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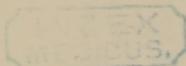
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A GUIDE

TO THE

CLINICAL EXAMINATION OF PATIENTS



AND THE

DIAGNOSIS OF DISEASE,

BY

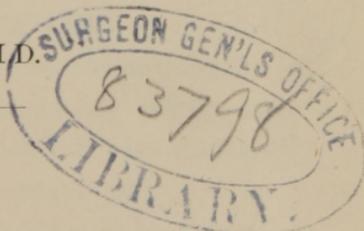
RICHARD HAGEN, M.D.,

Privatdocent to the University of Leipsic.

TRANSLATED FROM THE SECOND REVISED AND ENLARGED EDITION,

BY

G. E. GRAMM, M.D.



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AS THE CONDITION OF THIS VOLUME
WOULD NOT PERMIT SEWING, IT WAS
TREATED WITH A STRONG, DURABLE
ADHESIVE ESPECIALLY APPLIED TO
ASSURE HARD WEAR AND USE.

PREFACE TO THE FIRST EDITION.

THE contents of this work are intended for the perusal of students of medicine before attending clinics, in order to obtain an idea of their conduct at the bedside and the manipulations, *secundum artem*, required there; and also the principal phenomena by which the presence of a given disease is established.

For the sake of conciseness less important and rare diseases have been entirely omitted; others, which cannot be recognized without great difficulty, or the diagnosis of which is very uncertain, have only been mentioned. And only those symptoms have been given which are important for the recognition of the diseases treated of, without regard to their ætiology, histology, prognosis, and therapeutics. It is obvious that this *Guide* is not intended to supersede the larger works on special pathology and therapeutics by Virchow, Lebert, Niemeyer, Wunderlich, Kunze, etc., but rather to offer an inducement to the earnest perusal of them.

After the student has mastered the subject-matter of this work he will not only very quickly derive great benefit from his attendance at clinics, but also materially lighten the labors of his clinical instructors.

It is to be hoped that this *Guide* will be favorably received by those for whom it is especially intended, and obtain a just, but liberal, criticism.

THE AUTHOR.

LEIPSIK, May, 1872.

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PREFACE TO THE SECOND EDITION.

THE highly favorable reception which my work obtained in all interested circles, made a second edition necessary in the course of a year.

In this edition I have corrected the mistakes noticed by critics, as well as taken advantage of advice received from various quarters, at least in so far as this was in accord with the purpose of this book.

The arrangement of the contents is a different, and, as I am led to believe, a better one. Besides, an alphabetically arranged index (with the derivation of terms), various additions (*e. g.*, entozoa, chronic enlargement of the spleen, tetanus, lead-poisoning, delirium tremens, diphtheria, diabetes, inositus and insipidus) have been made.

The second edition is, therefore, entitled to be styled a revised and enlarged edition.

May it obtain a similar reception to that of the first edition, after the undersigned has acknowledged himself as its author.

DR. HAGEN.

LEIPSIK, December, 1873.

TRANSLATOR'S PREFACE.

THE accuracy, completeness, and conciseness of the subject-matter of this *Guide* have caused it to be so favorably received that it has been accorded a lasting place as a textbook in German universities.

As the necessity for such a book as this one is felt in every medical college, the translator believes that he has rendered a service to every English-speaking student and the busy physician in making it accessible to them. The degree of success with which his labors have been rewarded must be left to the judgment of just critics.

The translator has purposely abstained from making additions or inserting remarks, in spite of the temptation to do so, which assailed him at times.

It was only after considerable hesitation that the word "herdsymptome" was translated by "local symptoms," on account of the possibility of the reader being misled by the ordinary use of the term. Recollecting this when reading the diseases of the brain it will not be possible to be led astray.

In conclusion I cannot refrain from according to my son, Edward M. Gramm, M.D., the thanks which he has earned in aiding in the translation of this book.

May it be as favorably received, after being translated, as it was in the original.

THE TRANSLATOR.

PHILADELPHIA, February, 1881.

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INTRODUCTION.

§ 1. **WHOEVER** would make a successful examination at the bedside must first have thoroughly studied the anatomy and physiology of the human body in its normal state as well as its pathological anatomy.

§ 2. **Disease.**—By disease is understood every abnormal alteration of the functions and anatomical constitution of the human body.

§ 3. **Symptoms.**—Every disease elicits a train of phenomena which are called symptoms. These are classed as subjective and objective.

§ 4. **Subjective Symptoms.**—Subjective symptoms are those sensations which the patient alone experiences; *e. g.*, the sensation of lassitude, pressure, tension, pain, etc. Subjective symptoms are, on the whole, of little value to the physician;* frequently he cannot become cognizant of them, as in children, etc.

§ 5. **Objective Symptoms.**—Objective symptoms are those of which the physician becomes cognizant by

* As to the importance of subjective and objective symptoms there is a great difference of opinion among physicians.

means of his sense of sight, hearing, touch, etc., whether aided or not by instruments, as the ophthalmoscope, auriscope, rhinoscope, laryngoscope, colpeurynter, thermometer, and microscope, and chemical tests. They result from the disorder of the functions and the alteration of the physical properties of the various organs. The results of thermometry and microscopic and chemical investigations are also classed with objective symptoms. Objective symptoms are most important to the physician.

§ 6. **Pathognomonic Symptoms.**—Pathognomonic symptoms are such as indicate with certainty the presence of a given disease; *e. g.*, the rust-colored sputum of pneumonia.

§ 7. **Negative Pathognomonic Symptoms.**—Negative pathognomonic symptoms are those which are never or only extremely rarely observed in certain diseases; *e. g.*, herpes labialis in typhus abdominalis.

§ 8. **Diagnosis.**—Diagnosis, *i. e.*, the art of determining the nature of the disturbance from the symptoms present, has for its object to collect, arrange and trace the origin of the symptoms, and after that to determine the malady present. That diagnosis which decides the nature of a disease by the anatomical changes in an organ is called *anatomical diagnosis*; while *symptomatic diagnosis* is that which is based on a single prominent symptom. The latter is only justifiable in diseases the anatomical changes of which are unknown; *e. g.*, melituria.

§ 9. **Examination of the Patient.**—The examination of the patient, which precedes the diagnosis and leads to it, consists of the inquiry, 1st, into his previous history (embracing his mode of living and general health, and that of his family), and, 2d, his present condition. This is called the *genetic method*. A second method is the *analytic*, which consists in first determining the present condition of the patient, and after that his previous history. This is accomplished by following the anatomical order in the examination after subjecting him to a general inspection, now examining him topographically, according to the different regions of the body, now anatomico-physiologically, according to systems and organs.

§ 10. **Status Præsens.**—The examination for the purpose of obtaining the status præsens ascertains:

1. The general psychical and physical condition of the patient ;
2. The condition of the nervous system ;
3. The condition of the circulatory system ;
4. The condition of the respiratory organs ;
5. The condition of the skin ;
6. The condition of the chylopoëtic and uropoëtic systems ;
7. The condition of the sexual system.

The order in which the various organs are to be examined depends upon the individual case ; the examination must, however, not be limited to the diseased organ alone, but must include all parts of the body.

§ 11. **Differential Diagnosis.**—If the results obtained from the examination of the patient do not point directly

to the nature of the disease, or to one or more diseased organs, we attempt to arrive at a diagnosis by *exclusion*. To that end, those disturbances which do not possess the symptoms present, or which have characteristic symptoms not present in the case under consideration, are thrown aside, and thus, finally, a disease is determined upon as the one most probably present. Experience is of value here, because some diseases mutually exclude each other, while some are apt to supervene upon others. Thus, tuberculosis seldom occurs in those suffering from heart-troubles; herpes labialis only extremely rarely, but pneumonia and acute intestinal catarrh very frequently during typhus abdominalis.

§ 12. **Prognosis.**—The prognosis is dependent upon the diagnosis, and upon it again the *therapeutics* (*i. e.*, the remedies indicated and their rational administration).

Prognosis deals with the probable course and termination of a disease, and is either favorable, unfavorable, or doubtful.

It is modified, in general, by the constitution and age of the patient, the relative importance of the organs affected, the nature of the disturbance, existing complications, the possibility of effectual therapeutic measures, and in epidemics the character they assume. At this juncture it is necessary to call attention to the fact that great caution should be exercised in giving a prognosis.

§ 13. **Duration, Course, and Termination.**—In every disease we distinguish the course, duration, and termination.

According to their *duration* diseases are divided into

acute and chronic. Those without febrile manifestations are commonly regarded as chronic, although all chronic diseases are not without fever; some chronic diseases are made up of a series of single acute diseases.

The duration of a disease is determined by the nature of its causes and their mode of operating.

Every disease has a definite *course*, which is dependent upon the nature of the disturbance as well as upon the manner in which the system attempts to re-establish health. In the majority of cases an increase and decrease of the disease process is observed, which, at times, is limited to a definite period. This is especially the case in the acute exanthemata.

The *onset* of a disease is either sudden (as in apoplexy, wounds, poisoning, convulsions, pneumonia, etc.) or gradual. As a rule, disease begins in the latter way, and the stage preceding the appearance of the characteristic symptoms of the malady is called the prodromal stage. Besides this stage the course of a disease is divided into other stages, as follows: the stage of increase (*stadium incrementi*), the stage of the height of the disease (*stadium acmes*), the stage of decrease (*stadium decrementi*), and the stage of convalescence (*stadium reconvalescentiæ*). Between the *stadium acmes* and the *stadium decrementi* another stage is frequently found in some diseases, the stage of indecision (*stadium amphiboliæ*).

By *crisis* is understood a rapidly appearing (from 4 to 36 hours) amelioration (a fall of temperature of from 2° to 5° C. and a diminution in the frequency of the pulse of from 20–60 beats per minute). By *lysis*, on the other hand, a steadily progressing amelioration requiring more than two days for its complete establishment.

Occasionally a relapse (*recidivum*) of the disease occurs during the *stadium decrementi* or at its close.

A disease may terminate in one of three ways: 1st, in recovery (complete or partial); 2d, by the supervention of another disease; or, 3d, in death.

Recovery ensues either rapidly or gradually, the latter being oftenest the case, when it is generally preceded by the stage of convalescence, whose first symptom is an increased desire for nutriment.

When one disease supervenes upon another the original disease is altered according to the character and location of the new one.

The termination of a disease in death may be due to the deprivation of food, air, and the temperature necessary to the support of life by alterations in various organs (heart, lungs, and brain). Death may occur from paralysis of the heart (syncope), from suffocation (asphyxia), and from paralysis of the brain (apoplexy). The remote causes of death are found either in the blood (hæmorrhage, loss of vital fluids, changes in the composition of the blood from impaired digestion, absorption of noxious substances from without, or retention of effete materials), or in the different organs (rupture of internal organs, paralysis, inflammatory processes, extensive exudations producing their effects by compression, as in hydrothorax, œdema of the lungs, etc.).

Death occurs either suddenly, or the gradual transition from life to death is accompanied by the phenomena of the progressing paralysis of the various organs, which has received the name of *agony*.

§ 14. **Repeated Examinations.**—Those phenomena which occur during the course of a disease and the re-

sults of the administration of medicinal agents should be obtained and noted down once or even several times per day.

§ 15. **Autopsy.**—In the event of a fatal issue of a disease an autopsy of the deceased should conclude the physician's labors. It must confirm or correct the diagnosis and establish the cause of death.

GENERAL CONSIDERATIONS.

§ 16. EVERY examination of a patient is divided as before mentioned : 1st, into the inquiry as to the previous history (*vide* §§ 98, 99, and 100); and, 2d, into the determination of the *status præsens*.

§ 17. For ascertaining the *status præsens* we make use of :

1. Inspection :
 - a. Of the patient's body ; and
 - b. Of its secretions and excretions (expectoration, hæmorrhages, urine ; *vide* §§ 84-93).
2. Palpation.
3. Mensuration.
4. Percussion.
5. Auscultation.
6. Thermometry.
7. Microscopic and
8. Chemical examination of the secretions and excretions of the patient (*vide* §§ 84-96).

INSPECTION.

A. *Inspection of the Patient's Body.*

§ 18. **General Condition of the Patient.**—The first thing to be determined in an examination is the physical and psychical condition of the patient ; it is necessary to observe whether he is lively and rational, or dull, stupid,

lethargic; whether he is cheerful, sociable or fretful, morose, melancholy, desponding; whether he is docile, obedient or vehement and unmanageable; whether he is temporarily excited from drinking or other causes; whether he is inattentive, delirious, or calm, collected, and in full possession of his faculties; whether he is grasping at flocks; whether he is dirty and poorly nourished or clean and well-nourished. All these and many other peculiarities will strike the eye at a glance, and must not be slighted, as they are of service in deciding the nature of the case.

§ 19. **Position of the Patient.**—In observing the position of the patient in bed notice should first be taken whether he is lying upon his back or side, and on which side; whether on the abdomen, face, or in any other position. It sometimes happens that people are in the habit of lying in a peculiar position in bed; information should, therefore, be obtained as to this fact. The position of the head, shoulders, trunk, and extremities should receive special attention. It should, for example, be observed whether the head is inclined forward or bent backward; whether the patient is lying flat on his back or face, prostrated and unable to move; whether the extremities are extended or flexed; whether lying limp or rigidly contracted or are placed in any peculiar position. It will be possible to decide from the position of the patient whether nervous exhaustion, general debility and prostration, convulsions, contractures, etc., are present. The position of the patient in some of the febrile diseases is characteristic; *e. g.*, in typhus, peritonitis, pleuritis, pneumonia, and pericarditis.

§ 20. **Face.**—It should be observed whether there is a general flushing or paleness of the face or only partial on the cheeks (as in phthisis and pneumonia); whether there are any red blotches, and whether they are covered with an eruption; whether the color of the face is brownish, cyanotic, livid, or florid; whether it is full and fleshy, puffed, swollen or thin, sunken, withered; whether it is dry or moist, hot or cold; whether the eyes are injected, ecchymosed, large, prominent, glittering, fiery or sunken, languid, glassy; whether the pupils are dilated or contracted; whether strabismus is present; whether the conjunctiva has a yellowish tinge; whether the look is straightforward, intelligent, firm or wild, unsteady, excited or languid, indifferent, vacant; whether the *linea nasalis* is well marked or not; whether the movements of the muscles of the face (in blowing, whistling, etc.) are normal; whether the mouth is open or shut; whether an angle of the mouth is sunken or distorted. When the lips, teeth, gums, and tongue are visible, it should be ascertained whether they are normal or coated. It should be noted whether the features are tranquil or distorted, vacant, dreamy, stupid, wild, agitated. Certain expressions of the face are highly characteristic of certain diseases and point to the diagnosis. Call to mind the *hippocratic face*! It is impossible to depict it accurately in words; but if it has once been seen it will never be forgotten. It is of great importance to the prognosis, and often indicates the approaching dissolution of the patient even before his friends are aware of the danger threatening him.

§ 21. **Respiration.**—It should be noticed whether the breathing is noiseless and natural (about 12–20

respirations per minute in adults ; 44, on an average, in infants ; 26 in children) ; whether it is strong, deep, regular, quiet or accelerated, loud, short, interrupted, irregular, labored, incomplete ; whether the patient breathes through the nose or mouth ; whether the *alæ nasi* are visibly dilated (as in *dyspnœa*) ; whether cough, blowing sounds, rattling, or gurgling in the throat or any other unnatural sounds can be heard ; whether the breath is fetid, and whether foam issues from the mouth during labored breathing. Finally, attention should be paid as to whether, if cough is present, expectoration follows it or not, and what is the nature of the sputa (whether containing air, liquid, shapeless, tough, gelatinous, lumpy ; colorless, whitish, grayish, yellowish, greenish, rust-colored, reddish, brownish, blackish, putrid ; and whether they contain pus-globules, blood-corpuscles, parasites, or fungi).

§ 22. **Skin.**—The color, elasticity, temperature, and secretions of the skin should be taken into consideration. It should be observed whether the skin is reddened or pale, warm, and dry ; whether it gives forth a pungent heat (*calor mordax*), or is cold, moist or covered with a cold, clammy sweat ; whether it is soft, smooth, or harsh ; whether desquamation is taking place ; whether it is parchment-like, shrivelled, chapped ; whether gooseflesh (*cutis anserina*) is present or not. Thus, a delicate and transparent skin is of a red color, as is also that of persons of a plethoric habit ; in chlorosis and anæmia it is of a waxy paleness ; in hydræmia it is a dirty white ; in carcinoma, clay-colored ; in icterus and pyæmia, yellow ; in some heart-troubles and emphysema, cyanotic ; after

the long-continued use of nitrate of silver, gray. A flabby and shrivelled skin indicates a lack of nutrition and absorption of the adipose tissue. In cholera it lies in folds. In diabetes mellitus it is dry. A low temperature of the skin, as indicated by the thermometer, is observed in cyanosis, anæmia, and hydræmia, while in febrile diseases it has a high temperature. Attention should be given to the secretions of the skin, as to their absence or marked increase, whether general or partial, what is their chemical composition, and whether perspiration occurs principally during the day or night. The skin should further be examined as to whether an exanthem (*i. e.*, spotted, confluent; elevated nodules, vesicles, pustules, papules, wheals; and how distributed) is present; whether the spots can be made to disappear on pressure; whether sudamina, purpura, petechiæ, vibices, excoriations, fissures, ulcerations, gangrene, or varicose veins exist.

A minute inspection of the skin-surface is indispensable, and ought not to be neglected in private practice.

B. *Inspection of Secretions and Excretions.*

Vide Expectoration, Hæmorrhages, Examination of the Urine.

PALPATION.

§ 23. **Palpation.**—Palpation, which serves to confirm inspection, has for its purpose the investigation of alterations in form, size, mobility, and consistence, as well as the grade of sensibility of a part, the temperature of the body, and the quality of the pulse.

Palpation is practiced either by using the palms of

both hands or the tips of one or more fingers (even by introducing a finger into a cavity).

§ 24. **Temperature.**—For the purpose of ascertaining the temperature of the body (36.25° – 37.5° C. when normal), the palm of the hand should be softly laid on the forehead, cheeks, palms of the hands, as well as upon a covered part (as the walls of the chest, abdomen, etc.). Estimating the temperature of the skin by means of the hand requires great experience and must always remain uncertain and approximate. Trustworthy results can only be obtained by the use of a clinical thermometer divided into tenths or fifths of a degree. It should be placed either under the tongue, in the axilla, rectum, or vagina, and should remain in position for some time (at least from 12–15 minutes). In order to facilitate its application the thermometer may first be heated above 41° C., and then left in position about five minutes. In any event it must remain in position until it does not rise any more (if it was not previously heated), or until it does not fall any more (if previously heated).

The temperature of the body is indicative of the grade of fever present and should always be ascertained by means of the thermometer. It is necessary to be able to judge of the import of deviations of temperature in diseases as they are of the utmost importance for the diagnosis and prognosis. The temperature should be ascertained at least in the morning and evening, and should, together with the number of pulse-beats and respirations per minute, be recorded on a chart prepared for the purpose (compare § 65).

It should here be mentioned that when the tempera-

ture of the body rises above 42° C. or falls below 35° C., the patient should be considered in imminent danger.

It has been found that the temperature rises highest in those diseases whose invasion is marked by a chill, as intermittent fever, endocarditis, puerperal fever, phlebitis, pyæmia, and cerebro-spinal meningitis. Next in order come typhus, the acute exanthemata, and finally some cases of pneumonia and pleuritis.

Generally, a fall of temperature occurs but seldom and is then mostly insignificant, *e. g.*, in heart troubles accompanied by marked cyanosis, and in diabetes mellitus. The lowest temperature (32.5° C.) heretofore observed in diseases was found in cholera in the *stadium algidum*.

At the commencement of a disease the temperature may either rise rapidly or gradually in proportion to the rapidity of the development of the disease process. It may either remain unchanged at the height to which it attains at first for some time, or during the entire course of the disease, or may alternately rise and fall. A temperature which remains high for a considerable time (*e. g.*, at 41° C.), has an unfavorable influence on the prognosis, while remissions in temperature are favorable, especially when they occur in the morning.

When diseases which are commonly attended by a high grade of temperature are approaching a fatal termination, a further elevation of temperature is generally observed shortly before death, if this occurs during the first stage of the disease. This rise in temperature may even continue a short time after death. On the other hand, it occasionally happens that death occurs after a gradual or sudden fall of temperature, *e. g.*, when it is due to hæmorrhages, and in tuberculosis and heart-trou-

bles accompanied by marked cyanosis, in which cases the temperature may even sink below the normal shortly before death.

§ 25. **Pulse.**—The pulse is felt by placing the tips of the first, second, and ring fingers of either hand close together on the radial artery, near the wrist, and holding it there for several minutes. This is done for the purpose of determining whether the pulse is frequent (more beats to the minute than are normal), infrequent (fewer beats than are normal), quick (when the impulse is felt a very short time and quickly disappears), slow (when the impulse is felt a long time), strong or weak (according to the distinctness or force of the beat), regular or irregular, intermitting (when one or more beats are omitted), intercurrent (when one or more beats are inserted in a series of regularly occurring beats), full, small, thready; whether it is dirotic or entirely absent. Care must, however, be exercised so as not to compress the artery too much. When the radial artery cannot be distinctly felt on account of its deep position, either from superincumbent adipose tissue, fractures, or luxations, another superficial artery may be selected for the purpose, as the temporal or carotid.

It is, moreover, advisable to compare both radial pulses with each other, as well as with the impulse of the heart, in order to ascertain whether differences in rhythm are present. For the purpose of simultaneously examining the radial pulse and the impulse of the heart, the above-mentioned fingers of one hand are placed on the artery, and the palm of the other hand in the region of the fifth intercostal space of the left half of the thorax,

with a gentle pressure. In this way the frequency, force, and duration of the heart-beat can be observed, especially at the end of each expiration, and by comparison with the radial pulse it can be ascertained whether they are isochronous or not. If the beating of the heart cannot be felt while the patient is lying down, he may be told to assume a sitting position and lean forward a little, or it may be examined with a stethoscope while he is in the horizontal position.

Various instruments have been constructed for making more accurate examinations of the pulse (pulsmanometer, by Hales; sphygmograph, by Vierordt). The examination of the pulse with the instruments which have thus far been invented is only possible in hospitals, so that in private practice we must avail ourselves of the examination by means of the fingers.

In syncope, asphyxia, violent convulsions, as well as at the approach of death, it is often the case that there will be no pulse felt in the radial arteries while it is still present in the arteries nearer the heart.

Age, sex, size, constitution, the time of day, the taking of food, motion, the temperature of the surrounding air, psychical impressions, and medicines exert an influence upon the frequency of the pulse. The entrance of the physician into the sick-room is very apt to excite the patient to a certain extent, especially if he is of an excitable nature, which is not without influence upon the pulse. Therefore, the examination of the pulse should not be undertaken immediately upon entering the sick-room, but only after some time has elapsed, so that the patient may have become thoroughly composed again.

The following table of the frequency of the pulse, at different ages, by Müller, is of importance :

Age.	Per minute.
In the fœtus,	130-150
In the infant (at birth),	120
At one month,	120
At one year,	120-130
At two years,	90-115
At three years,	80-100
At seven years,	72-90
At twelve years,	70
At puberty,	80-85
In the prime of life,	70-75
In old age,	60-65

Venous Pulse.—In health the veins do not pulsate. When pulsation is observed in them, it is either imparted to them by a neighboring artery or occurs within themselves. The latter condition is almost exclusively found in the jugular veins, and is there due to disease of the right heart, together with insufficiency of the valves of the jugular vein. It is only in rare cases that venous pulsation can be felt although visible to the eye.

When the jugular veins become prominent in consequence of disturbances of the circulation, two different movements may be observed in them. The one is dependent upon respiration, and consists of a distention and contraction synchronous with the respiratory movements. The other is dependent upon the contractions of the heart, and is characterized by a trembling, undulatory motion.

A marked dilatation of the jugular veins always indicates a serious derangement of the circulation, and only occurs with insufficiency of the tricuspid valve.

§ 26. **Fluctuation.**—Palpation is especially useful in determining the presence of fluctuation, *i. e.*, the sensation of undulation artificially produced in a cavity with compressible walls. It is produced by giving a short, quick tap with one hand upon the walls of the suspected accumulation of fluid, while the other is laid flat upon the opposite side to catch the sensation of undulation thus produced (as in ascites).

MENSURATION.

§ 27. **Mensuration** is performed by means of various instruments (callipers, tape-measure, spirometer). Its purpose is to ascertain the size, circumference, and diameter of the diseased organs, the relative size of parts of the body which occur in pairs or of symmetrical parts, the increase or diminution in size of a part of the body during the course of a disease, and, finally, the capacity of the lungs.

§ 28. **Physical Examination in its Limited Sense.**—Physical examination in its limited sense is accomplished by means of percussion and auscultation. Which of these two should first be practiced is, in general, of little importance; but in children it is advisable that auscultation should precede percussion, because they are very apt to commence crying if the examination is long continued and thereby render auscultation impossible, while percussion may even be practiced under those circumstances, although its results will not then be quite so reliable.

PERCUSSION.

§ 29. **Percussion.**—By percussion is meant the method, by tapping on the surface of the body, of eliciting a sound, the quality of which is taken as an index of the condition of the organs lying in the region percussed.

This method of examination is employed in all regions of the body which are known or suspected to contain air (thorax, abdomen, hernia, emphysema of the skin), in order to compare with the normal condition the boundaries, amount of contained air, tenseness, character of the walls of hollow organs and parts, as well as to judge of the position of the neighboring solid organs.

§ 30. **Method of Percussion.**—Percussion is practiced by making short, quick taps upon the surface of the body with the slightly flexed middle finger of the right hand. This movement should be made entirely from the wrist and not from the elbow. This method of percussing is called *immediate* percussion.

For the purpose of more accurately locating the disease one or two fingers are laid on the spot to be examined, their dorsal aspect receiving the percussion-strokes. Of late a plessimeter (a round or oblong plate of ivory, metal, or glass, about 4 cm. wide and having a rim about $\frac{1}{2}$ cm. high) is used in preference to the fingers. The percussing finger is also sometimes replaced by a percussion hammer (plexor). This is *mediate* percussion.

Linear percussion is practiced by placing the plessimeter on its edge instead of flat, as it is generally used. This method is preferable in situations in which it is

desired to percuss only a small area each time, as in making nice discriminations, or in situations where it cannot well be laid on its flat side (as when the intercostal spaces are very much depressed).

§ 31. **Origin of the Percussion-sound.**—The percussion-sound has its origin in the vibrations produced by percussion being transmitted to cavities, the contents of which are thereupon set in vibration. The vibrations, and consequently the sound which reaches our ear, vary in nature according to the extent of these cavities and the thickness and tension of their walls.

§ 32. **Import of the Various Sounds.**—If the region percussed does not contain air, or if the parietes—by which is here meant as well as hereafter the sum of the solid tissues intervening between the surface of the body and the cavity—are very thick, the so-called *dull sound*, also called *femoral sound*, because the same sound is elicited on percussing the thigh, is produced.

If the cavity contains air the tympanitic, resonant, clear, or muffled sounds are produced, according to circumstances.

The *tympanitic sound* ensues when vibrations which do not interfere with each other occur within a cavity with but slightly tense walls. This sound is, accordingly, the product of relatively similar vibrations, and approaches a musical tone. It may especially be heard over the intestines, which contain air. It is of a low pitch over a large cavity (as the stomach), and of a high pitch over a small one (as the intestines).

The *resonant (voll) sound* ensues in consequence of

vibrations occurring within a cavity having tense walls. As these vibrations occur simultaneously with others which interfere with them, the resonant sound entirely lacks the qualities of a musical tone. The best example of this sound is obtained by percussing the right side of the anterior wall of the chest of a healthy man.

The tympanitic as well as the resonant sounds become shorter and have a higher pitch when, in connection with normal parietes, the cavity is nearer to the surface. It becomes clearer when the parietes are very thin (clear, resonant sound of a child's thorax), and duller or more muffled when the thickness of the parietes is considerable (scapular region of adults).

