement takes place, they would be severely injured. Similar would have been the case if they would have been where the second vertebra meets the two processes of the first vertebra. These processes enter the cavities of the second and form a movable joint which moves forwards and backwards. It would also not have been suitable for the nerves to emerge either from the posterior or anterior part owing to the reason already mentioned in the description of all the vertebrae, or from the two sides because of the thinness of the bone owing to adontoid process. Thus, it was inevitable for the nerves that they should be a little below the joint of head and towards the back of the two sides, that is, they are midway between the back and the side. And since the two foramina are necessarily small, hence the nerves also are finer.

In the case of the second vertebra it was not possible for the nerves to emerge from above the verterba as it was possible in the case of the first vertebra. There was the danger of the nerves being broken and bruised by the movement of the first vertebra over it in bowing the head towards the front or turning it towards the back, had the passage of its nerves been at the first vertebra. It was also not possible for them to have emerged from the front or back of the vertebra for the aforementioned reasons. Again it was not possible for them to have emerged from the two sides, as this would bring them in conjunction with the first vertebra, making them necessarily thin and leaving little room in the first vertebra, resulting in weak pairs close to each other, with the possibility of their union with the first vertebra. The deterioration that would occur in the first vertebra, if it had been perforated at the two sides, is obvious. It was necessary that the foramina of the second vertebra should be so located in the two sides of the spinous process that they might correspond to the two foramina of the first vertebra and the substance of the first vertebra might be able to share in forming the two foramina. The adontoid process growing from the second vertebra is tied with the first by means of strong ligaments. The joint which the head and the first vertebra together make with the second vertebra is more mobile than all the joints of the vertebrae owing to the great need of movements which is performed by the two whose structure is evidently perfect. When the head moves with the joint of one of the two vertebrae, the second vertebra, by virtue of its joint, so clings to the first as if both were one. So, if the head moves forwards and backwards it becomes with the first vertebra as a single bone, and if it moves towards the two sides without bending the first and the second vertebrae become as a single bone. This is what we had to present concerning the cervical vertebrae and their characteristics.

Section IX

Anatomy of Thoracic Vertebrae and their functions

Thoracic vertebrae are those with which the ribs meet and then enclose the respiratory organs. There are eleven vertebrae with spinous and transverse processes, and one which has no transverse processes. Thus there are twelve vertebrae. Their spinous processes are unequal, the processes which are close to the vital organs being bigger and stronger.

The transverse processes of the thoracic vertebrae are harder than those of the other vertebrae owing to the articulation of the ribs with them. In seven upper thoracic vertebrae the spinous processes are big and the transverse processes are thick so as to provide thorough protection to the heart. Since their bodies enter the spinous and transverse processes, their articular processes are made short and wide. The articular processes of the vertebrae, except the tenth, are broad and directed upwards with condyloid fossa. The articular processes directed downwards have protuberances which fit into the fossa and their spinous processes are directed downwards. The spinous processes of the tenth thoracic vertebra rise like a dome. Its articular processes have fossa without condyles at both ends because it is fixed from both above and below. But in the vertebra below the tenth, the condyles of the articular processes are directed upwards and the fossa downwards, and its spinous protuberances are directed upwards. We shall describe the functions of all these later. The smallness of the ribs necessitates the absence of the transverse process in the twelfth vertebra, but it is protected by other means which combine protection with other advantages which will now be explained. It is necessary for the lumbar vertebrae to be larger and their joints to be stronger for carrying what is above them. So it is also necessary for the fossa and processes in the joints to be greater in number. Thus their articular processes have been made double. And it is also necessary that the facet which is close to the twelfth vertebra should be made similar to the latter. Thus its articular processes have been doubled. The substance which was fit to be used in the formation of the transverse processes is thus exhausted in the formation of the (extra) articular processes. Moreover, these processes are made so wide that they are almost similar to the transverse processes. Thus twine advantages accrue from this formation. It is to this twelfth vertebrae that one side of the diaphragm is attached. Thus the smallness of those vertebrae which are above the twelfth renders this sort of strengthening by means of numerous articular processes needless. But the spinous and transverse processes growing from them have been enlarged. So their substance has been diverted from the creation of numerous articular processes. And as the thoracic vertebrae are larger than the cervical ones, the inter-vertebrae foramen has not been so made as to be equally divided between the two vertebrae. But it has been so graduated that the upper vertebra contains more than half and the lower one contains less than half, till at last the foramen is completely contained in one vertebra and this graduation comes to an end in the tenth vertebra. The substance of the remaining of the thoracic and lumbar vertebrae is able to contain the foramen completely. Thus in the lumbar vertebrae there is a foramen on the right and a foramen on the left for the exit of the nerves.

Section X

Anatomy of Lumbar Vertebrae

The lumbar vertebrae have a broad spinous process as well as transverse processes. Their lower articular processes are wider. So they look like the protective wings. Lumbar vertebrae are five in number. In their union with the sacrum, lumbar vertebrae serve as base for the whole spine. They support and carry the pubic bone (as *innominatum*) and the nerves of legs emerge from them.

Section XI

Anatomy of Sacrum

The bones of sacrum are three. They are the hardest of all vertebrae, firmly fitted and strongly joined, and have broadest transverse processes. The nerves of the sacrum emerge from the foramina which are not exactly at its lateral sides so that the hip-joint might not press them. But they are very much deflected from them, and more towards the front and the back. The bones of sacrum look like the lumbar vertebrae.

Section XII

Anatomy of Coccyx

The coccyx is made up of three cartilaginous vertebrae which have no processes. Owing to the smallness of these vertebrae, the nerves emerge from them through inter-vertebral foramina as it is in the case of cervical vertebrae, and a single nerve emerges from the end of the third coccygeal vertebra.

Section XIII

Concluding statement on the functions of Spine

We have already given a fair description of the bones of the vertebral column. Now we give a comprehensive statement of the spinal column as a whole. We say that the spinal column looks on the whole as a single piece as characterised to be the best of the figures, which is round because, of all the figures, this one is the least susceptible to injuries caused by collision. So the heads of the spinous processes of the upper vertebrae are directed downwards while those of the lower ones are directed upwards. They meet at the medial one, that is the tenth vertebra. It is not bent towards either of the two sides, so that the two curves may fit upon it simultaneously. The tenth is the middle of the spinous processes, not in number but in length. The spine requires the movement of flexing and bending towards the two sides and this is possible when the middle bends in the opposite direction and the upper and the lower parts both bend in the other direction as if the two ends of the spine were inclining to meet each other. So only cavities rather than the condyles have been made in the tenth vertebra. Again, the lower and the upper condyles have been directed towards it. The upper condyles are directed downwards and the lower ones upwards so that the tenth vertebra might incline opposite to the direction of inclination of the spine and that the upper condyles might incline downwards and the lower upwards.

Section XIV

Anatomy of Ribs and their functions

The ribs encage and protect the respiratory organs and the upper parts of the alimentary organs. They have not been made in the form of a single bone, making the whole structure too heavy and susceptible to injury, so that the chest might be able to expand when needed, to meet more than natural requirement or when the viscera is replete with food and gases, hence being in need of a wider space to accommodate the inspired air, and that the muscles of the chest which are helpful in connection with the function of respiration and are contiguous with it could be accommodated in their midst. Moreover, as the chest surrounds the lungs, the heart and other organs with them, it is necessary to observe utmost care in its protection because they are liable to be injured easily. Besides, as the vital organs had to be firmly protected from all sides so that they may not be compressed or damaged, the upper seven ribs have been created with their accessories and join each other at the sternum, encircling the principal organs from all sides. The ribs which are adjacent to the alimentary organs have been so created as to be an invisible protector at the back. They do not join each other in front, but gradually tend to separate. Consequently, the upper ribs are closer in their projecting ends, whereas the lower ones are farther away from each other. This arrangement has been made with a view to protect the liver and the spleen etc. including the alimentary organs on one hand, and to provide space to the stomach on the other, so that the stomach is not compressed when it is full of food and gases. The upper seven ribs are called thoracic ribs. There are seven of them on each side, the central ones being bigger and longer while those at the ends are shorter. This shape and placement of ribs are more appropriate for the purpose of covering and protecting the enclosed organs from all sides. These ribs first tend to descend with their tubercle, then curve upwards as in retreat with the result that they meet the sternum which we are going to mention shortly. Thus they provide additional space (for the organs). Each rib has two tubercles which articulate with two depressions on the transverse process of its corresponding vertebra. Thus double joint appears. This is also the case with the seven upper ribs which meet the sternum.

As for the last five and short ribs, they are posterior as well as false ribs. Their heads which join cartilages have been created for the purpose of protection from damage in case of injuries and to prevent them from meeting soft organs and the diaphragm because of their hardness, but meet them through a body between them and the soft organs which are moderate in hardness and softness.

Section XV

Anatomy of Sternum

The sternum is not a single piece, but is composed of seven bones for the same advantages as those described in other places and also to facilitate the expansion of the respiratory organs which surround it. This is why it has been made porous and joined with cartilages which help it in its light movement, though its joints are firm. It has been created in seven pieces corresponding with the number of ribs which articulate with them. At the lower end of sternum there is a broad cartilageous bone, the lower end of which tends to be round called xiphoid bone because of its resemblance to a dagger. This provides protection to cardiac orifice and serves as an intervening medium between the sternum and the soft organs so that the hard and soft part could meet each other smoothly as we have said several times.

Section XVI

Anatomy of Clavicle

Clavicle is a bone that is placed on each of the two sides of the upper part of sternum. Behind the concave part of the clavicle near the throat there is an opening through which the blood vessels ascend towards the brain and the nerves descend from it and the clavicle inclines towards the lateral side and articulates with head of the scapula. Thus the scapula is attached with this nerve and the arm is attached to both.

Section XVII

Anatomy of Scapula

The scapula is created for two purposes. First, that the arms and hands remain suspended through it, so that the arm is not attached to the chest, otherwise the movement of each hand towards the other would be inconvenient and straitened. Rather it is created free from ribs and greater space for its movement in (various) directions has been provided. Secondly, the scapula provides protection to the organs encaged in the chest, and serves as a substitute for spinous processes of vertebrae and their transverse processes in resisting injuries where there are neither such vertebrae nor sensory organs which might be able to perceive injuries, if any. The scapula is thin at the exterior side whereas the interior side of it is thick. On the exterior side there appears a shallow depression to articulate with the round end of the humerus. It has two processes: one of them, situated above and at the back, is known as acromion, and (the other) coracoid. Through the acromion the ligaments of the scapula are attached with the clavicle preventing the upward dislocation of the humerus. The other process (coracoid) is inwards at a lower level, and it also helps to prevent the inward dislocation of the shoulder. On the interior inner side the scapula continues to broaden to ensure a good covering. At the back of the upper part of the scapula there is a triangular process. Its base is on the exterior side and the apex at the inner one so as not to make the back irregular. If this base were at a lower level it would have left the skin exposed to injuries and damage. This projection which is similar to the spinous processes of vertebrae has been formed to give protection. Hence it is called the scapular spine. The broader end of the scapula near the cartilage with which it articulates has a rounded edge and its connection with it is for the reason mentioned in respect of other cartilages.

Section XVIII

Anatomy of Humerus

The arm bone has been made round in order to make it least susceptible to injuries. Its upper end is convex which articulates with cavity of the scapula having a loose movable joint, which is not firmly fixed. It is due to its flaccidity that this joint is frequently exposed to dislocation. Its flaccidity carries with it two advantages: necessity and protection. By necessity is meant the freedom of movement in all directions, and protection means that even though the arm is competent enough to move freely towards various directions these movements are neither frequent nor perpetual in which case the ligaments of the arm would have been in danger of being worn out and the arm itself dislocated. Rather, the upper arm is mostly stationary while the forearm is in motion. This is why all other joints are more firmly fixed than the shoulder joints.

The shoulder joint is attached by four ligaments. One of them is transverse and capsular which envelops the joint completely as in the other joints. Two other ligaments originate from the acromion process, one of them is of transverse edge to cover the sides of humerus whereas the other is larger and harder descending with the fourth ligament which also descends from the coracoid process in the form of a tunnel so as to let them pass through. The form of these two ligaments tends to transversity particularly where it is attached with the humerus. Their job is to cover its inner side. Thus they are attached with the muscle set on the inside of the humerus. The humerus is concave on the inner side and convex on the outer one. This is in order to accommodate the muscles, vessels and nerves set on the arm, and to help one to carry an object under the armpit as men do, and also to facilitate the movements of one hand towards the other.

At the lower end of the humerus there are two processes joining each other. The process that is attached to the inner side (medial epicondyle) is longer and thinner and has no attachment with anything. It provides protection to muscles and nerves. The outer elevation forms a part of the elbow joint and articulates with the ponding depression on the radius as we will shortly describe. Between these two processes there is necessarily a narrow pass on both ends of which there are two depressions, one upwards inclining towards the front and the second downwards inclining towards the back. The inner and upward depression is even and smooth without any obstruction, whereas the outer one is larger and the one which articulates with the inner depression is neither smooth nor round, but it is just like a straight wall, so when the lateral process of the forearm moves towards the outer side and reaches there it becomes stationary. The necessity of the formation of these two will be described shortly. Hippocrates terms these two depressions as 'two' thresholds.

Section XIX

Anatomy of Forearm

The forearm is composed of two bones joined together lengthwise. These are called the radius and the ulna. The upper bone is in line with the thumb, is thinner and called the radius, while that in line with the little finger is thicker and is called the ulna. It is thicker because it has to carry the weight of the radius. The purpose of the radius is to help the forearm to supinate and pronate, whereas the purpose of the ulna is to contract and extend the movement of the forearm. Both the bones are made thin at the middle so that the forearm could be free from the burden of the heavy thickness of the thick muscles which encompass it. Both the lower ends of the forearm have been made thick because they are in need of abundant growth of ligaments from them so that they may be protected against collision and injuries when the joints are in motion, and both of them are devoid of flesh and muscular tissue.

The radius is crooked as it originates from the inner side, and bends and inclines a little to the exterior side. Its advantage lies in facilitating the pronation of the hand. The ulna is straight because this was more desirable for extension and contraction.

Section XX

Anatomy of Elbow Joint

The elbow joint is composed of radius, ulna and humerus. At the end of the radius is an orderly depression having a condyle at the outer side of humerus and secured (by ligaments). The rotation of the radial head in this depression enables pronation and supination of the forearm.

The ulna has two processes with an intervening notch that is similar to the sigma of the Greek alphabet Σ. This convex notch is placed in the concavity of the humerus so that it could fit suitably in the notch at the end of the forearm which is concave. However, the form of its concavity is similar to convexity of a circle. It is in the orderly notch which is found between the two processes (of the ulna that the elbow joint is formed). When one notch (moves) on the other notch, backwards or downwards, the arm extends. Consequently, when the process of ulna is blocked by the posterior wall of the notch the hand is stopped from further extension and the upper arm and forearm are kept straight. When one notch moves forward and upwards on the other the forearm contracts till it touches the upper arm from the inner and frontal side. The lower ends of the radius join together (to form as it were a single piece, an extensive depression is common to both but) the greater part lies in the ulna. The part which does not articulate is convex and smooth, so that it could remain immune from injuries. Behind the articular surface of the lower end of ulna there emerges a lateral process. We shall speak of the use of all these things shortly.

Section XXI

Anatomy of Wrist (Carpus)

Wrist is formed of bones (that are multiple to prevent the injury). The carpal bone is made of seven (bones) plus an additional one. The seven main bones are set in two rows: one row articulates with the forearm and has three bones; being proximal these bones are thinner. The bones of the second row are four because they articulate with metacarpus and fingers; so they are necessarily wider. The three bones (in the first row) are so positioned that their heads are in proximity with the forearm. They join the forearm, are thinner and well set. Their heads which are in proximity with second row are wider and loosely set and articulated with each other. The eighth bone is out of alignment with both the rows of the carpus, and has been created to provide protection to the ulnar nerve. The side formed by the conjunction of the ends of bones in the (first) row enters the wedge between the ulna and the radius we have described, resulting in a joint which is capable of extension and of contraction. As for the process of the ulna already mentioned, it enters the wedge in the bone which is proximal to the carpal bone, giving rise to a joint for pronation and supination.

Section XXII

Anatomy of Metacarpus

The palm is formed of numerous bones to prevent the occurrence of an injury, and to enable the palm to form a hollow which could hold round objects and fluids. These bones have firm, interlocked joints, so that they may not disentangle and consequently let the hand become too weak to hold and grip. Excoriation of the palm would reveal that the bones are so close as to be indistinguishable (from one another). Nevertheless, ligament binds them with each other firmly. However, they are flexible and capable of contraction which causes a hollow in the palm. Metacarpal bones are four which are connected with the four fingers. They are close to each other at the side which articulates with the metacarpus, so that their articulation with the bones could be firm and they become firmly joined and attached with each other with a little opening at the side of the fingers. This has the advantage of their articulation with the bones that are separate and detached. The metacarpus is concave on the side of the palm for obvious reasons. The wrist-joint articulates with the metacarpus with the wedges in the ends of the carpal bones, and the condyles of the metacarpal bones covered with cartilages enter them.

Section XXIII

Anatomy of Fingers

Fingers are the instruments which help in holding things. They are created fleshy but are not free of bones, though a variety of weak movements is possible even without the bones, as in many worms and fish. The movements which would have taken place without bones would have been as weak and feeble as that of palsied persons. (The fingers) have not been made of single bone so that their actions are not difficult as is the case with those who are afflicted with tetanus. Each finger has three phalanges, because if the number had exceeded three, the fingers would have acquired greater range of movement, but this would have necessarily led to a substantial reduction of strength in functions which require stronger grip. Similarly, had the number of phalanges been less than three, as for instance, there were of two bones only, the fingers would surely have been stronger but the range of movement would have been restricted, whereas as a matter of fact the fingers, because of their performance of movements of different kinds, require mobility rather than excessive strength. Fingers have been made of bones which have wider bases and smaller heads. The lower bones continue to be broader to such an extent that the ends of the upper tips of fingers become thinner. This has been done in order to strike a balance between the finger that lifts and the weight that is lifted. Further, the bones of fingers have been made round so that they could provide protection against injuries, and made hard without a cavity and marrow, so that they could be firm and strong for moving, holding and dragging (objects), and made concave internally and convex externally for gripping, pressing and rubbing (objects). They have not been made convex or concave in relation to one another so that they might articulate with each other as one piece, whenever there was need for (them to act as) a single bone. But the outer sides, i.e., of the thumb and the little finger, are convex as they have no adjoining finger to combine with them, so that when all the fingers come close together they might appear round to protect them against injuries. The inner sides of the fingers are fleshy in order to secure greater ease in gripping. But they have not been made so on the outer side so as to unite and become a heavy and dreadful weapon as a whole.

The tips of the fingers have been made too fleshy so that they could be properly set when they meet. The phalanges of the middle finger are the longest, next come those of the ring-finger, then the index-finger and then the little finger so that the tips form a straight line on contraction without a break. Another advantage is that the depression of the fingers and palm can firmly hold a spherical object. The thumb occupies the most suitable place in relation to all four fingers. Had it been in another place its purpose would have been defeated. If it had been placed on the inner side of the palm, we might have missed many actions which we have by means of the palm, and had it been placed at the side of the little finger, the two hands would not incline towards each when they require to hold a (a certain object) together. A more awkward position than this would be the placing of the thumb at the back, having no connection with the metacarpus, so that distance between the thumb and the fingers could not be narrowed. When the four fingers envelop an object from one side and the thumb assists them from another side the palm can possibly hold big objects.

The thumb, from another point of view, is like a pair of tongs applied to the objects to be held by the hand and hidden thereby, whereas the little and the ring-fingers are like a cover from below and all the phalanges have been joined with each other through sharp processes and articular cavities, having viscid secretion in between which keeps the joints moist (so that they do not become dry due to movement).

The joints of the phalanges are covered with strong ligaments. The interphalangeal joints articulate with cartilages and the gap in their joints is filled up by small bones called sesamoid in order to make them (the joints) more stable.

Section XXIV

Functions of Nails

Nails have been created for four purposes: (one of them is) to support the tips of fingers so that if they hold certain object their grip is not weakened. Secondly, to enable them to pick up minute things. Thirdly, through them to scratch and clean objects. Fourthly, to serve at times as weapons. The first three purposes are best suited to mankind and the fourth to the animals. The nails have been made round at the edges for known reasons. They are made of inclinably soft bones so that they may protect what is behind them and are not split. They have been made perpetually evergrowing as they are perpetually exposed to friction and scratch.

Section XXV

Anatomy of Pelvic Bones

On the right and left side of the sacrum there are two bones which articulate with each other in the middle through a strong joint. They serve as base for all upward bones and as supporter and carrier for the downward ones. Each of them is divided into four parts. The part that joins the outer side is called ilium; the one that joins the front is called ospubis; the one that joins the back is called ischium, while the one joining the inner side is called acetabulum because it maintains a cavity in which the head of the convex femur enters. It is this bone upon which the principal organs are placed, as for instance bladder, uterus, the vessels of sperm in males and the anus.

Section XXVI

Concise statement on the functions of Legs

Legs are useful in two ways. One of them is to help stability and erect posture, and this comes through feet. The other (use) is to enable walking straight and to move up and down, and this comes through femur and shank. When the feet are injured stability and erect posture become difficult, but not walking except when the injury is such that support from one of the two legs becomes necessary. When muscles of thigh and shank are affected, stability is easy but walking is difficult.

Section XXVII

Anatomy of Femur

The first bone of leg is femur which is the largest bone in the body, because it bears what is upon it and moves what is below. The upper end of this bone has been made round so that it fits the ischium; it is convex on the outer side (and in the front) and concave on the inner side and at the back. Had it been placed straight and parallel with acetabulum, a kind of walking with toes inwards would have appeared as happens with persons who are congenitally so and it would not have been convenient to provide protection to large muscles, blood vessels and nerves. Consequently, no part of it is straight. Besides, the posture of sitting would not have been nice. Again, if the femural head had not been bent inwards, deformity of another kind would have appeared and the inclining posture would have made the balance difficult. At the lower end of the femur there are two lateral processes for the sake of the knee joint. We should first speak about the shank and then about the joint.

Section XXVIII

Anatomy of Bones of Leg

Like the forearm, leg is also made of two bones. One of them is larger, longer and at inner side. It is called tibia; the second is smaller and too short to meet the thigh. However, at the lower side it ends where the larger one ends. This bone is called fibula. The upper of tibia is convex at the outer (side) while the lower part is concave on the inner side for balanced posture. Tibia, which is in fact nothing but shank, has been created smaller than the femur. This is so for two reasons: On the one hand, there was the need for increase in size for stability and bearing what is upon it, and on the other there was need for decrease in size for fast movement. The second reason serves better the purpose of the shank, and so it was made shorter, whereas the first reason is appropriate to the thigh and so it was made larger. The shank has been so balanced that any increase in the bone would impede movement, as happens to patients of elephantiasis and varicose. On the other hand, a reduction would cause weakness, difficulty in movement, and inability to lift the weight of what is upon it, as those born with thin shanks. Nevertheless, the legs are stabilised and strengthened with fibula. The fibula has some other advantages, e.g., to cover muscles and nerves passing between the two bones and to join the tibia with the joint of the foot, so that it may become firm and strengthen the joint for extension and contraction of the foot.

Section XXIX

Anatomy of Knee (Joint)

The knee-joint is formed of the two condyles at the end of femur articulating with the two cavities at the end of the tibia. These two condyles are firmly joined together with cruciate ligaments, a ligament fastened in the depth, and two strong ligaments on both sides, and the front of them has been set with patella. Patella is a bone that is rather round; its purpose is to provide protection against dislocation at the time of crouching down and moving the leg forward and to strengthen the joint that has to bear the burden of the body when it moves. Patella has been placed in front because generally in front it has to meet the force of bending, there being no force in bending backwards. It bends at the right and left very rarely. It mostly bends towards the front as it is here that the patella meets severe force at the time of standing and bending the knee etc.

Section XXX

Anatomy of the Foot

The foot has been created as an instrument of stability; it is for this purpose that in shape it has been lengthened in front to help in standing confidently. The foot has been provided with a sole at the inner side so that it is firmly placed, particularly at the time of walking against the other in motion. Thus there is greater confidence in stability through gravity on the side upon the proper contact with the ground in order to make the burdened foot steady while moving. This balances standing. Moreover, the soles enable the feet to tread upon uneven surfaces coming in the way without much discomfort and to set the foot firmly on things like ladder and ascending slopes.

The foot is composed of numerous bones for several purposes, one being to have a better grip while walking on the ground whenever required. Indeed, the foot establishes itself on the ground firmly just as the hand does while holding an object. Whenever an object to be gripped requires that the bones of the foot adopt a particular shape, they do it with a firm grip. Multiple bones are thus better than a single bone which would have prevented the formation of various shapes. Apart from this the multiple bones (of the foot) have the same bone advantages common to multiple bones elsewhere.

The bones of foot are twenty-six. One of them is the astragalus which forms the ankle-joint. Another is calcaneum which imparts stability. Yet another is scaphoid which is related to the sole. Four bones make up the tarsus which articulate with the metatarsal bones, one of them being the cuboid bone which is like a hexagon and is placed towards the outer side enabling greater stability on the ground towards that side. Five bones form the metatarsus.

In man, the ankle-joint is more cube-shaped than in all other animals. It is, as it were, the pivotal bone of the foot for the purpose of movement, just as calcaneum is the pivotal bone of the foot for the purpose of stability. The ankle-joint is placed between the two ends projecting from shank and fibula which cover it from all sides, i.e., from above and behind and from the outer and inner sides. The two ends firmly enter the heel through two cavities. The ankle joint is linked between the shank and the heel. It is through this that both are articulated with each other nicely and the joint between them is firm, and there is no fear of looseness. It is, as a matter of fact, placed in the middle, though on account of the sole it could have been imagined that it is inclining towards the outer side. The ankle-joint is articulated with the scaphoid bone in front in the manner of a joint, and this scaphoid is articulated with the calcaneum from behind as well as in front through three tarsal bones. At the outer side it is articulated with the cuboid bone which may be taken, if you like, as a single and separate bone, or preferably, as the fourth tarsal bone.

The scaphoid is placed under the tarsal bone; it is hard and round, inclining towards the back so that it could stand injuries and abrasions; it is greasy underneath so as to secure even contact with the ground and as a result obtain a firm footing. It has been made larger to enable it to lift the weight of the body, and has been made in the form of an elongated triangle which goes on thinning gradually till it slowly ends near the sole inclining towards the outer side so that the cavity of the sole gradually increases from the back towards its middle.

The tarsal bones are different from the carpal bones in that the latter are in one row only while the former are in two rows, and that the tarsal bones are significantly fewer in number. The reason for this is that in respect of movement and grasping, the hand is in greater need than the foot because the only advantage of the foot is to stand firm. Another reason is that multiplicity of parts and joints stand in the way of holding and grasping the spot on which the foot rests, because this brings about some sort of looseness and wide gap, just as complete absence of flabbiness proves harmful in this regard preventing moderate and suitable extension. So it may be realised that for the purpose of firm holding and grasping that which is abundant in number and smaller in size is more suitable, while for the purpose of firmness and stability that which is fewer in number and larger in size is more suitable.

The metatarsus is made of five bones so that each bone articulates with corresponding toe, when there are five toes properly arranged in a row. Here, there was greater need for stability than the power to hold and grasp which is the requirement of the fingers of hand, each of which has three phalanges, excepting the thumb which has only two. We have spoken enough about bones.

Taken together, these bones total two hundred and forty-eight, excluding the sesamoid bones and the bone that is similar to the letter lambda of Greek alphabet (λ). This brings to an end the discussion of bones.

CLAUSE II

MUSCLES

Comprising thirty sections

Section I

General statement on Nerves, Muscles, Tendon and Ligament

A voluntary movement of organs can be completed only by means of an impulse which comes to them from the brain through nerves Initially, the nerves could not have a good contact with the bones which undoubtedly are the main support of movement for motor organs, because the latter are hard and the former are tenuous. So the Creater through His mercy made something similar to nerves grow out of bones which is called ligament. Then God assembled and intertwined the ligaments with nerves as if both were one thing. The body composed of nerves and ligaments after all is thin, because the volume of nerves, though great at their origin, diminishes on reaching the organs. On the other hand, the volume of the nerves at their base is only so thick as to be borne by the brain, spinal cord, head and base of the nerves. Had the movement of the organs been assigned to the nerves with their possible volume, and particularly when they are divided and dispersed into the organs and the share of one bone becomes much smaller than the real one when they go far away from their origin and the base, it would have been a cause of obvious disorder. Consequently God Almighty, in His perfect wisdom has endowed the nerves with thick fibrous tissues and given them a covering of muscular tissues and stuffed flesh in between and covered them with a membrane and put in the middle of them certain pillar rising from the substance of the nerves like an axis. They all make an organ which is composed of nerves, ligament, their fibres, the stuffed flesh and the enveloping membrane. It is this organ which is called muscles, and it is the same which, when it shrinks, drags the tendon composed of ligaments and nerves shooting off from it towards the base. So the muscle shrinks and pulls the organ towards itself and when it extends the tendon becomes loose and produces extension.

Section II

Anatomy of Facial Muscles

It is known that facial muscles should be of the same number as the motor organs in the face. The motor organs of the face are: forehead, two eyeballs, two upper eyelids, two cheeks in common with two lips, the two lips alone, sides of two nostrils and the lower jaw.

Section III

Anatomy of Muscles of Forehead

The forehead is moved by a muscles that is thin, flat and membranous and spreads beneath the skin of the forehead being firmly attached to it to such an extent that it appears to be a part of the structure of the skin. Hence it is impossible to separate it from the skin. This muscle articulates with the motor organs without a tendon, simply because it is only the flat and light skin which moves, hence it is not worthwhile for a thing like this to move through tendon. It is the movement of this muscle which causes both eyebrows to lift up, and the laxation and suspension of it assists the eye to close.

Section IV

Anatomy of Muscles of Eyeballs

The muscles which move an eyeball are six. Four of them are placed in the four sides, upper, lower and in the two canthuses. Each of them helps the movement towards its side. The remaining two muscles are attached to the eyeball obliquely and rotate the eye. Behind the eyeball there is a muscle which supports the optic nerve which we shall describe later, because of its attachment to the optic nerve and what goes with it. So it supports it and prevents the eyeball from bulging out and controls it at the time of staring. Since this muscle, because of its ligamented membranes, is divided, its entity has raised doubts. So according to some anatomists it is only one muscle, according to others there are two muscles, whereas according to some others, three. Whatever may be the case the muscle has only one head.

Section V

Anatomy of Muscles of Eyelids

The lower eyelid does not need movement, because the purpose is achieved and accomplished by the movement of upper eyelid which makes the eye perfectly competent to open and close. God in His mercy is careful about reducing the organs as far as possible without hindrance. You know well how multiplicity of organs causes inconvenience. The upper eyelid might have been stationary and the lower one moveable, but the Creater in His mercy was careful to make actions arise from their original sources and to direct the means towards their ends in the most suitable way and straight manner.

The upper eyelid is nearer to the origin of nerves, so when a nerve turns to it, it would require no leaning and no turning over. And as the upper eyelid needed two kinds of movement, one of elevation at the time of opening the eye and the other of descendance at the time of closing the eye, and further, the closure of the eye needed the muscle which pushes downwards, it was inevitable that the nerve should reach the eye bending downwards first and then rising upwards. Hence it was but necessary for the nerve, if it is one, to articulate either with edge of the eyelid or with the middle of it. Had the nerve gone to the middle of the eyelid it would have covered only the central portion of the eyeball and if it had gone to one side of the eyelid it would have articulated with one side (of the eye) only, with the result that the closure of the eyelid would not have been even but oblique. Hence closure would have been intense in the side if the eyelid meets the tendon first and mild on the other side with the result that the closure, not being proper, resembles the eyelids of a man affected with facial paralysis. So there was a need to create not one muscle but two muscles projecting from the two canthuses. It is these two muscles which close the eyelid evenly from below.

As for the opening of the eyelid, one muscle going to the middle of the eyelid was quite enough. So the side of its tendon spreads on the side of the eyelid. When it is contracted the eye opens. Hence only one muscle has been created. This has straightly been placed between the two layers of the fascia and is attached in length to a plate in the eyelid which is similar to a cartilage and spreads beneath the origin of eyelash.

Section VI

Anatomy of Muscles of Cheeks

Cheek has two kinds of movement. One of them is subject to the movement of the lower jaw, while the other is subject to participation of the movement of the lower lip. The movement of the cheek which is dependent on the movement of another organ is due to the muscle of that organ where the movement of the cheek which takes place with the participation of another organ is caused by a muscle that is common to cheek and lips. This muscle which is flat spreads in both cheeks and is known as buccinator.

Both of them are composed of four parts because fibres come to them from four places; one of them rises from clavicle and its ends articulate with the two ends of lips at the bottom and it drags the mouth obliquely downwards. The second arises from the sternum and clavicle on both sides and the fibres of the two tend to be oblique: the one arising from the right side crosses the other that rises from the left and thus goes on penetrating till one set, rising from the right side, articulates with the lower side and is opposed to it. When these fibres shrink the mouth becomes narrow and pursed as in the state of blowing. This is like the closure of purse when its strings are pulled from both sides. The third rises from the acronium process of the scapula and is attached with the fibres of the said muscle. It is this which makes the lips inclined towards both sides evenly. The fourth arises from spinous process of the cervix; it passes over the ear to be attached with the end of the cheek. These fibres which make the cheek move are visibly followed by the movement of the lip. In some individuals they are very near the root of the ear and attached to the ears. Hence the ear of the individual also moves.

Section VII

Anatomy of Muscles of Lips

The muscles of lips are similar to what we have just described. Some are common to lips and cheek. Four muscles, however, are exclusive to lips. A pair of these muscles coming from above proceeds towards the cheek and is attached approximately to the ends of the lips. Two of them come from below. These four muscles are competent enough to move the lips because when anyone of them moves exclusively, the movement of the lip will follow the same direction. When two of them move from two sides the lips will extend on both their sides. This completes the movement of lips in the four directions. These four movements being sufficient, the lips have no other movement. These four sides and ends of the common muscles are so fused with the body of lips as to be indistinguishable from the main substance of the lips which are soft, fleshy, and boneless organs.

Section VIII

Anatomy of Muscles of Nostrils

The small and strong muscles are attached to the end of nostril. They are small so that they would not encroach upon other muscles of which there is a greater need. As a matter of fact the movements of the cheek and the lips are more frequent, more repetitive and constant. They are needed more than the movement of the ends of nostrils. They are made strong to make up for their bonelessness. These two muscles arise from the sides of cheeks and are primarily attached to the fibres of the cheek because their movement is in the direction of the cheeks.

Section IX

Muscles of Upper and Lower Jaw

Movement rests with the lower jaw to the exclusion of the upper one. This has many advantages: movement is easier and better in the lower jaw; the movement of that which is free of important organs, which may be disturbed by movement, is better and safe; had the upper jaw been able to move conveniently, its joint and the joint of the head would have locked firmly.

The lower jaw does not need more than three movements; the movement of opening, gaping and closing of the mouth, the movement of mastication and grinding. The opening movement lowers the jaw, the closing movement elevates it and the masticating movement makes it rotate and moves towards both sides.

It is evident that the closing of mouth necessitates the movement of a muscle coming from above and pulling the lower jaw upwards. Gaping requires the reverse and mastication requires oblique muscles. Two muscles, known as temporal muscles, have been created for the purpose of closing the mouth. They are of small sizes in human beings, because the organ that is moved by them is small, spongy and light in weight and also because the movements to which this organ is exposed and which arise from the said two muscles are lighter.

As far as animals are concerned, their lower jaw is larger and heavier than those of man, and has to perform several types of movement; mangling, biting, nibbling and uprooting. These two muscles are soft on account of their approximation with the brain which is their source and is an extremely soft body, with only one bone dividing the brain and these two muscles. Thus there was the danger of the brain being affected by an injury or pains to the muscles as happens during meningitis and similar diseases. The Creator in His wisdom has covered the said muscles near their source and origin, viz., the brain with a pair of two bones and sheltered them to penetrate in a fornix composed of a pair of bones and the heights of those holes which pass on along with them while the borders of this fornix envelop them up to a proper distance till they come near a pair of bones. It is so because the substance of these two muscles could become gradually harder, and it could slowly move away from their first source.

Each of the two muscles has a big tendon which covers the border of the lower jaw. So when this tendon contracts, it lifts the jaw. These two muscles have been assisted by two muscles passing through the mouth and descending towards the lower jaw in two hollows. As a matter of fact, when a heavy part is to be lifted, increased strength necessarily becomes an overriding factor. The tendon growing from these two muscles arises from the centre and from their ends, providing the additional strength.

The pterygoid muscles and the descent of the jaw arise from the two fibres of the mastoid processes behind the ear. They come down and form a single muscle which forms a tendon in order to gain additional strength; then it expands again into a short fleshy muscle. Thus it becomes a firm muscle so that it might not be exposed to injuries because of length. Later on it is attached to the lower jaw near the chin. When the muscle contracts the jaw pulls backwards and is retracted. As natural gravity is helpful to retract, these two muscles are sufficient and there is no need of further assistance.

Masticating muscles are two. On every side there is a triangular muscle. The apex of the triangle lies at the angle of cheek. Hence two fibres proceed therefrom : one of them descends towards the lower jaw and the other rises to the region of the temporal bone, forming a base in between. In this way every apex is firmly attached to adjoining structures so that this muscle could have various sides differing from each other in the act of contraction. So they are not straight in their movements. They would rather have a variety of movements, ranging from grinding to mastication.

Section X

The Anatomy of Muscles of Head

There are some movements which are confined to head alone, while some others are common to head and other structures including the first five cervical vertebrae. There are also regulated movements by which the neck moves with the head. In the movements of the head, whether they be common or specific, it is necessary that the head could move backward or forward and recline to the left or to the right. The two movements give rise to movement of rotation with a circular form.

The two particular muscles which bend the head come from two different sides. Their fibres spread out upward from behind the mastoid and downward from the sternum. These two muscles spread upward in a manner as if they are attached to each other. Often it is presumed that these two muscles are one. Some presume that they are two while some others presume they are three because one of the ends is divided into two branches. When one of the two muscles moves, the head inclines to one side and when both of them move simultaneously, the head inclines forward slightly. The muscles which bend the head and neck forward are a pair of muscles placed under the oesophagus. After arising from the first and second vertebrae they get attached to the head and neck. If their part which is attached to the oesophagus contracts, the head bends, and if those which arise from the two vertebrae contract, the neck bends. The muscles turning the head backward are in four pairs placed under the muscles already mentioned. These muscles originate from above the joint (of head and neck). Some of them originate from spinous processes, the source being at a little distance from the middle of the vertebrae. Some of them originate from transverse processes, the source being near the middle of the vertebrae. One of the pairs comes from the two transverse processes of the first vertebra and is above the pair coming from the second spinous process. One of the pairs is that whose fibres spread out from the transverse process of the first vertebra to the spinous process of the second vertebra. The function of this muscle is to keep the head, while in motion, in its natural position with a slight obliquity. The fourth pair arises from the above (vertebrae) and enters beneath the third pair obliquely and then meets the transverse process of the first vertebra. The first two pairs move the head backward, no matter whether the bending is slight or extreme. The third pair maintains the head with its natural bent (or inclination). The fourth pair moves the head backward somewhat obliquely. When one of the third and fourth pairs is inclined to any side it moves the head to that side and when both of them contract, they move the head backward but without any obliquity. The muscles moving the head with the neck are in three pairs situated deep (in the neck). One of these pairs gives coverage to other. Each part of it is a triangle with occipital bone as its base and the apex attached to the neck. One pair descends from the two sides of the vertebrae; one pair is inclined more towards the transverse processes and one is situated between the two transverse process of the vertebrae and their sides.

The muscles which move the head to both sides are in two pairs and attached to the joint of the head. One of the two pairs is placed in the front and reaches between the head and the second vertebra (of the neck). One part of the pair inclines to the left and the other to the right. The second pair, placed at the back, connects the first cervical vertebra and the head. One muscle of this pair is at the right side and the other on the left. When any of these four muscles contracts, the head bends slightly to that side. When any two of them contract from any side the head bends towards them without any deviation. If the two front muscles contract they help the head to bend forward. If the two muscles at the back contract they turn the head backwards. When all the four muscles contract together the head becomes straight and erect. Though these four muscles are very small, their smallness is made good by their suitable position and by their protection under other muscles. They do the work of the bigger muscles as well. Moreover, the joint of the head was in need of two contrary functions: Firmness, to keep the joint in position and reduce movements; and abundance of movements, to bring about relaxation and easing of the joints. Thus these joints have been made loose as well as stationary and firm with the aid of a heavy coverage of muscles. Thus both the ends are achieved. God be exalted, the best of all creators.

Section XI

Anatomy of Muscles of Larynx

Larynx is a cartilaginous organ which is created as an instrument of sound. It is composed of three cartilages. One of them is palpable and visible in the front of the larynx and beneath the chin. This is called the thyroid cartilage because, being concave on the inner side and convex at the outer, it resembles a shield. The second cartilage is placed behind the first, close to the neck, and fastened to it. It is recognized as a nameless organ. The third cartilage is in an inverted position upon the first two; it is attached to the one which has no name and is connected with the thyroid without any joint. There is a joint between the second and third cartilages consisting of two depressions into which the two elevations of the nameless cartilage are locked. Both the cartilages are firmly attached with each other through ligaments. The third cartilage is known as epiglottis. The expansion and contraction of larynx are regulated by a distance between the thyroid cartilage and the nameless cartilage. The opening and closing of the larynx is regulated by the inversion of the epiglottis over the thyroid, and its drawing close or moving away.

Near the larynx and in front of the epiglottis there is a triangular bone which is known as *al-'aẓm al-lāmī* (lambdoid bone=hyoid bone which is similar to the letter lambda of the Greek alphabet, which has this shape λ The advantage from the creation of this bone is that it acts as a support and a resting place. The fibres of the muscle of larynx originate from it, because larynx stands in need of a muscle which should connect the thyroid cartilage with the nameless cartilage, another muscle to connect the epiglottis and close them, and a third to separate the epiglottis from the other two cartilages so as to open the larynx.

A pair of muscles for opening the larynx arise from the hyoid bone and is attached to the front of the thyroid cartilage which it covers completely. When this pair contracts, it elevates the epiglottis from the front and above and thus widens the larynx. The second pair of muscles is included amongst pharyngial muscles inclining downwards and, in our opinion, is common to both, the pharynx and the larynx. This pair arises from the inner side of the sternum towards the thyroid cartilage.

In many animals these muscles are supported by another pair, i.e. by two pairs. One pair of muscles comes from behind the epiglottis and joins it. When the two muscles contract they lift the epiglottis and push them back from the thyroid cartilage, thus widening the larynx. The two muscles of the other pair come from the two sides of the epiglottis. When these two muscles contract, they separate the epiglottis from the thyroid cartilage and expand it transversely, helping the larynx to expand.

The constrictors of the larynx form a pair which emanates from the periphery of the hyoid bone and join the thyroid cartilage. Then they widen and enclose the nameless cartilage till the ends of both the muscles are united behind it. When they contract, (the larynx) is closed. There are four other muscles—or as some think, two double muscles—which close the larynx. They are linked with the thyroid cartilage and the nameless cartilage. When they contract, the lower part of the larynx closes. It is thought that one of the two pairs lies inside the larynx and the other outside.

The muscles which close the larynx are excellently positioned inside the larynx. When they contract, they pull the epiglottis downwards and thus close the larynx. A pair has been created which emerges from the base of the thyroid cartilage and ascends from inside to the sides of the epiglottis and the base of the nameless cartilage from left and right. When these muscles contract they tighten the joint and close the larynx so completely that, resisting the thoracic muscle and the diaphragm, it holds the breath. These two muscles have been made small so as not to narrow the larynx, but are strong enough to undertake the closure of the larynx and holding of the breath completely. These muscles proceed obliquely upwards and serve as a link between the thyroid and the nameless cartilage. Two other muscles are found under the epiglottis which support the pair of muscles already described.

Section XII

Anatomy of Muscles of Pharynx

Pharynx is composite. It has two pairs of muscles which pull it downwards. One of them is the pair we mentioned while dealing with the larynx; the other arises from the sternum, goes upwards and joins the hyoid bone, and passes to pharynx and pulls it downwards. As for the muscles of the pharynx, they are the fauces. These are two muscles in the pharynx which assist in swallowing.

Section XIII

Anatomy of Muscles of Hyoid Bone

Hyoid bone has some exclusive muscles and some muscles that are common to the hyoid and other bones. The muscles which belong to the hyoid consist of only three pairs. One pair arises from the two sides of lower jaw and is in alignment with the hyoid bone. It pulls it towards the jaw. Any other pair arises from beneath the chin, then passes below the tongue and is attached to the upper side of hyoid bone. It also pulls the bone towards the jaw. The third pair arises from the sagittal processes near the ears and is attached straight to the lower end of this bone. The muscles which are common to this and other bones have either already been mentioned or will be described later.

Section XIV

Anatomy of Muscles of Tongue

The muscles which move the tongue are nine. Two are flat, and emerging from the sagittal processes they are attached to both the sides of tongue. The next two muscles are long, they arise from the upper sides of the hyoid bone and then are attached to the middle of the tongue. The third pair which moves the tongue obliquely, arises from the lower end of the hyoid bone and goes into the tongue in between vertical and horizontal position. The fourth pair spreads on the tongue and gives it form. They are placed under the muscles already mentioned. The fibres of this pair run laterally and are all attached to the jaw bone. Of the muscles of the tongue, mention will be made of the one that connects the tongue and the hyoid bone, and pulls the one towards the other. No wonder if the muscles moving the tongue forward and making it protrude give the impression as if it moves of itself, just as it appears to retract and twist on its own.

Section XV

Anatomy of Muscles of Neck

There are only two pairs of muscles which move the neck. One of them is on the right side and the other on the left. When anyone of them contracts, it inclines the neck to that side with a twist; when both function together, they incline the neck to that side without a twist. When all the four muscles function unitedly, the neck erects without inclining.

Section XVI

Anatomy of Muscles of Chest

The muscles which move the chest are those which simply produce expansion or those which just produce contraction, or those which cause expansion and contraction at the same time. The muscles for expansion are only nine. Included in them is the diaphragm which lies between the respiratory organs and alimentary organs, to be described later on. There is a pair below the clavicle which arises in part from the end of the scapula which we shall describe later. It is attached to the first rib on each side. There is another pair each part of which has double-muscles. This pair has two heads, the upper one is attached to the neck and moves it, and the lower head moves the chest. Both of them are joined to a muscle which we shall describe presently. They are attached to the fifth and sixth ribs and move the chest. The third pair is located in the concave surface of the scapula. This pair is joined by another pair which arises from the first thoracic vertebra and goes to the scapula; both are joined together as one, and are attached to the false ribs. The fourth pair arises from the seventh cervical vertebra and the first two thoracic vertebrae and is attached to the ribs of sternum. These are the muscles which expand the chest.

Of the muscles which contract the chest are those that do so indirectly, as the diaphragm when it is at rest, or those that do so directly. There is a pair of muscles which spreads below the roots of the upper ribs and has the function of strengthening and unification. There is another pair. It extends on both sides of the sternum between the xiphoid cartilage and the clavicle. Therefrom it goes upto the straight muscle of the abdomen. Besides, there are two other pairs which help the muscles mentioned earlier.

The muscles which bring about contraction and expansion simultaneously are those that are located among the ribs. Reflection reveals that the muscles for contraction must be different from those for expansion. For, in fact there are four muscles between every two ribs, although they are generally taken as a single muscle. These four muscles, which are conceived as a single muscle, are woven with criss-cross fibres, some of which serve as lining and some as covering. Some of the covering fibres are attached to the cartilaginous ends of the ribs and others are attached to the strong posterior parts of the ribs. The fibres which serve as lining differ completely in shape from the enveloping fibres, and those that are attached to the cartilaginous ends differ in shape from those attached to the posterior ends. When fibres have four different forms, it is very likely that the number of muscles is also four. Consequently, those which are placed above cause expansion; those which are placed below make contraction. Thus it is obvious that the total number of the muscles of the chest are eighty-eight. The muscles of the chest are helped by two other muscles which come from the clavicle and reach the head of the scapula. Each of them is attached to the first rib and draws it upwards. Thus it helps the chest to expand.

Section XVII

Anatomy of Motor Muscles of Humerus

The muscles of the upper arm which move the shoulder joints are three. They come from the chest and pull it downwards. One of these muscles emerges from the lower part of the breast and meets the upper arm at the front near the front part of the collar-bone. It is this muscle which lowers the upper arm and brings it closer to the chest, taking it along the shoulder. There is another muscle which comes from the upper part of the sternum and is in harmony with the inner side of the head of the upper arm. It raises the upper arm to the left and brings it closer to the chest. The third muscle is a large twin-muscle which comes from around the sternum and meets at the bottom of the frontal part of the upper arm. When the fibres in its upper part come into action they raise the upper arm and bring it nearer to the chest, while those in the other part lower the upper arm and bring it closer to the chest. When fibres from both the parts act together, the upper arm is straightened. There are two other muscles which come from the iliac bone and join together where the larger muscle ascends the sternum. One of them is a large muscle which arises from the iliac bone and the false ribs and draws the upper arm to the false ribs in a straight posture, the second one is thin which arises from the skin of the iliac bone and not from the bone which is near to the back and meets the tendons which arise from near the breast. It performs the first act of assistance by drawing the upper arm slightly backward.

There are five other muscles which rise from the scapula. One of them starting from the scapula fills the space between the diaphragm and the rib nearest to the shoulder and enters the outer part of the arm, inclining a little to the inner side; and moves the upper arm farther with somewhat inward direction.

Two of these five muscles come from the upper rib adjoining the scapula. One of these two is large and its fibres reach down to the lower part of the diaphragm filling the space between it and the middle part of the lower rib until it joins the external end of the arm. This muscle draws the arm farther from the chest. The second muscle is so linked with the first as to look like a part of it. It goes along with the first muscle and acts synchronously. However, it has not much to do with the upper part of scapula. It meets the outer part of the arm rather obliquely and inclines it outwards.

The fourth muscle is the one that fills the depression in the scapula. Its tendon meets the internal parts of the end of the humerus. Its function is to turn the arm backwards. The tendon of the second muscle, which comes from lower part of the lower rib adjoining the scapula, meets the larger muscle, which comes from the ilium, at the top. Its function is to raise the upper end of the arm. The arm has one more muscle with two heads which have one common and two different functions. This muscle emerges from the neck under the collar bone and is linked up with the head of the arm.. The meeting point is from where the tendon of the large muscle of the chest goes up. Physicians have stated that one head of this muscle is a little oblique on the inner side and the other head is somewhat oblique on the outer side at the lower end of the scapula. Working together, the two heads raise the arm vertically. Some physicians speak of two more muscles, one small muscle coming from the breast and the other is hidden in the shoulder joint, and often these two meet the anconeous muscle.

Section XVIII

Anatomy of motor muscles of the forearm

The muscles which move the forearm are either those that contract it or those that extend it. These muscles come from the upper part of the arm. Some muscles help the supination of the forearm and some in its pronation. But these muscles are in no way connected with the arm. The muscles which extend the forearm form a pair, one member of which comes from the frontal lower part of the arm and goes into the inner parts of the elbow, extends the forearm inwards. The other member extends the forearm outwards, as it comes from behind the arm and is attached to the outer part of the elbow. When the two members act together, the forearm is straightened.

The muscles which contract the forearm also form a pair, the larger member of which contracts the forearm slightly inwards. It emerges from the glenoid fossa and the coracoid process of the scapula. The points of origin are fixed and in the case of this member, it is in the inner side of the arm. Its heavily nervous tendon meets the radius in the front. The second member contracts the forearm a little outwards, because its point of origin is in the outer part of the arm at the back. It is a muscle with two fleshy heads. One head is at the back of the arm and the second at the front. This muscle reaches the front of the ulna, its passage being a little covered. The muscle which, while contracting the forearm, inclines it outwards, meets the ulna and the one which inclines it inwards meet the radius, so that the inclination may be firm. When both the muscles work together, they straighten the forearm at the time of contraction. The two muscles which extend the forearm are covered by another muscle which surrounds the humerus though it appears to be just a part of the second muscle.

The muscles which supinate the forearm consist of a pair, one member of which is situated between radius and ulna towards the outer side and meets the radius without any tendon. The second member is thin and long which comes from the head of the arm and following the outer course, much of it reaches the carpal joint through the forearm. Thus its inner part comes from the radius and meets it through the membranous tendon.

Muscles that supinate the forearm are also a pair on the outer side. One of its members emerges from the inner side of the head of the arm and meets the radius without the carpal joint. The second member is smaller than the first with broad fibres and ends lined with nerves. This muscle emerges from the ulna and meets the end of the radius near the carpal joint.

Section XIX

Anatomy of motor muscles of the wrist

The muscles which move the wrist are those that cause contraction, extension, supination and pronation.

The muscles which extend (the wrist) are so joined that they look like a single muscle. One muscle comes from the middle of the ulna whose tendon meets the thumb. It pulls away the thumb from index finger. The second muscle comes from the radius whose tendon is attached to the metacarpal bone of the thumb. It faces the thumb.

When the two muscles act together, they make the wrist slightly supine while extending it. If the first muscle moves alone, it creates distance between the thumb and the index finger, while the second muscle, acting alone, pronates the wrist a little.

There is another muscle which comes from the lower end of the arm and runs outside the radius. Two tendons emerge out of it, the end of one tendon joining the middle finger and the metacarpus of the index finger, and the end of the other tendon resting on the radius near the carpus and making the wrist a little supine while extending it.

The muscles which contract form a pair outside the wrist. The lower member of them emerges from the internal part of the end of the forearm and ends at the metacarpal bone of the little finger. The end of the upper muscle starts from the upper part of the arm and ends there. Attached to it is another muscle which comes from the lower part of the arm and is situated between the two muscles. It has two ends which cross each other at a right angle and go on to meet between the index finger and the middle finger. When the two act jointly, they contract the wrist.

These, then, are the muscles that contract and extend. Silmilar to these are muscles that supinate and pronate. These, then, are the muscles which flex and extend and also supinate and pronate when two of them facing each other meet slantingly. When the muscle attached to the metacarpal bone of the little finger acts alone, it pronates the wrist, turns the palm downwards. If this muscle is assisted by the muscle attached to the thumb, which we shall describe later, supination is achieved. If the muscle in front of the thumb attached to the wrist acts alone it pronates a little and when it acts in conjunction with the muscle of the little finger which we shall describe later, complete pronation is achieved.

Section XX

Anatomy of motor muscles of the finger

The muscles which move the finger are located inside the palm and in the wrist. If all the muscles had been concentrated in the palm, the palm would have been burdened with abundance of flesh. Since the muscles in the wrist are far from the fingers, it is essential for them to have long tendons. These muscles have been covered with the membranes. The tendons of these muscles are round and strong but are not broad until they come in full contact with the organ, in which case their breadth helps the perfect movement of the organ.

The muscles which extend the fingers rest upon the wrist. All the muscles which extend the fingers rest upon the wrist and the muscles which move the fingers are also located in the lower part of the wrist. Of the muscles which extend the fingers, there is one which is placed in the front and middle part of the wrist. It comes from the elevation of the lower end of the arm and sends out tendons to the four fingers, enabling them to extend. The muscle which flex the fingers are three. These muscles meet one another on one side. One muscle comes from in-between the two processes at the outer end of the arm and sends two tendons to the little ring finger. The second muscle is really a twin muscle which comprises the remaining two muscles, which come from between the lower and inner part of the two processes of the arm and on the side of the ulna from where the two tendons go to the middle and the fore finger (and in-between). The second of the two muscles, which is in fact the third muscle, comes from the upper part of the radius and one tendon of it proceeds to the thumb. Near this muscle is another muscle which is one of the two muscles that move the wrist. It comes from the middle of the ulna and its tendon pulls the thumb away from the four fingers.

Some of the muscles which flex the fingers rest upon the wrist and some muscles are located in the palm. The muscles which are upon the wrist are three, one upon another, and are located in the middle of the wrist. The most important of them is the muscle at the bottom which is covered and attached to the ulna. Since it has to perform an important function it is necessary for it to be situated in a safer place. It starts from the inner side of the middle part of the outer end of the arm. When it penetrates, its tendon is broadened and divided into five, each part going into the fingers.

Each of the four tendons which go into the fingers flexes the first and the third joints. The first joint is flexed because the tendon in it is attached to a ligament which envelops the two (the tendons and the joints). The third joint is flexed because of the tendon ends and is attached there. The tendon which goes into the thumb is attached to the second and the third joint making them flexible.

The second muscle, which is above (the one just described) is much smaller. It comes from the inner parts of the two ends of the arm and meets loosely with the ulna. It is always in the middle of the inner and outer borders, that is the upper surface of the radius. As it proceeds it is inclined towards the inner side of the thumb and sends its tendon to the middle joints of the fingers so that they may flex. Only a portion of it goes into the thumb, but the tendon comes from another location. This tendon has two heads, one coming from the ends of the ulna and radius and other from the end of the ulna. There is only one muscle to flex the thumb, whereas there are two in the fingers to flex them. This is because the main function of the fingers is to flex and that of the thumb is to extend and be away from the index finger.

The third muscle is not meant for flexion but its tendon spreading out inside the palm and getting broader, it produces sensation, hinders the growth of hair, gives cushion to the inner side of the palm strengthening it to enable it to handle a thing when needed.

The palm has 18 muscles arranged in two rows, one upon the other. The bottom row is deeper and the top row close to the surface of the palm. The bottom row has seven muscles. Five of them turn the fingers upwards. The muscle of the thumb comes from the carpal bone. The sixth muscle is smaller and broader with diagonal fibres. Its end is attached to the palm adjacent to the middle finger, its tendon being attached to the thumb which flexes it. The seventh muscle is located near the little finger and starts from the metacarpal bones and flexes it. Apart from the seven muscles, there is no other muscle which helps flexion. Thus five muscles help extension and two help flexion.

The muscles in the top row are just under the muscle which covers the hollow of the palm. They are the same as described by Galen, and are eleven. Eight of them go in pairs, one pair attached to the first joint of each finger. The members of each pair are one above the other and both flex the joints, the lower muscle helps the flexion of the finger by lowering them, whereas the upper muscle helps flexion by raising them. When the two muscles function together the fingers are straightened. Three muscles are exclusive to the thumb, one muscle flexing the first joint and the other two flexing the second. It is now known that there are five muscles which extend the fingers and two muscles for each finger, excluding the thumb and the little finger. There are four muscles which flex all the fingers and one for each finger to raise it.

Section XXI

Anatomy of motor muscles of the spine

Some muscles of the spine bend it backward and some forward. All other movements as well, arise from these muscles. The muscles which bend the spine backwards are specific, known as spinal muscles. They are two, and it may be surmised that each of them is made up of 23 muscles, one muscle coming from each of the 23 vertebrae. An oblique fibre comes out of every vertebra except the first. When these muscles stretch moderately the spine is raised and straightened. When the muscles stretch further, the spine is bent backwards. The spine follows the inclination of the muscle.

The muscles which bend the spine forward are a set of two pairs. One pair, located above, moves the neck and head. They arise from both sides of oesophagus. The lower end of this pair is in some persons attached to five, and in others, to only four thoracic vertebrae. The upper end of this pair meets the head and the neck. The other pair is below it and called "two halves of the back". This pair comes from the 10th or 11th thoracic vertebra and goes down, bending the spine forward. This pair is adequate for moving the spine in the middle, bending it forward, backward and in doubling it up.

Section XXII

Anatomy of muscles of abdomen

The abdomen has eight muscles with joint functions. Some of them contract the viscera and uterus to help evacuation of urine and faeces and childbirth. Some support the diaphragm and help it through contraction during flatulence and by covering the stomach and intestines keep them warm. Of these eight muscles, there is a pair which is straight. Its fibres come down vertically from the xiphoid cartilage to the pubic bone. The ends of this pair spread on the sides. This pair is entirely fleshy. Two more muscles cross each other horizontally. They are located on the upper part of the membrane which spreads over the abdomen. Similarly, there are two vertical muscles at the bottom. The crossing of these two muscles with the two mentioned earlier is at a right angle. Two pairs are diagonal, one on each side. There are two pairs. Each pair which crosses each other at a right angle extends from epigastrium to pubis and from iliac bone to xiphoid cartilage. The ends of one pair of muscles, coming from right and left, meet near the pubic bone, and the ends of the other pair at the xiphoid cartilage. These two muscles cover the fleshy parts from all sides and are crossed by two muscles coming obliquely. Both the pairs are fleshy until they meet the rectus muscles through the wide tendon which are like membrane. These two pairs are placed on two muscles that are long and horizontal.

Section XXIII

Anatomy of muscles of testicles

In the male there are four testicular muscles which guard the testicles and support them to prevent from becoming loose. Each testicle has a pair of muscle, but in the female there is just one pair of muscle which suffices as there is only one testicle which does not hang and protrude as those in the male.

Section XXIV

Anatomy of muscles of the bladder

The bladder has one muscle at the orifice whose fibres cover the bladder breadthwise. Its function is to hold the urine according to the will. Its grip is loosened when there is the will to urinate. In that case, the muscles around the cavity of the bladder are pressed and the urine is discharged by the expulsive power like a spray.

Section XXV

Anatomy of muscles of the penis

The muscles which move the penis are two pairs. Two muscles of one pair extend to the two sides of the penis. When these muscles contract, the urethra expands and the passage of semen becomes straight and easy. The second pair comes from the pubis and meets the base of the penis obliquely. When it stretches normally, the penis becomes erect. If it stretches abnormally the penis bends backwards. If the contraction is towards a particular side—the penis inclines to that side.

Section XXVI

Anatomy of muscles of the anus

The anus has four muscles, one of which covering its orifice is as close to the tissues as are the muscles to the tissues of the lips. This muscle binds the anal ring and squeezes out the unexpelled part of the faeces. Another muscle is deeper and above the first as in the human head. It is thought that it has two ends, one end being, in fact, attached to the base of the penis. Above the two muscles is an oblique pair of muscle whose function is to support the anus and prevent it from becoming loose and protruding.

Section XXVII

Anatomy of muscles of the thigh

The largest muscle of the thigh is that which stretches it. Next comes the muscle which flexes it. The most important functions of these two muscles are these two movements. Stretching is a more important function than flexion, because it is through stretching that standing posture is achieved. Then comes the muscles of abduction, adduction and circumduction.

Of the abduction muscles in the thigh there is one which is the largest in the body. It is that which goes over the pubic bone and ischium, upto the knee, covering the thigh fully from inside and from the back. The originating points of its fibres are different, and so is their functions. For example, some fibres originate from the lower part of the pubic bone, they go into the thigh and are dispersed. Some other fibres come from a little above and flex the thigh. Still others come from a much higher level which, while flexing the thigh, turn it inwards. Since some fibres originate from the ischium, while straightening it, they fully extend the thigh.

There is a muscle in the thigh which covers the joint in the ischium at the back. It has three heads and two ends. These heads originate from the ilium, ischium and coccyx. Two of these heads are fleshy and the third membranous. The two ends of this muscle are attached to the two ends of the thigh. When one end of the muscle is pulled, the thigh inclines to that side. If both the ends are pulled, the thigh becomes straight and is flexed.

The thigh has another muscle which comes from the whole of the front part of ilium and is attached to the large processes above which are called greater trochanter. This muscle is somewhat distended in the front and is inclined inwards. There is another muscle resembling it which is attached to the lower part of the lesser trochanter and by descending, performs its function. It does not spread out very much, but is sharply tilted. It originates from the frontal lower part or the ilium. The thigh has yet another muscle which has its origin in the lower part of the ischium, and is inclined backwards. It spreads out a little towards the back, but its distension is greater inside (the thigh).

Muscles that contract the joint of the thigh: There is a muscle which contracts the thigh a little inwards. It is straight, and originating from two places it comes downwards. One end of it is attached to the half of the lower part of the back and the other end is attached to the ilium and goes on to the inner part of the lesser trochanter. Another muscle comes from the pubic bone and is attached to the lower part of the lesser trochanter. One more muscle lies slantingly on one side of the thigh and looks like a part of the larger muscle. The fourth muscle comes from the vertical spines of the ilium. It flexes the thigh and the shank as well. Some of the muscles of the thigh have been described while dealing with extension and flexion. There is one more muscle for these movements which comes out of the pubic bone and, greatly lengthened, meets the knee, the muscles which incline the thigh outwards are two, one of which comes from the ilium. Besides, there are two muscles which rotate the thigh, one coming out of the outer part of the pubic bone and the other from the inner part. Both of them meet at an angle and are joined inside the lower part of the greater trochanter. The thigh follows these muscles, with slight extension, to whichever side they turn.

Section XXVIII

Anatomy of muscles which move the knee joint

Muscles which move the knee joint are three, located on the front of the thigh. They are the largest muscle of the thigh which help in extending it. One out of these three is a double muscle with two heads, one head coming out of the greater trochanter and the other from the front part of the thigh. This muscle has two ends, one end being fleshy which meets the patella before taking the form of a tendon. The other end is nerve-like which is attached to the inner part of the thigh bone. The other two muscles are those which we have described while dealing with the flexion of the thigh, that is, those which come out of the spines of the ilium and from the outer process of the thigh. The two are joined together. Out of them comes a tendon, broad and encompassing the patella, and strengthening the parts below it. It is attached to the upper end of the shini bone by pulling which it extends the knee.

There is another extension muscle which comes from the point where the pubic bones meet, and goes down obliquely towards the inner side of the thigh and is finally attached to the upper part of the shank which is covered with vessels. It extends the shank from inside. Some books on Anatomy speak of another muscle opposite to it arising from the ischium and coming out obliquely until it reaches the part covered with vessels. There is no other muscle so oblique as this muscle. It extends the shank a little outwards. When the muscles on both the sides stretch, the shank is also stretched and is straightened.

Of the muscles which flex the shank there is one that is thin and long and which originates from near the ilium and the pubic bone, close to the muscle which extends the shank on the inner side, and out of the spines in the middle of the ilium. It penetrates into both the sides of the knee obliquely and, coming out, ends on the process in the knee, to which it is attached, where there are vessels. It serves to flex the shank upwards and forwards, going a little towards the groin.

There are three other muscles; inner, outer and middle. The outer and middle muscles flex the shank a little outwards, and the middle muscle a little inwards. The inner muscle originates from the lower part of the ischium, and proceeding obliquely along the back side of the thigh it ends inside the shank where there are vessels. This light green muscle is attached here. The other two muscles also come out of the base of the ischium and reaching out to the place of the vessels become attached to it on the outer side. There is a muscle in the knee joint which is set deeply in the fossa of the knee, and performs the same function as a middle muscle. It is thought that the double muscle coming from the spine has a tip which sometime flexes the knee indirectly. There is a tendon spreading out near this double muscle which strengthens the hip joints and is attached to the surrounding parts.

Section XXIX

Anatomy of the motor muscles of joints of the feet

Among the muscles which move the joints of the feet are those that raise the feet and those that lower them. One of the elevator muscles is large, which is located in the inner frontal part of the shank. It originates in the outer part of the head of the tibia, and going up tends towards the shank. Then it goes round towards the large toe and is attached near its base, helping to raise the feet. There is another muscle originating from the head of the fibula. But of it comes a tendon which is attached near the base of the little toe, helping to raise the feet, particularly in conjunction with the first muscle. Thus the feet are straightened and elevated.

As for the muscles which lower the feet, there is a pair of them which comes from the end of the thigh, going down towards the shank in the form of flesh. Out of this pair grows the largest of the tendons. This tendon is the heel tendon which is attached to the heel bone and pulls it backwards obliquely with outward inclination. This is the reason for the feet being firmly fixed on the ground. It is assisted by a violet muscle which arises from the head of the fibula and goes down till it is attached by itself, without the aid of the tendon. It continues to be fleshy and is attached to the end of the heel above the preceding point of the attachment. When these two muscles or their tendons suffer and are injured the feet remain immovable.

There is a muscle from which two tendons branch out, one flexes the feet and the other extends the large toe. It is so because this muscle originates from the head of the tibia at the meeting point of the fibula and goes down between them until it divides into two tendons, one tendon being attached to the lower part of the tarsus in front of the large toe. This tendon helps to lower the feet. The second tendon originates from a part of this muscle above the first tendon. The muscle sends a tendon to the first joint of the large toe and stretches it obliquely inwards.

There is a muscle which comes out of the outer head of the thigh and is attached to one of the two muscles of the two heels and branches out into two. It separates from them, and going ahead to the shank, it becomes parallel to a tendon which is to fully spread over the lower part of the foot. It covers the foot like the muscle covering the inner part of the palm.

Section XXX

Anatomy of muscles of the toes

There are many flexor muscles which move the toes. One of them is a muscle which comes down from the outer part of the head of the fibula and covers it. Out of this muscle proceeds a tendon which branches into two to flex the middle and the third toes. The second muscle is smaller which originates at the back of the shank. A tendon comes out of it and divides into two, the first and the little toes. Each of the two muscles sends a tendon, which join and become one, upto the big toe so as to flex it. A part of the third muscle, which has already been described and which comes out of the outer part of the tibia and proceeds down between it and the tibia, flexes the foot. Another part goes towards the first phalange of the big toe. These are the muscles at the back of the shank which flex the toes. There are ten muscles in the sole which were unknown to the anatomists and were first discovered by Galen. These muscles are found on both the sides of each toe. They flex the toes. When the muscles on the sides of a toe act together, the toe is straightened; when only one muscle acts, the toe flexes towards it. There are four muscles resting on the tarsus, one for each toe. For flexing the big toe and the little toe there are two specific muscles.

These muscles are so close to each other that when any one of them is affected, all others are weakened and they touch theline of the affected muscles. This is the reason why it is not possible for some of the toes to flex when others do not. There are five other muscles of the toes which are located in the upper part of the foot and incline outwards. There are five muscles in the lower part of the foot, each muscle being attached to the nearest toe. It flexes the toe inwards. These five muscles, alongwith the muscles exclusive to the big toe and the little toe are similar to the seven muscles of the plam which has ten muscles described previously. There are 527 muscles in the human body.

Clause III of the V Lesson

Section I

General statement on nerves

Some of the functions of the nerves are direct and the others are indirect. In their direct function they produce sensation and movement in the organs through the brain and their indirect function is to strengthen the muscles and the body. They also communicate to the brain if any injury is caused to non-sensory organs like liver, spleen and the lungs. Though these organs have no sensation, they are covered with a nervine surface enclosed by a membrane. When these organs are inflammed, or distended because of gases, the burden of the inflammation or gaseous distension is felt at the base of the nervine surface. The impact of the burden and the splitting gas is felt by the nerves.

As has already been noted, the nerves originate from the brain and terminate at the surface of the skin. The skin has a net work of fine fibres which come out of the nerves which in turn have their origin in the proximate organs. The brain is the seat of two kinds of nerves: those that come straight from the brain, and those that come from the spinal cord which comes from the brain. The nerves which come straight from the brain do not produce sensation and movement in any other organ except those of the head, the face and viscera. The rest of the organs get sensation and movement from the spinal cord.

Galen has drawn attention to a great favour of the Creator: the nerve going down from the brain to the viscera which has been so protected as no other organ has been, for a nerve that goes far from its origin needs better protection. Therefore this particular nerve has been covered with a structure, which is of a temperate consistency, that is the mean between the consistency of cartilage and nerves, resembling in the initial stage the nerve-covering until it extends to three places: larynx, posterior ends of the ribs and beyond the thorax.

The nerves which come out of the brain, and have to perform the function of conveying sensation, go straight into the organs for which they are meant. A straight line is the shortest course, and the effect of that which comes immediately from the centre is more powerful. This is because the sensory nerves do not require the hardness which the motor nerves require by going in a round about way and losing gradually their softness; and the softer a nerve, the more sensitive it is. Both kinds of nerves receive softness and hardness from the brain. The greater part of the sensory nerves arises from the forebrain which has a soft consistency, whereas the motor nerves arise from the hind brain which has hard consistency.

Section II

Anatomy of the cranial nerves and their tracts

There are seven pairs of cranial nerves. The first pair arises from two nipple like processes of the ventricles of the fore-brain and has the olfactory sensation. This pair is large and hollow, one member going from right to left and the other from left to right, the two members intersecting each other. The right member then enters the right eye ball and the left to the left. They spread out and absorb the vitreous humour. Someone but not Galen has stated that the two memebers cross each other as straight lines.

It has been stated that the above point of intersection has three advantages. The first is to divert the vital force from an injured eye ball to the other eye ball. This is why when eye is closed, the other sight is strengthened. If one eye is divested of the power of sight, the other eye, if it is able to see, sees better. When one eye is closed the pupil of the other eye is dilated to a greater degree to enable the power of sight to enter the seeing eye with force. The second advantage is that it allows a single passage into the eyes which see a single picture which is focused at the intersection. The squint eyed, thus, sees a double image because one eye is removed from its normal position. This dispositioning disturbs the line of vision as the optic nerve stops short of intersection. The third advantage is to enable the two members to derive strength from each other, and to be firmly positioned as if they emerged from the vicinity of the eye balls.

The second pair coming from behind the place of origin of the first pair, is inclined outwards. It passes through the orbital fissure, and is distributed among the nerves of the eye ball. This pair is thick to make up for its tenderness because of its remaining close to its source and being unaided. The strength thus imparted makes it a strong pair of motor nerves.

The third pair, being engaged in moving the lower jaw is left with no energy in excess, and needs a helper as we shall now describe.

The third pair originates from the border of the fore-brain and hind-brain near the base of the brain. First it meets the fourth pair, leaving it divided into four branches. One branch comes out of the foramen of carotid artery which we shall describe later. It goes down the neck and passing the diaphragm spreads out in the viscera. The second branch comes out of the foramen of temporal bone and goes on to join the fifth pair which we shall describe presently. The third branch comes out of the same foramen from which the second pair comes out and spreads out in the facial organs. It would have been ill-contrived if it had passed through the foramen of the first pair, resulting in the interference with and pressure on that noble nerve and blockade of the cavity.

The third branch, soon after emerging from the foramen, divides into three sub-branches; one going towards the canthus and covering the temples, masticator muscles, eye brows and eye lids. The second sub-branch goes into the foramen near the canthus and enters the nose and spreads inside the bridge of the nose. The third sub-branch is not so small. It descends into the small cavity of the cheek bone and becomes forked with one end going to the baccul cavity and spreading out to the teeth. That part which spreads out in the molars is visible, and that which spreads out in the gums is not. The other end spreads out in the external organs like the cheeks, sides of the nose and the upper lip. These are the three sub-branches of the third branch. The fourth branch of the third pair comes out of the foramen of the upper jaw, extends to the tongue and spreads out on its upper surface, imparting to the tongue a special sense—that is taste. A part of the branch, not spreading out of the upper surface of the tongue, proceeds to the lower gum and the lower lip. The branch which comes to the tongue is finer than the optic nerve because the hardness of the tongue has to be tempered by the fineness of the nerve.

The fourth pair emerges from the back of the third pair and is inclined towards the base of the brain. As we have already said it is joined to the third pair and turning from it spreads over the palate, imparting it sensation. Though small, it is harder than the third pair, as the palate is harder than the surface of the tongue. Each member of the fifth pair divides into two halves, like any other thing which is two fold. Most of the physicians think that each member of this pair is a pair itself emanating from the two sides of the brain. One member of the fifth pair spreads over the auditory meatus and covers it fully. The point of origin of this member is the hind-brain. This member carries the sense of hearing. The second member which is smaller than the first comes out of the foramen of the petrosal bone and is called foramen caecum. The foramen caecum has a complicated passage, so that the nerve passing through it may have to take a longer route and become harder because of the distance from the source. When this pair comes out of foramen caecum it joins the third pair, and a greater part of it proceeds to the cheek, the flat muscle and the rest go to the temporal muscle.

The sense of taste has been bestowed on the fourth pair and that of hearing on the fifth. Since the organs of hearing have to be opened to let the air flow and the organ of taste to be invisible, it was necessary for the auricular nerve to be harder. This was achieved by making this nerve come from near the hind-brain. A single nerve sufficed for ocular organs, whereas multiple nerves were placed in temporal muscles. This is because the foramen of the eye needed greater space to enable the thick optic nerve having cavities to pass through. The orbit holding the eye cannot contain more foramina. The temporal nerve needs greater hardness but not thickness. The thickness would curtail its movement. The petrosal bone through which this nerve passes is hard and hence capable of having many apertures.

The sixth pair comes from the hind-brain close to the fifth pair and is so covered with membranes and ligaments as to look like a single nerve. It turns away from the fifth pair and passes through that foramen which is near the lamdoid suture. Before its emergence from the foramen it divides into three branches—all of which come out of the same foramen. One branch proceeds towards the muscles of the pharynx and the root of the tongue to help the functions of the seventh pair. The second branch goes down to the scapular muscle and the adjacent area and a major part of it spreads out in the flat muscle of the shoulder. It reaches its destination in a manner as if it were suspended. The third branch is larger than the other two. It comes down to the viscera from where the carotid artery goes up, and is closely attached to the latter. When it comes in front of the larynx it divides into branches which go upwards to the laryngeal muscles and lifts the larynx and its cartilages. When the third branch goes beyond the larynx, it sends out a branch downwards to the inverted muscle. It is this nerve which closes and opens the arytenoid cartilage. It pulls the muscle downwards and is called vagus nerve. The vagus nerve comes from the brain, and not from the spinal cord for then it would have gone up obliquely and been incapable of pulling the muscles downwards. It has been created out of the sixth pair and apart from it there are no tender nerves before the sixth pair. This branch spreads out in the facial and cerebral organs. The seventh pair comes out obliquely, unlike the sixth pair which is straight.

Every thing which goes up or turns inwards requires strong supporter resembling a pulley that is strong, straight and smooth and close to the object which (pulley) it supports. This function could not be performed better than by the aorta. The ascending part of this branch, which is thick and straight, goes up to the aorta on the left and is loosely attached to it. On the right hand, however, the ascending part of the nerve is not so close as the other part is, and its branches are thin. When this part bends towards the armpit, it is no longer straight but goes obliquely. It is therefore necessary that this part should be firmly tied with ligaments which helps it ascend to compensate for the lack of straightness and thickness. The advantage of the vagus nerve being distant from its origin is that it becomes stronger and harder in this manner while its branches are closer to the origin. The strongest branch of the vagus nerve is that which spreads over both the lids of the larynx alongwith the assisting branch. Next in strength is the branch which comes down and sends out branches to the diaphragm, muscles of the chest, heart, lungs, veins and arteries in the lungs. The remaining branches go into the diaphragm and become one with the discending part of the third branch and after covering the visceral membrane they end on scapular bone.

The seventh pair comes from the border of the brain and spinal cord, and a greater part of it spreads in the motor muscles of the tongue and in the muscles common to thyroid and hyoid bones. Though it is generally believed that the whole of this pair spreads out in the muscles nearer the tongue, the fact is that it is always not so. Because of a number of muscles with different functions over the tongue, it is not proper that it should have foramen on its upper and lower surface. The proper thing is that the motor nerve of the tongue should be located right there enabling the sensory nerve to come from a different place.

Section III

Anatomy of the cervical nerves and their tracts

There are 8 pairs of nerve which come from that part of the spinal cord which passes through the cervical vertebrae. The first pair comes out of the two foramina of the first vertebra and spreads out in the muscles of the head. This pair of nerves is small and thin because it is safer for it to be thin at its source as we have explained while dealing with bones.

The second pair comes from between the first and the second vertebrae, from the foramen described dealing with the bones. The larger of it goes towards the head and gives it sensation of touch. It ascends the neck obliquely and spreads over the external parts of the ears and compensates for the first pair which is being small falls short of reaching the adjacent organs. The remaining part of this pair goes to the muscles of the nape and the flat muscle and enables them to move.

The third pair comes out of the foramen between the second and third vertebrae. Each member of this pair is forked. One branch (of each member) goes deep into the muscle on the spot and develops multiple branches one of which may be mentioned in particular: that which turns the head and the neck and when it is towards the spinous process and faces it, becomes attached to its branches. Then it goes up towards the heads of the vertebrae and is linked up with the membranous ligaments coming from the vertebral processes. Proceeding further, it turns back and penetrates the ears. This branch goes right inside the ears of animals, but not men, where it ends and produces movements in the muscle of the ear. The second branch passes in the front and goes to the flat muscle. First it ascends and is intertwined with the blood vessels and muscles in the vicinity in order to become stronger. In animals, this branch goes to the muscles of the ear and temporal muscles and often it spreads out in the muscle of the cheek.

The fourth pair originates from the foramen between the third and the fourth vertebrae and like its predecessor divides into branches in the front and the back. The frontal part is smaller and meets the fifth pair. It is said that a branch from it, resembling the cobweb, spreads on the carotid artery and passing from the sides of the mediastinum reaches the diaphragm. The longer part of it turns back and penetrates the muscles, reaching out to the spinous processes where a new branch is formed which goes to the muscle common to the head and the neck. Then it meanders in the front, and in animals it meets muscles of the cheeks and ears. It is also said that this branch goes down to the vertebral column.

The origin of the fifth pair is from the foramen between the fourth and fifth vertebrae. It has two branches. The one in the front is smaller and spreads out in the muscles of the cheek, the muscles that tilt the head, and in all the muscles common to the neck and the head. The second branch also divides into two, one of which is located between the first and the second (main) branches. It ascends to the scapular bone and joins some parts of the sixth and seventh pairs, the second branch meets the fifth, sixth and seventh pair and goes into the middle of the diaphragm.

The sixth, seventh and eighth pair come out of the remaining foramen, but the eighth pair comes from the foramen between the last servical and the first thoracic vertebra. The branches of these nerves are well connected. A major part of the sixth pair spreads over the scapular bone. Some of the branches (of the sixth pair) go deeper into the diaphragm than the branches of the fourth pair but not so deep as those of the fifth pair. Most of the branches of the seventh pair spreads out in the arm, with one branch going, along with a branch of the fifth pair into the muscle of the head and the neck, the vertebral column and the diaphragm. A major portion of the eighth pair goes to the forearm, but no branch of it goes into the diaphragm. The entire sixth pair goes towards the arm but does not cross the shoulder bone. The seventh pair does not go beyond the upper arm. The nerve that goes from the shoulder bone to the forearm comes from the eighth pair which is connected with the first thoracic vertebra.

The nerves that go into the diaphragm are different from those which come from the spinal cord just under them. The reason for the nerves coming down is the equitable distribution, particularly when they tend to spread over the mediastinum. The nerves coming from the spinal cord are unable to enter the diaphragm straight, with no curves and angles. If the nerves were to come to the diaphragm from the brain they would have followed a longer route. If these nerves were not in the centre of the diaphragm but on one side of it they would not have spread out evenly. If the nerves had spread over the diaphragm from its periphery they would have deviated from the straight course. Movement in the muscles proceeds from the periphery to the centre, and this is so in the diaphragm. When it was necessary for the nerve to come down to the centre of the diaphragm it was also necessary to suspend the diaphragm. It was also necessary to protect and cover the diaphragm, which was achieved through a membrane coming down from the mediastinum. As the diaphragm has to perform very important functions, the sources of its nerves are many so as not to interrupt its functioning if one of the sources is injured.

Section IV

Anatomy of the spinal nerve of the thorax

The pair of the thoracic nerve comes from between the first and second thoracic vertebrae and divides into two. The larger branch goes into the muscles of the ribs and spine, and the other branch passes over the upper ribs and joining the eighth cervical nerve goes along with it to the arm till it covers the entire wrist in the palm. The second pair comes from the foramen already described. One member of this pair goes into the outer side of the arm and carries sensation to it, while the other member, alongwith other thoracic nerves goes to that part of the muscle of the shoulder which supports the muscles that moves the shoulder joint, and then goes on to the muscles of the spine. The branch of this nerve which comes from the thoracic vertebra, that is the one which does not come from the shoulder, spreads over the muscles of the spine, intercostal muscles and the outer muscles of the chest. The branch which comes from the vertebrae of the smaller ribs reaches the intercostal muscles and muscles of the abdomen. Arteries and veins run along these nerves, and the enterspinal cord from where the nerves emerge.

Section V

Anatomy of the nerve of the lumbar vertebrae

The lumbar nerves are common in the sense that a part of them goes into the muscles of the spine and the other part into the muscles of the abdomen and the muscles lining the spine. However three upper lumbar nerves join the nerve coming from the brain, while others do not. A long branch proceeds towards the lower two pairs going to the two shanks where a branch of the third pair and the first nerve of the sacrum meet. These two branches do not go farther than the hip joints but spread out in its muscle which goes to the shanks. The other nerves proceed beyond the hip joint and end up in the shanks. There is a difference between the nerves of the thigh and the legs and those of the arms; all the nerves of the thigh go to its depth, because the thigh joins the hip bone differently from the arm joining the scapula. Further, the thigh is not connected with the source of its nerves in the same way as the arm is connected with its source of nerves. The nerves of the shank proceed differently, some going on the inner side and some on the outer and some penetrating deeply under the muscles. Since the nerves which arise in the region of the pubic bone could not enter the legs either from the back of the body or through the inner parts of the thigh because of the abundance of the muscles and blood vessels, a part of the main nerve was to pass through the muscle of the leg. Thus it is able to follow the channels going towards the testicles and enters the pubis from where they descend and reach the muscle of the knee.

Section VI

Anatomy of the nerves of sacrum and coccyx

The first pair of the nerves of the sacrum joins, as has been already mentioned, the lumbar nerves. The other pairs and individual members which arise from the proximity of the coccyx spread out in the rectal muscles, the male organ, bladder, the uterus and its lining, the internal parts of the organs coming from the pubic bone and in the muscles, coming from the sacral bone. The statement on nerves ends.

CLAUSE IV

Arteries

Section I

Description of arteries

Beating vessels are those arteries which, excepting one, have two linings. The inner one is stronger, for it is this lining which has to sustain the beating and the movement of the powerful vital force, the second lining gives strength and protection to the arteries. The arteries emerge from the left ventricles of the heart, the right ventricle being nearer the liver has to perform the task of absorbing and using the nutriment.

Section II

Anatomy of the venous artery

First, two venous arteries arise from the left ventricle, one of which reaches the lungs and spreads out there in order to draw oxygen and supply blood. The other venous artery carries nutriment to the lungs from the heart, indeed it is the heart which supplies nutrition to the lungs, that is, the nutrition comes to the lungs from the heart. It arises from the finer parts of the heart where the veins enter and has a single lining as opposed to all other venous arteries, for this reason, it is called venous artery. It indeed has a single lining to keep it soft and thin, to make it easy to expand and contract and to enable the vapours of the fine blood which almost reaches the point of coction in the heart, and which helps to keep the tissues of the lung soft, to filter the blood though the blood in the venous artery does not need as much coction as the running blood in the vena cava, because being nearer to the heart it easily receives the blood maturing heat. Another reason for the venous artery to have a single lining is that the organ in which it beats is tender, and there is no danger of the venous artery being affected by hardness. Venous artery has thus been freed from being thick in structure, unlike other veins found in proximity of hard organs.

We shall now describe the arterial vein which comes from the posterior part of the lung close to the vertebral column, and spread, out on the front part of the lung and penetrates it so as to become a part of it. Since the arterial vein has to help in expansion and contraction and to allow easy permeation, it has greater flexibility and less hardness.

The second artery which Aristotle calls aorta, is the largest. It comes out of the heart and sends forth two branches, the larger one of which circles the heart and penetrates it. The smaller branch also goes round the heart, then spreads out in the right ventricle. The remaining part of the aorta then divides into two, the larger part going downwards and the smaller part going upwards. The part that goes downwards is larger as it has to feed greater organs in number and volume. These organs are distant from the heart.

The root of the aorta is covered with three hard membranes in the outward direction. If there were only one or two membranes, with greater volume they would not have fulfilled their function because of heaviness. If there were four, they would have become too thin to carry out their function. An increase in their volume would also result in the narrowing of the passage.

The venous artery has two membranes directed inwards. There are only two membranes as there is no need here, as elsewhere, for obstruction. There is greater need here for softness and thinness to allow the fuliginous vapours and to have the blood an easy excess to the lung.

Section III

Anatomy of the ascending artery (ascending aorta)

That part of the aorta which goes upward divides into two, the larger branch of which ascends to the front part of the neck, then turns to the right till it reaches the soft flesh resembling the nearby thymus. Then it spreads into three branches, two of which called carotid arteries rise up on the right and the left of the neck alongwith the internal jugular vein which we shall describe later. We shall describe a further division afterwards. The third branch spreads over the sternum, the first rib of which is prominent, the upper six foramina of the neck and along the collar bone, and reaching the scapula, goes down the arm. The smaller branch of the aorta emerges from near the armpit and is distributed in the sameway as the third branch of the larger part of the aorta.

Section IV

Anatomy of the carotid arteries

Both the carotid arteries divide into two on the upper part of the neck. The two branches are called anterior and posterior. The anterior branch again divides into two, one of which travels inwards and reaches the tongue and the deep muscles of the lower jaw. The second branch travels outwards, and going up in front of the ears spreads out in the muscle of the temple from where it proceeds in the form of multiple branches to the crown of the head from the right and the left.

The posterior branch divides into two. A major portion of the smaller branch goes up the back and spreads out in the flat muscle of the skull, while a part goes to the base of the skull and enters the foramen of the lambdoid suture. The larger branch enters the foramen of the petrosal bone which is next to the foramen of an lambdoid suture, then it forms a network in which various branches intertwine, layer upon layer, so that no branch can be lifted alone. After forming a network from all the four sides in which each branch is interlaced with the others, it emerges again in the form in which it was before. Then it pierces the meninges and rises to the brain and after covering the pia-mater it enters the brain, its ventricles and down to the membrane. The orifices of these arteries join the ascending veins. Then their orifices join the descending veins. The arteries have been made to ascend and descend because they supply blood, and the vessel that pours well is the one with tilted sides. The arteries also help the vital force in its tendency to move upwards. The vital force does not require pouring through the tilted vessel, as it would only increase the flow of the blood, and slacken the ascent of the vital force. The movement and the stability of the vital force is just enough to spread out in the brain and provide it with the requisite warmth. The net work of blood vessels under the brain enables the vital force and the blood to circulate and receive coction to approximate to the temperament of the brain and to be absorbed by it gradually. The network of the blood vessels is seen between the skull and dura mater.

Section V

Anatomy of the descending artery (descending aorta)

The second branch of the aorta first goes down vertically with the support of the fifth (thoracic) vertebra. Its location is just in front of the apex of the heart. The thymus gland, which acts as a pillar and support of the heart is located here between the aorta and the hard bone. Then, reaching the oesophagus it turns to the right and goes farther from it till it joins a membrane close to the diaphragm, keeping it free of constriction. When the descending aorta reaches the fifth vertebra it turns and inclines downwards and covering the vertebral column reaches the sacrum. While passing in front of the chest it sends out small and thin branches which spread out in the lungs till it reaches the sides of trachea. As it proceeds, it sends forth a branch at each vertebra going between ribs and spinal cord. When it reaches beyond the chest it divides into two branches which proceed to the diaphragm and spread out on its sides. Here, another branch emerges which spreads out in the stomach, liver and spleen. One more branch comes out of the liver which runs to the bladder. Yet another branch emerges and goes to the mesentric vessels of ilium and the colon.

There are three more arteries, the smallest is specific to the left kidney which spreads out in the membrane of the kidney and surrounding organs and gives it life. The other two branches reach the two kidneys to enable them to drain water out of blood. These two branches mostly carry impure blood from the stomach and the intestines. Then two more branches emerge and proceed to the testes. Alongwith the branch which comes to the left testicle there comes a part of the branch which runs to the left kidney, and often the branch which comes to the left testicle comes from the left kidney itself. The branch which comes to the right testicle always originates from (descending) aorta. This branch is seldom found along the branch that comes from the right kidney. The aorta gives rise to many arteries which spread out along the mesentery which surrounds the rectum. One branch goes to the spinal cord and enters the foramina of the vertebrae. Some other branches proceed to the hips and some to the testes. Apart from these arteries there is a pair of small arteries in women which ends at the vulva. There is another pair common to men and women which joins the veins. We shall describe it later.

When aorta reaches near the last vertebra it divides along with the vein, which we shall be describing, into two. It forms the Greek letter "Λ". One branch goes to the right and the other to the left. Both the branches come down to the sacrum and proceed to the thighs, but just before reaching the thighs each branch gives out a sub-branch, and the two sub-branches meet at the umbilicus after crossing the bladder. They are prominent in the foetus but dry up after delivery, with only the roots surviving. A branch emerges from the sub-branch which spreads out in the muscle above the sacrum. The sub-branch which goes to the bladder divides and spreads out inside the bladder, with its ends going down to the penis (in the men), and to the womb in women. This sub-branch forms a small pair.

The two arteries proceeding to the legs divide into two large branches on reaching the thighs—one branch being on the inner and the other on the outer side. The outer branch inclines a little inwards and puts forth a branch which spreads out in the local muscle, then as it goes down, it gives forth a large branch which reaches the great toe and the second toe. The other branches spread out in a greater part of the foot and are covered by veins as we shall describe later.

There are certain arteries which do not go along the veins, unlike the arteries which go from the liver and through the umbilicus into the foetus.

There are certain arteries which do not move along the veins, unlike the two branches coming from the liver into the foetus through the umbilicus, the branches of arterial veins, the artery going into the fifth vertebra, the artery going towards the clavicle, the artery to the armpit, the two carotid arteries which spread in the pia-mater, the arteries going to the diaphragm, the artery which along with its branches goes to the scapula, the arteries going to the stomach, liver, spleen and the intestines, the artery descending from the hypochondrium and the arteries spreading in sacrum and its extremitus. When the venous artery reaches the back it is accompained by the vein which serves as its mount, for that which is inferior has to support the superior. In the organs that are visible the vein goes under the artery as a lining in order to serne as a shield. The artery is accompained by the veins for two reasons first, to enable the veins to be tied with the arterial membrane and thus protect the artery in the organ so that the two may nourish each other. Here ends the chapter on arteries.

Clause V of V Lesson

Section I

Description of the veins

All non-throbing vessels come out of the liver. First two vessels come out of the liver: one from the concave side of the liver whose major function is to bring nutrition to the liver and is called porta hepatis, and the other from the convex side whose function is to take nutrition from the liver to the organs and is called vena cava.

Section II

Anatomy of the vein called portal vein

We shall now describe the anatomy of the vein called porta hepatis. We should state that the porta hepatis puts forth five branches which go deep into the concave side of the liver and then proceeds to the convex side of the liver. One branch enters the gall bladder and can be compared to a tree the roots of which go deep down from their base. Near the concave side of the liver, the porta hepatis divides, as it proceeds further from the liver, into eight branches, two small and six large. One of the first two branches joins the intestine called duodenum to receive nutrition from it. A few sub-branches emerge from this branch and spread out in the pancreas. The other branch goes under the stomach to obtain nutrition from the pylorus.

Of the remaining six branches, one spreads over the surface of the stomach to provide nutrition to the outer part of the stomach, the inner part in order to obtain nutrition from the food reaches the stomach directly. The second branch goes to the spleen to provide nutrition, but before it reaches the spleen it sends out a branch which gives the pancreas better nutrition than that which nourishes the spleen. Then this branch joins the spleen, and when adjoined sends out a fine branch which turns and spreads out over the left side of the stomach to provide it nutrition. The vein going into the spleen, on reaching the middle of the spleen, develops a branch that goes up then comes down. A part of the branch that goes up spreads in the upper half of the spleen to provide nutrition, and another part divides into two branches as it approaches the concave part of the stomach. One branch spreads out and provides nutrition in the external left side of the stomach, while the other branch penetrates the cardiac orifice and carries acrid and sour humoral wastes so that the spleen may excrete these wastes into the cardiac orifice and produce through titillation a sense of hunger as we have described before.

The branch that comes down divides into two, one part spreading in the lower half of the spleen and providing it nutrition and the other part spreading in omentum and providing it nourishment. The third of the six branches comes to the left side of the rectum and spreads in the surrounding net work to absorb nutriment from the waste. The fourth of the six branches divides into hair-like branches, some of which go to the outer left part of the concave side of the stomach and face the branches coming from the left side of the spleen. The fifth of the six branches spreads in the net work around the colon to provide them nutrition. Similarly a major part of the sixth branch spreads around the jejunum, while the remaining part spreads arround the five small intestines adjoining the coccyx and draws nutrition from there.

Section III

Anatomy of vena cava and its ascending branches

The vena cava first arises in the liver and extends there like hair in order to draw nutriment from the hair-like branches of the portal vein which spreads out in the liver. The branches of the vena cava come from the convex side of the liver and spread out of the concave side, but the branches of the portal vein proceed from the concave side of the liver and spread out in its interior. One branch of the vena cava, on emerging from the convex side of the liver divides into two branches, one going up and the other going down. The ascending branch pierces the diaphragm and enters it, sending two shoots to enable the diaphragm to get nutrition. Then it reaches the vicinity of the pericardium where it sends forth hair like branches which spread out in the region and give nourishment. Further, it again sends out two branches, the larger branch going into the right cardiac auricle. It is the largest of the branches of the heart, because it has to perform the function of supplying nourishment, whereas all other branches simply supply fine air. Nutriment is heavier than the fine air, and therefore it is necessary that its orifice should be broader and its channel larger. As soon as this branch enters the heart, it gives rise to three membranes facing inwards so that it may draw nutrition during the contraction of the heart and prevent the nutrition from flowing back during expansion. These membranes are among the tough ones. Near the heart, this branch sends out three branches in the region of the heart. One branch, which originates from near the source of the arteries to the left, goes to the lungs, bending towards the right ventricle. This vein, like the arteries has a double coat, and is therefore called arterial vein. It has two functions: first, to let thin blood ooze out which is consistent in some degree with the substance of the lung. As the blood was recently coming from the heart to get the proper maturation inside the venous artery so its second function is the proper coction of the blood.

The second branch circles the heart and goes into it to supply nutrition which is possible only when the vena cava goes deep into the right cardiac auricle. The third branch is directed, in the human being, towards the left and reaching the fifth thoracic vertebra rests upon it and reaches out in the eight ribs, adjoining muscles and other organs.

Having sent forth the previous three branches, the branch of the vein coming out of the vein vena cava proceeds further from the heart and goes up, spreading out in the upper parts in the mediastinum and pericardium. It sends out hair like branches in the soft flesh called thymus gland and as it approaches the clavicle it sends forth two more branches obliquely towards and away from the clavicle. Each of the branches gives forth two more branches. One of them goes down round the sternum and ends up at the xiphoid cartilage, In its course it sends out branches which spread out in the muscles between the ribs. Their orifices join the orifices of veins found there. Some of the branches emerge and spread in the outer muscle of the chest. When the branch reaches the xiphoid cartilage it produces a bunch of vessles which spread in the motor muscles of the scapula. Another branch goes down and spreads out in the flat muscles. Many more branches come out of this branch whose ends join the branches of the sacral vein which go upwards. We shall describe them soon.

The remaining branches are in pairs. Each member of a pair gives forth five branches. One branch goes to the chest and supplies nutrition to the upper four ribs. The second branch supplies nutriment to the muscles of the shoulder. The third branch goes deep into the muscle of the neck to provide nourishment. The fourth branch enters the foramina of the upper six cervical vertebrae and goes upto the head. The fifth branch which is the largest, comes to the axilla from all sides and gives out four branches. The first branch spreads in the muscles of the sternum which move the shoulder joint. The second branch goes into the glandular flesh and the axillary membrane. The third branch passes by the chest and reaches to the hypochondrium. The fourth branch is the largest and gives out three branches. One of which spreads out deep inside the muscle of the scapula. The second branch spreads in the large muscle of the axilla. The third branch, which is the largest goes down the arm and reaches the hand. It is called the axillary vein. The remaining part of the vein, which gave rise to many branches, ascends to the neck. and before going into its interior it divides into two branches: external jugular vein and internal jugular vein.

When the external jugular vein divides into two on reaching the clavicle: one branch goes to the side from the front, and the other comes to the front and then goes up, emerging near the clavicle and going round it, meets the first branch on the external side of the neck, the two becoming one and known as external jugular vein. However, before the two meet, the second branch sends forth two branches: one going horizontally to where the clavicles meet, and the second going obliquely along the external side of the neck. The members of this branch do not meet. Out of the two pairs cobweb like branches are formed which are invisible. But there are three veins coming out of the second pair which are prominent among all its other branches which are visible and whose size can be gauged. All the other branches are invisible. One of these veins goes to the scapula and is called scapular vein. The cephalic vein comes out of it. The ends of the scapular veins divide into two branches which go to the extremity of the scapula. One of them stops there, and without proceeding further it spreads out in the region. But the other branch goes on to the end of the humerus where it spreads out and ends there.

The external jugular vein, after its two branches meet, is again divided into two branches. One branch goes inside and produces small branches which spread in the maxilla. Most of the larger branches spread in the mandible. A part of both the branches spread out around the tongue and in the lateral surfaces of its muscles. The tips of the branches emerge and enter the head and ears where they spread.

The internal jugular vein goes up vertically along the oesophagus and in its course it sends out its branches which meet the branches of the external jugular vein. All its branches go to the oesophagus, larynx and deep muscles and spread out. The tip of the internal jugular vein goes to the lambdoid suture where its branches spread out in the organ between the first and second vertical vertibrae. A thin hair-like branch proceeds to the joint of the head and neck, and a few branches from it go to the precranium and arrive at the cranium from where they penetrate the head. These branches apart, the remaining portion of the internal jugular vein goes into the head as far as the end of the lambdoid suture. Here some of its branches spread out in the piamater and duramater to nourish them and to bind the duramater which envelops the brain. From here they go to the precranium to nourish it, then along with piamater they descend into the brain. These branches spread out like the arteries and fasten the duramater with its folds to the brain. Then they go to the open space where the blood pours. Then they go to the two segments called torcular herophile, when the branches come near the middle ventricle of the brain they become out of necessity larger for drawing nutriment from the torcular herophile and its channels. Then they go beyond the middle ventricle of the brain, spread out in anterior ventricles and join with the arteries coming from below, to form a membranous network known as choroid plexus.

Section IV

Anatomy of the veins of the hands

When the scapular vein, also called cephalic vein, arrives in the arm, the branch that first emerges out of it spreads out in the skin and the outer part of the muscle. Then, near the elbow joint it gives forth three branches. One branch, known as fumis branch, spreads over the outer part of the radius, then proceeding along the outer side it is directed towards the projecting part of the ulna and spreads out in the outer and lower parts of the wrist. The second branch, proceeds in the outer part of the forearm towards the bend of the elbow and joins parts of the axillary vein. When they join they form the median cutaneous vein. The third branch penetrates deeply and joins the axillary vein.

The first branch emerging from the axillary vein goes deep in the arm and spreads out in its muscles where it ends. Another branch goes to the forearm. When the axillary vein reaches the elbow joint it is divided into two branches, one going deep inside and the other joining the depth of the cephalic vein. They run together to a distance, then separate. One branch goes in the interior towards the little finger, ring finger and half of the middle finger, while a part of it goes into the surface of the hand close to the bone. The second branch of the axillary vein spreads out in the forearm and gives out four branches. One branch passes through the lower part of fore arm and goes to the wrist. The second branch proceeds like the first. The third branch spreads out in a similar way in the middle of the forearm. The branch which is the largest goes up along the outer part and gives rise to a branch which forms the median cubital vein. The remaining part is known as the basilic vein. Then it goes deeper and disappears.

The median cubital vein arises in the interior of the hand, goes towards the radius then tending outwards, divides into two branches, like the greek letter lambda, the upper parts of which reach the radius and passing through the wrist spread out at the back of the thumb and forefinger as well as between the two. The lower part of the vein goes to the ulna and divides into three branches, one going between the forefinger and the middle finger and joining the vein coming from above towards the forefinger. On joining they become a single vein. The second branch called salva-tilla spreads out between the middle finger, ring finger and the little finger. All the (three) branches spread out in fingers.

Section V

Anatomy of the inferior vena cava

We have finished the description of the ascending Vena Cava which is smaller of the two (superior Vena Cava and inferior Vena Cava). The descending Vena Cava gives forth, soon after emerging from the liver and before seeking the support of the spinal cord, hair like vessels which enter the membrane of right kidney and supplies nutrition to it and the surrounding tissues. A large vein proceeds from the discending Vena Cava to the left kidney and hair like vessels come out of it and spread in the membrane of the left kidney and surrounding tissues to provide nutrition. Two veins emerge from the Vena Cava and are called renal veins. These two veins go into the two kidneys to separate the water from the blood, for it is this water which supplies nutrition to the kidneys. There is a branch coming out of the left renal vein which, in men, goes into the left testicle, and, in women, to the left overy, in the manner we described under arteries but not to be confused with them. Nor should there be a confusion that there are two branches going out of the renal vein towards the testicles. The vein that goes to the left testicle always comes from the left renal vein, and in some people the branches of both the renal vein to the left testicle. As for the right testicle, it is established that the branches of the renal veins rarely go to the right testicle, and rarely do they meet. Among the vessels going from the kidneys to the testicles there is a passage with circuitous veins in which the semen matures and undergoes the colour transformation from red to white. Some veins come to the testicles from the spine, a major part of which goes into the penis and cervix uteri in the same way as described under the arteries. After the rise of the renal veins and their branches the Vena Cava takes support of the spinal column and goes down, producing a branch at each vertebra which goes into it and in the adjacent muscles. Apart from there, the vena cava sends veins to the hips and also to the muscles of the abdomen which end there.

The veins descending from Vena Cava entering the vertebrae reach the spinal cord. When the Vena Cava reaches the last vertebra, it divides into two branches, inclining towards right and left and proceeding towards the thigh. Before they reach the thigh each of them divide into ten branches. The first goes to the sides of the back. The second branch has minute sub-branches go into the peritoneum. The third branch goes into the muscles which cover the sacral bone. The fourth branch spreads in the outer part of the sacrum and the muscles in the anus. The fifth branch goes in women to the cervix uteri and spreads there and in the surrounding area upto the bladder where it is divided into two branches, one branch spreads in the bladder and the other just near the neck of the bladder. In men, because it goes to the penis the fifth branch is larger than the one in women. The sixth branch spreads in the muscles of the pubis. The seventh branch goes up the rectus muscle of the abdomen. This branch meets the ends of the veins going down from the chest to the hypochondrium which we have already described. There are certain branches that emerge from the root of the seventh branch, some of them reach the uterus and the other to the breasts, relating the uterus to the breasts. The eighth branch goes in both male and female to the procreative organs. The ninth branch goes into the muscles of the thigh where it spreads. The tenth branch starts at ureter and goes to the outer side of the hips and joins the ends of the the veins coming from the breast. A major portion of these veins goes into the buttocks, and advances to the thigh where it puts forth many branches one of which spreads in the superior muscles of the thigh. Another branch spreads in the deeper and interior parts of the thigh. There are many other branches going to the interior of the thigh. The remaining part of the vein divides into three branches on reaching the knee. One, which is the outer one, spreads in fibula reaching down to the ankles. The medial branch goes down from the knee joint to the interior muscle of the shank where it gives out a branch and then divides itself into two branches, one of which enters the muscles of the shank and is dispersed, whereas the second branch spreads between the fibula and tibia till it reaches the upper part of the foot where it meets the outer branch mentioned above. The third branch is an interior branch inclined towards the outer part of the shank and spreading in the convex part of the fibula and tibia from where it discends to the interior frontal part known as vena saphana. These three branches later become four, two outer ones which proceed from the fibula to the foot, and two inner ones. One of the two exterior branches comes from the front and spreads in the upper part of the little finger. The other branch meets the outer part of the interior branch mentioned above which spreads in the lower parts (of the foot). This is the enumeration of the veins in dealing with the anatomy of homogeneous organs. The anatomy of the composite organs will be dealt with in the chapters on therapeutics. We shall now turn to the faculties.

LESSON VI

Consisting of a clause and a section

Clause

consisting of six sections

Section I

General statement on the various faculties.

Faculties and functions are understood with reference to each other, since each faculty is the source of some function and each function proceeds from a faculty. Therefore we shall deal with them together in a single lesson. According to the physicians the kinds of the faculties and the functions proceeding from them are three:

(1) the psychic faculties
(2) the physical faculties
(3) the vital faculties.

Many philosophers and physicians in general, particularly Galen, consider that each faculty has its own principal organ. This principal organ is the source of the faculty and from this very organ the functions of the faculty emerge. They consider that the psychic faculties reside in the brain, and their functions proceed from it. There are two kinds of the physical faculties. One is concerned with the preservation of the individual and his (biological) administration. It controls the matters of nutriment so that it might nourish the body till the end of life and faster its growth to its maximum limit.

The repository of this kind of faculty and the source of its function is the liver. The other is concerned with the preservation of the species. This controls the matters of generation so that it might separate the semen from the fluids of the body and give it a form according to the decree of the Creater, the Most High. The repository of this facalty and the source of its functions are the testicles.

The function of the vital faculty is to control the pneuma which is the vehicle of sensation and movement. It enables the pneuma to receive these impressions (of sensation and movement) when it reaches the brain. Moreover, it makes pneuma capable of imparting life to those parts into which it diffuses. The repository of this faculty and the source of its functions is the heart.

Aristotle, the great philosopher, believes that the source of all these faculties is the heart, though their primary functions are manifested in the aforementioned organs. Just as the physicians think that the source of sensation is the brain and that every type of sensation is specific to an organ where its functions appear.

If truth is investigated and probed into it will come out to be what proper inquiry and investigation would uphold the view of Aristotle, and not of others. It will be found that the statements of the latter are deduced from specious and unwarranted premises because they have followed only the superficial matters. But it is not for the physicians, as such, to verify the truth between these two views. It is rather the responsibility of the philosopher or the physicist. When a physician has been made to accept that the above mentioned organs are sources of some sort or other of these faculties, he is no longer concerned while dealing with medical matters, whether they are derived or not from any source prior to the brain. The philosopher should not, however, ignore such issues.

Section II

Ordinative physical faculties

Physical faculties may be divided into primary and secondary faculties. The Secondary faculties are of two kinds:

One uses the nutriment for the preservation of the individual, and has two kinds: the nutritive faculty and the augmentative faculty.

The second acts into the nutriment for the preservation of the species and has two kinds: procreative and formative faculties. *Nutritive faculty* is the faculty which changes the nutriment into the likeness of the nourished organ and makes up for the loss. *The augmentative faculty* is the faculty which extends the dimensions of the body in harmonious proportion so that it might attain full development by means of the nutriment penetrating into it. The nutritive faculty serves the augmentative one. The nutriment supplied by the nutritive faculty is, sometimes, equal to the loss and sometimes less or greater than it. Growth will not occur unless the supplied nutriment is more than the loss. However, the supply of more nutriment than the loss does not necessarily produce growth. Corpulence after leanness during the stationary period of life is an example of this kind. It is not growth. Growth is really an increase in all the dimensions and in harmonious proportions so that the body may achieve through it the limit of development after which there is no growth at all, though there might be corpulence. Similarly, prior to the stationary period of life there might be leanness but no emaciation. Emaciation is less likely to occur before the stationary period of life than corpulence after it.

The function of the nutritive faculty is accomplished with the help of three partial functions: First there is acquisition of the replenishing substance which is blood and humour which resemble the organ in their function. This function is disturbed, as in the disease known as "atrophia", which is the lack of nutrition. Secondly, there is adhesion in which the nutriment, acquired through the first function, is made nutriment by means of a complete action, i.e. the nutriment becomes a part of the organ. Sometimes it is interfered with as in anasarca. Thirdly, there is resemblance in which the nutriment subsequent to its becoming a part of an organ becomes absolutely like it in all respects, even in texture and colour. Sometimes it is interfered with, as in leukoderma and vitiligo, because acquisition and adhesion are present in them yet there is no resemblance. This function pertains to the metabolic faculty which is one of the nutritive faculties. The metabolic faculty is a generic term, in relation to the human species and the psychic faculties, but is different insofar as those organs are concerned whose parts have a certain resemblance. Every organ has its own faculty according to its temperament which transforms the nutriment and brings about a specific resemblance which is different in resemblance from the faculty of other organs. However, the metabolic faculty in the liver acts for the whole of the body.

Reproductive faculty is of two kinds: The first forms semen in the male and female. The second separates the faculties of the semen and rearranges them in such mixtures as are appropriate to each organ. Thus it imparts to the nerves, the arteries, and the bones their distinctive temperaments and this process takes place in the semen which has homogeneous ingredients or temperament. The physicians call this faculty the primary alterative faculty.

The moulding faculty, by the decree of its Creator, the Hallowed, the Most High, differentiates the organs, their configurations, their cavities, their foramina, their smoothness and roughness, their positions and relations to one another, in short all the functions relating to the dimensions of the organs.

Nutritive and augmentative faculties are subservient to this faculty which acts upon the nutriment for the preservation of the species.

Section III

Subordinative physical faculties

The secondary faculties simply serve the nutritive ones and are four: attractive; retentive; digestive; expulsive. The attractive faculty was created to attract what is beneficial (i.e., nutriment) and this is done by means of the vertical fibres of the organs.

The retentive faculty was created to retain the beneficial (nutriment) as long as the alterative faculty acts upon it and derives nutrition from it. This is done by means of oblique fibres and sometimes the transverse fibres help them.

The digestive faculty is the faculty which absorbs the material drawn by the attractive faculty and retains and transforms it into a consistency ready for the action of the alterative faculty and also changes it into a temperament capable of becoming an actual nutriment. This action upon the beneficial material is known as 'digestion'.

Its action upon the superfluous matter changes it, if it can, into the aforementioned state (i.e., actual nutriment), which is also called digestion. Or it facilitates its discharge from the organs retaining it with the help of one of the action of the expulsive faculty, viz:

(a) by attenuating the consistency if its thickness hinders expulsion;
(b) by thickening it if its thinness hinders expulsion;
(c) by breaking it up if its viscidity hinders expulsion.

This process is called coction. Sometimes digestion and coction are used synonymously.

The expulsive faculty expels the superfluous matter, the remnant of the nutriment which is not fit for nutrition, exceeds the quantity sufficient for nutrition, and is no more required, its function is said to have been completed through urination.

This expulsive faculty expels the superfluous matter through the natural passages or orifices. If these passages or orifices do not exist it diverts the superfluous matter from the superior organ to the inferior organ or from a hard organ to a soft one. The direction of expulsion is the same as that in which the superfluous matter is tending to divert, the expulsive faculty, as far as possible, does not change it from that direction.

These four physical faculties are served by four primary qualities: heat, cold, moisture and dryness.

Heat: In fact, its service is common to all the four faculties.

Cold: It serves some of the physical faculties indirectly, and not directly, because the direct action of cold is really opposed to all the faculties, since these faculties act by movements which are apparent in attraction and expulsion and implied in digestion and retention, as digestion is perfected after the separation of thick and dense particles from one another and the aggregation of thin and rarefied particles, and these are movements of separation and aggregation.

The retentive faculty acts by activating the oblique fibres to hold the contents firmly. The cold deadens, paralyses and inhibits all these actions. But indirectly it helps in retention by holding the fibres in a suitable contracted position. So cold is really not included in the action of the retentive faculty, but it simply helps the fibres to maintain a state whereby the functions of this faculty are performed.

The expulsive faculty is assisted by cold in three ways: It prevents the dispersion of gases which aid in the expulsion of the superfluous matter. It aids in condensation of the gases. It aggregates the transverse constricting fibres and makes them dense.

This action of cold is also a sort of preparation of the fibres and not an aid to the actual action. Thus cold takes a part in the service of these faculties indirectly. Had it been included in their action, it would certainly harm and suppress the movement.

Dryness is required for the actions of three faculties: two transporting and one retentive. The two transporting faculties are the attractive and expulsive ones. These are assisted by dryness, because in dryness there is a surplus of strength which is indispensable for movement. By movement I mean the movement of pneuma, the carrier of these faculties, which proceeds forcefully towards the functions of the faculties. Such forceful movement is not possible if there is humid relaxation in the substance of pneuma or the substance of its instrument. The retentive faculty brings about contraction. The digestive faculty needs moisture more than dryness.

If you consider the degree of active and passive qualities requisite for these faculties, you will find that the retentive faculty needs more dryness than heat. This is because the period of rest provided by the retentive faculty is more than the period during which it causes a contractile movement in the transverse fibres.

Heat is necessary for movement, but, as only a short time is required by the retentive faculty to cause movement, the rest of the time is spent to retain the material and gain rest. The temperament of children is more moist, so this retentive faculty is weak in them.

The attractive faculty requires more heat than dryness. It is so not only because heat aids in attraction but also because the greater part of its duration of actions is spent in movement. Its need for movement is greater than its need for providing repose and contraction to the particles of its fibres by means of dryness. Moreover, this faculty requires not simply movement, but vigorous movement.

Attraction is brought about: by the action of the attractive faculty, as the attractive faculty of magnet attracts iron; because of vacuum, as the attraction of water in syringes., or by heat, as the flame of a lamp draws up oil.

This third kind, according to some scholars, comes under vacuum, and the last two actions are considered as one. However, when the attractive faculty is assisted by heat, attraction becomes more powerful.

The expulsive faculty requires less dryness than the attractive and retentive faculties, because there is no need of contraction requisite for retentive faculty nor it needs, like the attractive faculty, to contract the fibres and then cling to the attracted material and enclose it by holding a part of the fibres followed by the attraction of another part. In short, the expulsive faculty has no need for repose at all, but it needs movement and condensation just enough to help in compression and expulsion, not to the extent of maintaining the fibres in a state of persistent compression or contraction, as is done by the retentive faculty, nor for a short period as is done by the attractive faculty to attract the material. So the expulsive faculty has lesser need for dryness. The digestive faculty requires more heat than any other. It has no need for dryness, it requires moisture to liquefy the nutriment and prepare it to enter the channels in different shapes. But one must not suppose that, if moisture helps digestion, the digestive power of children should be capable of digesting hard things. In fact, this is not the reason why the children are unable to digest hard things and the youths are able to do so. It is for another reason, which is 'similarity' and 'dissimilarity'. Hard things are not 'similar' to the temperament of children. So their digestive and retentive faculties do not accept them and their expulsive faculties expel them rapidly, whereas in youths the hard things suit their temperament and are fit for their nourishment. It may be summed up that the retentive faculty requires contraction and the stability of the state of contraction for a long time, and a slight help in movement. The attractive faculty requires contraction and the stability of the state of contraction for a very short time, but it needs greater help in movement. The expulsive faculty requires only contraction without any considerable stability and needs help in movement. The digestive faculty requires liquefaction and commingling (of substances). So these faculties differ in their functions and requirement of the four qualities.

Section IV

Vital faculties

According to the physicians vital faculty is the power. When this power permeates the organs it prepares them to receive the faculties of sensation and movement and perform the functions of life. They attribute to this faculty the generation of fear and anger because in these conditions contraction and expansion occur in the pneuma which is related to this faculty. We now proceed to amplify this brief statement. We state that just as dense things, such as organs and their parts, are formed of dense humours according to their temperament, rarefied substance, i.e., pneuma, is formed of the vapoury and rarefied portions of the humours according to their temperament. According to the physicians, just as the liver is the source of the production of the former (i.e., dense things) the heart is the source of production of the latter (i.e., rarefied substance). When this pneuma is produced with an appropriate temperament, it is disposed to receive a faculty. This faculty prepares all the organs to receive other faculties, such as psychic faculty. The psychic faculties do not appear in the pneuma and the organs unless the vital faculty has come into being. When an organ loses its psychic faculties, yet it retains the vital faculty, it continues to live. Do you not see that a benumbed or a paralysed organ loses the faculty of sensation and movement for a time, because either a temperament renders it incapable of receiving sensation and movement or an obstruction comes in the way of the brain and the nerves spreading in an organ, but in spite of this the organ has life. An organ which is dead, loses sensation and movement and decomposes and putrefies.

Thus it is evident that a paralysed organ has a power which preserves its life and when the obstruction is removed, the power of sensation and movement comes back to it. It is because of the intact vital faculty of the organs that it is capable of regaining sensation and movement. The obstruction is that which prevents an organ from accepting sensation and movement for a time, but this is not so with a dead organ. This predisposing faculty is not the nutritive faculty alone in the sense that the organ remains alive as long as the nutritive faculty is existent and dies when it is not there. This statement may equally be adverse to the nutritive faculty, for sometimes its function ceases in an organ and still the organ continues to live. Sometimes its function is unimpaired, and yet the organ tends towards death. If nutritive faculty as such had indeed been the predisposing cause of sensation and movement, even plant life would have been able to receive sensation and movement. Hence it is clear that the predisposing cause should be something else which follows a particular temperament and is known as vital faculty. This is the first faculty which appears in the pneuma as soon as the latter develops from the rarefied particles of the humours.

According to the philosopher, Aristotle, the 'prime source" or 'soul' turns towards the pneuma whereupon all faculties come into being. The functions of these faculties do not proceed from the pneuma in the very beginning, according to the physicians, sensations for example, do not proceed from the psychic pneuma which is the brain until it has passed to the crystalline humour or tongue etc. Thus when a part of this pneuma reaches the ventricles of the brain, it acquires a suitable temperament whereupon the functions of the faculty already present, begin to appear prominently. Similar is the case with the liver and the testicles.

The physicians state that unless the pneuma on reaching the brain, acquires an altogether new temperament, it is not capable of acquiring the soul, the source of sensation and movement. This is so with the liver. As the primary composition (i.e., temperament) helps (the pneuma) to receive the primary power, i.e., vital faculty, so it is in every organ, as if, according to the physicians, there were a separate soul for each category of functions and the soul were not only one from which the faculties emanate or that the soul were the sum total of all these faculties. As soon as the pneuma and a power which is the perfection of it come into being, the primary composition aids pneuma in accepting the primary power, i.e., the vital force. But this power alone, according to them, is not adequate to help pneuma to accept all other powers unless a particular temperament appears in it. They claim that the vital faculty, though meant for maintaining life, is also the source of movement of the rarefied pneumatic substance towards the organs and the source of its expansion and contraction whereby it gets fresh air as has been described. Thus with reference to life, this faculty imparts reaction, and with reference to respiration and pulsation, it imparts action (to the soul).

The vital faculty resembles the physical faculties in involuntary functions. It resembles the psychic faculties because of its diverse functions, that is, it contracts and expands simultaneously and causes two opposite movements. But when the philosophers use the word 'soul' for the terrestrial soul, they mean by it the perfection of organic bodies and by perfection they mean the source of every faculty from which diverse movements and functions proceed. Thus, according to philosophers, the vital faculty is a psychic faculty, just as they call the physical faculties, which we have mentioned, as psychic faculties. If the soul is not understood in this sense, but as the power which is the source of all sensation and voluntary movement, and if the physis is taken to be the faculty from which bodily functions of a different kind proceed, then the vital faculty would not be the psychic one, but the physical one of an order higher than that the physicians call physical. And if the physis is defined as that which controls the matter of nutriment and its formation whether for the preservation of the individual or of the species-then the vital faculty will not be the phsycial faculty but a third one. Since anger, fear and other similar emotions are the reactions of the vital faculty, these are attributed to it, although their source is sensation, imagination and perceptive faculties. The investigation, whether this faculty is one or more, concerns physics, which is a branch of philosophy (not of medicine).

Section V

Psychic perceptive faculties

The psychic faculty consists of two faculties and stands as a genus for them. These are perceptive power and motive power. Again, perceptive power also is a genus for two powers, i.e., external perceptive power and internal perceptive power.

The external perceptive power is sensory. According to some it is as a genus for five powers, and according to some others—it is for eight powers. They are taken as five, they are: sight, hearing smell, taste and touch.

If they are taken as eight, it is because most of the scholars think that the power of touch is composite, comprising of four powers each of which has a separate power, although they are combined into a sensory organ, such as taste and touch in the tongue, and sight and touch in the eyes. The investigation into these (statements) is the concern of the philosophers.

Internal perceptive faculty, i.e. the animal power is as a genus for five powers: One of them is known as panesthesia or imagination. According to the physicians, it is a single faculty, but according to the philosophers it is twin. Panesthesia is the faculty where all sensations converge, which reacts to their forms and in which these forms combine. Imagination is the power which preserves these forms (S.C.) and brings them back after they have disappeared from it. Thus out of these two powers, the one which is the recipient should be different from that which is the preserver. The establishment of truth in this case is also the concern of the philosophers. Nevertheless the seat of these two and the source of their functions is the anterior ventricle of the brain.

The second faculty is that which the physicians call, the thinking faculty and which the philosophers sometimes call the imaginative faculty and sometimes the cogitative faculty. It is employed by the animal instinct which we shall describe later on, when it begins to act by itself, it is called the 'imaginative faculty'. When the rational faculty turns towards it and uses it in such a way as is useful to it is called cogitative faculty. The difference between this faculty and the first one (i.e., panesthesia), whatever the first one might be, is that the first faculty receives preserves of (the sensory impression); on the other hand the cogitative faculty disposes the sense impressions stored in the imagination. It rearranges them through synthesis and analysis. Thus it produces such forms as are received through panesthesia and sometimes such others as are contrary to those received through panesthesia, such as a flying man. But the imagination presents only those forms which have been received through panesthesia. The seat of this faculty is the middle ventricle of the brain.

This faculty is an instrument for the faculty which is actually internal perceptive faculty in animals, and it is the instinct. The instinct is the faculty which dictates to the animals so that the wolf is an enemy and that a child is affectionate and that the shepherd is a friend from whom they should not run way. It comes in a non-rational way. Animals cannot perceive enmity and love (by sensory organs). Since enmity and love are determined by a faculty which has nothing to do with sense perception. It follows that it is a non-rational faculty. Man also uses this faculty in many of his decisions, and in this respect he is like the non-rational animals.

This faculty differs from imagination since imagination grasps the percepts, while this faculty determines imperceptibly the meaning of the percepts. It differs also from what is called the cogitative and imaginative faculties, because no conclusion results from the activities of these faculties, while the activities of this faculty are followed by one or rather many conclusions. The function of the cogitative and imaginative faculties is to synthesise the percepts whereas the function of the instinct is to draw, imperceptibly, the meaning of the percepts. And as panesthesia in animals is the judge of the perceptible forms, in the same way the instinct in them is the judge of those meanings of the forms which have their access only to the instinct and not to panesthesia. There are some people who tend to call this faculty imagination. They are at liberty to do so because there should be no controversy concerning the names. But it is necessary that one should know their meanings and differences among them. The physicians do not care to understand this faculty, because the harms of its actions are consequent on the harms of the actions of some other prior faculties, for example the faculties of imagination and cogitation of memory which we shall describe later on. The physicians consider only those faculties whose malfunctions result into a disease. Thus, if there are harms in the function of a faculty because of the disorder in the function of a prior faculty and if this harm follows dyscrasia or dysplacia of an organ, it is enough for the physician to know that this harms is consequent on dyscrasia or dysplacia of that organ so that he might cure it or guard against it. Once he knows the state of faculty which is directly affected, he need not find out the state of the faculty affected indirectly.

The third faculty described by the physicians is in reality the fifth or the fourth faculty; the faculty of memory and recall. It is a repository of those meanings of the percepts which find access to the instinct, but it is not the repository of perceptible forms. Just as the imagination is the repository of those perceptible forms which reach panethesia. The seat of this faculty is the posterior ventricle of the brain. Here arises a point of philosophical discussion whether the faculty of memory and recall which brings back the imports which have escaped from memory out of the repository of the instinct, is one faculty or two. It is not necessary for the physician to inquire into it, because the harms to either of the two are similar. These injuries, which occur in the posterior ventricle of the brain, belong either to temperament or to composition. The last of the perceptive faculties of the soul is the rational human faculty. The physicians do not discuss the instinct for reasons we have explained, they should all the more avoid discussing this faculty. Their attention is confined to the functions of the three faculties alone.

Section VI

Psychic motive faculties

Motor faculty is that which contracts and relaxes the tendons, through which the organs and the joints extend and flex. The tract of this faculty runs through the nerves which is connected with the muscles. This faculty is a genus which has species according to the nature of primary movements. Each muscle has a secondary nature which is subordinate to the instinct causing concurrence.

The last section

Functions

We say that some of the single functions are performed by a single faculty, as for example digestion, and other functions by two faculties, as for example, the appetite for food because it is completed by the natural faculty of attraction and by the faculty of sensation located at the cardiac orifice. The attractive faculty produces appetite by causing movement in the longitudinal fibres when it demands what it should attract and by sucking the available moistures. The faculty of sensation completes its function by perceiving these reactions and by preceiving the irritation caused by atrabile which stimulates appetite which has already been mentioned. This sensation cannot be completed except by the two faculties acting together, because whenever any injury befalls the faculty of sensation, hunger and appetite become meaningless. There is no desire for food though the body needs it.

Similarly, swallowing is also performed by two faculties. One of them is the natural attractive faculty and the other is the voluntary propulsive faculty. The function of the first is achieved by the longitudinal fibres in the cardiac orifice and oesophagus. The function of the second faculty is achieved by the fibres of the swallowing muscles. If either of the faculties fails to act, swallowing becomes difficult. Even if the faculty does not fail, but is not yet prompted to act, swallowing becomes difficult. Do you not notice that swallowing of a substance becomes difficult for us in the absence of true appetite. When we intend swallowing a substance inspite of our aversion to it, the attractive faculty abhors it and it becomes difficult for the voluntary power to swallow it.

The transit of nutriment is also accomplished by two faculties. One of them is the propulsive faculty of the organ from which the nutriment is dissociated and the other is the attractive faculty of the organ to which the nutriment is directed. In the same way, discharge of the waste matter takes place from the two (urinary and faecal) passages. Sometimes two faculties, psychic and physical, are the source of a function and sometimes the cause of the function is a faculty and a property, as for example cooling which helps the expulsive faculty to check the humour from flowing into an organ and helps to turn the homour back.

Cold prevents the humour in two direct ways i.e., by thickening the substance of the pouring (humour) and by narrowing the pores, and thirdly in an indirect way, i.e. by extinguishing the absorbing heat which assists attraction. Heat absorbs in ways which are opposite to those mentioned above. Vacuous involuntary act first attracts the rarefied matter and later the denser matter. On the other hand, the natural attractive faculty attracts only the things which are most appropriate or the things which are specific to its nature and attraction. Thus sometimes the denser matter becomes more appropriate and specific. This is the end of Part I of Book I on Medicine.

PART II

Consisting of three lessons

Lesson I	..	Diseases
Lesson II	..	Causes
Lesson III	..	Symptoms

LESSON I

Consisting of eight sections

Section I

Causes, disease and symptom

We say that according to medical books cause is that which occurs first and thus necessitates the existence or the persistence of a certain state of human body. Disease is that abnormal condition of human body which, by itself, produces functional disorder as a primary consequence, and that is either an intemperament or an abnormal composition. Symptom is the phenomenon which follows this (abnormal) condition. It is abnormal whether it is harmful to physis, as the pain of colic, or not harmful to it, as the excessive redness of cheeks in pneumonia. Putrefaction is an example of cause, fever is an example of disease, the example of symptom is thirst and headache. Again, the example of cause is the repletion of the vesseles descending towards the eye and that of disease is iris which is an organo-constitutional disease. The example of symptom is the loss of vision. Again, example of cause is the hot catarrh; that of disease is the ulcer in lungs; and that of symptom is the redness of cheeks and the curving of nails. Symptom is sometimes called a symptom and sometimes a sign according to its nature and in relation to that to which it belongs. It is called indication as per studies of the physician who is guided by it to have a knowledge of the real nature of the disease.

Sometimes one disease causes another disease, as colic causes syncope, or paralysis, or epilepsy, and sometimes the symptom becomes a cause for disease, as acute pain in colic becomes a cause for the occurrence of syncope. Similarly acute pain becomes a cause for swelling because of the effusion of matter to the spot of pain. Sometimes the symptom itself becomes a disease, as headache caused by fever, because sometimes it becomes persistent and stable still it becomes a disease. Sometimes the same thing is a disease, a symptom and a cause simultaneously in relation to itself, to what precedes it, and to what follows it, as consumptive fever. It is a symptom of the ulcer of lungs and is in itself a disease, and is the cause of the weakness of the stomach. A similar example is the headache caused by constant fever. This headache is a symptom of the fever and a disease in itself, and sometimes it turns into meningitis, and becomes its cause.

Section II

State of human body and the kinds of diseases

The states of human body, according to Galen, are three: *Health,* it is a state which helps to maintain the functions of the human body through (proper balance) of its temperament and composition in a correct and sound manner. *Disease,* it is that state of the human body which is contrary to the aforementioned state. Then there is a state in which, according to him, there is neither health nor disease: neither the health is perfect nor the diesease is absolute, as the bodies of the old and the convalescent and of children, or when both the states occur simultaneously either in two organs or in a single organ but in two remote genera, as when an organ is temperamentally normal but structurally abnormal, or in a single organ but in two proximate genera, as when an organ is normal in shape but abnormal in size or position, or when an organ is normal in regard to two passive qualities, but not in regard to two active ones, or the succession of both the states at two different periods, as when a person becomes healthy in winter and sick in summer. Diseases are of two kinds: simple and compound.

Simple diseases are of two kinds, belonging either to the category of the diseases of temperament or to the category of the diseases of structure which we shall describe later. Compound diseases are those in which two or more of them combine to form a single disease.

We shall first start with the simple diseases, We state that simple diseases belong to three groups: The first group comprises diseases which are related to the homogeneous organs, and they are the varieties of dyscrasia. These are related to the homogeneous organs because primarily and essentially they befall the homogeneous organs and consequently affect the compound organs till it is possible for you to consider their presence in any one of the homogeneous organs you like. But such consideration is not possible in compound diseases.

The second group comprises of diseases related to composite organs. They are diseases of structure and occur in the organs composed of homogeneous ones. These composite organs are the instruments of functions.

The third group contains diseases which are common to the homogeneous organs as such and to the instrumental organs as such. Their occurrence in the composite organs is independent of their occurrence in the homogeneous organs. This category of diseases is called "loss of continuity" and occurs in a joint without occurring at all in the homogeneous organs of which the joint is constituted. Sometimes it occurs in such homogeneous organs as nerves, bones and vessels.

To sum up: there are three groups of diseases—diseases which follow intemperament, diseases which follow the disorders of structure, and diseases which follow the loss of continuity. Every disease is subject to one of them and is attributed to it. The diseases of temperament are well known. They are sixteen in number and we have already mentioned them.

Section III

Structural diseases

Diseases of structure can also be divided into four kinds: diseases of shape, diseases of size, diseases of number and diseases of position. *Diseases of shape:* Here the shape is changed from its normal course causing functional disturbance, as when a straight organ becomes curved and a curved one straight, or a square organ becomes round or a round one square. The flattening of the anterior or posterior prominence of the skull affecting its function or excessive roundness of the stomach and absence of flatness in the pupils belong to this kind.

Diseases of channels: They are of three kinds:

The channels dilate, as the dilation of the eyes, pannus and varicose veins;

the channels become narrow, as the narrowing of the pupil, respiratory passages and oesophagus;

the channels are obstructed, as the obstruction of the pupils and vessels of liver, etc.

Diseaes of vasa and cavities: They are of four kinds:

The Vasa and cavities become larger and wider, as the expansion of the scrotum;

they become smaller and narrower, as the smallness and the narrowing of the stomach and contraction of the ventricles of brain in epilepsy;

they get obstructed or repleted, as the obstruction of the ventricles of brain in apoplexy;

they get depleted or emptied, as the emptiness of the blood from the cavities of the heart during the fatal excess of joy or fatal excess of terror.

Diseases of the organic surfaces: They occur in two ways:

When surfaces, which should be rough, become smooth, as stomach and intestines when they become smooth;

or when the surfaces, which should be smooth, become rough, as trachea when it becomes rough.

Diseases of size. They are of two kinds: increase in size, as in elephantiasis or enlargement of penis which is a disease called priapism or the disease which struck a man named Nicomachus whose organs became so enlarged that he was unable to move; decrease in size, as the atrophy of the tongue and eyeball and emaciation.

Diseases of number: They are of two kinds: Increase in number. They are of two kinds:

(a) Normal as the additional tooth and the supernumerary finger;

(b) abnormal, as tumour and stones.

Decrease in number. They are of two kinds:

(a) Decrease which is congenital, as in one who did not have a finger at birth;

(b) decrease which is accidental, as in one whose finger has been cut.

Disease of position: According to Galen, position requires location and inter-relation. The diseases of location are four;

Dislocation of an organ from its joint;

deviation of an organ from its location without (complete) dislocation, as intestinal hernia;

involuntary and unnatural movement of an organ in its location, as tremour;

fixity of an organ to its location so that it can not move there from as happens in calcification of joints in gout.

Diseases of inter-relationship: They include all unnatural situations in which an organ is found in relation to its proximity to or remoteness from a neighbouring organ. They are of two kinds:

First, when the movement of an organ towards a neighbouring organ (or away from it)[1] becomes impossible, and secondly when it is impossible for an organ to move away, though it was possible earlier. For example, it may be impossible for a finger to move and contact its neighbour or be separated from it, though it was possible earlier, or the difficulty in opening or closing the eyelids or the difficulty of separation of joints due to laxity during paralysis or extension of the palm.

Section IV

Diseases of loss of contiguity

Diseases of loss of contiguity affect skin and are called scratches and abrasion. They also affect the flesh, and if they are new and do not suppurate, they are called wound, but when they suppurate they are called ulcer. Pus is formed because the superfluous matter is pushed towards the flesh because of its weakness and inability to use and assimilate its nutriment. Thus the nutriment also changes into superfluous matter.

Sometimes the terms wound and ulcer are used for the loss of contiguity occurring in places other than the flesh as it occurs in the bone in such a way as to break it into two pieces or a few big pieces, or into many small pieces, or splits it lengthwise. It also occurs, in these three ways, in the cartilages. In the nerves, when the loss of contiguity occurs transversely, it is called severance, when it is longitudinal, and not numerous, it is called scission, and if it is numerous, it is called split.

Loss of contiguity also occurs in various parts of the muscles. When it occurs at the end of the muscle it is called tear, whether it is in the nerve or tendon of the muscle. If it occurs in the muscle horizontaly, it is called a notch and if it occurs transversely, less in number and deeper, it is called crack. If the parts of muscles are divided it is called contusion and tear. If the loss of contiguity occurs in the middle of the muscle, it is called split, crack and contusion.

If the loss of contiguity occurs in the arteries, it is called an aneurism, and if in the veins, it is called rupture. Again when it occurs in them horizontally, it is called a cut and scission, when it occurs transversely, it is called fission, or it occurs in such a way as to open their orifices, then it is called a burst. When it occurs in the arteries and does not heal up, allowing the blood to flow from it towards the surrounding space till it is saturated, and the blood returns towards the arteries

[1] These words though given in the Arabic text should he ignored to make the meaning sensible.

when the surrounding space is pressed, it is called an aneurism. One school calls each arterial rupture as aneurism.

It should be known that every organ cannot bear the loss of contiguity. For instance, heart cannot bear it, and death follows. If it occurs in the membranes and fasciae it is called a rent. If it occurs between the two components of a composite organ, separating one from the other without loss of contiguity in the homogeneous organ, it is called secession and dislocation. If it occurs in a nerve so that it is dislocated, it is called a displacement. When it occurs in the vessels they become wider, but when they occur in organs without vessels, new channels are created.

(Diseases of) the loss of contiguity like ulceration, heal up quickly if they occur in an organ with sound temperament. But if they occur in an organ with unsound temperament, they are hard to cure, especially in such patients as those who are suffering from dropsy, anemia or leprosy. It should be known that, when the ulcers appearing in summer last long, they result into corroding ulcer. You will find a comprehensive description of the loss of contiguity later in the books dealing with details.

Section V

Complex diseases

We give a general statement of the compound diseases also, and say that by compound diseases we do not mean diseases occurring simultaneously by chance, but we mean diseases out of which, in case they are conjoined, there emerges one single disease. This is exemplified by swelling. The pustules are a kind of swelling and the papules are small swellings, whereas the swellings are large pustules.

All the genera of a disease are found in a swelling. Thus in it we find the disease of temperament, because no swelling can take place without intemperament associated with matter. The diseases of form and structure are also found in it, because there is no swelling without there being a defect in form and size, and often it is accompanied by diseases of position. The disease of interrelation is also found in it, which is loss of contiguity, because there can be no swelling if there is no loss of contiguity. There is no doubt that contiguity is lost when the superfluous matter, effusing the swollen organ settles in its parts. This matter goes on separating the parts from one another till it settles down there.

Swellings occur in soft organs. Sometimes a thing like swelling occurs in bones also whereby their volume becomes thick and their moisture is increased. It is not surprising if the organs increasing in volume because of nutriment should also increase in volume owing to superfluity if it penetrates into them or is formed in them. There is no external cause for any swelling. Again, its physical cause implies transfer of matter from one organ to another organ situated below the former. Then it is called catarrh.

Sometimes the material cause, which produces swellings and pustules, is located within other humours which are not harmful in their nature. When those sound humours are discharged through any sort of depletion, whether they be natural, as happens to a parturient woman and during lactation period, or unnatural as happens when good blood is lost through a wound, unsound humours alone are left. The physis affected by them, then expels them. Sometimes the direction of expulsion is towards the skin, causing swellings and pustules.

Swellings are classified according to different distinguishing features. The most reliable features are those originating from the causes (of swellings) which are such matter as giving rise to swellings. The substances from which the swellings originate are six; the four humours, and watery and airy matters.

Swellings may be either hot or may not be so. It is not proper to think that the hot swelling is that which arises from blood or bile only, whereas it arises from any substance which is hot in itself or has become hot because of putrefaction. These genera can again be divided according to the type of the matter. But it would be proper to deal with these types in the discussion on swellings. Physicians are in the habit of calling purely sanguineous swellings as phlegmona and purely bilious swellings as erysipelas and they give their combination a compound name in which the first part is dominant of the two. Thus, sometimes, they say, phlegmonous erysipelas and sometimes, erysipelatous phlegmona. When the two go together, it is called abscess. When the swelling occurs in soft flesh, as in armpits, tonsils and glands behind the ears and in inguinal glands, and is also of a malignant kind, it is called plague. We shall describe it in its particular place.

The initial stage of the hot swellings is when the humour starts coming in, the humour and the swelling become apparent, then the humour keeps growing in volume and area till it reaches the peak and stops. From there it starts declining, and either it matures and is dissolved, or forms pus.

The results of hot swelling are three: dissolution, formation and sclerosis.

Swellings which are not hot are caused by atrabilious or phlegmatic or aqueous or pneumatic matter. Again, the swellings which are caused by atrabilious matter are of three kinds: sclerosis and cancer, which mostly occur in the autumn, and various kinds of glands which give rise to scrofula and tumours. The difference between the various kinds of glands and those of sclerosis and cancer is that the glands are either disconnected from the sarrounding surfaces, like normal glands, or they are loosely attached with the surrounding of the upper surfaces only, like scrofula. Sclerosis and cancer infiltrate in the organ in which they occur. The difference between a sclerosis and a cancer is that the former is an inert and stationary swelling which deadens or weakens sensation, and is painless. A cancer is mobile, growing and painful. It has roots entangled inside the organs. It does not necessarily destroy sensation unless it is chronic, when it deadens the organ and destroys sensation. It is quite possible that the difference between cancer and sclerosis is merely symptomatic and not substantial.

The hard atrabilious swellings get sometimes hard by the onset of the humours and sometimes grow hard afterwards, especially the sanguineous ones. Sometimes this is so with the phlegmatic swelling also. Glands, tumours and the like are differentiated from the ganglion in so far as the ganglion is firmly attached to its location and is nerve-like to touch. When it is dispersed by means of compression, it reappears, and when it is dispersed by means of strong medicine without compression, it does not reappear. They are often produced by toil and are completely eliminated pressing with heavy objects, such as lead etc.

The phlegmatic swellings can be divided into two groups: soft swelling and soft tumour. They differ from each other in that the tumours are distinguished by their sacs, while the soft swelling is so coherent as to be indistinguishable. Most of the winter swellings are phlegmatic, and even the hot ones becomes whitish.

It must be known that the phelgmatic swellings vary according to the thickness, viscosity and thinness of the phlegm, Thus sometimes they resemble the atrabilious swellings, sometimes the pneumatic swelling and sometimes the aqueous swellings. In catarrh, often thin phlegm descends upon the interspaces of the nerve fibres and at last it reaches the lower muscles of larynx and even further below.

The aqueous swellings are such as dropsy and hydrocele and the swelling which appears in the skull owing to aquosity, and similar other swellings.

Pneumatic swellings are also of two kinds: Oedema and flatulence. The difference between oedema and flatulence is due to two factors: consistency and admixture. The explanation of this is that in oedema gas is admixed with the organ whereas in flatulence, it is accumulated, distended and not admixed with the organ. Oedema is soft to touch, whereas flatulence offers resistence more or less to pressure.

Pustules also have as many kinds as the swellings. Thus some of them are sanguineous, as small-pox; some are purely bilious as bilious urticaria and miliaria and some are mixed, as measles, herpes, corns, scabies, warts, etc. Sometimes they are aqueous as blister and sometimes, pneumatic such as pamphiqus. You will find the details of swellings, pustules and other relevant matter in the Fourth Book.

Section VI

Matters reckoned as diseases

There are certain matters which are not diseases but are counted among them. They are matters concerned with beauty: first, the hair; second, the complexion; third, the odour; and fourth, the physique minus the colour. The diseases of hair are:

> General alopecia, local alopecia, shortness, scantiness, splitting, thinness, thickness, excessive curliness, excessive straightness, greyness, any change of colour.

Disorders of colour are of four kinds and are caused by humoral dyscrasia, as jaundice, or non-humoral dyscrasia, as chalkiness owing to the simple cold intemperament and the yellowishness which is caused by simple hot intemperament; or by external causes, such as, the sun, cold, and wind altering the colour; by expansion of substances of unnatural colour over the skin, the biseases of colour, such as vitiligo nigra or dotting in it, such as moles, redish freckles, blackish freckles and freckles of mixed colour; marks left after the end of the loss of contiguity, such as pock-marks and scars of ulcers; afflictions of odour, such as stench of the armpit, and similar bad odours which emanate from the body; afflictions of physique minus the colour as emaciation or obesity.

Section VII

Periods of diseases

It should be known that most of the diseases have four periods: the period of onset; the period of advancement; the period of culmination; the period of decline, the period excluding them is the period of health. By the period of onset and decline we do not mean as the two ends during which the state of disease is not apparent. Each of the two has a definite period for which there are definite rules.

The period of onset is the period during which the disease makes its appearance and is in a uniform state with no apparent increase. The period of advance is that during which the advancement of the disease is apparent throughout. The period of culmination is the period during which the disease reaches its highest point in all respects. The period of decline is the period during which the disease shows abatement, and as time passes the abatement becomes more and more evident. These periods cover the entire course of the disease from the onset upto the end, and are called 'general period', and when they are restricted to a single paroxysm they are called 'partial period'.

Section VIII

Concluding statement on diseases

Diseases are named in various ways: after the organs carrying them, as *dhat al-janb* or pain in the sides (pleurisy) and *dhat al-riya* or pain in the lungs (pneumonia) after their symptoms, as *ṣar'* or falling down (epilepsy); after their causes, for example we say melancholia, after their resemblance, as we say leontiasis and elephantiasis or after a person known to have been first afflicted as *qarḥ al-ṭilansiya* or the wound of Telephus; after a city in which the disease is prevalent, for example they say *qurūḥ-i-Balkhiya* or the ulcer of Balkh; after a person reputed for his successful treatment as *qarḥ al-khairūniya*. The ulcer of chirona treatment; after the nature and effect of the disease, as fever and swelling.

According to Galen, diseases, whether external or internal, are (sometimes) easy to recognise, such as pains of stomach and lungs and (sometimes) difficult to recognise, such as the disorders of the liver and of the bile duct, and (sometimes) they can never be known except by guess, such as the disorders of urinary tracts.

Diseases are sometimes primary and sometimes secondary. One organ shares the disease with another, either because both are directly interconnected by means of an organ, such as the brain and the stomach are interconnected by means of nerves, and the veins interconnect the uterus and the breast. Sometimes one organ serves as a passage for another such as the groins (i.e. inguinal glands) for the swelling of the shanks, and sometimes organs are adjacent to each other, such as the neck and the brain. Thus each of the two shares with the other (in disease), especially when one of the two is a weaker neighbour it receives the superfluous matter from its companion, as axilla does from the heart. Sometimes one of the two is the origin and source of the function of the other organs, as diaphragm for the lung in respiration. Sometimes, an organ is the servant of another, as nerves are servants of the brain. Sometimes both are associated with a third organ, as the brain is associated with the kidney because each of them is associated with the liver. Sometimes this association becomes an affliction, for example, when the brain is afflicted, the stomach shares it and thus its digestive power gets impaired. Consequently, the stomach supplies morbid vapours and imperfectly digested aliment to the brain and so increases the affliction of the brain itself. The secondary diseases are governed by primary diseases in occurrence and reoccurrence. There are six stages of the body from health to disease: a body in perfect health; a body in health but not in perfect health; a body which is neither healthy nor diseased as already stated; a body which is readily susceptible to illness; a slightly diseased body; a thoroughly diseased body.

Every disease is either amenable to treatment or not. The amenable disease is one in proper treatment of which there is no impediment, whereas that one which is not amenable to treatment has some impediment associated with it which disallows correct treatment as headache when it is associated with catarrh. It should be known that the disease matching with the temperament, age, and season is less dangerous than the one which does not match with them and occurs only through a grave cause.

It should be noted that cure of every seasonal disease may be expected during the opposite season. It should also be known that some of the diseases are transformed into new ones, and so they are themselves uprooted bringing good. Thus one disease becomes the cure of the other diseases, like the quartan fever which often cures epilepsy, gout, variocose veins and diseases of joints, scabies, prurigo and pustules and convulsion. Similarly sprue cures conjunctivitis, lienteric diarrhoea and pleurisy. Similarly opening of the anal vessles is useful to every melanotic disease, coxalgia, nephralgia and uteralgia. Sometimes some diseases are transformed into other diseases making the condition worse, as the change of pleurisy into pneumonia and the change of pherinitis into lethargus.

Some of the diseases are infectious such as leprosy, scabies, small-pox, epidemic fever, and putoid ulcers. They occur specially when the houses are congested, and similarly, when the neighbouring area is low lying. Then there is the example of conjunctivitis which occurs in a person who gazes at it. Or the example of the teeth getting sour even at the very thought of a sour object or the examples of phthisis and leukoderma.

Some diseases are hereditary, as leukoderma, congenital baldness, gout, phthisis and leprosy. Some of the diseases are ethnic diseases which are peculiar to a tribe, or the people of a region where they are widespread. It should be known that the weakness of organ is subjected to intemperament or flabby structure.

LESSON II

General causes

Clause I

consisting of XIX sections

Things happening on account of general causes considered one by one

Section I

General statement on causes

For the three states of the body which we have already mentioned, i.e. health, disease and an intermediate state, there are three causes: remote, external and immediate. What is common between the remote and immediate causes is that they are related to the body, i.e. they are humoral or temperamental or structural.

External causes are those that are outside the body, and may be physical, such as a blow, atmospheric heat and hot or cold food entering the body, or they may be psychological, because psyche is a different thing, distinct from the body, such as states caused by anger, fear and the like.

Remote external causes are similar in the sense that sometimes there is some intermediary between them and the states of body. External and immediate causes are similar in the sense that sometimes there is no intermediary between these causes and the aforementioned states, but the remote causes differ from the immediate causes in the sense that the (effect) is not manifested immediately after the remote causes. But there are other intermediate causes which are nearer the effect than are the remote causes.

The remote causes differ from the external causes in the sense that they are corporeal, and also in that sense there is necessarily an intermediary between the remote causes and the effect, whereas this is not necessary in the case of external causes. The immediate causes differ from the external causes in the sense that the immediate causes are corporeal, and also that there is no intermediary at all between them and the effect, while in external causes such a condition is not necessary, and both the possibilities (of their being or not being an intermediary) are there.

Thus remote causes are the corporeal causes, i.e., humoral or temperamental or structural. They produce a state indirectly, i.e. they produce it through an intermediary. Immediate causes are the corporeal causes which produce corporeal states directly, i.e. without an intermediary. External causes are non-corporeal causes which produce corporeal states directly or indirectly.

Examples of remote causes: repletion is the remote cause of fever, and repletion of the vessles of the eye is the remote cause of cataract. Examples of immediate causes are bad smell producing fever, and fluids flowing towards the pupil causing obstruction, and the obstruction causing blindness. Examples of external causes are heat of the sun, violent movement, grief, sleeplessness, eating hot things such as garlic. All these are (the external causes of) fever. Similarly, a blow is an external cause of dilation of the pupil and of cataract.

Every cause is either a direct cause, like pepper which produces heat and opium which produces cold, or an indrect cause, as cold water when it produces heat by closing the pores and retaining the heat, and as hot water when it produces cold by dispersion, and as scammony when it produces cold through discharge of the calorifacient humour.

Every cause does not act upon the body just reaching it. It requires, besides access to the body, three conditions to produce the effect: sufficient active power, sufficient receptive power, and prolonged contact of the two.

Sometimes the causes differ according to their effects. Thus sometimes a single cause produces different diseases in different persons, or different diseases at different times. Again, sometimes its actions in weak, strong, acutely sensitive and less sensitive persons are different. Some of the causes leave their effects behind, while others do not.

We say that the causes which alter the states of the body or maintain them are essential or non-essential. A man cannot escape during his life from the essential causes which are of six kinds:

> atmospheric air; food and drink; physical movement and rest; psychic emotions; sleep and wakefulness; depletion and retention. We shall first describe the first kind.

Section II

Effects of air on the human body

Air is an element of our bodies and pneuma. Besides being an element of our bodies and pneuma, it is a reinforcement which reaches our pneuma and becomes a cause of its purification not simply as an element but also as an active cause by which I mean a modifying agent. We have already elucidated what we mean by pneuma. We do not mean by it what the philosophers call the 'soul'. The modification which is performed by air in our pneumas is related to two functions, viz: supply of pneuma and purification. The supply of pneuma brings about the modification of hot temperament of pneuma which becomes excessively hot in most cases by congestion and in a few cases by other causes. By modification I mean the relative modification which I have already explained. This modification is attained by means of inhalation through the lungs and through the breathing pores of the pulse adjoining the arteries.

The air surrounding us is much cooler in relation to the temperament of the innate pneuma and much more so than the temperament arising from congestion. So, when a blow of air reaches the pneuma and mixes with it, it prevents it from the heat of congestion. This heat leads to either intemperament owing to which pneuma loses its inherent capacity for receiving psychic impulses which are the cause of life, or to the dispersion of its own gaseous and moist essence.

Purification is so attained that the air during exhalation takes out in its company the smoky vapours which are delivered to it by the discriminating power. The relation of the smoky vapour to pneuma is the same as that of the superfluous humour to the body.

Modification is attained by the air coming in contact with the pneuma during inhalation, and purification is attained by the air departing from it during exhalation. It is because the inhaled air, for its act of modification, required to be acutally cool at the time of entry. When it changes itself to the quality of the pneuma, by being heated because of its prolonged stay, it has no further use. Hence, it is no more needed and there is the need of new air which should enter and occupy its place. Therefore, there arises the necessity of expelling the former for making room for its successor and also for the removal of the superfluity of the substance of the pneuma. As long as the air is attempered and pure, unmixed with any extraneous substance contrary to the temperament of pneuma, it is effective in attaining health and in preserving it. But when it is altered it acts contrary to its function. The air is subject to normal as well as abnormal changes and also to those changes which are outside the normal course and also contrary to it. Normal changes are the seasonal changes because in every season the air changes into another temperament.

Section III

Characteristics of seasons

It should be known that the seasons as defined by the physicians are different from those described by the astronomers. According to the astronomers, the four seasons are the four periods in each of which the sun, starting from the vernal equinox, covers a quarter of the zodiac.

According to the physicians spring is the season in which, in the temperate zones, there is no need of protection against cold or ventilation against heat. It is in this season that the trees start burgeoning. The season of spring begins with the vernal equinox or a little earlier or later and extends upto the time when the sun has reached the middle of Taurus.

In countries like ours, *autumn* is the opposite of spring. In other countries spring may come sooner and autumn later. Summer is the whole of the hot period and winter the whole of the cold period. According to the physicians, both spring and autumn are shorter than either the summer or the winter. Winter is equal to summer more or less depending on the regions. Spring is the season of blooms and the formation of fruits. Autumn is the time when leaves change colour and fall. The period outside these two seasons comprises winter and summer.

We say that the temperament of spring is equable and not hot and moist as is believed to be. Its thorough investigation belongs to that part of Philosophy which is called Physics. But it should be accepted that the spring is equable.

The summer is hot owing to the proximity of the sun to zenith and the intensity of the rays radiating from it. The reflection of these rays in summer is imagined to be at very acute angles or they are reflected back along the line of incidence. Thus the rays are concentrated near it.

The actual reason is this. The place where the rays of the sun fall is like the target of an arrow shot to a cone and cylinder. As if, some of the rays, proceeding from the centre of the body of the sun, go towards what is facing them. And some portion of the earth is like the plain periphery and the neighbourhood of the periphery. And the power of the rays is concentrated upon their target because the effect is directed towards it from all the sides. While the rays which are near the extremeties are weaker. During summer we are situated within the target or are close to it. This condition remains for a longer time for us i.e. the people of the northerly regions. During winter we are near the periphery of the cone. This is the reason why light is brighter during summer, even though the distance from our place to the sun, which is in the neighbourhood of its apogee, is greater. The determination of this proximity and remoteness will be found in Astronomy which is a branch of Mathematics which, in turn, is a branch of Philosophy. The inquiry about the intensity of heat or light is the domain of the physics which is a branch of philosophy.

In addition to being hot, summer is also dry, since during this season moistures get dispersed owing to the intensity of heat and the attenuation of air which then resembles the temperament of fire. Moreover, during this season there is less humidity and rain.

Winter is cold and moist for just the opposite reasons. Autumn is the season during which heat has abated but cold has not stabilized. This is why we find ourselves placed between the centre of the conical rays and the periphery. Consequently, the heat and cold are almost moderate in this season, but it is not so in respect of moisture and dryness. It is comprehensible as the sun has dried the air but till now no factor has emerged which could produce moisture and encounter the factors responsible for dryness.

What is applicable to coldness is not applicable to moisture. Transformation into cold takes place easily but transformation into moisture is not easy.

The transformation of moisture into cold is not similar to that of dryness into heat, because transformation of dryness into cold is easier. Even a small measure of heat may produce dryness but a small amount of cold cannot produce moisture on the other hand, even ordinary heat may act strongly in producing moisture especially when the matter contains some coldness. Even a little heat may evaporate the matter but does not dissolve it. Contrary to it, a small amount of cold does not produce density nor can it collect or retain the matter. It is for this reason, that the persistence of moisture of the cold season in autumn and the persistence of dryness of the hot season in autumn are not similar.

The moisture of spring moderates itself in a period of time because of heat, but in an equal period the dryness of autumn does not moderate because of coldness. The humectation and desiccation probably resemble the acquisition of a characteristic and its deprivation rather than the action of contraries. Here, desiccation means only the elimination of moist substance but humectation does not mean elimination of dry substance. It means the acquisition of a moist substance. In this context, when we say "this air is moist" or "that air is dry" we do not refer to its specific form or natural quality On such occasions we are not concerned at all or very little concerned with this state. Thus when we say "this air is moist" by it we mean an air with which plenty of aqueous vapours have mixed up or an air which having become dense resembles the aqueous vapours. Similarly, when we say "that air is dry" by it we mean an air with which much aqueous vapours are not admixed or that air with which the aqueous vapours previously admixed have separated or an air which, owing to its condensation, has changed, having became rarefied, into the likeness of fire or with which earthly smokes, which resemble earth in dryness, have got mixed up. The moisture of winter is reduced in spring with that little amount of heat which comes from the sun which during this season is at its zenith. But a little coldness of the autumn fails to moisten the air. To be convinced, think whether dry things get wet in cold atmosphere in the same way as wet things get dry in hot atmosphere—the coldness of the cold atmosphere being approximately equal (in degree) with the heat of the hot atmosphere. When you think so you will observe the difference in the two.

Besides the factors already stated, there is yet greater cause, another and more important factor that moisture cannot sustain itself in the cold or hot atmosphere for long, unless it gets regular supplies; whereas, dryness needs no help.

The moisture cannot sustain itself in the bodies exposed to the air or it is in the air itself without any help. It is so because when we say that "the air is very cold", we say it in relation to our body. The coldness of the air does not attain that degree in areas surrounding our own place that it could stop evaporation altogether. In the neighbouring inhabited countries the air does not achieve so much cold that it cannot disperse. But since it is aided by the sun and stars, it, in all conditions, remains capable of evaporation. Hence it can disperese (i.e. evaporate) in all conditions when reinforcements to moisture cease and evaporation continues, the air gets dry. In spring there is more dispersion and less evaporation. The reason is evaporation depends upon two factors i.e. the presence of moderate heat in the atmospheric air and the strong heat hidden in the earth by which only light things may reach its surface. In winter the interior of the earth is extremely hot as is established by Physics and the atmospheric air has moderate heat. Thus two causes combine for moistening i.e. evaporation and condensation. Besides, the coldness of winter by its own nature, condenses the air and adds to it more (water) vapours.

In spring, dissolution is more and evaporation is less. The heat concealed in the interior of the earth decreases very much. Moreover, some of this heat which is directed towards the exterior of the earth, comes out suddenly. This heat is, more in degree, than the heat required for evaporation or it is of such a degree that it produces mild evaporation because when it reacts strongly on the matter it attenuates it. This mild evaporation produces more heat in the atmospheric air. Thus these vapours are dissolved. The effects (which we have described) occur independently i.e. without the assistance of some other causes. (The intervention of other causes) will bring about another situation which we have not described. It is also necessary that the matter should not be so profuse that when it rises it may evaporate or be attenuated. Thus, it is necessary that the spring should be moderate in moisture and dryness as it is in heat and cold.