As intermediate sounds are distinguished clear-tympanitic and muffled-tympanitic sounds. The terms clear and resonant, as well as muffled resonant, should not be employed; in place of them the respective sounds should be briefly termed resonant or muffled.

The *amphoric sound*, a modification of the tympanitic, ensues in consequence of vibrations in an ampulla-like cavity, and may be artificially produced by percussing a jug.

The *metallic sound* is a modification of the preceding, having a metallic ring and a higher pitch.

The *cracked-pot sound* (called clinking, "klirren," by P. Niemeyer), the peculiar sound produced by percussing a cracked pot, is due to the rapid escape of compressed air through a narrow opening.

§ 33. **Force Employed in Percussing.**—Too much force exerted in percussing brings regions into vibration which it is not intended to examine; too little force will

not suffice to bring comparatively thick parietes into such vibration as to affect the subjacent cavity.

Therefore, forcible percussion is purposely employed where thick parietes exist, and gentle percussion when it is intended to set only a small, limited area into vibration.

Great thickness of the parietes, and a consequent muffling, is simulated by a tense condition of the superincumbent muscles, or forcible expansion of the parietes (deep inspiration).

§ 34. **Resistance.**—If the percussed spot offers an unnatural resistance to the finger, it either indicates an abnormal thickness of the parietes, or a subjacent solid organ.

The amount of resistance offered by a percussed spot also indicates the degree of compression of an inclosed fluid (fluctuation).

§ 35. **Physiological Percussion Signs.**—The physiological percussion signs are:

The *resonant* sound over the lungs in the regions hereafter to be mentioned ;

The *muffled* sound over the boundaries of the heart and liver ;

The *dull* sound over the heart and liver ;

The *tympanitic* sound over the colon and stomach ;

The *muffled-tympanitic* sound over the left lobe of the liver as far as it covers the stomach.

§ 36. **Pathological Percussion-sounds.**—The *tympanitic* sound over the lungs is due to relaxation of the

walls of the alveoli by the entrance of air into the pleural sac, or by the presence of cavities in the parenchyma of the lung near the parietes.

The *amphoric, metallic, clinking* sound (klirren) appears under certain circumstances over cavities near the surface of the lung.

The *muffled* or *dull* sound over the lungs is due to changes in the contained air by solidification of the lung tissue, by effusion into the pleural sac, by thickening of the parietes of the chest (pleuritis), by enlargement or displacement of the heart and liver, and by distention of the pericardium.

The muffled or dull sound appears over the intestines when they contain fæces, or in consequence of displacement or enlargement of the liver, spleen, heart, bladder, uterus, or ovaries, or effusion into the peritoneal sac, or exudation upon the walls of the intestines.

Abnormally the tympanitic sound appears in hernia and in emphysema of the skin.

AUSCULTATION.

§ 37. **Auscultation.**—Auscultation is the method of examining, by means of the sense of hearing, the sounds which occur in consequence of the movement of the air in the organs of respiration, as well as in consequence of the circulation of the blood through the heart and blood-vessels.

§ 38. **Mediate and Immediate Auscultation.**—Auscultation is either accomplished by placing the ear immediately in contact with the surface of the body to

be examined, or by interposing a stethoscope between them.

§ 39. **Stethoscopes.**—The stethoscopes in use are: 1st. The common stethoscope of Laennec, consisting of a tube of wood or vulcanized rubber having a cup-shaped lower opening and a disk for the ear. 2d. The stethoscope of Niemeyer, called “akuoxylon,” similar in shape to the first, but is not hollow, and terminates at the bottom in a hemisphere. 3d. The stethoscope of König, in which the vibrations of the surface of the body are transmitted by contact to a cavity bounded by two thin, tense caoutchouc membranes. The vibrations of the air in this cavity are then auscultated by placing one end of a flexible rubber tube, which is fastened to the foregoing, in the ear of the observer.

§ 40. **Purpose and Method of Using the Stethoscope.**—The stethoscope, on the one hand, answers the purpose of making the examination more convenient both for the physician and patient, especially No. 3 above, and, on the other, of making it possible to examine a particular spot with great accuracy.

In using the stethoscope it should be so placed that its lower opening touches the surface of the body at all points of its circumference, and the ear should be firmly laid upon the disk at the other end in such a way that the opening of the canal through it lies directly opposite to the meatus auditorius. It should be held by three fingers just above the lower opening, for the purpose of steadying it. Care should be taken that no portion of the clothing rubs against it, which would produce foreign

sounds, as well as that too much pressure upon the instrument be not exerted, and thus cause the patient pain or difficulty in breathing.

The object of auscultation is to examine the sounds produced by respiration, and the sounds in the heart and bloodvessels.

§ 41. **Physiological Normal Respiratory Sounds.**—

1. *Tracheal respiration*, which may be heard in the neck over the trachea during inspiration and expiration, is similar to the sound produced by blowing with moderate force through a tube, *e. g.*, the stethoscope.

2. The physiological *bronchial respiration*, which is similar to the tracheal respiration, but of a higher pitch, is heard during inspiration and expiration in the region of the root of the lung, *i. e.*, at the level of the second to fourth rib posteriorly, alongside of the spinal column, especially on the right side.

3. The *vesicular respiration*, a gently whiffing sound, is heard over the whole lung of a healthy adult during inspiration. It may artificially be produced by gently inspiring while having the lips slightly parted.

4. *Puerile respiration*, a somewhat louder variety of the foregoing, is especially distinct in the thorax of children.

§ 42. **Origin of the Pathological Respiratory Murmurs.**—The pathological respiratory murmurs occur in consequence of disorder of the mechanism of breathing, obstructions in the respiratory tract, or changes in the

transmission of the sounds, all due to pathological processes in the parenchyma of the lungs, in the bronchi, etc., or in the coverings or organs surrounding the lungs. The pathological respiratory sounds may occur during every respiration; they occasionally appear only during forcible respiration.

§ 43. **Pathological Respiratory Sounds.**—

1. *Weakened respiration*, a sound of a lower grade than the vesicular respiration, occurs with the most varied disturbances of the respiratory function, and occasionally passes over into the suspended respiration. It is frequently masked by other pathological respiratory sounds.

2. The *jerking respiration* (*saccadirteo*), consisting of single intermitting inspirations, appears in defective expansion of the lungs, or where the bronchi only are at fault in delaying the passage of the air through them.

3. *Prolonged expiration* occurs in disturbances of the elasticity of the lung-tissue, as when certain parts become more solid and stiff than normal on account of a diffused infiltration.

4. *Harsh* (*verschärfte*) *respiration*, similar to the puerile, but harsher, is heard in every diminution of the breathing capacity over those portions of the lungs whose function is not impaired.

5. *Bronchial respiration* simulates the physiological bronchial respiration, but sounds as though it was very near to the ear, is harsher, and can be heard in the most various places. When it is very marked it is also called *consonant respiration*.

When the parenchyma of the lung (which transmits sounds but slightly on account of containing air), surrounding a large ramification of the bronchial tubes, becomes airless over a considerable extent, and in consequence behaves like a solid body, *i. e.*, transmits the sounds very readily and augments them by its vibration, bronchial respiration becomes audible; it therefore, becomes an auscultatory sign of the above-mentioned alteration in the lung tissue.

It is necessary for the production of bronchial respiration that there shall be an actual circulation of air in the bronchus surrounded by the condensed lung-tissue. It ceases when the bronchus is occluded or compressed. The parenchyma of the lungs becomes airless, either from solidification (pneumonia, tubercular infiltration) or from compression (pleuritic exudation).

6. *Amphoric respiration*, a modification of bronchial respiration, occurs under the same circumstances when the stream of air passes an ampulla-like cavity. It may be artificially produced by gently blowing in a horizontal direction across the mouth of a tube.

§ 44. **Origin of Rales.**—Very frequently collections of fluids are found in the respiratory tract—mucus, pus, blood, and amniotic fluid in neonati. If fluid enough they are intimately mixed with air, and transformed into foam by the repassing of air during respiration, and are attached to the walls of the bronchi in the shape of large or small bubbles, or completely occlude some of the ramifications of the bronchi. The tough, not foamy, secretion occurs in the same locations. As the air during

every respiratory movement, while making a passage for itself, pushes these masses forwards and backwards, forces its way through them and causes some bubbles to burst, various sounds, collectively called *râles*, are produced.

§ 45. **Varieties of Râles.**—Râles are, in general, denominated *dry* and *moist*, because a conclusion as to the consistence of the contents of the air-passages is formed from the acoustic effect produced by them.

a. Dry Râles.—1. *Breaking* or *crackling* is a very dry râle, which occurs when airless, tough, mucous lamellæ, which adhere to the walls of the bronchi, are set into slow, valvelike vibration by the air passing over them.

2. *Snoring* or *whistling* sounds form an intermediate grade, and occur in consequence of the vibration of airless but not very tough masses of mucus, which the air pushes aside or through which it forces its way.

3. The *crepitant râle*, “zellenknistern” (sometimes incorrectly called subcrepitant, “knisterrasseln”); it occurs when the air separates the walls of the alveoli and finest bronchi which were glued together by a sticky secretion (in the commencement and end of pneumonia. On account of the last stage of pneumonia more frequently coming under observation, it is also called *crepitationo redux*).

b. Moist râles are all bubbling râles. They are divided into coarse, fine, and medium-sized bubbling râles.

The pitch of the sound produced by the bursting of a bubble is lower the larger the bubble, and the size of the bubbles is increased the greater the diameter of the bronchi in which they are found; therefore, a râle of a low pitch is called a *coarse bubbling râle*, and is located

as being in the larger bronchi, while a râle with a high pitch is called a small or *fine bubbling râle*, and is sought in the smaller bronchi.

The *medium-sized râles* occupy a place between these two.

The *subcrepitant râle* is the finest of the small bubbling râles.

Indefinite râles consist of a combination of all the varieties of moist râles.

Other râles are :

The *tracheal râle* is a loud, deep rattling, which may be heard at a distance, and has received the name "the rattles," or "boiling in the chest," from the laity. It occurs in consequence of the collection of a large quantity of secretion in the trachea which the patient can no longer remove by coughing, and is an indication of the gravest significance.

It should not be confounded with the rattle of snoring, which is due to the vibrations of the uvula in consequence of paralysis of the velum palati.

The *bronchial râle*: This occurs under the same conditions as bronchial respiration. It differs from the ordinary râle by having a peculiar resonance and distinctness.

When bronchial râles acquire an extreme harshness and distinctness they are called *consonant râles*. These terms are very frequently used interchangeably though incorrectly.

The *amphoric râle*: This occurs under the same conditions as the amphoric respiration, and has a similar timbre.

The *ringing metallic râles* embrace the higher-pitched metallic varieties of the foregoing.

Metallic tinkling (tintement métallique) occurs when a single bubble bursts in an amphoric cavity. A similar tone is produced when a drop of water falls into a bottle which is half full of water.

All the amphoric sounds (amphoric respiration, amphoric râles, metallic râles, metallic tinkling) are embraced by the term *cavernous sounds*. A cavity is a hollow space in the lungs, of amphoric construction, which is due either to dilatation of a bronchus or to suppurative degeneration of a portion of the lungs.

§ 46. **Auscultation of the Voice.**—If, during the auscultation of a healthy thorax, the person examined is told to speak (generally to count) aloud, the voice is heard as an indistinct humming in the thorax. If, on account of solidification or compression of the lung-tissue, sounds are more readily transmitted (pneumonia), the voice becomes very distinct and sounds as though it was very near to the ear, as is the case in bronchial respiration. This phenomenon is called *bronchophony* (pectoriloquy). It occasionally has a quavering, trembling tone, and is then called *ægophony*.

The voice is not heard at all if, with intact parenchyma of the lungs, the thoracic parietes are thickened by a loose, inelastic tissue (pleuritis), which deadens the sound.

If the lung itself is solidified or compressed, and in addition the thoracic parietes are thickened, a weak, distant-sounding bronchophony is produced.

§ 47. **Vocal Fremitus.**—The vibrations of the thoracic parietes due to speaking aloud may be felt by the examining ear or the hand, and depends upon precisely the same conditions as bronchophony. There are, therefore, increased, diminished, and suspended vocal fremitus.

§ 48. **Flageolet Tone.**—When, in connection with an abnormal communication between the lung and pleura, air enters into the pleural cavity, a musical tone of very high pitch is occasionally heard during inspiration, called the flageolet tone (flageolet-pfeifen).

§ 49. **The Succussion Sound** is a splashing sound with amphoric echo. It occurs when waves are produced in an amphoric cavity (*e. g.*, on shaking a bottle half full of water.) These conditions are present when, after the air has forced its way into the pleural sac, its lower portion is occupied by a pleuritic effusion, its upper portion by air, while the lung is compressed. The succussion sound is produced by shaking the patient, and may, at times, be heard even without auscultating him.

§ 50. **Auscultation of the Heart and the Bloodvessels.**—In auscultating the heart and bloodvessels we hear:

1. *Sounds.*—Short, regular vibrations approaching somewhat a musical tone. How they are produced and when and where they may be heard will be elucidated under the circulation.

2. *Murmurs.*—These are produced by irregular vibrations, rotatory and oscillating, which arise in the column of blood when its course is impeded by

roughening of the walls, compression of the vessel from the outside, or by regurgitation.

§ 51. **Physiological Sounds and Murmurs.**—The physiological sounds are those which occur normally in certain places over the heart and the bloodvessels, as well as the placental murmur over the gravid uterus. In children the heart-sounds are also occasionally heard posteriorly.

By means of the stethoscope two sounds, which may be represented by the Iambic metre (— —), a short and a long one, are heard in the normal condition over the carotid and subclavian arteries; while in the larger arteries more remote from the heart (abdominal aorta, crural and brachial arteries), but only as far as the popliteal space and the elbow, but one can be heard. When the walls of the arteries become incapable of vibrating this sound is lost. Small arteries, as a rule, do not present any auscultatory phenomena.

§ 52. **Pathological Sounds and Murmurs.**—Sounds are pathological when abnormally loud or in an abnormal location, or when absent where they should normally be heard. Murmurs are pathological when they occur in connection with or in the place of sounds, as well as in localities where normally neither a sound nor a murmur should be heard.

The second sound heard in the carotid and subclavian arteries, which is only the transmitted sound produced by closure of the aortic valves, must disappear with the second aortic sound (insufficiency of the aortic valves).

§ 53. **Cause of the Intensified Sound, etc.**—When the second sound of the heart is very loud, when one or two sounds are heard over the thorax outside of the boundaries of the normal heart-region or outside of the course of the large arteries, or over small arteries (*arteria radialis, tibialis postica, temporalis*), it is due to an increase in the contractile power of the left ventricle. The same is true of the right ventricle when the second sound is louder and more sharply accentuated over the pulmonary artery, in the second intercostal space to the left of the sternum, than over the aorta.

The preceding is not applicable when, during pneumonia, attacking the lower lobe of the left lung, the heart-sounds become audible on the left side posteriorly, as this is due to a more perfect transmission of the sounds.

§ 54. **Murmurs in the Heart.**—Murmurs occur in the heart in connection with the heart-sounds, or in place of them, in insufficiency of its valves or stenosis of its ostia, as well as in anæmia and febrile conditions, as the so-called hæmic or false murmurs, without discoverable anatomical lesions.

§ 55. **Murmurs in the Bloodvessels.**—Murmurs occur in the arteries either in consequence of being transmitted from the heart, when they may be heard there at the same time, or in consequence of diseases of the coats of the arteries, dilatation or compression from without (calcification, aneurism, compressing tumors). Murmurs may artificially be produced by pressing too hard with the stethoscope. Finally, in certain diseases (chlorosis, anæmia, hydræmia, acute rheumatism, typhus, etc.), mur-

murs whose origin is still entirely unknown are heard in the arteries.

Sounds do not occur in the veins at all; murmurs, with the exception of that which ensues when an abnormal communication is established between an artery and a vein, occur only in the jugular veins, and are known as nun's murmur (*bruit de diable*). The venous murmur is a continuous noise, at times blowing, at others rough, and is alternately strong and weak. It seldom occurs when the blood is in a normal condition and in persons who are in blooming health, but is very frequently found in chlorosis and anæmia.

§ 56. **The Thrill of Aneurism — Fremissement Cataire.**—The oscillations, *i. e.*, the whirling, eddy-like motion in the blood which gives rise to the murmurs, may become so strong that they may be felt by the hand (the thrill felt over an aneurism; the *cat's purr*, *frémissement cataire*, over the left ventricle in insufficiency of the mitral valve).

§ 57. **Friction sounds** are produced by the rubbing together of two roughened surfaces, and may, according to their intensity, be heard (auscultation), or occasionally also felt (palpation).

§ 58. **Pleuritic friction sounds** occur during inspiration and expiration in consequence of the rubbing together of the two—pulmonic and thoracic—surfaces of the pleura which have been roughened by exudation. If the exudation becomes organized so that it causes adhesions between the two surfaces, or so fluid that it does

not produce the requisite roughening, the friction sound disappears.

§ 59. **Pericardial friction sounds** are produced in precisely the same way. They may be heard first and most distinctly at the base of the heart. When the quantity of the effusion is but slight, it is heard especially during the systole, but continues somewhat longer, and when a medium quantity of effusion is present during the diastole also. When the effusion is great, or there is a total adhesion of the pericardial surfaces, it disappears entirely.

THERMOMETRY AND FEVER.

§ 60. **Fever.**—By *fever* is meant that general condition in which, in connection with an *elevation of the temperature* of the body, disturbances of the *pulse, digestive apparatus, and secretions* occur after a preliminary chill.

Shortly after a shivering, shuddering, or shaking chill a sensation of heat sets in, and soon after that a more or less profuse sweat.

The disturbances of the digestive apparatus which are observed are: loss of appetite, squeamishness, nausea, vomiting, increased thirst, and constipation or diarrhœa.

The urine of fever patients, which is generally diminished in quantity, varies from a yellowish-red to a red color, is of greater specific gravity, and, as a rule, is richer in urea than normal.

The nutrition of fever patients is impaired.

The heart beats with increased frequency, the impulse is stronger, and not seldom a systolic murmur is heard instead of the normal first sound.

§ 61. **Pulse.**—The different characters assumed by the pulse have already been mentioned (*vide* § 25).

In fever patients the pulse rises above the normal.

Generally an increase in the frequency of the pulse accompanies a rise in the temperature of the body, and *vice versa*.

An elevation of temperature is a necessary phenomenon

of the appearance of fever, *i. e.*, without an elevation of temperature there is no fever.

§ 62. **Temperature of the Body.**—The temperature of the body is best obtained by placing the thermometer (divided into fifths of a degree) in the axilla, rectum, or vagina, between 7 and 9 A.M. and 4 and 6 P.M., if circumstances do not require it to be taken at particular hours. In the morning the temperature of fever patients is lowest, in the evening it is highest.

§ 63. **Normal Temperature of the Body.**—In health the temperature in the axilla varies from 36.2° to 37.5° C.; in the rectum and vagina it varies from 36.8° to 38° C.

§ 64. **Limits of Health.**—Every person whose temperature is higher or lower than the above mentioned is sick, although he may feel perfectly well; on the other hand, a normal temperature may be observed in disease.

§ 65. **Temperature Curve.**—By placing the results of taking the temperature, pulse, and respirations per minute at stated intervals on a so-called temperature chart, by means of dots and lines, the temperature, pulse, and respiration curves are obtained. From these an insight into the circumstances (explanatory of the diagnosis, prognosis, complications, and modification of the course of the disease) attending the case may be obtained.

§ 66. **Anomalies of Temperature.**—In light acute and in chronic diseases, as well as during convalescence,

and in some mental disorders, the temperature is very frequently stationary, or, at least, rises very little in the evening; it is very seldom diminished, and then only in the morning.

§ 67. **Temperature in Rigors.**—The temperature of the body in rigors is generally very high (40° C. and higher), even while the extremities, nose, chin, ears, and forehead exhibit a diminished temperature. In the so-called nervous chill (in consequence of great irritation of sensory nerves from the immediate introduction of poisonous materials into the blood), an elevation of temperature is, however, generally absent.

The chill which ushers in a febrile disease, or an attack of fever, lasts from half an hour to two hours. During its continuance the temperature rises, and attains its maximum at its close, or oftener in the fever stage which follows. The further manifestations of the temperature are dependent upon the nature of the causes which produced the chill.

Rigors occasionally occur with a falling temperature, *e. g.*, in profuse hæmorrhages (the rigors of collapse), as also with high temperature without coldness of the peripheric parts, as in pyæmia; on the contrary, a coolness of peripheric parts often occurs with a high or rising temperature of the trunk without any sensation of chilliness.

§ 68. **Rigor.**—A single chill generally indicates the invasion of pneumonia, septicæmia, or one of the acute exanthemata (small-pox, scarlatina, typhus exanthematicus); regularly recurring chills, intermittent fever, or typhus recurrens; irregularly recurring chills, pyæmia.

§ 69. **Fever-heat.**—The high temperature of the body produced by fever either follows a chill or else is developed from the normal temperature without being preceded by a chill. It presents great variations in regard to intensity.

§ 70. **Collapse.**—By collapse is understood a general disturbance of the organism supervening during the course of a disease and modifying it, and is characterized by a local diminution of temperature, particularly at the periphery. It is generally of short duration and varies very much in intensity. In collapse the temperature of the internal organs may be normal, diminished, or increased; it is therefore divided into *collapse with high temperature*, occurring especially in very violent, acute, as well as chronic febrile diseases, and frequently precedes the agony; *collapse with low temperature*, frequently occurring in chronic diseases and terminates in agony; *collapse of defervescence*, occurring at the end of the febrile stage of acute diseases; *remittent collapse*, occurring in the course of the markedly remitting fever of some serious, acute, but mostly chronic, diseases, which are of short duration and have a tendency to recur at regular intervals; the *collapse occurring during intermittent fever*; and the *occasional collapse* which may supervene in any stage of a disease in persons who are apparently healthy, as well as in debilitated patients, in which the temperature sinks in an alarming manner and agony rapidly sets in.

§ 71. **Temperature.**—The temperature of the body is either normal, below the normal, or above the normal.

A *normal* temperature is observed in many chronic diseases.

A temperature *below the normal* occurs, as a rule, only during defervescence, in the agony, in profuse hæmorrhages, and in collapse; and here a distinction is made between the temperature which is below the normal and above 35° C. in the axilla, and that below 35° C., which is the temperature of collapse.

A temperature *above the normal* is oftenest found in persons who are sick. It is divided into a high normal or non-febrile temperature (to 38° C.); subfebrile (from 38.1° to 38.5° C.); slightly feverish (from 38.6° to 39° C.); febrile (from 39.1° to 40° C.); very feverish (above 40° C.); and hyperpyretic (above 41° or 41.5° C.).

§ 72. **Import of a Given Temperature.**—In judging of the import of a given temperature, account must be taken of the time of day at which the observation was made, and of the individuality of the patient; for while the temperature is higher, on an average, and shows greater variations in children (and sometimes, also, in women and excitable persons) than in the prime of life, in old age it is frequently from $\frac{1}{2}^{\circ}$ to 1° lower than the average temperature found in similar disturbances in younger individuals.

§ 73. **Variations in Temperature.**—In health the variations in temperature occurring within twenty-four hours are not so great as in disease. In disease the temperature may vary from 1° to $1\frac{1}{2}^{\circ}$ or 6° to 8° in a day, and may show different variations on different days.

A fever is of moderate intensity when, in connection

with a not very high temperature, the fluctuations are only slight, but is considerable when, in connection with a high temperature, the fluctuations are slight. When complications exist or the disease is running a very irregular course very marked fluctuations occur.

§ 74. **The Daily Fluctuation of Temperature and its Periods.**—The variations in temperature which occur during twenty-four hours are termed the daily fluctuation. It is divided into four periods: 1st, the exacerbation, *i. e.*, the time during which the temperature shows a marked increase; 2d, the remission, *i. e.*, the time during which the temperature shows a marked decrease; 3d, the height of the exacerbation or daily maximum; 4th, the lowest point reached during the remission or daily minimum. By the length of the four above-mentioned temperature periods is understood the time occupied by each of them.

In judging of the intensity of the fever, the length of these periods as well as the height attained by the temperature must be taken into consideration.

§ 75. **The Daily Difference of Temperature.**—The daily difference of temperature, *i. e.*, the range between the daily maximum and daily minimum, may vary very much in extent, but even if the difference of one day is equal to that of another, its significance will vary according to the average rise or fall during twenty-four hours. Thus, small daily differences with a high grade of fever indicate, in general, the early outbreak of a disease or that it will be complicated. A fall in temperature occurring when a disease is at its height almost always

points to improvement, or even to recovery. If the temperature remains at the point to which it has fallen it indicates convalescence. If the remissions in temperature cease while the fever continues without a reduction of the mean daily temperature, a relapse or complication may be expected. A great difference produced by the temperature falling below the normal may be favorable, of indifferent value, or dangerous. A progressing rise of temperature indicates a decidedly unfavorable result.

§ 76. **Type of a Fever.**—By the type of a fever is understood its course during a number of consecutive days. If its daily difference is equal to $\frac{1}{2}^{\circ}$ it is called *febris continua*; if it is a little more it is called *febris subcontinua*; if it is greater than 1° it is called *febris remittens*. The intermittent type of fever (*febris intermittens*) is characterized by a regular or irregular alternation between an attack of fever (paroxysm) and a time when fever is absent (apyrexia), and may either be quotidian, tertian, or quartan. Any one of these may be antepoising (*typus intermittens antepoisons*), in which the paroxysm occurs at an earlier hour than the preceding one; or postponing (*typus intermittens postponens*), in which the paroxysm always occurs at a later hour than the preceding one.

Febricula or *ephemera* is a rudimental form of fever, which is principally characterized by its short duration (from a few hours to one or two days, seldom longer), and generally by a very high temperature (as high as 40.5° C., and higher).

A persistent continued fever is one in which the temperature either remains constantly above the normal, at least until the fever has passed its maximum of develop-

ment, or only exceptionally and for a short time sinks to the normal or below it.

Intermittent and *relapsing* fevers are those in which the elevated temperature is one or more times interrupted by a temperature not indicative of fever.

§ 77. **Typical Diseases.**—Typical diseases are those which run a fixed course according to certain laws and are accompanied by a correspondingly fixed course of the temperature, as typhus abdominalis and exanthematicus, relapsing fever, measles, simple scarlatina, small-pox, primary croupous and lobular pneumonia.

§ 78. **Atypic Diseases.**—Atypic diseases are those in which the disease as well as the temperature do not follow a regular course, as acute rheumatism, meningitis, parotitis, diphtheritis, affections of the serous membranes, endocarditis, inflammations of the liver, spleen, kidneys, etc.

§ 79. **Diseases Approaching a Typical Character.**—Between the two classes of diseases just mentioned a third is found which approaches a typical character, as complicated scarlatina, varicella, rubeola, pyæmia, erysipelas, tonsillitis, intermittent fever, etc.

§ 80. **Stages of Fevers.**—The course which the temperature of the body runs in febrile diseases is divided into the following, although sometimes not decidedly marked stages: 1st, *the initial stage, i. e.*, the period of the development of the fever; 2d, *the fastigium, i. e.*, the period of the height of the fever; 3d, *the defervescence, i. e.*, the period of the decline of the fever; 4th,

the stage of *convalescence*; 5th, the *præmortal stage*, in which the disease terminates fatally.

The marked decrease of the temperature towards the normal is sometimes preceded by a period during which there is an insufficient decrease, this period being called the *stadium decrementi*, and does not last longer than a few days. It is distinguished from the *stage of indecision* (*stadium amphibolum*) by the absence of marked rise of temperature.

§ 81. **Crisis—Lysis.**—Defervescence is rapid (*crisis*) if it is completed in a few or at the utmost thirty-six hours, while it is protracted (*lysis*) if completed in about three days; or, finally, it is slow if it takes from several days to a week or more for its completion.