It is, however not denied that the earlier part of spring tends to be moist but is not so distant from moderation as the autumn is (distant from moderation) in dryness. Again, it will not be incorrect to say that the autumn is not very moderate in respect of heat and cold. It is so because the noons of autumn are like those of summer, the air (in autumn) is very dry, readily accepts heat and is quickly converted into fieriness, which was created by summer. The nights and mornings of autumn are cold. It is so because in autumn the sun is away from the zenith and the attenuated and thin air is more susceptible to causes producing cold.

The spring is nearer to moderation in the two states (of heat and cold). It is so because the causes making the autumn air hot or cold do not enable the spring air to accept heat or cold in similar quantity and it is for this reason that the nights of spring are not more different (in heat or cold) from its days. If some one objects how it is that the nights of autumn are colder than those of spring though the air (in autumn) is hot, in reply we shall say that the air which is highly rarefied accepts heat and cold quickly. Rarefied water is an example. When such water is heated, it condenses much earlier than the water which is cold as (the former) owing to its rarefaction quickly accepts the cold. In spring the body does not feel so much cold as it does in autumn. The reason is that in spring the body passes from coldness to heat and is already accustomed to the former, while in the autumn the position is just the reverse. Besides, the autumn is moving towards winter and the spring is receding from it. One should know that the differences of seasons in different areas produce different diseases. Hence, a physician should acquaint himself with all these things so that preventive or precautionary measures could be adopted before hand. Occasionally, a single day resembles a specific season. Thus some days are like the days of winter, some like those of summer, and some like those of autumn. Again, there are days in which a single day is both hot and cold.

Section IV

Seasonal laws and their changes

Each season is agreeable to healthy temperament, but is disagreeable to those who have unhealthy temperament. If a season is far removed from (its inherent) moderation it is equally disagreeable to those having healthy temperament and those having unhealthy temperament because such (state of) season weakens the faculties. Similarly, each season is agreeable to that unhealthy temperament whose characteristics are contrary to those of that season.

If two seasons (one succeeding the other) deviate from their (inherent) characteristics and this being in contrary directions and there being no excessiveness or prolongation; as winter may be visited by southerly winds (which are hot and moist) and then comes spring with northerly winds (which change the inherent heat and moistness of spring into coldness and dryness), then in such a state the second season succeeding the first would be agreeable to and moderate for the bodies as the spring will remove the disadvantages of winter. In the same way, if the winter is exceedingly dry and the spring which follows it is exceedingly moist, then the spring will moderate the dryness of winter. The action of spring deviating from moderation will not manifest itself in a harmful humectation so long as the spring does not become extraordinarily moist and this state does not stay for long.

Changes occurring during a single season do not cause epidemics so much as the changes occurring in several seasonal causes. However, these changes should not be such as we have stated earlier. The air which is hot and moist is most susceptible to putrefaction. Changes occur in air mostly in areas which are deep or uneven. In even areas changes are less, and in high areas even lesser. What is appropriate in respect of a season is that it should come with its characteristics, i.e. summer should be hot and winter cold. Each season should follow this pattern. A contrary pattern may possibly cause diseases. The year which has a similar season throughout is a bad year; for example, the entire year may remain moist or dry or cold or hot. Such a year may give rise to diseases in accordance with the season it may be having, and (such diseases) shall last long. The reason is when a season produces diseases relevant to it, the entire year shall fare in the same manner. By way of illustration, when cold season comes into contact with one having phlegmatic temperament, it may cause epilepsy, paralysis, apoplexy, facial paralysis and such diseases as convulsions. Similarly, when hot season comes into contact with one having biliary temperament, it may cause mania, acute fevers; inflammatory swellings. One can well imagine what shall happen if the entire year has a single season (throughout). If winter comes earlier the diseases of winter will also take place earlier and if summer comes earlier the diseases of summer will take place earlier and the diseases which were already there would change according to that season. When a season lasts longer its diseases may also increase (in number), especially *in summer and autumn.*

Changes in seasons are very effective in changing the conditions. This effect is not due to season and its time but to the fact that the change in season has changed the conditions. This is the reason that when air in a single day changes from hot to cold it begins to reveal its different effects on bodies. The best things for seasons are: there may be rains in autumn, moderate cold in winter but that cold may not be absent altogether, However the cold should not be more than what is usual for that country. If there be rains in spring and summer we may also not go without them, these things are best for these two seasons.

Section V

Fresh air

Good air is that with which foreign matter e.g. vapours and smoke is not mixed, which is open to the sky and is not closed by walls and roofs. However, if outer air itself has some general corruption, the open air will be more susceptible to corruption than the closed air. But in all other conditions open air is better.

Good air is that which is fresh and pure, with which are not mixed up vapours rising from lakes, ponds, ditches, damp land, fields of vegetables especially those fields in which cabbage and rocket seed (*Jirjir*) are grown, dense forests, yew trees, walnut trees, fig trees, and with which putrid air is not mixed up. In addition, it should not be closed. Good air is the one which comes from high and even lands. It is not one which is closed in a pit whereby it gets hot quickly with the sun rise and gets cold quickly with the sun set. It is not closed by new walls freshly plastered and the plaster has not yet dried. It is also one which is not troublesome for breathing or is not suffocating.

You have already known that some changes of the air are natural and some unnatural and some are neither natural nor unnatural. You should know that the unnatural changes of air, whether they are contrary or similar, take place sometime according to the rotation of seasons and sometime irrespective of such rotation. As regards seasons, the best thing would be that they retain their inherent characteristics, for if they deviate from these characteristics they would produce diseases.

Section VI

Qualititive action of weather and seasonal requirements

Hot air dissolves (fluids) and loosens (organs). If this air is moderate in heat, it would attract the blood to the surface and redden the complexion. But if it is excessive in heat, it will dissolve the blood which is attracted to the surface and turn the complexion yellow. It would cause more perspiration and reduce the urine, weakens digestion and increases thirst.

Cold air hardens (organs), strengthens digestion and increases urine. It is so because the fluids remain confined (within body) and are dissolved little through perspiration, etc. It reduces faeces because of the contraction of the muscles of anus and rectum and does not allow it pass easily because of the inconducive state of the passage. Thus the faeces remains collected there (in the rectum) and its aquasity dissolves it into urine.

Moist air softens the skin and moistens the body, while dry air withers the body and dries up the skin. Turbid air causes suffocation and agitates the humours. Turbid air is different from the dense air, because the dense air is uniformly consistent but the turbid air is that which is intermingled with thick bodies and it is indicated by two things: reduced visibility of starlets and reduced twinkling of the flickering fixed stars. This is because of the excess of vapours and smoke and the scantiness of good air. You will again come across the description in this connection and that will be completed when we deal with the unnatural changes of air. For every season, provided they are in conformity with the essential requirements of its nature, there are particular rules. The end of each season and the beginning of the following season share the rules and diseases of the two seasons.

Spring is the best season provided it is in conformity with its nature. It is suitable for the temperament of the pneuma and blood because of its equability which we have mentioned, spring readily inclines towards subtle atmospheric heat and natural moisture. It reddens the complexion because it attracts the blood moderately and does not disperse it as much as a very hot summer does.

During the spring chronic diseases are stirred up because it causes the stagnant humours to move and flow. It is for this reason that melancholia among the melanotic persons is stirred during this season.

Those whose humours are in abundance during winter due to their gluttony and less exercise are susceptible to the diseases which are stirred up through these humours which are dissolved and set in motion by the spring. When spring is prolonged and equable, summer diseases are minimized.

The diseases of spring are haemorrhagic diarrhoea, epistaxis, agitation of the melancholia which is produced by black bile, swellings, furuncles, diphtheria which is fatal, and abscesses of various kinds. During this season the vessles are ruptured, haemoptysis and cough are common, particularly in wintry spring which resembles winter. The conditions of those who have had these diseases deteriorate, particularly those who have consumption. And since spring excites phlegm in phlegmatic persons, apoplexy, paralysis and rheumatic pain occur during it. Some of the factors which cause these diseases are excessive physical and psychic movement and also eating of calorifics because they help to aggravate the nature of the air. Nothing averts the disease of spring so much as venesection, evacuation, lessening of food and drink, taking diluted intoxicating drinks or avoiding it altogether. Spring suits the children and those who approximate them. Winter is the best season for digestion because cold retains innate heat, and thus it becomes strong and does not disperse; there is paucity of fruits and people use only natural foods; people make less movements when their stomach is full; people seek shelter in warm places. Winter is most effective season for reducing bile because of its cold and because it has shorter days and longer nights. Moreover, it is the most effective of all the seasons in suppressing the morbid matter. Consumption of dilutents and attenuants are needed most during this season.

Diseases of winter are mostly phlegmatic, an increase occurs in phlegm and even the vomitted matter contains phlegm; swellings are mostly whitish in colour, and cold and catarrh are common. The autumnal air blowing in winter brings cold and catarrh which may be followed by pleurisy, pneumonia, hoarseness of voice and throat pain. Later pleuralgia, back ache and nerve diseases, chronic headache, even apoplexy and epilepsy may occur. These diseases are caused by the blockade of excessive phlegm. Those who are old are troubled by winter as well as those resembling them. And the middle-aged are benefited by it. During winter sediment in urine increases in comparison to summer and its quantity also increases. Summer disperses the humours and pneumas as well and enfeebles the faculties and natural functions because of the excessive dispersion. Blood and phlegm decrease during this season, and the yellow bile increases. Then in the end, black bile increases because of the dispersion of the thin fluids and retention of the thick. Old persons and those resembling them look stronger in summer. The colour of the body turns yellow because of the dispersion of the blood attracted (by the skin). During this season diseases are of short duration. The reason is when *vis medicatrix naturae* is strong it finds the air helpful in maturing, dispersing and expelling the morbid matter. But when it is weak, the atmospheric heat adds to its weakness by relaxing it. Thus the vitality is lost and the patient dies.

Hot and dry summer quickly resolves the diseases but a moist summer delays (recovery) and makes the duration of diseases prolonged. For this reason most of the ulcers turn into cancer during this season (i.e. moist summer), and diseases of dropsy, lienteric diarrhoea and looseness of the bowels are prolonged by the exceses of fluids descending from the upper towards the lower (parts), especially from the head.

Examples of summer diseases are fevers like tertian, and constant fevers and atrophy of the body, and pains like otalgia and conjunctivitis. Erysipelas and pustules which go with this season abound, particularly when there is no breeze.

When summer is spring-like, the fevers do not aggravate, and are not rough and dry. There is excess of sweating, as is to be expected during crisis, because heat and moisture favour sweating, the heat dispersing and the moisture slackening and widening the pores.

When the summer wind is southerly, epidemics, small-pox and measles abound. When the summer wind is northerly it is healthy but constrictive diseases are frequent. The constrictive diseases are caused by the matter that flows owing to the external or internal heat. When the chill hits the matter, it is squeezed. Such diseases are catarrh and what follows it. When northerly wind in summer is dry it benefits the phlegmatic persons and women, but bilious persons are liable to dry conjunctivitis and chronic acute fevers, and black bile dominates. The burning of the congested yellow bile enables the black bile to be preponderant.

Autumn brings many diseases for the following reasons: people are mostly exposed to hot sun during the season and then they rest in cold; excess of fruits and corruption of humours by them; dissolution of vitality during summer; humours are corrupted during autumn because of the bad articles of food and because of the dispersion of the attenuated (part of humour) and the retention of the thick part and its burning. Whenever any humour is agitated by the physis for dispersion and expulsion, cold forces it back

Blood decreases much in autumn which in temperament is an anti-blood (season). Hence it does not help in its formation. Summer has already dispersed and decreased the blood. During this season, yellow bile left over in the summer, becomes excessive, and black bile (also) increases because during the summer humours are burnt away. So, during autumn black bile is in plenty because summer burns (the humours) to ashes and autumn cools them. Early autumn is suitable for elderly persons but later it grows highly harmful to them.

Diseases of autumn are excoriating scabies, ringworm, cancers, rhumatism, irregular fever, and quartan fevers as we have already explained, are caused by excess of the black bile. Spleen is also enlarged for the same reason.

During this season strangury occurs because of the difference of temperament occurring in bladder in heat and cold. Difficulty in urination also appears during this season, and this is more common phenomenon than strangury. Lienteric diarrhoea also arises in this season because cold drives thin humours inside the body. Sciatica also crops up in this season. Angina becomes irritative and bilious in this season and phlegmatic in spring. It is because the origin of each of the two is the humour which is agitated by the preceding season. Dry ileus is frequent during this season.

Sometimes apoplexy, diseases of lungs, pains of the back and thighs occur during this season because the superfluities are activated in summer and then they are retained during this season. During this season worms are in plenty in the intestines because of the weakness of digestive and expulsive faculty. Particularly in dry autumn small-pox is frequent, especially when it is preceded by a hot summer. Insanity also occurs in frequency during it, because of the malignant bilious humours and the admixture of black bile with them.

Autumn is the worst season for the persons having ulcers in the lung, i.e. the persons suffering from consumption. If consumption has begun before autumn and its signs are not evident, autumn clears the difficulty in (recognising) this condition. It is the worst season also for persons suffering from simple hectic fever because of its desiccating (character). Autumn is as a surety for the diseases coming over from summer. An ideal autumn is the one which is more moist and rainy; and a dry autumn is the worst.

Section VII

Rules regarding seasonal abnormalities

If northerly spring follows a southerly winter and then comes a sultry summer with excessive rains and the spring retains humours till the summer, death rate among children becomes high in autumn. Moreover, intestinal abrasion, intestinal ulcers and prolonged irregular tertian fever are frequent.

If the southerly winter is excessively moist, those who are due to give birth in the spring will be liable to abortion on a slight cause. And if they give birth, the off-spring will be weak, or dead or diseased. Conjunctivitis, haemorrhagic diarrhoea are frequent among the people. At that time catarrh spreads in excess, especially among the elderly persons. There are attacks of catarrhs, especially to the elderly who are affected by it which often result in sudden death due to blocking of the passages of pneuma.

If spring is rainy and southerly and it follows a northerly winter, acute fevers, ophthalmia, looseness of bowels, and haemorrhagic diarrhoea are in excess in summer. These are mostly caused by catarrh and by the flow of the phlegm accumulated during winter towards the interior cavities because heat activates it, specially among persons of moist temperament such as women. Sepsis and septic fevers become frequent. If during summer of this type there is rain at the time of the rising of the Dog Star and northerly wind blows, it may be expected that there will be improvement and the diseases will vanish.

Such a season is more harmful to women and children. Those who escape these illnesses are afflicted with quartan fever because humours burn and are reduced to ashes—which leads to dropsy and pain in the spleen and weakness of the liver. It is less harmful to old persons and to those for whom cold is harmful.

If a dry northerly summer is followed by a rainy and southerly autumn, people are disposed to suffer from headache, cough, hoarseness of voice and consumption in winter. It is because people very often catch cold. Similarly, when a dry southerly summer is followed by a rainy northern autumn, then also headache, catarrh, cough and hoarseness of voice become frequent in winter. If a southerly summer is followed by a northerly autumn, diseases of constricting the bowels and congestion are frequent in it, and you have already been acquainted with them.

When summer and autumn coincide with each other in being southerly and moist, the fluids certainly abound. So when winter comes, the aforementioned diseases of constricting of bowels appear. It is not unlikely that congestion and the excess of accumulated matter, with blocked pores, may lead to putrefactive diseases. (The following) winter must cause diseases because of the presence of highly putrid accumulated matter.

When both (i.e. summer and autumn) are dry and northerly, the persons having moist temperament and women are benefited, whereas others are susceptible to dry conjunctivitis, chronic catarrh, acute fevers and melancholia. A cold, rainy winter causes urethritis. When summer is excessively hot and dry, it produces diphtheria, both fatal and non-fatal as well as explosive and non-explosive, dysuria, measles, chicken-pox varicella and small-pox, conjunctivitis, corruption of blood, anxiety, amenorrhoea, dysemia, and haemoptysis. If a dry winter is followed by a dry spring, it is bad.

Epidemics impair trees and vegetables and thus they perverse the animals which feed on them and also the human beings who feed on both.

Section VIII

Effects of temporary changes in weather not contrary to the natural course

It is necessary for us now to complete the statement concerning all those unnatural changes in air which appear under the celestial and terrestrial influences. We have already referred to many of them in the description of the seasons. The changes which are caused by the celestial influences, may be such as those caused by the stars. It is because sometimes many of the luminous stars group together with the sun. Now this causes excessive heat in those parts (of the earth) where this constellation is overhead or nearly overhead. Sometimes they move far away from the zenith thus heat becomes less. The heating effect of vertical position (of the rays) is not much unless the vertical or nearly vertical position continues for a longer time.

As for the terrestrial influences, some are caused because of the latitude, and some because of the elevation or depression of a locality; some because of the mountains, and some because of seas; some owing to winds; and some owing to soil.

As far as changes of the latitudes are concerned, in every country approximate to the Tropic of Cancer in the north and Tropic of Capricorn in the south, summer is hotter than in the one which is farther from either the equator or the north. It is necessary that the statement of those who say that the countries within the equinoctial zone are temperate may be regarded as true. It is because the celestial heating cause, that is, the verticality of the sun is only one factor. This verticality alone is not much effective, it is the prolonged verticality that is effective. This is the reason why heat is greater after the noon prayer than exactly at noon. For the same reason when the sun is at the end of Cancer and in the beginning of Leo, heat is greater than when the sun is at its maximum declination. Again, for the same reason when the sun passes from the Tropic of Cancer to a place of less declination, it is greater in heating effect than when it is at the same limit of declination but has not yet reached the Tropic of Cancer.

In the countries close to the Equator, the sun is at its zenith for a few days. Then it moves away quickly because the increase in declination at the two poles is enormously greater than in the two tropics where the movement (of the sun) for three or even four or more days does not cause any perceptible effect.

Again the sun remains there in the same region for a longer time. Hence its heating becomes scorching. So from this (fact) it is necessary to believe that the countries, the latitudes of which approach complete declination are the hottest of countries and next are the countries the distance of which from this point (i.e. complete declination) towards the two poles is nearly fifteen degrees.

Heat is not so excessive in equatorial region as it is in the inhabited part in the vicinity of the orbit of Tropic of Cancer. But the countries remote from this orbit towards the north, are still colder.

This is what must be in regard to the latitude of countries in case they are alike in all conditions. As far as changes which arise according to the situation of high or low land are concerned, the land that is low is always hotter and an elevated place is always colder. It is because the atmosphere in which we live will be hotter if it is nearer the earth due to the power of the rays of the sun, and colder if it is farther. This has been fully explained in that part of philosophy which deals with Physics. If the low-lyng place is with that (intensity of rays), like a pit, it retains much more rays and is hotter.

With regard to changes because of the mountains, if the mountains are located, they are included in the category which we have already described. But now we intend of talking about the places where the mountains stand as neighbours. We say that the mountain influences the atmosphere in two ways: it reflects the rays of the sun to the town or conceals them from it and it prevents the winds or assists their blowing. The first, for example, holds good when in the towns, even in the northerly of them, there is a mountain to the north. So the sun shines on it in its orbit and its heat is reflected back towards the town. Hence it makes the town warm in spite of its being situated in the north. This is also the case when the mountain is in the west and the eastern side is exposed. And if it is in the east, it is less effective in this sense. It is because the sun shines on that mountain when it is fading as it moves farther away from the mountain each hour. Thus the quality of the shining rays on it decreases. And it is not so if the mountain is in the west and the sun approaches it each hour.

With regard to the holding back of breeze, if the mountain is in the north, it prevents the northerly cooling breeze from entering the town which at the same time is fully exposed to the southerly warming wind. Where a town is situated between two mountain peaks it is exposed to the direction of the wind. The wind is more powerful there than it is in towns over the plains, for it is the nature of the air that when it enters a narrow passage, it continues to proceed onwards without ever stopping. Similar is the case with water. Its cause is explained in physics.

The best situation of a town with respect to the openness and protection by the mountain, is when the mountain lies to the north of the town and shields it from the west and south wind.

The oceans, to be brief, cause an increase in the humidity of the towns which are in their neighbourhood. If the ocean is to the north, it is helpful in cooling a town because the northerly wind passes over the surface of water which is cold by nature. If the ocean is in the south of the town, it necessitates an increase in the density of the air, especially when the southerly wind does not find a passage because of the presence of a mountain on its way.

If the ocean is in the direction of the east, it produces more humidity in air than when it is on the western side, because the sun shines brightly (on the ocean in the East) causes greater evaporation, but does not do so with the ocean in the West.

In short, the proximity of the ocean necessitates humidity of air. Again, if the winds become stronger or keep blowing and are not resisted by mountains, they remain free from putrefaction, as the winds which are unable to blow are liable to undergo putrefaction and putrefy the homours.

The best of the winds in this sense is the northerly. Then come the easterly and the westerly. The worst of them is the southerly.

Changes brought about by the wind may be stated in two ways:

(a) general and (b) according to each of the countries and its peculiarities.

The general statement is this: In most countries, southerly winds are hot and moist. They are hot because they come from hot regions which are so because of their proximity to the sun. They are moist because most of the oceans are to the south from us. Although they are southerly, the sun acts on them powerfully and produces out of them vapours which mix with the winds. For this reason southerly winds are relaxing.

Northerly winds are cold, because they pass through cold countries and snow-clad mountains and are dry because much vapour is not admixed with them. It is because evaporation in the north is very little and the winds do not pass over flowing ocean water. But mostly they pass either over frozen waters or deserts.

Easterly winds are temperate in heat and cold, but they are drier than the westerly winds because there is less water in the north-east than in the north-west; and we are, in fact, the inhabitants of the north.

Westerly winds are a little moist because they pass over the oceans and the sun goes in the opposite direction. Since the sun and the winds are opposite to each other, the sun does not evaporate water so much (from the westerly wind) as it does from the easterly winds. Easterly winds mostly blow in the early hours of the morning and the westerly winds mostly blow in the evening. That is why the westerly winds are less hot than the easterly winds and are cooler. The easterly winds are hotter, but both the easterly and westerly winds are temperate compared to the southerly and northerly winds.

The laws relating to the winds vary in different countries according to other factors. Sometimes it so happens that in some countries the southerly winds are cooler when they are bordered by snow-clad mountains to the south. Thus the southerly winds are cooled as they pass over the mountains. And sometimes northerly winds are hotter than the southerly winds if they pass over scorching deserts.

Simooms are either the winds which have passed over very hot deserts, or they are a sort of vapour which produces in the atmosphere fearful fire-like forms. When the vapours are heavy, there occurs in them a sort of kindling and combustion. Thus the rarefied portion is separated from them and the heavy portion, containing combustion and fieriness, comes down.

According to philosophers, all the powerful winds originate from above although the source of their matter is from below. But the source of their movement, gale and gust are from above.

This is a general law. The investigation of truth in this case is concerned with that part of philosophy which deals with Physics. We shall describe it in a section while dealing with habitation.

Countries differ in soil, some having pure earth, some being rocky or sandy some muddy or porous or saltish, and some having a soil with mineral properties. All of them influence air and water.

Section IX

Effects of abnormal changes in weather are harmful to the natural course

Abnormal atmospheric changes are of two kinds: change in the substance of air, and change in its quality. Change in the substance of air means that the substance has become morbid, but it does not mean that any of its quality has grown in intensity or decreased. A change of this kind brings epidemics. It is the putrefaction of air which occurs in the same way as the putrefaction of foul and stagnant water. By air we do not mean the pure simple air, because the air which surrounds us is not that air. But even if there is pure air it is different (from atmospheric air), No simple air can putrefy. But one simple element can be changed into another by changing its property or its substance, as water changes into air. Here by air we mean the mass which is spread out in the atmosphere. This is a mass composed of elemental air, watery vapour, terrestial particles which ascend through smoke and dust and fiery particles.

We regard the atmospheric air as the air in the same way as we call sea and lake water as water though it is not the pure, simple water.

It is admixed with air, earth and fire, but the dominant element is its water. This air is liable to putrefaction and its substance is vitiated just as the lake water undergoes putrefaction and its substance is vitiated. Epidemics and putrefaction of air mostly occur towards the end of summer and during autumn. We shall describe the occurrence of epidemic diseases elsewhere.

As regards changes in the qualities of air, there might occur an intolerable excess of heat or cold resulting in destruction of crops and animal life. The change may be homogenous, as intense heat during summer, or heterogenous as intense cold during the summer owing to (atmospheric) disturbance.

When the air changes, it produces disorders in the bodies. When air undergoes putrefaction, it putrefies the humours. It begins with the putrefaction of the humour within the heart because it is more accessible to air than any other humour. When the air becomes excessively hot, it looses the joints and dissolves the fluids, increasing thirst. It disperses the pneuma, and causes decline of the faculties. Moreover, it prevents digestion by dispersing the innate heat which is the means of physis. It makes the complexion yellow by dispersing the sanguineous humours which make the complexion red and by causing the bile to dominate all other humours. It makes the heart unnaturally warm. It makes the humours flow, putrefies them and after putrefaction diverts them towards the cavities and the weaker organs. It is not good for healthy persons, but sometimes it benefits persons suffering from dropsy, paralysis, catarrh, cold tetanus, repletive spasm and cold facial paralysis.

Cold air retains the innate heat as long as it is not so excessive as to drive the innate heat deep into the interior when it proves fatal. The air which is not excessively cold, prevents the flow of matter and confines it. But it produces catarrh, and enfeebles the nerves, and injures the trachea very severely. However, it strengthens digestion; and all inner functions and excites appetite. To sum up, for healthy persons it is more suitable than the excessively hot air. cold air is harmful to the functions associated with nerves by closing the pores and squeezing the cushions of the organs. Moist air is good and suitable for most of the temperaments. It improves the colour and skin and makes the latter soft, keeps the pores open, but it tends to produce putrefaction. The dry air has the opposite effect.

Section X

Effect of winds

We have already discussed to some extent the conditions of the winds in the section on Changes in the Air. Now we intend giving a comprehensive statement in a different order, and beginning with the northerly winds.

Northerly winds

Northerly winds are highly energetic. They prevent the flow of external excretions, close the pores, strengthen digestion, cause constipation, increase the discharge of urine, and purify the putrid epidemical air. When the southerly winds immediately precede the northerly winds, then liquefaction is caused by the southerly winds, and inward squeezing by the northerly winds. Sometimes a rupture is caused towards the exterior. For this reason, during this period flow of matter from the head, and diseases of the chest occur most often. The northerly winds cause neural pains, diseases of bladder and uterus, dysuria, cough and pain in the joints, sides and chest, and horripilation.

Southerly winds

Southerly winds are relaxing for the faculty. They open the pores, excite the humours and move them outwards, dull the senses, vitiate the wounds, cause diseases to relapse, produce debility and itching in the wounds and gout, excite headache, induce sleep and cause putrefactive fevers. But they do not produce sore throat.

Easterly winds

When these winds blow by the end of the night and in the early part of the day, they bring such air as has already been attempered and rarefied by the sun and its moisture has lessened. Thus they are warmer, drier and rarefied. If they blow towards the end of the day and in the early part of the night, the case is reverse. On the whole, easterly winds are better than the westerly winds.

Westerly winds

If they blow by the end of the night and in the early part of the day, they bring such air as is not affected by the sun. So they are thick and dense. If they blow towards the end of the day and in the early part of the night, then the case is reverse.

Section XI
Effects of habitation

We have already described some conditions of abodes under the heading '*Changes in air*'. Now we propose also to give a brief statement in that connection in a different order. We do not mind if there are some repetitions.

You have already learnt that dwelling places have different effects on the bodies through:

(1) their own height and depression;
(2) their surroundings such as mountains;
(3) the state of their soil; whether pure, or muddy, or fetid having mineral powers;
(4) abundance or scarcity of water;
(5) conditions in the neighbourhood such as trees, mines, cemetries, and dead animals, etc.

You have learnt how the temperaments of air are recognized by the latitude of a territory or by its soil, by its vicinity to mountains and seas, or by the (prevailing) winds.

We may sum up: the air which tends to become quickly cold after sunset, and warms up on sunrise, is rarefied and that which acts contrarily is not rarefied.

Again, the worst kind of air is that which contracts the heart and disturbs respiration. Now we shall explain the condition of habitations one by one.

Hot habitation

Hot abodes darken the complexion, curl the hair and weaken the digestion. When, in such countries, evaporation becomes excessive and the fluids are decreased, senility sets in early as in Ethiopia where people of some towns become old at the age of thirty years, and their hearts are timid because of the excessive dispersion of pneuma. People of hot countries have soft constitution.

Cold habitation

Inhabitants of cold countries are stronger and braver. Their digestion is good as you have learnt. If these countries are (also) moist, the inhabitants are fleshy and fatty. Neither their veins nor joints are prominent, and their skin is free of wrinkles.

Moist habitation

Those living in moist places are of beautiful complexion and soft skin. They soon get tired with exercise. Their summer is not excessively hot; nor their winter is excessively cold. Prolonged fevers and diarrhoea are frequent among them, and also menorrhagia and much bleeding from piles. Piles, ulcers, stomatitis and epilepsy are also common.

Dry habitation

Dry countries cause their inhabitants to develop hot temperaments. Their shin is dry and cracks. Their brains become dry. Their summer is hot and their winter is cold.

Elevated habitation

The inhabitants of high places are healthy, strong and capable of much physical work and have long life.

Habitation in low-lying places

Inhabitants of low-lying places are always in sulry air, and feel depressed. They do not have cold water, especially when it is stagnant, or in a lake or saltish. However, water of such places is bad also because of their air.

Bare rocky places

The air of the residents of such places is excessively hot in summer and cold in winter. Their bodies are hard and compact in constitution. They are shaggy and have strong prominent joints. Dryness is dominant in them; they keep awake, ill-natured, arrogant, and domineering. They display valour in battles, are skilful in arts, and wrathful.

Habitation in snow-clad mountains

Inhabitants of snow-clad mountains are governed by the same conditions as the inhabitants of all cold countries. Their countries are windy. As long as the snow lasts, there are good winds. But when it melts, mugginess prevails since the mountains screen off the winds.

Maritime habitation

The heat and cold of these regions are temperate because the moisture resists the reaction due to acceptance of what penetrates into it. As regards moisture and dryness, such regions no doubt tend to be moist.

If these regions are situated close to the sea and to its north, and at a lower altitude, they are temperate. But if they are situated to the south and are hot, the case will be reverse.

Northern habitation

These places have the same effect as the cold countries and cold seasons in which diseases of retention and squeezing are frequent and there is much accumulation of humour inside. They necessarily bring in good digestion and long life. Epistaxis is frequent among them because excessive repletion (of blood) and lack of dispersion cause rupture of veins.

Epilepsy does not occur among them because of the health of their internal organs and the sufficiency of their innate heat. When, however, it occurs, it is very severe as it would not have occured except from a potent cause. Ulcers of their bodies heal up quickly because of their strength and healthy blood, and because there is no external cause to loosen them and make them soft. Because of the excessive heat of their heart, they are savage in manners.

Their women do not become completely free from menses which do not flow sufficiently because of the constriction of the passage and the absence of what causes flow relaxation (i.e. heat). For this reason, it is said, they are sterile because their uterus is not cleansed. This is however, contrary to the reality observed in the country of the Turks. But I say that their excessive innate heat compensates for the absence of such factors as cause relaxation and flow.

It is also said that abortion is infrequent among them. This is a valid argument for the great vitality of the inhabitants of this region. Women experience difficult parturition because their genital organs are folded and blocked. If abortions occur at all, they are due to cold. Their milk is scanty and thick because the cold prevents penetration and flow.

Sometimes tetanus and consumption occur in these countries, largely among those who are weak, like women, and in particular among women after childbirth because tetanus and consumption frequently affect them due to excessive strain during parturition. Thus the veins in the neighbourhood of chest or parts of nerves and fibres are broken, the first causing consumption and the second tetanus. The soft portion of their belly is liable to crack at the time of excessive squeezing. Boys develop hydrocele which disappears as they grow up; and girls develop ascites and hydrometra which disappear with age. Ophthalmia is rare among them, but is severe when it does occur.

Habitations in southerly regions

The rules for the southern countries are the same as those for the hot countries and seasons. The water of these countries is salty and contains sulphur. The heads of the inhabitants of these countries are full of moist matter activated by the south. They always suffer from diarrhoea because of the inevitable flow (of matter) from their heads towards their stomach. They have loose and weak organs, dull senses and a weak desire for food and drink. Wine for them is greatly intoxicating because their brain and stomach are weak. Their ulcers are slow to heal and (their bodies) become flaccid. Women bleed profusely during menstruation and they conceive with difficulty. Abortions are common as a result of frequent illness rather than any other cause. Haemorrhagic diarrhoea, piles and moist ophthalmia which is quickly resolved, affect the people. Paralysis affects the middle-aged persons above fifty because of their catarrhs. They generally suffer from congestion of the brain, asthma and expansion, and fevers characterized by both heat and cold as well as prolonged wintry nocturnal fevers. Acute fevers are less frequent among them because of their excessive diarrhoea and the dispersion of the rarefied parts of their humours.

Habitations in eastern countries

Towns open to and facing the east are health giving and have good air. The sun rises on them in the beginning of the day and purifies their air. Then the sun moves away from them when the air has already become pure. Gentle winds caused by the sun blow over them, and the sun itself follows them, the movements of both coincide:

Habitations in western countries

The sun does not reach the towns open to the west and concealed from the east for some time and when it reaches them it starts receding from them rather than coming closer. Thus it neither rarefies their air, nor makes it dry, but leaves the air moist and thick. If it sends winds towards the towns, it sends them from the West at night. Hence the rules governing such towns are those of the countries which have thick and moist temperament and moderate heat. Had the air been not dense in these towns, they would have been similar to the nature of the spring. But they lack very much the healthy air of the eastern countries. Hence one must not pay heed to the statement of those who say absolutely that vigour of these countries has the same healthy effect as the spring, but in relation to other countries it is very good.

One of the undesirable features of these countries is that the sun comes to them only when it has the power of warming that climate because of its height. For this reason, it rises on them suddenly after the fall of the night. Since the temperament of the air is moist, the voice of the inhabitants becomes hoarse, especially during autumn owing to their catarrh.

Choice of sites and their preparation

In selecting sites one should consider the soil, the altitude, whether open or closed, availability of water and its quality and whether it is on the surface or subterranean, and whether it is exposed to winds or deep in the earth; whether the winds are fresh and cold; are there oceans, lakes, mountains and the mines in the vicinity; condition of the inhabitants with regard to health and disease and their endemic diseases; the vitality of the natives, their appetite, digestion and the kind of their food; condition of the houses whether they are wide, spacious or with narrow entrances and no ventilations.

Again, it is necessary to keep the windows and the doors facing north east. The houses should be so built as to catch the easterly winds through the entrances and sun rays through all the sides as they render the air pure. The vicinity of plenty of sweet, good, running deep and pure water which becomes cold in winter and hot in summer contrary to the hidden water, is good and health-giving. We have fully discussed about the air and habitations. Now it is proper for us to deal with other factors.

Section XII

Effects of movement and rest

The effect of movement on human body depends on whether the movement is vigorous or mild, whether it is prolonged or moderate, whether it is accompanied by rest, as according to the philosophers, this is an independent kind (of movement) and whether it is controlled by matter (like fire with ironsmith or water with the washerman). All kinds of movements, whether vigorous, or prolonged or short, or accompanied by rest, act together in stirring heat. But the short vigorous movement differs from the prolonged non-vigorous movement and from the prolonged movement accompanied by rest. It is because the short vigorous movement makes the body very hot and causes less dispersion if at all, whereas the prolonged movement in spite of its mildness produces greater dispersion than warming. When any two of the (i.e., short vigorous movement and prolonged non-vigorous movement) is excessive, it produces cold because it excessively disperses the innate heat and also dilutes it.

When the movement is controlled by matter, it may sometimes become strong and sometimes weak. For instance, if it is the movement involved in washerman's occupation, it is liable to produce cold and moisture, and if it is the movement involved in black-smith's art, it is liable to produce more heat and dryness. As for rest, it is always cooling because there is no excitation of heat and there is congestion which soothes the heat. Moreover, rest is moistening because there is no dispersion of the superfluities.

Section XIII

Causes of sleep and wakefulness

Sleep is quite similar to rest, and wakefulness quite similar to movement. However, the two have certain characteristics which must be kept in view. We say: sleep strengthens all the physical faculties by retaining the innate heat and relaxes the psychic faculties by moistening and relaxing the passages of psychic pneuma and by making the pneuma turbid by preventing dispersion. Sleep removes all types of fatigues and restrains excessive depletions because movement increases the flow of those matters which are predisposed to flow. Sleep sometimes helps to expel the matter which is in the vicinity of the skin by confining the innate heat in the interior and by distributing the nutriment in the body. The matter which is near the skin is expelled by the injections of the matter which is distant. But wakefulness is more effective in this regard. Sleep causes more perspiration than wakefulness. It is because sleep produces sweating by a process of overcoming the matter, and not by a process of continuous dispersion of the fluids. If a person sweats excessively during sleep and there are no other reasons for it, it means that his body is replete with intolerable amount of food. When sleep encounters a matter ready for digestion and coction, it turns it into the nature of blood and warms it, in consequence of which the innate heat spreads in the body. If sleep encounters hot bilious humours for a prolonged period, it produces foreign heat in the body. If sleep finds an emptiness, or a humour which is not amenable to digestive power it disperses it. Wakefulness acts contrary to all these things. But, when it is excessive, it vitiates the temperament of brain by producing dryness and weakens it. Thus it causes imbecility, burns up the humours and causes acute diseases. On the other hand, excessive sleep causes an opposite effect. It produces dulness of the psychic faculties, heaviness of head and cold diseases. This is because excessive sleep prevents dispersion.

Wakefulness stimulates the appetite by dispersing matter. It impairs digestion by dispersing the power. Caught between wakefulness and sleep, and rolling about in bed, is the worst of all states. One of the prominent features of sleep is that heat moves inward during it while cold dominates. This is why so many blankets are needed to keep the limbs warm during sleep but they are not requied in the waking state.

You will find the rules governing different states of sleep and other related factors in detail in the succeeding books.

Section XIV

Causes of psychic movements

All psychic conditions are followed or accompained by either inward or outward movement of pneuma which may either be sudden or gradual. The outward movement of pneuma is followed by the cold of the interior. Sometimes this (movement) is excessive. Hence pneuma gets dispersed, and both the interior and exterior become cold and a severe syncope or death follows. The inward movement of pneuma is followd by the coldness of the exterior and heat of the interior. Sometimes it is choked by severe contraction. Hence both the exterior and the interior become cold and a severe syncope or death follows it. The outward movement of pneuma is either sudden, as in anger, or gradual as in pleasure and happiness. The inward movement of pneuma is either sudden, as in terror, or gradual as in sorrow.

The aforementioned suffocation and dispersion always follow the sudden movement (of pneuma). Deficiency and the decline in the innate heat always result from the gradual movement of pneuma. By deficiency, I mean suffocation which is not sudden but gradual and in each part and by the decline in innate heat I mean not sudden but gradual dispersion. Sometimes it so happens that the pneuma moves simultaneously in two directions. It happens when an emotion involves two impulses, e.g. worry, because it produces anger and gloom and gives rise to two different movements, or shame which causes the pneuma to first contract towards the interior and then when reason and good judgment are restored, to expand and rise towards the exterior, reddening the complexion.

Body is also influenced by psychic states (other than those which we have already mentioned, such as psychic notions) which influence physical factors. For example, a baby resembles the person whose image is in the mind at the time of coitus, and its complexion resembles the colour thought of at the time of seminal discharge. Persons who are not aware of the hidden states of creation are reluctant to give credence to such things, whereas those who have deeper knowledge do not reject such things as baseless. Such a state is the movement of blood (towards the face), which occurs in a suitably predisposed person when he intently gazes at red objects. And in the same category is the case of the teeth becoming sour by the mere sight of someone eating sour things, or pain in a limb producing similar pain in the onlooker. And to the same category belongs the change in the temperament because of the idea of fearful or pleasant objects.

Section XV

Effects of foods and drinks

Foods and drinks act upon the human body in three ways: by their quality alone, or simply by their element, or by their substance as a whole. Often, according to linguistic usage, the meaning of these terms come near one another. But while using them we shall adopt the meanings which we are going to point out.

Qualitative agent

A thing has the quality of becoming hot or cold when it enters the human body and thus produces heat or cold without being assimilated in the body.

Elemental agent

It is when the nature of a thing undergoes change and it adopts the form of any organ of the human body. But some times it so happens that through out the process of taking on the form of an organ a thing retains its original qualities which are stronger than those of the human body. For example, blood produced from lettuce remains colder than the human temperament even after becoming blood and is suitable for becoming a part of any organ of the human body. Similarly, blood produced from garlic has an opposite quality.

Substantial agent

It is the agent which acts by its specific form which determines its distinctiveness, and not by its quality of being with or without having the likeness of a body. By quality, I mean one of those four qualities i.e. heat, cold, moistness and dryness. Where an agent acts through its quality, its substance has no part to play. The elemental agent is that whose element undergoes change directing power to the body, first by replacing the worn out tissues and secondly by augmenting the innate heat through increased blood supply. Thirdly, it also acts through its remaining quality. Substantial agent is that which acts through its specific form which emerges after the temperament, when there has been a comingling of the elements which gives rise to something unified ready to assume a new entity and a new form, over and above the elements. This form is neither the primary qualities of the elements nor the temperament arising from their combination. It is the perfection which the elements acquire from its temperament according to its capacity, as the attractive power of magnet or as the physis of the various species of plants and animals which emerges from the temperament according to the capacity of the temperament. Specific form is neither the constitutents of the temperament nor the temperament itself. It is not hotness, coldness, moistness or dryness, either alone or in combination, but is like the colour or smell or the individual quality or some other form that is not perceptible.

The specific form which arises after temperament has the power of being affected by outside influence in relation to something other than itself; for example, brittleness. Sometimes this form as that of sourness has the power of affecting other bodies. Then the specific form has the power to act upon other bodies, it may affect the human body or may affect other bodies but does not affect it; When it acts upon the human body, it may act favourably or unfavourably. The origin of this action is not its temperament but its specific form which emerges after temperament. That is why this is called an action derived from the substance as a whole, i.e. from the specific form and not from the quality, that is, not from the four (primary) qualities nor their temperament. An example of favourable action is that of peony (*fāwāniya*) also called *'ūd-i ṣalīb*, which removes epilepsy. An example of opposite action is the poisonous effect of aconite for human beings.

We now come back and observe: when we call an eatable or liniment hot or cold, we speak of its being potentially so, and not actually hotter or colder than the human body. We mean by potentiality the ability of being affected by the heat of our body, and when it is in fact affected by our innate heat, potentiality becomes an actuality. Sometimes by potentiality we mean a strong tendency, as we speak of sulphur being potentially hot. Sometimes when we say that a certain thing is hot or cold, we take into consideration the preponderance of hotness or coldness of the temperament of the elements without reference to its action in our body. Sometimes we say that a certain medicine is potentially such and such then potentiality is used in the sense of faculty like that of a writer who has left writing yet possesses that faculty, or, for example, we speak of aconite being lethal. The difference between potentiality and faculty is that the former does not act until the body (heat) transforms it, whereas the faculty comes into action as soon as it comes into contact with the body, like the poison of a viper or aconite when it undergoes the slightest change. There is another potentiality between the two forces we have just described. It is the intermediate patentality like that of a poisonous drug.

Next, we say that the drugs have been divided into four grades: The first of these grades comprises the action of drugs administered orally which may produce heat or cold but which does not manifest itself until the drug has been taken repeatedly or in a large dose. In the second grade the action is more powerful than that in the first, but does not produce any apparent harmful effect nor does it affect the physiological functions, except when it is indirect or when a drug is taken repeatedly or in a large measure. In the third grade, the action of a drug necessarily results into apparent disturbance, but does not cause death and destruction. In the fourth grade the action of a drug goes to the extent of causing death and destruction. This action of the poisonous drugs arises from their quality, whereas the drug which is lethal by its specific form is absolute poison.

We resume the discussion and say that all the substances that enter the body and produce action and reaction between them are (of three kinds): those that are altered by the body but do not alter it; those that are altered by the body and also alter it; and those that are not altered by the body but alter it. The substance which is altered by the body but does not produce any considerable change in the body is either homogeneous to the body or heterogeneous.

Thus the substance which is homogeneous to the body is absolute nutriment, while the substance which is not homogeneous to it is temperate medicine. A substance which is altered by the body and also alters it may either (i) alter and be altered by the body until finally the body alters it to the point of becoming ineffective. (ii) it does not become ineffective, and ultimately alters the body and brings about physical disturbances. In the first case, a substance may either be homogeneous to the body and becomes alimentary drug, or heterogeneous and becomes absolute drug. In the second case, a substance becomes poisonous drug. The substance which is not altered by the body at all but alters the body is absolute poison.

When we say that absolute poison is not altered by the body, we do not mean that it is not heated by the action of the innate heat of the body. As a matter of fact, most of the poisons do not act on the body unless they are heated by the action of its innate heat. We simply mean that they do not change their physical form and though they retain their power and form, they continue their action till they corrupt the body. Sometimes the nature of poison is hot, and enhances the property of poison to disperse the pneuma, as for example, snake venom and aconite. Sometimes it is cold, and enhances the property of the poison in enfeebling and smothering the pneuma, as for example scorpion's venom and hemlock.

All nutritional substances finally bring about a natural change in the body, that is heating process. For, when such a substance changes into blood, it inevitably increases heating. Thus even lettuce and pumpkin cause this heating (process). By change we do not mean heat produced by nutritional substances but that which arises out of the quality of a substance while it retains its specific form.

The body alters both the substance of the medicinal food and its property. The change first occurs in the property. Some medicinal foods first change into heat and thus heat (the body), for example, garlic, while some of them first change into cold and thus make the (body) cold, such as lettuce. When the transformation into blood becomes complete, most of its action is to produce heat by increasing blood. How could it not produce heat even after increasing the blood when it has shed its coldness and itself changed into heat. But even after a change in the substance of the two cases some of the innate quality persists. Thus a slight cold remains in the blood formd from lettuce and a slight heat in the blood formed from garlic, though for a short time.

Some of the medicinal foods are rather drugs than foods and some rather foods than drugs, just as some foods are closer to blood like wine, egg yolk and extract of meat. While some of them are a little remote from blood, like bread and meat. There are some that are remote (from blood) as medicinal foods.

We say that foods change the state of the body by their quality and quantity. As for quality, it is already known. As regards the quantity, an excess produces indigestion, obstruction and then putrefaction. If the quantity falls short, it causes emaciation. Excess of food is always cooling in effect, except when there is putrefaction which produces heat. Just as putrefaction is caused by extraneous heat, similarly extraneous heat is also caused by it.

We say also that some foods are light, some are heavy and some are moderate. Light food is that which produces thin blood while heavy food is that which produces thick blood. Again, each of these kinds is either rich or poor in nutrition. Examples of light food, rich in nutrition, is wine, extract of meat, half fried or boiled yolk of eggs. They are rich in nutrition because most of their substance is converted into nutriment. Examples of heavy food which is poor in nutrition is cheese, dried meat and egg-plant and the like. It is because only a small portion of them is converted into blood. Examples of light food which is poor in nutrition is *Julab* (honey diluted with rose water), vegetables which are moderate in property and consistency, and fruits like apples, pomegranates and the like. Examples of heavy food which is rich in nutrition are boiled eggs and beef.

Again, each of these kinds is either of bad chyme or of good chyme. Examples of the light food which is rich in nutrition and good in chyme are half fried yolk of egg, wine, extract of meat. Examples of the light food which is rich in nutrition but bad in chyme are lungs and meat of young ones of pigeons. Examples of light food which is poor in nutrition and good in chyme are lettuce, apple and pomegranate.

Examples of light food which is poor in nutrition and bad in chyme are radish, mustard, and most of the vegetables. Examples of heavy food which is rich in nutrition and good in chyme are boiled egg and meat of a year old lamb. Examples of heavy food which is rich in nutrition and bad in chyme are beef and flesh of duck and horse. Examples of heavy food which is poor in nutrition and bad in chyme are dried meat. From these examples you may find out what moderate food is.

Section XVI

Description of water

It should be known that water is one of the elements, which is distinguished from the other elements by the fact that it is a part of all foods and drinks, and though it does not nourish, it carries food (into the body) and rectifies its consistency.

We have said that water is not nutritious only because a nutritious thing is that which is potentially blood and has the remote ability of becoming a part of an organ of human body. A simple body, unless it has been formed into a compound, does not change in such a way as to take the form of blood or the form of an organ of the human body. But water is a substance which helps to liquefy food and carries it into the vessels and the channels. The help thus rendered by water in completing the process of nutrition is indispensable.

Water is of different kinds, not because of its aquosity but purely watery substance, and because of what is mixed with it and the conditions which dominate it. The best water is that of springs not all springs but springs on pure earth which is not dominated by any condition or (polluted) by extraneous elements, or springs which are on rocky ground and thus they do not putrefy as easily as those on pure earth. But a spring situated on pure earth is better than the one on rocky ground. But all springs on pure soil are not so. Only those springs which, in addition to being located on pure earth, are better. Again, the simple running of springs is not enough, they must be exposed to the sun and winds, for this is what imparts purity to the springs.As for stagnant water, it becomes impure if it is exposed, but is free of impurity if it is deep and covered.

It should be known that water which runs on earth is better than that which runs over stones. It is because the earth cleanses water and absorbs the extraneous matter in it, making it pure, whereas stone does not do so. But the earth on which it flows must be pure and not muddy, saltish etc. If incidentally, this water is deep, flows rapidly and is so abundant as to dissolve what is mixed with it, and the direction of its flow is towards the sun, i.e., it flows towards the east, specially towards the summer-east, then it is excellent, particularly when it is very far from its source. The next best water is that which runs towards the north, whereas the water which runs westwards or southwards is bad, specially when the southerly winds are blowing at that time. Water which comes down from high regions and has all the (aforementioned) qualities is better. Water having (the aforementioned) qualities is fresh and is considered to be sweet. If such water is mixed with wine even though in a small quantity, it reduces the effect of wine. Such water is light in weight. It is quick to cool down and warm up because it is rarefied,. It is cold in winter and warm in summer. It has no taste or odour. It quickly passes down the epigastrium. Cooking with it is easy.

It should be noted that one of the successful methods for knowing the quality of water is by its weight. For, in most cases, light water is better. The weight may be ascertained by a measure or by taking two pieces of linen or cotton wool of equal weight and soaking them into two different kinds of water. Then they are thoroughly dried and weighed. The water of the lighter cotton-wool is better. Hard water is purified by distillation and filtration. If this is not possible, it should be boiled. It is because boiled water, as the learned have said, produces less flatulence and passes down easily. Some ignorant physicians think that when water is boild, its attenuated part is evaporated and the dense part is left behind, and thus there is no use of boiling because water becomes harder.

It should be known that water in its very sense of aquosity is homogenous in rarefaction and density because it is simple, not compound. But water becomes dense either because of the action of intense cold upon it, or because of the earthy particles mixing thoroughly into it. These earthy particles, being extremely minute, fail to be separated from water and settle down in it. Their quantity is not such as to break the continuity of water and enable them to settle down in it. Thus they are bound to remain admixed with water.

Boiling first removes the hardness produced by cold. Then the particles of water become well rarefied till it becomes thin in consistency. Thus it is possible for the heavy earthy particles mixed in water to be separated from it. They sink down in water and are thus separated from it in the form of sediment. There remains only water which is nearer to the simple water. Distilled water is no different from it. It is because when water is free from admixture, its particles are homogenous in rarefaction. Hence distilled water is not much superior to the rest of the boiled water. Thus boiling rarefies water by removing the hardness produced by cold and by causing the admixed matter settle down.

The proof of this statment is that if you let hard water stand for a very long time, the sediment that settles down is not considerable. But when you boil it, abundant sediment settles down soon and water becomes light in weight and clear. The cause of sedimentation is rarefaction achieved by boiling. Have you not noticed that the water of big rivers such as the Oxus, specially, when collected from the last part of its course is very turbid at the time it is drawn into a low lying area. Then, in a short time it becomes, all of a sudden, so clear that if you purify it again, no considerable sediment will be there. Some people have praised the Nile water very highly. They have summed up its virtues in four ways: remoteness of its source; Cleanness of its course; its South-North direction which makes its water rarefied; its depth, but this is common to other rivers also.

If you purify hard water daily by transferring it from one vessel to another, there will be fresh sediment every day. The sediment does not settle down unless (the water) is allowed to stand in a vessel for a longer time. Even then, it does not become thoroughly clear. The reason is that the admixed earthy particles easily settle down in water that is thin not hard, and not viscous and oily. But they do not so easily settle down through dense substances. Boiling makes water thin. After boiling, churning is another method of purification. Rain water is one of the best waters, specially during summer and falling from thundering clouds. Rain from clouds accompanied by stormy wind produces turbid water because it comes from turbid vapours and clouds. Rain from these clouds is adulterated and impure. Rain water readily undergoes putrefaction although it might be the best of its kind. This is because it is so thin that obnoxious matter from earth and atmosphere is quick to act upon it, and its putrefaction becomes a cause for the putrefaction of humours. Rain water is injurious to chest and voice. There is a school that attributes this putrefaction to the formation of rain water from the vapours which rise up out of different moistures. If this were so, rain water would have been unhealthy and uncommendable. But it is not so. The reason lies in the water being excessively rarefied. Indeed, when a substance is rarefied, it is (easily) affected. If rain water is promptly boiled its tendency to putrefaction is lessened. If one is forced to take rain water which is susceptible to putrefaction, some sour things should be taken to prevent its harmful effects.

Well water and canal water are worse in comparison to the spring water, because it is stagnant, remaining in contact with earthy matters for long period, and consequently cannot avoid being putrefied to some extent. Water (from wells and canals) is drawn and moved by external force, not by its own power which enables it to flow and come out, but by some invention or device which takes it through nearby channels.

water which passes through lead is the worst as it acquires certain property from the lead, and thus often produces ulcers of the intestines. Marshy water is worse than the well water. As the flowing of well water is continuous, because of drainage, it is in perpetual motion, and is not stationary for long nor does it linger at its source. On the other hand, marshy water stays in the stationary pores of the earth for a long time and it moves and comes out slowly. This too happens not by its own power to come out, but from its huge quantity. Besides, such water is found only in spoiled, putrid earth.

Waters from hail and snow are thick. Marshy and stagnant water specially when exposed, is unhealthy and hard. Such water becomes cold in winter because of snow and produces phlegm while during summer it is hot because of the sun and putrefaction and hence produces bile. Since water being hard and admixed with earthy particles, with its attenuated particles having been dispersed, the persons who drink it develop diseases of spleen. Their abdominal wall becomes thin, their viscera becomes stiff, their arms and legs, shoulder girdles and neck waste away, appetite and thirst become excessive, their stomachs are obstructed, and emesis is difficult. Sometimes they suffer from dropsy as a result of retenion of fluids in them. Sometimes they suffer from pneumonia, lienteric diarrhoea and splenitis. Their legs become lean, livers become weak, and nutrition is impaired due to splenitis. Insanity, piles, varices, pneumonia and oedema occur among them, specially among women. In women, both conception and parturition are difficult. Their off-springs are flabby. They often suffer from pseudocyesis. Their children suffer from hydrocele and grown-ups from varices and ulcers of legs. Their ulcers do not heal easily and their appetite is increased. They hardly suffer from diarrhoea, but, if they do, it causes pain and ulcers in the viscera. Quartan fever is frequent among them, and the old often suffer from burning fevers owing to the dryness of their faces and constipation. All stagnant water, from whatever sources, is unfavourable to stomach. Water taken in a pit from springs has almost the same rule as the stagnant water has. But it is superior to the stagnant water in the sense that its stagnancy in one place is not long, and as long as it does not flow, there is necessarily some heaviness in it. Stagnant water often causes constipation and quickly becomes hot inside the stomach. Hence it does not suit persons having fevers and those in whom bile is dominating. It is more suitable for those needing constipation and maturation.

All water which has mineral substances or the like and is infested with leeches is bad. But certain kinds of such water are beneficial. Water containing iron is advantageous as it strengthens the viscera, prevents sprue and stimulates appetite and carnal desire. We shall describe the qualities of such water just now. When ice and snow are pure, and are not adulterated, it is equally good whether they are melted into water, or water is cooled by them externally, or they are added to water. Water obtained in these ways does not differ greatly. But this kind of water is harder than all other kinds, and is thus injurious to one suffering from neuralgia. When it is boiled it becomes good. When ice is made of dirty water or snow has acquired impurity on falling to the ground then it is better to cool water without allowing the ice or snow to mix with it. Cold water in moderate quantity is suitable for healthy persons. It is however, injurious to the nerves and is harmful for persons having swellings in viscera. It stimulates the appetite and strengthens the stomach.

Hot water impairs digestion, and keeps the food floating. It does not appease thirst instantly. Sometimes it causes dropsy and hectic fever and emaciation of the body. If the water is tepid it induces nausea. If it is hotter and is taken on empty stomach, it often cleanses the stomach and loosens the bowels. But its excess is bad. It weakens the faculty of stomach. Very hot water sometimes dissolves the colic obstruction and breaks gases in spleen. Persons for whom artificial hot water is beneficial are those suffering from epilepsy, melancholia, cold headache, ophthalmia, and those who have pustules in pharynx and gums and swellings behind the ears and those suffering from different kinds of catarrh and having ulcers in diaphragm and dissolution of continuity in the regions of thorax. It is emmenagogue, diuretic and analgesic.

Salt water causes emaciation and dryness. By virtue of its abstergence it first induces diarrhoea and later produces constipation by its desiccating nature. It corrupts the blood and thus causes itch and scabies. Turbid water gives rise to calculi and emboli. So a diuretic should be taken afterwards. Nevertheless, a patient of abdominal affections is often benefited by it and by all (kinds) of dense and hard water because it stays in the stomach and passess down slowly. The antidote of turbid water is fat and sweets.

Water containing ammonia moves the bowels whether it is taken as a drink or is used for sitz-bath or as enema. Alum water helps menstrual discharge, haemoptysis and bleeding piles. But it is strongly inducive of fever in the bodies predisposed to it.

Ferruginous water resolves splenitis and is useful to sexual power. Water containing copper is good for dyscrasia. When various kinds of water, good and bad, are commingled, the strongest of them has the dominant effect. We have described the correctives for impure waters in the Section on The Regimen for Travellers, and shall discuss the remaining matters pertaining to water, its properties, and effects of its various kinds in the chapter on water in (Book II on) Simple Drug.

Section XVII

Effects of depletion and retention

Retention of what ought to be depleted naturally may be due to weak expulsive faculty; or strong retentive faculty which clings to it; or weakness of digestion, hence the natural faculties retain the matter so long that it is completely digested; or narrowness and obstructions of the channels; or matter that is thick or viscid or abundant so the expulsive faculty is unable to overpower it; or the lack of feeling for expulsion of the superfluity, because sometimes depletion is aided by voluntarly power, as in biliary colic; or diversion of physical power towards another direction as happens in crisis when there is acute retention of urine and faeces because critical depletion occurs elsewhere.

Retention of the matter which must be depleted causes certain diseases. They may be structural as obstruction, relaxative and moist as spasm and the like. Or they may be diseases of temperament, as putrefaction, suppression of innate heat which turns into fieriness, extinction of the innate heat because of the prolonged or severe confinement of it resulting in coldness or domination of moisture in the body. Or they may be secondary diseases, such as blockade or rupture of vessels. Dyspepsia is one of the worst causes of these diseases, specially when it occurs after a period of starvation, for example, owing to excessive eating after a good harvest following hunger during famine. Or they may be compound diseases, such as swelling pustules.

Depletion of the matter which must be retained may be due to a strong expulsive faculty; or a weak retentive faculty; or excessive matter causing distrubance by its heaviness; or distension because of gas; Or irritation because of its acuteness; Or because the matter is thin and easily flows out by itself. Sometimes depletion is helped by the widening of the channels, as occurs in spermatorrhoea; Or when they are torn longitudinally or cut transversely or their orifices are opened, as epistaxis and this opening may take place out of external or internal causes.

Depletion of matter which must be retained causes coldness of temperament, as the inflaming matter which feeds the innate heat is expelled. Sometimes depletion makes the temperament hot, the depleted matter being of cold temperament, as phlegm, or closer to equable temperament, as blood. Thus the excessive heat, like that of bile dominates and makes the body hot.

Depletion (such as has been described above) always causes dryness directly. Sometimes it produces moisture in the same manner as we have mentioned with regard to the body-heat. This happens at the time of moderate depletion of desiccating humour or when the innate heat is unable to digest the food completely, leading to excess of phlegm. But this moisture is of no use to the innate temperament nor is itself innate as that heat (produced by the domination of bile) is not innate. But after every kind of excessive depletion there occurs coldness and dryness in the substance and nature of the organs, though after some of the depletions foreign heat and unhealthy moisture are produced. Sometimes even obstruction, which is one of the organic diseases, follows excessive depletion because of the excessive dryness and occlusion of the vessels. Besides, convulsion and tetanus also follows excessive depletion. If depletion and retention are balanced and occur at the time when they are needed, they are beneficial, and maintain health. We have described the essential causes and their varieties, although most of the variations are not essential. We now take up other causes.

Section XVIII

Incidental causes not harmful to the body

Now we talk of the factors which are neither necessary nor harmful. They are not inherent in the nature (of the body), nor they are contrary to it. These are things that touch the human body excepting the air which is an essential factor, such as baths, various kinds of massage, etc. We begin with a general statement of these factors. We say that the things acting upon the human body from outside by means of contact do so in two ways: they so act upon the body that either their attenuated portion penetrates into the pores of the body by means of their penetrating power, or the organs attract them through their pores or with the cooperation of both the matters; Or the two factors work together. They do not act by means of admixture at all, but simply by means of their property which brings about a change in the body. This happens either when a thing has an active property, like cooling liniment which actively cools, or poultice, which is active in producing heat, and so produces heat; or a thing has a potential property, but the innate heat of our bodies excites it and turns it into active property; or because of the specific form (of a thing).

Certain things produce change by external contact, but not when taken internally. For example, onions applied as plaster cause ulceration but do not do so when taken internally. There are other things which act contrarily, such as white lead which, taken orally, causes a great change, but if applied (externally) it does not produce such change. Certain other things act in both ways. The first kind of action is the result of any one of the six reasons: Firstly, when a substance like onion reaches the interior of the body, the digestive power immediately attends to it, breaks it up and changes its temperament. Thus this power does not allow the substance to remain intact long enough to cause internal ulceration. Secondly, when taken as food, such a substance is admixed with other foods. Thirdly, in alimentary vessels it is admixed with fluids which cover it to break its power. Fourthly, such a substance, when applied externally lies on one place, but inside the (body) it continues moving. Fifthly, such a substance when applied externally, sticks firmly whereas within the body it only touches it without any adhesion. Sixthly, when such a substance reaches inside (the body), it is controlled by physical power. Then its superfluity is quickly expelled and the wholesome part is immediately converted into blood.

The reason why the action of white lead is different is that white lead has thick particles which cannot penetrate into the pores from without. But even if they penetrate, they do not reach as far as the pneumatic vessels and the vital organs. But white lead is taken orally is a different matter. Moreover, the poisonous nature of the white lead is not stirred up unless the innate heat of our body has influenced it strongly and this is something which cannot be achieved by mere external contact. You will find further remarks of this sort in the Book on Simple Drugs.

Section XIX

Effects of baths, sunbaths, sand-baths, immersion in oils and sprinkling of water on the face.

Some pedants have said that the best bath-house is that which is cold and spacious, and has fresh air, and soft water. Others have added that the stoker should regulate the heat according to the temperament of one who is intending to enter the bath.

It should be known that the natural action of bath is to produce warmth by its air and moisture by its water. The first chamber of a bath has the cooling and moistening effect. The second has the heating and moistening effect. The third has the heating and desiccating effect. No attention need be paid to the statement of those who assert that water, whether it is used as a drink or is in external contact, does not moisten the primary organs. In addition to the effects and changes that we have mentioned, baths sometimes produce some other changes. Some of these changes are indirect, and some direct.

Thus, sometimes it so happens that the air of the baths has a cooling effect by excessive dispersion of the innate heat, and it also produces dryness in the organs because it excessively disperses the innate humours though it increases the foreign humours. When the water of baths is so hot that it produces horripilation and closes the pores then nothing from its moisture enters the body, nor does it disperse the humours fully.

Bath-water sometimes produces heat and sometimes cold. Its heating effect is due to its heat, provided it is sufficiently hot and not-tepid, because the latter produces cold and moisture. Sometimes the bath-water, if it is cold, produces heat by closing the pores. For it confines the heat gained from the air of the bath-house and gathers it in the viscera when cold water is poured over the body. As to the cooling effect of water, it is produced in two ways when bathing is prolonged: First water is innately cold, hence it ultimately produces cold even when it has been warmed by temporary heat. This warmth does not last but disappears and the water which the body has absorbed performs its natural function, that is, it produces cold; secondly, water is moist, whether hot or cold. When it has excessive moisture, it smothers and extinguishes innate heat and produces cold.

Sometime baths produce heat by dispersion also. This happens when there is any indigested aliment or cold humour which is not (completely) matured. (Hot) bath helps to digest the aliment and causes the maturation of the cold humour. Sometimes a bath is used dry. Hence it produces dryness and benefits persons suffering from dropsy and soft swelling. Sometimes a bath is used moist and it produces moisture. When a person stays longer in a bath, dryness results due to dispersion and sweating; and when the stay is short, moisture is produced because the body absorbs water before sweating. Sometimes baths are taken before breakfast and on an empty stomach. So they produce severe dryness and thus make the body thin and debilitated. Baths taken on full stomach fatten the person by attracting the nutriment towards the surface of the body. But in this case emboli are formed because owing to the bath, inmatured nutriment is drawn towards the organs from the stomach and the liver. Sometimes bath is taken when the first digestion has ended, but the stomach is not fully empty. Such bath is beneficial and makes a person moderately fleshy.

Persons taking bath for a moistening effect, as the patients of phthisis, should be fully immersed in water as long as they do not feel enfeebled. Then they should anoint the body with oil so that the moistening effect might be increased and the moisture which has penetrated into the pores be retained inside the skin. Such persons should not prolong their stay in the baths and should choose a temperate place and pour much water on the floor of the bath so that there is excess of vapours to make the air moist. They should be transferred from the bath on a stretcher without any trouble and exertion. After coming out of the bath, they, should use some cooling scent and should remain in the dressing room for a time till they have the normal respiration and then they should have some drink, such as barley water or donkey's milk. Those who remain in bath for a long time have the risk of syncope, because the bath renders the heart hot and first produces nausea. Though bath is useful in many ways, it is also harmful. It makes it easy for superfluous matter to flow towards organs that are weak. It makes the body lax; injures the nerves; disperses the innate heat; reduces appetite; and weakens the sexual power. Baths are classified according to the different types of water which may thus be nitrous or sulphurous sea water, alkaline or saline. Such baths may be natural, or artificially prepared by boiling something in water, like slaphysarum, or laurel seed, sulphur, etc, Such baths have dispersing and attenuating effect and remove Oedema and soft swelling and prevent the flow of matter towards the ulcers, and are beneficial for those suffering from guineaworm.

Water containing copper, iron and salt are useful in cold and moist diseases; in pains of joints, gout and paralysis; asthma and diseases of kidneys; they also strengthen the coaptation of fractured bones and benefit furuncles and ulcers. Water containing copper is useful for stomatitis, uvula, ophthalmia and otorrhea. Water containing iron is beneficial for stomach and spleen. Water containing nitre and salt is beneficial for head and chest disposed to receive (superfluous) matter. It also benefits the moistness of the stomach and persons suffering from dropsy and distension.

Bathing with water containing alum and green vitriol is beneficial for haemoptysis, bleeding piles, menorrhagia, prolapsus ani, miscarriage without any cause, oedema and excessive sweating. Water containing sulphur purifies the nerves and relieves the pain of distension and convulsion and cleanses the skin of papules, bad chronic ulcers, lentigo, vitiligo and leukoderma. Such water disperses the superfluities flowing towards the joints, spleen and liver. It is beneficial for hard uterus, but it makes the stomach flabby and causes loss of appetite. Bathing with desert water makes the head heavy. So the bathers should not immerse their heads in such water. Desert water produces heat after some time, especially in uterus, bladder and colon otherwise it is bad and heavy. Persons desiring to take baths in thermal springs should bath calmly, quietly, gently and gradually and not all of a sudden. You will find again matters relating to baths in the chapter on 'Preservation of Health, which should be taken together with what has been described previously. Similarly, the use of cold water will also be discussed there. As exposure to hot sun, especially during excessive movement such as walking and running effectively disperses the superfluities, causes perspiration, subsides flatulence, and disperses soft swellings and dropsy. It is beneficial for asthma and orthopnoea, relieves chronic cold headache, and invigorates the brain which is of cold temperament. If one having sun bath does not sweat in the parts unexposed to the sun and his seat is dry, it is beneficial for coxalgia, nephralgia, leprous neuralgia, hysteria and for clearing the uterus. If one is exposed to the sun (for a long time) the body becomes thick, hard and dark in colour; pores look as if cauterized, and there is no dispersion. Staying quietly in the sun at one place is more effective in burning the skin than moving about under it, and prevents dispersion in a higher degree.

As for sand bath, the sea-sand is the most effective of all sands in absorbing moisture from the skin, Sometimes the patient sits upon the hot sand; sometimes he buries himself in it and sometime it is sprinkled over the body little by little. Thus it removes all such pain and diseases as are mentioned under the discussion of the sun. In short, sandbath produces excessive dryness in the body.

Immersion in oil is beneficial to fatigued persons and for persons suffering from long-standing cold fever as well as to those who have pains in nerves and joints in addition to their fever. Besides, it is beneficial for persons suffering from convulsion, tetanus and retention of urine. The oil must be heated outside the bath. A fox or hyena boiled in oil in the manner we shall describe (later) is the best remedy for persons suffering from pains in joints and podagra.

Sprinkling water over the face

Wetness of face and sprinkling of water over it, specially when it is mixed with rose-water or vinegar, stimulate the faculties weakened by affliction, burning of fevers and syncope. Sometimes it restores and stimulates the appetite. But it is injurious to persons suffering from catarrhs and headache.

CLAUSE II

Special causes of bodily ailments consisting of twenty nine sections

Section I

Causes of heat (calorifics)

Agents of heat are of different kinds, such as moderate quantity of food; moderate movement, which includes moderate exercises; moderate massage; moderate pummeling; dry cupping because wet cuppying causes depletion of blood and produces cold; movement which is more than moderate but not too severe and excessive; hot food; hot drugs; moderate heated bath as it is known that the bath produces heat by its air and water; occupations involving the use of fire; contact of the body with things which produce heat but are not excessively hot as airs and plasters; moderate wakefulness; moderate sleep, provided it is according to the aforementioned condition*; anger in all conditions; worry when it is not excessive produces cold; moderate happiness and also putrefaction which has the property of producing nothing but foreign heat.

Putrefaction differs from excessive heat and burning and heat without burning certainly takes place and does not putrefy and it often occurs before putrefaction. Putrefaction very often remains even after the disapperance of the foreign heating agent which leaves behind the foreign heat which keeps stiring the moist matter and alters it in such a way that the organ which contains this moist matter loses its original temperament, but not to the extent that the moist matter takes on a temperament other than its own specific physical temperament, for if the heat alters the moist matter in such a way that it acquires a temperament different from its own specific temperament, the process is no longer putrefaction but is digestion. In burning moist substance is separated from the dry substance by the evaporation of the moist particles and sedimentation of the earthly matter. Simple heating means that all the fluids retain their specific temperaments but they become warmer; A few more examples of causes of heat are: constriction of the external body which shuts in the heat by retaining vapours and porosity inside the body which spreads heat.

As is the practice of Galen he classifies all these agents of heat into five groups: Movement which is not excessive; contact with a thing which produces heat but not in excess; hot food or drink; denseness; putrefaction.

Section II

Causes of cold (Refrigerants)

Cooling agents are also of different kinds: excessive rest which confines the innate heat; excessive eating and drinking; excessive reduction in food and drink; cold aliment; cold drugs; contact of the body with things producing heat in excess, such as scorching winds, hot plasters and water of hot springs; excessive flabbiness of the body which causes dispersion of innate heat; prolonged contact with things which produce moderate heat, for example, prolonged stay in baths;

*See 'Sleep and Wakefulness' (*Taᶜlīm 2, Jumla* 1, Chapter 13) excessively narrow pores which smother the innate heat; contact with things which actually produce cold; contact with things which potentially produce cold though they may be presently hot; excessive retention because (of superfluous matter) which smothers the innate heat: excessive depletion which causes the loss of matter containing tight and prolonged bandaging of an organ which blocks the passage of (innate) heat; excessive worry; excessive fear; excessive joy and pleasure; occupations producing coldness; immaturity and rawness, which is the opposite of putrefaction.

As is the practice of Galen he classifies them into six groups: excessive movement; excessive rest; contact with things which produce cold or which produce so much heat that it causes dispersion; matter having cooling effects; excessive reduction of food; excess of food.

Section III

Causes of moistures (Humectants)

The agents which produce moistness are several, such as rest; sleep; retention of that which should be depleted; depletion of the desiccating humour; excess of food; humectant food; humectant drugs; contact with humectants—particularly baths and especially after a meal; contact with things which produce cold, as they confine the moistness; contact with things which produce gentle heat, and thus cause the moisture to flow out; moderate joy.

Section IV

Causes of dryness (Desiccants)

The agents of dryness are many, such as: movement; wakefulness; excessive depletion; coitus; insufficiency of food; dry foods; desiccant drugs; successive psychic impulses; contact with desiccants e.g. bathing with water which produces contraction, cold or freezing which prevents an organ from attracting nutriment towards it because of the contraction which leads to obstructions that prevent the penetration of nutriment; contact with excessively hot things which cause excessive dispersion; even excessive baths have the same effect.

Section V

Causes of deformities

The causes which produce deformities include: causes occurring in the primary constitution because of which the formative or alterative faculty inherent in the semen falls short of its total action; causes occurring at the time of birth; causes occurring at the time of swaddling a child; or handling external causes, such as falling down and blow;

causes related to the effort at walking before the limbs are hard and firm; causes related to diseases, such as leprosy, consumption convulsion, paralysis and distenstion, undue obesity or excessive emaciation; swellings; diseases of position; bad healing of ulcers.

Section VI
Causes of embolus and stricture of the channeles

Primarily embolus is caused when there is an abnormal occurrence in the channel: it may be a foreign body as stone or an abnormal accumulation of faeces, or an abnormal quality, like extra-ordinary thinness, viscidity, or coagulation, like the clotting of blood. These are the things which cause obstruction in the channels. Some of them are static in a channel and some keep moving.

Sometimes embolus is caused when the orifice is blocked owing to the (bad) healing of an ulcer in it or there is an outgrowth, as by fleshly warts which cause obstruction, or the closing of the ducts from pressure of an adjacent swelling, or by the contracting effect of excessive cold, or by excessive dryness produced by astringents or by excessive retentive power, or by tight bandaging. Embolus is common during winter when cold produces contraction and superfluous matter is held back.

Section VII
Causes of dilation of the channels

Channels may be dilated (because of): a weak retentive faculty; a strong expulsive faculty, including holding of breath; deobstruant medicines, or the medicines which are relaxant, hot, and moist; Causes contrary to these and (other) obstructions make the channels narrow.

Section VIII
Causes of roughness

Roughness occurs when there is: a sharp and incisive detergent, such as acid secretions; an agent causing dispersion, such as sea-foam and pungent secretions; an agent with styptic action which produces roughness by its dryness, as for example, an acrid thing; an agent that is cold and causes roughness by producing denseness; a settling of earthy matter, like dust, on an organ.

Section IX
Causes of smoothness

The causes of smoothness are: Glutinous substances which produce viscidity; light dissolvents which make the matter thin and cause it to flow; removing impurity from the surface of an organ.

Section X

Causes of dislocation of joints and displacement of organs

An organ is displaced when there is: a cause producing extension, which stretches an organ until it is dislocated; violent movement which causes dislocation of the supporting organs, as sprain in the foot of a person. A relaxing and moistening cause, as happens in hernia; a cause which corrupts the substance of ligament through corrosion and putrefaction, as happens in leprosy and sciatica.

Section XI

Causes of preventing proximity

These causes may be: thickness; scars; convulsion; paralysis; dryness of humour and its calcification in a joint; congenital.

Section XII

Causes of preventing disproximity

These causes are: thickness; healing of ulcers; convulsion; congenital.

Section XIII

Causes of abnormal movements

These causes are: dryness which produces weakness, as dry tremor; dryness which produces convulsion, as dry hicough; superfluities which produce convulsion; superfluities which obstruct and prevent a faculty from reaching an organ. superfluities which are harmful because of their coldness, as in shivering fever, or are irritating, as in horripilation; sinking or scantiness of the innate heat which leaves the surface of the body cold; formation of gases which seek to be expelled, as in palpitation.

We say that when this injurious matter is vapoury and scanty, it produces yawning. When it is powerful, it produces fatigue provided it is stationary. When it is mobile, it produces certain other types of fatigues which we shall describe later. When it is more powerful, it produces horripilation. When it is still more powerful, it produces shivering fever. When gaseous matter is retained in the muscles, it produces palpitation.

Section XIV

Causes of increase in size and number (of members)

These causes are: excess of matter; the intensity of the attracting power in itself; the intensity of the attracting power aided by massage and the heating effect of plasters, like plaster of pitch and the like. This (last) one is instrumental ni increasing the size, but not the number.

Section XV
Causes of decrease (Reduction)

These causes are: congenital, owing either to the shortage of matter or owing to the mistake or weakness of the formative faculty; injuries from without, such as cuts, blows and frost-bite. injuries from within, such as erosion and putrefaction.

Section XVI
Causes of the loss of continuity

These causes are either internal or external. The internal causes include: corrosive, caustic, moistening, and relaxing humour or humours with drying and cleaving action; repletion of gases causing distensions or penetrating gases, repletion of humour causing distension. This repletion occurs owing to the vigorous movement in the humours which might be moving away from the body or penetrating into it to provide nutriment, or repletion of penetrating humours. All these causes occur either owing to excessive movement or owing to excessive matter as, for example, strong, abnormal expulsive movement, exercise after meal, skipping and leaping; and rupture of the swellings.

External causes include: a body which produces extension, such external causes include: A body which produces extension, such as rope and weights; a body which is sharp, as a sword; a body which produces burns as fire; a body which causes contusion, as stone such a body crushes the empty (organs) and produces rupture in the replete vessels; a body which pierces, as an arrow; a body which stings or bites, as mad dogs, a snakes and human beings.

Section XVII
Causes of ulcer

These causes are: rupture of swellings; sepsis in a wound; corrosive pustules.

Section XVIII
Causes of swellings

Some of these causes are related to matter, and some, to the condition of the organs. Causes related to matter are: repletion with the six things already mentioned (i.e., the four humours, aquosity and gases). Causes in regard to the condition of organs are:

Strong expulsive power of the organs; weakness of the recipient organ and its disposition for receiving the superfluity, which may be due to the following reasons: the very nature of an organ, which was created specifically for the purpose, such as skin; looseness of an organ, as the looseness of flesh in the three turnings, i.e. behind the ears, in the neck, armpit, and groin; the greater width of the passage leading to an organ and the narrowness of the passage going away from it; low position of an organ; the smallness of an organ which, with the incoming nutriment, causes tightness; the inability of an organ to digest its nutriment owing to some injury; a blow which causes the retention of matter in an organ; lack of dispersion of the matter which is usually dispersed by exercise; excessive heat of an organ, resulting in attraction of heat; This heat is either natural, as the heat of the flesh, or it is acquired, i.e. it has been caused by pain, vigorous movement or something which produces heat.

Fractures produce swellings because of the aforementioned causes, such as confusion and compression of an organ and its stretching by means of which the bones are set; swellings arise in bones also, and even in teeth. It is because the bones receive growth from nutriment and undergo wetting and putrefaction, so they have a disposition for swellings also.

Section XIX

Causes of pain in general

Pain is one of the unnatural states of a living body. We begin with a general statement of the causes of pain. We say that pain is an adverse feeling. The causes of pain are of two kinds: sudden changes of temperament, or variable intemperament, and loss of continuity. By variable intemperament we mean that the substance of organs has a constant temperament. Then a foreign temperament of contrary character supervenes. This temperament is either hotter or colder than the original one. The sensitive faculty perceives the entry of the contrary temperament and in consequence it feels pain, for pain is only the sensation of contrariety produced by a contrary thing.

Constant intemperament does not produce pain, nor it is perceived, as, for example, when a bad temperament becomes integrated in the substance of the organs and destroys the original temperament, it almost becomes the original temperament. Such temperament does not cause pain because it is not perceived. The reason is that the sense organ must be affected by that which is perceived. A thing is not affected by the condition which becomes persistent in it and does not change it from its pre-existing state. But it is affected by the entrance of such a contrary thing as brings about a change in the pre-existing state of the thing. This is why a patient of hectic fever does not feel so much of burning as one who has ephemeral or tertian fever, although the heat of the hectic fever is much greater than the heat of the tertian fever. It is because in hectic fever the heat is persistent and settled in the substance of the principal organs, but the heat of the tertian fever reaches the organs from the nearby humour, but they retain their natural temperament. Should the humour be removed, the natural temperament will continue in the organ and the (superimposed) heat will disappear unless the fever becomes hectic.

Constant intemperament settles in an organ only gradually. An example which makes this point understandable is found in health. The example is that of a man who enters the bath all of a sudden in winter and bathes with hot or tepid water. At first, he is disgusted because the quality of his body is far from, and contrary to, that of the water. Afterwards, as the effective cold of the body gradually diminishes it becomes in accordance with hot water and he enjoys it. But if a person was to sit in the inner chamber of a bath for some time, his body would often become warmer than that in tepid water; and if the same tepid water were suddenly poured upon him, shivering would result because he would feel the water cold.

After you have learnt this, we shall proceed to describe though every variable intemperament is one of the two types of the causes of pain, yet not every intemperament is variable. A hot or a cold intemperament directly causes pain, but a dry intemperament does indirectly so. A moist intemperament does not cause pain at all, because heat and cold are two active qualities while dryness and moisture are two passive qualities and their structure is not such as to affect, but to be affected, by another body. Dryness produces pain only indirectly, because sometimes it is followed by some cause belonging to the other type, that is loss of continuity. It is because sometimes dryness becomes a cause of loss of continuity due to excessive contraction.

A study of Galen's school of thought would lead to the fact that the actual cause of pain is nothing else than loss of continuity, and that heat produces pain only through a loss of continuity. Similarly, cold also produces pain only because it necessitates loss of continuity. It is because cold exerts such a condensing and countracting effect that the parts (of an organ) are drawn towards the point of contraction. Thus loss of continuity occurs in the place from where the parts are drawn.

Galen has gone so far in this discussion that in some of his books he conjectures that all sensations cause pain in the same way, that is, by loss of continuity, or contraction caused by loss of continuity. Thus a black object causes pain to the sense of sight, because it creates excessive contraction (of the parts of the eye), and a white object does so because it causes excessive dilation. Similarly, bitter, saltish, and sour things cause pain to the sense of taste because they cause excessive expansion and the acrid things do so because they cause excessive contraction necessarily followed by loss of continuity. Similar is the case with the sense of smell. Loud noises also cause pain because when the powerful waves of air touch the auditory meatus, they cause loss of continuity.

The correct opinion in this regard is that a change in temperament by itself is the direct cause of pain, though sometimes it is accompanied by the loss of continuity. It is, however, not for medicine to give a hard and fast statement in such matters but it is the domain of physics. However, we give here its brief description and say: Pain occurs uniformly throughout an organ but breach of continuity does not occur. The presence of pain in the parts having no breach of continuity results from intemperament. Cold produces pain when it contracts and aggregates and also where it is applied, although cold does not produce breach of continuity where it is applied, but in the distal parts of the organ where cold is applied. Pain is undoubtedly a sudden perception of a contrary agent as such. Thus the painful is that which is suddenly perceived as a contrary. The reverse of the definition is that every perceptible thing which is contrary as such is painful. If the cold which alters the temperament is conceived to be so much that it only disturbs the temperament but does not produce any breach of continuity, do you think that it would not be perceived as a contrariety or it would not be called pain. It is thus clear that a sudden change in temperament causes pain as the breach of continuity does. Pain generates heat which in turn accentuates pain. Sometimes even when the pain is gone there remains a sensation of pain though it is not actual pain. It is one of those things which are dispersed by themselves. But the ignorant physicians begin to treat it and thus cause harm.

Section XX
Causes of different kinds of pain

The kinds of pain which have definite names are: itching pain; rough pain; pricking pain; compressing pain; stretching pain; tearing pain; breaking pain; loose pain; boring pain; piercing pain; benumbing pain; throbbing pain; heavy pain; fatigue pain; irritative pain. All these pains make fifteen kinds.

The cause of itching pain is pungent or salty humour. The cause of rough pain is coarse humour. Pricking pain is produced by such a cause as extends the membrane in transverse direction, as if it were separating the continuity of the membrane. Such pain is sometimes uniform and sometimes, it is not. That which is not uniform is so for (the following reasons): The tissue on which the membrane is extended and with which the membrane is in contact is not homogeneous in hardness and softeness, as clavicle for the pleura when swelling in pleurisy is attracted towards the upper part; irregularity in the movement of the membrane, as diaphragm in relation to the pleura; sensitivity of an organ is not uniform either because of its nature or because some of the parts are affected by an injury while the others are not. The cause of stretching pain is such gas or humour as causes tension in nerves and muscles as if it were attracting them towards their ends. Compressing pain is caused by some matter which pressurizes an organ or by some gas which surrounds and confines an organ leading to compression. The cause of tearing pain is that matter which intervenes between the muscles and their membrances. Thus it causes distension in the membranes and breaks the continuity of the membranes or even of the muscles. The cause of breaking pain is some matter or gas which comes in between the bones and the enveloping membrane or cold which produces intense contraction in that membrane. The cause of loose pain is some matter which extends the flesh of the muscles but not the tendons. It is called loose because flesh is more loose than tendons, nerves and the membranes. The cause of boring pain is some thick matter or gas which, like the colon, is retained in the coat of a hard and thick organ and goes on penetrating into the organ which feels as if it were being bored by a gimlet. The cause of piercing pain is matter similar to that which causes boring pain, except that the matter does not stop short of penetration.

The cause of benumbing pain is an excessively cold temperament or blockade of the passages of the sensitive pneuma going towards an organ through nerves, or repletion of the vessels.

Throbbing pain is caused by some hot swelling, not cold swelling because cold swelling—whether hard or soft—does not cause pain unless it changes into a hot swelling. Throbbing pain arises from hot swellings only when an adjoining organ is sensitive and has a pulsating artery nearby. When the organ is healthy, the patient does not feel the movement of the artery which is located in the organ. The beating sets up pain when the organ is afflicted and has a swelling. Heavy pain is caused by a swelling in an insensitive organ such as the lung, the kidney and the spleen. It is because this swelling, owing to its weight, is attracted towards the lower part and thus attracts the organ with the surrounding sensitive fascia and the attachments from which the fascia grows. Hence the fascia and the attachements feel the downward drift of the organ. Sometimes heavy pain is caused by swelling in an organ which, though sensitive, has got its sensation destroyed by the disease as cancer in the cardiac orifice; it is felt because of its weight but it does not cause pain because it destroys the sensitivity of the stomach.

Fatigue pain is sometimes produced by exertion. Hence this pain is called labour fatigue. Sometimes it is produced by a humour which produces distension; pain caused by such humour is called tension fatigue; sometimes it is produced by gases and is called flatulent fatigue; and sometimes it is produced by some irritating humour and is called ulcerous fatigue. Combinations of these factors lead to several mixed varieites of the fatigue pain. We shall describe them in their proper place. Among the mixed varieties of (this pain) is the pain which is known as inflammatory fatigue. It is a combination of tension and ulcerous fatigue. Irritative pain is caused by a humour which has a pungent property.

Section XXI
Causes of alleviating pain

Pain can be alleviated by removing its cause or by evacuation, as for example by applying dill and linseed plaster over the painful place, or through something which increases moisture and induces sleep, like intoxicants. Thus the faculty of sensation sinks deep and stops its function. Or pain can be relieved by substances producing cold and analgesia, as all the narcotics do. The real alleviating factor, however, is the first.

Section XXII
Effects of pain

Pain disperses the faculties, prevents the organs from their specific functions, and even stops the respiratory organs from respiration or disturbs their function by making respiration intermittent or continuous or altogether unnatural. Sometimes pain first makes an organ hot, and finally cold. This is because it disperses and weakens the pneuma and the vital force.

Section XXIII
Causes of pleasure

These causes are of two kinds: When an imbalanced temperament suddenly returns (to its normalcy) so that it is perceived;

when there is a sudden restoration of the natural continuity. What is not sudden is not perceived and felt as pleasure. pleasure is the perception of what is agreeable, and every perception comes from a sensitive faculty and arises from the reaction of that faculty. When the reaction is agreeable there is pleasure, when not, there is pain. Touch is the coarsest of all the senses, and it retains the contrary or suitable impression for a longer time for the perception of agreeable things though the sense of touch gives greater pleasure to the persons of coarse disposition, and the perception of the contrary things causes greater pain than the particular perception of the other senses.

Section XXIV
How movement causes pain

Movement causes pain because of distension or contusion or laceration.

Section XXV
How abnormal humours cause pain

Bad humours cause pain either due to their quality, as when they cause burning, or due to their quantity as when they cause distension, or both.

Section XXVI
How gases cause pain

Gases cause pain through distension. Gas is distending sometimes in the cavities of the organs and their ventricles, as in the inflation of the stomach. Sometimes it is in the layers and fibres of the organs as in flatulent colic. Sometimes it is in the layers of the muscles, or beneath the membranes and above the bones, or around the muscles in between them and the flesh, or the skin; or the gas encircles the organ as it encircles the thoracic muscles. Rapid dispersion or prolonged stay of the gas depends on its abundance or dearth as well as its density or thinness, and on the thickness and porosity of an organ.

Section XXVII
Causes of retention and depletion

Retention and depletion are easy to understand if one refers to what we have already described in this regard. Hence one should study that description.

Section XXVIII
Causes of dyspepsia and repletion

These causes are either external or internal. An example (of external cause) is the use of the objects which produce moisture in excess. The body is then no longer in need of the moisture which is produced by foods and drinks. When both the factors combine, there is an excess of moisture in the body, and the action of physics upon this matter is impaired, such as through excessive bathing, specially after meals, and an excess of such things as are prohibitive of dispersion, for example, repose, stoppage of exercise, lack of depletion, heavy foods and drinks, and bad regimen. Internal causes are such as the weakness of the digestive power which fails to digest or the weakness of the expulsive faculty or (the strength of) of the retentive faculty, hence the humours are confined and are not expelled, or the narrowness of the channels,.

Section XXIX

Causes of weakness of members

The cause of weakness either befalls an organ, or befalls pneuma which is the vehicle of the modifying faculty of an organ or it befalls the faculty itself. The cause which is particular to an organ is persistent intemperament, especially the cold one, although hot intemperament also, like a cold intemperament, enfeebles and benumbs an organ by corrupting the temperament of the pneuma as happens with persons who stay too long in a bath and suffer from syncope. Dry intemperament prevents the faculties from penetrating (the organs) by becoming thick; moist intemperament (produces weakness) by relaxing (the organs) and obstructing (their passages). Structural disease: a special feature of this disesase is that a person suffering from it seems to have no pain, disease or discomfort. It is the looseness of the texture in the nerve-fibers of an organ for all physical and voluntary actions are carried out by these fibres and by their coordination. Digestion also requires that the nutriment should be retained in a suitable condition and this is done by the fibres. The causes which are particular to the pneuma is intemperament or dispersion of pneuma by itself or following any kind of depletion. The causes which are particular to a faculty are the excess and repetition of the functions, for they enfeeble the faculties, though dispersion of pneuma also accompanies it as a cause accompanies another.

If we take into reckoning the cause (of weakness) in another way and include also those remote causes which are the causes of proximate causes, the causes of intemperament emerge. Amongst these causes is the corruption of air, water and aliment. Some of these causes are such as would first scare the pneuma, as for example foul smell, putrid water and diffusion of poisonous effects in air and the body. Among the causes of weakness are also those that are related to depletion, such as: hemorrhage; diarrhoea, specially when the thin humours (are depleted), a sudden withdrawal of a lot of dropsical water by tapping incision of a large abscess if it causes a sudden flow of pus or when the abscess bursts forth by itself; profuse sweating; excessive exercise; pains also cause weakness, because they disperse pneuma, though sometimes they change the temperament.

Some of these pains are more effective, such as pain in the cardiac orifice whether it is distending or irritating, and all the pains which are in the region of heart. Fevers are among the (causes) which produce weakness by dispersion, depletion of the blood and pneuma, and change the temperament. Widening of pores assist the occurrence of weakness because of dispersion. Severe starvation is of the same type. Sometimes weakness in one organ or in a part of an organ causes weakness of the whole body. For example, injury in the cardiac orifice poduces weakness of the body so much that the faculties are dissolved and the heart and brain of such a man are severely affected even by slight injuries. Thus such a man is quickly annoyed and upset even by trifles. Sometimes weakness is caused by prolonged suffering from diseases. Some of the organs are congenitally weaker than other organs (of the same) or different type such as lungs and the brain. They readily receive the matter expelled by congenitally stronger organs. If the brain had not been distinguished by its higher position it would have to undergo in this way unbearable sufferings and its power might not persist. This is all you have to know in this regard.

LESSON III

Consisting of eleven sections and two clauses
Signs and symptoms

Section I

General statement on signs and symptoms

Signs and symptoms indicate one of the three states of the human body already mentioned i.e.. health, disease, and the intermediate state. They manifest the states in one of the three ways: Knowledge of present state; Galen says that this is of advantage to the patient alone as it shows him what he must do. Knowledge of the past state according to Galen is of advantage to the physician alone because it proves his progress in his art, hence there is greater reliance on his advice. Knowledge of the future state is of advantage to both. (The patient and the physician), it proves the prior information of the physician, and it makes the patient understand the precautions that he must observe.

Signs of health

Some of the signs show equability of temperament. We shall describe it in its proper place. Some of them show the evenness of structure. Again, some of these signs of evenness of structure are substantial; some are accidental; and some are final. The example of substantial signs is that the constitution, position, quantity, and number are such as they should be. This has already been discussed in detail. Accidental signs are such as beauty and comeliness. Final signs are the complete functions and their continuance in perfection. Thus an organ with perfect functions is a healthy organ. The method of gaining information about the vital organs by means of functions is (as follows). Information concerning brain is gained by (knowing) the states of the voluntary functions, sensory actions and the actions of imagination. Information concerning the heart is gained by (studying) the pulse and respiration. Information of liver is gathered by (studying) stools and urine. Thus the weakness of liver is indicated by stools and urine resembling the washings of fresh meat.

Symptoms of disease

Some of the symptoms indicate the disease itself as rapid pulse in fever because it indicates the fever as such. Some of them show the location of disease, as serrate pulse in case of pain in the region of the chest indicates that the swelling is in pleura and diaphragm; or as wavy pulse in a similar condition indicates that the swelling is in the substance of the lungs. Some of them show the cause of the disease as signs of repletion in its different states; each type of signs shows a certain type on repletion. Some of the symptoms are temporally determined. They begin and end with the disease—such as acute fever, pricking pain, dyspnea, (dry) cough, and serrate pulse (begin and end) with pleurisy. Some symptoms show no time relation (of this kind). Thus sometimes they follow the disease and sometimes do not, as headache in the case of fever. Again, some of these symptoms appear at the close of the disease, for example, signs of crisis, of maturation or lack of maturation, and of death. Most of these are (observed) in acute illness.

Some of the symptoms show the diseases of external organs. They are discernible either by particular sensory perceptions, as the colour or the sense of touch in hardness, softness, heat and cold etc.; or they are discernible by all the senses together, as (the symptoms are related with) the constitution of the organs, with their positions, movements and rests. Some of these symptoms show the internal states, such as tremor of the lip reveals vomiting. Similarly, increase or decrease in quantity or number (is among the signs which are discerned by all senses together. Again, some of these (symptoms of quantity and number) show the internal states of the organs, such as shortness of fingers denotes smallness of the liver. To make inference from stools, such as in the case of jaundice, whether they are black or yellow is based on the sense of sight. Similarly, inference of flatulence and indigestion from borborygmus is based on the sense of hearing. The drawing of inference from odours and tastes etc. is also of the same kind. Inference of consumption and hectic fever from curving of nails is concerned with the sense of sight but it is among the category of joint senses. Some of the visible things reveal some internal matters, as redness of the cheeks shows swelling of the lungs and curving of nails indicates ulcer of the lungs. Inference from movement and rest requires detailed description which we shall give.

Signs pertaining to the category of repose are such as apoplexy, epilepsy, syncope and paralysis; those pertaining to the category of movement are such as, rigorous shivering, hiccup, sneezing, yawning stretching, cough, tremor and the initial stage of convulsion. Some of these symptoms arise from the action of the body in its normal state as hiccup, and some arise from the action of the body in its abnormal state,as convulsion and tremor. Some of them are purely voluntary as restlessness and tossing about in bed. Some of them are combination of natural and voluntary movements, as coughing and micturition. In some of these movements volition precedes the physis, as coughing, while in some, physis precedes volition provided the volition does not hasten to it, as in micturition and defecation. Movements arising from physis without any volition are of two kinds: movemnts which are perceived by senses, as shivering; movements which are not perceived by senses, as tremor.

Movements differ according to the nature and number of exciting factors. Thus the exciting factors for sneezing are more than those for coughing, because coughing is accomplished simply by the movement of the organs of chest and sneezing is accomblished by the combined movements of the organs of both chest and head. These movements sometimes differ according to the degree of risk, as dry hiccup is more risky than the movement of moist coughing, though coughing is more powerful. Sometimes these movements differ according to the object from which the physis gains aid. Thus it is aided by some essential primary instrument, as when it is aided by the abdominal muscles is defecation, sometimes it is aided by some extraneous instrument, as 'external' air in coughing. Sometimes these movements differ according to the organ which are their source, as coughing and nausea. Sometimes these movements differ according to their active powers. For example, the source of tremor is physical faculty and that of coughing is psychic faculty. Sometimes these movements differ according to the difference of matter. For example, (the movement of) coughing results from sputum and tremor results from gases. Thus these are the signs which indicate (the states of) of external organs and mostly indicate the external states, though sometimes they also indicate the internal diseases, as redness of the cheeks indicates pneumonia. Some times these movements differ according to their active power.

Some of the signs help in discerning the internal diseases. But the persons desiring to discern them must have sufficient knowledge of anatomy and be aware of the substance of each organ whether fleshy or non-fleshy is the structure of an organ so that it might be known, whether the swelling of a particular shape is found in it or in other organs is appropriate to the form of a member or not; whether it is proper for anything to be retained in the organ or not, if it discharges like the Jejunum, whatever is received by it; and if it is proper for a thing to be retained in it or expelled from it, what that thing is; the position of an organ, which enables one to judge whether the perceived pain or swelling is within or without the organ; the relations of an organ so as to judge whether the pain in a certain organ arises from itself or is caused by the involvement of a neighbouring organ; the matter has separated itself from the organ or has entered into it from the related parts; the morbid matter which has separated from the organ belongs to its substance, or comes from another organ and penetrates it; the (kind of) matter that the organ contains so that it might be known whether the excreted matter corresponds to the concerned organ; the function of the organ so that any disturbance in the function may point to the diseased state of the organ. All these (points) are learned from anatomy. It should be remembered that a knowledge of these points from anatomy is essential to a physician trying to control the diseases of the internal organs. When a physician is equipped with the knowledge of anatomy, he should rely on six laws in the diagnosis of the internal disease: The first is functional disorders. You have already learnt the functions, their qualities and degrees. Functional indications are direct, and constant; secondly, (internal diseases) are known through depleted matter. The indications made by them are constant, but not direct. The indications are constant because they always certify the disease. They are not direct because they indicate the disease through maturation and its absence; thirdly pain; fourthly swelling; fifthly position; sixthly through other appropriate and apparent symptoms. The indications made by them are neither direct nor constant.

We shall now describe these laws one by one. As by inference from functions, when a function does not proceed normally, it appears that some evil has befallen the faculty and the evil of the faculty is in consequence of a disease in the organ to which the faculty belongs. Functional disturbances occur in three ways: Functions become deficient, as when the eyesight becomes weak so the objects are not clearly seen unless they are at a short distance; or when similarly, the stomach digests food with difficulty and slowly and in a small quantity; functions undergo a change, as when the eye sees that which is not there or sees the things incorrectly; or when the stomach corrupts the food and spoils the digestion; actual loss of functions, as when the eye does not see and the stomach does not digest (food) at all.

Indications of diseases with the help of depletion and retention

These are varied: indication gained through abnormal retention, such as the retention of a thing which is normally discharged, as one whose urine and faces are retained; indication gained through abnormal depletion. The depleted thing may or may not be from the substance of the organ.

The matter which is depleted from the substance of an organ helps the diagnosis in three ways: it guides by its substance, as when phlegm is coughed out it points to the corrosion of trachea; it helps the diagnosis by its quantity, as when the flakes passing out in dysentery are thick, they show that the ulcer is there in the large intestine; and when they are thin, they indicate that the ulcer is in the small intestine. It helps the diagnosis by its colour, as the red flaky sediment shows that it is (discharged) from fleshy organs, such as kidneys; and a white sediment indicates that it is from nervous organs such as the bladder. If the depleted matter is not from the substance of an organ, it indicates (the disease) in the following ways: the depletion is not natural, as the discharge of healthy humours and blood; it is abnormal in quality as putrid blood, whether the discharge is normal or not; it is absolutely abnormal in substance, as calculus; it is abnormal in quantity though the discharge is natural. It is either scanty or excessive, as excessive and scanty defecation and micturition; it is abnormal in quality, although the discharge is normal, as black faeces and black urine; it is abnormal in the direction of its discharge though the discharge is normal, as the passing of faeces by the mouth in the case of ileus.

Pain indicates disease in two ways: by its location, as for example, pain in the right side indicates that it is in the liver and if it is in the left side, it indicates that it is in the spleen. Sometimes it indicates the cause by virtue of its nature, as we have explained in the lesson on 'Causes'. For example, if it is heavy it indicates swelling in an insensitive organ or in an organ which has been rendered insensitive. Tensive pain indicates excess of matter: and irritative pain indicates acute matter.

Swelling indicates (disease) in three ways: by means of its substance as erysipelas indicates the (presence of) yellow bile and hard swelling points to black bile; by means of its location, as swelling in the right side indicates that it is near the liver; and if it is in the left side, it shows that it is in the region of spleen; by means of its shape, if it is in the right side and is crescent shaped it shows that it is in the liver itself, and if the swelling is elongated, it shows that it is in the muscle which is above the liver. Indication by position which consists of location and relationship. The indication by location is evident; the indications of relationships are such as pain in finger owing to any previous cause from which we infer that it is because of an injury to the sixth pair of the cervical nerve.

Section II

Defferential signs between primary and secondary diseases

Diseases occur in organ either primarily, or through association as head and stomach are interrelated in their diseases. Hence it is necessary to mention the defferential symptoms between the two conditions. We say: It is necessary to consider which of the two diseases arose first. The disease arising first is primary and the other is an associated (that is, secondary) disease. Again, one must note that out of the two, the one which persists even after the disappearance of the other, is primary, and the other is secondary and vice versa. For it is supposed that the secondary disease appears after the first and ceases when the first is relieved. Mistakes, however, do occur. It is because often a primary disease is unperceived and painless in the beginning, and its harmful effects are perceived after the appearance of the secondary disease. But in fact the secondary disease occurs after the first and follows it. Hence the secondary disease which is an accident is considered to be the real disease. Sometimes only the accident comes into notice and the real or primary disease is really neglected.

To guard against this mistake, the physician must know the relationship of the organs, and it is through his knowledge of anatomy. He should also possess the knowledge of all perceptible and imperceptible injuries befalling each of the organs so that he might not hurriedly decide that the disease is primary except after a careful inquiry. For it is possible that the occurrence of the disease is secondary to the real one. Therefore the physician will inquire of the patient regarding the symptoms of (various) disease which can possibly occur in the organs related with the diseased organ. Again it is also possible that they are neither perceived, nor apparently painful, nor arouse symptoms bearing close relationship, but they are followed by remote (and unconnected) perceptible matters. The patient does not know that they are the symptoms of that distant, primary disease, but the knowledge of the physician can lead to this fact. In diagnosis, a physician is mostly assisted by his contemplation of the functional disorders (of the members). When he finds that they are prior, he decides that the disease is secondary.

In some of the organs diseases appear only after the diseases of some other organs. Thus diseases of head, in most cases, are associated with the diseases of the stomach, while the reverse is rare.

We are now going to describe for you the symptoms of original and accidental temperaments in general way. The specific signs of each of the organs will be described in the chapter on it. Some of the symptoms of the structural diseases are apparent and hence detected by senses; others are internal which are other than repletion, embolus, swellings and breach of continuity and which are difficult to be included in the general statement. Similarly, the description of all those cases of repletion, embolus, swelling, and breach of continuity which are specific to various organs will be postponed till the particular statements are made.

Section III
Signs of temperaments

Signs through which (various) states of temperaments are discernible are of ten kinds: The temperament (of a person) is discerned by touch by considering whether the feel of that person corresponds to that of health in temperate zones and temperate climate. If it corresponds, it indicates equability (of temperament). If some person of healthy temperament is so affected that he finds the feel of another's body cold or hot, softer or harder or coarser than normal; the other person is of abnormal temperament provided there is nothing to soften and coarsen the body such as the atmosphere or water-bath etc. Sometimes the state of the finger-nails in their softness, roughness and dryness informs of the state of the temperament of the body provided it has not resulted from some foreign cause. Moreover, the decision on the basis of softness and hardness depends upon the preceding correct indications of equability, heat and cold. For, if the case is not so, it is probable that the heat makes the hard and rough feel (of the body) besides the equable (feel) soft by its dispersing action. Hence it is fancied that the feel is soft and moist by nature. Similarly, cold may make the soft feel besides the equable one—hard by its great congealing and condensing action. Hence it may be fancied that the feel is dry like ice and fat. The ice is such by being congealed and the fat by becoming thick. Persons of cold temperament have mostly soft bodies even though they are lean and thin. It is because immaturity in them is in excess.

2 *Indications gained from flesh and fat*

When red flesh (i.e. muscle) is plentiful, it shows moisture and heat, and in such cases there is firmness. If the muscles are scanty and fat is not in plenty, it indicates dryness. Fat always denotes coldness and in such cases there is flabbiness. If at the same time there is narrowness of the veins and lack of blood, and the persons concerned feel weakness by starvation owing to the lack of innate blood which is provided for the nutrition of the organs, it shows that this temperament is innate and natural. But if other signs are absent, it shows that the temperament is an acquired one. Deficiency of liquid and solid fat denotes heat because the substance of fat is greasiness (of blood) and their active cause is cold. Hence greasy matter is flimsy over the liver and plentiful over the intestines. Fat is more plentiful over the heart than it is over the liver because of the matter, not because of temperament, and shape (of the heart) and also because physis attends to this kind of matter. The congelation of fat over the body is lesser or greater according to the excess or deficiency of heat. If the body is fleshy without excessive fat, it is hot and moist body. If it has excessive red flesh with little fat, it indicates excess of moisture. If fat is in excess, it denotes that the excess is in cold and moisture and that the body is cold and moist. The most emaciated body is that one which is cold and dry; then the body which is hot and dry; then the body which is dry but equable in heat and cold; then the body which is hot and equable in moisture and dryness.

3. *Indications acquired from hair*

Indications from hair are gained by noting the following things: rapidity or slowness of growth; excess and scantiness; thinness and thickness; straightness and curliness; colour.

Inferring from rapidity and slowness of growth or absence of growth; slow growth or absence of growth shows that the temperament is very moist provided there is no sign indicating anemia. If the growth is rapid, the body is not so moist but it is tending to dryness. Heat and cold of the body are shown from other signs which we have mentioned. But when heat and dryness are present together, the growth of hair is rapid and it becomes profuse and thick. It is because abundance of hair shows excess of heat and thickness of hair indicates excess of smoke as it is in adults but not in children. For it is the vaporous matter and not the smoky matter which is dominant in children. The opposite of these two denotes the corresponding contraries (of heat and dryness). As for shape, curliness shows heat and dryness. sometimes it indicates tortuosity of the openings and pores. This cannot change with the change of the temperament. The first two causes (viz. heat and dryness) are subject to variations, caused by the change of temperament. Straightness of hair denotes opposite of heat and dryness.

Colour of hair: Black hair denotes heat; reddish brown hair indicates cold; yellowish red and red hair show equability of temperament. Greyness of hair either shows moisture and cold as in old age or it shows much dryness as it happens with the plants when their darkness turns into whiteness owing to their dryness. This happens also in man after desiccant diseases. According to Aristotle, the cause of greyness of hair is that the substance changes into the colour of phlegm. According to Galen, it is mustiness which necessarily accompanies the nutriment coming to the hair when the nutriment is cold and slow in motion while it is penetrating into pores. If you consider both the views, you will really find them quite similar because the white colour of both phlegm and musty matter results from the same cause and this pertains to physis. After this it must be kept in view that countries and climates also affect the hair. Thus one should not expect to find yellow red hair in Negroes in order to infer from it the equability of their particular temperament. Similarly, one should not expect to find black hair in Slavs in order to infer from it the dryness of their particular temperament. Age, too, has an influence in the matter of the hair. Thus the youth are like the inhabitants of the southerly countries. the children are like the inhabitants of the northerly countries and the middle-aged are like the inhabitants of central region. Abundance of hair in a child indicates that its temperament will change to atrabilious when it grows up; and in the elderly person it shows that his temperament is atrabilious at present.

4. *Indications gained from the colour of the body*

Whiteness denotes loss or deficiency of blood accompanied by cold. For, if it is accompanied by heat and yellow bile, the body would be yellow. Redness is an indication of excessive blood and heat. Yellow and yellowish red colour indicate (abundance of) heat. But yellow colour chiefly indicates bile and yellowish red colour chiefly indicates (excess of) blood or bilious blood. Sometimes yellow colour indicates loss of blood though bile is not in excess as happens in the bodies of convalescents. Duskiness is an indication of excessive cold. Blood formation decreases as a consequence and even that little amount of blood gets congealed and changes into black and changes the colour of the skin. Brown colour shows heat; purple shows cold and dryness because such colour is the result of pure black bile; chalky colour clearly denotes cold and phlegm; lead colour shows cold and moisture with a little of black bile. This is because it is white with a little trace of green. Thus whiteness results from the colour of phlegm or from the temperament of the moisture while the greenness results from dark congealed blood which, mingled with phlegm, becomes green. Ivory colour shows phlegmatic cold with a little bile. In most cases the colour of the body changes into yellow and white because of the liver and into yellow and black because of the spleen; and into yellow and green in piles. This is not permanent, but varies.

Tongue: The colour of the tongue is an excellent guide to the temperament of the stomach and intestines and veins of the body. The colour of eyes is an excellent indication of the temperament of brain. Sometimes the colours of two organs differ in a single disease, for example, the tongue is white and the countenance dark in a single disease such as jaundice which results from the excessive combustion of bile.

5. *Indications acquired from the forms of the organs*

(Persons of) hot temperament have broad, large and well developed chest; the hands and feet are not narrow and short. The vessels are wide and prominent; their pulse is big and strong, and muscles are big around the joints, because all the functions of growth and constitutional forms are accomplished by heat. Persons of cold temperament have the opposite characteristics because, owing to cold, the natural faculties are inadequate to complete the functions of growth and creation. The persons of dry temperament have dry and rough skin, prominent joints, and prominent cartilages of trachea and nose. Their nose is straight.

6. *Indications acquired from the ready receptivity of the organs*

If the organ is quickly warmed without any difficulty, it has a hot temperament, because a change into a related genre is easier than a change into an opposite one. If the organ is quickly cooled, it has an opposite temperament and the reason is quite similar. Some one may assert that "it should be otherwise because we know for certain that a thing only reacts to its contrary and not to its like, whereas the statement you have given implies that a thing would react more strongly to its like". Its reply would be that a thing does not react to its like only when the quality of both the things is the same in its kind and nature. Thus a hot thing is not like a cold thing. Indeed, even two hot things are different if one of them is hotter than the other. Thus a thing which is less hot is relatively cooler than the one which is hotter. Hence it is affected by the other not because of heat but because of its relative cold. Similarly, it is also affected by a thing which is relatively or absolutely cold. But one of the two increases and supports the dominant quality of the other while the other lessens the quality of the first. Thus the change of the less hot thing into that which increases and supports its dominant quality, becomes easier.

Moreover, there is another matter which is particular with the things similar in quality but dissimilar in degree. For example, a thing of hot temperament, by nature, quickly receives the influence of a hotter thing because the heat destroys the effect of the contrary, viz., cold which prevents the thing of hot temperament from drawing more heat. Thus when they (i.e., the two hot things) meet and the obstacle is removed, they help each other in producing heat. Hence this mutual help results into the accumulation of the two qualities.

When external heat tries to destroy the balance, the internal innate heat vigorously defends against it to such an extent that it defends even against the hot poisons and pushes it back and destroys its substance. In fact, innate heat is an instrument of physis. The physis expels the injurious action of extraneous heat by motivating pneuma to expel the extraneous heat, to remove its vapour, to disperse it and to burn its substance. Similarly it also expels the injurious action of extraneous cold by its contrary (quality). This quality is not in cold because it opposes and defends against the extraneous heat only by its contrary quality and does not oppose the extraneous cold.

Innate heat is that which protects the innate fluids from being dominated by foreign heat. So when the innate heat is strong, physis is able to work through it upon the fluids and so effects maturation and digestion and maintains them in healthy state. So the fluids move according to the administration of the physis, and are prevented from moving according to the administration of extraneous heat. Hence they do not undergo putrefaction. But when the innate heat is weak, physis neglects the fluids and stops its function because of the weakness of the intermediary link between the physis and the fluids. The foreign heat encounters the fluids unused in any administration. Hence it overpowers them and dominates them and imparts a foreign movement to them. Thus it causes putrefaction. Thus innate heat is an instrument of all the faculties whereas cold is contradictory to them and is useful to them only indirectly. That is why we speak of 'innate heat' but not of 'innate cold'; and the control (of the functions) of the body is attributed to heat and not to cold.

7. *Indications acquired from sleep and wakefulness*

Balanced sleep and wakefulness indicate the equability of temperament, specially of the brain. Excessive sleep denotes (excess of) moisture and cold and excessive wakefulness denotes excess of dryness and heat, particularly in the brain.

8. *Indications acquired from the functions*

As long as the functions continue to be found perfectly and full in a natural way, they indicate equability of temperament. If they change from their natural way to excessive movements, they indicate hot temperament. Similarly, when they are rapid, they show excess of heat such as rapid development (of organs) and rapid growth of hair and rapid eruption of teeth. If the functions are dull, weak, inactive and slow they indicate cold temperament. Moreover, sometimes weakness, dullness and disorder happen in the functions owing to hot temperament. But in such a case, basides the weakness, the functions are necessarily deviated from the natural way. Many natural functions are lost or lessened by heat. As, for example, sometimes there is loss or lack of sleep owing to hot temperament.

Similarly, some of the natural states may be intensified by cold, as, for example, sleep. But this is not strictly the outcome of absolute natural states but with some conditions and causes. For necessity of sleep to ensure life and health is not absolute. It is necessary because it gives the peneuma rest against the activities which cause fatigue; or because during sleep the pneuma, which cannot perform two functions simultaneously, has to give full attention to digestion. Hence the need for sleep follows defficiency and it is without the natural necessity. And if this unnatural (thing) is called natural in the sense that it is inevitable, this is only because the word 'natural' here is used for the 'inevitable' by virture of the common use. This is most accurate of indications of the equability of temperament when the functions are balanced and perfect. Indications to hot, cold, dryness and moisture from this kind of signs are only guess work. Among powerful functions which denote heat are: powerful and loud voice, rapid and continuous speech, short temper, brisk movements and frequent blinking. They occur, not owing to a general cause, but owing to a cause particular to the organ which performs that function.

9. *Expulsive faculty of the body and the quality of discharging*

If the expulsion continues and the excreted faeces urine and sweat etc are acrid and strong in odour, normal in colour, oxidised and properly matured, then the body is hot. The body showing contrary signs is cold.

10. *Signs derived from the states of psychic faculties in their actions and passions*

Examples of the conditions indicating heat are intensity of anger, depth of anxiety, acuteness of intelligence, understanding, initiative, effrontery, good opinion, optimism, callousness, vivacity, strong morality, alertness and slowness of reaction towards everything; the opposite of these indicate coldness. Persistence of anger and joy and of imagined and retained things indicate dryness, while rapid disappearnce of reactions indicates moisture. Visions and dreams also belong to this category. Thus a person who has the domination of heat in his temperament dreams to be warming himself at a fire or bathing in the sun, and a person having domination of cold in his temperament dreams to be ice-stricken or submerged in cold water. It is said that every person has his dreams according to the dominating humour. All or most of the signs mentioned by us are signs of those temperaments which are innate and congenital.

11. *Signs of unnatural temperaments which are accidental*

The signs of hot temperament are: painful heat of the body; agony in fevers; exhaustion at the time of movements because they flare up the heat; excessive thirst; inflammation in the mouth of the stomach; bitter taste in the mouth; weak; very rapid and continuous pulse; discomfort from hot foods; comfort from cold foods and adverse condition in summer.

12. *Signs of abnormal cold temperament*

These are: deficient digestion; less desire for drinks; laxity of joints; excess of phlegmatic fevers; discomfort from catarrh and taking cooling things; comfort and satisfaction from taking heat-producing things and the condition is worse in winter.

13. *Signs of abnormal moist temperament*

These signs are similar to those of cold temperament. Moreover, there is relaxation of muscles, flow of saliva and mucus, tendency towards diarrhoea, dyspepsia, discomfort from taking moistening things, excess of sleep and oedema of the eyelids.

14. *Signs of abnormal dry temperament*

The signs of such temperament are: dry skin; insomnia; emaciation; harm from eating dessicative things makes condition worse in autumn; comfort from eating moistening things; ready absorption by the body of hot water and light oils and their quick reception.

Section IV

Summary of the signs of equable temperament

The signs of equable temperament from those mentioned by us are: balanced feel of the body in respect of heat, cold, dryness, moistness, softness and hardness; balance of colour between whiteness and redness; body grown moderate in bulkiness and leanness, but inclined to bulkiness; the blood vessels are neither too deep nor superficial, and separated from the flesh; the hair is neither profuse nor scanty and curly nor straightly. It is yellowish red during childhood and dark and black during maturity; moderate sleep and wakefulness; free and easy movements; vigour of imagination, intellectual power and memory; habits and behaviours are in between excess and deficiency i.e., the mean between courage and timidity, between anger and calmness, between cruelty and clemency, between violence and sobriety and between pride and humility; (the organs are) healthy and all the functions are perfect; growth is good and rapid; stability in middle life; sweet dreams; natural tendency towards fragrance mellifluous voice and delightful company. A person having these qualities is popular, cheerful, gay; moderate in his desire for food and drink, has good digestion of food in astomach, liver and vessels which are assimilated in the body and has normal excretion of the superfluous matter through proper passages.

Section V

Signs of gross abnormality of temperament

The organs (of the body) of such a person do not have a uniform temperament. Sometimes, even the principal organs deviate from equability and differ from one another. Thus one deviates towards a certain temperament and another towards the contrary temperament. When the constitution is out of balance it is unfortunate both for understanding and reasoning power. Thus a person with large belly, short fingers, round and almost semicircular face, big or small head, fleshy face, forehead, neck, and massive and very different set of jaws and similarly, round head and forehead, but a very long face, excessively thick neck and sluggish movements of eyes are the characteristics of persons who are far from happy.

Section VI

Signs indicating repletion

Repletion is of two kinds: repletion in regard to vessels and repletion in regard to vitality. Repletion in regard to vessels means that the humours and pneuma, in spite of their being in good quality, are so much in quantity that they fill up the vessels and make them distended. For a person having such repletion and movements becomes dangerous. For, sometimes repletion tears up the blood vessels and the humours flow towards choked passages giving rise to diphtheria, epilepsy and apoplexy. The treatment of such repletion is prompt venesection. Repletion in regard to vitality means that the trouble is not only because of the quantity of the humours but also because of the morbid state of their quality. Such humours overwhelm the vitality of the body with the morbid state of their quality and do not yield to the processes of digestion and coction. A person suffering from such repletion is in danger of putrefactive diseases.

The signs of repletion in general are: heaviness of the organs, sluggish movements, redness of colour of the body, inflation of the veins, distension of the skin, fullness of the pulse, coloured and dense urine, loss of appetite, weak eye sight, dreams indicating heaviness as when one dreams that he is unable to move or unable to stand up, or is carrying a heavy weight or he is unable to utter words, just as dreams of flying and of rapid movements show that the humours are thin and in moderate quantity.

Signs of repletion in regard to vitality

Heaviness, sluggishness and scanty appetite are associated with the first kind of repletion also. But when the repletion in regard to vitality is simple, the veins are not very much inflated, the skin is not so tight, pulse is not so full and large, urine is not so dense and its colour is not so red. There is lassitude or fatigue only after undue movement and activity. In such repletion there are dreams of itching, stinging, burning and fetid odours. The dominant humour is indicated by the signs which we are going to mention presently. In most cases, repletion in regard to vitality produces illness before all its signs are manifest.

Section VII

Signs indicating dominance of each of the humours

The signs of blood being dominant are very similar to those of repletion in regard to vessels. That is why domination of blood sometimes produces heaviness in the body, especially in the base of the eyes, and in the head and the temples. There is necessarily stretching, yawning, fainting and drowsiness. Senses become disturbed and the reasoning is dull. Fatigue occurs even without any preceding exertion. There is unusual sweatness in mouth and the tongue is red. Boils appear frequently in the body and pustules in the mouth. Bleeding occurs from the places which are easily ruptured like nostrils, anus and gums. Sometimes domination of blood is revealed by the temperament, previous regimen, country, age, habits and the fact that the venesection has not been carried out for a long time. The dreams indicating preponderance of humours are such as seeing red things, excessive flow of blood, immersion in blood and the like.

Signs of dominance of phlegm* are : excessive white colour (of the body), flabbiness, soft and cold skin, abundant sticky saliva, diminished thirst especially in old age excepting when the phlegm is salty, weakness of digestion, sour eructation, whiteness of urine, excess of sleep and sluggishness, laxity of nerves, mental dullness, soft pulse tending to be slow and infrequent. Age, habits, previous regimen, occupation, country, and dreams in which waters, rivers, ice, rains and thundering hailstorms are seen (also indicate the dominance of phlegm).

Signs of dominance of bile are yellow colour (of the body) and the eyes, bitter taste in the mouth, rough and dry tongue, dryness of nostrils, feeling of delight in cool breeze, excess of thirst, rapid pulse, weak appetite, nausea, bilious vomiting of green and yellow colour, irritative diarrhoea and horripilation as from needle-pricks. Then there are the signs already mentioned—age, temperament, habits, country, time and occupation, the dreams in which fires and yellow flags are seen. Moreover, the things which are not yellow are seen to be yellow and blaze and heat as from a (hot) bath and the sun etc are seen.

Signs of dominance of the black bile are: dryness and duskiness (of the body), blackness and thickness of the blood, excess of evil thoughts and anxieties, burning in the cardiac orifice, false appetite, dark coloured, black, red and thick urine, the body being black and hairy. Black bile is rarely dominant in the bodies which are white and have scanty hair. There is frequent occurrence of *vitiligo nigra,* bad ulcers and diseases of spleen. Then age, temperament, habits, country, occupation time (indicate black bile) as described before. Frightful dreams of darkness, deep pits and black and fearful things (are also the signs of black bile).

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* In the Arabic text published by the Institute of History of Medicine and Medical Resarch, New Delhi, the word is used as الدم instead of البلغم which is a printing arror.

Section VIII

Signs indicating emboli

If there are signs indicating retention of matter, one perceives distension without any sign of repletion from any part of the body, then undoubtedly there are emboli. Heaviness is felt only because of the emboli in the channels through which much matter is bound to flow, as for example, the emboli of the liver. Thus, when the nutriment going towards the liver is detained by the emboli, much matter is accumulated and confined so as to produce a much greater heaviness than a swelling would. Embolus is differentiated from swelling by the greater heaviness and absence of fever. When the emboli are in other channels, there is no sensation of heaviness. But the stoppage of the flow of blood is felt because of distension. Mostly the persons having emboli in their vessels are pale in colour because the blood does not gain access through its passages to the surface of the body.

Section IX

Signs indicating gases

Gases are recognised by means of pain occuring in the sensitive organs; and it (pain) follows the breach of continuity caused by the gases. Sometimes they are known through the movements which take place in the organs, and sometimes they are recognised by means of sound and touch. Pains indicating gases are the severe pains. They indicate gases particularly when there is a feeling of some abatement. If the pain is of a shifting type, the evidence is complete. This is only when the breach of continuity is in sensitive organs. In organs like bone or glandular tissues, the presence of gases is not manifested through pain. Sometimes there are gases in bones though the bones are fractured or contused and yet there is no pain. If pain does occur, it is owing to the pricking of the broken bone into the neighbouring tissues. Movements of the organs indicate gases, such as fluttering indicates that the gases are being formed and are moving to be eliminated and dispersed. Sounds indicate gases in (two ways): sounds produced directly from the gases, as boroborygmus etc. and sounds felt in spleen when gases are the cause of pain in it; sounds evoked by percussion as is done for distinguishing between ascites and tympanites. Indication of gases is gained through touch, as for example, touch differentiates between flatulence and tumour because in flatulence distension yields to pressure and there is no quivering, fluid material or viscid humour. Tactile sense differentiates between these conditions. The differences between flatulence and gas is not substantial but in the form of motion which is confined and shifting.

Section X

Signs indicating swellings

External swellings are diagnosed by senses and observation, whereas hot internal swellings are revealed by accompanying fever and by a feeling of heaviness, if the affected organ is devoid of sensation. But, if the organ is sensitive, there is pricking pain with a feeling of heaviness. Similarly, injuries affecting the functions of an organ also indicate swelling and help in diagnosing it. Feeling of flatulence in the region of the concerned organ is a sign of swelling provided it is within the reach of the sense concerned. Cold swellings are not necessarily accompanied by pain. It is difficult to point out the general signs of swellings. Even if it were easy, a wearisome description would be required. Hence it is better to defer the description of it to the particular statements of each of the organs. Here it is enough to say that whenever there is the feeling of heaviness but no pain and the signs of the dominance of phelegm are also present, it should be inferred that the swelling is phlegmatic. And if it is accompanied by the signs of the dominance of black bile, it is atrabilious, especially when it is hard to touch. Hardness is the best evidence of an atrabilious swelling. When hot swellings appear in the nerves, there is severe pain and intense fever. Besides, they rapidly lead to distension and mental confusion and produce distrurbance in the movements of contraction and expansion.

All swellings of viscera make the abdominal wall thin and weak. When the swellings begin to be localised and form an abscess, pain and fever become severe and high; the tongue becomes very rough; sleeplessness and other symptoms are aggravated; the sense of heaviness becomes great; sometimes there is sensation of hardness and piercing (pain); sometimes sudden emaciation of the body and sudden hollowness of the eyes may appear. When pus is formed, the intensity of fever, pain and pulsation subsides and itching replaces the pain. If there is redness and hardness, the redness lessens and the hardness turns into softness. All the signs of pain subside and heaviness reaches at its height. When the abscess bursts, the acridity of pus first produces rigor and then fever. Then owing to depletion the pulse becomes broad, unequal, weak, small, slow and infrequent. There is loss of appetite and often the extremties grow warm. The matter (i.e. pus) is discharged through easy passages viz through expectoration or urine or faeces.

The good signs after the bursting of an abscess are complete disappearance of fever, easy breathing, recovery of strength and quick evacuation of matter through its proper channels. Sometimes, in internal swellings, matter passes from one organ to another; this transference is sometimes good and sometimes bad. It is good when matter passes from a principal organ to a subordinate one; as for example, in the swellings of brain it passes from brain to (glands) behind the ears; and in swelling of liver it passes from liver to the groins. It is bad when matter passes from an inferior organ to a superior one or to an organ which has low resistence against what happens to it, as, for example when liquid matter of pleurisy passes to the region of heart or to the swelling of lung. There are signs of the corrupt matter of internal swellings passing to another organ and when the pus of abscesses are inclined upwards or downwards. For, when they pass downwards, there is the feeling of distension and heaviness in epigastrium. When they pass upwards, it manifests itself by bad condition of respiration, dyspnoea and stenothorax. There is a burning sensation beginning from below and passing to the upper parts. There is heaviness in the region of the clavicle; headache (also) occurs and sometimes the effect appears in the wrist and arm. The matter, which passes upwards and settles in the brain, is bad and dangerous and if it passes into the loose tissues behind the ears, there is hope for recovery. Epistaxis is a good sign in such a case and in all the swellings of viscera. For a comprehensive description one should wait for the chapters where we shall fully discuss the swellings and describe the condition of swelling of internal members one by one.

Section XI

Signs of loss of continuity

The loss of continuity occurring in an external organ is recognised by senses; and if it occurs in internal organs, it is seen through piercing, pricking and corroding pains, especially when it is not accompanied by fever. Often it is followed by the flow of some humour, as, for example, haemoptysis or effusion of humour into a cavity or discharge of purulent matter and pus, provided it occurs after the signs of swellings and their maturation. Hence the discharge of pus following swellings sometimes indicates that the bursting has taken place after maturation and sometimes not. If, the bursting (of the abscess) is owing to maturation, fever subsides when the abscess bursts and the pus is discharged; moreover the sensation of heaviness subsides and lessens. But if it is otherwise, pain becomes severe and aggravated. Sometimes the loss of continuity is indicated by luxation of the organs from their position or by (partial) displacement of an organ from its position as in hernia. Sometimes loss of continuity is indicated by the stoppage of excretions from the (usual) channels because they often flow towards the cavities caused by the loss of contiunity and do not pass out through the natural tract as happens in the case of a person whose intestines are ruptured and the faecal contents are confined. Sometimes loss of continuity is hidden and is not recognised by the aforementioned general signs. For the diagnosis of such loss of continuity, particular statements concerning each of the organs are needed. This (i.e. hidden loss of continuity) happens when the organ is insensitive or when it does not contain any fluid which might flow out or when it has no room so that it might be displaced from its position or when it is not supported by any other organ so that it might be displaced with the displacement of the supporting organ.

It should be known that the swellings and the loss of continuity occurring in extremely sensitive nervous tissues are very grave in consequence because sometimes they are fatal. Syncope and convulsion always follow such swellings. The syncope is owing to the severity of pain and the convulsion is the result of neurosity of the organ. Next in severity are those which occur in joints because the excessive movement of the joint makes the recovery slower and because there is, in the joint a space which readily receives the matter flowing into it. Since pulse and urine are among the general signs of the states of the body, we now proceed to describe them.

CLAUSE I

(*of Part Two*)

PULSE

Containing 19 sections

Section I

General statement on pulse

We say that the pulse is a movement in the vessels of pneuma which comprises expansion and contraction. The purpose of this movement is to temper pneuma with breeze. The discussion of the pulse may be either general or particular according to each of the diseases. Here we shall deal with the general principles of the science of pulse and defer the particular principles till the discussion of the particular diseases.

We say: each pulse beat comprises two movements and two pauses, because each beat is composed of one expansion and one contraction. Then it is necessary that there should be a period of rest between two opposite movements, because it is impossible for any movement after it has actually reached the end of its course to be connected with another (type of) movement. This is one of the matters which are made clear in physics. When such is the case, it is most necessary that each pulse-beat till the next, has four parts—two movements and two rests, i.e. (a) movement of expansion; (b) rest between expansion and contraction; (c) movement of contraction; and (d) rest between contraction and expansion.

Many physicians consider that movement of contraction is not perceptible at all but some of them hold that the contraction is sometimes perceived. Thus in a strong pulse it is perceived as a result of its strength; in a large pulse, (it is perceived) as a result of its height; in a hard pulse, (it is perceived) as a result of its resistance; in a slow pulse (it is perceived) as a result of the long period of time taken by the movement. Galen says, "For a long time I was ignorant of the movement of contraction, but I persevered in my search till I comprehended something of it. Then after some time I gained the precise knowledge of it and then the doors of sphygmology were opened to me. Whoever perseveres like me would achieve what I have achieved. Even if the fact be the same as held by some (that contraction can be perceived), in most cases contraction is not perceptible."

Reason for feeling the pulse at the wrist

Pulse is felt at the wrist for three reasons: it is easily accessible; the patient is not distressed by exposing this part; it is situated in the continuity of the heart and is close to it. While feeling the pulse, the forearm should be on the side because when the arm is on the side it increases the width and the height of the pulse but decreases the length, specially in thin persons, while supination of the arm increases the height and length of the pulse but decreases the width. It is also necessary that the pulse is felt at a time when the patient is not in anger, joy, exercise and in any other emotion. He should not be overfed or hungry. He should neither have given up (usual) habits nor should have adopted new ones. The examination should be based on the pulse of a well balanced person so that it might be a measure for the pulse in inequable temperaments.

Then we say: according to the physicians the features by which the state of the pulse is discerned are ten although they should have been nine only—based on the degree of expansion; based on the impact of the pulse-beat on the fingers; based on the duration of each movement; based on the texture of the artery; based on the emptiness and fullness of the artery; based on heat and cold of the feel (of pulse); based on the duration of rest period; based on the equality and inequality of the pulse; based on the fact whether the inequality of pulse follows some order or none and based on the rhythm of the pulse.

Degree of expansion

The kind based on the degree of the pulse is noted from the degree of the three dimensions of the pulse, i.e. length, breadth and height. Thus the pulse has nine simple and (many) compound varieties. The nine simple kinds are: long, short and moderate; broad, narrow and moderate; low, elevated and moderate. The long pulse is one the parts of which are perceived to be greater in length than the pulse which is absolutely normal, i.e. during the real equable temperament or these parts are greater in length than the normal pulse which is peculiar to that person and that normal pulse is the equable one in this case. You have already known the difference between the two. The short pulse is the opposite of the long one and between these two is the moderate pulse. The remaining six can be decided in the same manner.

There are compound pulses derived from (the combination of) these simple ones, some of them have names and some have none. Thus a pulse which has increased length, breadth and height, is called large; and that which shows diminution in these dimensions is called small. Between these two is the moderate pulse. A pulse which is increased in breadth and height is called thick and that which is diminished in these two dimensions is called thin. Between these two is the moderate pulse.

The kind of pulse based on the quality of stroke on the fingers has three varieties: strong—this resists the finger during expansion; weak—this is opposite of the strong pulse; moderate—this is between the two. The kind of pulse based on the duration of each movement has three varieties: rapid—this completes the movement in a short time; slow—this is opposite of the rapid pulse; then the moderate—this is between the two. The kind of the pulse based on the texture of the artery has three varieties: soft—this is easily compressed, when touched; hard—this is opposite of the soft pulse. Then comes the moderate pulse. The kind of pulse based on the state of the artery has three varieties: full pulse—in this pulse it is felt that its cavity is full of considerable fluid and is not totally empty; empty pulse—this is opposite of the full pulse; then is the moderate pulse. The kind of pulse based on feel has three varieties: hot, cold and moderate.

The kind of pulse based on the duration of rest has three varieties: frequent pulse—in this pulse the period between two beats is felt to be short. This is also called quick and dense pulse. Infrequent pulse—this is opposite of the frequent pulse. This is also called a rare and sluggish pulse. Again, this period (of rest) is recognised according to the perception of contraction. If the contraction is not perceived at all, this period of rest is found between each two expansions. If the contraction is perceived, the period of rest is reckoned from the time of the two extremes. The kind of pulse based on equality and inequality is either equal or unequal. This equality or inequality is considered according to the similarity of the strokes or the parts of a stroke or a single part of a stroke in the (following) five things: largeness and smallness; strength and weakness; swiftness and slowness; frequency and variation; hardness and softness. It may happen that in a single pulse the last part of expansion is rapid owing to excessive heat and weak owing to reduced vitality.

If desired, one could expand the discourse and consider all the other kinds of pulse regarding equality and inequality in the aforementioned three kinds. But (for the physicians) only these five things are the basis of condsideration. An absolutely equal pulse is equal in all the (aforementioned five matters). If it is equal in one thing, it is equal in that only. For example, you speak of a pulse as equal in strength or equal in swiftness. Similar is the case of the variable pulse. This is not equal and this inequality is either absolute or conditioned in relation to a particular thing in which it is not equal.

The kind of pulse based on orderliness or disorderliness has two varieties: variably regular and variably irregular. Thus variably regular pulse is one which varies according to a definite order. Again this has two forms: absolutely regular and periodically regular. Absolutely regular is that in which only one irregularity is repeated; periodically regular is that in which two or more irregularities go on repeating in cycles, as for example, a pulse has two different cycles of irregularity but both are so repeated that they form a single cycle. An irregular pulse is converse of the regular pulse. After careful inquiry you will find that the ninth kind is like the eighth one and is included in inequal pulse.

It should be noted that the pulse has a musical nature. The art of music deals with two things: juxtaposition of tunes according to the relation among them in pitch and heaviness; cycles of pause between the strokes. The pulse also is similar because the time relation in respect of rapidity and continuity is the pause relation; and the relation of its states in strength and weakness and in quantity is rythmic relation.

Just as the periods of pause (i.e. intervals) and measurements of tunes may be harmonious or disharmonious, the differences in the pulse may be sometimes regular and sometimes irregular.

Again the relation among the states of the pulse in weakness, strength, and quantity is sometimes harmonious and sometimes disharmonious or rather different. This is excluded from the kind of pluse based on order.

According to Galen, the perceptible degree of the relation of rhythm of the pulse is one of the five musical relations given below: 2:6 this is the ratio of three times because it is compoused of two ratios: (a) double time (b) two-three time. 2:4; 2:3; 3:4; 4:5

Further relationships are not perceived. I regard that the recognition of these relations by the sense of touch is of great importance, but it is easier for those who are familiar with the grades of pauses and relations of musical notes by means of practice. Moreover, they are also capable of applying this theoretical knowledge of music to practical things. If such persons pay (proper) attention to the pulse, it is possible for them to understand these relations by the sense of touch. Let me add: those having regular and irregular pulse, can come under the one of the ten categories, and it is not right to put them in a separate category.

The kind of pulse based on rhythm is in comparison to the relationship of the four periods: two periods of movement and two of rest. When all these are not perceived, the relations of the periods of expansion are to be compared with the period which is between two expansions. In short, the period of movement should be compared with the period of rest. Those who consider in this connection that the period of movement should be compared with the period of movement and the period of rest, with that of rest, are introducing a (different) chapter under it. Although this encroachment is possible and, even permissbile, yet it is not desirable. Metre is that in which musical proportions are found.

Then we say that the pulse is either rhythmic or disrhythmic. Disrhythmic pulse has three varieties: (a) pararhythmic or dicrotic pulse: it is the pulse which acquires the rhythm of the pulse closer to that of an adult, as for example, the rhythm of child's pulse being like that of the pulse of a young man. (b) heterorhythmic: (in this the rhythm of a child's pulse is) like that of the pulse of an old man (c) disrhythmic: it is the pulse which is not similar in rhythm to the pulse of any age. A great deviation of pulse from rhythm indicates a great change in the bodily states.

Section II

Constant and variable pulse

(Physicians) say that the variation of the pulse occurs either in several beats or in a single beat. When the variation is in a single beat, it is either in several parts (of the pulse), that is, in several places where the different fingers are applied, or in one part, that is, on the spot of applying a single finger.

Among the inequal pulses varying in several beats is the one in which variation is gradual and regularly continued. This begins with one beat and there is a change towards increase or decrease. This continues gradually in the same manner till it reaches the maximum or minimum limit. Then there is a break, and it returns to its increased or decreased previous condition. This retreat is, similary in both the conditions, contrary to the first speed, but it is necessary that it should proceed from the beginning to the end in the same manner. Sometimes it reaches the end; sometimes it stops before the end; and sometimes it surpasses it. When it stops, it so happens sometimes in its middle owing to a pause, and sometimes it acts against the break, that is, movement occurs in its middle. Intermittent pulse is a variety of the inequal pulse in which a pause occurs when movement is expected. Supernumerary pulse is a variety of the inqual pulse in which movement occurs when pause is expected.

When the variation of the pulse refers to the several components of a single beat, this may be with regard to the position of its components or to their movement. Variation in the position of the components means the variation in the relation of the parts of the artery with regard to directions. Since the directions are six, the variations occurring in them are also six. Variation in movement means: (a) whether the variation is swift or sluggish; (b) whether it is premature or delayed, i.e. whether a part moves before the proper time of its movement or after that time; (c) whether it is strong or weak; (d) whether it is large or small. All of this may be in a regular order or in an irregular order, showing irregularity in increase and decrease. Again, this irregularity may be in two or three or four components. The components mean the places where the fingers are applied (in feeling a pulse). It is upon you to work out the other variations of pulse (in a similar manner).

When the pulse-variation is in a single component, it may be an intermitting or a recurrent or a continuous pulse.

Intermitting pulse is the pulse which is disconnected in one part by a slight interval. The two extremes of the part which are divided by the interval, sometimes differ in swiftness and sluggishness and sometimes are similar. Recurrent pulse is that in which large pulse becomes small in one part and then by and by becomes large again. In this category comes the intervening pulse. In this pulse a single beat appears to be two beats as a result of irregularity or two beats appear to be a single beat resulting from overlapping. Opinions about it differ.

Continuous pulse is the pulse which varies gradually and continuously, and in this change no break is perceived from swiftness to slowness or conversely when the pulse changes to normal, neither from the mean between the two nor from largeness or smallness. This variation continues in a like manner. But, in spite of continuity, there is greater irregularity in regard to some of the parts and sometimes less.

Section III

Different kinds of compound pulse with specific names

(i) *Gazelle Pulse:*

It is the inequal pulse varying in one part. It is slow but later on becomes rapid.

(ii) *Wavy Pulse:*

The irregularity is in respect of thickness, smallness, height and breadth of the parts of the artery. Similarly, in this pulse the beat is too soon or too late. This type of pulse is soft but it is not very small; it has some breadth. It is like the waves which follow one another in orderly way and yet vary in the extent of rise and fall, and in swiftness and slowness.

(iii) *Vermicular Pulse:*

It is similar to the wavy pulse. But it is small and very regular. Its regularity causes it to be mistaken for a swift pulse though it is not so.

(iv) *Ant-like Pulse:*

It is smaller and still more regular than the vermicular pulse. The difference between the vermicular pulse and ant-like pulse is more apparent in feeling in respect of height, anteposition and postposition of the beat rather than their difference in respect of breadth, which is hardly perceptible.

(v) *Serrate Pulse:*

This pulse resembles the wavy pulse in inequality of the various parts, rise, breadth, anteposition and postposition. It differs, however, in being harder though the hardness is not uniform. Hence, the serrate pulse is swift, continuous and hard. Its parts differ in size of expansion and in hardness and softness.

(vi) *Mousetail Pulse:*

In this pulse variation is gradual whether it is from decrease to increase or from increase to decrease. This happens sometimes in many beats and sometimes in several parts or a single part of a single beat. The distinct variation of this pulse is in size. Sometimes the variation occurs in respect of slowness, swiftness, strength and weakness.

(vii) *Spindle-shaped Pulse:*

It starts from smallness and increases upto a certain limit. Then it declines and comes back to the original position. It is like two mouse-tails joined to each other at the base.

(viii) *Dicrotic Pulse:*

Physicians are divided about this pulse. Some of them regard it as a single beat varying in anteposition and postposition, while others regard it to be a dual beat. In short, the intermission between the two beats is not so much as to facilitate for the movement of contraction and then of expansion. Whenever two beats are felt in a pulse, it is not necessarily made up of two beats. Otherwise the pulse, in which the expansion stops for a while and rises again, will have to be deemed as a pulse made of two beats. A pulse should be taken as composed of two beats only when there is an expansion in the beginning and then through a movement of contraction it goes down deep, and then expands again.

(ix) Intermittent and (x) Supernumerary varieties of the pulse have already been described.

The difference between supernumerary and gazelle pulse is that in gazelle pulse the second beat begins before the first is finished. In supernumerary pulse an extra beat appears during the period of rest after the first beat has ended.

In this group are also included: (xi) spasmodic, (xii) tremulous and (xiii) twisted pulse. The twisted pulse is like the thread which is being twisted. These varieties differ from one another in progress and delay of the beat and in position and breadth.

(*xiv*) *Cord-like Pulse*:

This is one of the varieties of the twisted pulse. It resembles the tremulous pulse with the difference that in the cord-like pulse the movement of expansion is less conspicuous; similarly, the departure from the regularity of position of rise is less evident, but tension is evident in cord-like pulse. Sometimes the tension is in one direction only. The cord-like, the twisted and the like varieties and the one with tension in only one direction occur only in dry diseases. Other varieties of compound pulse are almost innumerable and have no specific names.

Section IV

Varieties of normal pulse

Out of those aforementioned varieties of pulse, which differ in respect of increase and decrease, each variety contains an equable pulse and that is normal except in the case of the strong variety. For, then, the normal pulse is that which has increased (in power). If a pulse belonging to other varieties marks an increase in consequence of an increase in strength, and thus becomes large, it is still called normal for being strong. Among the varieties in which there is no possibility of increase and diminition is the normal pulse which is equal, regular and of good rhythm.

Section V

Factors governing the above mentioned varieties of pulse

Factors governing the pulse are of two types:

(i) General, essential and intrinsic causes which take part in the formation of the pulse. These causes are called retentive causes.

(ii) Causes which do not take part in the formation of the pulse. These causes are of two types:

(a) causes which, when altered, alter the rules of the pulse. These are called essential causes.

(b) the causes which are not obligatory. These are called alterative causes in general.

The retentive causes are three: (a) vital force in the heart, which creates the pulse. You have already learnt it in the chapter on vital faculties. (b) Instruement of the pulse, i.e. the pulsating vessel. You have learnt it in the description of the organs. (c) The third is the need for extinguishing. It requires a definite amount of extinction, and restricts the limit of heat in its intense, or extinguished or moderate (states).

The functions of these retentive causes, change according to their association with the essential causes or with the alterative causes in general.

Section VI

The extent of the causes of retentive factors

As long as the instrument (the pulse, i.e. artery) is submissive because of its softness, the power (of the heat) remains strong, and the need for extinction urgent, the pulse would be large. The need (for extinction) is most important of the three for making the pulse large. If the power is weak, the pulse necessarily becomes small; and if with the weakness of power the instrument (artery) becomes hard and the need (for extinction) small, the pulse would still be smaller. Hardening (of the artery) also makes the pulse small. But the pulse that is small owing to the hardening of the artery differs from the pulse that is small owing to the weakness (of power). It is because the former is hard but not weak, so it is not extremely short and low as happens during weakness of power. Reduced 'need' (for extinction) also makes the pulse small, but in such cases pulse is not weak. Out of these three causes, weakness (of power) is most effective in producing a small pulse. A little hardening of the artery accompanied by power makes the pulse smaller than the one in which there is reduced need (for extinction) and a greater power. It is because the power, in spite of the lack of need (for extinction) does not reduce the pulse from equability to a greater extent as there is nothing to prevent (the artery) from expanding. Really, it does not produce much increase which is deviated from equability and is also unnecessary.

When the need (for extinction) is great, and the power strong, but the instrument (the artery), on account of hardness, is unable to expand, the pulse necessarily becomes swift so as to make up for the lack in volume. If the power is weak, the pulse neither becomes large nor quick. Hence its frequency necessarily increases so as to make up for the loss of largeness and rapidity through frequency. Thus several beats (of this kind) would become equivalent to one adequately large beat or two swift beats. This condition of weakness is like that of a man who has to carry a heavy weight. If he is able to carry it all at a time, he will do so, otherwise he will divide it into two portions and make haste (in carrying each); or he will divide it into several portions and carry each portion quickly or slowly according to his capacity. He will take no rest between two journeys though he might be slow. But if he is extremely weak, he will take a rest for a while and carry the weight with difficulty and come back slowly. If the power is strong and the instrument (artery), submissive but the 'need' (for extinction) is much greater than moderate, then even a large pulse is made quicker. And if the 'need' is still greater, the pulse, along with greatness and swiftness, attains regularity.

A pulse may be long actually for the same reasons which make a pulse large, provided there is an obstacle preventing the pulse from becoming broad and high, like the hardening of the artery which prevents increase of width and thickness of flesh and skin which prevent increase in height. Or a pulse may be long indirectly through emaciation.

Broad pulse may be due to the emptiness of the arteries causing the upper layer to fall on the lower one, thus increasing the breadth, or due to the extreme softness of the artery. The causes of *frequent pulse* are: weakness and the great 'need' owing to (excess of) heat.

The causes of an *infrequent pulse* are: strength is so great that it meets the 'need' by increasing the largeness of the pulse; cold is so severe that it reduces the 'need'; or great loss of power and approach of death.

The causes of *weak pulse* are: excessive worry; insomnia; depletion; emaciation; bad humours; excessive exercise; movement of the humours and their contact with sensitive organs or organs close to heart and all things producing dispersion.

The causes of *hard pulse* are: dryness of the arteries; great distension in the arteries; intense cold following intense struggle which leads to the tension of the organs in the direction of the expulsive power.

The causes of *soft pulse* are: causes with naturally moistening effect, as of aliments; diseases with moistening action; such as, dropsy and sleeping sickness. Causes which are neither natural nor morbid as bathing.

The irregular pulse, which retains strength, is the result of the heaviness of matter which may be food or humour. The irregular pulse with reduced strength is due to the fight between vitality and disease. Another cause of irregularity is the repletion of the arteries with blood, which is removed by venesection. A sure cause of irregularity is the viscidity of blood which smothers the moving pneuma in the arteries, especially when this congestion is in the vicinity of the heart. Yet another cause which produces irregularity in a short period is full stomach and grief or worry over anything. If there is any bad humour in the stomach, the irregularity (of the pulse) continues, sometimes leading to palpitation of the heart and a tremulous pulse results.

The causes of a serrate pulse are: the flow of putrid, immature and cocted matter (all at the same time) into the artery; varying states of the artery in hardness and softness; inflammation in the nervine organs.

The cause of *dicrotic pulse* is great vitality and pressing 'need', but as the artery is hard it does not show immediate response in expansion though the vitality attempts to expand. This is similar to the case of a person who, being unable to cut a piece of wood with a single stroke (of axe), does so with the help of a second stroke specially when the need increases all of a sudden.

Mousetail pulse is produced when the vital power is weak. Hence it gradually comes to rest after activity. The pulse which is in one fixed state indicates weakness, but the mousetail and other similar (forms of) pulse show that some vitality still exists and that weakness is not at its extreme. The worst type of mousetail pulse is the intermittent, then the continuous and then the recurrent.

Intermittent pulse occurs when the vital power is enfeebled and so it (needs) rest, or it is caused by an unexpected factor to which the attention of mind and body is diverted all of a sudden.

Spasmodic pulse occurs when the vital power behaves irregularly and the structure of the artery is defective.

Tremulous pulse is produced when the power is strong, the artery hard, and the 'need' is pressing. Tremulous pulse cannot occur without these conditions.

The pulse becomes *wavy* mostly when the power is so weak that it is unable to expand the artery quickly but it so acts gradually. Some times softness of the artery also produces a wavy pulse though the vital power is not very weak. This is because a soft and moist object does not receive an impact in each of its parts so easily as a dry and hard object, because dryness helps objects to be moved easily (readily) and to vibrate. If one end of a hard and dry object moves, the other end also moves, whereas in a moist and soft object it is possible that a part of it moves and this movement does not affect any other part. This is because such objects readily accept separation, pliability and different shapes.

Vermicular and ant-like pulse are due to extreme weakness causing sluggishness, a rapid frequency and irregularity all at once among the components of the pulse. This is because the vital force is unable to expand the artery instantly; it so acts only gradually.

Pulse with *faulty rhythm* occurs in two conditions: (a) When there is a defect in the state (of the pulse) at the time of repose, and that is owing to an increase in 'need'; (b) When there is defect in the state (of the pulse) at the time of activity, and that is owing to increased weakness or lack of 'need'. The defect at the time of activity as a result of quick expansion is a different (phenomenon). The causes of full and empty, hot and cold and high and low pulses are evident.

Section VII

Effects of age and sex on pulse

The pulse of man is larger and much stronger because their power and 'need' are both marked. And since their 'need' is fulfilled by the largeness, their pulse is mostly slower and more infrequent than that of women. If power is maintained in a pulse and it is frequent, it must be swift because swiftness 'precedes frequency'. That is why the pulse of men when it is slower, is also more infrequent.

Pulse of children: The pulse of children, because of moisture, is softer, weaker and more frequent. It is because in children heat is strong but the vital power is weak for growth has not yet become complete. In consideration of the size of their bodies, children have, however, a large pulse. This is because their arteries are very soft and their 'need' is greater and their power, in relation to the size of their bodies, is not weak, as their bodies are small in size. But their pulse is not large in comparison with that of the adults. In children the pulse is quicker and moves frequently because of the 'need'. The reason is that in children there is a greater aggregation of smoky vapours consequent of eating so often and so liberally. Therefore, there is a greater need for the elimination of the smoky vapours and for refreshing the innate heat.

Pulse of adults: In mature persons the pulse is large but not very swift, rather it is very deficient in swiftness and frequency and is inclined towards irregularity. Pulse is large during the prime of youth, and stronger in the middle of the youth. We have already explained that the innate heat is almost the same in children and youth. There is, therefore, the same need in each. But in youth vital power is greater. Hence it makes the pulse so large that it becomes a substitute for swiftness and frequency. The main factor which makes the pulse large is vital power; the 'need' gives it the direction and the artery is a contributory factor.

The pulse of the elderly persons is smaller owing to weakness and, for the same reason, as well as due to reduced 'need' it is slower. Besides, it is quite irregular.

In persons during the advanced years of life, the pulse becomes smaller, irregular and slower. Sometimes it becomes soft owing to external, but not innate, moisture.

Section VIII

Effects of temperaments on pulse

Persons of hot temperament are in greater need (of relaxation). If the power and the artery are favourable, the pulse is large. But if anyone of these (a factors) is adverse, it works in the manner already described. If the heat is not the-result of an intemperament, but is natural, the temperament is powerful and healthy and the vital power is very strong. One should not suppose that the increase of innate heat leads to a corresponding decrease in power. Actually, it strengthens the pneuma and makes the mind noble and brave. As the heat arising from intemperament goes on increasing, the power goes on decreasing. In a cold temperament the pulse shows a tendency towards deficiency, for example, it becomes smaller, slower, and irregular particularly, more marked. If the artery is soft, the pulse increases in width and becomes slower and more irregular. But if the artery is hard, contrary signs appear. The weakness produced by a cold intemperament is greater than that produced by a hot intemperament because heat is more favourable to physis. Persons of moist temperament have a wavy and wide pulse. Persons with dry temperaments have narrow and hard pulse. If the vital power is strong and the 'need' great, the pulse will become dicrotic, or spasmodic, or tremulous. Now it is your duty to proceed with the principles which you have already learnt.

Sometimes it happens that a person is found to have a different temperament on each side of the body e.g. on one side the temperament is cold and on the other hot. Hence the pulse is different on the two sides according to heat and cold respectively. The pulse on the hot side is like that of a person with hot temperament and on the cold side it resembles that of a person with cold temperament. From this we learn that the expansion and contraction of the pulse is not related to the ebb and flow of the heart but is related to the expansion and contraction of the artery itself.

Section IX

Pulse in relation to seasons

Spring: During this season the pulse is equable in all respects except that it is more forceful.

Summer: During summer the pulse is quick and frequent owing to 'need'. Since the high atmospheric heat disperses the power through the dispersal of pneuma, the pulse becomes small and weak.

Winter: During winter the pulse becomes more infrequent and slower and weak. At the same time it is also small because the power is lessened. In some people heat is confined to depth inside the body. Hence, being aggregated together it makes the power stronger. This happens when the hot temperament is dominant and able to resist the cold without being influenced by it. Thus the cold is unable to pass into the body.

Autumn: During autumn, the pulse is unequal and inclined to weakness. The inequality is as a result of sudden changes in weather, sometimes manifesting hot and sometimes cold. The cause of weakness is also the same because the temperament which varies all the time is more upsetting than an almost stable temperament even though the latter is a morbid one. Moreover, autumn is a season antagonistic to the very nature of life because in autumn heat is weak and dryness excessive. During periods in between the seasons, the pulse corresponds to the adjoining seasons.

Section X

Pulse in relation to countries

Some countries are temperate and vernal; some are hot and aestival; some are cold and winterly, some are dry and autumnal. Hence the guiding principles for the pulse in these countries are to be decided in the light of what you have learnt about the pulse in different seasons.

Section XI

Pulse determined by foods and drinks

Aliments alter the condition of the pulse according to their quality and quantity. Their action by their quality means when they have excessive heating or cooling property, they alter the pulse accordingly. Their action by their quantity means that if they are moderate in quantity, the pulse becomes larger, quicker and more frequent owing to increase in power and heat. This effect persists for a considerable length of time. If the aliment is in great quantity the pulse becomes unequal and irregular because the burden of food overwhelms the power. Overloading of every kind renders the pulse unequal.

Archigenes claimed that in such a condition the pulse is more rapid rather than regular. This change lasts for a long time as the cause also lasts for a long time. If the quantity of food is not so excessive, the pulse shows regular inequality. If the quantity is further reduced, the pulse is not so unequal, large and swift. This change does not last long because the amount of food is small and hence it is quickly digested. If the power is weakened and exhausted because of excessive or small quantity of food whichever of the two might be true—the (resulting) pulses are finally similar to each other in smallness and in being infrequent. Again, when physis is strong enough to carry on digestion and transformation, the pulse becomes equable.

Wine has one special quality in the sense that though the excess of it makes the pulse unequal, it does not produce considerable inequality or as much inequality as is caused by an equal amount of other drinks. This is because the substance of wine is rarefied, attenuated, thin and light. When the wine is served cold, like other cold things, it also makes the pulse smaller, infrequent and slower in proportion to the rapidity with which it enters the body. Once it is warmed by the body, the initial effect passes away.—When hot wine enters the body, it is not very different from innate heat and undergoes rapid dispersion. If taken cold, it causes greater injury than any other cold article of food. This is because these substances gradually become warm and do not penetrate into the body as quickly as wine does, but wine quickly penetrates into the body even when it has not been warmed. The harm of such wine is great, specially for persons who tend to suffer from cold. The heating effect of wine is not so injurious if it is taken warm. The reason is that hot wine does not cause much injury in its first contact with the body. The physis receives it when it has been distributed, broken up and dispersed. Cold wine makes the physis sluggish and extinguishes its power even before it is ready to be distributed, broken and dispersed.

The aforementioned effects of wine are in regard to its excessive quantity as well as its warm and cold conditions. But when we consider it as an energy producing substance, it has certain other rules. Wine by its nature is a tonic for healthy persons and stimulant for energy through its quick access to the pneuma. Although the heating and cooling effects of wine are injurious to most persons, each of the two effects sometimes suits a certain temperament and at times does not. Thus cold things serve as tonic for persons of hot intemperament. So Galen says that the juice of pomegranate is always a tonic for persons of hot temperament; and honey water is always tonic for those of cold temperament. Thus wine, with regard to its being hot or cold by nature, invigorates some persons and enfeebles others. But at present we are not concerned with this. Really we are concerned with its invigorating property by virtue of which it quickly changes into pneuma. From this point of view wine, by itself, is always invigorating. If the invigorating action of wine in any person is assisted or opposed by its heating or cooling property, it is enhanced or decreased in its power accordingly. Thus it alters the pulse also in the same manner. If it is strong, pulse also increases and gains in strength; if it produces heat in the body, it increases the 'need', and if it produces cold in body, it lessens the 'need'. Wine in most cases increases the energy. Moreover, it never increases the 'need' without rendering the pulse more swift. Since water is the means by which the aliment is enabled to permeate, it also gives strength and acts in the same way as wine does. But it induces cold rather than warmth, it does not increase the 'need' as much as wine does.

Section XII

Effects of sleep and wakefulness on the pulse

Rules of the pulse during sleep vary according to the stages of sleep and the state of digestion. At the beginning of sleep, the pulse is small and weak because the innate heat then shrinks and moves inwards instead of expanding and moving to the surface. It is because the innate heat directed by the 'anima' turns wholly inwards for the digestion of the food and maturation of the superfluities. The heat is, as it were, subdued and confined. The pulse also becomes very much slow and infrequent in spite of the fact that their is an increase in the innate heat according to contraction and aggregation. But (during sleep) the innate heat is deprived of that increase which exists during the waking state in proportion to the heat-producing movements. Movement stirs (the innate heat) more effectively and leads it to an intemperamental state, whereas a moderate aggregation and congestion causes less stir and produces less unrest. You may understand by it that the restlessness of a tired person is much more than the restlessness of the one whose innate heat has been confined by some cause similar to sleep. For instance, to be submerged in moderately cold water during wakefulness would divert the heat inwards and make it more powerful, but it does not increase the respiration as much as fatigue and exertion do. After a careful consideration you will realise that there is nothing more potent than movement in stimulating heat.