§ 82. **Elevation of Temperature during the Præmortal Stage.**—A rise of temperature just before death has been observed at the end of intense febrile disturbances, *e. g.*, typhus abdominalis and exanthematicus, measles, scarlatina, small-pox, pyæmia; and also in insolation, pneumonia, erysipelas, acute rheumatism, endocarditis, meningitis, encephalitis, tetanus; and also in epilepsy and hysteria, and within a few hours attained the highest point ever observed (44.75° C.).

§ 83. **Temperature after Death.**—After the cessation of the heart's action and of respiration a further increase of the temperature occurs, which lasts from a few minutes to almost an hour, and attains at the utmost the height of a few tenths of a degree. This is called the *post-mortem* temperature.

EXPECTORATION.

§ 84. In diseases of the organs of respiration the sputa should be collected in a spittoon in order to ascertain their quantity, color, consistence, and smell from day to day. It should be observed whether they are copious or scanty; whether they may be easily raised or only with difficulty and after coughing for some time; whether they are only occasionally or constantly present; whether they are cumulative; whether expectoration occurs oftener at night or during the day, or *vice versa*, in the morning on awaking or at night on retiring. It should be ascertained whether the sputum is thin or thick, shapeless, tough, gelatinous, in balls, nummular or ropy; whether it contains more or less air, is foamy or has a uniform appearance throughout; whether it is colorless or whitish, grayish, yellowish, greenish, reddish, rust-colored, brownish, or black; whether it is serous, sero-purulent, or purulent; whether it contains an admixture of blood in streaks, dots, or in larger quantities; whether it remains firmly adherent to the bottom of the spittoon when it is inverted or drops off in lumps; whether membranous shreds or tubular or branched masses of fibrin are present; and whether it floats on water. It should be examined as to whether its reaction is alkaline or acid; whether it has a sweet, sour, putrid, or gangrenous smell, as well as whether it has a flat, salty, sweetish, bitter, or nauseous taste.

§ 85. **Microscopic Examination of the Sputa.**—The sputum should be examined under the microscope for the purpose of ascertaining whether it contains cast-

off epithelium (the tessellated epithelium originating in the mouth and pharynx, the cylindrical or ciliated epithelium in the larynx, bronchi, and lungs), mucous corpuscles, pus-globules, various elementary cells (elementarkörnchen, körnerhaufen, körnchenzellen, elementarkörperchen), cell nuclei, fat, blood-corpuscles, elastic fibres, crystals of cholesterin, of ammonio-magnesian phosphate, of hæmatin, particles of echinococcus, infusoria, fungi, or particles of food (meat-fibres, plant-fibres, starch-grains).

HÆMORRHAGES.

§ 86. **Hæmorrhages.**—Every hæmorrhage is due to a rupture of bloodvessels, either in a cavity communicating with the surface of the body, so that the blood may be discharged, or in a closed cavity, or, finally, in the parenchyma of an organ. Hæmorrhages are divided into ecchymoses, suggillations (small quantities of effused blood), extravasations (larger quantities of effused blood), vascular hæmorrhages (from large vessels), and capillary hæmorrhages (from the capillaries).

The mucous membranes of cavities connecting with the surface of the body are peculiarly predisposed to hæmorrhages, because they are very vascular and of a very loose texture and easily become hyperæmic.

According to the greater or less intensity of the hæmorrhage we distinguish oozing of blood, passive hæmorrhage, and active hæmorrhage.

Bright-red blood is arterial, dark is venous. It is either liquid or coagulated, pure or mixed with various secretions or excretions, or discolored.

Blood issuing from the mouth or nose, or simultane-

ously from both, may come from a number of different sources, *i. e.*, from the mucous membrane of the nose (epistaxis), mouth (gums, carious teeth, tongue, soft palate), pharynx, œsophagus, stomach, larynx, trachea, bronchi, or lungs.

In order to determine the source of the hæmorrhage, all portions of the mucous membrane of the nose, mouth, pharynx, and larynx should be examined, either with or without the laryngoscope or pharyngoscope.

It should be ascertained whether the hæmorrhage occurs in connection with or after coughing or hawking, or with the expectoration; whether suddenly or profusely (hæmoptoë); or whether in connection with or after violent bodily exertion and vomiting.

It should be ascertained whether the blood is bright or dark red, acid or alkaline; whether it is intimately mixed with air (foamy), or is in streaks, dots, or lumps, fluid or coagulated, pure or mixed with mucus, pus, etc.

An investigation should be made as to whether a hæmorrhage from the mouth or nose is accompanied or followed by one from the rectum.

Bright-red, foamy, alkaline blood, which is evacuated after coughing, has its origin in the respiratory tract, while a dark, acid blood, mixed with remnants of food, proceeds from the stomach.

If the blood evacuated from the rectum is intimately mixed with fæces, or is of a tarlike consistence, it indicates a hæmorrhage from the stomach, while a bright-red blood adhering to the fæces indicates a hæmorrhage from the intestines, and particularly from the colon.

A part of the evacuated blood should be examined under the microscope, to determine whether it contains

round human blood-corpuscles (found in mammalia in general), or the oval, elliptic blood-corpuscles of birds, reptiles, and fishes; whether it contains mucous corpuscles, pus-globules, or ciliated epithelium (the presence of ciliated epithelium in the blood indicates a hæmorrhage from the organs of respiration); or whether fat, oil, starch-granules, fragments of muscular fibre or any other animal tissues, or spiral ducts, plant-cells, or other elements of vegetable tissues are present (which make a hæmorrhage from the stomach probable).

In hæmaturia the blood may proceed from the kidneys, ureters, bladder, or urethra. The blood has its origin in the kidneys when it is intimately mixed with the urine (coloring it uniformly red), and when it either does not become precipitated in the shape of powder, or only very slightly after the urine has been allowed to stand awhile; in the ureters when long, threadlike coagula are passed with the urine; in the bladder when it consists of pure blood, mostly in clots, or is not intimately mixed with the urine, and soon separates from it on standing; in the urethra when it is not passed in connection with the urine, or is not intimately mixed with it.

In hæmorrhages from the rectum, vagina, and uterus (metrorrhagia) inspection and a digital examination will reveal its source.

EXAMINATION OF THE URINE.

§ 87. **A. Normal Constituents of the Urine.**—The normal constituents of the urine, which are principally to be looked upon as the products of tissue metamorphosis, consist of :

a. The *organic nitrogenous* constituents of the urine: urea, uric acid, hippuric acid, oxalic acid, creatinin, xanthin, coloring and extractive matters, and

b. The *inorganic* constituents: the chlorides of sodium, potassium, and ammonium, phosphates (acid phosphate of sodium and the phosphates of magnesia and of lime), sulphates, nitrates, and traces of iron, silica, and hydrogen dioxide.

§ 88. **I. The Principal Organic Constituents of the Urine.**—

1. *Urea* ranks first among the above-mentioned organic constituents of the normal human urine. It is the principal product of the retrograde metamorphosis of the nitrogenous constituents of the body. Normal urine contains, on an average, 2.5–3.2 per cent. of urea with a mixed diet, so that 22–35 grammes are excreted in twenty-four hours. The quantity of urea thus excreted is, however, very variable, and is dependent upon the weight of the body and the food taken. A purely animal diet increases the quantity of urea, while a diet of substances containing little nitrogen diminishes it.

In all acute febrile diseases (typhus, pneumonia, etc.) the excretion of urea is increased in the beginning and until the acmé of the fever has been passed; later it is diminished. In intermitting forms of fever it is already increased before the commencement of the chilly stage.

In the majority of the chronic diseases which are attended by an impairment of the process of assimilation or nutrition, the excretion of urea is diminished; in dropsical conditions, if diuretics are not administered, it is very marked.

Uræmia, poisoning by urea, is due to the retention of urea in the blood in consequence of suppression of urine.

2. *Uric Acid*.—The quantity of uric acid in the human urine is less dependent upon the character of the food than upon particular conditions of the organism, and, even in the normal condition, is subject to considerable variations, from .2–1 gramme being excreted in twenty hours. An increase of uric acid is due to disturbances of digestion and impaired nutrition in general.

It is increased in all febrile conditions, particularly in diseases of the respiratory organs and disturbances of the circulation, and also in leucæmia, while it is always diminished in chronic gout, and occasionally in diabetes mellitus.

3. *Creatinin*.—With a good mixed diet normal human urine contains, on an average, about 1 gramme of creatinin in twenty-four hours.

It is excreted in greater quantity in acute diseases, especially in pneumonia, in typhus at the height of the disease, in intermittent fever, etc.; it is decreased during

convalescence after acute diseases, especially if marked anæmia is present, and in tetanus.

§ 89. **II. The Principal Inorganic Constituents of the Urine.**—The principal inorganic bases contained in urine are sodium, potassium, lime, and magnesia, which are partly free and partly combined with various acids. Thus sodium and potassium exist in combination with uric and hippuric acid, and also with sulphuric, phosphoric, hydrochloric, and nitric acid; and alkaline urine also contains ammonia salts. The quantity of the fixed salts contained in the urine varies very much in different persons and pathological conditions; in men from 9.06–24.50 grammes, and in women from 10.28–19.63 grammes have been observed.

1. *Chloride of Sodium.*—Almost all the chlorine contained in the urine is combined with sodium. The quantity of the excreted chloride of sodium varies in different persons and at different times of the day, on an average 14.73–17.50 grammes in twenty-four hours.

The quantity of chloride of sodium is extraordinarily diminished in all acute febrile diseases, especially those which are accompanied by a copious exudation (pneumonia, typhus, meningitis, acute articular rheumatism, pericarditis, pleuritis; peritonitis, enteritis); while during the paroxysm of intermittent fever it is generally increased.

In all acute diseases a continual decrease in the amount of the chlorides excreted indicates an aggravation, and a continual increase of chlorides in the urine an amelioration of the disease.

In chronic diseases the excretion of chlorine is, as a rule, decreased (and also before the commencement of diuresis in dropsy); in diabetes insipidus it is, however, increased either transitorily or for a longer time.

2. *Sulphates*.—An adult excretes, on an average, 2.094 grammes of sulphuric acid in twenty-four hours. After an abundant animal diet the sulphuric acid in the urine is found to be increased, as also after the introduction into the system of sulphuric acid, either free or in combination.

In most diseases the excretion of sulphuric acid is more or less markedly diminished.

3. *Acid Phosphate of Sodium*.—The acid reaction of the urine is principally due to the presence of the acid phosphate of sodium. On an average about 2.75 grammes are excreted in twenty-four hours.

In diseases the amount excreted is very variable.

4. *Phosphates of lime and magnesia* are found as such in solution in urine of an acid reaction. If such urine be neutralized by the addition of ammonia, the phosphate of lime is precipitated unchanged, but the phosphate of magnesia becomes transformed into ammonio-magnesian phosphate by entering into combination with the ammonia, and appears as such in the precipitate. In health and with a mixed diet adults excrete, on an average, 0.9441–1.012 gramme of earthy phosphates in twenty-four hours, *i. e.*, 0.31–0.37 grammes of phosphate of lime and 0.64 gramme of phosphate of magnesia.

In disease the absolute quantity of earthy phosphates excreted appears to depart very much from the normal. They are increased in acute and chronic brain diseases, in

rheumatism, osteomalacia, rachitis, and catarrh of the bladder; while they are decreased in chronic spinal diseases and in kidney diseases, as well as in extensive dropsies and in the last months of pregnancy.

§ 90. **B. Abnormal Constituents of the Urine.**—The principal abnormal constituents of the urine are albumen, sugar, constituents of the bile, leucin, tyrosin, mucin, fat, etc.; besides these, infusoria and spermatozoa should be mentioned.

1. *Albumen.*—In the animal economy albumen serves as well for the nourishment of the body as for new material to compensate for tissue waste.

It does not find its way into the urine under normal circumstances, but under pathological conditions it is found there, and most constantly in all diseases of the kidneys which are embraced by the name morbus Brightii, as well as in heart diseases and some febrile diseases.

It is not possible to detect the presence of albumen in urine by mere inspection; it is, therefore, always necessary to examine it chemically; a pale, foamy urine may, at the most, lead to a suspicion of the presence of albumen.

2. *Glucose.*—The urine frequently contains traces of sugar; it is only, however, present in considerable quantity and for an extended time in diabetes mellitus (also in the blood, perspiration, and saliva). Sugar has also been detected in the urine in other diseases, particularly in disturbances of the circulation in the abdomen. Injury to certain portions

of the medulla oblongata in animals has caused sugar to appear for a time in the urine.

3. *Constituents of the Bile.*—The coloring matters of the bile, as well as the biliary acids, are pathologically present in the urine in icterus, phosphorus poisoning, etc. Cholesterin has occasionally been detected in the urine in fatty degeneration of the kidneys.

4. *Lactic Acid.*—Ordinary lactic acid is found in fermenting diabetic urine. Sarcolactic acid is found in abundance in the urine after poisoning by phosphorus, acute atrophy of the liver, trichinosis, and osteomalacia.

5. *Fat* is not very frequently observed in the urine. The peculiar milky urine (*urina chylosa*, *galacturia*), which is occasionally observed, is supposed to be due to the elimination of chyle from the blood by the kidneys. In addition to a greater or less quantity of fat, which is held in suspension as an emulsion by the albumen also present, chylous urine contains chyle-corpuscles and blood-corpuscles. Not seldom a creamlike layer collects on the surface which frequently commences to ferment after standing a longer or shorter time, whereby fibrin coagula, which are soluble in a solution of saltpetre, separate themselves. These fibrin coagula are either soft, white, and are found throughout the whole fluid, or they form into more or less firm slimy lumps, of a light or dark red color, and are also soluble in a solution of saltpetre. On the addition of ether such a chylous urine becomes perfectly clear.

6. *Volatile Fatty Acids.*—Thus far formic, acetic,

propionic, butyric, and valerianic acids have been detected in the urine, the latter in typhus, variola, and acute atrophy of the liver.

7. *Leucin and Tyrosin* generally occur together, and are products of the decomposition of nitrogenous substances.

Pathologically leucin and tyrosin occur in typhus, small-pox, affections of the liver, and are especially abundant in acute phosphorus poisoning and in acute atrophy of the liver, for the latter of which they may be considered almost as pathognomonic as albumen is for nephritis and sugar for diabetes mellitus.

8. *Hydrocyanic Acid*.—In addition to leucin and tyrosin hydrocyanic acid has been detected in the urine in a number of cases of acute atrophy of the liver.

§ 91. **C. The Urinary Deposits.**—By urinary deposits are meant those various sediments, almost always present in urine, which are observed either immediately after it is passed or which separate from it after it has stood for a longer or shorter time. By the microscope organized as well as inorganic formations may be recognized in the urinary deposits, the latter occurring either in an amorphous or crystalline condition. On that account urinary deposits are divided into organized and inorganic sediments, as well as into normal and pathological sediments, according to whether they occur in the normal urine or as a consequence of disease.

The urinary deposits are of great importance to the physician; they give an explanation concerning certain

modifications of the general tissue-change in disease, and from them certain localized diseases of the uropoëtic system may be recognized.

§ 92. **I. Organized Urinary Deposits.** — As organized deposits may be mentioned : mucus (mucin) and epithelium, blood, pus, renal casts, spermatozoa, fungi, and infusoria.

1. *Mucus (mucin) and Epithelium.* — Normal, freshly voided urine after being at rest a short time exhibits a slight cloudiness, which is due to mucus derived from the urinary tract (and also from the vagina in women).

An increased quantity of mucus in the urine is of great importance to the physician, and indicates the existence of an irritation of the mucous membrane of some portion of the uropoëtic system (and in women of the vaginal mucous membrane also). The increase of mucus and epithelium in the urine may either be due to a local disease (blennorrhœa of the urinary passages) or to a general disease process, as typhus, pneumonia, etc.

The *shape* of the epithelial cells is characteristic of their origin. The cast-off epithelium of the uriniferous tubules almost always forms tubular casts of them, which have their shape and diameter (epithelial casts), while the epithelium of the remaining portions of the urinary tract is made up of a number of layers of tessellated epithelium. The most superficial layer consists of more or less flattened cells, which are smaller and less flattened if from the pelvis of the kidney (and are occasionally branched), while those from the bladder are mostly larger

and more flattened, and occasionally exhibit fossæ-like excavations on the surface next to the middle layer. The middle layer consists principally of smaller, more oval, and fusiform caudate cells.

Besides epithelium the mucous sediments frequently contain other ingredients, as spermatozoa, crystals of the urates, of oxalate of lime, of the ammonio-magnesian phosphate, etc., as is proven by a microscopic examination.

A very great increase of mucus in the urine is almost always connected with a tendency to acid or alkaline fermentation, which, on account of the consequences of such a tendency (a still greater irritation of the mucous membrane of the urinary tract and the formation of urinary concretions), is well worthy of attention.

2. *Blood*.—In urine tinged with blood, blood-corpuscles may always be detected by the microscope (except in hæmatinuria). In any considerable hæmorrhage the blood either coagulates within the urinary organs—forming coagula, which may produce occlusion of the urinary passages, retention of urine, dysuria, strangury, and the formation of urinary calculi—or it may coagulate after the urine has been voided.

The presence of blood-corpuscles or coagula in the urine indicates a hæmorrhage in the uropoëtic system.

If the urine contains very much blood, it mostly has its origin in the pelvis of the kidney, the ureters, or the bladder, caused by a scorbutic condition, renal calculi, inflammation in the pelvis of the kidneys and the ureters, hyperæmia or ulceration of the vesical mucous membrane, vesical calculi, or softening cancer of the bladder.

In the absence of all symptoms of a disease of the urinary passages, a small quantity of blood in the urine leads to the supposition that it is derived from the parenchyma of the kidney.

When a small number of blood-corpuscles, in addition to pus and tube-casts, are present in the urine they indicate a beginning or progressing nephritis parenchymatosa.

Grains and flakes of blackish-brown pigment in the urinary sediment indicate an occlusion of the renal vessels in consequence of melanæmia.

3. *Pus*.—If the urine contains pus a suppurative process must be going on in some portion of the uropoëtic system, or an abscess must have opened into it, but it must not be forgotten that in women the pus may originate in the vagina or uterus.

If pus may be squeezed out of the urethra independently of urination it is derived from the urethra.

If the pus originates in the bladder there are always symptoms present which point to an acute or chronic vesical disease.

If the pus is derived from the ureters, occasional colicky pains are observed along their course.

If the urine contains pus for a protracted period, a suppuration of the parenchyma or pelvis of the kidneys is present.

When the urine only contains pus for a few days in succession, it indicates a mere superficial affection, while a longer-lasting purulent urine indicates a graver affection of the mucous membrane of the urinary passages connected with material alterations of structure.

4. *Tube-casts*.—They appear under the micro-

scope as longish, tubular, or cylindrical formations having the shape of the tubuli uriniferi. A sediment composed of these formations is of the greatest importance for the diagnosis of certain diseases of the parenchyma of the kidneys, as it is one of the most important symptoms.

There are three varieties :

a. Epithelial Casts.—These are tubular aggregations of epithelial cells very similar in character to those which are obtained when the kidney is cut through and a portion of the medullary substance scraped off and placed under the microscope. This epithelium is cast off by a pathological process in coherent pieces from the tubuli uriniferi (tubes of Bellini), and voided with the urine. In addition to these epithelial casts, single epithelial cells (caudate cells) are frequently found in the urinary sediment and are derived from the calyces or pelvis of the kidneys.

b. Granular Casts.—These are solid cylinders, similar in shape and size to the preceding ($\frac{1}{100}$ to $\frac{1}{50}$ line in diameter), but composed of a granular mass which occasionally entangles single epithelial cells, but more frequently blood-corpuscles, pus-globules, and various crystals. Besides these granular casts the urinary sediment frequently contains blood-corpuscles, pus-globules, and compound granule-cells.

c. Hyaline Casts.—These are solid cylinders like the foregoing, but are entirely colorless and transparent, so that they are hard to discover under the microscope. They may be found more easily by adding a solution of iodized potassium iodide to the

urine, thereby coloring them. They are said to consist of coagulated fibrin.

When certain portions of the hyaline casts are made up of pus-globules, granular molecules, drops of fat or fat-granules, they approach in character the granular casts and partake of the characters of both.

The tube-casts always have their origin in the tubuli uriniferi of the kidneys.

The presence of epithelial casts in the urinary sediment for several days in succession indicates transitory desquamative nephritis.

When epithelial casts and pus-globules are simultaneously present a more intense inflammatory process is going on in the parenchyma, the calyces, or the pelvis of the kidneys.

Granular and hyaline casts point to a grave disease of the parenchyma of the kidneys and to its chronicity. The greater the number and the longer that casts occur in the urinary sediment, the more intense is the degenerative process in the kidneys.

If the casts contain an abundance of fat, and for a protracted period, a fatty degeneration of the kidneys is present.

If the tube-casts contain blood, or blood is found in the urine in addition to the casts for a protracted period, the presence of a disease of the renal vessels may be suspected (collateral hyperæmia, rigidity, or fatty degeneration of the arteries of the kidneys).

When a number of the above modifications of tube-casts are found in the urine at one time, it indicates the existence of complicated pathological processes in the kidneys.

5. *Spermatozoa*.—The presence of mature spermatozoa in the urine, determined by the microscope, indicates coitus, pollutions, or spermatorrhœa, while immature spermatozoa indicates onanism or excess in venery.

6. *Fungi and Infusoria*.—These are found almost exclusively in urine which has been kept for a long time, or in chronic vesical catarrh where the urine decomposes in the bladder. Of the fungi which occur in the bladder may be mentioned:

a. *Yeast-fungus* (*Cryptococcus fermentum*.—Transl.), which occurs only in urine containing sugar, and indicates glycosuria.

b. *The sarcina*, which, by its presence in the bladder, aids perhaps in the decomposition of the urine, and may induce the alkaline reaction of the urine and the precipitation of the earthy phosphates, etc.

The infusoria (monads and vibriones) which are found in decomposing urine containing albumen, mucus, blood, or pus, cause or favor its decomposition. Even if the infusoria have been developed in the urinary passages, their germs have undoubtedly been introduced from the outside (*e. g.*, by dirty catheters).

§ 93. **Inorganic Urinary Deposits**.—As inorganic urinary deposits may be mentioned sediments of uric acid, urates, hippuric acid, phosphate of lime, and ammonio-magnesian phosphate (phosphates), oxalate of lime, cystin, xanthin, and tyrosin.

1. *Deposits Composed of Uric Acid and Urates*.—These deposits are very frequently found in the

urine, especially in acute febrile diseases, or in febrile exacerbations of chronic diseases, and then first make their appearance some time after the urine has been voided—after it has become cold.

Uric acid is only found in strongly acid urine, and, on the whole, very seldom alone, while it frequently occurs in connection with the urates. It is never colorless; sometimes, indeed, it is a pale-yellow, but generally it is of a bright-yellow, orange-red, or brown tinge, and its crystalline character may easily be recognized by the naked eye. Under the microscope it is seen to be made up of four-sided laminæ, or six-sided plates of a rhomboidal appearance, out of which fusiform or barrel-shaped crystals are often formed by the rounding off of their obtuse angles.

If uric acid is already precipitated within the urinary passages, and the urine is therefore turbid when passed, the formation of renal or vesical uric acid calculi is to be feared.

Uric acid may be separated from the urates by warming and filtering the urine, since the urates are soluble when it is warmed and are reprecipitated when it cools.

The color of deposits composed of the *urates* varies very much; at times it is clay-colored, at others brick-red or rose-red, or from a brownish-red to a purplish-red. They often look very similar to organized bodies (blood, pus), but may be differentiated from them by the microscope and by being soluble when the urine is warmed.

The urates which are found in the sediment are the acid urate of sodium, acid urate of potassium, acid urate of ammonium (especially in urine of an alkaline reaction

in connection with the earthy phosphates), and the acid urate of lime (rare).

The urates may be most easily recognized by the fact that urine which has become turbid becomes clear on warming, although when it cools it again becomes turbid.

They are occasionally found in the urine of persons who are entirely healthy (after great muscular exertion, after an abundant meal, after copious sweats and consequent diminution of the urine). As they are almost always precipitated outside of the body, they seldom give rise to the formation of urinary concretions.

2. *Deposits Composed of Hippuric Acid.*—They occur relatively seldom and may easily be recognized under the microscope (crystals composed of prisms with a rhombic base or needle-shaped crystals).

In health an abundant deposit of hippuric acid is found after partaking freely of fruit; this cause is, of course, operative in disease. An abundance of hippuric acid in the urine may occur as a consequence of pathological alterations in nutrition. It has been found in abundance in the acid urine of fevers, in diabetes, chorea, etc.

3. *Deposits of Phosphate of Lime and Ammonio-magnesian Phosphate (Triple Phosphate).*—These two combinations are mostly found together. They cannot form in urine which is strongly acid; but only occur in urine which is slightly acid, neutral, or alkaline.

The phosphates (earthy phosphates) are very frequently present as urinary deposits and principally in chronic

diseases (contrary to the urates), and in urine of an alkaline reaction. They are always present in the latter.

Phosphate of lime is frequently, especially in slightly acid urine, only held in solution by the carbonic acid present, and on boiling the urine is immediately precipitated as whitish flakes, which may be redissolved by the addition of an acid (even acetic acid).

It mostly appears under the microscope in an amorphous condition, and is only occasionally crystalline, when it is in the shape of isolated or aggregated needle-shaped crystals, which frequently cross each other at right angles.

The ammonio-magnesian phosphate is not found in normal urine, but often occurs in great quantity in bladder and spinal affections. It is soluble in acetic acid, by which it is distinguished from oxalate of lime.

The triple phosphate is always crystalline, its crystals being mostly of the shape of a coffin-lid (a modification of a triangular prism.—Transl.).

If phosphates and urates are present simultaneously, the urates are readily soluble on warming the urine, while the phosphates remain insoluble even at the boiling-point.

The presence of earthy phosphates in the urine indicates that it is of an alkaline reaction. If earthy phosphates are present in the urine for a protracted period it may be caused: 1st, by a decomposition of urea in the urinary passages; 2d, by the continued use of alkalies (caustic alkalies, carbonates of the alkalies, vegetable alkalies); 3d, by alterations in nutrition (imperfect assimilation, anæmia and chlorosis, debility).

If the freshly voided urine contains the earthy phosphates (originating, therefore, already within the urinary

passages) for a protracted period, the formation of vesical calculi is to be feared.

4. *Deposits Consisting of Oxalate of Lime.*—Oxalate of lime occurs in solution in urine in which the acid sodium phosphate is at the same time present. It is, however, more frequently found in connection with deposits of uric acid and the urates, and appears under the microscope as small, sparkling, octahedral crystals, which refract the light very strongly.

Some plants (*oxalis*, *rumex*) which are used as food, as well as some medicines (*radix rhei*, *gentianæ*, *saponariæ*, etc.), contain oxalic acid and oxalate of lime. The oxalic acid which is introduced into the organism in this way is eliminated either entirely or in part by the kidneys as oxalate of lime. Oxalic acid is frequently formed as a secondary product in the oxidation of uric acid, creatinin, and leucin, and in the incomplete oxidation of sugar, starch, and salts of the vegetable acids, and, perhaps, from the carbonates and bicarbonates of the alkalies by one molecule of oxygen being withdrawn from them (as after drinking champagne and Seltzer water). The following may cause an abundant excretion of oxalate of lime by the kidneys: affections of the respiratory organs with insufficient oxygenation of the blood, excessive use of sugar, sparkling wines, and foaming beer, as well as the internal use of bicarbonates of the alkalies or alkaloids.

If the urine contains large quantities of oxalate of lime for weeks or even months, the supposition is justified that a so-called oxalic acid diathesis (*oxaluria*) exists, which is important in that the presence of considerable

quantities of oxalic acid in the organism may produce dangerous results (upon the heart and nervous system, as well as the formation of oxalate of lime calculi in the kidneys or bladder).

Traces of oxalate of lime, as well as a greater quantity of the same in the urine, but transitory, have been frequently observed in various acute and chronic diseases (emphysema of the lungs, rachitis, epileptiform spasms, convalescence after typhus).

5. *Deposits of Cystin and Xanthin* in the urine only deserve consideration as causes of the formation of urinary calculi.