But it is not mere wakefulness which produces heat through physical movement in the sense that the resting of the body would bring about a cessation of heat production. In fact, wakefulness produces heat through the constant expansion and movement of pneuma towards the exterior parts from the time it is generated, that's it. When digestion is complete during sleep, the pulse regains strength because the power is increased by nutriment and also because the power is increased by nutriment and also because the innate heat which had passed to the inner parts to regulate the nutriment returns towards the surface and towards its source. For this reason, the temperament is made hotter by nutriment as we have already mentioned and also because the arteries become softer owing to the penetration of nutriment the pulse becomes large. But there is no marked increase in swiftness and frequency because it is not one of the factors which increase 'need' nor is there any other cause to prevent the pulse from attaining the largeness required.

If sleep continues the pulse again becomes weak because the innate heat is suppressed by the superfluities which are to be eliminated through different kinds of depletion only in waking state. These different kinds of depletion are: exercise; perceptible depletions; and imperceptible depletions. That's all. If the stomach is empty when the sleep began and there is nothing awaiting digestion, the temperament is changed by sleep towards cold. Hence the pulse continues to be small, slow and infrequent.

For wakefulness also there are different rules. When a sleeping person awakes in his natural way, the pulse gradually becomes large and rapid and returns to its natural state. But when someone suddenly wakes up owing to an unexpected event, the pulse stops for a while because the energy is overthrown by the accidental cause. The pulse becomes large, swift, frequent and unequal, tending to be tremulous. It is so because this movement is similar to a forced one. Hence it also stimulates heat. Moreover, a sudden and natural movement of the energy to counteract the (sudden) happening produces several different movements which make the pulse tremulous. This tremulousness does not, however, last for a long time but soon returns to normal. For, though the cause is seemingly potent, its duration is short and its disappearance is soon appehended.

Section XIII

Effects of exercise on pulse

At the start of exercise, as long as it is moderate, the pulse becomes large and strong. This is because the innate heat increases and makes the pulse strong. The pulse also becomes very quick and frequent owing to the extreme 'need' necessitated by the movement. If the exercise is continued for a longer time or it becomes very intense—even for a short time—the pulse loses the benefit of (increased) strength and becomes weak and small owing to dispersion of innate heat. But it continues to be quick and fequent for two reasons: one of them is the intensity of heat and the other is the inability of the energy to make the pulse large. Again, with further decrease in strength the swiftness goes on decreasing and frequency goes on increasing. Finally, if the exercise continues and strains (the energy), the pulse grows ant-like owing to weakness and great frequency. If the exercise is carried on to an extreme limit, till it leads to a state akin to death, it produces all those signs which are the result of failing strength. Thus it first renders the pulse vermicular and then makes it infrequent, slow, weak and small.

Section XIV

Effects of baths on pulse

Hot and cold water bath: Bathing with hot water has, in the beginning, the same effect as that of energy and 'need'. When the bath has brought about a great dispersal (of energy), the pulse becomes weak and, according to Galen, the pulse is then small, slow, and infrequent. We now say that this weakness and smallness of the pulse is one of the inevitable things. But when the temporary warmth of water produces heat in the interior of the body, it does so in two ways: (a) heat is not persisting because the natural quality of water, i.e. coldness prevails; (b) the heat may persist and adhere to (the organs).

Thus when the effect of temporary property is dominant, the pulse becomes swift and frequent and when the natural character is dominant, the pulse becomes slow and infrequent. Similarly, if the temporary heat of water causes so much dispersion of power that syncope is imminent, the pulse becomes also slow and infrequent.

Bathing with cold water affects (the pulse) in two ways: (a) If the cold reaches the interior parts, it makes the pulse weak, small, infrequent, and slow. (b) If it does not do so but aggregates the innate heat, the power increases and thus the pulse becomes somewhat large but swiftness and frequency (of pulse) are decreased.

Waters of hot springs which have desiccating quality make the pulse harder and smaller. The waters having heating quality make the pulse swifter. But if they disperse the energy, the pulse reacts according to the principles we have already mentioned.

Section XV

Pulse of pregnant women

With pregnant women the 'need' becomes intense because the foetus also shares in the inhaled air. It is as if the mother's respiration were for two 'needs' and two lives. The energy (in pregnant women) is neither necessarily increased nor greatly decreased. The slight weakness which does occur is the result of the fatigue caused by carrying (the extra) load. Hence (the pulse of pregnant women) is governed by the rules of the pulse in moderate energy and greater 'need', i.e. it becomes large, swift and frequent.

Section XVI

Effects of pains on pulse

Pain alters the pulse by its intensity, its occurrence in a vital organ, and its prolonged duration. Pain, at first, stimulates energy and thus activates it for defensive and expulsive actions. It also stirs the (innate) heat. Hence the pulse becomes large, swift and very infrequent. Largeness and swiftness serve the purpose. When owing to the aforementioned cause, pain leads to great loss of strength, the pulse begins to weaken and show opposite signs until it has lost its largeness and swiftness; but, then, the pulse first becomes very frequent, then it becomes small and afterwards vermicular and ant-like. If the pain increases further, it makes the pulse infrequent and finally leads to death.

Section XVII

Effects of swellings on pulse

Some of the swellings cause fever either because of their large size or because they affect some vital organ. Thus they alter the pulse in the whole body. By this I mean that particular change which is produced by fever, we shall explain it in its (proper) place. Some swelling do not cause fever. They directly change the specific pulse of the organs in which they occur. Sometimes, they indirectly change the pulse of the whole body not because they are swellings but because they produce pain. A swelling which causes change in the pulse so acts according to (a) its kind; (b) its phase (c) its size; (d) the organ in which it occurs and (e) resultant diseases.

The example of a swelling producing change according to its kind is the hot swelling. A hot swelling, by virtue of its kind, makes the pulse serrate, jerky, tremulous, quick, and frequent, provided there is no moistening factor to interfere, otherwise the pulse would lose its serrate character and would become wavy while remaining constantly jerky, quick, tremulous and frequent. Just as there are certain factors which prevent the pulse from becoming serrate, there are others which make it more prominently serrate. A soft swelling makes the pulse wavy, but if it is very cold, it makes the pulse slow and infrequent. A hard swelling makes the pulse more serrate. When abscess appears, the pulse ceases to be serrate and becomes wavy owing to the moistening and the subsequent softening. The pulse also becomes more unequal owing to the weight of the abscess. The swiftness and frequency of the pulse often decreases with the temporary heat settling with maturation (of the pulse).

Changes depending on the phases of a swelling (may be explained thus): As long as a hot swelling is in a developing stage, the serrate character of the pulse and all other characteristics which we have already mentioned go on increasing. Moreover, the pulse constantly goes on becoming more and more hard owing to the increased tension of the swelling, and more and more jerky owing to pain.—When the swelling reaches the climax, all the features of the pulse become more marked, except those depending on energy because it becomes weak in pulse. Hence, the frequency and swiftness of the pulse are increased.—When the swelling continues for a longer time, the swiftness vanishes and the pulse becomes ant-like. During decline, when the swelling begins to resolve or ruptures, the pulse becomes strong because the energy gets relieved from its weight. The pulse also becomes less jerky because the tensive pain is decreased.

As for changes depending on the bulk of the swelling, a large mass of a swelling makes the aforementioned characteristics more marked and greater. When the swelling is small, these characteristics are less marked and slight. Changes in accordance with the affected organs occur when the nervous organs are affected by a swelling and pulse becomes harder and more serrate. If the affected organ is vascular, the pulse becomes larger and highly unequal, especially when the arteries dominate the affected organs in the spleen and lung. The pulse remains large as long as the strength is maintained. When the swelling involves a soft and moist organ such as the brain or lungs, the pulse becomes wavy. The example of change brought about in the pulse by a swelling through some diseases is that of pleuritis which makes the pulse diphtheric, or that of hepatitis which makes the pulse lean, or of nephritis which makes the pulse like the pulse during the retention of urine, or inflammation in a highly sensitive organs like stomach and diaphragm, which make the pulse convulsive or like pulse of the syncopic patients.

Section XVIII

Psychic reactions on pulse

Anger, which stirs up the vital power and causes the pneuma to expand all at once, makes the pulse large, very high, swift, and frequent. But it does not necessarily becomes unequal because the reaction is uniform, unless it is mixed with fear, in which case anger would prevail at one time, and fear at another. Similarly if shame is combined with (anger) or there is a conflict in the mind and it strives to restrain the person from excitement and from indulging in fight with the aggressor (the pulse becomes unequal). So far as pleasure is concerned (the pneuma and vital power) are gradually diverted outwards. Hence the pulse does not become as swift and frequent as in anger. But its largeness is sufficient to meet the 'need', hence the pulse becomes slow and infrequent. Similarly in joy the pulse is similar to that in pleasure, because it generally becomes large with softness and is inclined to become somewhat slower and infrequent. In grief, the innate heat is choked and diverted inwards, the vital power is weakened, and the pulse becomes small, weak, infrequent and slow. When there is sudden fear, it makes the pulse quick, jerky, unequal, and irregular. If the fear is prolonged or it sets gradully, it alters the pulse in the same way as grief does.

Section XIX

Changes produced by the agents antagonistic to the nature of pulse

The state of pulse is changed by the following factors: (a) Intemperament; The effect of the temperaments upon the pulse has already been learnt. (b). The power is composed., Hence the pulse becomes unequal. If the compression is very severe, the pulse becomes irregular and arrhythmic. The compressing agent may be of excess of matter whether it is a swelling or not. (c) Dispersal of the vital power, whereby the pulse becomes weak, small and regular as in severe pain and those psychic reactions which are powerful in causing dispersion.

Clause II of the Lesson III of the Part II

Urine and stool

Section I

General statement on urine

Methods of forming an opinion from (various) states of urine are not reliable unless the following conditions are observed: Urine must be passed in the morning. It must not be retained (in the bladder) for too long. The specimen should be of the overnight urine. The patient be advised not to have taken any food or drink (before passing urine).

The patient is not to have taken substances which colour the urine as saffron and cassia fistula because they colour the urine yellow or red or such vegetables as make the urine green or such a thing as *murri** which turns the urine dark or such a substance as intoxicating wine which renders the colour of the urine similar to its own colour. Substances having colouring property, such as henna, shoul not be applied on the face and skin because sometimes they colour the urine. He should not have taken an agent (sustance) which expels some humour, such as the agents which expel bile and phlegm.

The patient should not have undertaken much movement and exercise or be in an unnatural state which changes the colour of the urine, e.g. fasting, insomnia, fatigue, hunger and anger, for all of them make the urine yellow or red. Coitus also makes the urine very much oily. Similarly, vomiting and evacuation also change the real colour and texture of the urine. The same thing happens if the urine is kept for some hours. That is why it is said that the urine should not be examined if it is kept for six hours. The reason is that its symptoms become weak, its colour changes, the sediment is dissolved and altered or the density increases. Personally I think that the urine should not be examined if it has been left even for an hour. The whole of the urine should be collected into a wide flask lest anything should be spilt out of it. Examination should not be carried out at once but after the urine has been allowed to settle down in the flask. Urine must not be exposed to the sun or wind, otherwise it might become hot or cold enough for the sediment to become separated and the evidence is destroyed. The sediments of the urine are not separated immediately after urination, even if it is well matured. Urine should not be collected in a flask which has not been washed after its previous use.

The urine of children provides very little indications, specially the urine of the infants because it has the effect of milk and because the colouring matter in them is unstirred and hidden. Since they are weak in their nature and they sleep much, the evidence of maturation (of their urine) is absent.

The container of urine should be transparent and pure in substance, such as clear glass and crystal. You should know that the nearer you bring the urine, the more turbid it appears, and the farther you keep it from you, the clearer it looks. In this quality, the urine differs from all the adulterated samples which are submitted to the physicians for their test. When the urine is collected in a flask, care should be taken to protect it from the effects of cold, heat, and air. Moreover, it should be examined in the light that the rays do not fall upon it, i.e. it is kept away from them. In this way an opinion is

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* A kind of liquor (or vinegar) made by steeping rice in water and letting it to be fermented.

formed about the urine from the indications observed therein. It should be known that urine gives direct information about the state of the liver, the urinary passage and the state of the (urinary vessels) and indirectly about diseases in the organs. The precise information to be obtained from urine is that concerning the states of liver, specially of its convex part. The points to be noted about the urine are of seven kinds: colour, texture, clearness or turbidity, sediment, quantity, odour, and foam. Some persons add to these points the sense of touch and taste of the urine but we reject them.

By colour we mean the various shades of colour perceived by eye, i.e. white, black, and the intermediate. By consistency we mean its state of density and thinness. By clearness and turbidity we refer to the state of the urine with respect to the ease or difficulty with which the eye traverses it. Clearness and turbidity differ from consistency in the sense that sometimes the urine is dense but clear as the white of an egg or as the solvent fish-glue or olive oil. Sometimes the urine is thin but turbid, like turbid water, because it is thinner than the white of an egg. The reason of turbidity is the admixture of particles of foreign colour, blackish or tinted with other colours which are indistinguishable. They remove the clearness, but cannot be distinguished as separate entity. Turbidity differs from the sediment in the sense that the sediment is quite distinctly visible to the eye. Similarly, it differs from colour in the sense that the colour pervades the whole substance of the liquid (i.e., urine) and is more thoroughly admixed with the urine.

Section II

Indications from colours of urine

Yellowness of urine has various shades, such as: straw-yellow; citron-yellow; raddish-yellow; orange-yellow; flame-yellow; the one resembling the colour of saffron; it is also called perfect yellow; saffron-yellow, resembling the stigmas of saffron—also called bright red.

All the varieties mentioned after citron-yellow denote heat. They vary according to their degrees owing to excessive movements, pains, hunger, and insufficient water (in the body). After the above mentioned shades (of yellow) come the red-brown; rosy; dark red; blackish; all these denote dominance of blood. Whenever the urine is inclined towards saffron colour, bile is dominant and whenever it is inclined towards dark red, blood is dominant. Flame-yellow urine, in comparison to red and blackish urine, points to greater heat, as bile in itself is hotter than blood. In acute hot diseases, the colour of urine tends to be like that of saffron and flame. If the urine is also thin, it shows a certain degree of maturation that has begun (in colour), but, it has not appeared in its consistency. If the yellow colour depends on the flame-yellow, (it shows) that the heat is greatly increased. This type of urine is also called bright-red. When, afterwards, the urine begins to clear up, it shows that the heat is decreasing. Sometimes, in hot and haemorrhagic diseases, the urine is like the blood itself without any rupture of the blood-vessel. This shows an excessive Sanguineous plethora. If the urine passes in small quantity and has foul odour, it is a sign to be dreaded because it indicates flow of blood towards the vital organs. If such urine becomes thinner and maintains its colour, state and odour, the (prognosis) is still worse. If such urine passes in large quantity, it is a good sign in acute and irregular fevers, becuase it is mostly a sign of crisis and recovery. The only exception is, if the urine becomes suddenly thin before the time of crisis. Such a phenomenon would be a sign of relapse. Similarly, the thin urine after the crisis shows a bad sign if the change to thinness has not been gradual. In jaundice, if the urine becomes deep red till it is nearly black, its stain on linen cannot be removed, and it passes in large quantity, then it is a good sign. But if the urine is white or slightly reddish, and the jaundice continues to be in the same stage, it is feared that dropsy may develop. Hunger is among the factors which render the urine high-coloured and bright.

The examples of various shades of green are: a colour approaching that of pistachios, the colour of verdigris, sky-green, emerald green, leek green, etc..

The pistachio-green urine is a sign of cold and similarly the urine of green colour also denotes cold. But verdigris-green and leek-green are exceptions, because they denote extreme combustion. Leek-green is stronger than verdigris-green. If verdigris-green colour appears after toil, it denotes convulsion. In children, too, the green urine is a sign of convulsion. Sky-green urine denotes, in most cases, extreme cold; and in this respect, green urine comes first. According to some it shows that poison has been taken as drink and that if sediment is present there is a hope of life, otherwise the patient is likely to die. Verdigris green colour of urine is indicative of great danger.

The shades of black urine are: dark urine approaching blackness after it has been of saffron colour. For example, in jaundice, which denotes denseness and burning of the bile or rather black bile resulting from yellow bile, and also jaundice. Blackness resulting from pitch-black bile denoting sanguineous atrabile. Black urine which results from green and blue urine, denoting pure atrabile. Generally black urine denotes: (a) excessive combustion; (b) intense cold; (c) extinction of the innate heat and its disappearance; (d) crisis; (e) expulsion of atrabilious superfluities by the physis.

The urine which becomes black owing to the combustion (of matter) is recognized by the following facts: There is great combustion (in the body): Previous history of yellow and red urine; the sediment of the urine is dispersed and not uniform, and not aggregated and compact and urine is not very black. It tends to be saffron-yellow, yellow or blackish. If it has much of yellowness, it denotes jaundice. (Similarly) black urine as the result of cold is recognised (by the following things): The urine previously tended to be green and dusky; the sediment is scanty and compact and looks dry; the urine is of pure dark colour etc..

Urine also differs in hot and cold temperaments. Thus a dark urine with strong smell shows that the temperament is hot. But, if it is odourless or has weak smell, it shows that the temperament is cold. This is because, when the physis is greatly enfeebled, the urine has no smell. Black urine indicates the extinction of innate heat which is caused by a fall and dispersion of innate vitality.

The darkness of urine (sometimes) results owing to crisis and evacuation (of black matter) as happens during the last stage of quartan fever during the dissolution of splenic diseases on relief from pain of back and uterus and at the end of atrabilious fever and also nocturnal and diurnal fevers. Urine becomes dark in diseases caused by amenorrhoea and obstruction of blood from piles specially when diuresis is brought about by physis or by artificial means. Similarly, this happens in women whose menses are obstructed because physis does not accept the waste matter of blood. The urine, before it becomes dark, is watery and not maturated; makes the body feel lighter after it passes in large quantity. If the case is not so, the black urine is a bad sign, specially in acute diseases, particularly it so happens if at the same time the quantity of urine is small because scanty urine is the evidence that combustion has destroyed the fluids. The greater the thickness of such urine, the worse it is, and the thinner it is, the lesser is its evil effect.

Sometimes black or dark red urine passes out after drinking wine of the same colour. The physis does not act upon it at all, so it passes out as it was. In such cases there is no danger. Sometimes black urine during acute diseases also denotes healthy crisis. If the urine of a patient is thin and dregs is suspended in it at different layers, this mostly denotes headache, insomnia, deafness, and mental confusion. Particularly, if the urine is secreted only in drops and for a long time and has a pungent odour and the patient has fever, all this would be a strong evidence of headache and mental confusion. But when there is insomnia, deafness, mental confusion and headache, such urine shows that epistaxis is about to occur. Dark urine may also be an evidence of stone in the kidney. According to Rufus, in the diseases of kidney and in diseases caused by thick humours, dark urine is generally a good (sign). But it is a grave sign in acute diseases. We say that black urine is a bad sign in diseases of the kidney and bladder when at the same time there is excessive burning. Hence one must take all such signs into consideration. In old men, dark urine is not a good sign because, as it is known, it occurs only after a serious disturbance. Similar is the case with (old) women. Black urine after toil is a sign of convulsion. In brief, black urine is fatal in the beginning of fevers as well as at their close, if there is no abatement of the symptoms and there are no sign of crisis.

White urine has two meanings: (a) It is thin and transparent, as people sometimes call a transparent thing 'white'. For instance, they describe clear glass, or clear crystal, as being white. (b) It is really white. Such a urine has a colour which the eyesight can (easily) distinguish, such as that of milk and paper. Urine of this kind is not transparent so that the sight might penetrate into it, because transparency really means the absence of all colours.

Thus white urine in the sense of transparent denotes coldness (of temperament) and defective maturation. If the urine is at the same time thick, it shows the presence of phlegm. A urine which is really white is always thick. The varieties of (white urine) are: the whiteness of urine is mucilaginous, it shows excess of phlegm and crude phlegm. Whiteness of urine is fat-like. This shows liquefaction of fat. Whiteness of urine is waxy. It shows phlegm and actual or latent dissolution of fat. whiteness of urine is champagne-like. The urine is thin and contains pus and shows septic ulceration of the urinary passages. When there is no pus, it means the dominance and excess of crude, non-matured matter and sometimes it is owing to stone in the bladder. Whiteness of urine is semen-like. Such urine passes during crisis of phlegmatic swellings, looseness of viscera and crisis of the diseases arising from vitreous phlegm. If the urine is semen-like and is not owing to crisis or phlegmatic swellings but appears in the early stage, it forewarns of apoplexy and paralysis. If urine remains white throughout the fever, it is likely to change into quartan type. Lead-white urine without sediment is very bad.

Milky urine, too, during acute disease is a fatal (sign). During acute fevers whiteness of urine, howsoever it might be after the disappearance of colour, shows that bile has drifted towards an organ which is about to develop a swelling or it has descended towards the bowels. But mostly such urine shows that bile has drifted towards the region of the head. Similarly, if urine, during the fever, is thin at first but later on it suddenly becomes white, mental disturbance is likely to develop. If during healthy state urine is persistently white, it denotes absence of maturation. Wax-like urine resembling olive oil forewarns of death or phthisis.

It should be known that sometimes urine is white though the temperament is hot and bilious, and sometimes it is red though the temperament is cold and phlegmatic. It is because when bile is deviated from the urinary passage, it is not admixed with urine. Hence it remains white. It is, therefore, necessary to study white urine. If its colour is radiant and the sediment is plentiful and thick, and at the same time its consistency is inclined to be thick, it should be known that the whiteness (of urine) is the result of cold and phlegm. If the colour is not radiant, and the sediment is not plentiful but is concentrated, and the whiteness is not inclined to be dusky, it should be known that it is because of the concealment of bile. When during some acute disease the urine is white and there are such signs of soundness as negate fear of cerebritis and the like, it should be known that the pungent matter has been diverted towards some other passage and intestines which get abraded.

The urine turns red during cold diseases for one of the following reasons: There is severe pain which disperses the bile, as happens in cold colic. There is some embolus which appears in the duct between gall bladder and intestines owing to the dominance of phlegm. Hence the bile does not fall into the intestines in a natural and customary way, but is compelled to accompany urine and pass out with it as happens in cold colic.

The liver is weak and its power is insufficient to separate water from blood, as happens in cold dropsy. In diseases of weakness of liver urine mostly comes to look like the washings of fresh meat. There is accumulation of matter which leads to obstructions and thus changes the colour of phlegm in the veins owing to the subsequent putrefaction. The sign of this change is that the wateriness of the urine and its sediment are of the kind already mentioned. Again, it is faint in colour and not radiant, whereas bilious urine is radiant. Urine is often white in the early stage. Then it becomes dark and offensive in smell as in jaundice.

Urine becomes white after a meal and remains so till the digestive power begins to function and then it begins to assume colour. It is for this reason that the urine of the persons suffering from insomnia becomes white and it is also because of the dispersion of the innate heat. But it is not radiant. It tends to be turbid owing to the absence of maturation. In acute diseases urine of red colour is better than a watery urine. Urine which is white owing to its consistency is also better than a watery urine. The urine which is red because of blood is better than the urine which is red owing to bile and the redness owing to bile is not so dangerous if the bile is quiescent as it is when the bile is stirred up. Red urine is a bad sign in kidney diseases because it mostly denotes a hot swelling. Red urine in diseases associated with headache portends mental confusion. If in acute diseases urine is red in the early stage and continues to remain so without showing any sediment, there is fear of death and it shows the swelling of the kidneys. If urine is turbid besides being red and remains so, it shows a swelling in the liver and also the weakness of innate heat. Among the colours of urine some are compound.

Urine like fresh-meat washings

One of the colours of urine is that which is like fresh-meat washings or like blood-stained water. Such urine results sometimes from the weakness of liver and sometimes from the excess of blood. But in most cases the cause is the weakness of the liver owing to the dominance of any form of intemperament. Such a state is denoted by the weakness of digestion and dispersion of vitality. If the power is strong, this type of urine results only from the excess of blood and the excess is to such an extent that the discriminating power is unable to distinguish it fully.

Urine having the colour of olive oil

One of the compound colours is that which is like olive-oil. It is yellowish tinged with the colours of the beet leaf. Such urine resembles the colour of olive oil because it is viscid and transparent with oily sheen; its consistency is thin tending to slight thickness. Such urine, in most cases, indicates evil effect and does not denote a good sign of maturation or improvement. In rare cases it indicates the depletion of the sanguineous fatty matter by way of crisis. This occurs necessarily after recovery. Such urine is that which is fetid besides being oily and particularly when it passes drop by drop. It is still worse if it is admixed with a thing like fresh-meat washings. Such urine mostly appears in dropsy, consumption and bad colic. When this type of urine passes after it had previously been black it is then a sign of improvement. If olive coloured urine appears on the fourth day, I mean during acute diseases, it forewarns in most cases that the patient will die on the seventh day.

In brief, oily urine is of three kinds: urine is fatty throughout; only lower part is fatty; only upper part is fatty.

Sometimes urine is oily only in colour as in consumption specially during its early stage. Sometimes it may be oily in consistency only or it may be so both in colour and consistency as in diseases of kidneys and at the climax and termination of consumption. Then comes purple as one of the compound colours. This type of urine is bad and fatal because it shows the combustion of the yellow and the black biles. Sometimes urine is red with which a tinge of blackness is admixed. Such urine is a sign of compound fevers and of fevers arising from thick humours. If the colour becomes clear and the blackness is seen only in the top layers of the urine, it is a sign of pleurisy.

Section III

Indications from consistency of urine and its states

The consistency of urine may be thin or thick or medium. *Thin Urine:* Very thin urine always shows that maturation is incomplete. Sometimes it is a sign of embolus in the vessels or of weakness of kidneys and the tracts of urine. Some of these (organs) attract only thin matter, or if they attract other matter, they fail to discharge it except that portion which is thin and capable of excretion. It also shows excessive intake of water or a very cold temperament with some dryness. In acute diseases, such urine is a sign of weak digestive power and absence of maturation. Sometimes such urine shows that all the powers are so weak that they cannot influence water at all and hence it passes from the body in the same state in which enters. Thin urine of this type is worse in children than it is in adults. It is because natural urine of children is thicker than the urine of adults, as the children are more moist owing to the greater requirement of matter for their growth, their bodies attract moistures more readily.

Thus if their urine becomes very thin in acute fevers, it shows that they have greatly departed from their natural condition. If thin urine persists in them, it is a grave sign. In fact, if thin urine persists, it forewarns of death unless it is accompanied by favourable signs and stable vitality and in such case thin urine shows that an abscess is forming, specially below the region of the liver. Similarly, if this type of urine persists in healthy persons without any variation, it shows that some swelling is being formed in the region in which they feel pain. Mostly it so happens that, in addition to this pain, they experience pain in loin and kidneys also and indicates that they are ready to develop a swelling. If the pain and heaviness are not localised but are general, it is a sign of pustules, smallpox and swellings all over the body. If during crisis urine suddenly becomes thin it forewarns of a relapse.

If the urine is very thick, in most cases it is a sign of absence of maturation and, in rare cases, it shows maturation of humours of thick consistency as occurs at the height of humoral fevers or it shows rupture of abscesses. Thick urine during acute diseases is often a bad sign, but persistence of thin urine is still worse. It is because thick urine is a sign of digestion which adds to the consistency of urine. Since thick urine denotes digestion and shows that the faculties are capable of expelling (the superfluity), improvement might be expected. Thick urine is also a bad sign because it shows the corruption and excess of matter and that the matter has not been so much maturated that it is separated as sediment. To ascertain which of the two things is dominant one should notice whether comfort or increased weakness follows.

Thick urine during fevers which passes suddenly and in large quantity is a good sign. But if it passes in small quantities, it shows excess of humours and weakness of power. Thick urine, which is followed by a urine of moderate consistency associated with comfort and is a favourable one. When thin urine becomes thick during acute diseases and there is no improvement (in the condition of the patient), it denotes wasting away. If thick urine persists in a healthy person and he feels pain in the region of head and complains of stretching of limbs, it forewarns of fever. Sometimes urine may be thick owing to the evacuation of superfluity or rupture of swellings or ulcers in the regions of urinary passages. Thin as well as thick urine points to the lack of maturation since maturation is followed by moderate consistency, the maturation of thick matter is in the state of becoming thin after digestion, and the maturation of thin matter is in the process of becoming dense.

As we have already said, thick urine is sometimes clear and transparent and sometimes it is turbid. The difference between thick transparent urine and thin urine is that when thick transparent urine is shaken it does not break up into little waves, but there are larger waves with slow movement, and if it produces foam, the foam is composed of big bubbles which do not coalesce for a long time. This type of thick and transparent urine originates from phlegm which has undergone good digestion or from vitelline bile provided the urine has a tint of yellowness. But if there is no yellowness, it denotes that vitreous phlegm has been dissolved in the urine. This is often found in the urine of the epileptics. It sould be known that a well-coloured thin urine owes its colour not to maturation for otherwise maturation would have first created consistency in it, but it is so because of the admixture with bile. It is because the first function of maturation is to produce consistency and then colour. Maturation in consistency is better than maturation in colour. Hence during the course of an acute disease the persistence of thin and yellow urine is a bad sign and shows weakness of digestive power. If you see different particles of red and yellow colour in a thin urine, it is a sign of severe fatigue. If husk-like objects appear in a thin urine without any disease of the bladder, it is owing to the burning of phlegm. In brief, thick urine in acute diseases indicates excess of humours and sometimes denotes a wasting away. If such urine is left for a while it becomes thicker and denser.

In short, turbidity of urine results from earthiness and gas which is admixed with wateriness. When all these are admixed, turbidity is the result. When these are separated from one another, the urine becomes clear. Then the following three states should be observed: If the urine is clear at the time of passing, and then becomes thick, it indicates that the physis is preparing to mature (the matter) but the matter has not yet fully succumbed to it though it has been influenced by it. Sometimes this state denotes wasting away of the organs.

The urine is thick when passed, then it becomes clear and the thick part of it is separated and settles down. This shows that the physis has already overcome the matter and matured it. The clearer it grows, the greater the amount of sediment, and the more rapidly the sadiment subsides the more complete is the maturation. A state between the first and the last is found in the following conditions: If that state persists and the physis is strong, and vitality is intact, it should be expected that maturation will soon reach completion. But, if the vitality is not intact, there is a fear of death before the maturation of urine. Should this condition prolong without appearing the feared symptoms headache is likely to follow because it shows the agitation (of matter) and the presence of vapours. The thin urine which turns dense and stays in the same state is often better than the one which mostly remains dense. Urine often becomes thick and turbid owing to the loss of vitality and not because of the explusive function of the physis.

The urine which is watery when it passes and remains so (afterwards) indicates that there is no maturation at all. Thick urine which is good is that which passes easily and in larger quantities. This kind of urine is a sign of recovery from paralysis and the like conditions. Urine which has previously been thick and then it becomes gradually thin and passes in large quantity, is a good sign. A turbid urine which is first thick and scanty, but later on becomes thick, turbid and plentiful and is an indication of improvement. This happens when in the beginning thick and turbid urine passes in small quantities, then suddenly a large quantity of urine passes out easily. Thus such urine provides recovery from diseases whether the disease is an acute fever or any other plethoric disorder or only a repletion which has not yet taken the shape of an apparent disease. This type of urine is very rare.

When the urine of normal colour becomes extremely thick, it sometimes shows that physis is trying to eliminate matter in considerable quantity and is helping it to flow out easily. Sometimes it heralds death because it denotes excess of humours and weakness of power. The sign of such urine is that it passes with difficulty and in small quantity. Thick and good urine which passes at the crisis of splenic diseases and in mixed fevers, should not be expected to be uniform, because the physis carries on its act of expulsion. In short agitated urine denotes that the humours are abundant in spite of the fact that the physis is engaged with them and with their maturation. Thick urine which has an oily sediment indicates stone.

Thick urine denoting rupture of swellings may be recognised by the admixed material and the previous history. The admixed material may be pus the existence of which is inferred by a fetid odour, or flakes which pass out with the urine like white or red flakes or like pus etc. which will be described later. The previous narration means if prior to that urine there had been a sign of a swelling or ulcer in the bladder or kidneys, or liver or in the region of chest, it indicates rupture of swelling. If the urine prior to that were like the washings of fresh meat, it is from the convex part of liver. If the stools are also of the same colour, the swelling is likely to be on the concave side of the liver. If prior to this there were dyspnoea, dry cough, and stabbing pain in the organs of the chest, it shows that there was a pleurisy and rupture and the matter is being expelled through the region of a large blood vessel. If the pus which (is passing out with urine) is mature, it is a good sign.

Sometimes a healthy person who leads a leisurely life and takes no exercise passes urine resembling pus and ichor. Thus his body is purified and his laxity resulting from the absence of exercise is removed. When there are emboli in the liver or in the adjoining parts, the thickness of urine results from the opening of these emboli and the expulsion of their matter. This thickness is not due to pus: the thickness which follows a rupture produces pus. If this thick urine is tending to be black and there is also pain in the left side, it is from the region of spleen. Similarly, if the pain is above the umbilicus and in the upper part of the abdomen, it means that it is coming from the region of stomach. Generally this type of urine results from liver and the urinary passages.

Turbid urine often denotes loss of vitality. When vitality is lost, coldness dominates and hence it is like the extraneous coldness. Turbid urine resembling the colour of turbid wine or chick-pea water is found in pregnant women and in persons suffering from chronic hot swellings of viscera. Urine which looks like the urine of donkeys and other cattle and which owing to great frothiness seems to have been frequently shaken, denotes corruption of the humours of the body. But mostly it shows that some heat has acted upon the crude phlegm and thus has produced thick gases. For this reason, such urine sometimes denotes that headache is likely to develop or it is already present. If such urine persists, it forewarns of lethargus. If the urine is of the colour of some organ (of the body) and perists to be so, it is a sign of some disease in that organ. According to some physicans, if in the lower parts of urine there is something like cloud or smoke, it shows that the illness will be prolonged: if this condition persists throughout the whole of illness, it presages death. Immature phelgm is distinguished from pus by offensive smell. When the urine has large-sized sediments, it denotes that physis has greatly acted upon, it is quite powerful, and that the pores are fully open. If something like entagled threads is seen in a urine, it denotes that it passed immediately after coitus.

Section IV

Indications from the odour of urine

According to physicians the urine of sick persons never has the same odour as the urine of the healthy persons. We say that if the urine has no odour at all, it shows a cold temperament or excessive rawness. In acute diseases, it is sometimes a sign of the extinction of innate heat. A foul-smelling urine with signs of maturation indicates scabies and ulcers in the urinary organs, and they are inferred by their signs. If the urine has no sings of maturation, the foul odour is likely to be from lack of maturation or it may be owing to putrefaction. Such a urine in acute fevers, without any cause of the urinary organs, is a bad sign. If this type of urine tends to be sour, this is a sign of putrefaction of cold humours which are dominated by extraneous heat, if the disease is acute, such urine forewarns of death because it denotes extinction of the innate heat and predominance of cold in physis with extrinsic heat. Sweetish odour of a urine points to dominance of blood. Urine of foul smell shows dominance of (yellow) bile and if it tends to be sour also, it denotes dominance of black bile.

When foul smelling urine persists in (apparently) healthy persons, it denotes fevers which arise from putrefaction or shows the expulsion of putrescent matters which were retained in them. The latter is evinced by a sense of recovery. If in an acute illness foul-smelling urine suddenly becomes odourless but there is no improvement, it is a sign of failure of vitality and dominance of weakness.

Section V

Indications from froth

Froth arises from moisture and the gas to be forced into the flask with the voidance of urine. The gas which comes out with the urine and is mixed with it undoubtedly assists the formation of froth. This is particularly so when the gas is predominant in the body, as occurs in the urine of persons suffering from distension owing to numerous bubbles. Sometimes inference is drawn from the colour of the froth as the black or orange coloured froth denotes jaundice. Sometimes inference is drawn from the bubbles being large or small. Large bubbles denote viscidity. Inference is drawn also from scarcity and abundance of bubbles. Their abundance denotes viscidity and excess of gas. The fact that the bubbles burst slowly or rapidly also provides information. Thus, if the bursting is slow, it denotes viscidity. If in kidney diseases the bubbles persist, it shows that the illness will be of long duration because they denote gas and viscidity. In short, viscous humour during kidney diseases is a bad sign and denotes corrupted humours or cold temperament.

Section VI

Indications from varieties of sediments

In the very outset we have to say that the physicians's terminology for sediments and residues is different from the common use. It is because they use sediments and residues not only for the things which sink down but also for the substance which is thicker in consistency than water and also distinguished from it, regardless of whether it is suspended or floating. Hence we may say that the sediment provides information in the following ways: by its substance, its quantity, its quality, its structure, its position, its time and the nature of its admixture.

Sediment providing information may be natural and benevolent, and such sediment denotes natural digestion and maturation. It is white, settles down and its particles are in continuity, homogeneous and regular. Benevolent sediment must be round in shape, smooth, regular, light and like the sediment of rose water. Just as white and smooth pus with uniform consistancy denotes maturation of swellings. A benevolent and natural sediment indicates maturation of matter in the body as a whole. But pus, however, is heavy while benevolent sediment is light. The presence of sediments and residues (in urine) is a good sign even if it has no colour. According to the ancient physicians uniform consistency of urine is a better index of maturation. The uniform sediment which is not so white but is reddish in tint is undoubtedly better than a white and rough sediment. Mostly a sediment has the same colour as that of the urine. The best among the colours other than the white is red, next to it is yellow and then the colour which is like that of yellow arsenic. Harm begins with the lentil-like sediment. One need not pay any attention to what others say. White urine does not result from maturation and uniformity is not possible without maturation. Thus sometimes whiteness results from the excessive admixture of gases.

When the sediment is bad and unhealthy, its discontinuity is better than its uniformity. You will soon learn about the sediment which is bad. But the good sediment which we are talking about resembles thin pus and thin crude phlegm. Pus is differentiated by its foul odour and phlegm by the compactness of its particles. The good sediment differs from both in being rarefied and light. One should not expect to find such sediment in a person who is healthy. It is found in a sick person because it is beyond doubt that corrupt matter is retained in his body and in his blood-vessels. If this matter is not maturated it produces evil effect. This is not the case with a healthy person because his blood-vessel does not necessarily contain a humour which ought to be removed. But such a sediment in healthy person is a sign of superfluity which is cuased by the defective digestion of food and which has settled in the urine, mature or immature.

In lean and thin persons who are healthy and especially those who take regular exercise or have some strenuous occupation, sediment is scanty. It is plentiful in corpulent and leisure-loving person. Similarly, in the urine of lean and thin patients one should not expect so much of sediment as is expected in the urine of fat patients. It is because often the disease of the thin patients is over and even then there is no sediment in their urine, for their urine does not contain enough sediment to settle down. But there is only a small sediment which either floats about (in the urine) or is suspended. It is not true, when it is said, that the sediment appears in all urine except the mature urine. It requires a little patience to (observe this). The sediments mostly bear the same colours as that of urine and the colour which may well replace white is red rather than yellow.

Abnormal sediments are of the following kinds: flaky (under which come) furfuraceous; tare-like; gritty; resembling arsenic which is red and deep yellow (in colour); fleshy; fatty; purulent; mucoid; resembling pieces of yeast infused in water; like blood-clots; hairlike; sandy; ashy, etc.

Flaky sediment is composed of large red or large white particles. These particles indicate that they come from the organs which are close to urinary organs. Thus the white particles denote that they come from the bladder owing to ulcers or scabies out of erosions in it. If they are red like flesh, they suggest that they come from kidneys. Sometimes a flaky sediment is blue or blackish or like the scales of fish, this kind of sediment is very bad or rather worse than all the varieties of sediments we are going to mention. This kind of sediment suggests the shedding of the linings of principal organs. The first two varieties generally are not harmful at all. On the contrary, some times they cleanse the bladder. Some physicians have reported that a patient took cantharides and then passed urine of white flakes resembling the membrane within eggs. When these flakes were shaken, they were dissolved and gave reddish tint. (After such urine) the patient recovered and became healthy. Among the flaky sediment there is one which is less wide than the aforementioned two varieties, but is denser in consistancy. If it is red it is called tare-like and if it is not red, it is called furfuraceous. If tare-like sediments are red, they are the dead particles of liver; sometimes they are burnt blood and sometimes they emanate from the kidneys. When they come from kidney, they are mostly homogeneous to flesh, whereas in the other two cases they resemble the non-fleshy things and are frittered easily. If these sediments tend extremely to be yellow, they decidedly come from the kidneys as they having emanated from the liver tend to be black. But sometimes the sediment from liver is coufused with that from the kidneys.

Furfuraceous sediment results from the desquamation of the bladder and sometimes from emaciation of the organs. The difference between the two is recognised thus: if there is itching at the root of the penis and urine is also fetid, the sediments come from the bladder, particularly if pus passes with urine prior to the sediment and there are other evidences of maturation in urine as well, it indicates that the veins over the bladder are healthy in temperament and that there is no change and that (the sediments come) from the bladder. If this (kind of sediment) is due to burning, decline in energy, and the healthy state of the urinary organs and its colour tends to be black, it is owing to the weakness of the humours.

Flour-like and gritty sediments mostly result from the burning of blood provided they are reddish. If they tend to be white they mostly result from the colliquation and scraping of the organs. In a few cases they are the result of desquamation of the bladder. It is possible for you to know the cause of difference between the two in the light of what you have already learnt. If the sediment tends to be black, it is owing to the burning of blood, especially in the diseases of the spleen. All the flaky sediments which do not occur owing to any cause in bladder or kidneys or urinary tracts are bad and fatal if they appear during acute diseases. From all these you have a knowledge of the fleshy sediments also and you know when fleshy sediments mostly arise from the kidneys and when they do not come from the kidneys. Fleshy sediments will be considered as arising from the kidneys only when the flesh is healthy and there is no emaciation of the body. Maturated urine shows that the veins are healthy because the diseases of kidneys do not hinder the maturation of urine. Maturation takes place above the kidneys. A fatty sediment indicates dissolution of solid and liquid fat as well as flesh, more so when it resembles gold water. The source of sediment is inferred from the fact whether the sediment is abundant or scanty and whether it is admixed or discrete. If it is abundant and discrete, it should be known that it arises from the region of kidneys owing to the liquefaction of their fat, but if it is scanty and well mixed up (with the urine), it emanates from some remote (part of the body). If you see a white particle like a pomegranate seed in urine, it should be considered to be emanated from the fat of the kidneys. *Purulent sediment* shows that pus is being discharged from some open ulcer, especially in the urinary organs. The sediment is more significant (in this respect) if it is also benevolent and sinks down.

The mucoid sediment shows that either there is an excess of a thick and crude humour in the body or it is being eliminated by the urinary organs or it is the crisis of sciatica and rheumatism and this case is inferred by the relief that follows. Sometimes such sediments become rarefied and thin and so they are considered to be benevolent sediments. Hence, during such diseases a physicians must not be deceived when he sees the appearance of benevolent sediment before the time of maturation or before its signs are evident. The mucoid sediment sometimes denotes excess of cold in the temperament of the kidneys.

The difference between the purulent sediment and crude sediment is that the former is fetid and is preceded by the evidences of swelling: its particles easily aggregate and get separated again; it is thoroughly mixed up with urine, it may also separate itself (from the water). A crude sediment is turbid and thick. It does not readily aggregate nor disperse easily. If a large quantity of urine containing abundant mucoid sediment passes at the final stage of gout and rheumatism it is a good sign. Hair-like sediment is caused by the coagulation of any moisture of elongated shape owing to heat which acts upon it. It is sometimes white, sometimes red. It clots in the kidneys. It is said that this sediment is sometimes as long as several hand-spans. A sediment resembling the pieces of yeast soaked in water denotes weakness of stomach and intestines and disturbs digestion in them. Sometimes the cause of such sediment is the use of milk and cheese.

Sandy sediment always denotes that there is a stone in the process of formation or has actually been formed, or is in the process of dispersion. If the sediment is red, it comes from the kidneys and if not, it comes from the bladder. Ashy sediment shows that phlegm or pus has altered its colour and its particles are broken up by long stagnation. Sometimes it is due to its burning.

Clotty sediment, if it is well mixed with the urine, denotes weakness of the liver, if not, it denotes ulceration of the urinary tract and loss of continuity in it. If the clotty sediment is discrete, it shows in most cases that it comes from the bladder and penis. We shall discuss this thoroughly while dealing with the particular diseases under the heading "haematuria". If red blood clots begin to pass in urine and the patient is suffering from some splenic disease, the spleen will decrease in size. Remember, that in diseases of bladder, there is not much bleeding because the blood vessels are very few in number and are narrow and deeply situated in its wall.

Inference can be drawn from the quantity of the sediment whose abundance or scantiness denotes the abundance or scantiness of the agent acting upon it. Quantitative characteristics have already been discussed under 'Flaky sediment'. The quality of the sediment can be judged by its colour. A dark-coloured sediment is worse than the varieties we have already mentioned. However, when only the sediment is black but not the urine, it is not so bad. Red sediment shows (dominance of) blood and impaired digestion. Yellow sediment denotes great heat and gravity of illness. White sediment has some types which are good as we have already mentioned and some are bad, as mucoid, purulent and glutinous all of which denote faulty maturation. Green sediment shows a transition to black sediment. As far as odour is concerned, it has already been discussed.

The composition of the sediment is either smooth or irregular. Thus in a benign sediment, smoothness and uniformity are healthy signs, but bad if the sediment is not benign. Irregularity of sediment denotes gases and weak digestion.

Position of the sediment:

The sediment may be floating when it is called cloudy or is suspended in the middle. The second kind is more maturated than the first of the suspended sediments, the one which is suspended with its fibres and fringes directed downwards is the best. If it sinks to the bottom it is a sign of still more advanced maturation. All this is found in the benign sediment, but in the case of the malevolent sediment it is more satisfactory when it is light as the black sediment, and this too holds good during acute fevers. Similarly, when the humour is phlegmatic or atrabilious, it is more satisfactory when the sediment is suspended like a cloud than when it sinks to the bottom. For it denotes lightness of the sediment, except when the cause of its floating is excessive gas. But when this is not the cause, the floating sediment is the best. The next which is best is the sediment which is suspended and the worst is that which sinks to the bottom. A sediment floats upon the surface because of excessive heat or excessive gases. A discrete sediment floats on thick urine, particularly when it is light. It sinks in the urine particularly when it is heavy. If in the early stage of a disease a floating or suspended sediment appears and then persists, it shows that crisis will come with an abscess. But in the case of slender and weak patients the illness disappears with the discharge of benign sediment—whether floating or suspended as we have mentioned earlier.

If a fatty sediment—be it floating or suspended—appears like a cobweb or pancake, it is a bad sign. Often a bad sediment appears floating (in the urine). Hence it causes anxiety, but it is actually the beginning of maturation, and it changes into good sediment. Then it is suspended and (ultimately) it sinks to the bottom. In that case it is not a bad sign. But when it is followed by bad sediments, it confirms the original fear of its being ominous.

Time required in sedimentation:

If the sedimentation after the voidance of urine is rapid, it is a good sign of maturation. But when it is slow or there is no sedimentation, it shows absence of maturation based on the state of the sediment. The indication from the state of admixture is such as we have already discussed while dealing with blood and fat in the urine.

Section VII

Indications of polyuria and oliguria

Scanty urine denotes weakness of vitality. If the urine is less in proportion to the fluid consumed, it is a pointer to great dispersion or diarrhoea or to a tendency to dropsy. Polyuria denotes emaciation and depletion of superfluous fluids from the body. The difference between the two is made by (noting) the condition of vitality. The greater is the discharge of urine of bad colour, the more favourable it is. If its flow stops, the harm will be greater in case of black and thick urine. If the urine is discharged in varying quantities, being abundant at one time and scanty at another being sometimes obstructed, it shows there is a severe struggle (of the disease) against the physis and it is a bad sign. If in acute diseases polyuria does not lead to recovery, it shows phthisis or convulsion owing to burning. The same rule holds good in case of sweating. Urine passed involuntarily; drop by drop in acute diseases, denotes cerebral disease affecting even nerves and muscles. If (in such cases) fever subsides and there are signs of recovery, it forewarns of epistaxis. Otherwise it is a sign of mental confusion or some other disturbance.

If in case of a healthy person, urine becomes thin and scanty and this condition persists, and the person feels heaviness and pain in the loins, this shows a hard swelling in the region of kidneys. When urine increases in a case of colic, it is a good indication that the physis is fully attentive, especially when urine is white and easily voided.

Section VIII

Mature and normal urine

A healthy urine is of moderate consistency and a light tint, tending towards orange colour. If there is sediment, in spite of the aforementioned properties (of the urine), it is benign, white, light, smooth, regular and has a round shape. It has a moderate odour, neither offensive, nor altogether still. If this type of urine is discharged suddenly at the height of an illness, it is an indication that the disease would disappear the next day.

Section IX

Variation in urine according to age

The urine of the infants tends to assume the colour of milk owing to their food and their moist temperament and is mostly inclined to be white . The urine of the children is thicker and denser than the urine of adolescents, and also more frothy as we have already mentioned. The urine of the adolescents tends to have yellowish tint of the fire and is of moderate consistency. Urine of the middle-aged inclines towards whiteness and thickness, but sometimes becomes thick owing to the excessive depletion of superfluities from their bodies. The urine of the old is very thin and white and the aforementioned thickness is very rare in their urine. But when their urine becomes very thick it is liable to develop calculus.

Section X

Variations in the urine according to sex

Urine of women is always thicker, whiter and less pellucid than the urine of men. This is because in women there is excess of superfluities, their digestion is weak, and the urinary tracts are wide. Moreover, something emanating from their womb is discharged towards their urinary organs. When the urine of men is shaken, it becomes turbid and the turbidity moves to the surface. The urine of men is generally turbid. And when the urine of women is shaken, it does not become turbid because the turbid particles are scarcely discrete and there is generally a circular foam on the top. Even if such urine becomes turbid it does so to a little extent only. The urine of men, if passed just after coitus, shows the presence of inter-twined threads. The urine of the pregnant women is clear and has a haziness on the top. Occasionally in pregnancy the urine has the colour of chickpea water or that of trotters water which is yellow with a bluish tint. On the top of the urine there is mistiness. Howsoever the urine might be, there is a sort of carded cotton in the midst of it. Frequently there is something like granules moving up and down. If the bluish tint is quite distinct it is a sign of the beginning of conception. When it gives place to redness, the pregnancy is to an advanced stage, especially if the urine becomes turbid on being shaken. During puerperium urine becomes generally black like soot or black ink.

Section XI

Difference between animal and human urine

When the urine of some animal is presented to the physician to test his knowledge, it may serve him good, if he is successful in identifying it. But this is very difficult. It is said that in the urine flask a donkey's urine looks like melted fat and appears to be turbid and thick from outside. Mule's urine resembles that of the donkey but the mule's urine is clearer than the donkey's and it seems that the upper half of the urine flask is clear while the lower half of it is turbid. Sheep's urine is white with a yellowish tendency approximating the urine of men; but it has a different consistency. Its sediment is like oil or like oil-lees. The better is the quality of food, the clearer is the urine. Deer's urine resembles the sheep's urine as well as the human urine but it differs in consistency and sediment and is clearer than the sheep's urine. Horse's urine is similar to human urine.

Section XII

Differences between urine and fluids resembling it

Oxymel and all fluids such as honey-water or water of straw and saffron and the like, appear clearer as they are brought nearer to the eye. Urine behaves in the opposite manner. Honey water has a yellow foam. The sediment of straw water lodges on the sides (of the glass) and not in the middle. It is neither quite stable nor it has any movement. So much suffices for the description of the states of the urine. Other details of urine will be discussed in the books dealing with particular diseases.

Section XIII

Indications from faeces

Inference is drawn from the quantity of the faeces by considering whether it is less or more or just in proportion to the food consumed or equal to it. It is well known that in larger quantity faeces is the result of excessive humours, and if it is in smaller quantity it is the result of the low quantity of humours or because of the retention of much of the faeces in the caecum, colon, and small intestines, the last case being a prelude to colic. Sometimes scantiness of faeces denotes the weakness of expulsive faculty. Inference is sometimes drawn from the consistency of stools. Thus moist stools point to emboli or defective digestion; sometimes it denotes weakness of the mesenteric vessels which consequently do not absorb moisture. Sometimes catarrh in head produces moist stools and sometimes such stools are caused by eating things which have moistening effect on stools. If the faecal matter is both moist and viscid, this is a sign of emaciation, but the stools are then foul-smelling. Sometimes it denotes excess of malignant and viscid humours, but in this case the faeces is not very great. Sometimes viscid stools denote that viscid foods have been taken in great amount and at the same time there is a powerful heat in the temperament, hence they are not properly digested. Frothy stools indicate that they have been cooked by the excessive heat or have been admixed with excessive gases.

Dry stools result from severe toil, or dispersion or polyuria, or igneous heat, or dryness of foods or their long stay in the intestines as we shall explain in the appropriate chapter. When dry and hard stools are also found moist it shows their prolonged retention in the moistures which prevent them from passing out and it also shows the lack of irritative bile which helps evacuation. When there is no evidence of prolonged retention (in the bowels) and no signs of (excessive) moistures in the intestines, the cause is that some ichorous and irritative superfluous matter is flowing from the liver into the neighbouring organs, and the ichorous superfluous matter owing to its irritative property, does not stay long enough to get admixed with the stool.

Sometimes inference is drawn from the colour of stools. The normal colour of stools is slightly flame coloured. If this colour is more marked, it shows that there is excess of bile, and if less marked, it shows lack of maturation and digestion. If the stools are white, the whiteness is the result of obstruction in the bile duct and it denotes jaundice. If white stools contain pus of offensive smell it denotes rupture of an abscess. A healthy person who does not take exercise often passes stools resembling pus. And this means purification and wholesome depletion whereby flabbiness of the body owing to the lack of exercise is avoided, as we have mentioned while discussing urine. It should be remembered that flame colour of stools during the periods of climax of diseases sometimes denotes maturation, and sometimes it is a sign of the deterioration in condition.

The indications of black stool are the same as those of black urine. It denotes excessive combustion, or maturation of an atrabilious disease or aliment which colours it or which procures the elimination of atrabile. The first type of stool is the worst. In case of black stool which is caused by the pure atrabile colour alone is not sufficient to lead to any conclusion. Its acidity, acridity, and the appearance of froth on its contact with earth should also be marked, such acidity is bad whether in stools or vomiting. One of the properties of black stool is that it has a glitter. In short, the discharged pure atrabilious humour is usually a sign of impending death. But the discharge of black chyme is often beneficial. It is because the discharge of pure atrabile shows excessive combustion of the body and destruction of its moistures.

Green and bluish stools denote extinction of the innate heat. Sometimes inference is drawn from the shape of stools being compact or puffed up. Thus the stool which is puffed up like cow-dug is a sign of gases.

Inference is drawn from the time of passing stools. If the stools pass rapidly and before the usual time, it is a bad sign. It shows excess of bile and weakness of retentive faculty. If there is delay in the passage of stools, it shows weakness of digestion, coldness of the intestines, and excess of moisture. If the stools pass noisily, it is a sign of flatulence. Stools of various unusual colours are bad and we shall mention them in the Book dealing with particular diseases.

Healthy stools are compact and homogenous. Their watery and solid parts are intimately admixed. They are of honey-like consistency and pass easily without causing any irritation. They have a yellowish colour. They do not have very offensive odour, yet they are not odourless. Such stools pass without borborygmus and flatus and are free from foam; they pass regularly at about the same time and in bulk they are nearly equal to that of the food consumed.

It should be remembered that each kind of homogenous and soft stools is not benign. It is because some homogeneity and softness result from proper maturation which is homogenous throughout the particles but at other times they are the result of combustion and dissolution of tissues and then they are bad signs.

It should be remembered that stools of normal consistency which tend to be thin are benign when there is no borborygmus or flatus and they do not pass at intervals little by little, otherwise such stools may be owing to the admixture of some pus which prevents cohesion. Occasionally signs found in sweat and other things are also taken into consideration. But it will be more appropriate to deal with them while dealing with the particular diseases. Hence you will find there further details of stools and urine etc. (For the present) you should learn what we have described.

PART III

Hygiene

Comprising five Lessons and a Section

Section : Causes of health and disease and the necessity of death

Medicine primarily comprises two parts: theoretical and practical. But essentially both are theoretical. What is specifically known as theoretical, however, provides postulates only without dealing with the practical procedures at all, for instance, temperament, humours, faculties, various diseases and symptoms. What is known as practical is that which provides the knowledge of mode of practice and regimen. For instance, it is that part of medicine which teaches you how to preserve the health of the body in this or that state and by what means you can treat the bodies which are afflicted with this or that kind of disease. You should never consider that the practical part of medicine is the actual practice of medicine, but it is the part in which the knowledge of medical practice is imparted. We have already made it clear to you in the preceding discussion. Having dealt with the theoretical part of medicine in the first and second parts of (this Book), we now turn our attention to deal with the remaining two aspects of the practical part in a general way. The practical part (of medicine) is of two *Kinds:* a. Knowledge of regulating the body so as to maintain its health. It is called hygiene. b. Knowledge of managing the diseased body and the methods of restoring it to health. It is called the knowledge of treatment. Now we begin to give in this part a concise account of hygiene. We say: In the formation of our bodies there are two things that serve as the primary sources: The semen of the male, more approximately to be regarded as the efficient case. b. The semen and menstrual blood of the female which are more appropriately to be regarded as the material cause. Both of these substances have the common feature of being fluid and moist but differ in that there is greater moisture and earthy substance in the menstrual blood and female semen, while airy and fiery substances are dominant in the semen of male. It is necessary that the primary congelation of these two (components) should be moist, even though the product of the two has also earthy and fiery elements. As earthy matter is hard and fire produces maturation, they make the coagulum hard by their interaction and give it more firmness and stability. But this hardness is not like that of stone or glass from which nothing or only an imperceptible quantity is dispersed. Hence it is secure from damages caused by persistent or prolonged dispersion. This is not so with human bodies, since our bodies are exposed to two kinds of injuries, each having an exterior and an interior cause.

One of the two kinds of injuries is the dispersion of moisture from which we have been created which takes place gradually. The second kind of injury is the putrefaction and corruption of the moistures and their inability to maintain life. This is different from the first kind, though ultimately this also causes dryness. This dryness results from moistures first becoming malignant and then their (nature) and quality becoming unsuitable for our bodies; then ultimately they are dispersed as a result of putrefaction. Putrefaction first corrupts the moistures and then disperses them, and leaves behind only a dry and ashy thing. Both these injuries are different from those arising from other causes, such as, freezing-cold, hot winds, various kinds of fatal breach of continuity and all kinds of other diseases. But only the aforementioned two kinds are to be taken up in this discussion. It is quite proper for us to deal with them under Hygiene.

Each of the two injuries arises from external as well as internal causes. An example of external causes is the air which causes dispersion and putrefaction. An example of the internal causes is (a) the innate heat in our bodies which disperses the fluids of our bodies and (b) the foreign heat which arises from various foods and causes putrefaction of our body fluids. All these causes aid one another in rendering our bodies dry. Indeed, the initial development of our bodies, our youth and the power to perform our various actions depend upon the production of adequate dryness of the body. But this desiccating process goes on increasing until it is completed.

This desiccating process going on in our bodies is essential and unavoidable because in the early stages (of development) we are excessively moist and it is necessary that the innate heat of our bodies should overcome the moistures otherwise it would itself be smothered by them. Hence the heat continues to act upon them drying them steadily. At first this drying effect is moderate. Then our body acquires the moderate limit of dryness. But the heat remains constant hence the dryness is now greater than before because the matter (i.e., moisture) is less and so it is more yielding to dryness. Consequently, dryness goes beyond the moderate limit and goes on increasing until (the whole of) the moisture of the body is consumed. Thus the innate heat, by consuming its matter, beomes indirectly the cause of its own extinction, as in a lamp the light goes out when all the matter has been used up. As the dryness increases, the innate heat diminishes and its ineffectiveness goes on increasing and so does its inability to replenish the lost moisture. Thus dryness increases in two ways: (a) reduced intake of (requisite) material and (b) reduction of the body-fluids owing to dispersion of the innate heat.

The heat becomes more and more feeble because: (a) dryness predominates in the body of the organs; (b) there is (progressive) decrease of innate moisture which is like matter and oil of the lamp. For, there are two kinds of moistures in a lamp—water and oil. It remains lit up with the help of one and is put off by the other. Similarly, innate heat thrives on the innate moisture and it is extinguished by the foreign moisture.

(c) The foreign moisture which serves as matter for the lamp of innate heat, goes on increasing because of the weakness of digestion. Thus when the innate moisture dries up completely, the innate heat also comes to an end and natural death ensues.

Again (it should be remembered) that the duration of life does not depend upon the ability of primary innate mositure to resist permanently the dispersive effect of heat of all types i.e. the extrinsic heat, the innate heat of the body and the heat generated by bodily movement. It is because the innate moistures are weaker in resisting these effects. The innate moistures continue to last because something is provided to replace that which has been thus dispersed—and that is food. Again, we have already explained that the faculty operates upon the aliment and renders it useful only for a (specified) period.

It should be noted that the hygiene is not the art which might avert death or extraneous injuries. It also does not secure the utmost longevity possible to the human beings in general. But it guarantees two things: a) initial prevention of putrefaction. b) safeguarding of innate moisture from too rapid a dispersion. This moisture has so much of potency that it remains as long as an individual lives according to his primary temperament. This objective is achieved by procuring proper means for replacing to the possible extent the loss in the body out of dispersion; means for preventing the domination of such causes as would lead to a rapid desiccation—leaving aside the causes which cause a (normal) desiccation; measures which prevent putrefaction by safeguarding the body from the domination of foreign heat—whether external or internal. For all individuals do not have the same degree of innate moisture and innate heat, there is a great diversity in regard to them. Moreover, every person has a certain limit in resisting the inevitable desiccation according to his temperament, innate heat and the quantity of the innate moisture. He cannot cross that limit but sometimes he may die even earlier owing to causes which produce (early) desiccation or to causes which prove fatal in one way or the other.

Many persons assert that the former types of death are natural and the latter are accidental. The art of preserving health aims at guiding the human body to reach the age, which is called natural span of life by paying attention to things suitable (for health). There are two faculties responsible for taking care of such suitable things and the physician (actually) serves these faculties. One of them is natural and that is nutritive faculty. This provides substitute for what is lost to the body which is mainly composed of watery and earthy elements. The second is the vital or pulsating faculty.. This faculty provides substitute for what is dispersed by pneuma, the substance of which is airy and fiery. Since aliments are not actually like the nourished organs, an alterative faculty has been created so that it might actually change the aliment into the likeness of the nourished organs or rather convert them into actual and real food. For this purpose instruments and channels for attraction, expulsion, retention and digestion have been created.

We may say that in the art of preserving heat the basic thing is the moderation of the aforementioned general and essential causes. But of them greater attention is paid towards the moderation of seven things: moderation of temperament; selection of the articles of food and drink; depuration of superfluity; protection of the constitution (of the body); purity of the inhaled air; proper clothing; moderation of physical and psychic movements which include, in one way or another, sleep and wakefulness.

You have learnt from what has already been described that there is no set limit for equability of health. Nor is any temperament in perfect state of health or equability at a given time, rather it stands somewhere in the middle. We, therefore, begin first with the Lesson on regimen for children having highly equable temperament.

LESSON I OF PART III

Child Care

Section I

Regimen for infants from birth to the time they begin to stand

Regimen during pregnancy and the period when parturition approaches will be described later in detail. Many wise physicians state that when an infant of equable temperament is born the umbilical cord should first be cut leaving the distance of four-fingers from the umbilicus and it be tied with a soft, clean and lightly twined woollen thread so as not to hurt the baby, and that a piece of cloth soaked in olive oil should be placed upon it. The physicians also advise dusting the umbilicus with a (fine) powder made of equal parts of turmeric, dragon's blood, sarcocolla, cumin, rock moss, and myrrh. Then one should hasten to apply slightly salted water on the body of the infant so as to harden the countenance and tone up the skin. The best salt (for this purpose) is that in which a small quantity of blood-stone, costus arabicus, sumach, fenugreek and thyme is mixed. But the nose and mouth must not be exposed to salted water. The reason for hardening the body of a newly born baby is that it is warm and delicate and anything which comes in contact with it is felt cold and rough. If the process of salting has to be repeated, as when the body has an excess of secretions it may be safely done. After this, the body should be bathed with tepid water. The nostril should be cleaned with the fingers, the nails of which are trimmed and a little oil should be dropped into the eyes. The anus should be titillated by the little finger, so that it may open. Care should be taken to protect the baby from chill. When the cord separates—and it is after three days—it is proper to dust the umbilicus with ashes of oyster shell or burnt tendon of calf's hoof or burnt zinc dissolved in alcohol.

When we wish to do the wrapping, the midwife should first gently press the limbs and mould the various organs of the infant to proper shape by flattening those which ought to be flat and thinning those which ought to be thin. All this should be done gently with the tips of the fingers. This process should be repeated. The eyes should be wiped regularly with material like silk. The bladder should be pressed to facilitate the voidance of urine. After this, the hands should be stretched out so as to meet the knees. The head should be covered with a turban or a properly fitting cap. The sleeping arrangements for the infant must be made in a room which is moderately airy and not cold. The room should have shade and be free from glare. During sleep, the head should be at a higher level then the rest of the body and care should be taken that there is no twisting of the neck, extremities, and the back. In summer, the infant should be bathed with water of moderate temperature and in winter with moderately warm water. The best time for bathing the infant is after a long sleep but it may be bathed two or three times a day. During summer the temperature of water should be gradually reduced to tepidity, but in winter moderately hot water must always be used. The bath should be continued till the body of the infant becomes warm and ruddy. Then it should be taken out of the bath, and care should be taken to prevent water from getting into the ears. While giving bath, the midwife should hold the infant by the right hand by placing its chest and not its belly over her left arm and its back should be gently and softly supported by the palm of the two hands and its head by the two legs. The infant should be wiped dry with soft linen and laid first on the belly and then on the back. At the same time it should be all the while dried, rubbed, and moulded (to proper shape). Then it should be turned round and tied with piece of cloth. Afterwards, sweet oil should be dropped into its nostrils because it cleanses the eyes and the lids.

Section II

Regimen for lactation and weaning

The infant should be fed, as far as possible, on mother's milk, because it is closer in its substance to the nutriment which the infant received while in the womb, i.e. the menstrual blood which is changed into milk. The infant readily accepts this milk and is quite used to it. Experience shows that merely to place the mother's nipple into the infant's mouth is very useful in removing the infant's discomfort. The breast feeding should be given only two or three times a day. In the beginning large feeds should be avoided. It is advisable to get someone else to nurse the baby until the mother regains her normal temperament. It is better to give the infant a little honey first, and the breast later. Some milk should be squeezed out of the mother's breast by pressing it two or three times in the early morning and then the nipple should be put into the infant's mouth, specially when the milk is defective. If the milk is defective or sourish, the nurse should not breast-feed the infant before breaking her morning fast. Besides this, there are also two useful things which should be done for the infant in order to strengthen his temperament. One of them is gentle rocking and the other is humming music or singing of lullaby as is customary while putting the infant to sleep. These should, however, be only as much as the infant may tolerate. This is to be decided from its capacity for exercise and music—one from its body and the other from its psyche.

If for reasons of health or because of defective milk or for the sake of her own comfort, the mother is unable to nurse the infant, a wet nurse should be selected according to the conditions which we are going to be described regarding age, physique, morals, shape of breast, quality of the milk, the interval of time which has elapsed since her parturition and the sex of her own child.

If a nurse, who fulfils these conditions, is found, she must be provided with good food consisting of wheat, millet, flesh of lamb and goats, and fish which is neither putrefied nor hard. Lettuce is a good food (for her) and so are almond and hazel-nuts.

Vegetables which are deleterious for the wet-nurse include rockets, mustard and wild basil because they corrupt milk. Mint also has a similar effect.

We now describe the qualifications of a wet-nurse and begin with the requirements regarding her age. The nurse should preferably be between twenty-five and thirty-five years of age because this is the period of youth, health and perfection. As for form and physique, she should have a good complexion, strong neck, strong and broad chest, muscular body, and firm flesh. She should neither be fat nor lean and should be full of flesh but not fat. She should have good and praiseworthy character. She should be less susceptible to the unseemly psychic passions, such as anger, grief and cowardice etc. for all these things spoil the temperament and sometimes adversely affect the baby. It is for this reason that the Holy Prophet—peace and blessings of Allah be upon him—has prohibited the employment of a mentally deranged woman as wet-nurse. Besides, owing to her bad moral character she might not give proper attention to the baby and might (even) be grudging in her caresses. Her breasts should be firm and large but not flabby and immoderately large. They should neither be too hard nor too soft.

The milk should be moderate in consistency and quality. The colour of the milk should be white, not dusky, greenish, yellowish or reddish. Its odour should be good without any acidity or putrefaction. The taste should be sweetish without any bitterness or acidity. It should be plentiful and of uniform consistancy and neither too thin nor too thick and cheesy, nor it should contain discrete particles nor should it be too frothy.

The consistency of milk may be tested by allowing a drop of milk to run over the finger-nail. If it flows it is thin, if it stays over the inclined nail, it is thick. It is also tested in a glass vessel. Add a little myrrh into a glass of milk and stir it with a finger. Thus the quantity of cheese and water in the milk is evident. The milk is good if the cheesy part and watery part are equal. If one is pressed by the need to employ a wet-nurse whose milk does not have this quality, the milk may be improved by modification and by medical treatment of the nurse. If the milk is thick and of undersirable odour, it is better to take it out of the breast and expose it to air before feeding the baby. If the milk is very warm, the nurse should not feed the baby until she has had her morning meal.

Treatment of the nurse

If the milk of the nurse is thick, she should take oxymel prepared from seeds with a decoction of attenuants such as mint, hyssop, thyme, and savory. Sal fish etc. and a little radish should be included in diet. She should be advised to induce vomiting with hot oxymel and take moderate exercise regularly. If the nurse is of hot temperament she should be given oxymel and a light wine separately or mixed together. If her milk is thin, she should have plenty of rest and avoid taking exercise, and given such food as produce thick blood. If there is no contra-indication, she should take sweet drinks and grape syrup and be advised to enjoy plenty of sleep. If the milk is scanty, the cause should be ascertained, e.g. whether it is a hot intemperament of her body as a whole or of the breast only. It can be known from the signs given in the preceding chapters and also from the feel of the breast. If there is any indication of abnormal heat, in her (body or breast), her diet should consist of barley-water, spinach and the like. If there is any indication of coldness of temperament, or of emboli or weakness of attracting faculty, light foods which are mildly hot in temperament should be given in good quantity. Gentle cupping should be done beneath the breast. When the milk is scanty, carrot seeds and carrot itself are very beneficial.

If the cause is malnutrition, the nurse should be given soups prepared from barley, bran, and some other cereals. It is necessary to add roots and seeds of fennel, dill and black cumin to the soup and foods of the wet-nurse. It is said that the udders of sheep and goat, taken alongwith the milk contained therein, are very useful. This is due to the similarity or specific property of the udders. It has been experienced that 3.5 gms. of white-ants or dried earth-worms given daily with barley-water for several days is very useful. Similarly, decoction of the heads of the salted fish in dill water is quite useful. One of the methods for increasing the milk of a wet-nurse is to serve her with a cup of pure wine mixed with 30 gms. of cow-butter, or finely ground sesame should be mixed with wine and clarified and then taken as a drink. Liniment prepared with the sediment of nard oil and ass's milk should be applied to the breast. Thirty gms. of the interior part of half-cooked brinjal should be thoroughly mixed with wine and given orally. Or bran and radish cooked with wine should be given as a drink. One could also take 90 gms. of dill seeds as a drink. One could also take 90 gms. of dill seeds, 30 gms. each of the seeds of lotus and leek and 60 gms. each of the seeds of alfalfa and fenugreek all powdered and mixed together with fennel juice, honey and butter. This may be taken (according to requirement).

If the abundance of milk causes a change in its quality or any discomfort owing to its confinement and thickness, it may be reduced by reducing the quantity of food and by less nourishing diet. A plaster made of cumin seeds and vinegar or of pure clay and vinegar or a plaster prepared by boiling lentils in vinegar should be applied over the chest and the breasts. Salted water should be used as drink after meals. Similarly, mint should be used in great quantity. Massage of breasts also increases the production of milk. If the milk has an unpleasant odour, the remedy is to give fragrant wine to drink and foods with good flavour.

Rules regarding the time to be elapsed since the wet-nurse was herself confined. She should have given birth recently but not too recently. This period should be one and a half or two months. The child of the wet-nurse should be a male child. The birth should have taken place at normal period. It is also important that the birth is not a premature birth and there is no history of habitual premature births.

The nurse should be advised to take light exercise and should be provided with foods of good chyme. She should abstain from sexual intercourse because it activates the menstrual blood, corrupts the odour of the milk and diminishes its quantity. Sometimes it also leads to pregnancy which is greatly harmful to both the babies. The suckling baby suffers because the lighter portion of blood goes towards the nutriment of the foetus while the foetus suffers from deficient nutriment because the baby at the breast also requires milk. It is necessary that a small quantity of milk should be squeezed from the breasts and discarded before each feed, specially before the morning feed. It is also necessary to help the flow of milk by pressing the breasts and thus save the baby from too much exertion of sucking which might hurt the organs of throat and oesophagus. A teaspoonful of honey preferably with a small quantity of wine given before each feed is useful. It is not proper to feed much milk at one time. It is better to feed little and often at small intervals. For, often, full satiety of the baby produces distension and excessive flatulence and makes the urine white. When any of these conditions appears, the feed should be stopped and the infant kept hungry and put to sleep till the digestion is complete.

During the first few days, at the most three feeds are given a day. As we mentioned earlier, on the first day the baby should be fed preferably by some woman other than the mother. Should the wet-nurse develop an intemperament or a painful malady, or have excessive diarrhoea or some painful obstruction someone else should take the responsibility of feeding the child until she is better. The same rule applies if it is necessary to administer to her some medicine which has a strong potency and quality. When after the feed baby goes to sleep the cradle should not be rocked vigorously otherwise it would churn the milk in its stomach. The rocking must be gentle. A little crying before the feeds is beneficial for the baby. The normal period of lactation is two years.

When the baby begins to ask for things other than milk, it should be allowed to take them gradually without any compulsion. When the incisor teeth begin to appear, foods giving greater vitality should be introduced gradually. But the baby should not be given such things as are hard to chew. It is better to begin with the bread which has been masticated by the wet-nurse. Afterwards bread should be given with water and honey or with diluted wine or milk. This is followed by a small drink of water and sometimes by a little quantity of diluted wine. It should not be allowed to take food to repletion. If the baby suffers from fullness of stomach, and flatulence, or the urine becomes white, all food should be stopped. It is good to feed the baby after the oil rub and bath. When breast-feeding is stopped, light food such as soups and easily digestible meat should be given. Weaning should be gradual and not all of a sudden. The baby should be kept busy with cones made of bread and sugar. If the baby keeps on crying for the breast, it may be coated with a paste made of 3.5 gms. each of powdered myrrh and purslane seeds.

Very light exercise: Exercise is quite natural for the babies. Their physis requires it, specially in the transitional period between infancy and childhood. When the baby begins to stand up and sit down it should not be allowed to make strenuous movements, or be encouraged to walk or sit before it has the natural desire to do so, otherwise its legs and back may be injured. When the baby first begins to sit up or crowl on the four over the ground, it should be placed on a smooth skin to prevent the (knees) from being bruised by the rough ground. Bits of stick, knives and similar other piercing and cutting objects must be kept out of its way, and it must be protected against falling off some elevated place. When the canine teeth begin to appear, the baby should not be given hard things to chew lest the material from which these teeth are made should become dissolved by mastication for which baby has a great liking. At this time rabbit's brain or hen's fat should be rubbed over the gums as this facilitates the eruption of teeth. When gums start splitting during dentition, the head and neck should be massaged with cleansed olive oil which has been mixed with hot water. A little of the same oil should be instilled into the ears. As soon as the infant is able to bite with its teeth, it gains satisfaction by keeping its fingers in the mouth and biting them (gently). At this time the infant should be given a piece of liquorice which is not too dry. It is because liquorice is beneficial at this period and proves useful in ulcers and pains of gums. Similarly, the mouth should be rubbed with salt and honey to prevent such pains. When the teeth are fully out, the infant should be given to chew a dried piece of liquorice juice or root of liquorice which is not so dry. Massage of neck with sweet olive oil or some other sweet oil is good for the infants during dentition. When the baby begins to talk, the root of the tongue should be regularly massaged.

Section III

Diseases of children and their treatments

In the treatment of infants the primary concern should be the regimen of the wet-nurse. Thus if there is any sign of plethora of blood in her, cupping or venesection should be carried out. If there is repletion of some other humour, it must be depleted. When it is necessary to bind or loosen the bowels, or to prevent the ascent of vapours to head, or to rectify the respiratory organ, or to alter an intemperament, this should be treated by providing her proper food drinks. If it is necessary to treat her with a purgative, or she happens to develop diarrhoea spontaneously, or if emesis needs to be procured or if vomiting occurs spontaneously with force, the baby should be nourished that day by some other woman. Now we shall describe the particular diseases which affect the children. Among these diseases are the swellings which occur in the gum during dentition, the swellings which occur near the tendon in the region of the jaws and lock jaw. In such cases the swollen parts should be gently pressed with the fingers and massaged with oils as already mentioned in the chapter on dentition. Honey mixed with oil of chamomile or with nebati gum is used. Decoction of chamomile and dill should be freely poured over the head from a height.

Diarrhoea

Diarrhoea is common among infants, particularly during dentition. According to some (physicians) the reason of diarrhoea in infants is that the infants suck the salty purulent waste matter from their own gums along with the milk. It is quite probable that diarrhoea in infants is not caused by the aforementioned reason. The real cause is that the physis, being seized as it is with the eruption of teeth, does not fully perform the function of digestion, or the cause may be the occurrence of pain which interferes with digestion in weak bodies. If diarrhoea is only slight, it does not require any treatment. When one is afraid that it will become profuse, fomentation with rose-seeds, or seeds of celery or anise or cumin should be applied to the abdomen or a plaster prepared with cumin and roses infused in vinegar or with millet boiled in a little vinegar is applied to abdomen. If these things fail, a small quantity of rennet from the stomach of a new born lamb dissolved in cold water should be given. Care should be taken to prevent curdling of the milk in infant's stomach by replacing the milk for that day with yolk of half-boiled egg, or with pieces of bread boiled in water or with roasted flour cooked in water.

Sometimes children develop constipation. This is to be treated with a suppository made of rat droppings or of condensed honey, or honey mixed with a small quantity of wild mint, or plain or burnt lily-root. Honey or nebatian gum equal to one gram should be given orally. Olive oil should be gently rubbed over the abdomen. Cyclamen and the gall of cow may be applied to the navel. Sometimes there is irritation in the gums. In such cases the gums should be massaged with oil containing wax. Salted and stale meat is also useful in such cases. Sometimes children suffer from convulsions, particularly during dentition. Mostly the convulsions result from the digestive disorders aided by acute nervous weakness, specially in the babies with moist and flabby constitution. The treatment is given by using oil of orris root, lily, henna or yellow gilliflower.

Sometimes children suffer from tetanus. This should be treated with water in which wild cucumber has been boiled or with oil of violets admixed with oil of wild cucumber. If there is reason to suppose that the convulsions are due to dryness because they develop after fevers or after severe diarrhoea, and because they gradually become more prominent, joints should be massaged with violet oil alone or mixed with pure wax. Violet oil or olive oil is applied to the head freely. If the baby suffers from dry tetanus, the treatment should be the same as already mentioned. Sometimes the children develop cough and cold. In such cases hot water should be poured freely over the head. Their tongue should be smeared thickly with honey and then the back of the tongue be pressed with a finger so that the baby might vomit out much of phlegm and get relief. Or gum arabic, gum tragacanth, quince-seeds and extract of liquorice and sugar are given daily in small doses with fresh milk. Sometimes a baby suffers from dyspnoea. In such cases olive oil must be rubbed over the roots of ears and root of the tongue and the baby should be induced to vomit. Vomiting is successfully induced by pressing the roots of the tongue. Warm water would be dripped into their mouth and linseed mixed with honey be given as a lincture.

Stomatitis (aphtha) is common among infants because the mucous membrane of their mouth and tongue are so delicate that even light (soft touch) sucking is unbearable. How could they then bear the detergent effect of milk water giving rise to stomatitis? The worst type of stomatitis is aphthae black like charcoal. White and red types are not so serious. They should be treated with some of the drugs meant for stomatitis mentioned in the Book on Particular Diseases. Sometimes powdered violets alone or mixed with roses, and a little saffron or carob will suffice. Occasionally, lettuce-juice, juice of garden night shade and purslane juice serve the purpose. If the disease proves obstinate, scraped and powdered liquorice root should be used. In stomatitis and boils of gums, it is beneficial to use myrrh, gall, and bark of frankincense thoroughly grounded and mixed with honey. Sometimes an extract of sour mulberries and unripe grapes may suffice. Sometimes it is advantageous to wash the gums with honey wine and honey water and follow this up with some of the desiccants we have already mentioned. When a more powerful remedy is needed, a powder made of 21 gms each of turmeric, rind of pomegranate, pomegranate blossom, and sumach, 14 gms of gall and 7 gms of alum mixed and powdered together, is used.

Sometimes there is otorrhoea in children. This is because their bodies, and more particularly brains, are very moist. This is treated by introducing into the ear a wick dipped in honey or wine containing a small quantity of alum or saffron or nitre. Or it may suffice to dip wool into astringent wine to which a little saffron is added and plug it into the ears. Occasionally children develop earache owing to gases or moistness. This is to be treated with *berberric aristata* common thyme, vateria multiflora, rock-salt, lentils, myrrh, colocynth seeds and juniper. Any of these should be boiled in oil which is dropped into the ears.

Sometimes an acute swelling arises in children's brain. This is known as *utash* (meningitis). Its pain often spreads to the eyes and throat and the face turns yellow. Hence the brain must be kept cool and moist by using the rinds of pumpkin and cucumber, juice of garden night-shade and specially purslane juice, and rose-oil with a little vinegar or rose-oil with egg-yolk. But whatever is used should be changed frequently. Sometimes there is hydrocephalus in children. We have already mentioned the treatment under the diseases of the head. When there is swelling in children's eyes, *berberris aristata* (ophthalmic berberry) mixed in milk should be painted over the lids and later on the eyes are washed with a decoction of chamomile and juice of wild basil. Sometimes excessive crying produces whiteness in the pupils. This is treated with the juice of garden night-shade. Sometimes excessive crying causes blepharitis. In this case also the treatment is with the juice of garden night-shade. If a child has fever, it is treated best by attending to the wet-nurse. At the same time, the child also should be given remedies like pomegranate juice mixed with oxymel and honey or cucumber juice mixed with a little camphor and sugar.

Then sweating is induced by applying juice of fresh bamboo leaves to the head and feet and wrapping the baby.

Sometimes children develop colic. Hence they writhe and cry. The abdomen should be fomented with hot water and with plenty of hot oil and a little wax. Sometimes children suffer from constant sneezing. This is occasionally the result of swelling in the region of brain. If such is the case, cooling measures should be adopted and cooling juices and oils should be applied (to the head). If sneezing is not owing to swelling, powdered seeds of wild basil are inducted into the nostrils. Sometimes boils form all over the body. If they are ulcerating and black in colour, they are fatal and they are fatal even when confined to the mouth, not to speak of their occurrence all over the body. Those that are white or red are not so dangerous. Sometimes the appearance of multiple boils over the body proves beneficial. In all cases, the treatment is to wash the body with water in which light desiccants such as roses, myrtle, leaves of the mastic tree and tamarisk have been boiled. Oils of these herbs may also be used. Simple boils should be left alone until they are mature, and then treated. When the boils turn into ulcers, ointment of white lead should be applied. Sometimes they may need washing with honey water and a little nitre. Stomatitis is treated in the same way. When the boils become purulent some stronger medicine is required. They may be washed with borax mixed with water or milk so that the child might bear it. If the body is affected with vesicles, it should be bathed with a decoction made of myrtle, roses, bogrush and leaves of the mastic tree. While adopting all these measures, the diet of the wet-nurse should be regulated first.

When a child cries very much, it causes umbilical hernia or some other type of rupture. Some physicians advise that a paste should be made of the powdered royal cumin with the white of an egg and applied to the navel. Then the navel is covered with a piece of linen or ashes of bitter Egyptian beans soaked in liquor are applied. Stronger remedies are the hot astringents such as myrrh, bark and seeds of cypress, aloes, and acacia, and some other remedies mentioned in the chapter on hernia. A swelling may be developed in the navel, especially when the cord is severed. In such cases one should take *fanjanūsh* (an electuary made of iron-fillings, wine and almond oil—Johnson) and turpentine resin and melt them in sesame oil. A small quantity of the same is given orally as well as applied on the navel.

Sometimes the child becomes sleepless and cries incessantly. It is restless to be slept . In such cases the child should be put to sleep by applying poppy rind, poppy seeds, or lettuce oil or poppy oil to the head and the temples. This should serve the purpose, but if a stronger remedy is required, the following preparation is used: one part each of lentil seeds, lichenea, yellow and white poppy seeds, linseed, seeds of *khuri*, seeds of purslane, seeds of greater plantain, lettuce, fennel, anise and cumin; all braised and powdered together and mixed with one part of roasted but unpowdered ispaghula. The whole product is again mixed into an equal quantity of sugar and given to the child in two 7-gms doses. When, however, a still more powerful remedy is desired opium equal to a one third part of any one of the other ingredients or even less is added to the prescription. Sometimes a child develops hiccough for which the child should be given coconut with sugar.

Sometimes a child develops severe vomiting. This is treated by giving three grams of cloves orally and by applying mild antiemetics to the abdomen. Sometimes the digestion becomes weak in children. In such cases liquor of lily, myrtle and rose-water should be applied to the stomach. A small quantity of extract of emblica and cloves with juice of quince or one and 1/4 grams of extract of myrobalan with quince liquor is given orally. Sometimes a child has nightmares. This is owing to overeating caused by the child's greed. Thus when the food undergoes putrefactive change, the stomach feels it and that injurious effect passes on from the sensitive faculty to the formative and imaginative faculties, wherefrom the terrifying dreams arise. It is necessary, therefore, to see that the stomach is not full at bed-time; honey should be given to the child to be licked so that it might digest that which is in its stomach and let it down.

Sometimes a child develops a swelling in the throat between the mouth and the oesophagus. Occasionally this swelling spreads to the muscles and cervical vertebrae. The treatment is to cause the infant's bowels to act by using a suppository. After this the infant should be treated by the syrup of mulberry and the like. Sometimes a child snores abnormally during sleep. The child should be given ground linseed with honey or ground cumin with honey to lick. Sometimes children develop convulsion. The treatment has already been described in the chapter on the diseases of head. But we may mention here something which is very useful for them: take equal parts of common thyme, castoreum and cumin. Grind them up and give it in doses of 1/3 gms.

Sometimes a child suffers from prolapsus ani. In such cases the child should be seated in warm water in which 3½ grams of pomegranate rind, fresh myrtle leaves, chestnuts, dried roses, burnt stag's horn, alum of Yemen, goat's hooves, pomegranate blossoms, and gall-nut have been so thoroughly boiled that the water absorbs their properties. The water should be used when it is lukewarm.

Sometimes children develop dysentery from exposure to cold. In such cases the following prescription proves useful: 10½ grams each of the seeds of water-cress and cumin are thoroughly ground together, sieved, and mixed into old butter of cow. A small quantity of it is given with cold water.

Sometimes injurious thread-worms are developed in children's stomach. They are generally near the anus. Round-worms are not so common and tape-worms are generally rare. Round-worms are treated with water of warmwood of which a small quantity is given with milk according to their tolerance. Sometimes it is necessary to apply over their abdomen a plaster made of absinth, embelia, ox-bile and colocynth pulp. In order to treat thread-worms, take one part each of elecampane and turmeric, add sugar equal in quantity to the whole. This should be taken orally with hot water. Sometimes a child develops abrasion in its thigh. In such cases a dusting powder made of myrtle leaves and liquorice root, powdered roses or powdered Indian cypress or the flour of lentil or barley is applied.

Section IV

Regimen for the young ones entering the period of childhood

Children should be carefully attended and supervised regarding their behaviour so that they remain within the limits of moderation. This is possible by checking outbursts of violent anger, fear, anxiety and sleeplessness. This is best ensured by always keeping in mind the child's natural desires and inclinations as well as aversions. The natural desires of the child should be fulfilled and the causes of irritation removed. There are two benefits in doing this. The first is that good habits are cultivated from the very infancy and become a permanent trait of the personality. The second is that the body is also benefited. For bad behaviours are the outcome of intemperament, so ill behaviours are caused by intemperaments according to their own nature. Thus anger produces an unusual heat and sorrow leads to undue dryness. Similarly dullness blunts the psychic faculties and inclines the temperament towards the phlegmatic type. Properly balanced behaviour is thus conducive to both physical and mental health.

When the child wakes up in the morning, it should first have a bath. It should then be allowed to play for an hour. Then it should be given something to eat and left to play for a long time. Then it should have another bath and a hearty meal. As far as possible water should not be given during the meals, because it leads to premature absorption of partially digested food. When the child is six years old he should be sent to a teacher and instructor. Care should be taken to adopt a progressive system and not burden the child with books all at once. When they reach this age the frequency of bathing should be reduced while the duration of exercise before the meals increased. Children should be prevented from liquor, particularly those whose temperament is hot and moist because the injurious effect of liquor—namely the generation of bile through drink—readily affects the children. The expected advantage of liquor is that it helps elimination of bile through urine and moistening of the joints. In children there is no such need because bile is not so plentiful in them as to need elimination through urine, nor do their joints need moistening. Children should be allowed to drink as much of cold, sweet and pure water as they like. The same regimen should be continued upto the age of fourteen. But at the same time day to day changes, when the moisture of their bodies becomes less and dryness and hardness increase, should be taken into consideration. Hence between boyhood and adolescence strenuous exercise should be gradually decreased to regular moderate exercise. After this age the regimen should be what is usual for the growth and for the preservation of health. We may now, therefore, discuss the fundamentals of the regimen for healthy adults. First take up exercise.

LESSON II

Common regimen for adults

Comprising XVII Sections

Section I : General statement on exercise

Since the main regimen for preserving health consists in the regulation of exercise, food, and sleep, we should begin our discourse with exercise. We say that exercise is a voluntary movement entailing deep and hurried respiration. One who has the opportunity of taking moderate and regular exercise has no need for such medicaments as are required for remedying humoral and temperamental imbalances. This is true provided the rest of the regimen is appropriate. This may be explained as follows: You already know that we need food and our health may be preserved by soft diet which is balanced both in quantity and quality. No part of the diet which is capable of nourishing the body is converted into actual nutriment in its entirety. In every case of digestion some superfluity is left behind and physis tries to eliminate it. Nevertheless, the evacuation which physis accomplishes is not a complete one. Hence at the end of each digestion there is necessarily superfluity left over. This process is continued and repeated and a considerable quantity is accumulated. As a result this accumulation of superfluous matters prove harmful to the body in various ways: When they undergo putrefaction, putrefactive diseases arise. If they act strongly, they give rise to diseases of intemperament. If they increase in quantity they cause repletion already mentioned. If they descend upon some organ, they cause swellings. Their vapours vitiate the temperament of the pneuma. It is therefore, necessary to eliminate these matters.

Their evacuation is usually completed and accomplished by the aid of toxic drugs which are, undoubtedly, harmful to the physis and even if they are non-poisonous, their use proves a burden on the physis. As Hippocrates has said, "A (toxic) drug purges and perturbs. Moreover, these drugs evacuate considerable quantity of good humours, innate moistures and pneuma which is the substance of life. This is what reduces the strength of the principal and auxilary organs. Hence there is a harm of one kind or another whether we allow the wastes to accumulate or we eliminate them. Exercise is the most effective cause to stop the beginning of repletion provided all other regulations of health are also observed. It is this exercise which stimulates innate heat and makes the body feel lighter. It is because the exercise generates mild heat and thus disperses daily whatever superfluity is accumulated. Exercise helps to expel the superfluity and divert it towards the outlets. Hence even after a period of so many days no considerable amount of superfluity is accumulated. Besides this, as we have just said, exercise increases the innate heat, hardens the joints and the ligaments, thus strengthening their actions keeping them free of adverse influences. It helps the organs to receive the nutriment because their superfluity is decreased and their attractive power is stimulated. Exercise makes the organs flexible and soft, attenuates the fluids and dilates the pores of the skin. The man who forsakes exercise would often incur the risk of tuberculosis because the faculties of the organs are impaired as they have no movement. In fact, it is the movement which attracts innate pneuma which is the source of life of each organs.

Section II

Varieties of exercise

One kind of exercise is that which results from professional activities, ordinary human activities and another kind is that of deliberate exercise for the sake of its benefits. There are several categories of the second kind of exercise. It may be short or long, strenuous or light, rapid or slow. Exercise may be of mixed type such as strenuous and rapid or light and slow. And there is a mean between each of the two extremes.

The methods of exercise are wrestling, trial of strength, boxing, brisk walking, archery, javelin-throwing, jumping over an object and swinging; hopping on one foot; sword play and fencing; horse-riding; clapping the two hands alternately in front and at back with a quick motion while standing on toes. These are rapid exercises.

Mild exercises

Light exercises are swaying in a swing or cradle in sitting, standing, or lying position, sailing in small and large boats.

The tougher exercises are: horse-riding, camel-riding, riding on a howdah and carriage riding.

Strenuous exercises include *maidaniyah* or chasing the opponent to the end of the field then returning backwards, reducing the distance continuously until he finally stands in the middle, shadow-boxing; clapping; jumping; spear throwing; polo; playing with balls big and small,; bathing; wrestling; weight-lifting; horse-trotting etc. There are various trials of strength: two wrestlers hold each other's back with both hands and while keeping a strong hold on one another, they try to extricate themselves; one wrestler grips the right hand of his opponent, and takes the left hand with his left, the two facing each other; then the one raises the other up into the air, and turns him round, sometimes in the bent position, sometimes in the upright position; two wrestlers press against each other chest to chest, one holds the other by neck to pull him to the ground, tripping one another; pinning down the other by interlocking and stretching to the legs. There are many other similar tactics employed by the wrestlers. Brisk exercises include: Interchanging of places by partners in quick succession; jumping forwards and backwards regularly or irregularly; fixing two stakes on the ground on both the sides, the distance between the two being 6 ft. and changing their position in rapid succession with crossed arms while keeping one's own positon. Vigorous and fast exercises should alternate with mild exercises or with rest. It is better to have different exercises and not stick to just one exercise.

There is a special exercise for each organ of the body. The exercise for hands and feet is obvious. Chest and respiratory organs are exercised by shouting with a heavy or shrill voice or with both. In this way the mouth, the tongue, and neck are exercised, complexion is improved and the chest is purified. Similarly chest and respiratory organs are exercised by holding breath and then exhaling it. This exercises the whole body and widens the breathing passages. Loud and much prolonged shouts are dangerous. Prolongation of loud shouts necessitates inhalation of much air and it is dangerous. Similarly prolonged shouts necessitate much expiration and this is very dangerous. The exercises of the voice should first be soft and then gradually raised to a high pitch which should be maintained for a reasonable length of time. This way the exercise would bring marked benefits. If, however, the voice is kept at high pitch for a long time, it would be dangerous even for balanced and healthy persons. There is a suitable exercise for every person according to his constitution and age.

Thus light exercises such as swinging is more suitable for persons who have been debilitated by fevers and are convalescing and can neither walk nor sit, as well as for those enfeebled by doses of hellebore and the like and those who have some diseases of diaphragm. Gentle swinging induces sleep, disperses gases, and is beneficial in various diseases of head such as absent mindedness and forgetfulness. Moreover, it stimulates appetite and excites the physis. Swinging on a board benefits those suffering from semitertian, composite and phlegmatic fevers. It is aso beneficial for those who are dropsical or have gout pain, or renal diseases, because such swinging induces the (corrupt) matter to be easily eliminated. Swinging should be gentle or vigorous according to the nature of man being hard or soft.

Riding a carriage has the same effect as swinging except that it produces stronger excitement. If one rides a carriage with the face in the opposite direction, it proves very beneficial for weak eyes and poor vision. Sailing in a small or large boat is beneficial for leprosy, dropsy, apoplexy, coldness of stomach and flatulence provided the sailing is near the bank. If in the beginning voyage causes nausea which subsides later on, it is beneficial to the stomach. Sailing in deep waters is more effective in relieving the aforementioned diseases because the mind is diverted by alternate feelings of joy and sadness.

Alimentary organs are exercised in consequence of the exercise of the general body. Eye-sight is exercised by inspecting minute things and by casting fleeting glances at bright objects. Hearing is exercised by listening to faint sounds or sometimes to loud ones. Every organ has its own special exercise. We shall describe it under health preservation of individual organs while we come to deal with the book on particular diseases.

Care must be taken that the strain of exercise is not likely to affect some weak organ. Such an organ should only bear the brunt of the exercise secondarily. For instance, a person with varicose veins should not use an exercise in which the feet are much used. He should restrict the movements of legs and put the burden of exercise on the upper parts of the body, such as neck, head and hands in such a way that its effect is carried to the legs through these parts. Exercise for the weak body should be mild while for a strong body vigorous exercise is recommended. It should be remembered that evey organ has its own peculiar form of exercise. For instance, the exercise for the eye is to gaze upon minute things and the exercise for throat is to raise the voice gradually. Similarly, teeth and ears have their own exercises which will be described in relevant chapters.

Section III

Time and limit for exercise

Exercise should be taken when the body is clean and there are no immature and bad chymes in the regions of viscera and blood-vessels which would spread in the body through exercise and when the previous day's meal has already undergone digestion in stomach, liver and blood vessels, it is almost time for the next meal. The digestion of previous day's meal is understood from the maturation of urine which is judged by consistency and colour. This is generally the time when assimilation starts. If, however, some considerable time has elapsed since the innate heat helped the assimilation and flame-colour is dominant in urine and the natural yellowness has exceeded, exercise would be harmful as it weakens the faculties.

For this reason it has been said that when vigorous exercise has to be undertaken, it is better that the stomach should not be quite empty but contain a small quantity of food. In winter food should be somewhat heavy but in summer it should be light. Moreover it is better to choose a time for exercise when one is not hungry and when one is hot and moist rather than cold and dry. But the best time is when the state is between the two. Exercise in a man of hot and dry temperament may lead to illness and he may recover after giving it up. It is necessary, then, for a person who is about to take exercise that he should first pass out the superfluity of the intestines and bladder and then begin the exercise. It is also better first to massage the body to prepare for the exercise. Massage stimulates the innate heat and dilates the pores. The massage should be carried out first with a rough towel and then with sweet oil. It should be gradually made more and more vigorous but with due care to avoid excessive pressure and rubbing. It should be done through strokes which pass through various positions so that muscular fibres are thoroughly massaged. Then massage may be stopped and exercise may begin.

In spring the best time for exercise is round about mid-day, and it should be done in a room with a moderate temperature. In summer, the exercise should be done earlier. In winter, it seems reasonable to delay it till evening, but if there are some hindrances the place used would be made moderately warm and the exercise should be carried out at a time which is best with regard to the digestion of food and expulsion of waste matter. For fixing the quantum of exercise, three things are taken into consideration; as long as there is improvement in colour, the exercise may be continued; as long as the movements are light and easy; exercise may be continued as long as the organs, continue to swell. When these signs begin to disappear and the sweat, instead of being evaporated, starts running down exercise should be stopped. After exercise the body should be thoroughly massaged with oil. This is particularly necessary if the exercise is of a type which involves holding of breath. When on the first day you mark the duration of exercise and diet and thus when you know the quantity of aliment the person can bear, do not prescribe any change on the second day. Arrange that the quantity of aliment and the quantum of exercise do not exceed the limit prescribed on the first day.

Section IV

Massage

There are several varieties of massage: hard, which makes the body firm; soft, which relaxes the body; prolonged, which reduces the fat of the body; moderate, which develops the body.

Various combinations of these varieties provide nine types of massage. There are some other types of massage as, rough massage, that is the massage with rough cloth. It draws the blood rapidly to the surface. Another type of gentle massage which is done with the palm or with a piece of soft cloth. It draws the blood and retains it in the treated area. The object of massage is to make a flabby body thick and to make it hard if it is soft and to make it thin if it is thick and to make it soft if it is hard. One type of massage is preparatory massage which begins gently and then becomes more vigorous as the time approaches for the exercise. Yet another type of massage is restorative massage, which is given at the end of exercise and is also known as 'soothing massage'. Its purpose is to disperse the superfluities retained in the muscle and not expel by exercise. It causes them to disperse so that they might not produce fatigue. This kind of massage should be carried out gently and moderately preferably with oil. It must not be stiff, hard, or rough at the end because it would then harden the organs. In children it hinders growth, although in adults its harmful effects are minimal. It is safer to err on the side of hard massage than on that of soft massage, because the undue dispersal by hard massage is easier to correct than to prevent the susceptibility of tissues to diseases (because of lack of dispersal of waste matter) by a soft massage. Moreover, hard and rough massage in excess hinders growth in children. This type of massage will be treated on various occasions after dealing with the time and conditions of massage. At this stage, only the restorative massage will be described in some detail. We shall say that restorative massage is really the concluding part of exercise. This type of massage should begin vigorously at first, and with oil, then it should be moderated but not brought to an end with hard strokes. It is best that several masseurs should work together. The person having been massaged, should stretch out his massaged limbs to help to expel the superfluity from them; and all the parts of treated limbs which are kept stretched shall be bandaged. He should hold his breath as long as possible and particularly he should relax his abdominal muscles and at the same time make his thoracic muscles tense, if possible. Finally, abdominal muscles are also tightened a little so that the viscera might receive some restorative massage. In the mean time it is also necessary that the person being massaged should walk about, lie down and engage his legs with those of the masseur. Experts in the art of exercise hold their breath for long periods during the exercise. Sometimes they begin restorative massage during exercise. Thus the exercise may be omitted or restored to, according to the condition of the body when it is to be prolonged or not. A person who desires restorative massage does not need much (preparatory) massage, provided he has nothing undesirable in his state and has no intention of resuming exercise. If he experiences fatigue, oil massage should be given gently in a manner to be described later. If there is dryness, the massage should be increased until the normal condition is attained. Some people get their bodies pressed and massaged before retiring. This is beneficial because it desiccates the body and prevents the fluids from flowing into the joints.

Section V

Bathing and varieties of baths

Persons whose regimen we are discussing do not need absolving baths because their bodies are free from superfluities. If anyone does require a bath, it is to derive a gentle warmth and a moderate amount of moisture from it. That is why such persons are not to stay for long in it. Even when they use sitz bath, they should stay in it only until the colour of the skin becomes red and toned up, and they should leave it as soon as dissolution begins. It is necessary to moisten the surrounding air by a fresh-water spray. One should leave the bath after a quick wash. A person should not go into the bath immediately after exercise unless he has taken full rest. I have described the regulations for the bath in another place. At this point we should state that those who propose to bath should enter the rooms of the bath house gradually and stay in the hot room only as long as they do not feel discomfort. Thus the baths prove refreshing by dispersing the superfluity and preparing the body for assimilation of food. Moreover, they guard against weakness, discomfort and most potent cause of putrefactive fevers.

A person who desires to become stout and fat should take his bath after meal, if he is not likely to develop emboli in cosequences. If he wishes to be safe and is of hot temperament, he should use oxymel to prevent formation of emboli. If he is of cold temperament, he should take confections of mint and pepper. A person who aims at dissolution and shedding weight, should take his bath with empty stomach and continue it for a longer time. A person who wishes merely to preserve health, should enter bath after the digestion of food in stomach and liver. If in this way, there is a fear of bile getting stimulated and one wishes to take bath on empty stomach, a small quantity of light food should be taken before entering the bath. This is absolutely necessary in the case of a person of hot or bilious temperament. Such persons are not allowed to enter hot chamber at all. The best thing for such persons is to take an appetizer or bread soaked in fruit juice or rose water.

During bath or immediately afterwards cold drinks should not be taken because the pores (of the body) are then open and the coldness would speedly pass towards the principal organs and damage their faculties. Similarly very hot things, especially water, should also be avoided because the warmth might penetrate rapidly to the principal organs and thus cause consumption and phthisis. Further, such persons should avoid leaving the bath abruptly or uncovering the head after it or exposing the body to cold. If it is winter, one should be dressed before leaving the bath. Bath should be avoided by those suffering from fever or from loss of continuity or from swelling.

It is clear to you from what has been said that the baths have the following effects : Warming, cooling, moistening, drying, or they are beneficial or harmful. The benefits of bath are: Induction of sleep; deobstruent action; cleansing; dissolution; maturation; nourishment of the skin; assisting the physis in dispersing the matter which is desired to be dispersed; prevention of diarrhoea; removal of fatigue, etc.

The injurious effects of bath are: The heart is weakened if bath is excessive; produces syncope and nausea; stirs and putrefies stagnant matter and sends it down into the cavities and weaker organs with consequent swellings in both internal and external organs.

Section VI

Cold baths and their rules

Cold baths benefit a person who observes all the rules fully and is of proper age, strength and physique and lives in a suitable climate. Moreover, he should not be suffering from dyspepsia, vomiting, diarrhoea, insomnia, and catarrh. He should neither be too young nor too old. The bath should be taken when the body is light and the movements easy. If one desires to tone up the skin and retain (innate) heat, a hot bath should be followed by a cold one. The water used for this purpose should not be very cold but of moderate temperature. When a cold bath is taken after exercise, the following rules should be observed:

> The preceding massage should be more vigorous than usual, but the oil should be rubbed as usual. The exercise after massage and rubbing oil should be moderate but a little more than usual. After exercise cold water should be poured over the body all at once so that it might reach the organs at once. One should stay in the cold water as long as it is pleasant and tolerable and there is no horripilation. After the bath massage should be given as we are going to describe. The quantity of food should be increased and that of drinks decreased.

The time taken by the natural colour and body temperature to return to normal must be noted. If they quickly return to normal, the duration of cold bath was moderate and if this process is slow, it shows that stay in cold water was longer than needed. It is this experience which should guide the duration of bath for the next day. Sometimes cold bath is repeated after massage and restoration of colour and warmth of the skin becomes normal.

One who wishes to do so, should enter the water gradually and begin it at noon in the hottest day of summer, and when no wind is blowing. He must not do so after coitus, nor after taking food, nor until the food has been digested, nor after vomiting, depletion, cholera, insomnia, and weakness of body and stomach. It should be avoided after exercise excepting those who are very strong. They should also observe the rules we have already mentioned. To use cold baths in the aforementioned ways drives the innate heat suddenly in the interior parts and then allows it to return to outer parts with increased vitality.

Section VII

Diet

Persons desirous of preserving health should take care that their nutriment is not based on medicinal foods, like (certain) vegetables and fruits etc., for the things which are light produce oxidation of blood and those which are heavy cause excess of phlegm and thus make the body heavy. The diet must include: meat, specially of young sheep, ox, or goat; wheat which is free of all defects and has been gathered during a healthy harvest without ever having been exposed to injurious influences; a sweet dish which agrees to the individual temperament; fragrant wine of good quality.

Any other kind of food can only be regarded as a sort of medicament or preservative. Fruits bearing closest similarity to food are: figs, fully ripe sweet grapes, and dates. Dates, of course, (form a part of the diet) in the regions and places where they are habitually consumed. If by taking fruit superfluity arises, it should be speedily got rid of. It is necessary that food is not taken unless one is hungry.

Similarly, meal should not be delayed when there is genuine hunger and not the false appetite of a drunkard or dyspeptic person. If fasting is endured, the stomach will be filled with ichorous humours. During winter, actually hot food should be taken and in summer cold or slightly warm. The food should not be so hot or cold that it becomes unbearable. It should be known that there is nothing worse than eating to repletion during a period of prosperity which is followed by state of starvation during a time of scarcity, and vice versa. The latter is much worse. We have observed that a number of persons lacked food at a time of scarcity but when they had plenty of food (at a subsequent period), they ate to repletion and died. Exceeding repletion, whether with food or with drink, is fatal. Many persons are known to have died of suffocation from overeating. When some medicinal food is taken by error, (suitable) measures should be taken to ensure its digestion and coction and the intemperament which is likely to arise must be avoided by using an antidote until the digestion is completed.

If the medicinal food is cold like the snake-cucumber or pumpkin, it should be tempered with the opposite food as garlic and leek and if it is hot, it should also be tempered with the opposite as snake-cucumber and purslane. If the food is of obstructive type, resolving and depleting things should be used and then the person should be instructed to fast. All those who wish to maintain their health, should avoid eating unless there is a true appetite and unless the stomach and the upper intestines have emptied themselves of the previous meal. The most injurious thing for the body is to superimpose aliment upon aliment which has not been properly digested. There is nothing worse than dyspepsia, specially when this is the result of bad foods. For the dyspepsia which results from heavy foods causes pain in joints and kidneys, dyspnoea, asthma, gout, hardness of spleen and liver and phlegmatic and atrabilious diseases. If it arises from light foods, it leads to malignant acute fevers and vicious type of hot swellings.

Sometimes it is really necessary to give a food or a substance like food after a meal just by way of medicine. For example, if a person has taken pungent and salty nutriments and then after sometime, when the digestion of the former nutriments is not complete, he takes humectant tasteless aliments, the chyme of the sharp and salty nutriments is rectified. This measure is sufficient for such persons and they do not need exercise. The contrary holds good in the case of person who partakes of heavy foodstuffs and afterwards takes something which is speedily digestible and pungent. Light movement taken immediately after meals helps to detain the food in stomach particularly when one wants to sleep after meals. Severe psychic disturbances and exessive physical exercise hinder digestion. In winter foods of poor nutritional value, such as vegetables, must not be used. One should take cereals which are more nutritious and solid. In summer the diet should be reversed.

One must not satiate oneself. One must stop eating while some desire for food still remains. Such a desire of hunger will disappear after some time. Once this habit is formed it should be maintained. An unhealthy meal is that which brings heaviness to the stomach and a bad drink is that which exceeds moderation and overflows the stomach. If one ate to excess one day, one should fast the next day and take a longer sleep in a moderate place which is neither hot nor cold. In case of insomnia one should take a good deal of continuous gentle exercise without break or rest. He should also take a little pure wine.

Rufus says: "I praise such type of walk, particularly after a meal, because it gives a good preparation for the evening meal." After meal one should first remain on the right side for a little then on the left, and finally on the right side.

It should be remembered that covering the body with blanket and keeping the pillow high aid digestion. In short, the organs should make a slope downwards and not upwards. The quantity of food should be according to one's habits and vigour. A normally robust person should take so much of food as does not produce heaviness or distension of the epigastrium or flatulence or borborygmus or floating of food or nausea or canine appetite or loss of appetite or dulness of brain or insomnia or the presence of the taste of food in eructations even after a long time. The longer the lingering of the taste of food in the mouth, the worse is the food.

That the meal was moderate is inferred from the fact that it does not make the pulse large and the breathing short which occurs only when the stomach presses on the diaphragm, making the breathing short. The heart therefore needs greater supply of pneuma. Thus the pulse becomes large, there being no weakness. Persons liable to suffer from feverishness after meals should not take a whole meal at one sitting but gradually in portions so that the repletion might not cause a state like shivering which might be followed by feverishness like ephemeral fever when the food gets heated in the stomach. Persons who cannot digest the amount of food appropriate for them should increase the frequency of their diet but diminish the quantity. Persons of atrabilious temperament need a food which is very humectant but not very heating, while persons of bilious temperament require a food which is humectant and cooling. Persons having very hot blood require foods which are cold and less nutritious. Persons who generate phlegmatic blood need foods which are less nutritious but are hot and light.

Foods should be used in a definite order and a person desiring to maintain his health must observe it. Thus, one should not take light and easily digestible food after taking rich and heavy food. The reason is that the lighter food gets digested earlier and being unable to enter the blood it floats on the heavier food. Consequently, it putrefies and decays and also putrefies the food which comes in contact with it. There is, of course, no harm if such things are taken in the manner to be described shortly. Similarly, it is not permissible to take rich and hard food just after a greasy food because the hard food would pass to the intestines with the greasy food without undergoing proper digestion. Fish and similar articles of food should not be taken after vigorous exercise because they get corrupted and then corrupt the humours. There are some persons who may be allowed to eat something astringent before their meal. Such persons are those who have flaccid stomach. The food leaves the stomach very rapidly and does not stay in it for long enough to undergo digestion. The condition and temperament of the stomach should be always taken into consideration. There are some persons in whom light and easily digestible food undergoes corruption in the stomach. Whereas rich and slowly digestible foods are digested easily. Such persons are those who have excessive heat in stomach. There are also those who are of the opposite type. (In short) regimen for an individual should be prescribed in accordance with his habits.

Countries have their own climatic conditions. Similarly, temperaments (individual) have too many aspects to be comprehended. It is, therefore, necessary to keep this in view and be guided by experience rather than rule. Thus, a favourite food, though injurious to a certain degree, may be more appropriate (for a given individual) than a food which is not one's favourite though it is of good quality. Every physique and every temperament has its own appropriate diet which is of a similar quality, but when it is intended to alter the physique and the temperament, food of a contrary quality should be given. Good and wholesome foods may be injurious to some. They should, therefore, avoid them. Persons who are able to digest bad foods should not be deceived because they will some day give rise to such bad humours as may lead to sickness or (even) death. Good food may often be allowed liberally to a person having bad humours in his body, specially when he is too weak to use a purgative. Persons who have such flabby bodies as yield easily to dispersion should be given moist and easily digestible food, even though it is a fact that such persons can digest different kinds of heavy foods and are less likely to be affected adversely by internal causes and are more susceptible to the injurious effect of external causes. A person who eats meat excessively and is accustomed to luxurious life should be regularly venesected. If the venesection causes cooling of temperament, he should use confections, myrobalans and similar other things which purify the body, the intestines and their adjoining vessels.

It is very bad to mix up different types of foods in one meal. Spending too much time over meals is also bad but to a lesser degree. For by the time the last portion of food enters (the stomach), the first portion begins to be digested. Hence various parts of food are not homogeneous in the process of digestion. It should be remembered that the best foods are those which are tasty because the stomach and the retentive faculty readily accept them, if they are of good substance and if all principal organs are in harmony and without any defect. This is a requisite condition. If, however, the temperaments of the organs are not normal or they have opposite temperaments, as, for instance, the liver which is opposed to the stomach (in temperament) to an unnatural extent, the aforementioned rule will not hold good. Among the noxious influences of a very delicious food is the possibility of its being taken in excess.

For persons fond of eating heartily it is best to take only one meal a day, and two on the next, i.e, morning and evening. But here it is necessary to keep the personal habits in view. Those accustomed to eating twice a day become weak and debilitated if they eat only once. Such persons, even if they have weak digestion, should take the (usual) two meals and reduce the quantity of food each time. Similarly, a person who is accustomed to one meal a day and then resumes the habit of two meals a day, becomes weak, lazy and slack. If such persons stick to a meal (only in the morning), they become weak towards the evening and if they take food only in the evening, they are unable to digest it and have sour eructations, bad mood, nausea, bitter taste, and loose bowels. This is because they have put into the stomach something to which they are not accustomed and they develop the symptoms which befall a person whose food is not fully digested. You will presently come to know these symptoms.

And among these symptoms are: cowardice, pain, and irritation and pain in the cardiac orifice. Because of stomach being empty, it contracts and gives rise to the feeling that the intestines and viscera are suspended. They also suffer from burning micturition and defecation. Sometimes they have a feeling of cold in extremities because the bile flows towards the stomach. It is more likely in persons of bilious temperament and also in those who have (much of) bilious humour in the stomach but not in the whole body. Such persons suffer from loss of sleep and keep turning over from one side to the other (in bed). Persons in whose stomach the bile gets accumulated should have a variety of easily digestible foods. They should take their meal before bathing. For other persons it is necessary to take exercise first, then the bath and then the meal. They should not take food before bathing. Persons who have to take food before exercise should take only bread in a small quantity so that it starts getting digested before exercise begins. Whereas it is necessary that the exercise taken before food should not be mild. It is necessary that the exercise taken after food should be mild and gentle. For such a bad appetite as prefers pungent things and loathes sweet and greasy things, there is no better treatment than to procure emesis with things like oxymel and radish after fish.

Obese persons should not eat any thing immediately after bath, but should wait and take a little nap. They are best advised to eat only once a day. One should not go to sleep immediately after the usual meal, with the food still floating in the stomach and one should completely abstain from strenuous exercise after meals as otherwise food will get absorbed into the blood before it is digested or glided out of the stomach without being digested or its temperament will be corrupted by excitement. After a meal one should not drink so much water that it might cause the food to leave the stomach and float about. But one should abstain from drinking water till the food has passed down from the stomach. This is inferred by the sensation of lightness in the upper part of the abdomen. However, if there is urgent thirst one might sip a little quantity of cold water. The cooler the water the greater will be the satisfaction even though the quantity is small. A small quantity stimulates the stomach and contracts it. In short, if water is taken just after the meals and not during the meals, it is permissible only in such quantity as would moisten the food. To go to sleep while thirsty is beneficial to persons of cold and moist temperaments but is injurious to those of hot and bilious temperaments. The same is true as regards going to sleep while fasting. In bilious persons fasting causes bile to flow to their stomach. So, when they eat anything, it is corrupted and the same symptoms arise in them whether asleep or awake as arise in the persons in whose stomach the food has undergone corruption. They also suffer from loss of appetite. In such cases some mild things which might pass (the food) downward and relax the bowels without any trouble, such as bukhara plum and a little of manna must be given. Then food should be taken when the appetite returns to normal.

Those whose bodies are moist by virtue of natural moisture are liable to speedy dispersion of moisture. Hence they are not able to stand hunger for so long a period as the persons of dry bodies do unless they are full of the moistures which are other than those already present in their organs and are also good and able to be fully converted by the physis into actual food. To take wine after meal is very injurious because it is quickly digested and enters the blood and hence causes undigested food to enter the blood. Thus it produces obstruction, putrefaction and sometimes scabies. Sweet things readily produce obstructions because the physis draws them (into the blood) before they have been properly digested. Obstructions culminate in various diseases of which dropsy is one. Heaviness of the air or water, especially that of summer season, corrupts the food. There is no harm, then, to take diluted wine after a meal or hot water in which aloe wood and mastic have been decocted.

When heavy food is taken by persons having strong heat in their viscera, it is often converted into gases which distend the stomach and the adjacent regions. Hypochondriasis occurs in such cases. When a person takes light food upon an empty stomach, the latter receives it fully. If later on, some heavy food is taken, the stomach abhors it and does not digest it (properly). Thus the food is corrupted. This would be avoided by allowing an interval of time between the two kinds of foods. Under these circumstances it is best to take the heavy food a bit earlier because the stomach, then, would not fail to digest the lighter food. When the food is taken in excess or churned in stomach by movements or is disturbed by (too much of) drink, it should be vomited quickly. If time passes away or the patient is unable to vomit, he should sip hot water little by little because it makes the repletion pass down and promotes sleep. The patient should therefore lie down and sleep as long as he could. If these measures fail or are not available you should reflect. If the physis itself suffices to expel the matter, it is well and good. If not, assist the physis by taking any laxative. In the case of persons with hot temperaments, myrobalan electuary and laxative confection of roses with some preserve of origanum should be given, but for those with cold temperaments, confections of cumin, *shahryaran* and tamarind are suitable.

Repletion with drinks is not so bad as with food After such food one of the good remedies is to take aloe in the dose of 375 mg. or half a *dirham* each of aloe and gum terebinth with six gm of borax. Another mild remedy is terebinth resin equal to two or three gram-seeds. Sometimes in equal or less quantity of borax is also mixed with the terebinth resin. Another much praised remedy is to use epithyme with wine. If none of these things is available, the patient should have a prolonged sleep and one day fasting. Then, if there is no heaviness in the stomach, the patient should bathe and foment the stomach and use light foods. If in spite of these (mentioned) measures, food is still not properly digested and it produces heaviness, distension and lassitude, it is obvious that the vessels have been repleted with its superfluity. It is because the excess of food even when digested by the stomach is rarely digested in the vessels. But it remains crude within them and distends them and sometimes produces even rupture in them. Besides, it produces lassitude, fatigue, stretching and yawning. The treatment in such cases is a purgative which might expel superfluities from the vessels. If these symptoms are not there and only fatigue is felt, rest should be given for a while. If the fatigue persists, it should be treated in the special way we are going to describe. A man who is very advanced in age cannot digest as much of food as he could in his youth. Hence his food turns into superfluity. So he should not eat as much as he used to do but somewhat less than before. When persons accustomed to heavy diet, suddenly change over to light food, the empty space left in the channels is filled with air. Again when they revert to eating heavy food, they develop emboli.

The ill-effects of hot foods are removed by use of oxymel, especially with the one prepared with seed. For, it is the most useful oxymel provided it is prepared with sugar. If prepared with honey, the simple oxymel will suffice. The ill effects of cold foods are removed by using honey water, honey wine and confection of cumin. The ill-effects of thick foods are to be removed in a person of hot temperament with oxymel made of strong seeds and in the case of a person of cold temperament, a little quantity of pepper or mint electuary should be given. Light foods are better for the health, but less valuable for vitality and strength. Heavy foods have the opposite value. Hence the persons who need strength and thus need foods of strong-chyme, should eat only when their urge for hunger is very strong and should avoid over-eating so that the food might be (properly) digested. Heavy foods are better borne by the persons who perform plenty of exercise and labour. Among the factors favouring the digestion of heavy foods, in this case, is their deep and undisturbed sleep. As these persons perpspire profusely and there is much dispersion from their bodies, their livers absorb the nutriment which is not yet properly digested. Thus towards the end of their life or even earlier they are predisposed to many serious diseases. It is so because they overrate their digestive power which they once had due to their (deep) sleep. But, as they become old, this deep sleep is lost owing to frequent insomnia.

Fresh fruits suit only those persons who do strenuous work and much exercise and have bilious temperaments but that is only during summer and before meals. These fruits are apricot, mulberry, sweet melon, peaches and bukhara plum. But it is better to regulate oneself by using other substances of food than these. For all of these fruits render the blood too watery and ferment inside the body just as the juices of fruits do outside. Although such things temporarily benefit, in the long run, they pave the way for putrefaction. Similar is the case with all such things which add crude humour to the blood, such as, cucumber and yellow cucumber, though it might be sometimes, beneficial. This is the reason why people using such things in excess are predisposed to fevers although these are initially cooling. It is to be remembered that sometimes watery humours become 'ichorous'. This happens when these are not dispersed but congested in the blood vessels. However, when these persons (using fruits in excess) take exercise before these humours have accumulated or rather take exercise immediately after eating fruits, the aquosities disperse away and the ill effect of the fruits is thereby lessened. It should also be noted that the presense of crude and watery humours in blood prevents the (nutrient part of) food from adhering to the tissues. Hence the nutrition of the body is deficient. It is proper for a person who takes fruits to go for a walk afterwards and then eat something so that the fruit may pass down along with the food.

Foods which produce (excess of) aquosity and thick, viscid and bilious humours, cause fevers. It is because their watery portion causes putrefaction in the blood, their viscid and thick portion causes obstructions in the orifices and channels, their bilious portion produces heat in the body. An intensity in the blood is formed from such foods. Bitter vegetables are sometimes very advantageous during winter while the tasteless ones are more beneficial during summer. If a person has to take unwholesome foods, he should reduce the number (of meals in a day) i.e. should eat after long intervals and combine with his food something of the contrary effect. Thus, a person who is liable to be upset by sweets, should, take afterwards sour things, such as vinegar, sour pomegranate, acetous oxymel and quince. He should also carry out evacuation. Persons liable to be upset by sour things should take after such things as honey and old wine but this is to be done before the maturation and digestion of the food already taken, are complete. The ill effects of fatty food are similarly corrected by: (a) acrid things such as chest-nut, myrtle-seeds, Syrian carob, Christ's thorn and azarole; (b) bitter things, such as bitter elecampane (c) salty or pungent things, such as kamakh (a kind of sauce), vinegar sauce, onion and garlic and vice versa.

Persons having thin morbid humours in excess, should be given wholesome food quite freely. If a person's body is such as they can be eaily dispersed, he should be given moist and quickly digestible food. According to Galen moist food is the one which is free from all other qualities and is as it were tasteless—being neither sweet nor sour, bitter nor sharp and astringent nor salty. Flabby persons tolerate heavy foods better than the muscular ones. Excessive use of dry food impairs appetite, impairs complexion, and produces dryness in disposition. Excess of fatty foods produces lassitude and loss of appetite. Excess of cold things produces lassitude and weakness. Excess of sour and pungent things induces premature senility. Excess of salty food is injurious to stomach and eyesight.

If a fatty and wholesome food is followed by an unwholesome food, it will corrupt the former. Viscid foods are slow in descending (through the stomach and intestines). That is why an unpeeled cucumber passes down more rapidly than a peeled one. Similarly bread made of flour with the bran passes down more rapidly than the one made of sieved flour. If a fatigued person takes a light diet and then takes heavy food such as milk with rice to satisfy hunger, he is likely to develop intensity and heat in the blood, and would thus require venesection even if he had taken it recently. The same is true when an angry person takes milk with such things. It should be remembered that nature absorbs the sweet diet before it is (properly) maturated and digested and hence the blood is tainted.

Certain rules must be noted in regard to combining various substances of food. According to experienced Indians and others, sour things and fish are not to be taken with milk because this causes various types of severe diseases including leprosy. In their opinion curd should not be taken with cheese or bird's meat; flour of roasted barley should not follow rice and milk, similarly fat and oil stored in a copper utensil should not be used with eatables and the meat roasted on coal of castor-wood should not be taken. To take different types of foods together proves harmful in two ways: (a) the rate of digestion is diverse and so there is a mixture of digested and undigested food; (b) the greater variety of food encourages the intake of more food at a time. The hard-working people of olden days avoided this error and used to eat meat at noon and (simple) bread at supper time.

The best time for meals during summer is relatively cooler one. Suppression of appetite fills the stomach with unhealthy 'ichorous' matters.

Remember that *'Kabāb'* (a variety of roasted meat) when digested are very nutritious but they slowly pass down as they linger in caecum. Meat-soups are excellent. If these are prepared with onion act as carminative and otherwise produce gases. Some people consider that grapes are good to be taken after eating the roasted head (of a goat). But this is not correct. Indeed this is very unsuitable and similar is the case with wine. It is rather better to eat pomegranate seeds without their refuse. Partridge (meat) is dry and constipating but chicken is moist and relaxing to the bowels. The best way to roast a chicken is to stuff it in the belly of a kid or lamb. This would preserve its moisture. Remember that chicken-broth tempers the humours strongly, more than the fowl broth—but the latter is more nutritious. Kid (meat) is relished better if served cold as its (unpleasant) vapours are then no more. Lamb is better if served hot as its unwanted odour is thereby dispersed. *Zīrbāj* (kind of spiced broth) when prepared for persons of hot temperament should not contain saffron. But when it is for persons of cold temperament, it is necessary. *Halwa* (a sweet dish) prepared with sugar like *faluzaj* is unhealthy because it causes emboli and evokes thirst. When bread is not digested, the harm that follows is great but when meat is not digested the harm is comparatively less.

Section XIII

Drinks

For the persons of equable temperament best water is that which is moderately cold or has been cooled by ice externally, especially when the ice were not pure. The same is true in case of good ice also because water obtained by melting such ice is harmful to the nerves, respiratory organs and the viscera. Moreover, a person cannot tolerate it unless he is markedly of sanguineous temperament. If ice-water does not harm a person at present, it will do harm after a long time or in old age. Experienced persons opine that one must not intermingle well water with river-water, except when the one of the two has passed out of the stomach. We have already spoken about the choice of waters and how to correct them when they are not good. (It is worth remembering that) water can also be corrected by adding little vinegar to it.

It should be remembered that it is harmful to drink water after exercise or after the bath, especially on an empty stomach. Similarly the satisfaction of false thirst at the night is also harmful. False thirst (generally) occurs in drunkards or topers or when the physis is engaged in digesting the food even after the preceding satiety with water. However, if one is very thirsty the thirst should be satisfied by (going into) the cool air or rinsing the mouth with cold water. If this fails to satisfy the thirst, water may be taken (in sips) out of a vessel with a narrow mouth. Sometimes drunkards are benefited by it and they are not hurt by drinking before breaking their morning fast. If a person cannot avoid drinking water on an empty stomach, especially after exercise, he should first take wine diluted with hot water. Persons having false thirst should know that it may be relieved by going to sleep without quenching it with fluid. For, during sleep, physis disperses the matter which is the cause of the thirst, especially when sleep and patience (i.e. abstaining from quenching the thirst with fluid) are combined then the nature, which maturates the matter is quenched by means of drinking water, is submissive to it, the thirst would relapse because the cause of the thirst still exists. One who has false thirst should not take water copiously but in sips. It is bad to drink much cold water. If it is very imperative to do so, it should be taken (only) after a sufficient meal. Tepid water produces nausea. Warmer water, if taken in excess, weakens the stomach. But when taken occasionally, it washes out the stomach and relaxes the bowels.

White and light wine is suitable for the persons of hot temperaments. It does not cause any headache; on the other hand, sometimes it has a moistening effect and thus relieves the headache caused by the irritation of stomach. A substitute for the light and white wine is the wine which has been clarified by infusing a piece of cake or bread in it, especially when this is done two hours before the wine is taken. Thick and sweet wine is suitable for the persons desirous of putting on weight or gaining strength. But they must be aware of developing obstructions. Old red wine suits persons of cold and phlegmatic temperaments. It is bad to take wine after any food for the reason we have already explained. Hence it should not be taken until the food has been digested and passed through the stomach. To take wine upon food for forming bad chyme, either during or after the food is digested, is bad because it causes the bad chyme pass into the remote parts of the body. The same is true if wine is taken after fruits, especially sweet melon. It is better to take wine in small cups than in big ones. There is no harm if two or three cups of wine are taken by those accustomed to it. The same is true of the healthy persons who have been recently venesected.

Wine is beneficial for the persons of bilious temperament because it evacuates bile. It is good for persons of moist temperaments because it matures the moistures. The better the aroma, flavour and taste of the wine, the more beneficial it is. Wine is very effective in penetrating into the whole body. It cuts phlegm and disperses it and expels bile through urine etc. It makes the black bile slippery and hence it is easily eliminated from the body. Moreover, it counteracts the harmful effects of this black bile by its contrariety. Wine resolves every type of solid matter without producing more foreign heat. We shall describe the varieties of wine in their appropriate places. Persons with healthy brains are not easily intoxicated by wine and their brains do not receive its ascending bad vapours. Moreover, only an expedient degree of heat reaches their brains. Hence their mental power becomes clear that it was not possible with the same degree of heat in the case of other persons. The effect is different on persons who are not of this calibre. A person, who is weak in chest—to the extent that he suffers from dyspnoea in winter—cannot take much wine in winter. A person who wishes to take much wine should avoid greater quantity of food and include some diuretic substance in it. If the person takes greater quantity of food or wine, he should vomit and take honey-water and then vomit again. Afterwards he should wash out the mouth with vinegar and honey, and also wash the face with cold water. When persons with excessive heat in the body and liver are upset by wine, their diet should include *hisramiah* (a dish of unripe sour grape) and the like and things like pomegranate and citron should be given as dessert. Persons liable to suffer from headache should take less wine and take it diluted and clarified. Some kind of dessert such as of quince should be taken with wine. Persons who suffer from heat in the stomach should take roasted myrtle-seeds and should suck camphor lozenges besides other astringent and sour things. If wine proves harmful owing to the cold in the stomach, Indian cypress, cloves, and citron peel should be taken as dessert.

It should be remembered that old wine is like a medicine and is less nutritious. Fresh wine is injurious to liver and causes hepatic diarrhoea due to its flatulent and diarrhoeial tendency. It should be noted that the best wine is the one which is neither too old nor too fresh, clear, whitish-red in colour and pleasant in odour. It has a moderate taste-neither sour nor sweet. A good wine which is known as *maghsul* is prepared by boiling three parts of grape juice with one part of water till one third of the whole is left. On taking wine if one feels burning (in the stomach) he should sip pomegranate juice and cold water just after it. Next morning he should take syrup of absinth and enter the bath and thereafter some light meal should also be taken. It should be remembered that diluted wine makes the stomach loose and humid. It intoxicates quickly because the watery constituent takes it (quickly) into all the parts of the body. It however cleanses the countenance and sharpens the psychic faculties. Wise persons will avoid drinking wine on empty stomach in the morning. It is to be avoided by the persons of hot temperaments till their limbs have fully received the due portion of water. Similarly it should also be avoided after vigorous exercise. In these two circumstances it injures the brain and the nerves and thus leads to convulsion and mental confusion. Wine should be avoided in hot diseases and in hot weather. Frequent intoxication is bad. It corrupts the temperament of the liver and brain; weakens the nerves and causes nerve diseases, apoplexy, and sudden death. When wine is taken in excess it is transformed into corrupt bile in the stomach of a person and into sour vinegar. In both the cases the harm is great.

According to some people, drinking wine once or twice a month is beneficial as it eases the psychic faculties, inclines one to repose, eases the discharge of urine or sweat and "disperses" the superfluity. It should be remembered that the most detrimental effect of wine is that upon the brain. Hence mentally weak persons should take only a small quantity of wine and that too, diluted with water. For a person, who has drunk wine profusely it is better to vomit if possible. In the absence of that he should drink a considerable quantity of hot water either plain or with honey. Then, after vomiting, he should have a sitz bath and be rubbed with plenty of oil and left to go to sleep. In childhood, drinking wine is like adding fire to a weak (i.e. scanty) fuel. Elderly persons may be allowed to drink within the limit of tolerance but the young need to take it in moderate quantity. Wine is borne better in a cold country than in a hot one. If a person wishes (deliberately) to take a full dose of wine, he must not fill (his stomach) with food or eat anything sweet. But he should take fatty soups, grated bread steeped in broth and fatty meat cut into pieces. He should take these in moderate quantity and avoid physical labour. He should take almonds, salted lentils and a condiment prepared with pickled capers as a savoury dessert with the drinks. If he takes *Kurunbia* (a dish made with cabbage) and olive prepared in water and the like, it proves beneficial and conducive to drinking more wine.

Similarly all those things which "dry up" the vapours are beneficial such as seeds of nabatian cabbage, cumin, dry common rue, mint, *nafti* salt and ajowan. Viscid and sticky things make the vapours (of the body) thick. And these are such as sweet and viscid foods. Hence such things hinder intoxication though they do not conduce to drinking much wine owing to their slow penetration (into the tissues). Rapid intoxication is produced by: (a) weakness of brain; (b) abundance of humours in the brain; (c) potency of wine; (d) scanty food; (e) irregularity in observing the various rules pertaining to the use of alcoholic drinks.

Intoxication from weakness of the brain should be treated like a chronic catarrh affecting the head with ailments mentioned in that particular chapter and the patient should also take less drink.

Intoxication may be delayed using any of the following preparations:

(1) one part of juice of white cabbage; one part of juice of sour pomegranate; a half part of vinegar; these are boiled together; it should be taken in the quantity of 30 gm before taking the wine;

(2) Pills made of salt, common rue and black cumin; these are to be made dry and one pill to be taken (after each drink).

(3) Take seeds of nabatean cabbage, cumin, peeled bitter almond, mint, absinth, *nafti* salt and dry common rue. These should be taken in the doses of 7gm with cold water on empty stomach. This is recommended only for those who do not fear any kind of injury owing to its heating effect.

One of the measures for curing intoxication is to drink water and vinegar consecutively for three times or to take whey and sour jogurt. Camphor or sandal wood odour should be inhaled, cold repellent drugs should be applied over the head—such as rose oil and vinegar of wine. The treatment of hangover (intoxication) will be discussed under particular diseases. If a person desires to be quickly intoxicated without being harmed, he should soak rockmoss and eagle wood in the wine. If for the treatment of a painful member a deeper unconsciousness is required, the patient should be given wine with the water of tars darnel or he should be administered henbane half a *dirham* (1.75gm) and each of fumitory, opium and nut meg, *suk* and eagle wood in the quantity of 250 mg. This preparation should be taken with wine if it requires so. Another preparation may also be taken by boiling black henbane and the peels of belladonna in water till it becomes red. This decoction should be added in the wine.

Section IX

Sleep and wakefulness

The causes of normal and abnormal sleep and their opposite the normal and abnormal wakefulness, necessary measures for restoring each whenever lacking and for treating it when it becomes harmful and the significance of each and all other points about them have been described in brief in the appropriate place. The other things will be described in the Part on treatment. Here it may be said that moderate sleep helps the physical faculty in its functions, gives repose to the psychic faculty and thus increases its "essence". With its relaxing effect, sleep prevents the dispersion of pneuma of every kind. This is the reason why the digestion of food in several aforementioned stages is accomplished and the weakness arising from dispersion in various ways i.e. from fatigue, coitus or anger etc. is remedied. Moderate sleep is "moistening" and warming if at the same time humours are also moderate in quntity and quality. This is the best thing for the aged persons because it preserves and restores the moistures of their bodies. That is why Galen—as he has described—used to eat spiced lettuce-curry every night. It is because lettuce induces sleep and spices rectify the coldness of the lettuce. He used to say, "I am now careful to have sleep because I am an old man and the "moistening" effect of sleep is beneficial to me and this is the best regimen for one who suffers from sleeplessness."

If a bath is taken after the digestion of the foods has been completed and plenty of hot water is poured over the head, this will prove very helpful (in inducing sleep). We shall mention more effective methods (for inducing sleep) when treatment and therapeutics are discussed. Healthy persons should pay attention to matters of sleep. It must be moderate, properly timed and excess must be avoided. They must avoid the mental harms caused by insomnia. Often a person is tried to keep awake and refrain from sleep owing to the possiblity of occuring syncope and loss of strength. The best sleep is that which is deep and occurs after the food has passed down from the upper part of the stomach and after the flatulence and borborygmus which may have followed, have subsided. For, in the presence of these conditions, sleep is harmful in many ways. Under such circumstances sleep would be neither sound nor regular and restlessness and turning from side to side will follow. It is harmful and thus injures the affected persons. For this reason, if the passage of the food (out of the stomach) is delayed, one must take a little walk and then retire to sleep.

Sleeping on an empty stomach is bad. It causes weakness. It is also bad to go to sleep with a stomach replete with food which has not passed down from the upper part, because sleep cannot be sound in such circumstances and it is accompanied by restlessness. When physis tries to attend to digestion—as it usually does in the state of sleep—sleep is disturbed which purturbs the physis and weakens it. Thus the digestion is distrubed. Sleeping in the day time is equally bad as it predisposes to diseases arising from humidity and catarrh, spoils the complexion and causes diseases of spleen. Moreover, it makes the nerves loose; produces laziness and impairs appetite. It often causes swellings and fevers. One of the causes of the injurious effect of sleeping in day time is that sleep is apt to be easily disturbed and physis becomes ineffective in its function. The advantages of sleeping by the night are that it is full, continuous and deep. If a person is accustomed to sleep during the day, he should not suddenly abolish it but leave his habit gradually.

The best way of sleeping is to lie on the right side and then turn over to the left. Sleeping on the belly first helps digestion very much because it confines and encompasses the innate heat and thus intensifies it. It is bad to sleep on the back. It predisposes one to bad maladies like apoplexy, paralysis and nightmares. This is because the superfluities flow to the (back of head) and thus are prevented from entering the (natural) channels which are in front, like the nostrils and the palate. Debilitated patients generally sleep on their backs because their muscles and members are so weak that one side cannot bear the other. Hence they quickly return to the supine position as the back is more powerful than the sides. It is for similar reasons that such weak persons sleep with their mouths open because the muscles which keep the jaws closed are weak. A full chapter is allocated on this subject in the Volume dealing with particular diseases.

Section X

Matters which should be mentioned later

Among the matters which are generally discussed at this place is the one pertaining to coitus and its moderation and the measures to be taken to correct its harmful effects. We postpone these discussions to the Book dealing with particular diseases. At this point one would discuss also purgatives and the management of their harmful effects. But we shall be dealing with some of these matters in our dissertation on Treatment and with some discussion of the purgatives. However, we may say here that a person who wishes to preserve his health should undertake evacuations by the bowels, the urine, the sweat and the sputum. Similarly women should follow the rules and regulations regarding menses. We shall elucidate and explain it in its (proper) place.

Section XI

Toning up debilitated members and their development

Members which are weak and under-developed may be strengthened. The members of the persons who are still in the stage of growing and developing may be strengthened by taking nutritious diet and in those persons who have just reached final limit of growth it is achieved by moderate massage and exercise which is persistent and suits to those members and local applications of pitch. Holding the breath is also among such measures, especially when the member is in the chest and lungs regions. For instance, if a man has weak legs, we will advise him to take a short running exercise and try a moderate massage and local applications of pitch. Next day he should have the same amount of massage but increase the running exercise. On the third day the massage given is of the same amount as before but the exercise is still increased further. During the course of exercise and massage, if there is the sign of the widening of blood vessels and 'pouring of matter' there, this regimen should be left off. In such cases some swelling and repletive disorder is feared in each member according to its specific nature, for example, varicose veins and elephantiasis in the case of legs. Therefore, if anything of that kind appears, exercise and massage should be reduced or rather stopped. Rest in bed should be advised and the affected member should be kept (slightly) raised. For instance, if the persons have an emaciated leg, raise it by the foot and massage it contrary to the first massage, i.e. from its distal towards its proximal end. If we wish to carry out this method for a member nearer to the organs of respiration—such as chest—we should apply a medium-sized bandage to the lower part of chest and have it moderately tight. Then we advise the patient to exercise his arms and to hold his breath quite deep, shout and raise his voice to a high pitch and have a gentle massage. You will find the full details of all these in the Book dealing with the particular diseases. Hence you should wait for the Book on Beauty Culture. As emaciation and debility in old age often result from (excess of) cold and dryness, the regimen for these is the same as for phthisis in old people. Some notice has been taken of it in the Book on Beauty Culture.

Section XII

Fatigue following exercises

There are three types of fatigues but a fourth type has also been mentioned. Causes of fatigue fall under two heads. Thus the three types of fatigue are:

(a) ulcerous fatigue; (b) tension fatigue; (c) inflammatory fatigue and the type which is mentioned as the fourth is known as desiccatory or dry or asthenic fatigue.

Ulcerous fatigue: In ulcerous fatigue one feels something in the outer and inner part of the skin and by touching he might feel it as an ulcer. The more serious fatigue is that which is in the inner part of the skin. Sometimes this is felt by touch and sometimes the afflicted person feels it while he makes any movement. Occasionally there arises a sensation of pricking of thorns and thus the afflicted persons shun all movements and avoid even stretching the body or do so very slowly. When this fatigue is intense the afflicted persons feel horripilation and if it increases further, they have rigors and fever. The cause of ulcerous fatigue is the excess of thin and acute superfluities or "liquefaction" of flesh and fat due to violent movements. In short, if the morbid humours diffuse into the blood vessels, their injury is counteracted by good blood. But, when they get into the skin, they reach there with their original harmfulness. The least of the afflictions caused by such humours is the occurrence of this type of fatigue. If these humours move a little, they cause horripilation and if they make a substantial movement they cause rigors. Sometimes acute humours of these superfluities force their entry into the blood vessels and remain there in an immature form and at times they may remain in an immature form even in the flesh.

Tension fatigue: In this fatigue a person feels as if his body is contused and he also feels heat and tension. Moreover, he dislikes movement even by stretching (of limbs), especially when this fatigue results from (excessive) toil. Tension fatigue is caused by the superfluities which are confined in the muscles. But these superfluities are of good substance and have no irritative effect. Sometimes this fatigue is caused by gases. These two types are differentiated on the basis of lightness and heaviness. Often this fatigue results from unsound sleep. If, however, it appears after sound sleep, there is likely to be some other cause. It is the worst of all types of fatigues and still worse is the one which stretches the tissues of the muscles very much.

Inflammatory Fatigue: In this fatigue the body becomes warm and appears to be swollen, voluminous and discoloured. There is aching in both touch and movement and there is also a feeling of tension with it.

Asthenic fatigue:: In this fatigue a person feels excessive dryness and desiccation in his body. It is caused by strenuous excercise which is followed by a restorative and rough massage even when the chyme (in the body) is good. Sometimes it is caused by dry air, malnutrition and fasting.

The two causes of fatigue are:

(1) It results from exercise and this type of fatigue is not so severe and has its own distinctive treatment.

(2) It occurs spontaneously and is prodromal to some illness. It has its own distinctive treatment. Sometimes one type of fatigue gets combined with another according to the admixture of their matters which get compounded either spontaneously or owing to exercise when you have learnt how to manipulate the simple fatigues, you may apply it to the treatment of the compound fatigues also on the basis of the rules I am going to describe latter. The principle is that greater attention should be paid first to the more important matter, keeping also the less important one in view. Any matter is to be considered important for three reasons, (1) because of its power; (2) because of its superiority; (3) because of its substance. When two or all the three of these conditions are combined in a fatigue, it is more important. When, however, only one condition of some fatigue is stronger enough to resist the two conditions of the first type, it becomes more important. Example: Inflammatory fatigue is stronger and superior. But, if the substance of ulcerous fatigue is much deviated from equability and normal course, it resists the two factors of the inflammatory fatigue. Thus the attention is first paid to the ulcerous fatigue. And if the deviation from normal course is not very much, the attention is to be given first to the inflammatory fatigue.

Section XIII

Stretching and yawning

Stretching of limbs occurs owing to the superfluities, accumulated in the muscles. This is why it happens often after sleep. When these humours accumulate in plenty, horripilation and rigors set in. If the accumulation is still increased, it causes fever. Yawning too is a kind of stretching produced by some cause which occurs in the muscles of jaws and lips. In the beginning in a healthy person frequent yawning and a stretching without any apparent cause is not appreciable. Their excess at an inappropriate time is also bad. The good kind of yawning and stretching is that which occurs at the time of last phase of digestion because it occurs for the expulsion of superfluity. Sometimes yawning and stretching are caused by cold, denseness, lack of dispersion and wakefulness before enjoying full sleep. Yawning and stretching assist expulsion by constricting the muscles. Wine mixed with an equal quantity of water is useful in the case of yawning and stretching provided there are no contra-indications.

Section XIV

Treatment of fatigue caused by exercise

We say that (prompt) care for the treatment of a fatigue is a must for preventing several diseases and even fevers. If exercise be the sole cause in ulcerous fatigues, it must be reduced as soon as the fatigue appears. If, however, excess of humours is an associated cause, the humours should be eliminated or, if the associated cause be recent dyspepsia, its harm should be counteracted by fasting, depletion and dissolution. The matter, which reached towards the skin, should be dispersed by excessive gentle massage with oil having no contracting effect. And restorative exercise should be done on the next day. On the first day the food provided should be in usual quality but the quantity should be reduced. The next day some moistening food should be given. If the blood vessels are clear and immature matter is in the muscular tissues of the fatigued person, massage maturates it, especially when the efficacy of the 'hot' medicines finds an access to it. Oil of white poplar is very useful for this purpose. Similarly oils of dill, chamomile and the like and decoction of beet root prepared with oil in a vessel placed in another vessel and oils of the root of marsh mallow, squirting cucumber, *bryonia alba* and rockmoss all are useful. Similarly all the oils to which rockmoss is added are useful.

The aim in treating tension fatigue is to relax what has become rigid. This is to be achieved by gentle massage with oil warmed in the sun and by sitz bath with tepid water and the bath is to be prolonged so much that even if it is taken twice or thrice a day, it is permissible. Oil should be rubbed after each bath. If, because of wiping off the sweat oil is also wiped off and the application of oil is further needed, it should be done again. Then a small quantity of some moistening food should be given because in this type of fatigue reduction of food is more needed than it is in ulcerous fatigue. This type of fatigue is relieved by exercise and sometimes even by itself. When fatigue arises spontaneously from excessive thick superfluities, depletion becomes essential. If it results from distending gases, it is relieved by cumin, caraway and anise.

The aim of treating inflammatory fatigue is three fold: (1) relaxation of the distended tissues; (2) regimen for heat and (3) depletion of superfluity. These aims are achieved by the following methods:—(a) excessive application of warm oil; (b) very gentle massage; (c) prolonged stay in water inclined to warmth and (d) rest.

The treatment of dry fatigue is the same as that in the case of healthy persons. But the water with which the patient of dry fatigue baths should be warmer. It is because the warm water has "thickening" effect on the skin and even then it has no such harm as the old water has. For, though the cold water has also thickening property, there is the danger that its coldness might penetrate into the debilitated parts of the body. Sometimes the cause of leanness is the porosity of skin or rather this is the cause in most cases. Next day restorative exercise should be performed slowly and gently; the bath should be taken in the way in which it was taken on the first day. Then the patient should be asked to enter cold water suddenly so that his skin might be dense and dispersion might be reduced and the moistures of the skin might be preserved. Moreover, water comes in contact with a body which has sufficient heat to combat it as the body has already been made dense.

These two factors assist each other in preventing the injurious effect of the cold water, especially when the person comes quickly out of the water into which he was plunged himself and does not stay (longer) in it because he is not secure from the (harmful effect of the cold water) if the stay in cold water is longer. Then a small quantity of moistening food should be given at about midday so that massage may be carried out once again towards the night. In such cases the evening meal should be delayed and attempt should be made to remove the superfluities from the body. Massage should be carried out with sweet oil. But abdomen is not to be rubbed unless there is a feeling of fatigue in abdominal muscles. In that case massage is to be carried out slowly and gently. Food should be given more (than usual) but care should be taken that it is not very hot.

The fatigue which is caused by exercise does not appear if the exercise is stopped as soon as there appears any sign of it. Then one should proceed to restorative exercise so that the moderate movement might push the matter towards the skin and the massage at intervals during the course of exercises might disperse it. The condition of a fatigued person is known from (the effect of) bath. If the bath induces shivering, (it indicates that) the fatigue has crossed the (moderate) limit, especially when the bath causes fever also. In such a case bathing must be stopped and depletion and rectification of the temperament *must be tried in stead.* If bathing does not produce any of these symptoms, it is beneficial provided it is given with lukewarm water. If there are immature humours in the vessels of a fatigued person, necessary measures for curing the fatigues should be taken first. Then one should adopt measures for maturation, attenuation and then elimination of the immature humours. If these are plentiful, then the person should be advised to take rest and give up exercise because rest assists maturation. Venesection should also be avoided because it often expels pure matters and leaves behind the immature ones. Purgatives should also be avoided before the maturation (of morbid matter) as they do no good but cause discomfort. There is no harm if diuretics are used. But very hot things should not be given, for, it would lead to the diffusion of immature matters throughout the body. If, however, hot things are used they should be used carefully in moderate quantity,. Diet of such patients should include pepper, caper, ginger, vinegar of caper, vinegar of garlic, vinegar of camel thorn and also the substance of these vinegars. The well-known electuaries should also be given in suitable doses. After maturation (of matter) and appearance of sediments in urine and maturation of the dominant sediment wine should be used to complete the process of maturation and diuresis. Wine must be light and thin. Besides, vomiting should not be allowed

Section XV

Measures against side effects of exercise

These are the after effects of exercise: condensation, expansion, excessive moistening and excessive dryness. We may first speak about these states and then pass on to the regimen for the fatigues arising spontaneously.

Expansion of the body: Very often this results from insufficient massage and from bath. It is treated with a dry massage tending slightly to roughness, the massage is given with an astringent oil.

Thickening of the body: This results from cold or any astringent thing or excess or thickness or viscidity of superfluous matters which are caused to remain in the skin-pores. Thickening (of the body), not being the result of the antecedent causes, may arise from exercise which draws out superfluities from the deeper tissues. Its cause is also considered as a man's residence in a dusty place or vigorous and hard massage. When thickening arises from cold and astringency, the colour of the skin becomes white—bodily warmth returns only slowly—sweating is delayed. The skin regains redness only slowly after exercise. Such persons should use hot baths and roll over the moderately hot iron plates or on the floor (of the hot room) till the perspiration sets in. Then they should anoint the body with some light, hot and dissolving oils.

Persons developing thickening of the body owing to exercise are marked by the absence of the afore-mentioned signs and by the discolouration of their skin. The treatment is the elimination of superfluity, if there be any and then use of some dissolving measures such as bath and oil-rubs. Persons suffering from thickening of body owing to dust and hard massage are much more in need of the bath than of oil-rubs. They should carry out gentle massage before and after the bath. Exercise with insufficient massage leads to weakness and flaccidity. Such effect is produced also by over-indulgence in coitus and too frequent baths. Such cases should be treated with restorative exercise and dry massage of somewhat hard type, with some astringent oil. They should take such moistening foods in small amount which are moderate both in heat and cold or slightly inclined to be hot. The same treatment is used in cases of debility, insomnia, grief or dryness resulting from anger. If, however, such patients have impaired digestion, restorative exercise or any kind of other exercises does not suit them at all. Owing to excessive bathing and too much of eating and drinking and leisurely life a man sometimes feels undue moistness, especially in his tongue and this disturbs the activity of the organs. Should this depend on some antecedent cause, as would be dealt with under 'particular treatment'. It happens as a result of any of the recent causes which we have just mentioned as excessive food and drink, and pleasurable pursuits and undue moistening effect of the bath, the patient should undergo vigorous exercise and should carry out dry and rough massage without oil or with a small amount of calefacient oil. When a person experiences undue dryness of his body, this belongs to the category of desiccatory fatigue. The treatment is the same in both conditions.

Section XVI

Treatment of spontaneous fatigue

If it be of ulcerous type then it is necessary to know whether the humour causing it is within or without the vessels. The humour is shown to be within the vessels by: (1) the foul odour of urine; (2) the nature of the previous diet; (3) tendency for the formation of excessive or scanty superfluity in patients' vessels; the superfluity is expelled rapidly or some medical treatment is required for this; (4) the type of the drinks taken—whether clear or turbid.

From all such signs it is inferred that humour is within the vessels and otherwise, it is without the vessels. If the fatigue is owing to the humour which is outside the vessels and the vessels are clean, it is sufficient to carry out restorative exercise and follow the regimen which we have indicated in cases of ulcerous fatigue arising from exercise. But if it is owing to the other factor, exercise should not be taken. Indeed, the physician should make the patient rest, sleep and starve. He should also be massaged with oil every night and should be given a moderately warm bath provided he can tolerate the bath in accordance with conditions we have already mentioned. Food should be scanty, of good chyme and in form of soups—neither too viscid nor too nutritious. And such foods are: barley, greek wheat and bird's meat.

As for drinks, oxymel prepared with honey, hydromel and light white wine are given. This type of wine should not be prohibited as it helps maturation and acts as a diuretic. But one must begin with a wine which is slightly yellow and then gradually come to the white and light wine. If this regimen proves ineffective, it means that some morbid humour is still present in the body. Hence the dominant humour should be eliminated. If the dominant humour is blood or mixed with blood, perform a venesection. Otherwise procure purgation or carry out both the measures, according to the proportion of blood which you judge to exist. But take care not to adopt either of these if the vitality is low. You may ascertain the kind of humour (concerned) by examining the urine, sweat and the state of sleep and wakefulness. If, in spite of a good regimen sleep is not induced it is a bad sign. If you think that there is a deficiency in good blood in the vessels and that the immature humours are in excess, you should give the patient rest and food and drink of attenuating quality, avoid any fluid which is calefacient, but choose such as has a diluting quality like oxymel of honey. If you require to increase the power of the attenuants, put some pepper into the food or into the barley water which you give the patient to drink. If you need *jawārish* of cumin and pepper owing to the immaturity of the humours, you administer them before or after the meals or at bed time accordingly, as it seems best to you. The dose is a small spoonful. *Jawārish* of mint will not suit because it is over-heating.

When you have ascertained that the immature humours are not in the vessels but in the vital and principal organs, you should recommend massage with laxative oils, especially, in the morning and give the patients the drinks which are warming and whose heat passes to the skin. They must have a prolonged rest. Then they should be bathed with moderately hot water. *Jawārish* of mint should be given without hesitation but it should be given before meal and exercise. If a digestive medicine is required after food, a strongly penetrative medicine like *Jawārish* of mint should not be given but *jawārish* of cumin and pepper should be given. Whichever of these two is given, it must be in small doses. *Jawārish* of quince may also be given but in this case the doses should be preferably larger than the doses of cumin and pepper. But it is only when you have decided that the accidental heat of the body is not in excess while you are giving it to the patient. Such patients are benefited by oils of chamomile, dill, and sweet marjoram. These oils are applied either plain or mixed with pine resin; their action is increased by mixing them with the olive oil which should be twelve times of it.

When you have ascertained that the humours are in the vessels and at the same time outside them, attention is to be paid first where they are in excess, not completely forgetting the tissues where they are in small amount. If the humours within and without the vessels are equal, first take care to ensure proper digestion by using *jawārish* of pepper. You may add, if you like, equal amounts of rock parsley and anise in order to procure a greater degree of diuresis. If you like, you may admix with it a little of the *jawārish* of mint but only after reducing the quantity of *jawārish* of cumin and pepper. Go on doing this step by step till there remains in the end only pure mint and the foreign matter in the vessels gets digested and eliminated; hence you have to deal with that which is exterior to them. And as you know, *jawārish* of mint is useful in such a case whereas it is harmful in the first case. Persons, in whom both these conditions are found in toto, should avoid all such things as might attract the morbid matter towards the outer surface or towards the interior parts. Hence you must not be hasty in prescribing vomiting and purgation until liquefying, diluting and maturing measures have been tried. Exercise is also not allowed.

When the fatigue disappears and complexion returns to normal and urine is maturated, a good massage followed by some exercise should be given. Then the patient should be taken to the bath for test. If there is any chance of relapse, it is to be avoided. If it appears that a relapse will not occur, it is to be continued regularly till they gradually resume the customary life with regard to bathing, anointing, massage, and exercise. Finally, potency of the oils should be increased. If there is a relapse of fatigue with a sensation of ulcer, the same regimen should be taken up again. If the relapse be without sensation of ulcer, the treatment should be done by restorative exercise. If the signs are inter-mingled (i.e. indefinite) and there is no sensation of severe fatigue, only rest is to be advised.

Tension fatigue: The cause of tension fatigue here (i.e. arising spontaneously) is repletion but the humour is not morbid. In persons with unhealthy temperament this is to be treated with venesection and attenuating measures. In respect of the body of which we speak, the treatment is only with attenuating and diluting agents; then the cure should be helped by using appropriate measures.

Inflammatory fatigue: Its treatment is venesection from the vein of the most affected area or of the part in which the fatigue arose first. If such distinction is not noticed in the members, venesection is to be done from the medium vein of the arm. It may be necessary to carry out venesection on the second or even the third day. Hence it should be carried out on the first day as soon as the fatigue appears; it must not be postponed, otherwise the condition may become established. On the second and third day venesection should be done at night.

Diet: On the first day, the diet of the patient must be barley-water or the soup of greek wheat without any oil provided that there is no fever and in case there is fever, only bare barley water is to be served. On the next day, the same food with some cooling or attempered oil like almond oil should be given. On the third day the diet be such as prepared with lattuce, white pumpkin, country mallow, sour dock and white soup made with sand fish is to be given.

During these days patients should be forbidden to drink cold water as long as it is possible. But if on the third day thirst becomes unbearable and food is not (properly) digested, hydromel or some light white wine diluted with water should be given. After these depletions, take care not to give them their full diet, for undigested food will be drawn into the vessels. There are three reasons for this:

(1) If the food is in small quantity, the stomach greedily holds it and its retentive power resists the attractive power of the liver. But, when food is in plenty, the stomach is not greedy of it and often it helps the attractive power of the liver with its expulsive power. The same holds good with each vessel in relation to that which comes next.

(2) If the food is in plenty, it is not digested well in the stomach.

(3) If there is excess of food, the nutrient matter reaching the vessels will also be in excess. Hence the vessels will be incapable of digesting it.

Section XVII

Measures for imbalanced temperament

The bodies, having such temperament, are of two kinds: (a) defective bodies and (b) congenitally defective bodies. Defective bodies are those whose natural temperaments are good. But they acquire at a given time bad temperaments in consequence of prolonged faulty regimen and ultimately these temperaments become persistent. Congenitally defective bodies are those whose temperament are congenitally bad. In defective bodies the nature of aberration both in quality and quantity should be known so that it might be treated by adopting contrary measures. It is known by the physique. In congenitally defective bodies defect is owing to their original temperament or to their age. We, therefore, begin the subject with the description of the regimen of the aged persons.

LESSON III

Regimen for the aged persons
Consisting of six sections

Section I

General statement on regimen for the aged persons

In brief, the regimen for old persons is to adopt both moistening and warming measures. Such as foods, baths and drink and similarly there should be plenty of sleep and time span on bed should be more than it is legitimate for adults. They should continually use diuretics and phlegm should be evacuated from their stomach through bowels and bladder. Their bowels should always be kept soft. Massage with oil, moderate in quantity and quality, is much beneficial from them. So is walking or if walking produces fatigue, one should use some conveyance. Massage may be repeated twice in the case of weak old persons. They should regularly use scents, especially such as are moderately hot. They should also anoint the body with oil after sleep because it stimulates the vital power. Then some (carriage) ride or walk should be taken.

Section II

Diet for the aged

According to their digestion and to their physical strength the old people should be served with small amounts of food at a time and thus fed two or three times a day. For example, they should take well-baked bread with honey at the third hour of the day. And at the seventh hour after the bath they should take some of the laxatives which we are going to mention. After that when the night is nigh, some nutritious food is to be given. If they are robust the amount of the food in their dinner may be increased. They should avoid any heavy food which produces black bile and phlegm and similarly avoid any hot, pungent and desiccant food, such as, *kawāmikh* (some kinds of sauce) and condiments except when they are taken as medicine. If, however, they do what is not proper for them take some food of the first group (thick diet) such as salted fish, or brinjal or dried meat or meat of hunted animals or fish with hard flesh or water melon, or yellow cucumber or should they commit any other mistake and thus take *kawāmikh* or salted fish, food and *bun*, a kind of *kamakh*, the remedy is to use the substances contrary to these things. But it is necessary to give them attenuant substances if one knows that there are superfluities in their bodies. When their bodies have been cleared from the wastes, they should be given moistening foods and from time to time some of the attenuant foods should also be included in their diet as we are going to mention in this respect.