6. *Deposits of Tyrosin*, mostly in connection with leucin, in the urine, when present in considerable quantity, indicates an excessive destruction of the albuminous constituents of the body. It has been found in increased quantity in acute atrophy of the liver and gangrene, as well as sometimes in leucæmia, typhus, and small-pox.

§ 94. **Qualitative Analysis of the Urine.**—Before proceeding to the qualitative analysis of the urine, the following have to be taken into account :

1. The *quantity* of urine passed in twenty-four hours, which may be more or less increased (diabetes) or markedly diminished (dropsical affections during the *stadium incrementi*, cholera, uræmia).

2. The *specific gravity* of the urine, which in the normal condition has a certain relation to the quantity passed and is, on an average, 1020, and is to be determined by Heller's urometer. Under ordinary circumstances the specific gravity is in inverse pro-

portion to the quantity passed; *e. g.*, if the quantity is increased in consequence of certain drinks the specific gravity falls and *vice versa*, according to the relative increase or decrease in the solid constituents of the urine. An increase of the specific gravity with an increased quantity of urine is observed in diabetes in consequence of the sugar present. Albumen in the urine, on the other hand, does not exert any marked influence upon the specific gravity.

3. The *color* of the urine: Normal urine is of an amber, wine, or reddish-yellow color.

In order to be able to correctly judge of the color of the urine, it must be put into a clean glass or white porcelain vessel after removing any turbidity which may be present.

The urine is of a cherry or purplish-red after the use of santonin; if it is alkaline the yellow acid santonin urine becomes a cherry or purplish red on the addition of caustic potash.

After the use of rhubarb (chrysophanic acid) and senna, the urine may be brownish or even of a deep blood-red, but becomes lighter, light yellow, on the addition of mineral acids, while bloody urine is not made lighter by the addition of mineral acids, but rather becomes darker.

4. The *smell* of the urine is, on the whole, of no importance. But if it already has an ammoniacal smell when voided, a primary or secondary catarrhal or inflammatory affection of the vesical mucous membrane is present. In diseases affecting the entire substance of the kidney (interstitial nephritis, amyloid kidney, atrophy), it is said that after taking turpentine, balsam copaiva, etc., their aromatic prin-

ciples are not found in the urine, as is usually the case (Ziegler).

5. The *reaction* of the urine, as is well known, is acid, and this acidity very often increases for some time after it is voided, especially if the urates are in process of precipitation. The acid reaction is caused in some cases by the presence of free acids (lactic, carbonic, uric), or of acid salts.

The alkaline reaction of the urine is caused by the presence of ammonium carbonate, in consequence of the decomposition of the urine, or by the presence of the fixed carbonates of the alkalies.

In order to ascertain the reaction of the urine it is not advisable to employ litmus-paper which is very red. It often happens that the same urine changes the red litmus-paper to a pale blue and the blue to a pale red ("amphotere reaction").

When the urine is of an alkaline reaction it must be ascertained whether this is due to the presence of ammonia or of a fixed alkali. If the red litmus-paper which has become blue on being dipped in the urine becomes red again after it has been dried, the alkaline reaction is due to ammonia, which has evaporated in the drying process. Another method is as follows: About ten drops of the alkaline urine are rapidly evaporated in a watch-glass, whereby the ammonium carbonate, if present, will be volatilized. If the evaporation is continued until there are about two drops left, the urine remaining will exhibit a markedly acid reaction if the former alkaline reaction was only due to ammonia, while the reaction will remain alkaline if it was due to a fixed alkali.

§ 95. **Short Chemical Tests.**—In order to rapidly obtain an idea of the condition of the urine while examining a patient, it should first be tested as to its reaction and then boiled.

If the urine is acid and turbid and the turbidity is cleared up by warming, urates are the cause of the turbidity.

If the urine is clear at first and becomes turbid on boiling, it contains phosphates or albumen. If phosphates are present, the turbidity disappears on the addition of nitric acid; if, on the contrary, the turbidity is due to albumen, it will either not be altered by the addition of nitric acid or becomes even more marked.

If the urine is turbid and remains so after warming, and even after the addition of nitric acid, the presence of mucus and pus should be suspected.

Hereupon we may proceed to search for other substances whose presence may be suspected from the symptoms of the disease.

The pathological ingredients of the urine have previously been mentioned.

§ 96. **Special Chemical Tests.**—The following are of great value in determining the diagnosis and prognosis, and should, therefore, be made the subject of a qualitative analysis: albumen, sugar (inosite is only rarely found in the urine), leucin and tyrosin, biliary coloring matters, biliary acids, oxalate of lime, chloride of sodium, urea, and uric acid. The quantity of each present is mostly estimated during the process of testing whether they are present.

1. *Albumen*.—If it is desired to be perfectly certain whether urine contains albumen or not, the following methods must be employed:

a. Nitric acid is added to filtered urine, which, if albumen is present, produces an intense white turbidity (acid albumen, which is characterized by being soluble in a large quantity of water). If only a little albumen is present in the urine, the slight turbidity which results may be overlooked, or it may be dependent upon the presence of other substances (*e. g.*, of urates), and may simulate albumen. The turbidity which is produced by urates disappears on the addition of heat.

b. Some of the filtered urine is boiled, whereby, if albumen is present in great quantity, a flaky coagulation is produced, while if but little is present a mere cloudiness appears. In order to ascertain with certainty that the turbidity produced by boiling is not due to the earthy phosphates, nitric acid is added on cooling and the whole shaken up, when the turbidity will be cleared up if it arose in consequence of the presence of the earthy phosphates, but if produced by albumen it will not be cleared up.

As albumen will not coagulate when the urine is alkaline or strongly acid, its reaction must be tested before boiling it, and an alkaline urine carefully neutralized by acetic acid, and a strongly acid urine by ammonia.

After boiling, the coagulated albumen should be allowed to settle at the bottom of the test-tube. The height of this sediment should, at the expiration of

twenty-four hours, be compared with the height of the column of urine passed. The increase or diminution of the quantity of albumen may thus be easily ascertained by consecutive observations.

If the flakes of albumen are of a reddish-brown color, the urine contains some of the coloring matter of the blood; and in that event the albumen is derived in whole or in part from the serum of the blood present in the urine. Whether the albumen in the urine is derived from the serum of the blood, or is transuded or is derived from pus, must be determined by the darker or lighter tinge of the albumen flakes and from an examination of the sediment.

2. *Sugar*.—The presence of sugar in the urine may be suspected when its color is a greenish-yellow and its specific gravity is at the same time from 1028 to 1050.

Various methods are employed to establish the presence of sugar in the urine.

a. Trommer's Test.—Fifteen to twenty drops of urine which has been freed from albumen and decolorized by animal charcoal are diluted by the addition of 4–5 cc. of water. To this is added about $\frac{1}{2}$ cc. of a solution obtained by adding a solution of cupric sulphate to liquor sodæ while cold. The whole is then heated almost to the boiling-point, when, if sugar is present, a yellowish-red cloud forms upon the surface, which, without further heating, is soon followed by a precipitation of yellow or red cupric oxide.

b. In order to be entirely certain that the reduction of the cupric oxide is due to the presence

of sugar and not of other substances (*e. g.*, uric acid), another mixture similar to that described under *a* is prepared and set aside from six to ten hours without having been previously warmed. If, at the expiration of this time, a precipitation of cupric oxide has occurred the presence of sugar is proven.

c. Böttger's Test.—To a quantity of urine which has been freed from albumen and decolorized an equal quantity of a solution of sodium carbonate (one part of the crystallized salt to three parts water) and a small quantity of bismuth subnitrate are added, and the mixture boiled. If a large quantity of sugar is present, the subnitrate of bismuth is reduced to the black metallic bismuth. The least blackish or grayish coloration of the snow-white bismuth subnitrate indicates the presence of sugar.

d. Heller's Potash Test.—Some of the decolorized urine is put into a long narrow test-tube, and to it is added some caustic potash, and only the upper portion of the column of fluid is then brought to the boiling-point. If sugar is present this upper portion will vary in color from yellow to brownish-red, while the lower portion will retain its original color. This should be used as a preliminary test on account of the facility with which it may be employed.

e. Lehmann's Test.—To a moderate quantity of diabetic urine, which has been freed from albumen, some yeast is added. In a short time, especially if the temperature is kept at 15° – 20° C.,

fermentation and the evolution of carbonic acid sets in.

All these tests are said to be unreliable if a mere trace of sugar is present, because other substances may, occasionally, produce the same reactions (Seegen).

3. *Leucin and Tyrosin*.—These two substances, which are especially found in the urine in acute atrophy of the liver, often appear as a greenish-yellow loose sediment which, after being evaporated on a slide, presents crystals of both substances under the microscope.

After the urine has been freed from albumen by boiling and filtered, as well as from coloring and extractive matters by basic acetate of lead, the superabundant lead is precipitated by hydrogen sulphide, and the clear liquid concentrated by evaporation. After the lapse of twenty-four hours the tyrosin will have been precipitated, and may then be dissolved in hot water and recrystallized. It forms a coherent snow-white mass, of a silky lustre, and is made up of long, aggregated, needle-shaped crystals, which are themselves composed of very delicate needles grouped together in star-shaped figures.

For the purpose of obtaining the leucin, the residue left by the evaporation is first treated with cold absolute alcohol until this will no longer dissolve anything; it is then extracted by boiling alcohol of the ordinary strength. A tough, dark-brown substance, soluble in water, mostly remains, which contains the remainder of the tyrosin.

The leucin separates from the latter alcoholic solution after it has been evaporated and the syrupy residue has stood for some time. It appears under the microscope as round balls, mostly of a yellow color, which are partly

concentrically striated, and are here and there also studied with fine needlelike processes.

4. *Biliary Matters*.—Biliary coloring matters (bilirubin, biliverdin, biliprasin, bilifuscin), as well as biliary acids (cholic, taurocholic, glycocholic), may be found in the urine in icterus, phosphorus poisoning, acute atrophy of the liver, etc.

If a test-tube which comes to a point at the bottom is filled to the height of 3 cm. with concentrated nitric acid which has been somewhat decomposed by the action of light, and on top of this a layer of the urine to be tested, by means of a pipette, a beautiful play of colors occurs at the point where the two liquids come into contact if biliary coloring matters, especially bilirubin, are present. At first a beautiful green ring forms, which gradually rises higher, and on its lower border a blue one slowly forms which is followed by a violet-red one, and finally by a yellow one.

If the foregoing test fails in spite of the apparent existence of coloring matters in the urine, the following should be employed: Lime-water is added to the urine, the precipitate collected, and while still moist put into a test-tube. This is filled half full with absolute alcohol, and so much diluted sulphuric acid added as will give to the mixture, after shaking, a distinctly acid reaction. It should then be warmed, filtered, and again heated to the boiling-point, whereupon, if the sulphuric acid be in excess, the greenish-yellow or yellowish-green color of the liquid will quickly change to a beautiful dark green, and after continued boiling it occasionally changes to a dark blue (biliprasin).

Small quantities of biliary coloring matters in the

urine may also be recognized by the addition of chloroform. If a urine which contains bile is mixed with chloroform, violently shaken, and allowed to stand a short time, a yellow sediment forms. After the evaporation of the chloroform, crystals of biliary coloring matters, varying from a yellow to a ruby-red color, appear.

In order to determine whether biliary acids are present, a few drops of a sugar solution are added to a small quantity of urine which is free from albumen, and after that sulphuric acid, concentrated one-third, is dropped in until the mixture has attained a temperature of 50° – 70° C. If any of the biliary acids are present the mixture assumes a beautiful violet color.

5. *Oxalate of lime* occurs in the urine, dissolved in the simultaneously present acid phosphate of sodium, but more frequently as a sediment together with epithelium, mucus, and other substances, especially in connection with urates (*vide* § 93, No. 4). It may most easily be recognized by the microscope in the sediment, and best with high powers, as octahedral crystals.

If the presence of oxalate of lime in solution is suspected in a strongly acid urine, the free acid should be almost entirely neutralized and the urine allowed to stand for some time in a test-tube which comes to a point at the bottom. As soon as a sediment has collected at the bottom of the test-tube the supernatant liquid is decanted and some of the sediment placed on a slide and examined under the microscope.

A very reliable test for the presence of oxalate of lime in solution is conducted as follows: To about 500 cc. of urine a solution of calcium chloride and enough am-

monia to produce saturation are added, and the resulting precipitate dissolved by acetic acid. At the expiration of twenty-four hours the precipitate which has formed, and which mostly contains uric acid also, is removed by filtration, washed with water, and a few drops of hydrochloric acid poured on it. The uric acid remains on the filter and the oxalate of lime in solution in the filtered liquid, which is now placed in a test-tube, diluted with about 15 cc. of water, and on the whole a layer of very dilute ammonia is placed by means of a pipette, and allowed to stand at rest. At the expiration of twenty-four hours crystals of oxalate of lime will be found to have been deposited at the bottom of the test-tube.

6. *Sodium Chloride*.—Nitrate of silver is employed to detect the presence of chloride of sodium in the urine. It produces a white, curdy precipitate of chloride of silver, which is insoluble in hydrochloric and nitric acids. Or the urine is evaporated until it assumes a syrupy consistence, when the sodium chloride will be crystallized in the form of cubes or octahedra.

In order to ascertain the quantity of sodium chloride present, the urine is first freed from albumen and acidulated with nitric acid, in order to prevent the precipitation of the phosphate of silver. If urates are present these are dissolved by gently warming the urine. A small quantity of urine thus prepared is placed in a test-tube, and about two drops of a solution of nitrate of silver (one part to eight parts water) are added. If sodium chloride is present, white, curdy lumps of chloride of silver fall to the bottom of the test-tube. If the urine contains a normal quantity of sodium chloride the lumps will be broken

up into coherent, persistent flakes on shaking. The smaller the quantity of chloride of sodium contained in the urine the less compact will the lumps be, and will be broken up into a cloud of molecules. If the urine contains a minimum quantity of sodium chloride, a mere white cloudiness is produced, which entirely disappears on slight shaking. An increase in the curdy precipitate denotes an increase in the quantity of sodium chloride present.

The disappearance of chlorides from the urine indicates a dangerous *status præsens*, while their return or increase makes the prognosis more favorable, even if the *status præsens* appears never so dangerous; and a reappear-ance of chlorides during convalescence makes the prognosis more grave (Heller).

7. *Urea*—Fifteen to twenty grammes of urine free from albumen are evaporated to a syrupy consistence in a water-bath, and the residue treated with alcohol until a drop evaporated on a watch-glass does not leave any residue. This alcoholic solution of urea is evaporated in a water-bath, and the urea, more or less colored, will remain. The residue should be dissolved in a little water, a drop of it put on a slide, and one end of a short piece of thread laid in it. The drop of the solution and the end of the thread are then covered with a cover-glass, and the free end of the thread is moistened with a drop of pure nitric acid, when the formation of crystals of nitrate of urea may be watched under the microscope. They appear in the beginning as rhomboidal plates, or short prisms, whose acute angles are 82° ,

but gradually change into hexagonal plates, or six-sided prisms.

An increase or diminution of the quantity of urea in the urine may be satisfactorily ascertained by the urinometer, as the specific gravity in the normal and most pathological urines is almost exactly in proportion to the quantity of urea present.

8. *Uric Acid*.—In acid fermentation of the urine, uric acid is frequently precipitated in more or less colored crystals. Thus, in diabetic urine after it has stood a short time, the uric acid is often found in the form of a red, sandy, crystalline powder on the bottom of the vessel.

If uric acid is suspected to be present in the urine, 5 cc. of hydrochloric acid are added to 200 cc. of urine, and the mixture allowed to stand eighteen to twenty-four hours, at the end of which time the uric acid will be found to have been precipitated. It appears in the form of colored crystals, some of which will be found swimming on the surface, others at the bottom and on the sides of the glass. These crystals should be dissolved in moderately diluted nitric acid, whereby alloxantin is formed; then this solution is carefully evaporated to dryness, whereby alloxan is formed from a portion of the alloxantin. If ammonia be now added, the beautiful purplish-red color of murexid appears, which is changed to a purplish-blue on the addition of caustic potash (murexid test).

Under the microscope the crystals of uric acid are occasionally colored, but always very transparent and of various sizes and shapes. They mostly appear as smooth four-sided laminæ or six-sided tablets of a rhomboidal

appearance, out of which fusiform or barrel-shaped crystals are formed by the rounding off of their obtuse angles.

Urate of sodium appears under the microscope as prismatic crystals, while urate of ammonia appears as concentrically striated balls with needle-like processes.

If uric acid is present in the urine, it is generally deposited of itself in some places on standing, either pure or in combination with sodium or ammonia.

As urea and uric acid are generally increased or diminished together, both in health and disease, the urinometer may be employed with advantage here also.

The accurate quantitative analysis of the normal and abnormal ingredients of the urine requires very accurate tests, the description of which would exceed the limits of this book. They may be found in Neubauer and Vogel's *Guide to the Qualitative and Quantitative Analysis of the Urine*, from which much of the foregoing has been obtained.

GENERAL CLINICAL EXAMINATION OF PATIENTS.

§ 97. **Conduct at the Bedside.**—At the bedside it should never be forgotten that the patient to be examined is to be treated with the greatest humanity, for he is in possession of an equal degree of sensibility as a healthy person, and is often tortured with various bodily or mental pains. Tact, benevolence, and delicacy should be combined in the physician.

Manifold opportunities are presented to him of educating his senses, and of forming an opinion from the impressions received by them, before addressing any questions to the patient. Here, for example, such cases may be called to mind where the sensorium of the patient is not clear, where the judgment is suspended, as in idiocy, mental diseases, etc.; and those diseases which are marked by a characteristic odor, *e. g.*, small-pox, gangrene of the lungs, etc.

§ 98. **I. Previous History.**—After the name, age, sex, social standing, occupation, and the date of admission into the hospital have been entered in a book kept for the purpose, the previous history of the patient is obtained. For this purpose we address ourselves to the patient himself, or, when necessary, to his relatives.

It should be ascertained whether the patient has generally enjoyed good health; whether he has been engaged in active pursuits, and what they were; whether he was

accustomed to work, and was strong and robust, or, on the contrary, was weakly, reared delicately, and not accustomed to violent muscular exertion; whether he has gradually become emaciated or not; whether he has had sorrow, care and want, or whether he has lived in easy circumstances; whether he has lived in the country or city; whether he has had any of the diseases of childhood and of maturer years, and what they were; whether he has ever suffered from a fall, or has received any contusion or other injury; whether he has indulged moderately in sexual pleasures and in drinking; whether he has ever had attacks of delirium tremens, how often, and when the last one occurred.

The patient should be asked whether and when he has suffered from syphilis, and when the last attack occurred; whether he has ever been salivated with mercury; whether scrofula, tuberculosis, rheumatism, gout, cancer, or other cachexiæ have been present in any members of his family, and in whom.

Female patients should be asked (naturally with the greatest regard for their feeling of delicacy) whether they are or have been married; whether they have ever had children, how many, and when the last parturition occurred; whether they have nursed their children themselves; whether they have ever aborted or miscarried, how often, and when last; when the menses first appeared, whether they were regular or not, when they are expected, when they appeared last, and how long they last each time; whether the flow is profuse or scanty; whether it was dark or light colored; whether clots pass with them; whether dysmenorrhœa occurred; whether the climaxis

has been passed ; and whether leucorrhœa is present or not.

In relation to children, it should be ascertained whether they have been vaccinated ; whether they have had vari-cellæ, measles, scarlatina, whooping-cough, croup, and diphtheria ; whether they have thrush, aphthæ, diarrhœa ; whether they have a bloated abdomen, while the rest of the body is thin ; whether there are present diseases of the spinal column, of the joints, scrofulous swellings, scars or fistulæ in the neck, on the jaws, or on the ears ; whether inflammatory conditions of the eyes, chronic skin diseases, etc., exist.

§ 99. **Inquiry into the First Symptoms.**—After the foregoing has been ascertained, it should be investigated in what way and when (noting the day and date, if possible) the first symptoms of the disease presented themselves, and what causes, ascertainable or probable, produced it ; whether the disease began with febrile manifestations or with a shaking chill (and its duration), with shuddering, with a cold feeling in the back, with heat, with a dry, hot skin or perspiration, with nausea, vomiting, with unpleasant sensations or pain or anxiety at the pit of the stomach, with sudden or gradual loss of appetite, with pains in the head, in the back, in the chest, in the abdomen, in the renal regions, in the joints, with general lassitude, languor, feeling of being bruised all over, with throbbing in the temples and loss of consciousness, with delirium, palpitation of the heart, oppression at the pit of the stomach, dyspnœa, cough, with general or local pains or with stitches.

§ 100. **Investigation of Local Manifestations.**—It should further be ascertained which of the local manifestations appeared first, and in what part of the body. If pain is given as the first symptom, it should be asked what its nature was (stitching, cutting, boring, throbbing); whether it was constant or returned at periodical or irregular intervals; whether it was only on one side of the body or on both sides. In relation to every other symptom complained of by the patient, it should be asked what is its location, what was the course pursued in its development, *i. e.*, what was present first, what course did it take, when and what other symptoms were connected with it, where were they located, what course did they take, and what were their characteristic features.

Now it should be attempted to determine to which organ the first symptoms should mostly or entirely be referred.

If any intimation is given by the patient of a previous disease, the principal symptoms and the organ or organs or parts to which they may most probably be referred should be sought for.

§ 101. **II. Status Præsens—General Condition of the Patient.**—In order to avoid repetition as much as possible, *vide* §§ 18–25 for determining the general condition of the patient.

§ 102. **Condition of the Nervous System.**—In addition to the points mentioned in § 18 in relation to this subject, knowledge should be sought as to the general sensibility, the existence of vertigo, dreams, delirium, loss of consciousness, spasms, paralysis (hemiplegia or paraple-

gia, paralysis agitans), and trembling. The condition of the organs of special sense (hearing, sight, smell, taste, touch) and of the speech should be ascertained. It should be observed whether ptosis is present on one or both sides. If paralysis exists, it should be ascertained in what condition (flexion or extension) the muscles are, as well as whether anæsthesia or hyperæsthesia is present; in spasms, whether they are tonic or clonic, whether a tetanic or cataleptic condition is present in any portion of the body. In regard to sleep it should be investigated whether it is quiet or restless and disturbed by dreams; whether it is pathologically diminished (sleeplessness, agrypnia), or pathologically increased (hypnosis); whether somnolence, sopor, coma, or lethargy is present. It should be looked after whether the patient is harassed by hallucinations. If headache is present it should be asked whether it is general or localized in the forehead, vertex or occiput; whether it is constant or periodical, superficial or deep, dull, stitching, throbbing, violent or slight, one-sided or on both sides. Syphilitic headaches are aggravated during the night.

If strabismus is present it should be ascertained whether one or both eyes are directed inwards, upwards, or outwards. The reaction of the pupils to light should be ascertained; whether they are dilated or contracted, and whether the dilatation or contraction is limited to one or both pupils.

Finally, it should be ascertained whether defecation and urination are involuntary or not.

§ 103. **Condition of the Muscular System.**—It should be investigated whether the muscles are well or moderately developed; whether they can perform their

normal functions ; whether they are paralyzed or paretic ; whether twitching or contractions of muscles are present.

§ 104. **Condition of the Joints.**—It should be investigated whether the joints have a normal degree of motion, or are immovable, swollen, or painful.

§ 105. **Condition of the Spinal Column.**—It should be ascertained whether the spinal column is straight or bent (in what direction), and whether it is movable.

§ 106. **Condition of the Head.**—The condition of the hair as regards color, thickness, fineness, and quantity should be taken into account ; and whether eruptions, tumors, exostoses, or rigid arteries are present. The condition of the fontanelles, the transpiration of the scalp, its temperature, and that of the forehead and temples should be ascertained.

In regard to the shape of the skull it should be noticed whether it is abnormally small (microcephalic), as in idiots, or abnormally large (macrocephalic), as in hydrocephalus, in which there is at the same time a small face and imperfect closure of the fontanelles, and also in hypertrophy of the brain ; whether the two halves of the skull are of the same formation ; whether it is rachitic (prominence of the parietal bones and delayed closure of the fontanelles).

The eyes, ears, and nose should be examined by the methods in vogue at the present time.

In relation to the face compare § 20 above.

§ 107. **Condition of the Neck.**—In examining the neck attention should be paid as to whether it is long

and thin (in emaciation and sinking in of the upper part of the thorax); whether it is thick and short (emphysema, heart affections, tendency to apoplexy); whether tumors are present (goitre, swollen glands, infiltration of the subcutaneous cellular tissue); and what is the condition of the bloodvessels. The carotids and the right internal jugular vein (venous hum) should be auscultated. It should be observed whether the muscles of the nape of the neck are contracted (meningitis). The larynx should be examined externally and by the laryngoscope internally.

§ 108. **Condition of the Heart and of the Circulation.**—In §§ 25, 50, 51, 52, and 55 sufficient has been said about the pulse and the sounds in the arteries and veins. The examination of the heart remains to be considered.

The impulse of the heart, which occurs synchronously with the systole, is observed in the normal condition in the fifth intercostal space of the left side 1–1½ inches to the right of the nipple-line.

The impulse of the heart is observed farther to the right when the heart is in the right side of the thorax (dextrocardie), when it is crowded towards the right in consequence of left-sided pleuritis or pneumothorax, in consequence of an attack of pleuritis in the right side having been followed by sinking in of the thorax, and in hypertrophy of the right ventricle; hence it is almost constantly displaced to the right when a high grade of emphysema is present.

The impulse of the heart is displaced towards the left side in consequence of the heart being crowded to the

left by right-sided pleuritis or pneumothorax, in hypertrophy of the left ventricle, in exudations into the pericardium, very often in aneurism of the ascending portion of the arch of the aorta, and in tumors of the mediastinum.

The impulse of the heart is displaced upwards (even as high as the 3d or 2d intercostal space) by distension of the abdominal cavity (meteorism of the stomach and intestines, peritonitis, pregnancy, ascites, enlargement of the liver and spleen, tumors), or in consequence of a diminution in the size of the left half of the thorax, due to atrophy of the left lung, or a sinking in of the walls of the chest after left-sided pleuritis.

The impulse is displaced downwards in consequence of a depression of the diaphragm by emphysema, pleuritic exudation, and by a large and long-existing pericardial exudation. It is also observed lower than normally (even as low as the eighth rib) in marked hypertrophy of the left ventricle, and occasionally in aneurism of the aorta.

In regard to deviations in the rhythm of the heart's action, it is to be mentioned that, instead of the single beat, a double one (systolic and diastolic), is occasionally observed, especially in hypertrophy of the heart.

When adhesions between the heart and pericardium have occurred, instead of the systolic bulging of the fifth intercostal space a depression is frequently observed.

The impulse of the heart is stronger, and then generally extended over a larger area, in the most various diseased conditions, which are not only localized in the heart but also in the rest of the organs of the thoracic cavity; thus, it occurs in carditis and hypertrophy of the heart, and

in pericarditis (but only in the beginning of pericarditis, as a considerable pericardial exudation masks the impulse—weakenes it), in disturbances of the circulation in the large arteries, and in diseases of the lungs and pleura (pneumonia, tuberculosis, pleuritis), and in bodily or psychical excitement, in hysteria, epilepsy, tetanus, etc.

A weakened impulse is observed in marked thickening of the thoracic parietes due to great muscular development, marked adiposis or dropsical effusions, in weak contractions of the heart in consequence of disorganization of the heart-muscle (atrophy, fatty degeneration, dilatation with attenuation of the walls of the heart), in marked pericardial exudations, in adhesions between the heart and pericardium, as well as when a portion of an emphysematous lung or small pleuritic exudations intervene between the heart and the thoracic parietes.

By the aid of the stethoscope the rhythm and the location of the heart-sounds may be ascertained, as well as the area over which they may be heard, their intensity and timbre; but more of this under auscultation of the heart.

§ 109. **Condition of the Respiration.**—*Vide* § 21.

§ 110. **General Condition of the Skin.**—*Vide* § 22.

§ 111. **Condition of the Digestive Apparatus.**

a. The *lips* should be examined as to whether they are red, moist, and natural, or pale, bloodless (in anæmia, spasms, syncope), cyanotic (in disturbances of the pulmonic circulation and disturbances in

the return of the blood from the head), dry (especially in acute febrile and inflammatory conditions), parched or covered with brownish or blackish crusts (typhus), whether they are swollen or whether herpetic (in intermittent fever and pneumonia, only extremely seldom in typhus) or other eruptions are present. It should be noticed whether the mouth is distorted (in paralyses); whether it is open (in stopping up of the nose, hardness of hearing, dislocation of the jaw, paralysis) or is tightly closed (in tetanic spasms); whether foam proceeds out of the mouth (in epilepsy, eclampsia, trismus, apoplexy, hydrophobia); whether neoplasmata (epithelioma) or syphilitic affections (rhagades-like ulcerations of the angles of the mouth, condylomata, infiltrations) are present.

b. *Teeth*.—It should be investigated whether the patient has lost any of his teeth or not; whether there is any coating on them; whether they are loose or not, and, if loose, whether mercurialization or syphilis is the cause; in children, whether they are teething.

c. *Gums*.—It should be ascertained whether the gums are dry, shiny, firm, and of a normal red color, or whether they are pale (anæmia), soft, dark-red, and swollen (parulis, epulis, muguet [schwämmchen]), loosened from the teeth, bleeding (scurvy, mercurialization), or exude a sero-purulent fluid; whether they are ulcerated or painful; whether they exhibit a slate-gray line (lead-poisoning); whether they are spongy (scurvy, apht.æ, cancer aquaticus).

d. *Buccal Mucous Membrane*.—It should be de-

terminated whether it is pale or not, thick or thin and atrophic; whether the glands of the buccal mucous membrane are swollen and prominent; whether the saliva is abnormally increased (ptyalism, in consequence of local irritation or of sympathetic stimulation from gastric, nervous, and brain affections, or of mercurialization), or is abnormally decreased; whether the saliva is of the normal alkaline reaction, or is of an acid reaction (in inflammatory irritation of the primæ viæ, catarrh of the mucous membrane of the stomach and intestines, ulceration of the stomach, etc.); whether it contains mercury or iodine, or whether salivary calculi are present.

e. *Tongue*.—It should be investigated whether the tongue may be protruded easily, straight, and quietly, or is protruded to one side (the paralyzed one), and which one (in hemiplegia, after apoplexy and softening of the brain); whether it can only be moved with difficulty or is paralyzed, in consequence of an affection of the hypoglossal nerve, generally central—in the brain, medulla oblongata, or at the base of the skull. The size of the tongue should be taken into account (it is hypertrophied, in consequence of inflammation in cretins); whether it is thick, broad, pointed, soft, moist, and takes the imprint of the teeth at the sides; whether it is of the normal color or has a white, yellow, brown, lead-colored, dark-brown to black, or sticky coating; whether it presents fissures or ulcerations, especially along the borders, or tooth-wounds or scars (epi-

lepsy); whether it is bleeding or is covered with blood; whether it is dry or very red (scarlatina).

A persistent coating of the tongue, limited to a certain place, denotes an affection of a part of its mucous membrane.

Prognostically a drying of the coating of the tongue indicates an aggravation, although only when the patient does not sleep with his mouth open.

f. *Pharynx and Œsophagus*.—It should be investigated whether the patient can swallow easily and without difficulty; if not, where the difficulty lies, and whether liquid or solid substances can be swallowed more easily; whether the mucous membrane of the roof of the mouth and the velum palati and uvula are reddened, swollen, or relaxed, or whether they are covered with muguet (schwämmchen, soor), aphthæ, or ulcerations; whether the tonsils are affected with acute or chronic inflammation, are hypertrophied or covered with a diphtheritic deposit, especially in scarlatina. The pharynx should be examined while the tongue is depressed, or during an artificially produced yawn, especially its posterior wall, whether a catarrhal, croupous, diphtheritic, or syphilitic affection is present; whether it is swollen and fluctuating (retropharyngeal abscess, spondylarthroace).

g. *Stomach*.—It should be ascertained whether there are present anorexia, disgust for food, nausea, squeamishness, pains or pressure and feeling of fullness at the pit of the stomach after eating, periodical or occasional vomiting of food and drink, and if periodical vomiting occurs, whether it takes place

immediately, or one, two, or more hours after a meal (catarrh, ulceration or cancer of the stomach); whether sour regurgitation (pyrosis) occurs; whether there is vomiting of sour or alkaline fluids; whether vomiting of clear or turbid, thick, foamy, or brownish masses has occurred recently or some time ago; whether blood, more or less decomposed, with or without coagula, has recently been vomited (ulceration of the stomach); whether sarcinæ, bile, sugar (diabetes), urea, ammonium carbonate (uræmia, typhoid stage of cholera), pus, ichor, gall-stones, hydatids, or ascarides are found in the vomited matters; whether stercoraceous vomiting in strangulated hernia, volvulus, intussusception, etc., is present. When vomiting sets in suddenly, and recurs often in a previously healthy individual, poisoning, pregnancy, or strangulated hernia must be thought of.

h. *Intestinal Canal*.—It should be examined whether the abdomen is sunken, flat, or bloated, painful, tympanitic, or is soft and yielding; whether the intestines are filled with fæces or not; whether ileo-cæcal gurgling may be heard; whether there is habitual constipation or a passage every day; whether the fæces are firm, in balls, clayey, soft, copious, watery, rice-water-like (cholera), diarrhœic; whether they are brown, light-yellow, pale, green, black, bloody; whether the passages are preceded by pain, cramps, or rumbling, and in which portion of the abdomen they originate; whether tenesmus is frequently present; whether the fæces contain admixtures of mucus, blood, pus, scrapings of the in-

testines, particles of undigested food or worms; whether the passages are voluntary or involuntary.

§ 112. **Condition of the Uropoëtic System.**—The normal quantity of urine passed in twenty-four hours is on an average from 1200–1400 cc. It should, therefore, be ascertained whether the quantity passed is diminished or increased for a protracted period or only transitorily, or is entirely suppressed. The specific gravity of the urine, which varies normally from 1005–1030, should be determined; in diabetes mellitus it reaches 1040 and higher, and in diabetes insipidus it sinks to 1002 and lower. The color of the urine, which may vary from being almost colorless to a red or brownish-red color, should be ascertained; whether it is colored a bright red or a dark grayish-red or even black by hæmatin, or is colored brownish or blackish-brown by biliary coloring matters, or blue by uroglaucin. It should be observed whether the urine is foamy or not.

As the normal (transparent, amber, wine, or reddish-yellow) urine exhibits an acid reaction (colors blue litmus-paper red), it should be ascertained whether it is acid, alkaline (red litmus-paper is colored blue by alkaline urine), or neutral, in which latter case it does not alter the color of either the blue or red litmus-paper.

It should further be examined whether the urine is clear or turbid when voided; whether, in the former case, a cloud (mucus) or a more compact sediment is deposited in the vessel after standing for some time; whether the deposit is organized (mucus, epithelium, blood, cancerous or tubercular masses, tube-casts, spermatozoa, infusoria, fungi) or inorganic; whether it is like

brickdust, white and opalescent, brownish, dark-red, blood-red, or reddish; whether the sediment or the clear transparent urine contains urates; whether a flaky precipitate is produced, with or without the addition of nitric acid, by boiling.

We should endeavor to ascertain whether the stream of urine is split or not, and is spiral; whether it is uninterrupted or intermits; whether it is passed with or without straining; whether the passage of urine along the urethra causes pain or not; whether there is frequent urging to urinate; whether strictures exist; and whether there is an inclination to stool on passing water.

It should be noted whether pains in the kidneys are present; whether the pains pass along the course of the ureters, as well as if the bladder is empty or full and distended by urine (it may even rise as high as the umbilicus).

§ 113. **Condition of the Thoracic Cavity and its Contained Organs.**—After obtaining a general idea of the condition of the patient by the foregoing methods, an accurate exploration of the great cavities of the body and the organs contained in them must be made in order to determine whether any physical alterations, *i. e.*, an organic disease, are present or not. Attention should first be given to the thoracic cavity and its contained organs. In order to make as accurate an examination of the thoracic organs as possible, the chest, divided into various regions, must be examined.

§ 114. **The Various Regions of the Chest.**—The thorax is generally divided into the following regions:

The anterior, lateral, and posterior thoracic regions. The anterior thoracic region is again divided into the suprasternal, superior, and inferior sternal, supra- and infraclavicular and the mammary regions. The anterior thoracic region is divided into the various regions by seven perpendicular imaginary lines—the sternal, the right and left parasternal (alongside the sternum), the right and left nipple, and the anterior axillary line of each side. The lateral thoracic region is subdivided into the upper and lower axillary regions. The posterior thoracic region is subdivided into the supra- and infra-spinous or scapular, infrascapular, interscapular (the region between the scapulæ), and the dorsal region (the lower portion of the region between the scapulæ). It is necessary to know which of the organs of the thoracic cavity are found in the various regions in the normal condition and the phenomena elicited by percussion and auscultation.

§ 115. **The suprasternal region** contains the trachea. Under certain, not necessarily pathological, conditions the arch of the aorta may be seen and felt pulsating in the suprasternal fossa, but it generally indicates a marked rigidity (not aneurism) of the aorta. Under perfectly normal conditions neither lung-tissue nor arterial pulsation is found in this region. The percussion sound of the trachea is clear and has a peculiar resonance, called tracheal. By auscultation a loud blowing sound (tracheal breathing) is heard during inspiration and expiration.

§ 116. **The superior sternal region** contains the left and a portion of the right vena innominata (the

superior vena cava is found along its right border), the ascending and transverse portion of the arch of the aorta, the trachea and its bifurcation (besides numerous bronchial glands) at the level of the second rib, a part of the right auricle, the remains of the thymus gland, and the upper portion of the anterior mediastinum. Percussion sound: resonant, slightly muffled. By auscultation the heart-sounds are heard over the ascending portion of the arch of the aorta.

§ 117. **The inferior sternal region** contains the right half of the heart, a portion of the liver, which is separated from the heart and pericardium by the diaphragm, and sometimes also a portion of the stomach when distended by food and air.

§ 118. **In both supraclavicular regions** the apices of the lungs are found, which reach to the height of several centimeters above the clavicle (and generally higher on the right side than on the left), portions of the carotid and subclavian arteries, and the jugular and subclavian veins. Percussion sound: resonant, clear, non-tympanitic. Distinct vesicular inspiratory murmur.

§ 119. **The clavicular region** contains a strip of the parenchyma of the lung about two centimeters wide. The right sterno-clavicular articulation covers the bifurcation of the innominate artery. On the left side the carotid and subclavian arteries rise perpendicularly behind the sternum, after which the subclavian artery changes its course downwards and outwards behind the

middle third of the clavicle. Percussion sound: clear and peculiarly resonant.

§ 120. **The infraclavicular region** of each side contains the upper lobe of the lung. In the second intercostal space, near the right border of the sternum, the aortic sounds may be heard, and near the left border of the sternum the sounds of the pulmonary artery. Percussion sound: resonant, clear, non-tympanic.

§ 121. **The right mammary region.**—Along the right nipple-line the resonant, clear, non-tympanic percussion sound of the lung can be heard as low as the sixth rib, where the dull liver sound commences, which, in fact, bounds the lungs below. Vesicular inspiratory murmur.

§ 122. **Left mammary region.**—Between the parasternal and nipple-line of the left half of the thorax, the resonant, clear, non-tympanic percussion sound of the lungs only reaches to the fourth costal cartilage, where the dull sound of the heart begins; the latter reaches to the point where the apex beat is observed (between the fifth and sixth ribs), where the dull liver sound begins. Between the papillary and anterior axillary line the lung, with its resonant, non-tympanic percussion sound, reaches as low as the seventh rib, where it is replaced by the tympanic stomach sound.

§ 123. **The axillary regions.**—In the regions bounded by the anterior and posterior axillary lines of each side, the lung reaches as low down as the seventh

rib, where it is bounded on the right side by the liver, and on the left by the stomach.

§ 124. **The supraspinous regions** cover the posterior surface of the apices of the lungs. Percussion sound, on forcible percussion, is resonant and non-tympanic. Vesicular inspiratory murmur.

§ 125. **The scapular regions** contain nothing but lung substance. Percussion sound: a somewhat more muffled lung sound than on the anterior surface of the thorax. Inspiratory sounds weaker than anteriorly.

§ 126. **The infrascapular regions** contain lung-tissue which is not so thick below. The resonant, non-tympanic lung sound reaches, on the right side, as low as the ninth or tenth* rib, where the dull liver sound commences; on the left side it only reaches as low as the ninth rib, below which the dull splenic sound is heard. Distinct vesicular respiratory murmur.

§ 127. **The interscapular region** contains some lung-substance on both sides of the spinal column, the trachea, bronchi, and roots of the lungs, and lower down the œsophagus and aorta. Resonant, non-tympanic lung sound. Vesicular, tracheal, and bronchial respiratory sounds.

§ 128. **The dorsal region** contains a little lung-substance on both sides of the spinal column, which is bounded

* If we reckon according to the position of the spinous processes the figures must, of course, be altered.

by the upper ends of the kidneys (dull sound), and in the median line the œsophagus and aorta. Percussion sound alongside of the spinal column: resonant, non-tympanic. Weak vesicular inspiratory murmur.

§ 129. **Position of the Heart.**—The heart, which is loosely surrounded by the parietal layer of the pericardium and intimately connected with the visceral layer, is placed in the normal condition partly behind the sternum and partly behind the fourth to sixth costal cartilages of the left side. The heart-beat may be felt in one or more intercostal spaces, but it is generally felt, and sometimes even seen, in the interspace between the fifth and sixth ribs of the left side, about midway between the left nipple and the ensiform cartilage.

The point in the above-mentioned intercostal space, where the impulse of the heart may be felt, may be completely covered by the tips of one, or at the utmost of two fingers. After ascertaining the character of the heart's impulse, the upper and then the right border of the heart should be established by percussion. If they are now connected by imaginary straight lines with the point where the impulse can be felt, the lower and left borders will be established, and consequently the area of the dull heart sound, which is about one and one-half to two square inches. A dull percussion sound is elicited over the heart. Above and to the left the dull heart sound is replaced by the resonant non-tympanic lung sound, below and to the right, by a muffled tympanic sound (because the left lobe of the liver covers the stomach in this locality), and below and to the left by the clear tym-

panitic stomach sound. The actual size of the heart is, however, much greater.

If the heart is entirely covered by lung-tissue its dull sound is somewhat masked by the lung sound. Percussion must, in that event, be performed with more force.

If a dull sound is heard in the region of the heart, over a greater area than normal, the heart may be enlarged, or there may be present a pericardial exudation, or an aneurism of the ascending portion of the arch of the aorta, or of the pulmonary artery.

The area occupied by the dull heart sound is decreased during inspiration and increased during expiration.

In auscultating the heart the stethoscope should first be applied at the place where the impulse may be felt, and then at a point at the level of the third rib, directly above the former, when the two sounds of the left ventricle may be heard (— ∪, a systolic long and a diastolic short sound). In the region of the fourth or fifth rib, at the left border of the sternum, the two sounds (— ∪) of the right ventricle may be heard. In the second intercostal space of the left side, near the sternum, the two sounds (∪ —) of the pulmonary artery may be heard; and in the second intercostal space of the right side, alongside of the sternum, the two aortic sounds (∪ —) may be heard.

The systolic sound is isochronous with the arterial pulse. The sound following it is the diastolic sound.

§ 130. **Position of the Ostia and Valves of the Heart.** — 1. Ostium venosum sinistrum and mitral

valve, in the fourth left intercostal space, one and one-half to two inches from the left border of the sternum. 2. Ostium aorticum and semilunar valves, the region over and around the sternal articulation of the third left rib. 3. Aorta ascendens, the line between the sternal end of the third left rib and the sternal end of the second right intercostal space. 4. Ostium pulmonale and semilunar valves, the second left intercostal space at the left border of the sternum. 5. Ostium venosum dextrum and tricuspid valve, from the third left intercostal space, close to the left border of the sternum to the sternal articulation of the fifth rib.

It is of great importance for the diagnosis of heart diseases constantly to remember what is occurring in the heart during the continuance of the sounds. The heart possesses a double valvular apparatus, one at the ostia venosa (auriculo-ventricular valves,—the tricuspid valve on the right side and the mitral valve on the left side), and one at the ostia arteriosa (the semilunar valves of the aorta and pulmonary artery).

The auriculo-ventricular valves prevent the regurgitation of the blood from the ventricles into the auricles during the ventricular systole; the semilunar valves, on the other hand, prevent the regurgitation of the blood from the arteries into the ventricles during the contraction of the arteries.

The two valvular apparatuses act in opposite directions; while the auriculo-ventricular valves are closed the semilunar valves are open, and *vice versa*.

During the second (diastolic) heart sound the ventricles expand, the blood rushes from the auricles into them through the ostia venosa, the semilunar valves are

set into vibration by the reflux of the arterial blood, and close the ostium pulmonale of the right ventricle and the ostium aorticum of the left ventricle.

When the systolic heart sounds are normal, the tricuspid and mitral valves and the ostium pulmonale and aorticum are healthy.

If, instead of the first sound, a systolic murmur is heard, the tricuspid valve as well as the ostium pulmonale of the right ventricle, and the mitral valve as well as the ostium aorticum of the left ventricle, may be diseased (insufficiency of the auriculo-ventricular valves; stenosis of the ostium arteriosum).

When the diastolic heart sounds are normal, the ostia venosa and the semilunar valves are healthy.

If, instead of the second sound, a diastolic murmur is heard, the ostia venosa as well as the semilunar valves may be diseased (stenosis of the ostia venosa; insufficiency of the semilunar valves).

During the production of the second aortic sound the blood in the aorta, while the ventricular diastole is taking place, is forced against the semilunar valves, and they become distended (close the opening.—*Transl.*).

If the first aortic sound is normal the walls of the aorta and the ostium arteriosum are normal.

If, instead of the first aortic sound, a murmur is heard, the ostium arteriosum (stenosis) as well as the walls of the aorta (roughening, calcification) may be diseased.

If the second aortic sound is normal the semilunar valves are healthy.

If, instead of the second aortic sound, a murmur is heard, the semilunar valves are diseased (insufficient).

If a systolic murmur is heard only in the ventricles, the tricuspid valve of the right ventricle or the mitral valve of the left ventricle is insufficient.

If a diastolic murmur is heard only in the ventricles a stenosis of the ostia venosa exists.

If, instead of the first sound, a murmur is heard in the ventricles and aorta, a stenosis of the ostium pulmonale of the right ventricle and a stenosis of the ostium aorticum of the left ventricle is present.

If, instead of the second sound, a murmur is heard in the ventricles and aorta, an insufficiency of the semilunar valves of the pulmonary artery of the right ventricle and an insufficiency of the aortic semilunar valves is present.

§ 131. **Condition of the Abdominal Cavity and its contained Organs.**—The abdomen may be divided into the following nine regions with advantage: On each side of the abdomen a perpendicular line should be erected from the middle of Poupart's ligament to the thorax, and two transverse lines crossing the foregoing at right angles, one about $2\frac{1}{2}$ cm. above the umbilicus, and the other from the crest of the right ilium to that of the left. The regions bounded by these lines are called the epigastrium (the middle of the upper three regions), the right and left hypochondrium (on each side of the epigastrium), the umbilical region (below the epigastrium), the right and left lumbar regions (on each side of the umbilical region), the hypogastrium (above the symphysis pubis), and the right and left iliac regions (on each side of the hypogastrium).

§ 132. **The epigastrium** contains the left lobe of the liver, a portion of the stomach, the pylorus, a portion of the transverse colon, the duodenum, and the pancreas. The small, somewhat sunken portion, immediately below the ensiform process, is called the scrobiculum cordis. In it the heart's impulse may frequently be seen and felt. Percussion sound: over the left lobe of the liver muffled tympanic; over the stomach tympanic. Auscultation of the stomach: metallic tinkling and amphoric echo when fluids are set in motion in it.

§ 133. **The right hypochondrium** contains the right lobe of the liver, under which is the hepatic flexure of the colon. Percussion sound: perfectly dull; muffled tympanic where the colon containing air lies beneath the liver. Auscultation: negative, unless fluids or gases are set in motion in the colon.

§ 134. **The left hypochondrium** contains the greater curvature of the stomach and the splenic flexure of the colon. Percussion sound: tympanic. Auscultation: metallic tinkling and amphoric echo when fluids and air are set in motion in the stomach.

§ 135. **The umbilical region** contains a portion of the transverse colon, particularly, however, the jejunum and portions of the ileum; in the lower portion of this region are the bodies of the lumbar vertebræ, the abdominal aorta to its bifurcation on the left side of the body of the fourth lumbar vertebra, which may easily be felt in thin subjects. Percussion sound: resonant tympanic (when the intestines are not entirely empty); clear, short, muffled

tympanitic (according to the amount of distention of the intestines by food and air, the tenseness of the abdominal parietes and walls of the intestines, and the amount of fat deposited in the omentum and on the abdominal walls). Auscultation: gurgling sounds (from motion of fluids and air in the intestines); friction sounds during the respiratory movements (in peritonitis), and the sounds of the abdominal aorta.

§ 136. **The right and left lumbar regions** contain the ascending and descending colon, as well as the right and left kidney. Percussion sound: dull over a portion of each lumbar region, and over the colon muffled or resonant tympanitic (according to its contents). Auscultation: negative, unless fluids or air are in motion in the colon.

§ 137. **The hypogastrium** contains the bladder, rectum, and, in women, the uterus; mostly some folds of the small intestines are found there also, except when the bladder, uterus, or ovaries are very much enlarged. Percussion sound: resonant or muffled tympanitic, according to the contents and the distention of the intestines. Auscultation: negative, unless air or fluids are in motion in the intestines.

§ 138. **The right and left iliac regions** contain the cœcum and the sigmoid flexure of the colon as well as some folds of the intestines, and, in women, the ovaries. Percussion sound: muffled tympanitic, or resonant tympanitic, according to the contents and distention of the intestines. Auscultation: as in § 136.

The right iliac region is also called the ileo-cæcal region.

§ 139. **General Condition of the Abdomen.**—It should be ascertained whether the abdominal muscles are normally tense; whether the abdominal parietes are soft and yielding or tense and hard; whether distended and tortuous veins are present in the skin of the abdomen; whether the abdomen is full or empty, distended or retracted, sunken in; whether it presents a uniform hemispherical distention, or protuberances here and there (umbilicus retracted or prominent), or is sunken in; whether during inspiration the upper portion of the abdomen instead of becoming distended, as is normally the case, is retracted (paralysis of the diaphragm); whether breathing, when the individual is at rest, is principally accomplished by the abdominal muscles (abdominal respiration); whether pulsating movements may be seen or felt (when they depend on the heart two sounds will be heard; when they depend on the larger arteries, or an aneurism, only one sound will be heard); whether intestinal or fœtal movements may be seen or felt; whether, in women, cicatrix-like attenuations of the corrugated skin of the abdomen (pregnancy cicatrices) are present; whether the abdomen is painful, hot, dry or moist anywhere; whether ulcerations or abnormal openings exist anywhere; whether fluctuation is present (detected by exerting an easy pressure, or giving a quick tap with the fingers of one hand on one side of the abdomen, while the palm of the other hand is laid flat upon the other side); whether, in children, the abdomen is distended while general emaciation and swelling of the mesenteric

glands are present; whether a tympanitic, muffled tympanitic, or dull sound may be elicited by percussion; whether eruptions (roseola) exist.

§ 140. **Upper Border of Fluids.**—When fluctuation is present the upper border of the fluid should be accurately determined while the patient is lying on his back, on the side, and while sitting and standing, and whether the fluid changes its location with the change of position of the patient.

§ 141. **Difference between the Phenomena of Ascites and Ovarian Dropsy.**—It should be determined, in women, whether dulness on percussion and fluctuation is due to a collection of fluid in the general peritoneal cavity or to ovarian dropsy. In ascites the enlargement of the abdomen is uniform and general from the beginning, while in ovarian dropsy the patient generally says that she has noticed that the enlargement began in one or both iliac fossæ.

In ascites the upper border of the fluid is altered in different positions of the body. In the dorsal position, if the quantity of fluid is not very great, a dull sound is elicited on percussion only on the sides and lower portion of the abdomen. The percussion dulness is bounded by a line whose concavity is upwards, above which a resonant tympanitic sound may be elicited. If the quantity of fluid is so great that it compresses or covers all the intestines a dull sound will be elicited all over.

In ovarian dropsy the dull percussion sound is limited to the neighborhood of the ovarian regions, alters its

location but little, or not at all, on changing the position of the body, and is bounded by a convex line. As soon as the swollen ovary has approached the surface, the dull percussion sound and fluctuation are observed to be limited to a certain portion of the abdomen. In ascites the fluid seeks the lowest level of the abdominal cavity.

§ 142. **Position of the Liver.**—The liver lies principally in the right hypochondrium, its left lobe reaching into the left hypochondrium, and approaching more or less near to the spleen. Over its greater portion a dull percussion sound is elicited, which, however, is replaced by a muffled tympanic sound in those positions where the colon or stomach, which contain air, lie beneath it (at its lower border and under its left lobe). The dull liver sound reaches along the right nipple-line from the lower border of the sixth rib to the lower border of the thorax, and is bounded below by the tympanic sound of the intestines, above by the non-tympanic lung sound. Along the sternal line the upper dull and lower and to the left muffled tympanic liver sound reaches about $2\frac{1}{2}$ cm. below the scrobiculum cordis and about 2 cm. to the left. In the right lower axillary region the dull liver sound reaches from the neighborhood of the seventh rib (bounded by the non-tympanic lung sound) to the lower border of the thorax (bounded by the tympanic sound of the intestines). Posteriorly, along a line drawn downwards from the inferior angle of the scapula, the dull liver sound reaches from the ninth or tenth rib of the right side to a little below the twelfth rib, and is replaced by the dull percussion sound of the right kidney. At the upper portion of the

liver the perfectly dull percussion sound can only be elicited where it lies close to the ribs, and very gradually passes over into the resonant, non-tympanitic lung sound in the situation where the lower lobe of the lung overlaps that portion of the liver which does not lie closely against the ribs. This space is about 2 to 4 centimeters wide.

§ 143. **Examination of the Liver.**—It should be kept in mind that the lower border of the liver may reach down lower than normally (hypertrophy), as well as that the liver may be depressed (by right-sided emphysema, pleuritis, pneumothorax), and pushed up (by exudations in the peritoneal cavity, distention of the intestines by gases, tumors), and drawn upwards (in consequence of atrophy of the right lung). It should be observed whether the right hypochondrium and the epigastrium present a marked bulging (hypertrophy or cancer of the liver, echinococcus), or not; whether the hepatic region is or was painful; whether pains are or were present in the right shoulder. While the abdominal parietes are relaxed by the patient flexing his thighs on the abdomen, it should be ascertained, by palpating with the fingers of both hands, whether the liver projects below the lower border of the thorax; whether its border may be caught between the fingers, and whether it is sharply defined, smooth, rounded; whether the surface of the liver is smooth or feels uneven or nodulous; whether fluctuation or the peculiar sensation produced by hydatids are present (hepatic abscesses and cysts); whether the gall-bladder or an echinococcus cyst may be

felt through the abdominal parietes; whether the liver has a transverse furrow (in women).

In very thin persons when the abdominal parietes are relaxed, the free border of the liver may be grasped by the fingers, and not only the gall-bladder but also gall-stones, if present, may be felt. When a circumscribed swelling of the liver is present it should be ascertained whether pulsation may be felt.

When a pleuritic exudation has occurred on the right side, the liver may appear to be enlarged; it should, in that case, be taken into consideration whether the upper border of percussion dulness descends on taking a deep inspiration and depressing the diaphragm, and rises again on expiring (in pleuritic exudation the upper border of percussion dulness remains the same during inspiration and expiration because the diaphragm does not alter its position). If, in connection with a normal position of the lower border of the liver, the dull percussion sound extends higher than normally, it indicates a diminution in the size of the thoracic cavity, because in hypertrophy of the liver the lower border generally extends farther downwards.