Milk is beneficial for those of them who can digest it fully and do not feel, after taking it, any distension in the region of liver or stomach; nor do they feel itching or pain. Milk is good for them because it is nutritious and humectant. (In old age) goat's or donkey's milk is the best. One of the properties of donkey's milk is that it does not curdle and passes down quickly, especially if salt and honey have been added to it. Care should be taken that the pasturage is free of astringent, pungent, sour or very salty herbs.

Vegetables and fruits specially suitable for old persons are: Beets and a little leek, these should be spiced with olive oil and *murry*. These are particularly useful when they are taken before the main food because they produce a laxative effect. Garlic is useful to old persons if it is taken occasionally provided they are accustomed to it. Preserved ginger and other hot type of preserves are suitable for them. These should, however, be taken in a quantity which (merely) warms the body and aids digestion but not in a quantity which produces dryness. Hence it is essential that their foods are humectants which are aided by them in respect of digestion and by heat producing effect but are not influenced by their dryness. Among the foods which are used as laxatives and are congenial to their bodies are fig and bukhara plum in summer and in winter dried figs cooked in honey-water. All these should be taken before meals in order to have a laxative effect.

Similarly lablab boiled with water and salt and flavoured nicely with *murry* and olive oil is also useful. Common polypody root which has been placed in chicken-broth or beet or in cabbage broth is also useful. If the bowels are loose on alternate days, there is no need for any lubricant or laxative. And if the bowels are loose one day and constipated for two days, lablab, cabbage-water, and pulp of carthum seeds with barley-water would suffice. Gum of terebinth in the dose of one or two or at the most three pine-nuts should also be taken.

It is because it has the property of making the bowels loose and cleaning the viscera without any harm. Another good medicine for old persons is that which is prepared by mixing one part of pulp of carthum seeds and ten parts of dried figs. The dose is to be equal to a walnut. Another good remedy is an oil enema. For, it not only cleanses but also softens the viscera, especially when sweet olive oil is used for this purpose. Strong enemas should be avoided because they dry the intestines. A moistening oil enema is the best thing for them if the bowels have been constipated for several days. There are also other laxative medicines meant particularly for old persons. We shall mention them in the formulary. As far as possible depletion in middle-aged and old persons should be procured without venesection because moderate purgation is more suitable to them.

Section III

Alcohol for the aged

The best of the wines for old persons is that which is old and red because it is diuretic and produces heat as well. They should avoid new and white wines unless a bath is taken after a meal and unless there is thirst. In such a case they may take white light wine of scanty nutrition in place of water. They must avoid such sweet wines as produce obstructions.

Section IV

Removal of obstructions in the aged

If obstructions appear in the aged and they are very likely to result from the use of wine, they may be removed by using *jawārish* of mint and pepper. Black pepper is also sprinkled over the wine. If they be accustomed to the use of garlic and onions, they should use them. Theriaca is very beneficial for them, especially when the obstructions are in initial stages. Similarly *Athanāsia* and *amrūsia* (both are the electuaries prepared by a number of ingredients) are very useful. But afterwards they must gain moisture in the body by means of baths, oil-rubs and foods such as meat-soup prepared with Roman wheat and barley. If they use wine of honey it proves useful to them and prevents formation of obstructions and joint pain. But if there is a sensation of an obstruction in a member or if there is a feeling of a tendency towards it, medicines specific to that member should be added to the wine of honey, for example, root and seeds of celery for urinary organs. If the obstruction is the result of a stone (in the kidney), something stronger like rock parsley is to be cooked in the wine of honey. If obstructions are in the lungs, drugs like hyssop, maiden hair, cassia-bark and the like are to be cooked in the wine of honey.

Section V

Massage for the aged

Massage for the aged must be moderate in quality and quantity. Weak and painful parts of their body must not be touched at all. If massage is to be repeated on the same day, it should be given with a piece of coarse cloth or bare hands. For, this would be beneficial for them and would prevent the periodical attack of the diseases on their organs.

Section VI

Exercise for the aged

Exercise in old age is to be different for different individuals. This is to be done according to their different bodily states, their customary diseases and their habits of exercise. If their bodies are in perfect normal condition, moderate exercises suit them. If any of their organs is not in its best condition, it should be exercised only indirectly through the exercise of all other organs. For instance, if vertigo or epilepsy develops in a patient or some morbid matter flows to his neck or vapours frequently ascend to his head and brain, then exercises which involve bending and dropping of head would not suit him. They should then start walking, running, riding and taking exercises in which the lower half of the body is involved.

If the ailment be in the feet, the exercise should employ the upper limbs, as resisting from being caught by the back, weight throwing and weight lifting. If the ailment be in the middle region of the body such as spleen, liver, stomach and intestines, exercises of both upper and lower extremities are useful provided there is no contra-indication. If the ailment is in the chest, then only the exercises of the lower limbs suit them. If the ailment is in the kidneys and bladder, then only the exercises of the upper limbs suit them. It is not possible for the old persons to increase gradually the exercises of their weak organs in order to strengthen them. This is only for old persons but not for all other periods of life and the middle age. For the middle-aged the same principle applies as for the old persons. But they must strengthen their weak organs by gradually increasing the exercises which are useful and proper for those organs. The exercise of the diseased members is sometimes permissible and sometimes not. Thus it is not permissible if the members are hot or dry or if there is such matter in them as might be immature and likely to putrefy.

LESSON IV

Regimen for each abnormal temperament
Comprising five sections

Section I

Rectification of excessively hot temperament

We may say that in a hot intemperament either the two passive qualities (i.e. moisture and dryness) are balanced or there is the dominance of dryness or moisture. When the two passive qualities are balanced, we know that the increase in heat is upto a limit but not excessive; otherwise it would produce excess of dryness. If hot intemperament is associated with dryness, it may remain so for a long period. If hot intemperament is associated with moisture, their association cannot last for long. Sometimes moisture becomes predominant and eliminates heat and sometimes heat becomes predominant and eliminates moisture. The condition of persons with more moisture than heat will improve towards adolescence and they become equable in these qualities. But with the advanced age, foreign moisture begins to increase and heat begins to diminish.

We say that all the regimens for persons with hot temperament are for two purposes: (1) to restore them to equability and (2) to conserve the existing state of health. The first aim can be realised if one has patience enough to give up normal occupations and amusement for a long time. The reason is that the imbalance of this type returns to equability gradually and any attempt to attain sudden recovery might cause illness. Second aim is achieved by providing them such foods as are appropriate for their temperament. In this way their existing health is also preserved. Among the persons of hot temperament those, who are equable in the two passive qualities, are nearer to health in the beginning of their life and have more rapid growth of hair and teeth. They are ready of speech, eloquent and quick walkers. As they grow up, heat becomes excessive in them; dryness increases and they develop a hot and burning temperament. Bile is formed in excess in most of them.

The regimen for such persons in the beginning of their life is the same as that for the persons of balanced temperament. As they advance in age, their regimen also should be changed and some diuretics should be prescribed. Their bile should be depleted through the two ways of purgation and vomiting, towards which their superfluities might be inclined. If physis does not suffice to prepare the humour for depletion, it is to be assisted with mild measures. Thus, if vomiting is desired, plenty of warm water, either alone or with *nabīdh* (a kind of wine) should be given. When purgation is required, drugs like the preserves of violet, tamarind, manna and Persian manna should be used. Their exercise must be reduced and they should be given foods of good chyme. Sometimes it is necessary for them to take bath thrice a day. It is also necessary for them to avoid each heat-producing cause. If bathing after meal does not produce any distension or heaviness in the region of liver or stomach, they may use it without any fear. But, if any of these symptoms should arise, deobstruents such as infusion of absinth, a mixture containing aloe, anise, bitter almond and oxymel should be used. Bathing after meal should be stopped.

These deobstruents are to be given when the previous meal has been digested and the next meal has not yet been taken. There should be sufficient time between the use of them and the next meal—namely it is the interval between their getting up (from sleep) in the morning and their morning bath. It is proper for them to take oil rub persistenly and drink white dilute wine. Cold water is also beneficial for them. Persons with hot and dry temperaments are even more in need of all these measures in the early stage (of the disease). Persons with hot and moist temperaments are predisposed to putrefaction and (morbid) matters tending to descend into the organs. Hence their exercise should be such as might cause much dispersion but it should be gentle so that overheating is avoided. They should also avoid such movements as produce agitation in the humours.

Among them those, who are not accustomed to exercise, must avoid it. The best time for exercise is after depletion and that for bath is one before meals. They should also take care to expel all the superfluities. When they are in spring season they should be cautious against carrying out venesection and depletion.

Section II

Rectification of excessively cold temperament

There are three types of cold intemperaments. Thus in the case of the persons in whom the two passive qualities are balanced we should try to stimulate their innate heat by means of hot food which are moderately moist and dry and by hot oils and hot *ma'ājīn*. Moreover, proper depletions of humours should be carried out. Baths to induce sweating and suitable exercises should also be prescribed. For, such persons sometimes may be equable in regard to moisture and yet they are liable to develop excess of moistures owing to the coldness. The regimen for the persons of cold temperament, who have also dryness in them, is actually the same as that for the old persons.

Section III

Regimen for the bodies easily susceptible to diseases

People are susceptible to disease because of : (a) repletion and (b) immature humours. In the former case the quantity of the humours should be moderated. In the latter condition the quality of humours should be moderated and moderately nutritious diet is to be given. The quantity of humours may be moderated by moderating the amount of food taken, by increasing the exercise and by massage before bath if the person is accustomed to them; otherwise they must be mild and by reducing the meals so that all food is not taken at a time. If they perspire easily and are also accustomed to it, sweating should be induced from time to time. If late meals do not lead to congestion of bile into the stomach, the meal should be delayed till it is taken after the bath; otherwise it should be taken before the bath. Proper time for meal is after the fourth hour of the day provided there is no other unfavourable factor. If congestion of bile into the stomach necessitates that food should be taken early as we have said and then the patient feels symptoms of obstruction in the liver, it is to be treated with such aforementioned deobstruents as are appropriate to his temperament. If there is headache after food, it should be treated by means of walking. If the food undergoes putrefaction in the stomach and then passes on by itself, this is good. But, if this does not pass on, its elimination should be procured with electuaries of cumin and the compound of fig and carthum seeds the prescription of which has already been given.

Section IV

Fattening the emaciated

The most potent cause of emaciation, as we shall describe later, is dryness of temperament, dryness of mesentery and dryness of atmosphere. When the mesentery is dry, it will not absorb nutriment and thus dryness and emaciation are further increased. It is necessary that a massage which is of a moderate degree between rough and gentle, is given before bath until the skin becomes red. Then the massage should be made more vigorous. After that liniment of pitch should be applied. Later on moderate exercise is given. Then bath is given without delay. Afterwards body is wiped with a dry towel and rubbed with a little oil. Lastly, a meal of suitable type is given. If the age, season, and habit allow cold water is poured over the body. Massage carried before the application of liniment is to be stopped before the swelling of the body begins to subside. The above regimen is almost the same as we have spoken of for increasing the size of an undersized member. A detailed account of this will be found in the chapter on Beauty Culture in Book IV.

Section V

Reducing the obesity

The regimen for this is to procure a "rapid passage" of the food from the stomach and intestines, in order to prevent completion of absorption by the mesenteric vessels. Foods which are bulky but poor in nutrition should be used. Baths should be taken regularly before the meals. Swift exercises and dissolvent oils should be used. As an electuary a small preparation of myrobalan, a compound of lac and theriaca are to be used; vinegar with *'murry'* should also be taken on empty stomach. The things which we are going to mention in the chapter on cosmetics, should also be used.

LESSON V

Changes (of seasons)

Having one section and one clause

Section

Measures for seasonal changes through cleansing the air

In the very beginning of spring one should take recourse to venesection and purgation according to the need and custom. During this season vomiting is particularly induced. All such meals and drinks as are very heating and moistening should be avoided. Meals should be light and exercise is to be moderate than what is undertaken in summer. Too much food should not be taken at a time but it should be divided (over a period). Cold drinks and robs should be used and all hot, bitter, pungent and salty things should be avoided. During summer foods, drinks and exercise should be reduced. Shady and covered houses should be chosen for living. Cooling things are to be used, if possible, vomiting is advisable. One should stay in the shade (of the trees) and in shaded rooms. During autumn, especially when the winds are not pleasant, best kinds of regimens are necessary. All desiccant things and sexual intercourse should be avoided. Much cold water should not be used neither for drinking nor for pouring over the head. One should not sleep in such cold places as might cause horripilation and should protect his head from cold at night and in the morning and not sleep on a full stomach. One should also protect oneself from the midday heat and the early morning cold. Seasonal fruits should be avoided or at least should not be taken in much quantity. In bathing only tepid water is to be used.

When in this season, nights and days are equal, depletion should be carried out so that the superfluities should not be retained (in the body) in winter. During autumn, it is proper for most of the persons not to stimulate and activate humours of their body; they should rather keep them undisturbed. Vomiting is forbidden in autumn as it produces fever. Wine may be used if it is well-diluted and not in excess. It should be remembered that much rain in autumn is a security against its evils.

During winter plenty of physical work should be done and diet should be liberal. But, if there are southern winds, exercise should be increased and diet decreased. Bread should be made of wheat which is "harder and stronger" than the one used in summer. The same rule applies to fresh meat, roasted meat and the like. Vegetables such as cabbage, beet, and celery may be taken but goosefoot, bliton, purslane and endive should be avoided. Healthy persons seldom fall ill during winter. But when any disease arises, it should be treated at once. If necessary, depletion should be procured because in this season, disease never develops without a potent cause, especially when the disease is a hot one. The reason is that the innate heat which governs the body, is very strong in winter because it is safe from dispersion and is accumulated because of being confined (within the body). In fact, all the physical faculties perform their functions quite efficiently in this season. Hippocrates prefers purgation to venesection in this season. He is against procuring vomiting during winter but approves of it during summer because humours are then on the move whereas in winter they tend to stagnate. Hence we should also accept this view.

When the atomosphere becomes contaminant and pestilential, steps should be taken to make the body dry and make the dwellings attempered with the things which are potentially cooling and moistening. This is very necessary in epidemics. Or they should be attempered with such agents as are heating and act contrary to the cause of the contamination of atmosphere. Things which have pleasing odours are very beneficial during epidemics, especially if they are contrary in temperament to that of the atmosphere. During an epidemic, need for inhalation of much air must be reduced and this is best ensured by taking rest and by oxygenation. Mostly air is contaminated from the soil. Hence it is proper to sit on couches and seek dwellings on elevated ground which is open to fresh air. Very often, the air itself is the source of corruption, either because it is contaminated by adjoining impure air or by some 'celestial' agent of a quality, at present, unknown to man. In that case it is necessary to retire to underground dwellings or to houses enclosed in walls on all sides or to closets. Fumigation should be done with Indian cypress, olibanum, myrtle, roses and sandal wood to purify the putrefaction of the air. Use of vinegar in epidemic secures one against its evils. We shall give the remaining instructions on this subject in the volume on particular diseases.

CLAUSE

Instructions for the travellers
Consisting of VIII sections

Section I

Early detection and management of incipient diseases.

(1) Those who suffer from palpitation of heart continually, should receive (immediate) attention to avert sudden death.

(2) When nightmare and vertigo are frequent, the patient should be treated by depleting the thick humour so that he might not develop epilepsy and apoplexy.

(3) When there are frequent twitchings in the whole body, the patient should be treated by depleting phlegm so that he might not develop convulsion and apoplexy.

(4) The same procedure is to be adopted if there is repletion associated with prolonged disorder of senses and weakness in movements.

(5) When there is loss of sensation in all the members, the patient should be treated by depleting the phlegm so that he might not develop paralysis and convulsion.

(6) When there is much twitching of the face, depuration of brain should be carried out, so that it might not lead to facial paralysis.

(7) When face and eyes become very red and tears flow and there is an aversion to light and there is headache also, the treatment is venesection, purgation and the like so that the patient might not develop cerebritis.

(8) When there is much gloom and dread without any (apparent) cause, the treatment is to procure depletion of "burnt" humours so that the patient might not develop melancholia.

(9) When the face reddens, swells, and becomes somewhat dark and this condition persists, it forebodes leprosy.

(10) When the body becomes heavy and wearied and the vessels are prominent, venesection should be carried out to avoid rupture of vessel, apoplexy and sudden death.

(11) When there is puffiness on face, eye lids and extremities, the liver should be treated so that the patient might not develop dropsy.

(12) When there is great stench in the stools, measures should be taken to remove putrefaction from the vessels so that the patient might not develop fevers. Similarly a foul-smelling urine provides more authentic indications (of putrefaction in vessels).

(13) When you notice fatigue and aching of the body, it should be taken as a premonition of fever.

(14) When there is a loss of appetite or undue appetite, it is an indication of any disease.

To sum up, when there is a change in the usual state of things-such as, appetite, stool, urine, sexual desire, sleep, perspiration, itching of the body, acuity of mind, change in the taste for anything, change in the habit of nocturnal pollutions with the result that there is an increase or decrease or a qualitative change in them, it portends some disease. The thing holds good if there is a change in the unusual dispositions, for instance, bleeding of piles or menstrual flow, vomiting, epistaxis or habitual desire for a thing, whether it is desirable or not, because habit is just like nature and that is why only very bad habits are advised to be given up and that too gradually.

(15) Sometimes some minor things indicate some other minor matters. Thus persistent headache and migraine warn of dilation of pupils and cataract.

(16) Imagining that there are bodies like insects etc in front of the face warns of cataract provided this condition is persistent and lasting and impairs the vision too.

(17) Heaviness and piercing sensation in right side, if prolonged, indicate disease of liver.

(18) Heaviness and distension in the lower part of the back and in the waist with abnormal urine, indicate a disease of kidneys.

(19) Absence of usual colour in the stools warns of jaundice.

(20) Prolonged burning of urine portends ulcers of bladder and penis.

(21) Diarrhoea causing burning in anus forewarns of abrasion (of intestines).

(22) Loss of appetite with vomiting, distension and pain in limbs forewarns of colic.

(23) Itching of anus, not owing to thread warms, is an indication of piles.

(24) Eruption of many boils and tumours indicates that some big abscess is developing.

(25) Ringworm portends scaly ring-worm and *pityriasis alba* portends leukoderma.

Section II

Regimen for travellers

A traveller has to do without so many things which he is accustomed to (while he is in his own home town) and has to face hardships and illness. He must, therefore, take care of the matters concerning his body so that he might be safe from many diseases. He should pay his utmost attention to the matters of diet and causes of fatigue. Hence he must regulate his diet and take a food which is of good substance and is taken to be less than actual desire, not too much so that it is properly digested and consequently superfluites are not accumulated in the vessels. One should not set out upon a journey in a state of repletion because the food will undergo putrefaction and he will require to take water which will increase gurgling and rumbling of stomach and make it heavy. Indeed it is better to postpone the meal to the end of the journey unless there are some of the causes which we are going to describe presently. Should the hunger be very pressing, the traveller may take something by way of refreshment, a small amount of food, unlikely to induce thirst. This rule applies whether the journey be by night or by day. He should take proper meausures against his fatigue according to the principles described in the chapter on fatigue. He should not travel in a state of blood repletion or something else. He should first purify his body and then begin his journey. If a person is suffering from dyspepsia, he should observe fast and sleep well and thus remove dyspepsia and then proceed on the journey.

It is proper for a traveller to gradually increase his exercise a little more than customary. If it is necessary to travel on without sleeping, the habit of doing so should be acquired gradually. Similarly, if one thinks that there is likelihood of hunger or thirst or something else (during the journey), a habituation to this should be made first. One should habituate oneself to the food which one intends to take during journey. The food must be in small quantity but nutritious. Vegetables, fruits and all articles which produce immature humours must be avoided unless these are required for the treatment of disease in the light of the restrictions we are going to describe in the following discussions. Sometimes a traveller needs to bear hunger for long and requires his appetite to be diminished. Among the things which are helpful in this respect are foods prepared from roasted livers and the like. Sometimes *Kabab* of liver are prepared with viscid substances, strong fluid fats, almonds, almond oil and certain fats like that of beef. If one takes even a single *kabab* of this type, it will starve off the feeling of hunger for a long time.

It is said that if a man drinks one *raṭl* (450 gm) of violet oil in which wax had been dissolved until the oil becomes just like a paste, he will have no desire for food for ten days. Similarly travellers should also be prepared to face thirst. Hence they must carry with them the thirst-quenching drugs which are to be named in the chapter on thirst in the third Book. A specially good drug of this kind is to use three *dirham* (10.5 mgm) of purslane seed with vinegar. Food likely to evoke thirst, such as fish, caper, salted foods and sweets should be avoided and talking minimised. Travelling should be undertaken without any strain. When water is not abundant, it should be taken with vinegar because in this way even a little water allays thirst.

Section III

Management of exposure to heat for those journeying in hot climate

If the persons travelling in hot climates do not take care of themselves, they ultimately become weak; their faculties are so much dispersed that they are unable to move and they develop an insatiable thirst. Sometimes their brains are inflicted by the sun. Hence their head must be protected well from the sun. Similarly a traveller must protect his chest from the sun and apply on it something like the mucilage of ispaghula seeds or juice of purslane. Persons about to journey into hot regions need to take something like flour of roasted barley and fruit syrups etc. before starting their journeys. For, if they start their journey and their intestines and stomach are empty, the dispersion will cause the utmost weakness as there will be no substitute for the loss. Hence it is necessary for them to eat a little of such things as we have already mentioned and wait a while till it passes out of the stomach and is not jolted in it. They should also carry with them the rose and violet oils on the journey and apply it to the head from time to time. Many of those who have the injurious effect of travelling in the heat, return to their normal condition with a swim in cold water. But it is best not to plung in it suddenly. One should wait a while and enter the water gradually.

If there is a risk of hot sandstorm, the nostrils and the mouth should be covered with a turban or veil and the traveller should endure the discomfort caused by this. Before being exposed to such a danger, one should take onions with churned sour milk, especially the onions which have been soaked in it for a night. One should first eat the onions and then take the butter-milk. The onions should be eaten and churned sour milk should be sipped off. The onion should be well-sliced before these are soaked in the churned sour milk. They should also sniff almond oil and the oil of white pumpkin-seeds and sip the latter because it prevents the probable ill-effects of hot sand-storm. If a traveller has been hit by hot winds, cold water should be poured over his extremities and his face be washed with it. He should be given cooling vegetables as food. Cooling oils such as oils of roses and willow and cooling juices as the juice of house-leek should be applied to the head and then bath should be given. Sexual intercourse must be avoided. Salted fish is beneficial for him provided the effect of sun-stroke has disappeared. Similarly diluted wine is also useful. For such persons milk is the best food provided there is no fever. If there is fever, which is not of a putrefactive type but of ephemeral type, sour churned milk should be given. If there is thirst after sun-stroke, one should go on rinsing the mouth, and should not drink water to repletion because of the risk of sudden death thereby. One must be satisfied with the rinsing of the mouth. If water is taken at all, it should be done in sips. When the condition improves and the severity of thirst decreases let him drink. Before starting with drinks, it is better to take first rose oil with water and then take the ordinary water after that. In brief, when struck by sunstroke, a person should stay in cool place; wash hands and feet with cold water; if thirsty, he should drink cold water by sips and he should take such food as is readily digestible.

Section IV

Instructions for travelling in cold and snow

Travelling in extreme cold is very dangerous even when all preparations have been made; it would be more so if it is undertaken without any preparation. Many travellers despite all possible precautions of adequate clothing died of convulsion, tetanus, catalepsy, or apoplexy owing to cold and the cold winds. They died in the manner of persons who die by taking opium or belladonna. And even if they do not die, they mostly develop a hunger called bulimia. We have described the treatment of this and also of other diseases in the proper place. The best thing for them to do is to close the pores (of the body) and protect the nose and the mouth so as to prevent the sudden inrush of cold air. Extremities should be protected in the manner we are going to describe presently. When the traveller has reached his cold halting place, he should not warm himself all of a sudden but by degrees. Similarly it is not proper to approach fire all of a sudden but it would be better if he does not come nearer to fire at all. However, if there is no way out, the approach must be made gradual. The best time for avoiding the vicinity of fire is that when one is intending to start journey at once and go out into the cold. These instructions are for those in whom cold has not yet produced any weakness or exhaustion. Persons actually affected by cold should be at once warmed and rubbed with warming oils, especially those which possess the properties of theriaca, like oil of lilies. If after travelling in cold, a traveller comes to halt and he is hungry and so he partakes of something hot, he develops a strange hotness like fever.

There are certain foods which mitigate the ill-effects of cold on travellers. These foods contain plenty of garlic, walnuts, mustard and asafoetida. Sometimes whey is added in order to impart a pleasing taste to the garlics and walnuts. Clarified butter is also good for them, especially when they drink pure wine afterwards. A person travelling in cold should not travel on an empty stomach. But he should eat to his fill and then drink wine instead of water. Then he should wait till the food has come to a rest in the stomach and started being hot. He may then start on the journey. Asafoetida is among the things which have a warming effect when one has become rigid from cold. This is particualrly so when it has been left in wine. The complete dose is 3.5 gm of asafoetida in a quantity of 450 gm of wine. For a person travelling in cold region certain medicines are (recommended) to be rubbed on his body. They protect the body against the ill-effects of cold. Olive oil and the like are among such medicines. Garlic is the best thing for one who has come to halt after travelling in cold winds. Although it injures the brain and psychic faculty.

Section V

Protection of extremities against cold

First the limbs should be rubbed until they get warmed. Then some hot and fragrant oils such as oil of lilies or oil of Persian lilac should be applied. Wine of lilies is an excellent epithem for them. When it is not availabe, olive oil will do, especially when pepper, pellitory, gum euphorbium, asafoetida or castoreum has been added to it. The other plasters for protecting the extremities from cold are those of galbanum and garlic. These provide relief but are not so potent as cedar tree resin. Socks and gloves should not be so tight as to hinder the movement of the limb inside them. For, movement of the limb is one of the causes which save it from cold. Whereas compressed limbs are seriously affected by cold. It is more protective for the limbs if they are covered with paper and hair and then with wool. If, for example, feet or hands become so that they do not feel the cold although there has been no decrease in cold and no precaution has been taken to protect them against it, it should be known that the sensation of cold is being lost and the cold has exerted its (harmful) effect upon them. In such cases the treatment should be that which we are going to describe just now.

If cold has exerted so much effect upon a member as it destroyed its innate heat and withheld the matter which is usually dispersed from the member and thus leading to its putrefaction, then in such cases mostly there is an urgent need for all those measures which have been discussed in the chapter on ulcers, especially the malignant eroding ulcers. If the frostbite has not yet produced putrefaction but is threatening to do so, it is best to place the limbs particularly in turnip juice or in water in which figs have been boiled. Similarly cabbage juice, sweet basil water, dill water and chamomile water are all good. Fresh churned milk is also a good epithem. Juice of warmwood and sweet basil and plaster made of turnip are good and useful medicaments for the purpose. Proximity to the fire must be avoided. It is also necessary to walk about and move the hands and feet and thus doing exercise with these. Then one should massage them with oil, apply liniments and paints and pour water over them as we have already mentioned.

It is to be noted that to allow the limbs to be hanging motionless in the cold air without moving or exercising them, is the surest possible way to subject them to cold. Some people keep the frost-bitten part in cold water and find it useful. The illeffects are removed just as happens with frozen fruits when they are left in cold water. In cold water it heppens as if something like ice comes out and spreads as a thin layer over its surface. Thus the fruit becomes soft and smooth. If the frozen fruit is kept near the fire, it will be spoilt. How it so happens is not the concern of the physician. When the frost-bitten part begins to turn blue, it should be scarified to let the blood out; the limb is then placed in warm water to prevent the blood from congealing in the openings of scarification and so failing to flow out of it. The flow is allowed to continue till it stops of its own accord. Then it should be covered with a paint made of vinegar and Armenian bole because it prevents putrefaction of that part. Cedar tree resin is also useful whether it is used in the beginning or at the conclusion. When the affected part becomes black and green and it is known that this is undergoing putrefaction, there is no alternative but to remove the putrefied part very soon so that the adjoining healthy parts might not undergo putrefaction and the latter might not spread on into (interior organs). The measures to adopt under these circumstances are described in the appropriate chapter.

Section VI

Protection of complexion during journey

Some viscid and sticky substances, such as mucilage of ispaghula and purslane seeds, gum tragacanth dissolved in water, gum arabic dissolved in water, the white of an egg, bread or cake soaked in water and tablets recommended by (a physician) should be applied to the face. For the treatment of the skin damaged by exposure to wind, or cold, or sun, the chapter on cosmetics should be seen.

Section VII

Protection of travellers against injurious effects of various waters

The traveller is more exposed to illness from the diversity of drinking water than that of foods. Hence it is necessary to be careful in this respect and take precautions against the injurious effect of water. Water may be improved by filtering it repeatedly through a porous earthenware. Boiling also purifies water and separates it from the impurities which are admixed with the intrinsic substance of water in the manner already described. The best measure is to distil the water by percolation. This may be done by making a wick from twisted wool. One end of this wick is placed in a vessel filled with water and the other end is placed in an empty vessel. Then water passes from the one to the other vessel drop by drop. This is a good way of clarifying water, especially when this process is repeated several times. Similarly bitter and impure water may be improved by adding to it pure clay and a few hanks of wool, while it is boiling. The water, squeezed out of the wool, would be better than the one purified by means of the first method. Sometimes water is purified by mixing it with pure clay which has been burnt in the sun and thus has no harmful contents. Then by means of filteration its impurity is removed. Harmfulness of water can be removed by taking wine with it provided the harmfulness is the result of the lack of diffusibility. When water is in a little quantity, it should be taken with vinegar, especially in summer because then more water is not needed (due to its quenching property).

Salty water should be taken with vinegar or oxymel. Moreover carab, myrtle berry and azarole must be added to it. After drinking aluminous and acrid water laxatives should be used. Wine is also useful after taking such water. After drinking bitter water sweet and oily things should be used. Sometimes rose syrup is also mixed with such water. Using water of gram seeds before drinking bitter water or before water of the similar quality, removes its harmfulness. Oral use of gram-seeds also has the same effect. Warm foods should not be taken before drinking stagnant and marshy water having also putrefaction. After such water some astringent cold fruits and vegetables such as quince, apple and ribes should be taken. Garlic should be taken after drinking heavy turbid waters. Among the things which will purify such waters is alum of Yamen. And among the things which remove the impurities of different waters is onion because it is antidote for this purpose, especially when it is used with vinegar. Garlic too has the same property. And among cold things lettuce has a similar effect. A good regimen for a person encountering different waters is to carry some water from his home town. He should mix it with the water available at the next halt and in this way continue repeating the process of mixing some water from the previous halt with that of the next one until the destination is reached. Similarly this is also useful if he carries some clay from his home town. He should mix this clay with the water which he happens to encounter and shake it well and then leave it until the water becomes clear. It is also necessary to take water after passing it through a strainer so that one might not swallow leeches unknowingly or other minute foreign particles of abnoxious nature admixed with water. It is also a good regimen to carry a sour rob (*rubb*) with oneself and mix it with various waters. It is a good regimen.

Section VIII

Instructions for voyage

Those who travel by sea often feel that they are moving in a circle or that other things are moving and sometimes they develop nausea and vomiting. But it happens during the first few days of the voyage and then it disappears. Efforts should not be made to check nausea and vomiting but one should allow vomiting to continue. If it is exessive, it should be then checked. There is no harm if one prepares oneself in such a way as vomiting might not occur to him. This is possible by taking such fruits as quince, apple and pomegranate. The use of celery seeds prevents nausea and relieves it if it is already roused. Absinth has the same effect. Among the measures which prevent vomiting is to take such sour things as strengthen the cardiac orifice and prevent the vapours from ascending towards the head. For example, lentils with vinegar, sour grapes, a little mint, wild thyme and bread soaked in fragrant wine or in cold water in which thyme has been soaked. The inside surface of the nostrils should be smeared with white lead ointment.

PART IV

Various modes of treatment with regard to general diseases
Consisting of thirty-one sections

Section I

General statement on treatment

We say that treatment comprises three things: (a) regimen and diet; (b) use of medicines and (c) manual operations.

By 'regimen' we mean the management of the essential factors which have been enumerated and are operating on life in a customary way. Food is one of them. Rules for managing the properties of these essential factors are the same as those for drugs. But among all these factors food has some particular rules pertaining to quantity. Food may, sometimes, be forbidden, sometimes, reduced or given in moderate quantity and sometimes it is increased. Food is forbidden when the physician wants the physis to be occupied in maturing humours. It is reduced when there is the need of preserving physical power at the same time. Thus he allows food in consideration of strength and lessens it in consideration of quantity so that the physis might not be occupied in the digestion of a large meal. Always the more important of the two should be attended to first. Thus if the strength is very low, it should receive prior attention and if the disease is severe, it must be attended to first.

Food is reduced in two ways: either with regard to quantity or with regard to quality. You may have a third kind by combining the two. Food is sometimes much in quantity but low in quality, such as vegetables and (some) fruits. For, one who takes much amount of them, really takes much in quantity, not in quality. Sometimes a food may be small in quantity but much in nutrition, such as half-boiled eggs and roasted testicles. Sometimes we need to reduce the quality of food and increase its quantity. It is when the appetite is excessive and the vessels contain crude humours. Hence we desire to satisfy the appetite by filling the stomach and thus we prevent further accumulation of much matter in the vessels so that the matter already present in the vessels might be matured. There may be some other purposes also.

Sometimes we need to increase the quality and decrease the quantity. It is when we desire to increase the bodily strength but the natural power of stomach is too weak to digest much amount of food. We recommend reduction or stoppage of food mostly when we are treating acute diseases. We reduce food in chronic diseases also but not to the same extent as in acute diseases. It is because in chronic diseases our greater attention is directed to maintain strength as we know that their crisis is far off and their climax is also far off. Hence, if the strength is not preserved, it will not last till the time of crisis and will not be able to mature the matter which requires a long time for maturation. But in case of acute diseases, the crisis is near at hand, so we expect that the vitality will not languish before the end of disease. But, when there is such a danger, we do not recommend too much reduction in food.

If an acute disease is in the early stage and the symptoms are not marked, such foods should be given as might strengthen (the body). But as the illness progresses and symptoms also become more prominent, quantity of food should be lessened in accordance with the principles already stated. This is to be done in order to relieve the powers at the hour of struggle. At the extreme of the disease the regimen must be made very attenuant. The more acute the disease and the nearer the crisis the more attenuant must the regimen be made, unless there should happen to be contra-indications such as we shall describe in the book dealing with particular diseases. With regard to nutrition, food has two other considerations:

(a) rapid penetration as that of wine and slow penetration as that of roasted meats and fried meats;

(b) heaviness of the consistency of what is produced from blood and its consequent retention as happens in the case of food containing pork and calves or thinness and rapid dispersion of that substance as happens in the case of food based on wine and figs.

We need a food of rapid penetrative power when we wish to compensate for the loss of vital power and revive it and when there is not sufficient time and power to keep waiting till the digestion of the foods which are slow in digestion. We avoid quickly digestible foods if some slowly digestible food had already been used. In such a case it is feared lest the easily digestible food should be admixed with the former and lead to the consequences which we have already described. We avoid heavy food when we fear of the formation of calculi. But we prefer highly nutritious foods and slowly digestible foods for the persons whom we want to strengthen and prepare for vigorous exercises. We prefer less nutritious food for the persons in whom pores (of the body) are easily choked up with thick matter.

There are three rules concerning the treatment with medicine:

(1) selection of drug according to its quality; i.e. its selection on the basis of its being hot, cold, moist or dry;

(2) selection of drug according to its quantity and this is further divided into:
   (a) measurement in terms of weight;
   (b) measurement in terms of quality, degree of its hot or cold quality etc.

(3) The rules relating to the time of administration.

In regard to the absolute choice of a drug of specific quality, the decision depends upon one's knowledge (of the nature) of disease. When one knows the quality of the disease, it is necessary to select that drug which, in quality, is contrary to the disease. It is because disease is treated by contraries whereas health is preserved by similars. The measurement of the quantity is determined by both the ways. Thus with the help of the professional expertise the nature of the members, the degree of illness and other things determining the suitability and fitness of the drug namely, species, age, habit, season, country, profession, strength and physique.

Knowledge of the nature of the member comprises the knowledge of four things: (1) temperament; (2) constitution; (3) position and (4) strength of the member.

Temperament: When the normal temperament of the member is known and its accidental temperament is also known, it is determined by the guess how much it has deviated from its normal temperament. Thus the amount of change (which is necessary to restore normally) is also determined. For example, if the original temperament is cold and the disease is hot (it means) the member has deviated too much from its temperament. Hence it requires a good deal of cooling. But, if both are hot, a little of cooling will suffice for the malady.

Constitution: We have already described the factors included in constitution. You should study the matter in that place. You should further note that the constitution of certain members is such that penetration is easy. They have cavities in the interior or in the exterior. Hence the superfluity is (readily) expelled through them by tenuous and attempered medicines. But there are other members which are not so formed. Hence they need strong medicines. Similarly some of the members are spongy and some are dense in texture. For the spongy members tenuous medicines will suffice while the dense require strong medicines. The member in the greatest need of strong medicines is that which has neither cavity nor receptacle, either internally or externally. There is the member which has a receptacle on one side only and there is the member which has receptacle on both sides, but is compact and dense like kidneys. Then is the member which has cavities both inside and outside and is loose in texture as lungs.

Position: As you know, position requires either location or relationship with other members. As regards the location of the member, you know it requires position and relationship. The greatest advantage of knowing the relations (of the members) is that one can then choose the part which will draw the medicine and thus divert it to the (desired) direction. For instance, if the matter is in the convexity of the liver, you should evacuate it through urine and if it is in the concavity of the liver, you should evacuate it by way of the intestines because the covexity of the liver is related to the organs of urine while the concavity is related to the intestines. One is benefited by knowing the position of a member in three ways: a) Remoteness and nearness of the member. If the member is near (the passage of the medicine) as stomach, even the moderate medicines reach it and act on it. And if it is remote, as lungs, the potency of the moderate medicines is "nullified" before they reach it. Hence in case of such members the potency of the medicines is to be increased. In the case of such proximal members as are readily accessible to the medicine, the potency of the medicine must be directly proportionate to the (severity) of the disease. If there is remoteness and distance between them (i.e. member and the medicine) and the disease be such as the medicine must have penetrative power to reach the member then the potency of the medicine should be more than the (usual) requirement, as in the case of the plasters for sciatica etc. b) One knows the substances which are proper to be admixed with the medicines in order to bring them rapidly to the member. For instance, diuretics are admixed with the medicines for the urinary organs and saffron with the medicines for the heart. c) One is able to know by what route the medicine is to be brought to the (affected) member. For instance, when we have ascertained that the ulcer is in the lower intestines, we convey medicines to them through enema; when we infer that the ulcer is in the upper part of intestines, we give the medicines in liquid form.

Sometimes it is advantageous to consider both position and relationship at the same time and this is when a physician has to decide what to do when the whole of the morbid matter has been discharged into a member or when it is in the process of being so discharged. Thus, if the matter is still in the process of infiltrating (into a member), we may attract it from its place after observing four conditions:

(1) Opposition to the direction, as the matter is attracted from the right side to the left and from above to the parts below.

(2) Consideration of the relationship, as menstrual flow is arrested by cupping the breast to attract (blood) towards related organs.

(3) Consideration of the parallels as in the diseases of the liver, venesection is carried out from the right basilic vein and in diseases of the spleen from the left basilic vein.

(4) Consideration of distance: The member towards which the morbid matter is drawn should not be very near the member from which it is drawn.

If the morbid matter has already been drawn into a member, both the matters (of site and relationship) prove helpful to the physician. Thus we may either take out the morbid matter from the member itself or we may transfer it to some close and (physiologically) related member and then draw it out from that member. For example, we carry out venesection from the saphenous vein in the maladies of uterus and from the vein under the tongue for treating swelling of the tonsils. When you wish to draw morbid matter to the opposite side (of the affected member), first relieve the pain of the member from which you are drawing the matter. And take care that the matter may not pass through some vital organ.

One is benefitted by the knowledge of the strength of a member in three ways:

(a) Consideration of nobility and principality: We do not put the principal members to risk by using potent drugs as far as possible. Otherwise we will be producing a harmful effect over the body. It is for this reason that when we need depletion of some (morbid) matter from brain and liver we do not carry it out all of a sudden nor do we make them excessively cool. Again when we apply dissolvent drugs over the liver, we add to them some astringent aromatics to preserve strength. We do the same when we give liquid medicines for this purpose. The members deserving such considerations are heart, brain and then liver.

(b) Consideration of the related function of the member even when it is not a principal member as stomach and lungs. For this reason we do not give very cold water in fevers if the stomach is weak. It should be remembered that the application of relaxants alone over the vital organs and the organs in their vicinity is very risky for life.

(c) Consideration of the sensitivity whether it is keen or dull. Medicines which are of inferior quality or irritant and injurious, should be avoided in case of the members which are sensitive and contain nerves for instance as it is the case with herbs belonging to the spurges.

There are three types of medicines the administration of which must be avoided: (i) strong dissolvents; (ii) strong cooling drugs;

(iii) drugs which have properties antagonistic to life e.g. verdigris, white lead and burnt copper etc. This, then, is the description in detail regarding the selection of medicines according to the nature of the member (to be treated).

Severity of disease: For example, when in a disease the accidental heat is excessive, it must be reduced by means of a medicine of strongly refrigerant quality and when in a disease the accidental cold is in excess, it must be warmed by means of a strongly calefacient medicine. But when the heat and cold are not so strong, remedies of less potency will suffice.

Consideration of the stage of disease means to ascertain in which of all its stages the disease is found (at present). For instance, if the swelling is in early stage, we use only repellants and when it is in the terminal stage, we use only dissolvents; if it is between these two stages, we combine both kinds of remedies. If the disease is acute in the early stage, we use moderately attenuating regimen. But if it is near the terminal stage, we use too much of attenuating regimen. If the disease is chronic in the early stage we do not use that attenuating regimen which we do in the case of acute disease and we use moderate attenuation near the end whereas many of the chronic diseases other than fevers, are dispersed by attenuating regimen. Similarly, if there is too much of agitated matter in a disease, we procure depletion in the very beginning and do not wait for its maturation. If the matter is in moderate amount, we maturate it and then procure depletion.

To infer from the things which provide guidance by means of their suitability it is easy for you to know it. Of all such things air is one which must be considered first; whether it will resist the drug or the disease. We say that in the case of diseases where there is the risk of loss of vitality with any delay or shortcoming in treatment, it is necessary to begin first with powerful remedies. But in the diseases which have no such risk we should gradually come to strong remedies if the milder ones do not serve the purpose. You must not abandon the correct method of treatment if you find that its action is delayed. Similarly you must not insist on a wrong treatment only because its ill effects have not yet appeared. At the same time you must not confine yourself to a single method of treatment with a single drug. But you must change the drugs because when the tissues are accustomed to one they cease to respond. Every individual or every member or even the same individual or member has a certain property to react to a given medicine at one time which they do not have at another.

When it is difficult for you to know the malady, leave it to physis and do not be hasty (in treatment). It is because either the physis will suppress the malady or the malady will reveal itself. When a malady is accompanied by pain or its cause is pain or effect of pain, as in the case of blows or falls, the first thing to do is to allay the pain. If you need an anaesthetic drug, do not go beyond the use of white poppy seeds because in addition to being anaesthetic, it is also a well known food. When you are troubled by the excessive sensitiveness of a member, you should take some blood thickening things, for instance, *harisa* (a kind of dish prepared with wheat, meat and aromatics). If there is no fear of cooling effects, cooling things, such as lettuce and the like should be used.

Remember, too, that among the good and effective treatments is the help afforded by the things which invigorate the psychic and vital faculties; for instance, merriment, visit to the near and dear ones and company of the persons who might amuse the patient. Sometimes the presence of persons before whom the patient is modest and shy is useful, as it prevents the patient from things which are harmful for him. Among the measures akin to this type of treatment is that of migration from one country to another and from one climate to another or the change is made from one position to another. Again, one of the similar measures is to observe such positions and movements as render some (deformed) member smooth or alter the temperament. Thus squint-eyed children should gaze sideways at some bright object and those suffering from facial paralysis should look into a 'Chinese mirror'. It is because this measure causes the person concerned to make efforts to correct his face and eyes. Sometimes this measure corrects (the malposition of face and eyes). One of the rules which must be remembered is to avoid strong measures of treatment during strong (hot and cold) seasons as far as possible, for instance, powerful purgatives, cautery, incision and vomiting, during summer and winter.

Among the case requiring accurate observation is the one when two contrary claims (i.e. indications) are found in a single disease. For instance, the disease may require cooling while its cause may require heating, as fever requires cooling and the embolus which is the cause of fever requires heating or conversely. Again (we come across) such a case if the disease requires heating and its symptoms require cooling, as the matter of colic requires heating and breaking and the severity of its pain needs cooling and anaesthetizing and vice versa. Remember, that every case of repletion is not to be treated by its contrary act namely depletion, nor is every intemperament to be treated by inducing a contrary state. But in most cases good regimen only will suffice for serious cases of repletion and intemperament.

Section II

Treatment of diseases caused by dyscrasia

When an intemperament occurs without matter we simply alter it and if it is associated with matter, we procure depletion. Thus, sometimes mere depletion suffices provided any kind of intemperament, because of its previous settled state, is not left behind. And sometimes it is not sufficient if the intemperament is not left behind. But we need to alter the temperament after the depletion has been procured. The treatment of intemperament is of three kinds. It is because intemperament is (i) either established as its treatment is strictly by contrary medicine. This is called medicinal treatment. (ii) Or it is in the course of development; it can be corrected by treatment and at the same time by such preventive measures as might check the cause. (iii) Or it is about to develop. In such cases we are in need of preventing the cause only. This is called 'prevention'. The example of medicinal treatment is the treatment of putrefaction of quartan fever with theriaca and the administration of cold water in tertian fever to extinguish the heat (i.e. temperature). The example of treatment and prevention is to procure depletion by means of hellebore in quartan fever and by means of scammony in tertian fever when we intend to stop the expected paroxyms. The example of preventive measure alone is to procure depletion by hellebore in case of a person predisposed to quartan fever owing to the domination of black bile and by scammony in case of those predisposed to tertian fever as the result of the domination of bile. If in any illness it is difficult for you to decide whether its cause is heat or cold and you propose to make an experiment, you must not do it with powerful drugs. And you should be careful not to be misled by the secondary super-imposed symptoms.

You should note that although cooling and warming processes take almost the same time but cooling is more dangerous because heat is the "friend" of physis. Similarly there is equal risk in moistening and desiccation but the period required by the former is longer. Each of moisture and dryness is maintained by strengthening its causes and is altered by strengthening the causes contrary to it. Heat is strengthened by the causes which we have already described and also by stimulants which mean dispersing of superfluity and repletion and opening of emboli then by the factor which preserves it and that is moderate moisture. Cold is strengthened by its strong causes and by smothering the heat and by the factors which cause excessive dispersion of it and they are dryness (acting) directly and moisture (acting) indirectly.

Physicians treating excessive heat by removing the emboli should avoid too much of cooling otherwise it will add to the petrification of the emboli and thus render the hot intemperament more obvious. Hence it is proper to be slow and first treat (the case) with abstergents. If a cooling abstergent such as barley-water or endive-juice proves sufficient, it is well and good. But if this be not satisfactory, some moderate abstergent should be used and if this too proves unsatisfactory, abstergents having light heat should be used. We should not hesitate in doing so for the benefits resulting from its removing action are greater than the harm done by its heating action; moreover it is easy to extinguish (the heat) when the (emboli) have been removed. Sometimes too much of extinguishing action prevents the maturation of hot humours though some people insist on refuting this opinion. They do not realize that powerful extinguishing action reduces the vitality, especially when it has been weakened by illness. Though it rectifies the matter a good deal, it begets other maladies, either in the form of simple cold intemperament or intemperament associated with matter contrary to the temperament which it has rectified. When a cold intemperament is established, it is difficult to render it hot but it is easier to do so in the early stage. In short, to render a cold intemperament warm at the outset is easier than to render a hot one cold at the outset. But to render a hot intemperament cold in the last stage is difficult, though it is not as difficult as to render a cold one hot in the last stage. It is because the extreme cold itself means the death of the physis or something like that.

It should be noted that cooling is sometimes associated with desiccation, sometimes with moistness and sometimes it is free from these associations. Desiccation bestows much stability to the existing cold and moistness is very effective in producing cold. All the causes of heat induce desiccation if they are preponderant and all the causes of cold cause humectation if they are preponderant. Nothing is likely to have this effect as rest, regular and light baths and sitz bath. We have explained it in the preceeding (discussion). Similarly diluted wine has strong moistening effect. You must note that if an old man requires cooling and moistening, it would not be sufficient to bring him to an equable temperament but that much of cooling and moistening would be required which goes beyond equability and reaches the cold and moist temperament which is normal for him. The reason is that though such a temperament is accidental, it is almost natural for old people.

Again you must know that for changing a temperament it is often needed to use things out of which some strengthen that temperament and some are contrary to it. For example, vinegar is needed to be used with medicines which are hot towards a given member so that their action might penetrate it (fully); again for example, it is needed to use saffron with cold drugs for the heat in order to help them reach the heart. In many cases a drug may be strongly effective in altering the temperament, but because of its lightness, it does not stay long enough to perform its action. Hence it is required to admix with it such thing as might render it thick and retain it, even though its action might be contrary to the action of the former. For example, we mix wax and other things with balsam oil to leave it on the member long enough to ensure its action being accomplished.

Section III

How and when depletion is necessary

The states, which show when it is right to procure depletion, are ten: (1) repletion; (2) vitality; (3) temperament; (4) appropriate symptoms, for example, if there is looseness of the bowels, purgation is not to be procured because it is dangerous to procure purgation after purgation; (5) physique; (6) age; (7) season; (8) climatic condition of the country; (9) habit of depletion and (10) occupation. If these factors are contrary to the symptoms which necessitate depletion then depletion is forbidden. Thus: (1) If the body be free from superfluity, depletion must not be procured. (2) Similarly, weakness in any of the three (primary) faculties is a contra-indication. But sometimes we (procure depletion and) prefer the weakness of a faculty to the harm accruing from avoiding it. This applies only to sensory and motor faculties. Or (we do so) when we expect to counteract the probable dangers and this is (probable) in all the faculties.

(3) Depletion is forbidden in hot and dry temperament and also in cold and moist temperament, in which there is no heat or very little heat. However, it is freely allowed in hot and moist temperament. (4). With regard to physique, in excessive leanness and thinness depletion is forbidden because there is the risk of dispersion of vitality. For the same reason, when person is weak and lean and has much bile in blood, he must be treated with medicine and depletion should be avoided. He should be given such foods which produce good blood inclined to coolness and moistness. Thus, in this way, sometimes you rectify the temperament of his humours and sometimes you make him strong enough to bear the depletions. Similarly, you should not procure depletion in the case of a person who is accustomed to eat sparingly. Marked obesity also contra-indicates depletion because there is the risk of making the cold dominant and of allowing the flesh to compress the vessels and close them when they are empty.

Thus the heat is smothered and the superfluity is pressed towards the viscera.

(5) Bad symptoms such as predisposition to sprue and convulsion, contra-indicate depletion. (6) Depletion must be avoided when the patient is of the age in which full growth is not achieved or has reached the age when emaciation begins. (7). Depletion is forbidden at a very hot or cold time. (8). A southerly country which is very hot is contra-indicative because (a) most of the purgatives are hot and combination of two heats becomes intolerable. (b) Faculties in such countries are enfeebled and slackened and since the extraneous heat draws the matter towards the surface and the medicine draws it inwardly. Thus there is a kind of pulling which leads to a conflict. Similarly depletion is avoided in very cold northerly countries. (9). Avoid depletion when the habit is to have depletions infrequently. (10). Occupations involving too much of depletions contra-indicate their use; for example the occupation of bath-attendants and coolies. In short, all occupations involving arduous labour are contra-indicative.

It should be known that in procuring depletion the purpose is one of the following five things:

(1) Depletion of that which must be depleted and this would be followed, necessarily, by rest. But there might be (after depletion) fatigue or outbreak of heat or transient fever or other accompanying maladies, for example, abrasions of intestines caused by diarrhoea and ulceration of bladder caused by diuresis. Thus in such cases though depletion is advantageous, the advantage is not appreciated unless the symptoms have disappeared.

(2) The direction to which the matter is inclined (to flow) should be considered. For example nausea should be treated with vomiting and gripping with purgation.

(3) Considering the "inclination" of the matter, an appropriate member for its elimination should be chosen. Thus, in the disease of liver, the right basilic and not the right cephalic should be chosen. An error in such cases sometimes proves dengerous. The member chosen for the site of depletion must be less important than that which is to be depleted, lest the (morbid) matter should pass down into a nobler member. Depletion must be procured through natural outlets, as the urinary organs are (natural outlets) for the convex part of the liver and the intestines for its concave side.

Sometimes the member through which the matter is to be eliminated is itself the one from which the depletion is to be procured. But the member has some deficiency or malady and it is dangerous to allow the humours to pass through it. Hence it is needed that the humours be diverted towards some other suitable member. Sometimes there is a risk of developing a malady in the member owing to the dominance of humours (which are diverted towards it). For example, there is the risk of developing diphtheria from the matter diverted towards the throat from the eyes. Hence, in such cases treatment should be carried out gently. Sometimes physis itself acts on the same principle and procures depletion through a member other than the usual in order to protect that member when it is weak. Sometimes (diagnosis) becomes difficult if the matter depleted by the physis is eliminated through a distant and opposite site. For instance, in the case of the matter which is diverted from the head towards the anus or legs and feet. For it is not really known whether it is from the brain as a whole or only from one ventricle.

(4) (Proper) time for depletion: Galen rightly says that one should wait for maturation in chronic diseases and not in other cases. You already know what maturation is. In chronic diseases it is proper to give attenuants such as water of hyssop, of wild thyme and of seeds. But in acute disease, it is best to wait for maturation, especially when the (morbid matter) is stagnant. If it is on the move, it is better to procure depletion at once because the injury accruing from its movement is greater than that involved in the depletion of the matter before it is maturated, especially when the humours are thin and when they are within the cavities of vesseles and have not entered the members. If the (morbid) humour is confined to a single member, it does not move at all until it is maturated and has acquired normal consistency as you have already learnt it in its proper place. Similarly if we are not certain that the vitality will last until the time of maturation, we procure depletion of the matter after noting carefully whether the matter is thin or thick. If the matter is thin, not penetrated into the tissues or it is of normal consistency, it should be depleted. But if it is dense and thick, it is not permissible to agitate it except after rendering it thin. The thickness of the morbid matter is indicated by some previous dyspepsia or by the intensive pain under the epigastrium or by the development of swelling in the viscera. In such a condition the most important thing that we have to do is to see that the passages are not closed. After all these precautions you may deplete the matter even before maturation.

(5) The amount to be depleted: This is to be estimated from: (a) the amount of the matter; (b) the strength of the patient and (c) the symptoms which remain after the depletion. If the depletion might leave behind some symptoms we should first know the amount of depletion which might lead to those symptoms and then reduce the amount in order to counteract them, as it is done in repletive spasm.

It should be known that there are two ways of depleting (morbid) matter and transfering it from its place: (a) by attracting it towards an opposite and distant member and (b) by attracting it towards an opposite and near member. The best time for this is when there is no excessive repletion in the body, nor the matter is already inclined to move. Let us suppose that there is a considerable flow of blood from upper part of the mouth in a man or from piles in a woman. Hence we have only two alternatives: (i) Either we deplete the matter by diverting it towards a near member of opposite character. Thus, in the first example, it is proper to divert the matter towards nose by inducing epistaxis and in the second example, towards uterus by inducing menstrual flow. (ii) But when we have to attract the matter towards some remote and opposite member, we will have to let the blood discharge from vessels and parts of the lower portion of the body in the first example and from the vessels and parts of the upper portion of the body in the second example.

When matter is to be attracted towards some remote and opposite member, that member should not be away (from the matter) in both dimensions (i.e. length and breadth) but should be so in one dimension only and that is at a greater distance. Thus if the matter is in the upper part of the right side, it must not be attracted towards the lower part of the left side. It should be either attracted towards the lower part of the right side itself and it is preferable or towards the left side of the upper part provided the distance between the two parts is as much as between the two shoulders and is not as much as it is the case of the two sides of head itself. For, if the matter is on the right side of the head, it is diverted towards the lower part (of the body), not towards the left side of the head. When you intend to attract the matter towards some remote member, you should first relieve the pain of the part from which the matter is attracted that its interference with attraction might be reduced. It is because pain exerts an attracting effect. If the matter does not move in the desired direction, do not use violent measures. It is because violence sometimes activates it and makes it thin. Hence it is not attracted and becomes more inclined to the painful part.

Sometimes it is sufficient to draw the matter away, although it is not depleted. It is because the attraction itself prevents the matter from progressing towards the member even when it is not depleted. Thus attraction itself serves the purpose without actual depletion of the matter. But you have to be content with things like bandaging up the opposite member or cupping or rubefacient medicines or in short any measure which causes pain. The matter which is in the vessels is depleted more easily. Then is the matter which is in the members and joints because sometimes it is difficult to remove and deplete it from them. In depleting it other things also are inevitably eliminated. A person from whom morbid matter has been depleted must not be tempted to take much raw foods otherwise the physis attracts them without being (fully) digested. If, however, there is such a need, one should take foods in small quantities—bit by bit—so that the (increase) is quite gradual and the food entering the body is well digested.

Venesection is a special (method of) depleting humours which are all increased equally. But, when only one humour is excessive or there is some corruption in its quality, the special method of depleting is something other than venesection. Excess of any kind of depletion produces fever in most cases. The checking of diarrhoea in case of persons having habitual looseness of bowels gives rise to any other malady, restoration of the same (kind of) depletion cures that malady in most cases. For instance, if the stoppage of discharge from ear or nose produces giddiness in a man, it can be removed by restoring the discharge.

It should be noted that to leave behind a little of (morbid) matter requiring depletion is less injurious than to strive to deplete it so outright and vigorously as to cause debility. For, in most cases, physis itself disperses all that is left behind. As long as the humour is of the kind that is fit to be depleted and the patient is able to sustain it, one should not be afraid of the excessive depletion. Sometimes you are in need of depletion even as far as syncope. When a person's natural body power is strong and he has plenty of depraved humour, depletion should be procured gradually. Similarly, if the (morbid) matter is extremely viscid or admixed with blood, it is not possible to deplete it at one sitting. This is true in the case of sciatica, chronic joint pains, cancer, chronic itch and chronic boils.

Remember that purgation draws moribd matter from the upper parts of the body and uproots it from the lower parts. Purgation is, therefore, favourable for both kinds of attraction—attraction towards opposite and suitable directions. It is also suitable when the matter has been localised. Thus, when the matter is below, it draws it towards the opposite direction and also uproots it from the position in which it is lodged. Vomiting performs attraction and elimination in an opposite way. Venesection is of different kinds according to the positions from which the blood is taken as you already know it. Persons having the least need of depletion are those who take proper food and have good digestion. Persons residing in hot countries have very little need for depletion.

Section IV

General rules for emesis and purgation and mode of action of the purgative and vomitive medicine.

A person intending to procure purgation or vomiting should break up his meal and should take the food sufficient for a day in instalments. He should also have different varieties of foods and drinks. For, in such a state the stomach has a tendency to expel what is in it, either upwards or downwards. The stomach is eager for the food which is not diversified and not taken after some (prior) food. Moreover, it retains the food and holds it very strongly, especially when it is in small quantity. But the persons having already loose bowels should not do any of these things. It should be remembered that the need of vomiting and purgation and the like does not arise in the case of those who follow a good regimen. It is because persons following good regimen need only milder things than vomiting and purgation and sometimes only exercise, massage and bath suffice for a person intending depletion. Again the repletion in the body of such a person is mostly with good humour, that is, blood. Hence such a person requires venesection instead of purgation for his depuration.

If it is necessary to procure venesection and also depletion with things like hellebore and strong medicines, we must begin with venesection. This is one of the precepts of Hippocrates in his Book Epidemics (ibidhimia) and this is sound. The same is to be done if the phlegmatic humours are admixed with blood, But if the humours are viscid and cold, venesection sometimes makes them more thick and more viscid. Hence it is necessary to begin with purgation. In short, if the humours are (increased) uniformly, venesection should be carried out first and if some humour is dominant even after that, it should be depleted. And if (the excess in) humours is not uniform, the dominant humour should be depleted first till all the humours are uniform; then venesection should be carried out. If a person administers medicine before venesection in a case where he should have procured venesection first, he should postpone the venesection for a few days. If after venesection a person soon requires depletion, he should be given an appropriate medicine. If medicine is administered in cases where venesection is necessary, it mostly causes fever and restlessness. If these symbols do not subside with sedatives, one should know that venesection must have been carried out first.

Depletion in each case is not necessitated by the excess of repletion. But sometimes it is needed by severe condition and by quality of repletion rather than its quantity. A venesection which is due at a time is often rendered unnecessary by a good regimen. Often depletion is needed but there is some obstacle which does not allow it. Hence in such a case no regimen is better than fasting, sleeping and correcting the intemperament which has been caused by repletion. Then there is a form of depletion which serves as prophylaxis. For instance, the depletion which is needed by a man who is habituated to gout and epilepsy etc. at a known time, especially in spring. Hence, he requires to use prophylactic measures before that time and procure the sort of depletion which is specific for his disease, whether it is by way of venesection or purgation. Sometimes external use of desiccants and some absorbent medicines serves as depletion, as it is done in the case of those suffering from dropsy.

Sometimes you have the need of a medicine having a quality corresponding to that of the humour which is to be depleted; as scammony is needed for depleting bile. Then it is proper to mix with it a drug which is of an opposite quality which aids it or (at least) does not hinder it in effecting purgation as myrobalan and if some intemperament arises as a result of it, it should be corrected afterwards. Vomiting and purgation are difficult in the cases of those suffering from the swellings of viscera. But if purgation becomes essential such things as lablab, carthum seeds, common polypody, purging cassia and the like should be used. Hippocrates opines that the best way of doing catharsis of a person who is lean and is easily susceptible to vomiting, is to induce vomiting and this should be done in summer or spring or autumn but not in winter. For one who is of normal built, purgation is indeed better. If, however, there is some factor necessitating vomiting for his depletion, it should be postponed to summer but it must be avoided when it is not necessary.

Before procuring purgation and vomiting the humour which is to be depleted must be attenuated. Moreover, the channels must be widened and opened because it saves the body from fatigue. Note that one of the most successful regimens is to make the physis mild and easily yielding to the desired vomiting and purgation before using strong medicine. Moreover, purgation and vomiting are difficult, wearisome and dangerous when the hypochondrium is weakened. Sometimes an emetic agent turns to be purgative when: (a) the stomach is strong; (b) it is taken during a state of great hunger; (c) the patient has diarrhoea and looseness of the bowels; (d) the patient is not habituated to vomiting and (e) emetic agent of a drug is heavy and quick in descending towards intestines. A purgative will act as an emetic drug when: (a) the stomach is weak; (b) there is much dryness of the stool; (c) the drug is unpleasant and (d) it produces dyspepsia.

If a purgative fails to act or depletes only immature humour it activates the humour which is to be depleted by it and then spreads it in the body. Thus this humour becomes dominant in the body and other humours also change into it. Consequently that humour becomes excessive in the body. Some of the humours are such as readily respond to vomiting in most cases as the bile and some of them are such as do not respond to it as the black bile and some of them are such as are in a changing state as phlegm. Purgation is better than vomiting in the case of those suffering from fever. Vomiting is difficult in the persons whose humours are passing downwards as the persons suffering from lienteric diarrhoea. Among purgative medicines the one which is the worst is compounded from drugs varying markedly in the time of their purgative action. Thus there is a disturbance in purging and one of the drugs acts before the other and sometimes the one would expel the other drug itself. If a person uses a purgative or an emetic and his body is free from abnormal humours, he is bound to develop vertigo, gripes and restlessness. Hence the matter which is depleted, is depleted with great difficulty.

In short, as long as a drug depletes the superfluities, there will be no restlessness. If it should cause restlessness it indicates that it is depleting something other than superfluity. When the humour depleted through vomiting and purgation changes into another kind of humour, it indicates that the body has got rid of the humour which was to be depleted. But when the depleted humour is the intestinal mucous and something black and foul smelling, it is a bad sign. If a sound sleep follows a purging or vomiting it indicates that the depletion has thoroughly cleansed the body and has proved beneficial. Remember that excessive thirst during purgation and vomiting indicates that the depletion has been thorough and satisfactory and the body has been properly cleansed.

It should be remembered that the purgative medicine expels a humour with the help of its attractive power which attracts that humour only. Thus, sometimes, it attracts the thick humour and leaves behind the thin one. This is done by the medicines which purge black bile. The assertion that the purgative itself gives rise to the one which it attracts or that it attracts first the one which is most tenuous, is baseless. Besides this view, Galen also generalises that when a non-poisonous purgative fails to act and is digested in the body, it produces the same kind of humour that it attracts. But this view is not sound. It would seem that Galen, in making this assertion, considers that there is similarity in substance between the attracting drug and the attracted humour and for this reason the drug attracts (the humour). But this is not true. If attraction took place owing to similarity, then a larger amount of iron must attract a smaller one and a larger amount of gold must attract a smaller amount of gold. But a thorough enquiry into this matter is not the concern of physicians.

It should be remembered that after the use of purgative and vomitive medicine the humours are attracted through the same channels through which they flow (into the tissues). Thus when these humours reach the intestines and the stomach, the physis expels them. It is occasional that after the use of a purgative the humours should ascend to the stomach; if they did, they would be expelled by vomiting. And if they do not move towards the stomach it is for two reasons: (a) the purgative medicine has passed on quickly into the intestines and (b) after use of the purgative the physis hurries itself to drive it from the mesenteric veins to the lower and still lower part and not to the upper part. For it is nearer and easier and because the matter which remains behind it also presses it. And this is what activates the physis to expel the matter through the nearest route (of exit). Although the purgatives have an attractive power which "clings" to the humour, the expulsive power of the physis may be dominant in a person whose faculties are sound. Moreover, the drug absorbs it only along a definite route. But the case of an emetic is contrary to this. For, when it is in the stomach it lingers there and attracts the humour towards itself from the intestines and by its own power and opposing the power of physis expels the matter through vomiting.

It must be known that the humours which the medicines attract, mostly come through the vessels. But the humours which are in the neighbouring tissues are attracted through vessels as well as through routes other than vessels. For instance, the humours which are in the lungs are attracted towards stomach and intestines by contiguity even when they do not move through the vessels. It should be remembered that absorbing action of drying medicines mostly serves as a cause of depleting moistures from the body as in dropsy.

Section V

Purgation and its rules

We have already stated that before giving a purgative, body must be prepared for it; the pores should be dilated and the bowels should be loosened especially in cold diseases. In short, loosening of the bowels before giving a purgative is a good rule and this ensures safety except in the case of those who have a tendency towards diarrhoea. In the case of such persons anything of this sort should not be done because it would be a cause of excess in diarrhoea. In the case of such persons an emetic medicine should be mixed with the purgative so that the purgative might not pass down quickly from the stomach before it has done its allotted act or rather the power of the two ingredients would be balanced. Hence the purgative will do its own function and the emetic will do its own function contrary to the direction of the purgative. Stammerers are predisposed to diarrhoea. Hence they do not stand strong purgatives. And the stammerers suffer from diarrhoea mostly because of the catarrhal flow from their heads. It is dangerous to administer a purgative if there is dry faecal matter in the intestine. It should be removed first by means of an enema or by a lubricating broth.

The use of bath for several days before administering a purgative serves as an attenuant. It is one of the best means of preparation for purgation provided there is no contra-indication. But there must be a little interval between the bath and the draught of medicine. One must not take bath after taking a purgative because it would attract the matter outwards and this is better only to control purgation and not to assist it. It may be taken only during winter. Then there will be no harm if the patient enters the first chamber of the bath where the heat is not capable of attracting the matter but is capable of only softening it. In short, persons using purgatives need such an air as is a little warm and does not cause sweating and restlessness. For such an air is one of the adjuvants. Massage and oil rubs also are among the adjuvants. A physician should abstain from administering powerful purgatives to those who are not accustomed to purgatives and have never taken such medicines.

Persons suffering from dyspepsia or having viscid humours or distension in epigastrium or those having inflammation and emboli in their viscera should not be administered any purgative unless these are rectified with emollient foods, bath, rest and by avoiding anything likely to cause activity and burning (in the humours). Persons who drink stagnant waters and those who have spleen disease require strong purgatives. If a person who has taken a strong purgative, it is better for him to sleep before the action of the medicine. Thus the medicine will act more effectively. If the purgative is mild, it is better not to sleep after it, because the physis would "digest" the medicine. If the medicine has started to act, it is better to avoid sleep be it (i.e. medicine) of any kind. One should not walk just after taking a purgative. He should take rest after it so that the physis might enclose it and thus act upon it. It is because as long as the physis does not act upon the medicine, the medicine also does not act upon it. (After a purgative) one should smell odours which check nausea, as the odours of mint, common rue, celery, quince and Khurasan earth with rose water and a little vinegar sprinkled upon them. If a person abhors the odour of a medicine while taking it, he should compress his nostrils. If a person is disgusted with the medicine he should chew something like tarragon till it anaesthetizes the mouth. And if vomiting is feared, limbs should be bandaged up and some astringent drug should be given after the purgative.

For such persons the physicians smear the pills with boiled honey or boiled sugar till they put them into a covering. Another useful artifice is to coat the pills with *qairuti*. Again another expedient step is to fill the mouth with water or something else and then swallow the pill or by using any other artifices; thus the whole thing should be swallowed before any effect of medicine is felt (in the mouth). A purgative drug must be taken in the form of warm decoction and a pill must be taken with warm water. The stomach and feet of the patient taking purgative must be kept warm. When the patient's mind has become soothed he should have a gentle walk because this movement is helpful. He should also sip warm water after a little intervals of time but not enough to purge out the medicine (through defecation) or weaken its strength unless there is the need of controlling the purgation. Moreover sipping of hot water also reduces the harmfulness of the medicine. If a person intending to take a purgative is of hot temperament, weak constitution and weak stomach it is better for him to take before it something like barley water or pomegranate juice. In short, he should have in the stomach some tenuous and light food. But for those who are not so, it is better to take the medicine on empty stomach. Persons taking purgatives in extremely hot summer generally may develop fever.

A person taking purgative must not eat or drink until the medicine has finished its action. He should not also sleep during purgation unless he wishes to stop it. If a person's stomach cannot bear hunger because it is in bilious state—bile readily pouring into it or because he has had a prolonged dieting or fasting, he should be given a little bread which has been soaked in a little wine after he has taken the medicine and before the bowels have acted on it. This is one of the measures which sometimes (help the action of) the medicine. The anus should not be laved with cold but with hot water. Some people say that if pills are to be given with decoctions, the decoctions must be of similar (quality). Thus the pill to purge bile must be given with such a decoction as of fumitory. The pill to purge the black bile should be given with a decoction, for instance, of dodder or common polypody or the like. The pill to remove phlegm should be given with decoction of such as common centaury.

If you have to deplete a body, which is dry and of hard flesh, with a strong medicine as hellebore and the like, you should fully moisten it with fatty foods before procuring depletion. In short, strong medicines are very dangerous. I mean to say medicines like hellebore produce convulsions if the body is free from (extraneous) matters. Moreover they produce suffocating movement in the moistures of the body if the body is over-loaded with them and draw such things towards the viscera which are difficult to expel. Curds check and cure the harmfulness of purgation when it is in excess due to the use of poisonous latex of herbs as mazerion and spurge. A medicine often leaves its odour behind in the stomach. Hence it appears as if it is still in the stomach. The remedy for this is the flour of roasted barley to wash it away. And this is the most efficient of all medicinal powders. When a purgative does not act even after sufficient time, we should leave it provided it is possible to do so without activating any harm. And if there is any danger, it would be better to sip honey-water or syrup of honey or water in which sodium nitrate has been dissolved or a suppository or enema should be given.

One of the causes of deficient action of a medicine is the narrowness of the passages. This narrowness might be congenital or as a outcome of the temperament or because of the proximity of any disease. Thus, in the case of persons afflicted with paralysis and apoplexy the passages of medicines towards the morbid matter become narrow and purgation becomes difficult in such persons. It is dangerous and against any principle to give purgatives twice on the same day. Every (purgative) medicine which is specific for a given humour will produce confusion (i.e. disorderly movements) and act with difficulty if it does not find that humour. It will act in the same way if it finds that humour submerged in opposite kinds of humours. Every (purgative) medicine first eliminates the humour which is specific for it, then the humour which is near to it in predominance and thinness and so on in the same order. But blood is excepted because physis stores it up and reserves it (to the very last). It is difficult to attract a humour from a distant part (of the body). If one fears that restlessness or nausea will occur after taking the medicine, it is better for him to induce vomiting by taking raw radish or its decoction three or two days before taking the drug. There must not be much salt in the food of those who wish to take a purgative medicine.

A (purgative) medicine often causes restlessness, nausea, fainting, palpitations of the heart and griping especially when it fails to purge or its action is delayed. Hence it is often necessary to induce vomiting but generally astringents suffice for this mishap. Use of barley water after purging removes the evils of purgation and cleanses whatever remains sticking with the passages. Persons of cold temperament, in whom phlegm predominates over other humours, should, after the use of medicine and its action, take water-cress washed in hot water and (dressed) with olive oil. And persons of hot temperament should take ispaghula with cold water, oil of violets and sugar candy or with rose water. Those of equable temperament should take linseed. If there is risk of abrasions, armenian bole with pomegranate juice should be given. The aforementioned things should be used only after the purgation has stopped otherwise they would stop the purgation. If a person taking purgative develops fever after the medicine then barley water is the best thing for him. As oxymel is an irritant, it should not be given for two or three days (after the purging) till the intestines regain their strength.

A person having undergone a purge should enter bath on the following day. If something from his humours is left behind, (it will react in two ways): (a) If you find that the bath is pleasing and agreeable for the patient, it indicates that the bath is eliminating the residual matter. Hence it should be continued. (b) If you find that the patient does not enjoy the bath but dislikes it, you should stop it.

Remember that persons of weak intestines often receive purgative power from the purgative medicines. Thus the case becomes chronic and a good deal of treatment is needed to check it. There are the similar risks of purgation in old persons. Remember that use of *nabīdh* (i.e. a kind of wine made from dates or grapes) after purgatives causes fevers and restlessness. Purgation and venesection often produce pain in liver. This is relieved by a draught of hot water.

Remember that the time of rising of the dog-star which is that of extreme cold and the season when the mountains are covered with snow, are not suitable for purgatives. (Purgative) medicines should be taken during spring and autumn. In spring only mild purgatives should be taken as the summer is to follow (soon); whereas autumn is the (best) time. One must not get accustomed to taking medicines whenever there is a need of loosening the bowels. This turns into a habit and leads the man concerned to untoward consequences. Persons of dry temperament are debilitated by strong purgatives. After a mild purgative activity must be reduced lest its power should be impaired. Violet and sugar are one of the mild and beneficial purgatives. One who has to take purgative in winter would wait for the southerly winds. Some people opine that the opposite rule should hold in summer (i.e. if it is to be taken in summer one should wait for northerly winds). But this needs a detailed discussion. If a mild purgative is administered to a patient and it does not act then it is not proper to activate it, we should rather leave it.

Purgative often makes the blood agitated. Hence it gives rise to fever. Venesection generally suffices for such fever.

Section VI

Excessive purgation and timing of its stoppage

Thirst is one of the symptoms that give us to know that the time for checking purgation has come. If diarrhoea (from drugs) persists and there is no thirst, one need not be afraid that the action is excessive. But thirst may develop, not from much purgation or excessive purgation, but because of the conditions of the stomach. Thus, when the stomach is hot or dry or both, it readily causes thirst. (Sometimes) thirst develops because of the character of the medicine, when it is hot and irritant. (Sometimes) it develops because of the matter itself when it is hot as bile. In the case of these causes it is not improbable that the thirst arises quickly. In the same wav if there are opposite causes it is not improbable that the thirst develops with delay. In any case when you see that the thirst is excessive and passing of stools is also not diminished, you must stop purgation, especially when the factors which cause thirst to develop quickly are not present and still the thirst is quite frequent. In such cases when there is thirst, one should not delay in stopping the purgation. Sometimes the discharge of what was intended to be discharged also shows that the time for checking purgation has come. Thus when a person taking a purgative for bile finds that the bile has been discharged and phlegm is coming out, it indicates that the action has been excessive. Just imagine how much more will it be so if the black bile begins to come out (in the stools). And if blood begins to come out it is dangerous and more troublesome. If purgative has caused griping, one should consider what has been said in the chapter on gripes.

Section VII

Treatment of the patient suffering from excessive purgation

Purgation becomes excessive because of the following things: (1) weakness of the vessels; (2) widening of the orifices of the vessels; (3) drenching of vascular orifices owing to purgatives; (4) intemperament acquired by the body from purgatives or any condition like intemperament. Hence when purgation has been excessive, bandage up the upper limbs and the lower ones, beginning at the armpit and groins and going downwards. Give the patient a drink of theriaca or a little of philonium. If possible, induce sweating either with bath or by passing vapour of hot water under his clothes which should cover the whole body except head. When sufficient sweating has occurred, the body should be massaged and the patient should be given astringent drinks and fragrant liquids prepared from aromatics, sandal wood, camphor and fruit juices should be given for inhaling. It is also necessary to massage the external members and keep them warm even when hot cupping is to be given below the ribs and between the should-ders. If deemed necessary, one may apply plasters prepared from crushed roasted barley and astringent juices over the stomach and intestines. Oils of quince and mastic may be used in the same way.

The patients should be protected against both hot and cold winds because cold wind induces purgation by squeezing and hot wind enfeebles their vitality. They should be invigorated by the use of fragrant perfumes. Moreover, they should take astringent drinks and cakes soaked in fragrant wine. But this wine must be hot and before this some bread with pomegranate juice should be given. Similarly various kinds of crushed roasted barley and powdered poppy seeds are also useful.

A well-tried prescription is as follows:—
Three *dirham* (10.5 gm) of garden cress are roasted and then boiled in churned sour milk until they have coagulated. Then it should be taken. It is extremely beneficial.

The food of such persons should be astringent as juice of sour grapes and the like and cooled with ice. One of the helpful measures to arrest purgation is to induce vomiting by drinking hot water. It is also helpful to keep the extremities in hot water. Such patients should not be exposed to cold even if they faint. They should not be given wine. If all these measures fail, you should use, as a last resort, narcotics and all those powerful treatments which have been mentioned in the chapter on arresting diarrhoea. It is proper for the physician to keep some astringent lozenges and powders ready before the time (of giving purgative). It is also advisable to have before hand appliances for giving an enema.

Section VIII

Regimen for one who takes a purgative but it fails to act

When a purgative fails to act and produces griping, restlessness, impaired vision, headache, stretching and yawning, one must have recourse to enema and common suppositories. The patient should be given a drink of three Kazamah (3 gm) of mastic in lukewarm water. Sometimes purgative is activated when the patient takes astringent drinks or eats such things as quince and apples after it. It is because these things constrict the cardiac orifice and what is below it; allay nausea and drive the medicine downwards instead of upwards and they also reinforce the physis. If enema does not prove useful and such bad symptoms as tension of body and exophthalmia (bulging of eyes) appear, it means that the matter is moving upward. Then venesection is quite essential. If the purgative fails to act but adverse symptoms do not appear, it would still be well to carry out venesection even after two or three days. For, if that is not done, there is a danger of the humours drifting towards the principal organs.

Section IX

Description of different kinds of purgatives

Some of the purgative medicines are very dangerous, as black hellebore and turpeth root which is not white and of good quality but is of yellowish kind and as agaric which is not of the white and pure kind but is blackish and as mazerion. All of these things are not safe and good. If any of these things is taken and adverse symptoms appear, it is better to expel it from the body as soon as possible by means of vomiting or purgation and appropriate theriaca should be given. The harmfulness of many of these drugs, as yellow and putrefied turpeth root, and the corruption that they cause to the physis may be removed by drinking very cold water and by sitting in it. Such harmfulness is also removed by all those things which nullify the acuity (of the purgatives) by their glutinosity and laxation and also by their greasiness in which there is glutinosity. These are beneficial in the aforementioned circumstances.