It should be investigated whether the dull percussion sound may be elicited lower down than the normal position of the lower border of the liver, and whether it is bounded by a line whose convexity is downwards (echinococcus cyst on the lower border of the liver; distended gall-bladder on the outer border of the rectus abdominis muscle); whether the dull liver sound is entirely absent (in a forcing of the liver away from the abdominal parietes by gases in the abdominal cavity-after perforation of the intestines), or whether the area of percussion dulness

is smaller than normally (when the colon is distended by gases and is lying anterior to the liver, and when the liver has receded from the abdominal parietes).

Auscultation of the liver generally yields negative results; sounds transmitted from the lungs, stomach, or intestines may frequently be heard, while friction sounds are occasionally heard in consequence of exudation upon its peritoneal covering, and a rattling sound is sometimes heard when gall-stones are present. When pulsation is felt over the left lobe of the liver, which is transmitted from the aorta or an aneurism, their characteristic sounds will be heard.

§ 144. **Position of the Stomach.**—The greater curvature of the stomach is found in the left hypochondrium and the pyloric opening in the epigastrium. It begins above, at the sixth or seventh left rib, and is bounded above, along the nipple-line, by the non-tympanitic lung sound, along the sternal and both parasternal lines to the right and above by the liver sound, below by the transverse colon, and to the left by the left anterior axillary line. Percussion sound: tympanitic.

§ 145. **Examination of the Stomach.**—It should be asked whether the patient has been fasting or has just eaten. The left hypochondrium and the epigastrium should be inspected, and it should be determined whether the latter is bulging over its whole area or only in circumscribed localities, or whether it is sunken or flat; whether, when it is bulging, a wave-like or distinct pulsating movement may be felt. The epigastrium and left hypochondrium should be carefully percussed with short, not

too powerful strokes, to determine the outlines of the stomach. In certain diseases of the stomach it will be found to be very much distended. It should be investigated whether a circumscribed dulness may be detected over the stomach. The auscultation of the stomach yields mostly negative results, although in consequence of the normal movements of the stomach, in connection with pressure or succussion, metallic tinkling or amphoric echo and splashing or gurgling sounds may be heard.

§ 146. **Palpation of the Stomach.**—The hand should be laid upon the epigastrium, and a gentle, gradually increasing pressure exerted according to the sensitiveness of the patient; it should be ascertained whether pain or nausea is produced by it, or if previously present, whether they are aggravated. It should be determined whether hysterical or imaginary pain is present, which is already complained of before touching the patient, or at the first gentle pressure, but disappears on continued pressure, or whether pain is present which actually increases on pressure (colicky pains are exceptions). It should be observed whether a pulsating movement may be recognized by the palpating hand, and whether it is indistinct and diffused, or is distinct and transmitted from the heart or abdominal aorta.

§ 147. **Palpation of the Stomach when the Abdominal Walls are Relaxed.**—While the abdominal walls are relaxed by flexing the thighs upon the abdomen, and the patient is in the dorsal position, the whole periphery of the stomach should be examined by the fingers of both hands, and pressing with considerable force from

its cardiac to its pyloric extremity, along the greater and lesser curvature and between the two. It should be noticed whether one or more parts are painful; whether its surface is uneven or nodular, or whether a larger swelling is present. If a part is found which is dull on percussion or pulsating, its position, area, degree of hardness, softness, movability, as well as, when possible, whether the swelling is in, on, in front of, or behind the stomach, should be determined. If the swelling pulsates, it should be ascertained whether it may be pushed away from its original location, and whether it then loses its pulsation; whether the pulsation is transmitted from some artery or is inherent; whether one or two sounds may be heard by means of the stethoscope; whether the phenomena elicited by percussion and auscultation disappear when the patient assumes a more or less upright position.

§ 148. **Palpation of the Pylorus.**—The palpation of the pylorus, by the fingers, is accomplished about $5\frac{1}{2}$ centimeters above the umbilicus and a little to the right. It should be ascertained whether a more or less hard, circumscribed swelling may be felt there. If a swelling is located in a deeply situated portion of the pylorus, its discovery will be extremely difficult, because it will evade the fingers on making pressure. The following method will then be found most efficacious: After having given the patient a powerful purgative the evening before, he is placed on his back, with his right side next to the edge of the bed, his thighs flexed on the abdomen to relax the abdominal parietes as much as possible, the palm of the left hand is then

laid on his right lumbar region and moderate pressure forwards made with the fingers of that hand; while supporting the abdomen thus the fingers of the right hand may be employed to palpate the pylorus anteriorly. In this way a swelling, if present, may be easily detected, and its dimensions, hardness, adhesions, etc., accurately determined.

§ 149. **Examination of the Intestines.**—For examining the intestinal canal in the various regions of the abdomen, palpation, percussion, and auscultation are made use of. The end of the ileum and cœcum, in the right iliac fossa, require a very careful examination in certain diseases (typhus, tuberculosis, perityphlitis, foreign bodies, ulceration of the vermiform process).

§ 150. **Palpation of the Intestines.**—It should be investigated whether a certain region is hot, painful, or becoming so on pressure, reddened, swollen, or flat; whether hard fœcal masses are present, or whether an emphysematous condition or crepitation exists. It should be determined whether a greater or less amount of œdema is present; whether the region has a doughy or soft feel; whether its percussion sound is more or less tympanitic, or if, on the contrary, only in the centre of the region a tympanitic sound may be elicited while the surrounding portions give forth a more or less dull sound. It should be investigated whether, on producing an alternating pressure by several fingers, a peculiar gurgling sound (ileo-cœcal gurgling), is observed. This gurgling sound may also be heard on auscultating if an alternating pressure is exerted by the lower end of the stethoscope.

§ 151. **Palpation and Percussion of the Colon.**—

It should be ascertained whether the colon may be traced throughout its course; whether fæcal accumulations are found in it, especially in the left iliac fossa where the sigmoid flexure lies, as well as whether it is painful in any portion of its course, and whether a tympanitic or dull sound may be elicited by percussion. The rectum must also be examined by means of a bougie, or oiled finger, as to whether any stricture or dilatation is present.

§ 152. **Examination of the Anus.**—The anus should be inspected, and the patient told to bear down as much as possible to determine whether a fissure, ulceration, abscess, or prolapsus of the mucous membrane of the rectum is present; whether hæmorrhoidal swellings, condylomata, polypoid excrescences, fistulæ, cicatrices, cancer, or worms may be found. It should be investigated whether urging to stool, itching, obstinate constipation, or diarrhœa, or involuntary passages are present, and whether blood, mucus, or pus passes with the stools, and what is their shape.

§ 153. **Position of the Spleen.**—The position of the spleen has only lately been determined with accuracy. It lies behind the stomach, and does not reach as far forward as the region of the fundus of the stomach, or only a small portion reaches that far forward. The average length of the spleen is $12\frac{1}{2}$ centimeters, its width $7\frac{1}{2}$ centimeters. The spleen is so placed that its breadth occupies the interspace between the upper border of the ninth and the lower border of the eleventh left rib, its upper and lower borders accurately following the curvature of

the ribs, consequently passing obliquely forwards and downwards from above and behind. The anterior border of the spleen corresponds to a vertical line $14\frac{1}{2}$ centimeters from the vertebral column; its location is sometimes, however, hard to determine when the left side of the concavity of the diaphragm contains the splenic flexure of the colon filled with fæces, which has insinuated itself, wedge-like, between the stomach and spleen. The dull splenic sound is bounded above by the resonant, non-tympanic lung sound, below by the resonant, clear sound of the intestines, and in front by the muffled tympanic sound of the stomach. The posterior border of the spleen cannot be determined at all by percussion. The apparent size of the spleen, determined by percussion, is smaller than its real size.

§ 154. **Examination of the Spleen.**—In order to percuss the spleen it is best to place the patient on his right side, and its upper border should first be determined, then its lower, and, finally, its anterior border. By this method, an enlargement of the organ anteriorly and below (intermittent fever, typhus, leucocythæmia, carcinoma, echinococcus), may be demonstrated. When the spleen is considerably enlarged it may entirely occupy the left half of the abdomen, and extend as low as the left iliac fossa, but the enlargement will always have its starting-point in the left hypochondrium. The varying positions of the patient will not influence the results of the examination.

It must, however, be constantly kept in mind that when the area of percussion dulness in the splenic region is increased, it may be due to a pleuritic exudation, to

an hypertrophy of the left lobe of the liver, to a full stomach, to the position of the colon, to an encysted peritoneal exudation, or to hypertrophy of the kidney.

In addition to percussion, palpation of the spleen should also be employed. For this purpose the patient is told to bend toward the left side, and the fingers are pushed under the ribs while the patient is taking as deep an inspiration as he can; the enlarged spleen may, in this way, occasionally be felt. It does not follow that the spleen is enlarged if it may be felt by this method; it may be dislocated in consequence of curvature of the spine, or of relaxation of the splenic ligaments (movable spleen).

Auscultation yields negative results.

§ 155. **Position of the Pancreas.**—The pancreas is placed transversely across the lower portion of the epigastrium, beginning on the right side in the concavity of the duodenum, passing towards the left in front of the abdominal aorta and inferior vena cava and behind the stomach, and reaches into the splenic region with its left end.

§ 156. **Examination of the Pancreas.**—It is not possible to examine the pancreas by percussion; it may, at most, be detected by palpation with the finger-tips when it is enlarged (cancer, abscess). A pulsation in the region of the pancreas is due to the abdominal aorta or to an aneurism, and in that case their characteristic sounds may be heard by auscultation.

§ 157. **Position and Examination of the Kidneys.**—The kidneys are placed on each side of the first to the

third lumbar vertebræ in the lumbar region. Their boundaries above and below can never be determined with certainty by percussion, as their dull percussion sound is bounded by that of the liver, spleen, spinal column, and psoas muscles. Anteriorly, however, the boundaries of the kidneys may be determined when the colon gives forth a tympanitic sound; they may also be determined when the kidneys are markedly enlarged (cancer, cysts, echinococcus), or movable, or if the patient is much emaciated. The right kidney is more apt to present an abnormal movability and changes of location. When displaced it would lie below or on the sacro-iliac symphysis, mostly very far forwards, and may be felt through the abdominal parietes being recognized by its beanlike shape.

§ 158. **Position and Examination of the Ureters.**

—The ureters extend from the kidneys to the base of the bladder. They may only be palpated when the abdominal parietes are very thin and on deep pressure. It should be determined whether they are painful either on pressure or without it along their entire length or over a limited extent; whether they are swollen in any place; and whether renal calculi may be felt.

§ 159. **Position and Examination of the Urinary Bladder.**—The bladder lies behind the symphysis pubis and reaches into the hypogastrium only when full. It is only in the latter event that its dimensions and upper boundaries may be determined by percussion (dull sound) and palpation. Palpation of the bladder must not only be accomplished through the abdominal walls, but also by placing one or more fingers in the rectum or vagina.

The catheter should be used in addition, and when a suspicion of the existence of a vesical affection exists, the chemical and microscopic examination of the urine should not be neglected.

In febrile diseases as well as in paralysis of the brain or spine the bladder must be examined daily.

SPECIAL CLINICAL EXAMINATION.

1. *Patients having Symptoms Pointing to a Disease of the Lungs and Pleura.*

§ 160. It should first be determined whether the patient has fever or not.

§ 161. **Acute Thoracic Diseases.**—The lung diseases which are accompanied by fever are bronchitis, pneumonia, pleuro-pneumonia, tuberculosis, pleuritis, empyema, pneumothorax, and gangrene of the lungs.

§ 162. **Chronic Thoracic Diseases.**—The lung diseases which are occasionally but not constantly accompanied by fever are chronic bronchitis, asthma, bronchiectasia, emphysema, chronic pulmonary tuberculosis, empyema, hydrothorax, cancer of the lungs, pleura, or mediastinum, and acephalocysts.

§ 163. **Method of Making a Diagnosis.**—In patients who are suffering from a thoracic disease accompanied by fever, what has previously been said in regard to respiration, expectoration, etc., should first be taken into account, and then the thorax should be examined by means of inspection, percussion, and auscultation. In this way the diagnosis of most of the lung diseases may be determined. Their principal symptoms, which may be elicited by physical examination, will briefly be given in the following pages :

§ 164. **Bronchitis.**—Percussion: normal. Auscultation: in the beginning whistling and humming. Harsh expiratory murmur; later, large bubbling râles. In capillary bronchitis, small bubbling râles. Vesicular murmur, weak or absent. Expectoration: in the beginning scanty, foamy; later copious, jelly-like, transparent, yellowish. In chronic bronchitis: thick, tough, mucopurulent, containing some air-bubbles. Temperature: elevated, rarely exceeding 39° C.

§ 165. **Pneumonia.**—Inspection: the diseased side, on which the patient mostly lies, is less movable. Palpation: vocal fremitus increased over the condensed portions of the lung. Percussion: in the first stage resonant tympanitic; later (hepatization), muffled and dull sound, increased resistance. Auscultation: in the first stage indistinct breathing and crepitation; later, bronchial breathing and bronchophony; in the beginning of the stage of resolution bronchial râles; later, simple coarse râles, and, finally, small bubbling râles (crepitiatio redux). Expectoration: in the beginning foamy and white, but very tough; later, yellowish, rust-colored, or extremely red; after hepatization has set in small whitish lumps are expectorated, which, on being placed in water, resolve themselves into small, branched fibrinous exudation casts of the smallest bronchi. Temperature: already during the chill 39.5° – 40° C., rising to 40.6° C., with small morning remissions ($.2^{\circ}$ – 1.1° C.) and evening exacerbations. Frequently a sudden descent to the normal.

§ 166. **Chronic Pulmonary Tuberculosis.**—In the first stage of tuberculosis, the percussion sound is not

altered, later it becomes tympanitic, and when the consolidation of the parenchyma of the lungs has reached the periphery, even dull. An empty cavity close to the thoracic parietes gives forth a metallic sound, and, under certain circumstances, to the cracked-pot sound. Auscultation: in the beginning only negative results. In atrophy and induration of the apices of the lungs: indistinct breathing. In the stage of the prodromal catarrh: harsh inspiratory and prolonged expiratory murmur, later small bubbling râles. In disseminated infiltration: harsh inspiratory murmur, or jerking respiration, or small bubbling râles. In localized infiltration, under certain circumstances, bronchial breathing, bronchial râles, bronchophony, increased vocal fremitus. When cavities are present: small and large bubbling metallic râles, amphoric respiration, metallic tinkling. Expectoration: not characteristic in the beginning, later the branched, sharply-defined elastic bronchial casts. Hæmoptysis is quite frequent. After the formation of cavities: roundish, globular, opaque, purulent or muco-purulent sputa, containing elastic fibres and irregular-angled granules.

§ 167. **Pneumothorax.**—Inspection: distention, and impaired motion of the affected side of the thorax. Intercostal spaces bulging. Percussion: tympanitic or muffled percussion sound with a metallic echo (heard best by placing the ear against the affected side of the thorax while forcible percussion is being made). If exudation is present, dull sound over the lower portion of the lungs, changing its location as the patient assumes different positions. Auscultation: never vesicular murmur; frequently amphoric respiration, with metallic râles on coughing. Weakened

vocal fremitus. Succussion, -if exudation is present: splashing sound with amphoric resonance. Impulse of the heart not felt in the normal position.

§ 168. **Emphysema.** — Inspection: barrel-shaped thorax. Difficult elevation of the thorax, like a cuirass. Percussion: resonant or, in parts, tympanitic sound (on the right side anteriorly to the seventh or eighth ribs, posteriorly to the tenth or twelfth ribs). More or less marked disappearance of the dull heart sound. Auscultation: weakened, often scarcely audible inspiratory murmur; generally prolonged expiration. The small or large bubbling râles are due to the accompanying bronchial catarrh. Expectoration: not characteristic. The sputa will vary according to the greater or less severity of the accompanying bronchial catarrh.

§ 169. **Pleuritis.**—During the first or dry stage of pleurisy there are no characteristic physical signs. When a watery exudation has taken place into the pleural cavity: Inspection: filling-up of the intercostal spaces; distention of the affected side of the thorax; diminution, or suspension of its movements during respiration. Percussion: dull sound, reaching highest along the spinal column and descending to the ordinary level of the fluid anteriorly in a wavy line, which generally does not alter its location when the patient changes his position. Above the upper border of the exudation a tympanitic sound. Lower position of the diaphragm and consequently of the liver. Displacement of the heart to the left when the exudation is on the right side, and to the right when it is on the left side. Auscultation: weakened, indis-

tinct or absent respiratory murmur over the site of the exudation. Between the lower ends of the scapulae bronchial breathing and bronchophony. Friction sounds only seldom in the beginning; they first appear later in the course of the disease. Vocal fremitus weakened or absent.

§ 170. **Hydrothorax.**—Seldom occurs alone, generally in connection with other accumulations of fluid simultaneously in both halves of the thorax. It has the same physical signs as the watery pleuritic exudation, except that the intercostal spaces are not bulging, as the intercostal muscles are not paralyzed. Dyspnoea. Enlargement of the thorax. Percussion sound dull, reaching to the same height anteriorly and posteriorly, altering its location with changes in the position of the patient. Respiration: weak, indistinct respiratory murmurs; when the lungs are markedly compressed, bronchial breathing alongside of the spinal column.

2. *Patients having Symptoms pointing to a Disease of the Heart and Great Vessels.*

§ 171. It should first be determined whether the patient has fever or not.

§ 172. **Febrile Heart Diseases.**—The diseases of the heart and great vessels which are accompanied by fever are acute pericarditis, acute myocarditis, endocarditis.

§ 173. **Afebrile Heart Diseases.**—The diseases of the heart and great vessels which are not accompanied

by fever are: adhesions between the heart and pericardium, hydropericardium, tuberculosis, and carcinoma of the pericardium; chronic myocarditis, hypertrophy, atrophy, rupture, and fatty degeneration of the heart; valvular diseases; nervous palpitation; angina pectoris; morbus Basedowii; aneurisms, and atheroma of the arteries.

§ 174. **Method of Making a Diagnosis.**—In diseases of the heart and great vessels only the results of physical diagnosis are of real diagnostic value, as is also the case in lung diseases. Everything pertinent to this subject has previously been mentioned in §§ 29–36, 50–59, 107, 129, and 130. Bearing in mind what has there been given, the principal diseases of the heart and great vessels will now be treated of.

§ 175. **Acute Pericarditis.**—Inspection: jugular veins distended. The area over which the impulse of the heart may be observed is increased in size and the impulse is stronger; later, if copious exudation has occurred, the impulse is indistinct, weak, or even absent; if the exudation is very great the cardiac region is bulging. Percussion: in the beginning, negative results; later, if the exudation is copious, the area of percussion dulness is increased in length and breadth (triangular with the base downwards). Auscultation: superficial friction sounds, increased on pressure by the stethoscope, not synchronous with the heart sounds. Heart sounds weak, even disappearing entirely, on bending forwards becoming more distinct. Other results: compression of the left lung, dyspnœa, singultus, cyanosis.

§ 176. **Acute Myocarditis.**—The diagnosis is made by exclusion. It is probably present when, in connection with high fever and constriction in the cardiac region and irregular pulse, no symptoms of endocarditis or pericarditis are discoverable. As a rule, however, both the latter diseases are also present.

§ 177. **Acute Endocarditis.**—Inspection: impulse stronger, and the area over which it may be observed increased in size. Palpation: pulse small and soft. Percussion: increase in the size of the area of percussion dulness in consequence of dilatation of the right heart. Auscultation: when the mitral valve is affected, a systolic murmur heard at the apex of the heart. In roughening of the auricular surface of the mitral valve, a diastolic friction sound heard at the apex, masking the second aortic sound. The second sound of the pulmonary artery very loud and sharp. It can only be recognized with certainty by the resulting valvular lesions (mitral or aortic insufficiency or stenosis; *vide* later).

§ 178. **Hydropericardium.**—Palpation: indistinct or absent impulse (if hypertrophy is not present). Percussion: shape and extent of the area of percussion dulness as in pericardial exudation. Auscultation: heart sounds weak, even disappearing. No friction sounds.

§ 179. **Chronic Myocarditis.**—No characteristic phenomena. The diagnosis is probable when, in connection with absence of cardiac murmurs and weak heart sounds, an increase in the area of percussion dulness exists, which cannot be satisfactorily explained by the supposition that

emphysema of the lungs or a pericardial effusion is present, and if, in addition, the phenomena of insufficient contractile power of the heart appear at the same time (Friedreich).

§ 180. **Hypertrophy of the Heart.**—

a. *Eccentric Hypertrophy of the Left Heart* (simple dilatation without hypertrophy is rare).—Visible pulsation of the carotids; systolic sound audible in the larger arteries. Impulse stronger, and may be seen and felt in the 1st–3d intercostal spaces, and lower than normally. Area of percussion dulness increased in size in the long axis of the heart. Heart sounds louder in the left ventricle, and the systolic sound sometimes having a metallic timbre.

b. *Eccentric Hypertrophy of the Right Heart.*—Stronger impulse, which may be felt more to the right. Area of percussion dulness increased in size. Heart sounds louder in the right ventricle.

§ 181. **Atrophy of the Heart.**—Inspection: weak or not visible impulse. Palpation: small pulse. Percussion: area of percussion dulness diminished in size. Auscultation: no symptoms or weak or dull heart sounds. Other phenomena: dyspnœa, dropsy.

§ 182. **Fatty Degeneration of the Heart.**—Palpation: small, soft, frequently very slow pulse. Inspection: weak cardiac impulse. Auscultation: weak heart sounds, especially the first, systolic, sound.

§ 183. **Valvular Diseases of the Heart.**—In valvular diseases of the heart, the following should be taken into consideration:

Primary valvular lesions occur almost exclusively in the left, almost never in the right half of the heart. In the right heart the tricuspid valve is the only one which becomes affected, as a rule, and this is mostly secondary, in consequence of valvular lesions in the left heart. Lesions of the valves of the pulmonary artery occur only extremely seldom.

In lesions of the mitral and aortic valves experience has taught that:

A murmur increasing in intensity from the apex of the heart vertically upwards, loudest over the mitral valve, but not audible over the pulmonary artery, indicates a lesion of the mitral valve.

A murmur audible over the apex of the heart, becoming louder near its base and audible over the aorta, as well as at the scrobiculum cordis, indicates a lesion of the aortic valves.

1. *Lesions of the Mitral Valve.*

a. *Insufficiency.*—Systolic murmur most distinct over the apex of the heart. The second sound over the pulmonary artery and the second sound heard in the ventricle are louder; aortic sounds weak. Pulse small. Area of percussion dulness increased in breadth in consequence of a compensating dilatation of the right heart. The impulse of the heart is stronger, and is observable over a greater area; it may even be felt to the left of the left nipple-line.

b. *Stenosis of the Left Ostium Venosum* (seldom occurring alone, mostly in connection with insufficiency of the mitral valve).—Diastolic murmur in the left ventricle. Second sound over the pulmonary

artery very loud ; first sound over the aorta very weak. Area of percussion dulness increased in breadth. Impulse of the heart moderately strong and the area over which it may be felt extended more to the right ; occasionally a slight purring sensation may be felt during the diastole.

c. *Stenosis with Insufficiency.*—Systolic and diastolic murmur in the left ventricle. Increased loudness of the second sound over the pulmonary artery ; the second sound over the aorta weak. Impulse of the heart and area of percussion dulness as in insufficiency, but the area of percussion dulness is larger. Pulse small.

2. *Lesions of the Aortic Valves.*

a. *Insufficiency.*—Diastolic murmur in the left ventricle and in the aorta. In the carotids only a sound or murmur is audible in place of the second sound. Impulse of the heart felt lower down, more to the left, diffused and undulating. Area of percussion dulness increased in size in the long axis of the heart. Pulse full, hard, jerking. In the medium-sized arteries (radial, dorsalis pedis, superficial palmar arch) a distinct sound may be heard.

b. *Stenosis of the Ostium Aorticum.*—Systolic murmur in the left ventricle and in the aorta. Second sound over the aorta weak. Impulse of the heart but little stronger and but little diffused. Area of percussion dulness moderately enlarged in length and breadth. Pulse very small.

c. *Insufficiency and Stenosis.*—Systolic and diastolic murmur in the left ventricle and in the aorta ; the

sound produced by the mitral valve is occasionally heard in addition.

3. *Lesions of the Tricuspid Valve* (rare only in connection with insufficiency of the mitral valve).

a. *Insufficiency*.—Systolic murmur over the sternum between the two cartilages of the fifth ribs, extending towards the right side. Generally or only occasionally increased loudness of the second sound over the pulmonary artery. Pulsation of the cervical veins.

b. *Stenosis of the Right Ostium Venosum* (seldom occurs alone, generally only in connection with insufficiency of the tricuspid valve).—Diastolic murmur in the right ventricle. The heart-sounds over the pulmonary artery weak. Jugular veins distended, but not pulsating.

4. *Lesions of the Valves of the Pulmonary Artery* (extremely rare).

a. *Insufficiency*.—Diastolic murmur at the left border of the sternum, between the second and third ribs. Area of percussion dulness only slightly increased in size, especially enlarged towards the right side. Impulse of the heart felt at its normal position. Jugular veins distended and tense.

b. *Stenosis of the Ostium of the Pulmonary Artery*.—Very loud systolic murmur at the left border of the sternum, between the second and third ribs, diminishing in intensity above to the right and below; a sensation like that produced by the purring of a cat may mostly be felt in the same place. Area of percussion dulness enlarged towards the right.

Increase in the contractile power of the heart, with indistinct impulse.

§ 184. **Aneurism of the Aorta.**—When the aneurism has attained a certain size, and has approached the anterior or posterior thoracic parietes lying to the left of the vertebral column, there is circumscribed dulness anteriorly at the right border of the sternum at the level of the second and third ribs; or when it is situated on the left side of the ascending portion of the arch of the aorta, along the left border of the sternum; or in aneurism of the descending portion of the arch of the aorta, at the inferior angle of the scapula, generally in the neighborhood of the eighth or tenth ribs. In the same locations a slight systolic trembling, cat's purr, may be seen and felt. In auscultating an aneurism of the ascending portion of the arch of the aorta, either a double sound or a systolic, and often, in addition, a diastolic murmur, bellows murmur, is heard. The radial pulse is no longer synchronous with the systole, but occurs after it.

3. *Patients having Symptoms pointing to a Disease of one of the Abdominal Organs.*

§ 185. (a.) **Diseases of the Stomach.**—The principal diseases of the stomach are acute gastric catarrh, chronic catarrh, perforating ulcer, cancer, pyloric stenosis, and perforation of the stomach.

§ 186. **Acute Gastric Catarrh.**—Lassitude, headache, slight fever, loss of appetite, sour eructations, bitter taste, nausea, vomiting, diarrhœa, or constipation. Coated

tongue; distention of the gastric region, which is painful on pressure; urates in great quantity in the urine.

§ 187. **Chronic Gastric Catarrh.**—Alternation of loss of appetite and greatly increased appetite, eructation, pyrosis, pain on pressure in the region of the stomach, distention of the stomach during digestion; frequently vomiting of mucus in the morning.

§ 188. **Perforating Ulcer of the Stomach.**—Circumscribed severe pain in the region of the pylorus, especially after meals; vomiting of blood (*hæmatemesis*), mucus, and food some hours after a meal; and, in addition, the symptoms of acute gastric catarrh.

§ 189. **Cancer of the Stomach** (*scirrhus, carcinoma medullare*).—Stitching pains, radiating towards the vertebral column; disturbance of appetite; vomiting of chocolate-colored or coffee-groundslike matters two or three hours after a meal; generally constipation; dry, harsh, yellowish-gray skin. Hard, irregularly round indurations may be detected, although not always, in the region of the pylorus.

§ 190. (*b.*) **Diseases of the Intestinal Canal.**—The principal diseases of the intestinal canal are acute and chronic catarrh of the small intestines, perforating ulcer of the duodenum, acute and chronic catarrh of the colon, typhlitis and perityphlitis, cancer of the rectum, invagination of the intestines, twisting of the intestines on their long axis (*volvulus*), parasites of the intestinal canal (*ascarides, oxyuris, tænia*).

§ 191. **Catarrh of the Small Intestines of Adults.**—Fever, headache, restless sleep; griping and other pains in the abdomen, either constant or only before or during stool; tympanitic distention of the abdomen, rolling of wind, diarrhoea (papescent, watery, light-colored stools, containing epithelium, mucus, undigested food); urine diminished; in summer it is frequently accompanied by vomiting, cramps in the calves of the legs, rapid collapse (cholera æstiva). In little children, diarrhoea and vomiting, very great distension and sensitiveness of the abdomen; frequently collapse and convulsions set in very rapidly.

§ 192. **Chronic Catarrh of the Small Intestines.**—No fever; at times long-continued diarrhoea, at others constipation, with painful tympanitis; loss of appetite; disturbances in nutrition.

§ 193. **Perforating Ulcer of the Duodenum.**—The same symptoms as in round ulcer of the stomach; the pains, which are periodical and set in some hours after eating, are located more to the right.

§ 194. **Typhlitis and Perityphlitis.**—High fever, great pain in the ileo-cæcal region, aggravated by pressure; swelling in the ileo-cæcal region following the course of the ascending colon; obstinate constipation. In psoas abscess the swelling is deeper and the right thigh has its motion impaired.

§ 195. **Proctitis and Periproctitis.**—Pains in the abdomen, burning in the rectum, tenesmus, almost always

constipation ; painful voiding of scybala, which are often covered with bloody mucus. In proctitis an examination of the affected region reveals a hard, diffused swelling lying in immediate contact with the rectum.

§ 196. **Cancer of the Rectum** (scirrhus, carcinoma medullare and alveolare).—Constipation ; discharge of narrow, formed faecal masses, and of cancerous masses ; irregular, uneven swelling ; stricture close above the sphincter ; pains ; hæmorrhages ; distention of the veins at the anus.

§ 197. **Incarceration, Volvulus, Invagination, and Twisting of the Intestine on its Long Axis.**—Constipation, distention of the upper portion of the intestinal canal, painful swelling, colicky pains, eructation, vomiting, stercoraceous vomiting (ileus).

§ 198. **Entozoa.**—The principal entozoa which are found in the intestinal canal are the *tape-worms* (cestoidea) *tænia solium*, *tænia mediocanellata*, and *tænia lata* or *bothriocephalus latus* ; as well as the *round worms* (nematodea), *ascaris lumbricoides* (round worm), and *oxyuris vermicularis* (thread worm). They do not produce any special diseases, but only undefined, mostly slight symptoms of the stomach, intestinal canal, or nervous system ; very frequently, however, they do not give rise to any symptoms, so that the attempt to diagnose their presence from certain symptoms is very unsatisfactory.

The *tape-worms* are generally present singly and inhabit the small intestines. They betray their presence by the passage of mature segments (proglottides) with

the fæces, and also (*tænia mediocanellata*) in the intervals between the stools.

The *ascarides*, which occur in colonies, also inhabit the small intestines and are voided at stool. They occasionally migrate upwards into the ductus choledochus (icterus), into the stomach, and, in rare cases, into the cavity of the mouth.

The *oxyuris* is found in great numbers in the descending colon and in the rectum as far as the anus; its presence in the lower portion of the rectum often occasions violent itching at the anus, which may be followed by general nervous symptoms (itching in the nose), and which point with considerable certainty to the presence of the oxyuris if no hæmorrhoidal trouble exists. These parasites are not only voided with the stool but migrate from their original seat; they may even go into the vagina (leucorrhœa of little girls).

§ 199. (c.) **Diseases of the Liver.**—The principal diseases of the liver and of the gall-ducts are: hyperæmia, inflammation, colloid and fatty degeneration, cancer and echinococcus of the liver; inflammation of the portal vein, icterus, catarrh of the gall-ducts and biliary calculi.

§ 200. **General Interstitial Fibrous Hepatitis** (cirrhosis of the liver, granulated liver).—Occurring mostly in consequence of alcoholism, is almost always a chronic disease, in which the liver mostly becomes enlarged in the beginning and later diminished in size, and indurated in consequence of atrophy of the interstitial connective tissue. It begins with undefined gastric symptoms, flat-

ulence, constipation, and pressure in the hepatic region. When atrophy sets in there are: sallow complexion, not seldom icterus, general emaciation, diarrhœa. Physical signs: enlargement of the spleen, ascites, atrophy, and consequently absence of the indurated left lobe of the liver.

§ 201. **Suppurative Hepatitis** (hepatic abscess).—Hepatitis due to traumatism is characterized by fever, pain, and swelling of the liver and icterus. If it supervenes upon chronic ulcerations of the intestines, the above-mentioned symptoms are preceded by violent chills. If an abscess forms, a dull pain sets in, which often radiates into the right shoulder; it is aggravated by pressure. When the abscess approaches the surface a fluctuating swelling will be felt; icterus is almost always present at the same time, but swelling of the spleen not always.

§ 202. **Acute Yellow Atrophy of the Liver.**—It occasionally sets in suddenly, at times it is preceded by prodromal symptoms (gastric derangements, slight icterus); to which are added vomiting (of slimy masses, of blood), pressure, and sensitiveness in the right hypochondrium or in the præcordial region, then sooner or later delirium, with great restlessness or sudden loss of consciousness; frequently general spasms, high fever, with greatly accelerated pulse, sooty coating of the tongue; constipation, clay-colored or tar-colored fæces, and hæmorrhages. At the appearance of the symptoms the liver becomes atrophied very rapidly, while the spleen increases in size; icterus is almost constantly present; the urine is

of an acid reaction, and contains leucin and tyrosin, while the urea and the biliary acids disappear.

§ 203. **Cancer of the Liver** (carcinoma medullare, more seldom scirrhus, still more seldom carcinoma hæmatodes, melanodes, cysticum, alveolare).—In the beginning deranged digestion, constipation, occasionally pressure and fulness in the right hypochondrium, icteric color of the skin and sallow complexion, gradual emaciation, occasional aggravation of the pains in the hepatic region, which radiate into the shoulder and loins; gradual enlargement of the liver, protrusion of the anterior border of the liver, which has a hard and knotted feel, below the ribs. Although icterus and ascites are frequently present, swelling of the spleen is absent.

§ 204. **Fatty Degeneration of the Liver.**—If, in persons who are of a tubercular diathesis, addicted to strong drink, or who lead a dissolute life, a greater or less enlargement of the liver is found, which is soft and smooth to the touch, and whose lower border can be but indistinctly felt, and there is at the same time no considerable pain in the hepatic region, icterus, enlargement of the spleen, or ascites, a diagnosis of fatty degeneration of the liver may be decided upon.

§ 205. **Echinococcus of the Liver** only becomes noticeable when the echinococcus cysts become considerably enlarged, when there are hemispherical swellings on the border of the liver, which are not sensitive to pressure, are tense, elastic, frequently distinctly fluctuating, and giving the peculiar purring feel of hydatids.

§ 206. **Thrombosis of the Portal Vein.**—Seldom any pain in the region of the portal vein, between the umbilicus and the ensiform process; only the symptoms of the primary trouble (cirrhosis, cancer of the liver, chronic peritonitis, cancer of the stomach) are mostly present. If the thrombosis is complete there are: a rapid onset and increase of ascites; enlargement of the spleen, developing more or less rapidly; watery, slimy, bloody diarrhoea; distention of the superficial abdominal veins (*caput Medusæ*). No fever.

§ 207. **Pylephlebitis Suppurativa.**—It is preceded by the symptoms of the diseases which give rise to it (typhlitis, circumscribed peritonitis, inflammation of the spleen, etc.). Pylephlebitis itself begins with a circumscribed pain in the right hypochondrium or in the epigastrium, and occasionally in the cœcal or umbilical region. Atypic chills soon set in with heat (36° – 42.37° C.), and profuse sweat, delirium, somnolence, icterus, and bile-colored urine, enlargement of the liver and spleen (painful before and on pressure); bilious, diarrhœic stools, often mixed with blood.

§ 208. **Hepatogenic Icterus.**—Icterus, which is produced by an occlusion of the gall-ducts and resorption of the bile into the blood, is almost always preceded by gastric derangements (fulness in the stomach, loss of appetite, coated tongue); then the skin and sclerotic become yellow-colored, the urine becomes dark (from a reddish-brown to a blackish-brown), having a green shimmer, forming a yellow foam (rich in cholepyrrhin), and always contains biliary acids; the fæces are mostly clayey, white, hard, lumpy; constipation; temperature

unchanged; pulse very often diminished in frequency; sometimes itching of the skin; seldom xanthopsia. Later, emaciation, prostration, lassitude.

§ 209. **Hæmatogenic Icterus.**—The origin of icterus following violent emotions, poisoning by phosphorus, ether, or chloroform, after snake-bites and in typhus, pyæmia, puerperal fever, yellow fever, and febris recurrens, is not yet clear. It has been supposed that it is due to the formation of bile within the blood itself, and that the biliary acids are absent from the urine.

§ 210. **Biliary Calculi.**—Occasionally only slight troubles; sometimes the calculi may be detected in the gall-bladder by palpation; the passage of gall-stones with the fæces removes all doubts. The impaction of a larger calculus in the ductus cysticus or communis choledochus causes intense, paroxysmal pains, which radiate from the hepatic region into the back, shoulder, and over the abdomen (gallstone colic) and icterus.

§ 211. (*d.*) **Diseases of the Peritoneum.**—The diseases of the peritoneum are peritonitis, ascites, tuberculosis, and carcinoma.

§ 212. **Peritonitis.**—Mostly begins with a chill; intense cutting pains and fever, with considerable elevation of temperature. The pulse is frequently absent in the beginning. Abdomen sensitive to the slightest pressure; patient lies on his back; vomiting; marked tympanitis; dyspnœa; urine scanty and high-colored (red). After exudation has occurred there is dulness on percussion in

the iliac fossæ and pelvic region; constipation, seldom diarrhœa.

§ 213. **Ascites.**—Distention of the abdomen; tensesness of the abdominal parietes; changes in the shape of the abdomen, according to the position of the patient; fluctuation; dull, dead percussion sound over the fluid, which always seeks the lowest level; alteration in the level of the fluid and of the percussion dulness when the patient changes his position; succussion sounds; pushing up of the diaphragm; compression of the lungs and heart; diminution in the quantity of urine; mostly constipation, sometimes diarrhœa.

§ 214. (*e.*) **Diseases of the Spleen.**—The diseases of the spleen are acute enlargement, chronic enlargement, amyloid degeneration, inflammation and hæmorrhagic infarct, atrophy, cancer, tuberculosis, and echinococcus.

§ 215. **Acute Enlargement of the Spleen.**—Pressure in the splenic region; bulging of the left hypochondrium; the smooth, round border, and eventually the round, blunt end of the spleen, may be felt below the lower border of the ribs, descending lower when the patient takes a deep inspiration. Dull percussion sound over a larger area than normal (*vide* §§ 153 and 154).

§ 216. **Chronic Enlargement of the Spleen.**—Considerable enlargement of the spleen, often reaching to the linea alba, its edge thickened and not sensitive. Chronic enlargement is due to

a. Hypertrophia of some or all of the elements

which make up the spleen in heart troubles, malarial cachexia, and leukæmia.

β. In consequence of colloid degeneration (sago spleen) in cachectic persons, carious degeneration of bone, ulcerative pulmonary tuberculosis, ulceration of the skin (syphilitic), and in rachitis, colloid degeneration of the liver and kidneys is frequently present at the same time.

§ 217. (*f.*) **Renal Diseases.**—The diseases of the kidneys are perinephritis, paranephritis, obstructive hyperæmia, hæmorrhage from the kidneys, desquamative nephritis (acute catarrh), parenchymatous nephritis (acute morbus Brightii), chronic morbus Brightii, colloid degeneration, fatty degeneration, suppurative nephritis, carcinoma, tuberculosis, renal cysts and parasites, abnormal movability of the kidneys, renal calculi, Addison's disease.

§ 218. **Obstructive Hyperæmia of the Kidneys.** (In consequence of valvular diseases of the heart, stenosis of the left ostium venosum, emphysema, chronic condensation of the lungs with blood stasis at the right heart.) Pain in the renal region, marked diminution in the quantity of urine with increase of urates. Urine deposits a copious sediment, is high-colored (red), urates abundant. If the pressure of the blood in the capillaries is great the urine contains albumen and fibrinous tube-casts. The dropsy which is present is due to the heart trouble.

§ 219. **Desquamative Nephritis** (in consequence of colds, the internal use of diuretics, renal calculi, in typhus,

scarlatina, cholera).—Fever; pain in the small of the back; sensitiveness of the renal region to pressure; scanty urine of an acid reaction, containing albumen, epithelial casts, frequently also blood-corpuscles and nucleated epithelium, which has not undergone fatty degeneration, floating about in it.

§ 220. **Parenchymatous Nephritis** (in scarlatina and after severe colds).—Shivering, or a regular chill; fever; vomiting; renal region sensitive to pressure; œdematous swelling of the face, and afterwards general anasarca. Urging to urinate; complete or partial retention of urine. Urine contains a considerable quantity of albumen, and is of a deep red color, turbid, depositing a sediment containing hyaline and epithelial casts, isolated epithelial cells and blood-corpuscles. When it passes into chronic morbus Brightii the urine contains epithelium which has undergone fatty degeneration.

§ 221. **Chronic Morbus Brightii** (developing from the acute form, or is latent in the beginning, and first directs attention to its existence by the setting in of dropsy).—Urging to urinate; pain in the renal region on deep pressure; urine increased in quantity, diminished or normal, is light-colored, has a peculiar greenish shimmer, and constantly contains albumen; pale, anæmic color of the face; bloated face; the urine gradually deposits a sediment consisting of pus-globules, blood-corpuscles, hyaline casts and casts made up of minute fat-globules (granular casts); the urine only contains a small quantity of urea; general dropsy. When the disease takes an unfavorable turn, insidious or sudden appear-

ance of uræmic symptoms (stupid expression of the face, drowsiness, headache, vomiting, delirium, coma, convulsions; urine mostly suppressed).

§ 222. **Amyloid Degeneration of the Kidney** (two varieties, diffuse or limited to the Malpighian bodies) occurs in patients who have become cachectic in consequence of severe chronic diseases (pulmonary tuberculosis, long-continued suppuration of bone, syphilis). Albuminuria; dropsy; diarrhœa; the urine deposits a scanty, white sediment, made up of epithelial cells which have undergone fatty degeneration, hyaline and fatty tubercasts, contains a large quantity of albumen, and is deficient in urea and sodium chloride.

§ 223. **Movable Kidney**, and changes in position of the kidney (mostly the right), bean-shaped, movable swelling on or below the sacro-iliac symphysis, which may be replaced into the renal region, frequently disappearing in the dorsal position, and is not sensitive; violent urging to urinate. It may become incarcerated, and produce serious symptoms.

§ 224. **Addison's Disease**.—Its main feature is said to be degeneration of the suprarenal capsules, with involvement of the neighboring solar plexus. Insidious development. Anæmia and abnormal deposit of pigment in the skin (in the beginning a smoky gray, later mulatto-like); impaired nutrition; great lassitude; sometimes gastric derangements, loss of appetite, diarrhœa; frequently transitory headache.

4. *Skin Diseases.*

§ 225. **Acute and Chronic Skin Diseases.**—Skin diseases either run an acute or chronic course. They are, therefore, divided into acute and chronic varieties.

§ 226. **Types.**—According to their type we distinguish the macula, stigma, papula, tuberculum, pomphus, vesicula, bulla, pustula, defurfuratio, and desquamatio.

§ 227. **Acute Contagious Exanthemata.**—The so-called acute exanthemata (scarlatina, measles, roseola, variola, varicella) mostly occur epidemically, are contagious, and are always accompanied by fever (frequently of a very-high grade).

§ 228. **Acute Non-contagious Exanthemata.**—The acute non-contagious exanthemata, which are at times accompanied by fever, at others not, are erythema, erysipelas, urticaria, herpes, and pemphigus.

§ 229. **Chronic Skin Diseases.**—The most common chronic skin diseases are eczema, herpes, psoriasis, impetigo, prurigo, pityriasis, lichen, acne, and lupus.

§ 230. **Further Classification of Skin Diseases.**—Skin diseases (with the exception of scarlatina, measles, and small-pox) may also be classified as follows:

a. Inflammations of the skin, which consist essentially of a reddening of the skin. To these belong

a. Erythema;

β. Erysipelas (which is subdivided into erysipelas fixum, migrans, œdematosum, erythema-

todes, phlyctænodes, bullosum, pustulosum, gangrænosum); and

γ. Roseola.

b. Inflammations of the skin during which conical, elevated *papules* form, which do not develop into anything else (*e. g.*, into pustules), but after remaining for a shorter or longer time undergo a retrograde metamorphosis as such. To this class belong

a. Lichen (scrofulosorum and ruber);

β. Prurigo (simplex and ferox seu agria).

c. Inflammations of the skin during which *blisters* with watery contents (*vesiculæ*), form. To this class belong,

a. Herpes (labialis, præputialis, zoster, iris, circinatus);

β. Eczema (vesiculosum, papulosum, squamosum, impetiginosum, rubrum seu madidans,—capillitii, faciei, mammæ, penis, scroti, extremitatum, marginatum,—medicamentosum [veratrin, oleum crotonis, unguentum hydrargyri cinereum],—artificiale, *i. e.*, having its origin in the occupation of the patient [barbers, confectioners, washerwomen]).

d. Inflammations of the skin during which *larger blisters* (*bullæ*), form. To this class belong,

a. Pemphigus (vulgaris, foliaceus, idiopathicus, symptomaticus, syphiliticus neonatorum);

β. Rupia (simplex, prominens).

e. Inflammations of the skin during which blisters with purulent contents (pustules), form. To this class belong,

a. Impetigo ;

β. Ecthyma (idiopathicum, symptomaticum, cachecticum, syphiliticum).

f. Inflammations of the skin during which lamellæ of *necrosed epidermis* (squamæ), are cast off. To this class belong,

a. Pityriasis (simplex, rubra);

β. Psoriasis (punctata seu guttata, diffusa, annulata, gyrata, scutellata, syphilitica);

γ. Ichthyosis (scutellata, scutulata).

g. Inflammations of the skin during which *wheals* (pomphi), form. To this class belongs,

Urticaria (from external irritation, from certain foods, idiopathic).

h. Apoplexies or hæmorrhages of the skin :

a. Petechiæ ;

β. Vibices ;

γ. Ecchymoses ;

δ. Purpura.

i. Inflammations of the skin during which *tubercles* form ;

a. Lupus (simplex, serpiginosus, tuberosus, exedens, erythematodes) ;

β. Lepra (elephantiasis Græcorum, Spedalskhed) ;

γ. Elephantiasis Arabum.

j. Diseases of the *sebaceous glands* :

a. Increase of the secretion of *smegma* (seborrhœa) ;

β. Diminution of the secretion of the *smegma* (miliun, comedo, acne).

k. Parasitic diseases of the skin (animal and vegetable):

a. Scabies (*acarus scabiei*);

β. Favus or tinea favosa (*achorion seu oïdium Schoenleinii*);

γ. Herpes tonsurans and circinatus; parasitic variety of mentagra or sycosis (tubercular trichomycosis), of eczema marginatum, and of some forms of onychomycosis (*trichophyton tonsurans*);

δ. Area Celsi seu porrigo decalvans seu alopecia circumscripta (*microsporon Audouini*);

ε. Pityriasis versicolor (*microsporon furfur*);

ζ. Erythrasma of the inguinal or axillary region (*microsporon minutissimum* of Burghardt and Bärensprung).

5. *Patients having Symptoms pointing to a Disease of the Brain and its Membranes.*

§ 231. **Diseases of the Brain and its Membranes.**

—The principal diseases of the *brain and its membranes* are inflammation of the *dura mater* (*pachymeningitis*), inflammation of the *pia mater* (*meningitis simplex* or *leptomeningitis*), epidemic cerebro-spinal meningitis, hæmorrhages into the meninges, hyperæmia and anæmia of the brain, œdema of the brain, cerebral or parenchymatous hæmorrhage (apoplexy), encephalitis (softening, abscess, sclerosis), tumors of the brain, atrophy of the brain, embolism and thrombosis of the arteries of the brain, acute and chronic hydrocephalus and thrombosis of the sinuses of the *dura mater*.

Many of the diseases which occur in the cavity of the

skull are extremely hard to diagnose, because only some of them present entirely characteristic symptoms, while the remainder simulate each other.

§ 232. **Acute and Chronic Diseases of the Brain and its Membranes.**—Those diseases which run an *acute* course are the inflammations, hæmorrhages, emboli, anæmiæ, and hyperæmiæ, and œdema. Those which run a *chronic* course are the varieties of encephalitis and brain tumors.

Those which are generally accompanied by fever are the inflammations of the meninges, as well as encephalitis after apoplexy.

§ 233. **Derangements of Function.**—The physical signs of diseases within the cranium are extremely few and exceedingly delicate; the majority of the symptoms are those of derangements of *function*. They are divided, in general, into phenomena of *irritation* and of *depression*; they are, besides, subdivided into sensory, motor, and psychical derangements.

§ 234. **Phenomena of Sensory Irritation:** Head-ache, heaviness of the head, pressure in the forehead and eyes, vertigo, flickering before the eyes, roaring in the ears, sensitiveness to light and sounds, hyperæsthesia of the skin and formication.

§ 235. **Phenomena of Sensory Depression:** Anæsthesiæ of various kinds, impairment or destruction of the sense of sight or of hearing.

§ 236. **Phenomena of Motor Irritation:** Trembling, twitching, contractions of muscles, partial or general spasms, contraction of the pupils, strabismus and nystagmus.

§ 237. **Phenomena of Motor Depression:** Weakness or paralysis of single muscles (especially in the face), or whole groups, drawing of the tongue to one side on protruding it, drawing down of the angles of the mouth, ptosis, diplopia and dilatation of the pupils.

§ 238. **Irritation of the Vagus:** Abnormally slow pulse, vomiting.

§ 239. **Paralysis of the Vagus:** Galloping pulse; slow, impaired respiration.

§ 240. **Phenomena of Psychological Irritation:** Sleeplessness, crowding of ideas, hallucinations and delirium.

§ 241. **Phenomena of Psychological Depression:** Indifference, mind benumbed, sopor and coma.

§ 242. **Groups of Disturbances of Function.**—As the various portions of the brain preside over various functions, a conclusion as to the part of the contents of the cranium which is affected, may be drawn from certain groups of derangements of function.

§ 243. **Phenomena presented by Affections of the Convex Surface of the Brain, the Cerebral Ganglia, and the Crura Cerebri.**—The affections of the convex surface of the brain, as a rule, affect the intellect; those

of the cerebral ganglia (thalamus opticus, corpus striatum, and the nucleus lentiformis), and the crura cerebri affect the motor, and sometimes, also, the sensory sphere.

§ 244. **Hemiplegic Affections.**—If an affection is limited to one-half of the cerebrum or to one crus cerebri (*i. e.*, above the decussation of fibres), a derangement of function will take place on the opposite side of the body.

§ 245. **Diseases in the Neighborhood of the Fissure of Sylvius.**—Diseases whose seat is in the neighborhood of the fissure of Sylvius, especially the left, frequently produce, in addition to hemiplegic symptoms, an inability to understand or employ language, numbers, letters, and gestures (aphasia, agraphia, amimia).

§ 246. **Affections of the Base of the Brain.**—The diseases which affect the base of the brain are recognized by affections of the nerves which leave the skull at that point (optic, oculo-motor, abducens, trigeminus, facial, auditory, etc.).

§ 247. **One-sided Brain Diseases.**—If only one-half of the brain is affected the disease usually has its seat on the *same* side of the base of the brain as the nerve whose functions are disturbed.

§ 248. **Disturbances of Function on Both Sides of the Body.**—Motor or sensory disturbances of both halves of the body, when some of the cranial nerves are also involved, indicate an affection of the pons Varolii, the medulla oblongata, or cerebellum.

§ 249. **Local Symptoms** (herdsymptome).—By local symptoms are meant those which point to a certain spot within the cranium as the seat of the affection, in contradistinction to the general head symptoms. They are flickering before the eyes; weakness of sight; loss of sight in one eye; dilatation or contraction of one pupil; roaring in the ears; hardness of hearing; loss of hearing in one ear; circumscribed headache; spasms of one side of the body; paralysis; neuralgia, etc.

In the following paragraphs the symptoms of the principal brain diseases will be given as fully as the scope of this work will permit.

§ 250. **Meningitis of the Convex Surface of the Brain.**—Its presence may be diagnosed by *high fever*; *quick pulse*; *very violent headache*, and other symptoms of sensory irritation; *psychical irritation*; twitchings; contraction of the pupils; vomiting. If the *second stage* sets in there is a continuance of the high fever and headache, accompanied by an *abnormally slow pulse*, *psychical depression*, convulsions, rigidity of the muscles of the nape of the neck, dilatation of the pupils, and especially *disorders of the intellect*.

§ 251. **Meningitis of the Base of the Brain** (tubercular basilar meningitis, acute hydrocephalus).—This disease is found almost entirely in children. The diagnosis is probable if, after an undefined prodromal stage, which may last for weeks, *severe headache*, restless dreams with screaming out, *constipation*, *vomiting*, *contraction of the pupils*, *contraction of the muscles of the nape of the neck*, fever, and accelerated pulse set in. It

is rendered certain if *repeated convulsions*, paralysis, and contraction of the muscles of one side of the body, strabismus, alternating dilatation and contraction of the pupils, disturbances of vision, sensory and psychical depression (sopor, fatuity, grinding the teeth, automatic motions), *slow pulse*, and irregular breathing supervene.

In the last stage, twelve to twenty-four hours before death, the pulse becomes very much accelerated, and, in connection with deep coma, paralysis of the sphincters (of the bladder and rectum) sets in.

§ 252. **Epidemic Cerebro-Spinal Meningitis.** *Vide* § 306.

§ 253. **Cerebral Apoplexy.**—Apoplexy consists of an effusion of blood into the substance of the brain in consequence of the rupture of a degenerated bloodvessel, and is most common in the cerebral hemispheres, seldom in the *crura cerebri*. It is followed by a paralysis of voluntary motion in the extremities; occasionally, also, in the face and tongue on the opposite side to that of the lobe affected (occasionally, also, a paralysis of the sensory nerves on the side paralyzed). In the beginning the effusion of blood, if great, involves the remainder of the brain by pressure, and, after a few days, by the inflammatory reaction of its surroundings. Apoplexy occurs almost entirely in persons of advanced age.

Its *onset* (apoplectischer insult) is marked by loss of consciousness (apoplectic stroke); snoring, irregular breathing, abnormally slow pulse; throbbing (violent pulsation) of the carotids; contraction of the pupils; paralysis of the sphincters, and vomiting, which set

in immediately or after the lapse of a very short time.

In a day or two, when consciousness has reappeared, the characteristic hemiplegia appears, and, in addition, slight psychological depression, disturbances of speech, sensory irritation, twitching or contraction of the paralyzed parts, and some fever.

Still later the characteristic paralysis (sensory and motor) is observed.

§ 254. **Embolism of the Artery of the Fissure of Sylvius.**—By embolism of the artery of the fissure of Sylvius is meant the occlusion of the above-mentioned artery by a clot brought there by the movement of the blood. It is therefore necessary in order that this affection may occur that a clot formation is in progress somewhere between the heart and the artery (heart lesions, aneurism of the aorta or common carotid). Embolism occurs almost without exception in the artery of the left fissure of Sylvius.

The consequence of this occlusion is a sudden setting in of a high grade of anæmia of the greater portion of the cerebral lobes with extensive disturbances of function, *i. e.*, *motor paralysis of the opposite half of the body* and *aphasia* (not paralysis of the tongue), some of which remain for life. Embolism may occur at any age. It is present if in a person who has had an *apoplectic stroke* (insult) a *right-sided hemiplegia* remains, which is frequently connected with aphasia, occasionally with *amimia* and *agraphia*, and if the presence of *cardiac insufficiency* (murmur over the left heart), or *aneurism of the aorta* or common carotid (a murmur and purring over them), may be established at the same time.