Some medicines suit certain temperaments but do not suit others. Thus scammony, will act only feebly in people of cold countries, unless a larger dose is administered as it is usually done in Turkey. In case of some persons and some countries only the extracts of medicines are to be used and not the actual substance. Fragrant medicines must be mixed with the purgatives to preserve the strength of the members. For this purpose medicines for heart are very suitable because they invigorate animal spirit of each member and most of them assist (purgation) because of their attenuating and liquefying property. Two medicines are sometimes combined, one of which expels its corresponding humour rapidly and the other slowly. Thus, the one completes its action before the other. And sometimes one may also slightly hinder the action of the other into its corresponding humour and then impair its power. Hence, when the other action begins after the first, it is weak in action and it induces only ineffective movements. Hence it is necessary to admix with it something which might "hasten" its action as dried ginger with turpeth root because it does not leave the turpeth to remain inactive for a (considerable) time. But this happens only when they have been admixed properly. You must also take into consideration all those principles which we have elucidated under the properties of purgative medicines where we have spoken of the general principles of simple drugs.

In spite of their specific property purgative medicines cause diarrhoea in different ways—(a) some of them dissolve (the matter) as turpeth root (b) some squeeze (the intestines) as myrobalan; (c) some soften (the matter) as manna and (d) some produce slipperiness, as the mucilage of ispagula and bukhara plum. Most of the powerful purgatives are somewhat poisonous and hence produce purgation by overpowering the physis. So they must be corrected by their antidotes. Sometimes bitterness, pungency, astringency, acridity and sourness greatly help the action of the medicine if they are in harmony with its property. For, bitterness and pungency help the resolvent property; acridity helps squeezing and sourness helps incisive property which enables (the matter) to slip. Lubricants must not be combined with squeezing medicines in such a way as the powers of both are equal to each other. In such cases it is better that one of them begins to act after the other. Thus, for instance, of the two medicines the laxative should do its function before the medicine does its function of squeezing. Then the squeezing medicine will come to act and purge the matter that was softened by the laxative one. The same rule should be applied (to the other cases).

Section X

Relevant points dealt with elsewhere

The prescriptions of purgative and laxative medicines—whether they be for internal use, external application or something else—according to the age of the patients are to be found in our pharmacopoea and in (the volume on) Simple Drugs, the rectification and corrective of each of the simple drugs and mode of their administration are to be found. Pills which are to be taken should neither be so dry as to petrify nor so soft as to cling and stick. But they should be taken when they are just beginning to get dry and yet yield to the pressure of the fingers.

Section XI

Emesis

Persons who least deserve that the physician should procure their emesis are so by nature of their habit. Thus the persons who are so by nature have contracted chest, unsound breathing and are liable to haemoptysis, have thin neck and are liable to inflammation of the throat. But, for the persons with weak stomach and those, who are very fat, purgation is (more) suitable. Lean and thin persons are fit for emesis owing to the excess of bile in their system. The persons who should not be treated with emesis owing to their habit comprise all those who find vomiting difficult or are not accustomed to it. In such persons if vomiting is procured by powerful emetics, the vessels of their respiratory organs are sure to burst and thus they will develop consumption. Persons feeling difficulty in vomiting should be given (first) mild emetics, then even powerful emetics like hellebrore etc. might be used.

If the patient is such as should not vomit but still vomiting is quite essential in his case then you should first get him disposed and accustomed to it and feed him on soft, oily and sweet substances. He should also desist from exercise and then vomiting should be induced and fats and oils should be given with wine. Then give him good food before vomiting, especially when vomiting is difficult to induce. For sometimes vomiting is not procured and physis is "miserly". Hence, if it holds back good food it is better than its holding back bad food. If a person vomits after taking food which he took for inducing vomiting, he should not eat until he is very hungry and he should allay his thirst with things like apple juice instead of water and instead of julep and oxymel since they cause nausea. The appropriate food for him is roasted chicken followed by three cups of wine. If one vomits sour material without having such habit previously and his pulse shows a slight fever the meal should be postponed to midday and before the meal warm rose-water should be taken.

If one vomits black bile persistently he should apply over his stomach a sponge soaked in sharp and hot vinegar. The food for inducing vomiting should preferably be of different kinds. For if the food is of only one kind, sometimes stomach with its tendency to withholding it retains it. If there is vomiting of mucoid matter it is useful to give sparrow or pigeon meat. But the patient must not eat bones of their extremities because they are heavy and slowly digested in the stomach. The patient should also be given a bath. Persons taking emetics should run fast, take exercise and get themselves fatigued and then vomit. This should be done at noon. At the time of vomiting their eyes should be covered with a cotton pad and bandaged and a soft strap should be tied gently over the stomach.

Substances which facilitate emesis are rocket, radish, dry salted fish, wild fresh pennyroyal, onion, leek, barley-water taken with its residue and honey, soup of beans with sugar, sweet wine, almonds with honey, unleavened bread fried in fat and resembling balkand, melon, cucumber, their seeds or a little of their roots which should be pounded and soaked in water and used with sugar and radish soup.

One who takes intoxicating wine to procure emesis, should not try to vomit after taking a little of it but should try to vomit after taking a large quantity of it. If beer is taken with honey after bath it produces vomiting and diarrhoea. A person intending to procure vomiting should avoid too much mastication of the food which he takes at that time. If a person uses any strong emetic like hellebore, he should take it on empty stomach at about two hours after sunrise when the bowels have been emptied provided there is no contra-indication. If vomiting is procured with the help of a feather, it is good; otherwise the patient should walk a little and if it also fails he should take the bath. The feather with which vomiting is induced should be anointed with oil like henna oil. If the patient develops biting (pain) and restlessness he should be given a draught of hot water with olive oil. Thus it will either empty the bowels or bring on vomiting. One of the ways which assist emesis is to apply warmth to the stomach and extremities because this will induce nausea. If the emetic is too strong and begins to act quickly, the patient should keep still and inhale pleasant odours. His extremities should be rubbed: he should drink a little vinegar and take apple and quince with a little mastic.

It should be remembered that moving about causes an increase in vomiting and rest lessens it. Summer is the best period for inducing vomiting. If a person whose physique is not appropriate for emetic treatment has to undergo it then summer is the best time for him to do so. The far-fetched purposes of vomiting are either primary depuration or secondary depuration. (In the first case) it is (to clean) the stomach but not the intestines. (In the second case) it is to clean (depurate) the head and the whole body. The attraction and uprooting (of the matter) take place from the lower parts also.

You should know that the emesis has been beneficial and not harmful when it is followed by lightness (i.e. relief), good appetite, good breathing and pulse and similar is the case of all faculties.

Moreover, the beginning of vomiting is with nausea and an intense irritation in the stomach might be most painful if the emetic is powerful like hellebore and its preparations. Then there is a flow of saliva and then there is vomiting of much phlegm for several times. Then it is followed by discharge of fluid things like spittle. And irritation and pain persist without passing on the other symptoms except nausea and restlessness. Sometimes an emetic causes looseness of the bowels. Then at the fourth hour the patient begins to settle down and is inclined to have rest.

A bad emesis has the following signs

(a) vomiting does not occur easily; (b) restlessness is increased; (c) distension takes place; (d) exophthalmia and eyes get considerably red; (e) sweating is profuse and (f) the voice fails.

When these symptoms are found in a patient and they are not counteracted, the patient dies. These symptoms are to be counteracted by giving an enema along with a dose of honey and tepid water and some oils of antidotal property, like oil of lilies and efforts should be made that vomiting does not recur. For, if the patient vomits he would be choked (to death). He should also have recourse to enema which you must have read beforehand. The best results of vomiting are gained in chronic diseases as dropsy, epilepsy, melancholia, leprosy, gout and sciatica. Although emesis has its benefits, sometimes it attracts some diseases as it produces deafness. It is not advisable to combine venesection with emesis. It must be postponed for three days, especially if there is any humour in the orifice of the stomach. Sometimes emesis becomes difficult because of the thinness of the humours. Hence it is proper to make them thick by taking powdered (dry) pomegranate seeds.

It should be remembered that if there is a severe diarrhoea after vomiting, it indicates that some indigestible matter has moved downwards and if there is vomiting after diarrhoea it indicates that it is one of the concomitants of diarrhoea. The best time for emesis in cases of pain in joints is the midday of summer season. Emesis is good for the body but harmful to the eyes. Pregnant women should not vomit because the superfluities of their menses are not expelled through it and the fatigue causes restlessness. Hence it should be stopped. But in case of all other persons vomiting should be encouraged when need be.

Section XII

After-care of emesis

When the vomiting stops, the patient should wash his mouth and face with water in which vinegar is mixed. This is to relieve the heaviness which occurs in the head. He should take a little mastic with apple-juice and avoid food and water and take rest. Moreover, he should apply oil over the epigastrium, enter the bath and make his ablutions quickly and come out. If it is necessary to give food, let it be tasty, wholesome and readily digestible.

Section XIII

Benefits of emesis

Hippocrates recommends that vomiting should be induced on two consecutive days every month so that the second might make good for the shortcomings and the difficulty of the first and expel what is attracted towards the stomach. Hippocrates ensures preservation of health thereby. But to exceed this would be bad. This kind of emesis expels phlegm and bile and cleanses the stomach. For in the case of the stomach there is nothing of such cleansing agent as there is for the intestines in form of the bile which affects them and cleanses them. Emesis removes heaviness of the head; clears the vision and cures dyspepsia. It benefits persons in whom bile passes into the stomach and corrupts the food. So, if vomiting precedes the food, the latter enters the stomach when it is clean. It removes the disinclination of the stomach to oily things; restores normal appetite and eliminates the desire of the stomach for sharp, sour and acrid things.

Emesis is beneficial for the flabbiness of the body and for ulcers of the kidneys and bladder. It is an effective treatment of leprosy, discolouration of skin, gastric epilepsy, jaundice, orthopnea, tremor and paralysis. It is a good treatment for persons suffering from ringworm. It should be procured once or twice a month after meals. But one should not observe fixed intervals or fixed days (in this connexion). Emesis is most suitable for the persons whose basic temperament is bilious and who are lean (in constitution).

Section XIV

Harmful effects of excessive emesis

Excessive emesis is injurious for the stomach. It weakens it and makes it exposed to the flow of (bad) matter. It is harmful for the chest, eyes and teeth. It is injurious in cases of chronic pains in head except those which arise owing to the involvement of the stomach also. It is harmful in the epilepsy of head which is not caused by the lower members. Excess of emesis causes harm to the liver, lungs and eyes and sometimes it leads to the rupture of some blood vessels.

Some people have the craving for filling up their stomach quickly. Then they are unable to bear it. Hence they have recourse to vomiting. And this habit is one of the things which lead to bad chronic diseases. Such persons must be forbidden to eat to repletion and their food and drink must be in measured amounts.

Section XV

Measures to counteract the complications from emesis

The various steps which are to be taken after the failure of an emetic have already been described. Distension and pain under the epigastrium are relieved by hot fomentation, massage with softening oils and by hot cupping. When after vomiting there is severe irritation in the stomach, it is to be relieved by taking greasy but readily digestible soup and the area (stomach) should be anointed with oil of violets admixed with oil of yellow gilli flower and a little wax. If hiccup develops during vomiting and becomes persistent, it is relieved by inducing sneezing and by sips of hot water. We have already described in the chapter on 'the harmful effects of emesis' the measures that are to be taken in cases of blood vomiting. If after emesis tetanus, cold diseases, stupor and loss of voice appear, it is useful to bandage the extremities; foment the stomach with olive oil in which rue and cucumber have been boiled and administer honey in hot water as a drink. All this is to be done in cases of stupor and (olive) oil is to be instilled into the ears.

Section XVI

Concerning excessive vomiting

It is proper for the patient to sleep. And sleep should be induced by all (possible) measures. His extremities should be bandaged in the same way as one does for stopping diarrhoea. Moreover, strong astringent plasters should be applied over his stomach. If vomiting is so excessive that it leads to the discharge of blood it should be arrested by drinking milk with four *quṭūlāt*(128 gm) of wine because it weaknes the evil effects of the emetic, stops bleeding and loosens the bowels. If with the stoppage of blood, you wish to clear the blood from the breast and stomach so that there is no risk of its clotting, you should make oxymel cool with ice and administer it little by little. Juice of purslane leaves taken with Armenian bole proves sometimes useful in such cases provided it is used by a person who vomits blood as a result of the excessive action of the medicine. The various grades of emetics, their mode of administration, espcially the use of hellebore are to be found in the *Qrabādīn* and in the Volume on Simple Drugs.

Section XVII

Enema

Enema is an excellent way of treatment for removing superfluities from the intestines, as well as for relieving pains and inflammation of kidneys and bladder and for various kinds of colic and for attracting superfluity from the upper principal members. But acute kinds of enema weaken the liver and produce fever. Sometimes enema proves helpful in removing the remnants left behind after depletions. We have mentioned the form of enema and how to use it in the Chapter on colic. Perhaps the best posture for a man taking enema is to be on his back and then turn over to the side of pain. The best time for giving enema is when the air is cold and it is in morning and evening, so that there might be less distress, restlessness and fainting.

The function of bath is to stir the humours and disperse them while the function of enema is to attract the confined humours. Hence it is not good to take bath before enema. If because of fever or some other disease enema is needed in the case of a man who has ulcer in intestines and at the same time there is the risk from procuring enema then his anus, umbilicus and the area around them should be fomented with hot millet seeds.

Section XVIII

Liniments

Limiment is one of those remedial means which approach the disease itself. Sometimes the same medicine has two properties one light and the other heavy. And the need for the light one is more than that for the heavy one. If the light substance of the medicine is equal to its heavy substance and it is used as a plaster then the light one penetrates (into the skin) and the heavy one remains behind. Thus one is benefited by the penetraing part (only) as it is done when coriander is used with crushed barley as a plaster for scrofula. Plasters are akin to liniments with the only difference that the plasters are of thicker consistency while the liniments are fluid. Mostly liniments are used with a piece of linen. If the liniments are to be applied on principal members as liver and heart then the linen applied by exposure to the vapour of raw eagle wood proves useful provided there is no contra-indication. In this way the efficacy of the liniment becomes impregnated with the scent which is agreeable to the members.

Section XIX

Douches

Douches are excellent treatments when there is something to be dispersed from the head or other members or when there is the need of altering the temperament of some members by hot and cold douches. When the superfluities have not passed (into members), at first hot douches should be used. Then cold water should be used in order to stengthen (the affected area). If the state of affairs is otherwise, the cold douches should be tried first.

Section XX

Venesection (blood-letting)

Venesection is a general depletion. It depletes the excess and surplus humour in the same proportion as is present in the vessels. Venesection should be carried out in two types of persons only.

(1) Those who are prone to develop diseases for excess of blood.

(2) Those who have (actually) developed a disease. In both the cases venesection is carried out either owing to excess of blood; bad quality of blood or owing to both the reasons. Persons disposed to these diseases are such as (1) the persons who are disposed to sanguineous sciatica, gout and pains in joints. (2) The persons who frequently suffer from haemoptysis because of the rupture of any lung vessel which is only partially healed. As soon as there is super-abundance of blood it bursts. (3) Persons disposed to epilepsy, apoplexy and melancholia owing to excess of blood and persons disposed to suffocating affections, swellings of viscera and hot conjunctivitis. (4) Persons with piles which generally bleed but have ceased bleeding for the time being. (5) Women in whom menstrual blood has been suppressed. In these two types of persons complexion gives no indication for the necessity of venesection as it may be dark, pale or greenish. (6) Persons who have weakness in internal members and also have a hot intemperament. In these cases it is best to procure venesection in spring even if they have not developed these diseases.

Venesection is carried out as a precautionary measure in cases of persons having blows or falls lest there should be a swelling. Venesection is carried out if a man has a swelling and there is a fear of its rupture before its maturation even though there is no other indication and no excess of humours. You must remember that as long as there is the only fear of maladies and which have not yet actually befallen, venesection is more safely permitted. When the maladies (actually) befall, venesection must be given up in the beginning because it would make the superfluities thin and spread them in the body and mix them with good blood. And sometimes it does not deplete the desired matter and so necessitates repeated trouble some venesections. If (the sings of) maturation are quite clear and the disease has passed the initial and the last stages then venesection, if necessary, may be carried out provided there is no contra-indication.

Venesection and depletion must never be attempted on a day when the disease is in agitation. For that day is the day of rest and the day when sleep is needed and the day when the disease is active.

If the disease has passed several crises and is of long duration, it is not proper to deplete much blood in any case. If possible, rest should be procured. And if that is not possible only a little of venesection may be done and the body should be left with enough preservation of the blood for (future) venesections—if there be need of them—and strength should be preserved to resist the crises. If one complains of aching (of limbs) during winter and a long time has elapsed since the venesection was done, one should be venesected but (sufficient) blood should be left to withstand (the winter cold). Since venesection draws the blood away (from the viscera), it frequently causes constipation. If the strength is enfeebled because of excessive venesection, (morbid) humrous are produced in excess. At the time of first venesection syncope occurs because of the unfamiliar sight. To procure vomiting before venesection is among the things which may prevent syncope. Vomiting has the same effect when syncope occurs.

It should be remembered that venesection causes agitation (in humours) except when you have managed to keep them at rest. Venesection and colic rarely go together. Venesection should not be procured during pregnancy and menstruation unless there is grave necessity, such as the need for arresting severe haemoptysis provided the (body) strength is sufficient. It must be remembered that venesection is not necessary at all whenever the aforementioned signs of repletion are found. For, sometimes repletion is the result of immature humour. Hence venesection is very harmful. It is because, if you procure venesection, humours will not attain maturation and there is fear that the patient might die. If one has the predominance of black bile, there is no harm in procuring venesection and then causing depletion by purgation. But you must carefully watch the state of the complexion according to the condition that we are going to describe presently and also consider the tension. For, the spreading up of tension in the whole body makes one quite sure that the venesection is necessary. And if a man has a little of good blood and there is excess of bad humours in his body then venesection will take out the good blood and leave behind the bad humours.

If a man's blood is not healthy and also scanty or it is inclined towards a member to which its inclination is immensely harmful and venesection becomes quite essential then a very little of his blood should be taken out. He should be then given very good diet for some days and venesection should be carried out for the second time so that the bad blood comes out and the good blood remains. If the bad humours are of bilious nature, measure should be adopted to deplete the first by mild purgatives or vomiting or alleviate (their intensity). Efforts should be made to provide rest and peace to the patient. If the humours are thick, the ancient (physicians) recommended the patients to take baths and to walk about for their routine occupations and sometimes they gave them before the venesection as well as after it (before the second venesection) drinks of attenuant oxymel which had been boiled with hyssop and thyme. If despite weakness, venesection becomes necessary because of fever or because of some other bad humours, it should be carried out in several sittings as we have already mentioned.

Narrow venesection is a great conserver of the strength but sometimes it entails the flow of the thin and clean blood and retains the thick and the turbid part of the blood. And wide venesection quickly leads to syncope and is more effective in the act of depuration, but it heals up more slowly. It is proper for those who are venesected prophylactically and for obese persons. But wide venesection is preferable during winter so that the blood might not clot and narrow venesection is preferable during summer provided it is necessary. Venesection should be carried out having the patient in supine position because this is more apt to conserve his strength; moreover it does not cause syncope.

Venesection should be avoided in fevers of excessive burning, in the beginning of all the fevers which are not acute and on the days of paroxysms. only a small quantity of blood should be removed in the fevers which are associated with convulsions, even though the need of venesection be great. For, when convulsion occurs, it causes sleeplessness, excessive perspiration and reduces the strength. Hence, sufficient blood should be present in the body to cope with the situation. Similarly, if venesection is carried out in fever which is not the result of putrefaction, it must be very little so that enough blood is left to remove the fever.

If the fevers are not of acute burning but are of putrefactive type, you should go through the 'ten rules' and then examine the urine. Thus, if the urine is thick and tending to redness and the pulse is large and the body is flatulent and the fever is not wasting away the body, instantly, venesection should be carried out at a time when the stomach is free from food. If the urine is thin and fiery or the body has been wasting away since the very beginning of the disease, venesection must be avoided. If there are intervals between two periods of fever, the venesection should be done during them. The state of rigor should also be noted. Thus, if the rigor is powerful, venesection must be avoided. You should (also) note the colour of blood which is taken out. If it is thin and inclined to whiteness, it must be stopped at once. To sum up, you should refrain from causing, in the patient, any of the two things—activation of the bilious humours and immaturity of the cold humours.

When during fever venesection becomes necessary no consideration need be paid to the saying that it should not be done. If it is necessary it be done even after forty days. This is Galen's opinion. However, immediate and timely action is preferable if there are proper indications of venesection. If there has been some delay in it, you may procure venesection any time—provided it is necessary—after paying due attention to the ten rules. And sometimes venesection is done in fevers though it is not needed. It is to let the physis dominate the matter by reducing the latter. But this is done only when body structure, age and strength etc. permit it. In sanguineous fevers the only way out is to deplete by venesection. It is not to be excessive in the beginning but need be excessive when maturation has set in. Venesection frequently eradicates fever immediately.

Venesection must be avoided in cases of: (a) excessively cold temperament; (b) extremely cold countries; (c) severe pain; (d) after resolving baths; (e) after coitus; (f) as far as possible, (children) below fourteen years of age and in old age; but if you have confidence in body structure, firmness of muscles, width and fulness of the vessels and redness of the complexion then you may venture to procure venesection even in old men and children. The children are made accustomed to venesection gradually by procuring very minor venesection. Similarly venesection must be avoided in the cases of: (a) excessively thin and obese persons; (b) persons having loose bodies; (c) persons having flabby bodies and white complexion; (d) as far as possible in persons with yellow complexion having anaemia; (e) persons suffering from chronic diseases; however, if the corruption of their blood demands venesection, they should be venesected; but you should examine the blood carefully; if the blood is black and thick, it should be taken out and if it is white and thin, it should be stopped at once because there lies great danger in it.

Similarly venesection should be avoided when the stomach is full of food so that immature matter might not be drawn into the vessels as a substitute for what is depleted. Venesection should be avoided also when the stomach is full of food and the intestines are repleted with fully matured or semi matured faeces. But effort should be made to deplete such matter. The depletion from the stomach and its adjacent region can be procured by vomiting and from lower intestines by any possible means, even by means of enema. Persons suffering from dyspepsia should not be venesected; you must wait till their dyspepsia is cured. Persons in whom the cardiac orifice is sensitive or weak or in whose stomach excessive production of bile is quite habitual, should not be venesected. For, in the venesection of such persons carelessness must be avoided, particularly (when it is done) on empty stomach. The person having sensitiveness in the cardiac orifice is known by the discomfort caused by swallowing the irritants. The persons having the weakness of the cardiac orifice are known by their impaired appetite and the pains in the cardiac orifice. The person in whom the cardiac orifice (readily) accepts the bile and the bile is produced in excess, is identified by constant nausea, bilious vomiting all the time and by a bitter taste in his mouth. Thus, if such persons are venesected without taking first proper care of the orifice of their stomach, great dangers occur and sometimes some of them even die.

Hence, in case of patients with senstive and weak cardiac orifice a small quantity of good bread soaked in some sour and fragrant rob should be given (before venesection). If the weakness (of the cardiac orifice results from a cold temperament then the bread should be soaked in sugar syrup with aromatics or in mint syrup perfumed with musk or in *maibah* (a syrup made from quince-juice) perfumed with musk and then venesection should be done. If a person has excess of bile then vomiting should be induced by giving him to drink plenty of hot water with oxymel. Then he should eat something and have a brief rest, then be venesected. It is necessary to makeup for the loss of good blood by substitutes (i.e. nourishing diet). If such persons are strong they may take *Kabāb* although they are "heavy". For, if the *Kabāb* are digested they are very nutritious. But it is proper to have them in a very small quantity because the stomach becomes weak due to venesection.

Venesection of a vessel is sometimes done for stopping haemorrhage whether it is because of epistaxis or from uterus or anus and chest or from some abscess. The purpose in such venesection is to divert the blood to the opposite side. This is a very potent and useful treatment. Hence the incision (for this purpose) should be very narrow. It should be repeated several times on alternate days but not on the same day with the exception when it is urgently required. At each subsequent sitting least possible quantity of blood should be taken away. To sum up, repeated venesection is better than a large let out (at one sitting). Unnecessary venesection activates bile and causes dryness of tongue and other systems. These should be treated with barley-water and sugar.

If one intends to be venesected repeatedly, his vessel should be venesected lengthwise so that the muscular movements might prevent it from blocking up. Besides, the incision should be wide. If, in spite of this, it is feared that the puncture might close up quickly, a piece of linen soaked in olive oil with a small quantity of common salt should be kept over it, then it should be bandaged. If at the time of venesection lancet is oiled, it prevents quick healing (of the incision) and causes less pain. The process is that the lancet is either lightly smeared with olive oil or some similar oil or it is dipped in olive oil and wiped with clean linen. Sleep between the first venesection and the subsequent one causes quick healing of the incision. You should remember what we have already said about the depletion with the help of drugs during winter. And in other words we should wait for the southerly days (i.e. the days when southerly winds blow). The same fact is equally true of venesection.

It should be remembered that there might not be (much)bleedings. The incision should be narrow in: (a) persons suffering from melancholia and insanity; (b) persons who are to be venesected during the night and during the hours of sleep and (c) similarly all those who do not require repeated venesection. It should be noted that the repetition of the venesections are to be postponed according to the degree of weakness. If there is no weakness, the maximum limit (for postponement) is one hour. If the object of venesection is diversion of matter, then one day is enough. Oblique incision is better for one who wants to repeat venesection during the same day. But breadthwise incision is better for one who wants to repeat venesection immediately and lengthwise is better for one who does not want to stop the process after repeating it for a time but wants to repeat it daily for several days. The more is the pain from venesection, the more slowly it heals up. Much depletion (of blood) in repeated venesection causes syncope except when the person undergoing venesection has eaten something.

Sleep in between the first venesection and the repeated one prevents the elimination of that superfluity in the blood, which is attracted by sleep towards the inner part of the body alongwith the humours. One of the advantages of repeated venesection is the preservation of the power of the person concerned. Besides, the necessary depletion is done quite perfectly. The best repeated venesection is that which is done with a gap of two or three days. Sleep after venesection causes aching of the body. Taking bath before venesection sometimes makes venesection difficult because it makes the skin thick, soft and slippery. But it is allowed if the person undergoing venesection has very "thick" blood.

Persons undergoing venesection should not venture to eat to their fill after it but they should gradually come to the normal diet and should use only light food in the beginning. Similarly they should not take exercise after it but should rest in the supine position and should not take dissolving bath after it. If after venesection there is some inflammation in the hand of the person concerned, the other hand should be venesected and only as much blood be taken out as might be endured and ointment of white lead should be applied to it and the surrounding part should be coated with strong cooling liniments. If a man having domination of humours in his body is venesected, the venesection becomes a cause of the out-break, flow and commingling of those humours. Hence there is the need of successive venesection. Atrabilious blood necessitates successive venesection. Thus it gives immediate relief but in old age it causes diseases such as apoplexy. Venesection very often causes fevers and those fevers often disperse the putrefactions. When healthy persons undergo venesection they should take what we have mentioned in the chapter on alcohol.

It should be noted that the vessels in which venesection is done are either veins or arteries. But arteries are very rarely venesected and thus the risk of much bleeding from them is always avoided, the least of its consequences is that an aneurysm develops and that is at the time when the incision is very narrow. But, if there is any protection against excessive bleeding from the venesection of an artery, then it is greatly useful to those particular diseases for which only the arteries are venesected. The venesection of an artery proves to be of the greatest advantage when a neighbouring member has acute disease the cause of which is some rarefied and pungent blood. Hence, when the neighbouring artery is venesected and it is not one of the things in which there might be any danger, it is greatly beneficial.

The veins which are (generally) venesected in the case of the hands are six: (i) the cephalic; (ii) the median cutaneous; (iii) the basilic; (iv) the funis brachium; (v) the salvatella; (vi) and that which is specifically called (axillary), is a branch of the basilic. The cephalic vein is the safest (for venesection). The venesection of all the three veins should be done above the elbow joint and not below it or opposite to it so that blood may come out freely as if it were coming out of a syringe and the injuries to nerves and veins (also) might be avoided. Similar is the case of cephalic vein. Longitudinal venesection of these (four) veins is slower in healing because it is in proximity to the joint. But in regions not in proximity to the joint the matter is reverse. It is better to have longitudinal venesection in sciatic, salvatella and the other veins. Moreover, in the case of cephalic vein, it is proper to turn the vessel from the top of the muscle to a soft place and the incision should be wide; repeated cuts should be avoided otherwise it will cause swelling. Errings in the venesection of the cephalic vein mostly do not arise owing to a single cut even if it is large. But the injury occurs as a result of repeated cuts. In the case of cephalic vein it is the longitudinal incision which is much slow in healing. When it is desired to repeat venesection, the incision is made longer. If cephalic vein is not found, we should search for some branch of it, located in the outer side of the wrist.

In venesecting the median cutaneous vien there is a danger for the underlying nerve. Sometimes the cut happens to be between two nerves hence it must be aimed at making a longitudinal incision which should not be deep. Sometimes a thin nerve is found spread over this vein. Hence this must be identified and precaution should be taken against any injury caused by it (by the cut). Otherwise there will be chronic anaesthesia. When this vein is thick, this nerve is also prominent and any mistake in incision regarding it proves to be very painful. Hence if by mistake the nerve is injured, do not allow the (wound of the) venesection to heal up and apply such things on it as might prevent its healing and treat the nerve with the remedy of the wounds of the nerves. We have dealt with it in the fourth Volume. Avoid putting cold things such as juice of green garden night-shade or sandal wood beside the wound but smear the surrounding parts and the whole body with warm oil.

In the case of radial vein also it is better to carry out venesection obliquely. But when it is deviated from the sides, it should be venesected longitudinally. Venesection of the basilic vein is most dangerous because of the underlying artery. Hence precaution should be taken in its venesection. For, if the artery is cut up, the blood does not cease to flow and it is difficult to stop it. In some persons basilic vein is surrounded by two arteries. When the person operating venesection identifies one of them, thinks that he is quite safe. Thus, he sometimes cuts the second one. Hence it is necessary to recognise it. When a tourniquet is applied, mostly there appears a protuberance. This protuberance sometimes occurs in the artery and sometimes in the basilic vein. Whatever be the case, it is proper to open the tie and massage the swelling gently; then the tourniquet should be applied again. If the swelling reappears, the same process should be repeated. If this is not fruitful, there is no harm if you give up the basilic vein and venesect its branch known as axillary vein. And it is situated in the lower part of the internal wrist. Distension of the vessel frequently leads to error. And, sometimes, tying of the tourniquet and the sweeping put the beating of the artery at rest and lift it up and make it elevated. Thus it is considered to be a vein and is venesected.

If you apply tourniquet to any vessel and consequently 'lentil and gram' like bulges appear on it, you should treat it with what we have said regarding the basilic vein. In the venesection of the basilic vein, the lower you go towards the wrist, the safer it is. The course of the scalpel in the vessel should be in the opposite direction of the artery. In the venesection of the basilic vein the error might not be owing to the neighbouring artery only. But there are the underlying muscles and nerves and the error might arise because of them also. We have already told you of it. The sign of committing an error in (the venesection of) the basilic vein and thus injuring the artery is that thin and bright red blood gushes out with force and after that the part appears soft to touch and gets depressed. In such a situation one should quickly fill in the mouth of the incision a small quantity of rabbit wool with a small quantity of olibanum powder or a little quantity of dragon's blood and aloes and myrrh with a little quantity of yellow vitriol and white vitriol. Cold water as much as possible should be sprinkled on it and bandage should be applied above the puncture and it should be tied quite tightly so as to prevent bleeding. Even if the bleeding stops, the bandage should not be removed for three days. And even after three days greatest possible care should be taken. Hence astringents should be applied over the region of the wound.

In many men bleeding is stopped by cutting right across their artery. And this is to make the vessel retract and the flesh (muscle) might so cover it as to stop the bleeding. Some people die of haemorrhage while some die because of the excessive pain caused by the tourniquet which is applied to prevent arterial bleeding till the member begins to die. It should be remembered that such bleeding sometimes ensues from the veins also. It should be known that the cephalic vein depletes blood often from the neck and the parts above it and a little from the parts below the neck but its action does not go beyond the region of liver and epigastrium. Epigastrium and the lower parts are not depurated to a considerable extent. Median cutaneous vein has the intermediary effect between the cephalic and basilic veins. The basilic vein depletes from the regions of the visceral part of the body unto its lower parts. The radial vein is like the cephalic vein (in action).

It is said that (venesection of) salvatella on the right side is useful in liver pains and that on the left, in pains of spleen and it is also said that when it is venesected it should not be bandaged until the bleeding stops by itself. And the situation demands that the venesected arm be kept in warm water so that the bleeding might not stop and the blood might come out easily if the blood flow is weak as it often happens in the cases of the venesection of salvatella. The best venesection of salvatella is that which is lengthwise. For venesecting the axillary vein the same rule holds good as it is in the case of the basilic vein.

The artery which is venesected in the right hand is that which is on the back of the palm between the index finger and the thumb. It is of wonderful use in hepatic pains and chronic disorders of diaphragm. Galen dreamt someone advising him to let out blood from this artery for the pain he had in his liver. So he did it and recovered. Sometimes another artery is venesected. It is more inclined towards the palm and has nearly the same benefit as the former has. One who intends venesection of any vessel of the arm but is not successful, should not persist in twisting (the arm) or applying the tourniquet very tightly or repeating the incision. He should, rather, postpone it for a day or two. However, if the need presses to repeat the incision, one should go upward from the first incision and should not come down from it (for choosing a point for incision). Tight bandaging produces swelling. It is good to make the tourniquet cool and wet with rose water or with pure cold water. It is also necessary that the tourniquet does not remove the skin from its place before and after the venesection.

In lean and thin persons a tight tourniquet becomes a cause for the emptiness of the vessels or prevention of blood from them. And in obese persons flabbiness (of the tissues) does not allow the vessels to appear (clearly), unless the tourniquet is applied tightly. Sometimes, some of the phlebotomists adopt a method for minimising the pain. They make the hand insensitive by tightening the tourniquet and leaving it for a while. And some of them apply oil to the cutting edge (of the lancet). And this, as we have said, minimises the pain of the incision but its healing takes time.

If the aforementioned vessels of the arm are not clear and any of their branches is clear, it should be thoroughly massaged by hand. If, after the massage, blood flows into it quickly and inflates it, it should be venesected; but otherwise it should not be venesected. If washing (of the hand) is intended, its skin should be folded so as to cover the incision. After wash it should be allowed to return to its (original) position. The tourniquet should be trimmed and its best shape is circular and then it is tied. If a piece of fat comes out of the incision it should be pushed back gently. It is not proper to cut it. And in such persons repetition of incision should not be desired unless it is a fresh one. And we shall discuss exhaustively this matter in the relevant section. Here we have touched upon it only incidently.

It should be rememberd that for stopping the blood and bandaging the wound there is a fixed time though it might vary (from case to case). Thus, some people, inspite of having fever, can stand blood loss of five or six *arṭāl* and some of them, though in health, cannot stand the loss of even one *ratl* (450 gm). But in this matter three things should be taken into consideration: (1) Spurting of the blood forcefully or slugishly. (2) Sometims, the colour of the blood is misleading, as it might be in the beginning of the venesection thin and white. If there are the symptoms of repletion and the condition necessitates venesection then you should not be misguided by that (kind of blood). Sometimes colour of the blood misleads in cases of swellings because the swelling attracts the blood towards itself. 3. Pulse—It should never be overlooked. Thus, when spurting of blood becomes weak or the colour of the blood changes or the pulse becomes small, especially when it becomes weak, then the bleeding should be stopped. Similarly it should be stopped if symptoms like yawning, stretching, hiccup and nausea arise. If the change of colour is very rapid or the flow becomes quickly feeble, one should rely in such a situation on pulse. Persons in whom syncope may readily arise are those who are of hot temperament, lean and have rarefied bodies and those who are not weak enough to develop it are those who have normal bodies and compact muscles.

It is said that the phlebotomist must have;

1. Many lancets with sharp points; the sharp pointed lancets are better for slippery veins such as jugular vein; 2. A ball of wool and silk; 3. A wooden instrument and a feather to excite vomiting; 4. Rabbit's wool, drug of aloes and olibanum, navel-bag of the musk deer or the drug prepared with musk and musk tablets.

These things obviously are needed, if there is any case of syncope and it is one of the risks of the venesection and some-times such patients do not recover, one should make haste and place the (silk) ball into the mouth and induce vomiting with the instrument. The patient should be given musk and a little of *dawā-al-misk* or musk tablets to swallow so that his power might revive. If there is rapid flow of blood, it should be packed up with rabbit's wool and drug of olibanum.

It is rather strange that fainting does not occur as long as the bleeding continues. But it mostly occurs when the bleeding is stopped except when the blood-loss is excessive. Besides this, if (in the course of venesection), in incessant fevers, preliminary apoplexy, diphtheria, large fatal swellings and severe pains there is fainting, one should not take notice of it. But this should not be done except when the strength (of the body) is well maintained. It happens by chance that while describing the vessels of the arms, we explained one thing or the other as eeplanation of other subjects and forgot veins of the leg and some other veins. Hence it is proper for us to link up our discussion with it.

We say that one of the veins of the leg is sciatic vein. It is venesected on the lateral side of the malleolus: either below it or above it. And the leg is bandaged downwards from hip to the ankle and it is wrapped with a strong band or cloth. It is better to have a bath before it and it is proper to venesect it lengthwise. If it is invisible, the venesection should be carried out from the branch which lies between the auricular finger and annular finger.

The venesection of sciatic vein is very much useful in sciatica and similarly in gout, varicose veins and elephantiasis. Repetition of venesection in sciatic vein is difficult. Similarly saphenous vein is also a vein of the leg. It is on the internal side of the malleolus and is more distinct than the sociatic vein. It is venesected for depleting blood from the members which are below the liver and for diverting blood from the higher regions towards the lower ones. This is why the venesection of this vein promotes the menstrual discharge forcefully and opens orifices of piles. A rational approach leads to the conclusion that the sciatic and the saphenous veins should have similar benefits. But the experience shows that the venesection of sciatic vein in sciatic pain is much more effective and preferable and this is because of the parallel position. The venesection of the saphenous vein is carried best if it is oblique and inclined to width.

One of the veins is the popliteal vein. This follows the same path as the saphendus vein does but it is stronger than the saphenous vein in promoting menstrual discharge and in pains of anus and piles. Among the veins of leg is the vein which is behind the tendocalcaneus as if it were a branch of the saphenous vein and runs the same path having similar benefits. In short, venesection of the veins of leg is beneficial in the diseases arising from the matter inclined towards the head and also in atrabilious diseases. The venesection of these veins causes more weakness than that of the arm veins.

It is proper that the venesection in the vessels of the region of head excepting the jugular vein is performed obliquely. Some of these vessels are arteries and some veins. Thus among the veins there is one like frontal vein which is located between the two eye brows. Its venesection is beneficial in heaviness of the head, especially at the back of the head, heaviness of eyes and permanent and chronic headache. The vessel, which is in the upper part of the head and is (called) parietal vein, is venesected for (curing) migraine and ulcers of head. The two temporal veins writhe on the temples. The two veins in the lachrymal angle of the eye. Mostly these veins are not marked except after strangling. The incision in them should not be deep;

otherwise, sometimes, it develops into a fistula. However, only a little blood flows from these veins (at the time of venesection). The venesection of these veins is beneficial in headache, migraine, chronic conjunctivitis, epiphora, sightlessness, trachoma, pustules of palpebra and night blindness.

There are three small vessels (too) and their situation is behind the meeting place of the upper end of the ear and hair. One of these three is more prominent. It is venesected in the early stage of cataract and when the head be receiving vapours of the stomach; it is (also) beneficial in ulcers of ear, neck and back of the skull. Galen denies that the persons living in celibecy practise the venesection of the two vessels on the back of ear to suppress their procreative power. Among these arteries are the jugular veins. These are two. These are venesected in the beginning of leprosy, severe diphtheria, dyspnoea, hot asthma, hoarseness of voice, pneumonia, pityriasis arising from the excess of hot blood and diseases of spleen and pleura.

According to what we have mentioned before, these veins should be venesected with a pointed lancet. In order to bind the vein the head should be tilted towards the opposite side of the venesection so that the vessels might be stretched. And the side which is more slippery should also be taken into consideration and thus the side opposite to it should be chosen (for venesection); the bandage must be horizontal, not lengthwise as it is done in the case of saphenous and sciatic veins but in spite of this (in this case) the venesection should be lengthwise. Among those there is one which is in the tip of the nose. The site of its venesection is the split at the end of the nose, the one which is divided into two when it is pressed with the finger and there the incision is made and the bleeding from this site is very little. The venesection of this vein is beneficial in freckle, dinginess of complexion, piles, boils and itching of the nose. But, sometimes it causes chronic redness of the complexion, which resembles favus and spreads on the face. Thus its harm is much more than its usefulness.

The venesection of the veins which are under the mastoid process and close to the pit is useful in vertigo arising from the light blood and also in chronic pains of head. Among those are the 'four veins'. These veins are one pair for each lip. Their venesection is useful in ulcers of the mouth, stomatitis, pains, swellings, softening, bleeding and rupture of the gums. And among them is the vein which is under the tongue and inside the chin. It is venesected in cases of diphtheria and swellings of the tonsils. Then there is a vein which is under the tongue and on the tongue itself. It is venesected in case of that heaviness of the tongue which arises from blood. It should be venesected lengthwise. If it is venesected transversely it will be difficult to stop the bleeding. Then there is a vein near the *'anfaqa*, the part between the chin and the lower lip. It is venesected for foul breath. Then there is a vein in the front part of the neck. It is venesected for treating (the diseases of) the cardiac orifice.

Arteries:

Among the arteries of the head are those of the temples. They are sometimes venesected; sometimes amputated; sometimes cut and sometimes cauterised. It is so done for checking the light and hot catarrhal flow towards the eyes and also in the early stages of the dilatation of the pupils. The arteries at the back of the ears: These are venesected in various kinds of conjunctivitis, beginning of glaucoma, leucoma, night blindness and chronic headache. But their venesection is not free from danger. Moreover healing (of the cut) is also very slow. Galen has described that a man received some injury in his throat and thereby his artery was also damaged and it bled in considerable quantity. He treated it with olibanum, aloes, dragon's blood and myrrh. Thus the bleeding stopped and he was relieved of a chronic pain that he had in the region of his hip. Amongst those vessels of the trunk that are venesected, there are two abdominal ones; one of them is situated on the liver and the other on the spleen. The vessel on the right is venesected in dropsy and that on the left in diseases of spleen.

It should be known that there are two occasions for venesection. One is discretional and the other is obligatory. Thus the preferable time for it is noon when the digestion is complete and (the superfluity) has been swept away. And the obligatory time for it is the time when no delay is permissible and no heed is paid towards any inhibiting cause. It should be known that a blunt lancet is very much harmful because it errs and does not reach the vessel and so causes swelling and pain. When you have a proper lancet prepared, you should not insert it by pressing it with hand; you should handle it gently so that the point of the lancet might reach the stuffing of the vessels. If it is used roughly, the tip of the lancet gets broken and thus becomes blunt and slippery and cannot cut the vessel. If you insist on venesecting with the same (blunt) lancet, you will be doing more damage.

It is, therefore, proper that the lancet is tried first on the skin before carrying out venesection with it and also when you intend to repeat the stroke. Effort should be made so as to make the vessels filled and inflated with blood. Then they seldom slip and deviate from their position. If a vein is unmanagable and does not become prominent under the tourniquet, the tourniquet should be removed and reapplied for several times. The part should be massaged with fingers and one should move them downward and upward till the vein is quite clear and prominent. It is tested in the way that at any of the places through which the vein passes, it is compressed between two fingers, sometimes (the flow of blood of) the vein is checked with both the fingers and sometimes it is checked with one of them and the other is used to promote the flow of blood till you feel through the static finger the "flow" of the vein when it is repleted with the blood and its ebb when it is empty. It is also proper that the tip of the lancet is inserted upto a (requisite) distance, not more than that, otherwise it would reach some artery or nerve. The need for making the vein prominent is greater if the vein is thin.

The lancet should be held with the thumb and the middle finger and the index finger should be left free for exploration. Besides, the grip should be at the middle of the iron piece, it should not be held above that; otherwise the grip would not be firm. If the vein tends to deviate towards one side it should be managed by tying and regulating from the opposite side and if it deviates towards both the sides equally. A longitudinal incision should be made with great care. It should be remembered that tying and compressing should be according to the condition of the skin in its firmness and thickness and also according to the excess and abundance of flesh. Tourniquet should be applied close (to the site of puncture). If the application of tourniquet hides the vein, it should be marked and care be taken that in tightening up the tourniquet the vein does not get displaced from the position of the mark. And with all that venesection should be carried out in a guided manner.

If it is difficult to raise up the vein and make it prominent, the body should be incised especially in case of lean and thin persons and a hook should be used for this purpose. Application of a tourniquet or bandaging near the joint prevents the proper repletion of vessels. If you intend to wash (the incised part), stretch the skin with your finger so that it moves away from the position of the puncture. Then wash it and wipe the spot of the bandage and leave the skin to return to its normal position. It should be known that the person who sweats profusely owing to repletion is in need of venesection. Sometimes a person having fever and headache is to be cured with venesection but develops a natural diarrhoea and thus has no need of venesection at all.

Section XXI

Cupping

Cupping depurates the neighbouring skin more effectively than venesection. It withdraws thin blood rather than the thick blood.

It is of very little use for the persons with bulky bodies and thick blood, for it does not draw out blood from them as it ought to. It only draws out the thin fluid and that too with difficulty. It produces weakness in the member on which it is operated. Cupping is not advised at the beginning of the lunar month because the humours are then not yet on the move or agitated; nor it is advised at the end of the lunar month because, then, they are less plentiful. It is advised at the middle of the lunar month when the agitated humours are on the increase following the increase in the moon-light when the brain is expanding and water is rising in tidal rivers.

The best time for cupping is the second and third hours of the day. It is proper to avoid cupping after bath except in the case of blood being thick. If so, one must take bath first then wait for an hour and then have the operation of cupping. Most people dislike the operation of cupping in the foremost part of the body (forehead). They are warned against it because of the harm that it might do to the senses and the intellect. Cupping at the hollow (of the back of the neck) is an alternative of (the venesection of) median cutaneous vein. It is beneficial in the heaviness of the eye-brows; makes the eye-lids light and is useful in the itch of the eyes and bad odour from the mouth. Similarly cupping between the shoulder blades is an alternative (of venesection of) the basilic vein; it is beneficial in pain of shoulder girdle and throat. Cupping at any of the two posterior neck veins is an alternative of (venesection of) the cephalic vein. It is beneficial in tremor of head and it is also useful to the members which are in the head; such as, face, teeth, molars, ears, eyes, throat and nose. But cupping at the hollow of the back of neck causes amnesia, as our guide, master and patron of our Shariah, Mohammad (Peace be on him) has said that the posterior part of brain is the seat of memory and the cupping makes it weak.

Cupping over the shoulder blades impairs the cardiac orifice and cupping over the nape produces tremor of the head. Hence, it should be a little below the nape and a little above the shoulder-blades unless, of course, cupping is done for treating haemorrhage and cough. Hence you should choose some lower position rather than going upward. The cupping over the upper part of the back and between the shoulders is beneficial in haemorrhagic diseases of the chest and sanguineous asthma. But it enfeebles the stomach and causes palpitation of the heart. Cupping over the shank approximates to venesection. It purifies blood and promotes menstrual discharge. In women who are pale, flabby and have thin blood, cupping over the shank is more beneficial than venesection of the saphenous vein.

Some claim that cupping over the occiput and the top of the head is beneficial in mental confusion and vertigo and according to some it delays the onset of senility. But this (opinion) is debatable. For this effect is found only in some persons, not in all the persons. In majority of the persons, it quickens the onset of senility. Moreover, (cupping over occiput and top of the head) is useful in diseases of the eye and (indeed) this is its greatest benefit because it is beneficial for furunculosis, pustular keratitis, and staphyloma. But it is harmful to the mind and causes idiocy, loss of memory, deterioration of intelligence and other chronic diseases. Moreover, it is injurious for persons suffering from cataract. But when the time and condition happen to be such when the cupping is quite proper, then sometimes it is not harmful. Cupping with scarification is more effective in diseases which are not caused by winds and cupping without scarification is more effective in resolving and eradicating old gases here as well as at various places. Cupping in front of the thigh is beneficial in swelling of testis and boils of thigh and leg. Cupping behind the thigh is beneficial for swellings and boils of buttocks. Cupping below the knee is beneficial in such trouble of the knees which is resulted from acute humours; it is also beneficial in malignant ulcers and chronic abscesses of shank and legs. Cupping of the ankle is useful in amenorrhoea, sciatica and gout.

Cupping without scarification (dry cupping)

(a) Cupping without scarification is sometimes employed to divert the matter from the direction of its flow as cupping over the breast for checking menstrual bleeding.

(b) Sometimes the purpose is to remove some swelling from deep part so that it might be accessible to medication.

(c) Sometimes the purpose is to transfer a swelling (from some important member) to a less important member in the neighbourhood.

(d) Sometimes the purpose is to warm a member, and attract blood towards it and dissolve its wind.

(e) Sometimes the purpose is to restore a member—deviated from its natural position—to its natural position as in scrotal hernia.

(f) Sometimes it is employed for relieving the pain as it is done over the umbilicus because of severe colic and gaseous distension of the abdomen and because of uterine pain owing to the movement of the menstrual fluid especially in young girls.

(g) Cupping over the hip is done for sciatica and when there is a fear of dislocation of the hip.

(h) Cupping between the hips is beneficial for the hips, thighs and piles and also for persons suffering from hydrocele and gout.

(i) Cupping over the anus attracts (matter) from the entire body and (especially) from the head; it is beneficial for intestines, cures menstrual disturbances and piles and it makes the body light.

We say that the cupping with scarification has three advantages:—

(1) Depletion from the member itself.

(2) Safeguarding of the essence of pneuma as the latter is not depleted with the humours which are being depleted.

(3) It does not interfere with depletion from the principal members. Scarification should be deep so that it might attract (blood) from the deeper parts. Sometimes the site of the application of cupping glasses develops a swelling and the removal of the glasses becomes difficult. Hence a piece of linen or sponge soaked in tepid water should be taken and the area around that site be fomented first. This occurs very often when we apply glasses in the breast region for checking menstrual bleeding and epistaxis. Hence it is not advisable to apply them on the breast itself.

If the region to be cupped is anointed with oil, one should hasten to apply the cupping glasses and should not delay but should hasten in scarification. The first application should be light and glasses should be removed quickly. Then gradually the duration of application should be increased. The person undergoing cupping should be given food after an hour. Infants may be cupped in the second year of age. It is altogether contra-indicated after the sixtieth year. Cupping of the upper parts of the body ensures that morbid matters will not pass down into the lower parts of the body. After being cupped persons of the bilious types should be given seed and juice of pomegranate, endive juice with sugar and lettuce with vinegar.

Section XXII

Leeches

According to Indian physicians some leeches are poisonous. Hence one should avoid all the following types:—

(a) Leeches with large heads, of antimonial or black colour or green colour.

(b) Leeches having soft hair and those resembling eels (snake-fish);

(c) Those upon which are azure lines and those which change their colour.

All these being poisonous, produce swelling, syncope, haemorrhage fever, paralysis and malignant ulcers.

Similarly one should avoid those which have been caught from bad muddy waters. But one should use those which are caught from waters which are covered with weeds and are the abode of frogs. Pay no heed to the opinion that leeches found in the water in which the frogs live are bad. (Moreover, leeches of the following types may be used):

(a) Emerald green leeches which are predominantly green and have yellow stripes over them.

(b) Brown leeches with round sides.

(c) Leeches the colour of which is like that of liver.

(d) Leeches which look like little locusts and those which are like mouse-tails.

(e) Leeches which are thin and have tiny heads.

But do not use the leeches with red bellies and green back, especially if they are found in running waters. Leeches draw blood from deeper tissues in comparision to cupping. Leeches should be caught one day before their use. If possible, they should be held upside down till the content of their stomach comes out. Afterwards they should be given, by way of nourishment, a little of blood from a lamb or some other animal before applying them. Then their viscidity and filth should be cleansed off, say, with a sponge. The place where the leeches are to be applied should be washed with borax and rubbed till red. When leeches are to be applied, they should be dipped in fresh water and thus cleansed and then applied. Smearing of the point of application with clay or blood stimulates the leeches to stick. When the leeches get distended and their removal is intended, one should sprinkle over them a little salt or ashes or borax or ashes of burnt flax cloth or burnt sponge or burnt wool; thus they fall off. After the leeches have fallen off, it is proper to suck up that place with cupping glasses so that some of the blood of that spot might get out and with that the injurious effect of the bite also might be removed. If bleeding does not stop by itself, dust the spot with burnt galls or lime or ashes or powdered earthenware or with some other styptics. These things should be prepared and ready when the leeches are applied. The application of leeches is very useful in skin diseases such as favus, ringworm, reddish freckles, freckles of black red colour and the like.

Section XXIII

Arresting depletions

Depletions are stopped as follows:—

(a) By transferring the matter (to other parts) without depleting it in any other way. (b) By depleting as well as transferring the matter. (c) Sometimes, by aiding the depletion itself. (d) By cooling, by astringent, agglutinant and caustic drugs, (e) By using a tourniquet.

(1) The example of arresting depletion by attracting material without any (kind of) depletion is application of cupping glasses over the breast to prevent uterine haemorrhage. The best (kind of) attraction is that which is done if the pain of the (diseased) part is first relieved.

(2) And the example of arresting depletion in which attraction as well as depletion is used is the venesection of the basilic vein for that (for stopping uterine bleeding) and induction of diarrhoea to arrest vomiting; induction of vomiting to arrest diarrhoea and sweating to stop both diarrhoea and vomiting. And the example of arresting depletion by aiding depletion (itself) is depuration of stomach and intestines by using purgatives from viscid humours which produce diarrhoea and are lubricating in effect.

(Another example is) the effort for depurating the cardiac orifice by vomiting so that the matter responsible for continued vomiting might be removed. (Depletion is arrested by) cooling medicines in the way that they coagulate the liquid matter and cause the orifices to become narrow. (And it is arrested by) astringent medicines in the way that they aggregate the matter and constrict the passages.

It is arrested by glutinous medicines in the way that they produce emboli in the orifices of the channels. If these medicines are hot and desiccant as well, the action is more effective. And caustic medicines arrest depletion by producing scab which stays on the orifices of the passages and thus obstructs them and closes them. But it might be dangerous because, sometimes, the scabs drop off and thus the passage becomes enlarged. Some caustics have a styptic action as white vitriol and some have no such action as quick lime. The styptic caustics are required when one wants a firm scab; the others are used when one wishes that the scabs should fall down quickly.

Retention of material by compression:—

(a) (One way) is by closing up the passage and compressing it to the fusion (of the walls of the passage), as the application of a tourniquet above the elbow when during venesection of the basilic vein the phlebotomist injures the artery by mistake.

(b) The other way is that the outlet of the wound is blocked with something which blocks the passage of the depleting material as packing up of a wound with rabbits hair.

We say if there is haemorrhage because the orifices of the vessels are open, it should be treated with styptics so that they might tighten their orifices but if it is because of rupture, it should be treated with glutinous styptics such as sealing clay and if it is the result of corrosion it should be treated with such things as are flesh growing by adding something which might cleanse away the corrosion.

Section XXIV

Treatments of emboli

Emboli result from either thick or viscid humours or from excess of humours. If the humours are excessive and there is no other reason thereof, their evacuation by venesection and purgation suffices for doing away with their injurious effect. If the humours are thick, resolving agents of polishing type are required. And if they are viscid especially thin, then erosive drugs are needed. You have already learnt the difference between thickness and viscidity; it is the difference between clay and melted glue. Thick matter requires a resolvent to make it thin and thus renders its elimination easy. A viscid matter requires an erosive drug so that it might cut its way between the matter and the part to which it is adhered thus parting from the other and that it might break the viscid matter into small fragments because the viscid matter causes obstruction by adhesion and by the cohesion of its particles. One must take care to avoid two opposite things while resolving a thick matter. One of them is the weak resolution which increases the porosity of the matter and also its volume without achieving resolution at all and thus increases the embolus. And the other is very powerful resolution with which the thin portion of the matter gets evaporated and the heavy part of it becomes petrified. Hence, when powerful resolution is necessary, it should be aided by a light purgation with something which is not thick and is moderately hot so that it might resolve the emboli completely. Emboli of the vessels and especially the emboli of the arteries are still more obstinate than others and those which are in the principal members are the most obstinate. If astringency and attenuation are combined in a deobstruent medicine, it is very effective because the astringency counteracts the damage which the attenuation does to the member.

Section XXV

Treatment of swellings

Some swellings are hot; some are cold and soft and some cold and hard. We have already enumerated them. The causes of swellings are either external or remote. The remote causes are such as repletion and the external ones are such as blows, falls and bites. Swellings arising from external causes may befall a body which is in (a state of) repletion or one in which the humours are in balanced proportion. Swellings resulting from remote causes and from external causes associated with repletion either occur in members which are adjacent to principal members and serve as their emunctories or do not corrupt in such members. If the swellings are not (in members which serve as emunctories of the principal members) then any of the resolvents should not be used at all in the beginning. But it is proper to ameliorate the repelling member (the member which has sent forth the matter of swelling) if there is any and, if it is not due to any member, the whole body should be treated and all such things should be used as might be repellent and astringent and might attract the matter to opposite direction. Sometimes morbid matter of an inflamed member is attracted towards a member in the opposite direction by exercise or by loading a heavy weight over it. Often, matter is attracted from an inflamed hand by lifting a heavy weight by the other hand for some time.

As to the astringents, one should be mindful that restorative astringents used in hot swellings are purely cold in temperament; but in cold swellings they (remedies) should be mixed with something possessing a heating property in addition to being astringent, such as bogrushes and sweet hoof. When these hot and cold swellings continue and the period (since their early stage) goes on increasing, the astringents should be decreased and resolvents should be mixed with them until at the height (of the swelling) these two kinds of medicines should be mixed in equal quantity; then, at the stage of medicine, only resolvent and relaxant drugs should be used. In cold puffy swellings the resolvents should have more drying and absorbing quality than they have in case of hot swellings. (This was concerning the swellings which arise from remote and external causes and there is also repletion). If a swelling is caused by an external cause but there is no humoral repletion then in the very beginning it should be treated with relaxant and resolvent drugs otherwise the treatment shall be like that in the first case.

The inflamed member may be the emunctory of a principal member as the glandular parts of the neck and around the ears are such emunctories to the brain and as the axillary glands are supposed to be those of the heart and as the glands of the groin act as an emunctory organ to the liver. Hence in all such cases one must not use repercussives at all, not because this is not (the real) treatment of their swellings; actually this is the treatment of these swellings but because we do not wish to treat the swellings. We try to increase these swellings and attract the (morbid) matter towards them. We do not mind if the injury to the member (concerned) becomes severe because we aim at the good of the principal member and fear that if we curb the matter it would turn towards the principal member and cause such things as we cannot possibly rectify. Hence we prefer the occurrence of an injury to an ignoble member if a principal member is benefited so much so that we ourselves try to attract the matter towards the subordinate member and cause swelling in it even by applying cupping or hot plasters having sharp attracting property.

When swellings of this or other kinds—especially in places of loose structures—suppurate then sometimes they rupture by themselves or by promoting the maturation and sometimes they need maturation and incision, at the same time. Maturation is achieved by substances which, besides being hot, have obstructing and glutinous property with which the heat (of the body) is retained. A person trying to maturate the swellings with such maturatives must note the condition of the affected part. If he finds that the innate heat is weak and the tissues of the member are breaking down, he should stop the glutinous and obstructive drugs and use deobstruents and deep scarification; then he should use the medicines which are resolvent and desiccative as we shall describe in detail in particular Books. Often the swelling is deep seated. Hence, it must be attracted towards the skin even if it is to be done with the help of hot cupping.

For hard swellings which have crossed the limit of the first stage the principle of treatment is to soften them with remedies which have less heating and desiccating property so that their dense parts might not undergo petrification owing to severe dispersion but they should all be disposed to be dissolved and then dissolution should be intensified. If it is feared that the act of dispersion might lead to (further) petrification in the remaining parts, the softening process should be resumed. Then these alternations are continued till the whole swelling disappears during the period of alternate softening and dispersion. Flatulent swellings are treated with drugs which have heating property and are of rarefied substance as well as that which might disperse the gas and open the pores as the cause of flatulent swellings is the thickness of the gas and the closure of the pores. One also must pay attention to the matter which is producing the gaseous vapour.

Some swellings are ulcerative as hepetic ulcers; so they should be cooled as (it is done with) phlegmonous swellings. But they should not be moistened even if the swelling needs moistening. But they should be desiccated because here the concommitant accident has dominated the cause and the concommitant accident is the ulceration which is expected or has already occurred and the treatment of ulceration is only desiccation and moistening is the most harmful thing for this.

As to the internal swellings, the morbid matter should be removed from them by venesection and purgation. The patient of internal swelling should avoid bath, wine, excessive physical and psychological activity as anger and the like. Then, in the early stages repercussive medicines, which are not very powerful, should be used, especially when the swelling is in organs like stomach and liver. As the time of resolution arrives, one must not omit introducing astringents of agreeable odour as we have pointed out in preceding discussions. The liver and the stomach are more in need of that principle than the lungs. In internal swellings the laxatives for the bowels must be used with such medicines as have maturating quality and are proper for the swelling such as garden night-shade and purging cassia. Garden night-shade has the property for dispersing the hot internal swellings. The patients of such swellings should be given only light food and that too only when the paroxysm is over, if there be any and (food should not be given even) in the beginning of paroxysm, unless the weakness is so marked.

One, who is afflicted with the swelling of the viscera and the loss of strength all together, is on the way to death. This is because strength is reanimated only with food and food is the most harmful thing in such condition. If the swelling dissolves by itself, that would be the best course and if it ruptures then things which might cleanse it should be given to drink such as honey water or sugar water. Then such things should be given as are mildly maturing and also slightly desiccating. Finally, one should administer desiccants alone. You will know it in detail in the Book dealing with particular diseases. Sometimes in the case of internal swellings or those below the stomach some mistake is committed. For they are not swellings but are ruptures. Hence an incision into them proves a (dangerous) mistake. Sometimes the swellings are internal and are not in the peritoneum but are in the intestine itself. It would be then dangerous to open it.

Section XXVI

Incisions

When one decides to make an incision into the diseased member he should make the incision along the folds and creases that are found in that member excepting the case when the member is like forehead. For, if the incision is done along the folds and creases of the forehead, its muscle would be cut and "fall down" on the eyelids. Similar care must be taken in the case of the members in which the folds run opposite to the course of the muscular fibres. The surgeon must know the anatomy of the nerves, the viens and the arteries so as not to commit a mistake and cut any of them. He must also have some haemostatics, various ointments to allay the pain, and some instruments of that type. Thus he should have equipments like 'Galen's medicine', rabbits's wool, spider's web, the white of egg and cautery. All these are for arresting bleeding if it is caused by some mistake or there might be such need. He should also have emollient medicines. Having opened an abscess and extracted its contents, one should avoid applying oil or water or an ointment in which fat and olive oil are in dominant (proportion) such as *baslīqoon*. But ointment like that of yellow vitriol should be used only when something has to be used and a sponge soaked in astringent wine may be put over the part.

Section XXVII

Treatment of decay of members and amputation

When an organ decomposes in consequence of decaying temperament whether involving humoral matter or not and remedial measures such as scarification and local applications as described in the particular books have failed, there is no way out but to remove the corrupt flesh from the organ. If possible, it is better to do this without the iron cautery because sometimes it badly injures the muscular fibres and the arteries. If this is unavailable and the decomposition has gone deep into the flesh, there is no way out but to cut it and cauterise the place with boiling oil. For, as a result of this, the neighbouring parts become safe from the calamity of that organ and the bleeding stops and on that spot there is the growth of flesh and some alien and unusual skin which resembles flesh in its hardness. If amputation is to be carried out, one should insert the needle into the member and move it round the bone. Hence wherever the adherence (of flesh with the bone) is correct and the pain increases with the insersion of the needle that indicates the safe limit. Wherever flabbiness or weak attachment is found, all that must be excised. Sometimes, holes are made by a drill around the bone which is to be severed; thus it is broken and separated and sometimes sawing is done with it. If one decides to do this, one should detach the part which is to be severed or perforated from the (healthy) flesh to avoid causing pain. If the bone which is to be severed is a projecting splinter and is unable to be set right or adjusted and it is feared that it would undergo corruption and thus corrupt the tissues next to it, we should detach the flesh from it either by dissecting and then stretching it by bandages to opposite direction or by some other devices which might be suggested by the situation. If there be any important organ (near the bone that is, to be severed, we should put between them some pieces of cloth to keep thereby the bone away from the organ and then excise the bone. If the (diseased) bone is such as femur and is large and is in the vicinity of nerves, arteries and veins and the decomposition is great, the physician must avoid amputation.

Section XXVIII

Treatment of loss of continuity and kinds of ulcers

Loss of continuity in bony members is treated by securing proper adjustment, setting and bandaging as described under the art of bone-setting and this will be dealt with in its proper place. Then rest should be given and such gelatinous food should be used as might produce cartilagenous nutriment and tie the edges of the fracture and make them firmly united as solder. The reunion of bone, especially in adults is impossible except in this way because it does not regain the original continuity at all. We shall shortly give a detailed discussion of bone setting in 'particular books'.

If loss of continuity is in soft members then for its treatment three principles are to be followed—provided the cause is fixed (in the member itself).

1. Arrest the matter and the flow of matter if it is sound in some neighbouring member.
2. Heal the slit with suitable drugs and foods.
3. Stop putrefaction (sepsis) as far as possible.

When you have achieved success in any one of these three principles you should pay attention to the remaining two principles. You already know how to arrest the flow of the matter. Healing is expedited by bringing together edges (of the wound)—provided they might come together—and by using desiccant remedies and gelatinous foods. You should know that in treating ulcers the main aim is to procure desiccation. Thus, if the ulcer is clean it is only to be dried up. And if it is a septic ulcer then acute erosive drugs such as yellow vitriol, white vitriol, yellow arsenic and lime should be used. If these do not succeed, cautery becomes inevitable. The drug prepared with verdigris, wax and oil cleanses because of the effect of verdigris and prevents excessive irritation due to its oil and wax; it is thus an attempered medicine for such conditions.

We say that all ulcers are either simple or compound. Hence in the case of a simple ulcer which is small and in which there is no loss (of tissues) it is proper to bring the two edges together and bandage it seeing that no oil or dust gets in between the edges. Thus it will heal up. Similar treatment will suffice for an ulcer which is big and in which there is no loss of substance and one edge of which might be brought together with the other. And the ulcer which is so large that its edges cannot be brought together whether it be a rent or a gap full of pus and there has already been some loss of substance of the member, should be treated with desiccants. If the loss is confined to skin, drugs which promote scab formation are needed. Such drugs have their action either directly as astringent ones or indirectly as acute ones like white vitriol and yellow vitriol provided they are used in definite small quantities. It is because these assist desiccation and formation of scab. If they are used in larger quantities they corrode (the tissues) and icrease the size of ulcers. If there is loss of flesh as in deep ulcers, one should not make haste in producing scab. But one should first pay attention to the formation of tissues. And only those drugs can produce flesh, which do not go much beyond the first degree in their desiccating power.

But for using desiccants there are certain conditions which must be observed:

1. Consideration of the state of the original temperament of the member and temperament of the ulcer. Hence, if the member in question is very moist in temperament and the ulcer is not very moist, a little desiccation in the first degree will suffice because the malady is not very far from the nature of the member. But, if the member is dry and the ulcer very moist, desiccants of the second and third degree are needed to restore it to its temperament. A balanced device is to be adopted if the member and the ulcer are balanced (in temperament).

2. Consideration of the temperament of the whole body: When the body is very dry and the (diseased) member has more moisture but in relation to a normal body it is normal in moisture, desiccation should be procured by using attempered desiccants. Similar is the case if the body is immoderately moist and the (diseased) member dry. Hence, if both go up increasing, (there might be two situations). If the rise is inclined towards moisture, more powerful desiccation should be procured and if it is towards dryness, a little of desiccation should be procured.

3. Consideration of the potency of the desiccants:

So desiccants causing the growth of flesh are such as no strong dessicant action which might prevent the flow of matter towards the (diseased) member is required of them, as it is required of the dessicants which are not used for causing the growth of flesh but for adhering action, yet it is required that they (desiccants causing the growth of flesh) are more abstergent and cleansing for the pus than the sealing desiccants from which only adhering, uniting and healing are required. All the drugs which are desiccants without causing any irritation may be included among those which promote the formation of flesh. Ulcers in non-fleshy situations do not heal up quickly and similar is the case of circular ones. It is proper to mix penetrative medicines as honey with dessicants and astringents which are used for (treating) internal ulcers and also the medicines which are specific for the (affected) part as diuretics are mixed with the medicines for treating the ulcers of urinary organs. If, in case of internal ulcers, we want to achieve healing we should use drugs which are viscid as well as astringent, such as sealing clay.

Remember that there are certain things which inhibit the healing of ulcers:

1. Unhealthy temperament of the member. Hence one should care to rectify it.
2. Unhealthy temperament of the blood which is supplied to it (member). Hence it should be remedied by such diet as might produce good chyme.
3. Excess of blood which flow towards it and makes it moist. It is to be counteracted by depletion, by light diet, and if possible by exercise.
4. Corruption of the underlying bone whereby pus is constantly flowing (towards the ulcer). The only remedy for this is to rectify that bone, it should be rubbed if rubbing might do away with its corruption or it should be caught and excised.

It is often needed that the persons treating ulcers should be having with them such ointments as might attract the bits and fragments of bone and take them out, otherwise they prevent the healing of ulcers.

In the treatment of ulcers nutritive food is required for (maintaining) strength and the nutriment is to be curtailed in order to lessen the pus. And these requirements are contrary to each other because when the strength reduces it requires to be strengthened and when the pus increases, the food is to be stopped. The physician has, therefore, to take decision carefully in this matter. When an ulcer is in the early stage and on the increase, the patient should not enter a bath nor hot water should be poured upon his ulcer; otherwise morbid matter is apt to be attracted towards it whereby the swelling will be increased. But when the ulcer reaches a stationary stage and becomes purulent then, perhaps, these things might be permissible. If an ulcer keeps on breaking soon after being healed, it is on the way to becoming a fistula. One must always watch carefully the colour of the pus and the colour of the edges of the ulcers. If the pus increases wihout an increase in the food, it is owing to maturation.

We speak now of the treatment of laceration. We say: Since laceration is a deep loss of continuity under the skin hence the medicines for it must be more powerful than that (required) for (resolution of continuity in parts) which are exposed to the view. Since the flow of blood is too much towards the affected part, resolvents are needed; but the resolvents should not be roo much, desiccant, otherwise they would disperse the rarefied parts and petrify the dense ones. When this end is attained through the resolvents, healing and desiccant medicines should be used so that the filth might not remain entangled in between the tissues finally giving rise to a stone and then it might petrify as a result of an ordinary cause or come out and thus produce resolution of continuity again. When the laceration is deeper the place should be scarified so that the medicine might "enter" (the wound) easily. For the treatment of minor laceration and contusion, often venesection may suffice. If laceration is associated with split, the latter should be treated first with medicines appropriate for a split so that the treatment of the laceration becomes possible. If the laceration be major it should be treated with desiccants. But, if it be minor such as a pin prick, the matter should be left to the physis itself unless the injury is poisonous and fatal or there is severe pain, or it has reached some nerve and thus it is feared that swelling and throbbing will develop.

In sprains a gentle bandaging, which might not cause pain, is sufficient and appropriate medicines should be applied over it. In cases of falls and blows venesection should be done on the opposite side; diet should be light and meat and similar things should be avoided; liniments and drinks described for this purpose in the particular books, should be used. We postpone the statement of the resolution of continuity in nervous organs and in bones and we shall resume it when we deal with the particular diseases.

Section XXIX

Cauterization

Cauterization is a useful treatment for it attains the following purposes:—

1. It prevents the spread of putrefaction.
2. It strengthens the member which has become cold in temperament.

3. It disperses the putrefactive matter which is firmly "adherent" to the member.
4. It arrests haemorrhage.

The best thing for procuring cauterization is gold. The place to be cauterized need be visible so that the cauterization is done after observation or it may be deeply situated inside a member as nose or mouth or anus. In such cases there is the need of a speculum coated with talcum and armenian bole soaked in vinegar, wrapped with a piece of cloth. The speculum is sufficiently cooled with rose-water or certain other juices. Then the speculum is entered into that passage till the place to be cauterized comes inside the hollow of the (instrument). Then the cautery is inserted into it upto the desired place without doing any harm to the tissues around it, especially when the cautery is thinner than the hollow of the speculum, it is not to touch the sides of the speculum. The person applying the cautery must take care that the effect of burning might not reach the nerves, tendons and the ligaments.

If cauterization is done for (arresting) haemorrhage, it must be vigorous so that a deep and thick scab is produced, which will not readily drop off. For, if the scab resulting from the cauterization for (arresting) haemorrhage falls off, it attracts a greater calamity than before. If cautery is done to remove the dead flesh and the limit of the healthy (tissues), is required to be known it is to be found where pain is felt. It sometimes, needed that both of the flesh and the underlying bone be cauterized and cautery be kept on that spot till all the dead matter is completely destroyed. If the necrotic bone is like skull, the cauterization must be gentle so that the brain might not be agitated and its membrances might not shrink. But in the case of other bones, we need not fear to cauterize vigorously.

Section XXX

Relief of pain

You have already learnt that the causes of pain are restricted to two kinds: (a) Sudden change of temperament and (b) Loss of continuity.

You have also learnt that the last classification of temperamental disturbances ends with hot, cold and dry intemperaments and that these may be without (association) of matter or with the association of chymous and gaseous matter and with or without swelling. The relief of pain, therefore, is attained by the contraries of these causes. You have already learnt what the contrary of each of them is and have also learnt how the intemperament and swelling and gases are treated.

When pain becomes intense, it may cause death, It first produces coldness and shivering of the body. Then the pulse becomes small and then fails. It is because the pulse attracts so much of cold to the body that the innate heat is not replenished by breathing any more and then the patient dies.

All the things that relieve pain have the property of changing the temperament or dispersing the matter or causing insensibility. Anaesthetics relieve pain because they impair the sensation of that member. And they destroy the sensation because of either of the two things: either because of excessive cold or because of some poison in it, which is contrary to the power of the member. Relaxants are included in all those agents which disperse matter gently such as, dill, linseed, sweet melilote, chamomile, seeds of celery, bitter almond and anything which is hot in the first degree, especially if they are somewhat sticky as the gum of bukhara plum, starch, lead carbonate, saffron, gum ladanum, marsh mallow, cardamom, cabbage and turnip and their decoctions, fats, green hyssop and oils already mentioned in this conncetion. Laxatives and evacuants of any kind are like this.

It is proper to use relaxants after depletion provided there arises its need so that the matter passing to that member might be prevented. Similarly all the drugs which cause maturation of swellings or their rupture (belong to the same class). The most powerful of the narcotics is opium; and among the class of narcotics are also mandrake, its seeds and bark of its root, the two kinds of poppy (white and black), henbane, hemlock, the anaesthetic variety of night shade and lettuce seeds. Ice and cold water also are among the anaesthetics. Sometimes mistake is committed regarding the pains as their causes happen to be extraneous such as heat or cold or faulty position of pillows, or uncomfortable bed or falls during intoxication etc. but search is being made for internal causes. Hence the mistake is inevitable. It is, therefore, wise to make a thorough investigation and determine whether there is any repletion or not and whether the causes of repletion are known or not. Sometimes the cause happens to comes to the body from outside but having become internal it becomes persistent. For example, drinking of icy cold water produces severe pain in regions of stomach and liver. In such a case, strong depletion or the like is not often needed because the use of a bath and good sleep may be enough for it. Similarly, a person may eat something (very) hot, which causes severe headache. For this, it is enough to drink cooled water.

Sometimes the thing from which the disappearance of pain is expected is either slow in action and the pain might not be bearable at that time, for example: depletion of that matter which is confined in the fibres of intestines and gives rise to colic. Or it is very quick in action but it is very dangerous. For example: anaesthetizing the painful part in colic with the medicines which are capable of doing that. The physician is, therefore, confused in such a case. Hence he should have a sharp wit to decide which of the two periods is a longer period during which the strength might persist or the period of pain. Moreover, he has to decide which of the two situations is more harmful: the pain or the danger liable to arise in case of anaesthetizing (the part). Thus he will give priority to that which is more reasonable. Sometimes, if the pain continues it proves fatal owing to its severity whereas anaesthetizing generally does not cause death although it is harmful in other way.

It is often possible to counteract its harmfulness and resume the proper treatment. In addition to all this, one must consider the composition and property of the anaesthetic drug in order to use the most convenient of it. Moreover, he should use it in the form of compound made with its theriacs unless the problem is very great and requires powerful anaesthetizing. In case of some members anaesthetics may be used without any fear because they do not cause any great danger. For example, the use of anaesthetics for teeth. Sometimes the use of anaesthetic drug orally taken is also safe in some members. For example the use of the anaesthetic drug to be taken through mouth for pain in the eye is correct because it is least harmful for the eye in comparison to the local application (of the remedy). Moreover, the harm done to other members by taking a draught may easily be rectified. But in diseases like colic, the calamity is aggravated (by the anaesthetics) because the matter becomes colder and more solid and thus encloses (the passages) more effectively.

Anaesthetics relieve pain by inducing sleep because it is one of the causes that relieve pain, especially if the patient is in the state of fasting and besides there is pain caused by morbid matter. Compound anaesthetics—the powers of which have been mitigated by medicines which are like theriacs to them—are safer such as 'philonium' and compound lozenges. But they are weak in anaesthetizing. Those of them which are prepared afresh are more powerful in action and the old ones may not have any action at all and those which are between the two extremes are intermediate (in efficacy). Some of the pains are very severe but they are easily curable at certain times as the pains caused by gases. Sometimes it is sufficient to pour hot water over the organ. But there is a danger in it. It is because the cause (of pain) is a swelling but it is thought to be gas. So, if hot water douche, especially in the beginning, is given, its harmfulness will be increased.

In addition to this, hot water fomentation proves harmful to pains caused by gases. It happens so when it fails to disperse the gas and instead increases its volume.

Fomentation too, is among the remedies for gaseous distension. And it is done best with a substance which is dry like millet. But in case of members which cannot bear it as eye, fomentation should be done with a piece of cloth. And there is a type of fomentation which is done with hot oil. A powerful fomentation is prepared by cooking flour of peas with vinegar and then getting it dry and then the fomentation should be done. And a weaker one is made with bran cooked in the same way. Salt fomentation produce heat in the vapours and millet fomentation is better but weaker than that. Sometimes fomentation is given by filling the bladder of animal with hot water and it is quite safe and gentle. But sometimes the aforementioned act (mishap) may happen if care is not taken. Hot cuppings are of the same order (as fomentations) and are powerful for relieving the pain caused by gas. If they are repeated, they eradicate the pain completely. But sometimes, they produce the same ill effects as have been already mentioned. Stroking (the painful part) gently for a long time is soothing for the pains because it relaxes the tissues. Similarly well-known light fats and oils which have already been mentioned, sweet music, especially if it inclines one to sleep and pleasant occupations may be powerful analgesics.

Section XXXI

Final advice regarding the kind of treatment we should begin with

When several maladies occur together we should deal first with that which has one of the following three characteristics:

1. The disease should be cured first the healing of which depends on that of the other. For example when swelling and ulcer occur simultaneously, we should treat the swelling first till the intemperament which accompanies the member is done away with and in the presence of that intemperament the ulcer would never be healed. Then, after the swelling we should treat the ulcer.

2. One disease is the cause of the other. For example, if embolus and fever occur together, we treat the embolus first and then the fever. If something hot becomes necessary for opening the embolus we should not care for the fever. Similarly we treat consumption with desiccants and ignore the fever because it is impossible that the fever will disappear while its cause persists. And the treatment of its cause is desiccation which is harmful for the fever.

3. Of the two diseases, the one which is more serious needs prior attention. Thus, when synochus and paralysis occur together we will treat synochus with cooling measures and venesection and will not pay attention to paralysis although venesection proves harmful for it.

When the disease and the concommitant symptoms occur together, we shall begin with the treatment of the disease. But if the concommitant symptom becomes dominant, we shall pay attention to it and ignore the disease. Thus, in the case of a colic with severe pain we administer anaesthetics although they are harmful for the colic itself. Sometimes venesection is necessary but we postpone it in view of weak stomach, pre-existing diarrhoea and existing nausea. Sometimes we procure venesection without any postponement but we do not remove the whole cause completely. For instance, in the case of convulsion we do not seek to remove all the morbid humour but leave a part of it to be dispersed by convulsive movements; otherwise the convulsive movements will disperse the innate moistures. This brief account of the General Principles of Medicine should suffice. God willing, I shall now start writing the volume on Simple Drugs. First Volume of the Canon of Medicine is now complete.

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