§ 255. **Tumors of the Brain and its Meninges.**—

By these tumors are meant circumscribed neoplasmata within the cranium (carcinoma, sarcoma, syphiloma, tubercles, echinococcus, cysticercus, aneurism of the arteries, etc.). All of these tumors are of slow growth, and exhibit a corresponding increase of the symptoms. They betray their presence, on the one hand, by localized destruction and irritation of the affected portions of the brain or of the course of the nerves (local symptoms), and, on the other hand, by the so-called general head symptoms.

The existence of a tumor is diagnosed if the following symptoms are present and if they *gradually increase in intensity*:

On the one hand, persistent *headache*; *vertigo*; occasional *vomiting*; psychical depression; apathy; attacks of loss of consciousness and convulsions; general hyperæsthesia; physical weakness.

And on the other hand, symptoms having their origin in a certain portion of a brain or of a nerve, *e. g.*, paralysis, or contraction, or twitching of the muscles of one arm or of one side of the body; localized hyperæsthesia or anæsthssia; paralysis of one or more cranial nerves which are in the vicinity of the tumor; paralysis of one nerve and irritation of a neighboring nerve; combination of hemiplegia with paralysis of the cranial nerves of the opposite side (when a tumor involves one of the cranial ganglia, *e. g.*, the corpus striatum, and at the same time the nerves below it at the base of the brain).

In short, the diagnosis is based upon the gradual appearance and increase of general brain symptoms in connection with local symptoms (*vide ante*, § 249).

Whether a motor nerve is affected at its origin (*central*) or along its course (*peripheral*), is determined by its behavior on applying the electric current, *i. e.*, the faradic current produces twitching of the muscles to which the nerve is distributed only when the affection is central.

§ 256. **Encephalitis** (abscess of the brain).—It hardly ever originates idiopathically, but mostly in consequence of traumatism or by the extension of a neighboring inflammation (in consequence of embolism in pyæmia). It presents the same gradual increase of the general and local symptoms as a tumor, with the characteristic difference that the local symptoms produced by a tumor exhibit a constant increase, while in encephalitis they present marked deviations.

§ 257. **Chronic Hydrocephalus**.—Chronic hydrocephalus consists of a very great distension of the ventricles of the brain by a serous effusion, with consecutive injury to the substance of the brain and a separation of the cranial bones.

It is present if the patient has a comparatively large head; weakening of the intellect even to imbecility; general motor weakness (uncertain staggering gait, uncertain grasp) and attacks of convulsions, vomiting and headache.

6. *Patients having Symptoms pointing to a Disease of the Spinal Cord and its Meninges.*

§ 258. **Diseases of the Spinal Cord and its Meninges**.—The principal diseases of the spinal cord and its meninges are: acute and chronic meningitis spinalis, hy-

peræmia of the spinal cord, effusion of blood into the spinal cord and its meninges (apoplexia spinalis), inflammation of the spinal cord (myelitis), and tabes dorsalis.

§ 259. **Febrile Diseases of the Spinal Cord.**—Only acute meningitis spinalis and acute myelitis are accompanied by febrile phenomena.

§ 260. **Classes of Symptoms.**—The symptoms of the diseases of the spinal cord and its membranes may, as in diseases of the brain and its meninges, be divided into *motor* and *sensory*, as well as into symptoms of *irritation* and of *depression*.

§ 261. **Phenomena of Motor Irritation.**—Twitching (of groups of muscles or fibrillar), tension, contraction, and spasms of muscles. When the respiratory muscles are involved, jerking, labored breathing, without motion of the thorax.

§ 262. **Phenomena of Motor Depression.**—Weakness or paralysis of single muscles (detrusor and sphincter vesicæ and of the muscles in connection with the rectum), or of whole groups, which originates and progresses, as a rule, from below upwards.

§ 263. **Phenomena of Sensory Irritation.**—Pain in the back, either on pressure or motion, or without either; sensitiveness of the spinous processes; hyperæsthesia of the skin and muscles; neuralgia; sensation of tension around the abdomen; of pressure in the soles of the feet; and increased reflex excitability.

§ 264. **Phenomena of Sensory Depression.**—Anæsthesia; lack of the muscular sense (sense of the position and movements of the limbs).

§ 265. **Disturbances of Co-ordination.**—In connection with the foregoing, symptoms of *disturbed co-ordination*, which belong at the same time to both the sensory and motor sphere, occur; *i. e.*, the extremities carry out the purposes of the will in an awkward, defective, or weak manner, and the movements are occasionally disturbed by the simultaneous action of groups of muscles which were not intended to be called into play, while the natural power of the affected limbs is retained (stamping gait).

§ 266. **Paraplegic Affections.**—It must be remembered that in affections of the spinal marrow *psychical symptoms* are entirely absent, contrary to what occurs in cerebral diseases, and that the sensory and motor disturbances occur only extremely rarely on one side, but rather affect *both halves of the body* in a nearly equal manner (*paraplegic affections*). The majority of the diseases of the spinal cord cause a derangement of function of a large portion of it, and in preference its lower and middle portion.

§ 267. **Acute Spinal Meningitis.**—Its symptoms are *fever*; very severe symptoms of sensory and motor irritation (in severe cases involvement of the muscular apparatus of the thorax); to which symptoms of motor depression (bladder, rectum), are soon added.

§ 268. **Chronic Spinal Meningitis.**—This either develops from the preceding, or arises independently. Its

symptoms are moderate sensory and motor irritation, to which slight sensory, but by preference motor depression, gradually creeping upwards (slight anæsthesia in the feet; uncertain, powerless gait; disturbances in the bladder and rectum), are soon added.

§ 269. **Acute Myelitis.**—It most frequently occurs in connection with acute spinal meningitis, and on that account its symptoms are masked by those of meningitis (fever, elevated temperature, copious sweat, violent back-ache, painful rigidity of the muscles of the trunk, hyperæsthesia of the extremities, consciousness intact). It is only when complete paraplegia sets in that the supposition becomes probable that myelitis is simultaneously present.

§ 270. **Chronic Myelitis.**—If it sets in independently of any other disease, it is hard to differentiate from chronic spinal meningitis. Myelitis is probably present if a considerable motor depression follows a period of slight sensory and motor irritation. A high grade of myelitis, with an almost complete suspension of the functions of the spinal cord, occasionally follows traumatism, or caries of the vertebral column. In that case a motor and sensory depression sets in which is often absolute, except that there is an increased reflex excitability.

§ 271. **Tabes Dorsalis.**—Tabes (atrophy of the spinal marrow, gray degeneration of the posterior columns of the spinal cord [Leyden], ataxie locomotrice [Duchenne]), is anatomically characterized by a degeneration of the

posterior columns of the spinal cord. It is, therefore, marked by the gradual origin and development of an *intermixture of sensory irritation and depression* (whereby the latter finally becomes considerable); moderate motor irritation; *disturbances of co-ordination, vesical and rectal disturbances, and disturbances of the sexual function.*

7. *Patients having Symptoms pointing to a Disease of the Peripheral Nerves.*

§ 272. **Diseases of the Peripheral Nerves.**—They are neuralgia of the trigeminus (*tic douloureux*), intercostal neuralgia, *ischias antica and postica*, and *lumbago* (pain in the lumbar region). These affections are all explained by their names. Their diagnosis is established by taking into account the anatomy of the nerve affected.

§ 273. **Tic Convulsif** (*spasmus facialis*). Motor irritation of a filament of the facial nerve.

§ 274. **Hemicrania** (*migraine*).—Headache on one side of the head, occasionally accompanied by an injection of the conjunctiva of the eye on the affected side.

8. *General Neuroses.*

§ 275. **General Neuroses.**—They are epilepsy, *chorea*, *hysteria*, *infantile spinal paralysis*, and *progressive muscular atrophy*.

§ 276. **Epilepsy.**—Epilepsy is a disease in which attacks of convulsions occur, which return at irregular intervals.

The attack consists, in the beginning, of tonic followed by clonic spasms of all the muscles, during which there is complete unconsciousness. It mostly commences with a scream, lasts as long as a quarter of an hour, and is succeeded by sleep.

The tongue is very frequently injured by being bitten during the attack, so that the scars which are left are of diagnostic value where it is necessary to establish a diagnosis from the previous history of the case.

§ 277. **Tetanus.**—Tetanus is a condition of irritation of the motor portion of the spinal column including the medulla oblongata, whose anatomical lesions have not as yet been determined, in consequence of which the whole or a portion of the muscular apparatus of the body is thrown into lasting, at times, extreme contraction. It occurs after wounds (tetanus traumaticus), especially of the extremities, or after severe colds (tetanus rheumaticus). Tetanus neonatorum may, perhaps, occur in consequence of the severing of the cord, and belongs, therefore, to tetanus traumaticus.

Its principal symptoms are, in the beginning, *stiffness in the nape of the neck*; *tenseness* of the muscles of mastication; later, tonic spasms; contraction of the muscles of the *nape of the neck*, of the *back*, of the *jaws*, even to closure of the mouth (trismus), of the *diaphragm*, and of the muscles of the *thorax* (dyspnœa); of the extremities, and of the face (facies tetanica); *fever*, which is very high in severe cases; *copious sweats*; a high grade of *reflex irritability*, and perfectly clear intellect.

According to the effect produced by the contracted muscles there are: opisthotonos, emprosthotonos, pleuro-

thotonos, and orthotonos. Those muscles which are almost always slightly contracted become as hard as a board and exceedingly painful during the attack. The *spasmodic attacks* occur at irregular intervals, and are almost continuous at the height of the disease. They are renewed in consequence of the slightest external irritation (concussion, touch, draft of air), as well as on attempting to move, and spontaneously. They may last over an hour, and in favorable cases diminish in frequency and duration. In case convalescence sets in, the disease occasionally lasts months.

The diagnosis is self-evident.

§ 278. **Chorea** (St. Vitus's dance).—Chorea is a disease which may last as long as twenty weeks, and occurs by preference in females at puberty. It especially develops upon an anæmic basis, and rheumatic influences are frequently its exciting causes.

Chorea is characterized by an abnormal motor irritation in consequence of which the voluntary muscles, on attempting any movement, produce other involuntary movements, which interfere with the movement desired to be made, and render it of no effect, or, at times, even impossible (the patients make grimaces while speaking, turn and twist the arms on taking hold of anything, and have an irregular, stumbling gait). The diagnosis is easy.

§ 279. **Hysteria**.—Hysteria is principally a female disease, and is characterized by a combination of phenomena of irritation and depression of the psychical, motor, and especially of the sensory sphere of the brain

and spinal cord. It is of uncertain duration, but because of not having any marked anatomical lesions, continually changes its character, and may disappear at any moment. Affections of the sexual organs are very frequently present in addition.

As particularly frequent symptoms may be mentioned: the *clavus hystericus*, a boring, one-sided headache, near the saggittal suture, and the *globus hystericus*, a sensation of pressure in the cervical and upper thoracic region.

§ 280. **Paralysis Infantilis Spinalis.**—By infantile spinal paralysis is meant a *paralysis* of single limbs or groups of muscles, especially of the lower limbs, with atrophy of the affected muscles, which is found in children and is connected with febrile symptoms (occasionally with the symptoms of an inflammation of the brain). The paralysis is occasionally paraplegic. It is almost never the case that all the muscles of a limb are affected at the same time.

It is probably due to a circumscribed myelitis.

§ 281. **Progressive Atrophy of the Muscles.**—This is a rare disease of adults and consists of an *atrophy of single muscles*. It almost always commences in the upper extremities (deltoid, muscles of the thumb, inter-ossei), and spreads slowly, without regularity, to the other extremities. The atrophied muscles lose their power proportionately to the progress of the disease. Its diagnosis is easy.

The diagnosis of many diseases of the nervous system may be accurately determined by electricity, but only

when used by those who have had a thorough experience with it.

9. *Poisoning.*

§ 282. **Poisoning.**—The most frequent poisonings are from lead, phosphorus, mercury, and arsenic, as well as from alcohol (delirium tremens).

§ 283. **Lead Poisoning.**—*Acute* lead poisoning is due to the introduction into the stomach of a great quantity of lead (adulterated wines); it is rare.

Symptoms.—Violent pains in the *stomach*; nausea; vomiting; mostly constipation; *numbness* and *weakness* of the extremities; frequently *slow* pulse; and, finally, singultus, syncope, and in some cases convulsions. If death does not ensue the symptoms of chronic lead-poisoning set in.

Chronic lead poisoning is much more frequent, and is due to the taking into the system of small quantities of lead at a time, and extended over a considerable period. It occurs most frequently in miners, painters, type-founders, type-setters, and potters. Persons seldom become affected who use lead medicaments for a considerable time, or who use snuff which is contaminated by lead on account of having been packed in it.

The symptoms are divided into different groups, which may occur alone or in combination with each other.

Lead Cachexia.—Emaciation; paleness; *clay-colored* or *slightly icteric* complexion; *gray line* along the gums; nauseous taste; *disturbed digestion*; occasionally extreme emaciation without any special local affection (tabes saturnina).

Lead Colic.—After some derangement of the digestive function *violent constrictive pain* in the umbilical region, which becomes aggravated at intervals; marked *retraction of the abdomen*; great constipation, which may last for weeks, and, generally, retarded pulse. The lead colic is often the first symptom of the poisoning, and is soon replaced by comparatively good health, but returns again if the cause continues to act.

Affections of the Spinal Nervous System.—*Violent, fixed pain in the joints* without swelling; *anesthesia* of various regions, often setting in very early; *paralysis of the extensors* of the hands and feet, seldom of other muscles, with *atrophy* and, frequently, loss of the power to contract on the application of the faradic current (the supinator longus and brevis of the hand are never affected); and, occasionally, tremor of the upper extremities.

Brain Affections, generally setting in late in the disease.—*Epileptiform attacks*; delirium; coma; which are preceded by *headache*, vertigo, and melancholy mood.

The diagnosis of *acute* lead poisoning is rendered certain by the establishment of its presence in the ingesta by chemical tests; that of *chronic* lead poisoning is founded upon the fact that the patient works in lead, when one of the above-mentioned groups of symptoms is present. It is made certain by the development of the cachexia.

§ 284. **Delirium Tremens.**—This is a not seldom observed disease which occurs in consequence of the *chronic abuse of alcohol*, and is accompanied by nervous and psychological disturbances. It either occurs spontaneously, or has for its exciting cause a violent emotion or

febrile disturbances (pneumonia, typhus, severe injuries).

Its principal symptoms are all varieties of *delirium*, even to the most violent mania, often with a partially clear intellect; stammering, indistinct articulation; *trembling* of the hands; *sleeplessness*; not seldom desire for motion and destructive tendency; and fever. The delirium is generally concerning small things, animals, worms, money, etc.

Secondary delirium tremens may be differentiated from the delirium of fever and of exhaustion by the fact that it sets in in the beginning of the disease present, by the extreme trembling, and by its etiology, *i. e.*, the extreme indulgence in strong drinks.

10. *Patients having Symptoms pointing to a Disease of the whole Organism.*

§ 285. **Constitutional Diseases.**—While in the so-called local diseases, which are limited to a certain organ, the diseased organ always presents changes which may be recognized by a physical examination, and therefore permit of the formation of a diagnosis at the first examination, the constitutional diseases, *i. e.*, diseases affecting the whole organism, have their original seat in the blood, where they cannot be recognized by any of the methods known to science at the present time. It is only when the various localizations, characteristic of each disease, occur in the different organs that, in some cases, a diagnosis may be formed from the symptoms present and the previous history, while in others it is necessary, in addition, to observe the course of the disease for several days or hours longer.

§ 286. **Infectious and Non-infectious Diseases.**—Constitutional diseases are divided :

a. According to their origin, into *infectious* diseases, those which are due to a contagium or miasma ; and *non-infectious* diseases, those which appear to develop spontaneously.

b. According to their course, into *acute* and *chronic* constitutional diseases.

§ 287. **Acute Infectious Diseases.**—They are small-pox, scarlatina, measles, varicella, intermittent fever, diphtheria, typhus recurrens (*febris recurrens*), typhus abdominalis, typhus exanthematicus, cerebro-spinal meningitis, septicæmia, pyæmia, cholera, and dysentery. The last two diseases always localize themselves in the intestinal canal, so that they might with equal propriety be placed among the local diseases.

§ 288. **Chronic Infectious Diseases.**—They are acquired and congenital syphilis.

§ 289. **Infectious Diseases which are Transmitted to Man from Animals.**—They are trichinosis, hydrophobia, glanders, and pustula maligna.

§ 290. **Acute Non-infectious Diseases.**—They are grippe, acute articular rheumatism (*polyarthritis acuta*), acute gout, and purpura hemorrhagica (*morbis maculosus Werlhofii*).

§ 291. **Chronic Non-infectious Diseases.**—They are chlorosis, scurvy, scrofula, leucocythæmia, and diabetes mellitus, inositus, and insipidus.

a. *Acute Infectious Diseases.*

§ 292. **The Acute Exanthemata**, small-pox, scarlatina, measles, and varicella, affect, as a rule, an individual but once during his lifetime, and on that account the knowledge of the previous history of a patient will partially exclude them from the diagnosis if they have affected him once already.

§ 293. **Small-pox.**—The eruption of small-pox consists in the beginning of red, somewhat elevated papules, on whose summit a vesicle soon forms and the contents of which rapidly become white and purulent. The developed pock may be as large as half a pea. In severe cases an effusion of blood frequently occurs into the pock, which causes it to become of a dark color (black small-pox). After the lapse of from two to seven days the pocks dry up and leave scars behind. It is probable that small-pox is developing if, in the prodromal stage, before the appearance of the characteristic exanthem, the previous history and status præsens are as follows: The patient has had a feeling of indisposition from one to four days, which began with a shivering or a positive chill; violent fever, the temperature rising as high as 41° C.; annoying backache; headache; occasionally pain in the splenic region, and slight pharyngeal catarrh. From the third to the fifth day after the chill the eruption makes its appearance, and after it appears a doubt as to the nature of the disease is no longer possible.

It must be kept in mind that occasionally a red, spotted, or blotchy, somewhat elevated eruption, similar to that of measles or scarlatina, which spreads over the

whole or a portion of the body, precedes that of small-pox. It disappears after the lapse of six to twenty-four hours, giving way to the characteristic small-pox eruption. The pocks are found all over the body, and also on the tongue and in the pharynx, where they may occasionally be recognized with greater certainty than on other portions of the body. The graver variety of small-pox (large, very numerous, occasionally confluent pustules), is denominated *variola vera*, the milder form *varioid*, and the lightest form, occasionally, *varicella* (*spitzpocken*).

Some authors call those cases *variola vera*, in which the temperature rises again, after falling to 37.5° , when the eruption appears, and the remaining cases *varioid*.

§ 294. **Scarlatina.**—Prodromal stage: feeling of indisposition from one to two days, beginning with repeated shiverings, seldom with a chill; very high fever, with its accompanying phenomena; in children, frequently, vomiting and spasms; pain on swallowing is constantly present in consequence of catarrhal or diphtheritic angina. After the appearance of the eruption, which mostly commences on the neck, and spreads very rapidly, the symptoms of the angina are mostly aggravated, and albumen and epithelial casts are found in the urine; in the later stages œdema of the face, of the feet, and of the genital organs, is present in addition. The scarlatina exanthem consists, in the beginning, of small, red, slightly elevated dots, which rapidly aggregate to form, first, a blotched, later a general redness. The skin is turgid. Occasionally small vesicles form on the reddened surfaces, or petechiæ appear. The exanthem occasionally

heals by imperceptible desquamation; but, frequently, especially on the hands, by a shreddlike desquamation.

§ 295. **Measles.**—Prodromal stage: feeling of indisposition from one to three days, beginning with shivering, rarely with a regular chill; fever moderately high; catarrh of the conjunctiva, of the nose, and of the respiratory tract. Its characteristic eruption is made up of red, elevated spots, of the size of a lentil, which are occasionally aggravated, and form figures of irregular shape. It begins in the face, around the mouth and the eyes, and rapidly spreads over the whole body. The above-mentioned catarrh is present in addition. In severe cases slight exudations of blood occur into the measles spots, which give to the exanthem a darker color. The exanthem heals by a branlike desquamation.

§ 296. **Varicella.**—This disease is not the lightest form of small-pox, as might be inferred from the name common to both (spitzpocken), but is a disease *sui generis*. Its diagnosis can scarcely be determined upon during the prodromal stage; the eruption establishes it. Very frequently a noticeable prodromal stage is entirely absent. The exanthem consists of isolated vesicles, appearing principally and first upon the head, and later on the rest of the body. They have a slightly hyperæmic base, which is only slightly swollen, or not at all, and appear as small, watery vesicles when the elevation of temperature occurs, which soon dry up without their contents becoming purulent. The temperature reaches its maximum at the appearance of the eruption, and then rapidly falls to the normal. The eruption generally appears in crops. They

either leave a very slightly excavated scar, which rapidly disappears, or none at all.

§ 297. **Intermittent Fever.**—Febris intermittens (intermittent fever) is due to an infection by malarial (swamp) miasm, which must be taken into account on ascertaining the previous history. It is characterized by febrile paroxysms which recur at regular intervals. When they return daily it is called quotidian; on alternate days, tertian; on every fourth day, quartan. The intervals between the paroxysms are free from fever. Each paroxysm consists: 1st. Of a *chilly stage* (shaking chill; cool, pale skin; small, hard pulse; high temperature of the internal organs), lasting about three hours. 2d. Of a *febrile stage* (burning-hot, dry skin; full, accelerated pulse), lasting two to eight hours. 3d. Of a *sweating stage* (copious sweats relieving all the symptoms; falling temperature, which mostly falls to the normal within a few hours), lasting three to five hours. The entire duration of the attack is therefore from eight to sixteen hours.

By physical examination a marked enlargement of the spleen is constantly found.

The diagnosis is made in the apyrexia (the period free from fever) from the history of the previous paroxysms and the enlargement of the spleen; during the febrile attacks, from the same facts in connection with the high temperature present (as high as 41° – 41.5° C.), and the condition of the skin.

§ 298. **Diphtheria.**—Diphtheria is a very frequent infectious disease, occurring particularly in children,

which mostly appears epidemically. It begins as a local affection, and either remains such, or leads to a secondary involvement of the whole system. It consists of an inflammation of the tonsils (*angina diphtheritica*), where it mostly begins, and of the soft palate, with great swelling of the neighboring lymphatic glands, and is often accompanied by very high fever; it more rarely commences as an inflammation of the mucous membrane of the pharynx or nose. It is characterized by patches of a dirty white, elevated coating, which may later become confluent, and which often spread to the pharynx, nose, larynx, and trachea. After a few days this coating, which consists of *necrosed mucous membrane* and subjacent tissue, is cast off, and leaves behind it a raw surface, which heals smoothly, or with more or less deforming scars.

The necrosis of the mucous membrane is due to the presence, in great quantity, of a *fungus* which occasionally penetrates deep into the tissues and spreads to other parts of the body from the local point of infection. It enters into the blood, and frequently establishes itself in the kidneys, causing albuminuria.

From one to five weeks after the disappearance of the local affection, *paralysis* of the soft palate, of the pharynx (entrance of food into the larynx and regurgitation through the nose), of the muscles of the eye (diplopia; paresis of accommodation), and less frequently of other groups of muscles or of the spinal cord (paraplegia, paralysis of the bladder).

[The *angina* of scarlatina is very similar to that of diphtheria, and may, perhaps, be identical with it. Similar inflammations proceeding to necrosis, and, therefore, also called diphtheritic, occur in

the conjunctiva, in the rectum (dysentery), in the vagina (in small-pox, typhus, puerperal fever), and in wounds.]

§ 299. **Typhus Recurrens.**—It is endemic in Russia and Poland, but only occurs epidemically in Germany. *Febris recurrens* has three stages: 1st. A feeling of indisposition, lasting as long as seven days, frequently beginning with a shaking chill; a high, rapidly-rising temperature (40° – 41° C. and higher), which exhibits, at the utmost, very slight morning remissions, and falls rapidly to below the normal on the fifth to seventh day; violent head symptoms; enlargement of the spleen; and occasionally diarrhoea, bronchial catarrh, and albuminuria. 2d. A stage following defervescence, which is almost free from fever, and mostly lasts from four to ten, seldom one to three, days; enlargement of the spleen, but otherwise a feeling of comparatively good health; a transitory elevation of temperature of from $\frac{1}{2}^{\circ}$ – 2° , which almost always occurs in the middle of this stage. 3d. A relapse following the preceding stage, of the same nature as the first, febrile stage lasting mostly three to four days, in which the maximum temperature is higher than before (mostly 41.4° to even 42.2° C.).

Occasionally a second relapse follows a second remission of one to four days, and sometimes another attack after another remission.

The diagnosis, which cannot be determined upon with certainty before the commencement of the remission, is based upon the knowledge of the disease being epidemic at the time, upon the previous history of the case, and especially upon the temperature during the febrile stage, as well as upon the negative testimony found in the pres-

ence of an enlarged spleen, which is only exceptionally absent.

§ 300. **Typhus Abdominalis** (ileotyphus), occurring both epidemically and sporadically, is a febrile disease which lasts from three to six weeks. Its principal symptoms are: *Fever*, the temperature gradually rising, with morning remissions, in the first week, to 40° or 41° C.; in the second, and later in the third week, remaining at this point with slight remissions; from that time until the eighth to fourteenth day falling to the normal, with morning remissions. *Dicrotic pulse* from the second to fourth week. *Head symptoms* in the first two weeks, mostly headache, vertigo; disturbed sleep in the second and third weeks, clouded intellect and occasionally delirium. *Bronchial catarrh*, occasionally *pneumonia*, especially of the lower lobes. *Enlargement of the spleen*, with sensitiveness to pressure in the second and fourth week. Constipation or diarrhœa in the first week; *diarrhœa* without colic is almost always present in the second and fourth week. *Sensitiveness to pressure* in the *ileo-cæcal region*, the seat of the typhoid intestinal ulceration, in the second and fourth week. *Roseola*, an exanthem consisting of slightly raised red spots about the size of a lentil on the trunk and chest, but generally scanty in the second and third week. *Dry tongue*, second and fourth week. Occasional perforation of the intestines, or intestinal hæmorrhage, second and fourth week.

The diagnosis cannot be made with certainty during the first week. Later, dependence must be placed upon the previous history (the duration of the disease, fever, head symptoms, and condition of the intestinal canal),

and upon the status præsens (high fever, head symptoms, dry tongue, roseola, enlargement of the spleen, pain in ileo-cæcal region, and diarrhœa). It may even be possible that by the status præsens alone the stage of the disease, as well as the disease itself, may be established.

A relapse must be suspected if in the third or fourth week a lasting increase of the fever and of the head symptoms sets in, and new roseolæ make their appearance.

§ 301. **Typhus Exanthematicus** is endemic in Great Britain, Poland, and Upper Silesia, and mostly occurs in Germany only epidemically, seldom in imported cases. It is an extremely contagious disease of two to three weeks' duration. Many cases have a *stage of incubation*, lasting from three to ten days, with undefined ailments and catarrhal phenomena.

Its principal symptoms are: *fever*, ushered in by a chill or repeated shiverings; in the first few days a rapidly rising temperature (seldom below 40.5° C., generally 41° – 41.5° C.), remaining at a certain height for a few days, which is followed at the end of the first week by a remission. This remission is itself followed in the second week by a renewed transitory stage of high temperature, which, at the end of the second week, descends towards the normal by a rapid fall of 2° C. In severe cases the remission on the seventh day is absent, and the definite apyrexia first sets in in the third week. The temperature is always very high, and sometimes rises above 42° C. *Head symptoms*: headache, vertigo, a rapid setting in of confusion of mind, and delirium. *Catarrh of the bronchial tubes* (always present), with annoying cough, catarrh of the conjunctiva and of the nose. In the second week

pneumonia frequently occurs. *The exanthem* is similar to that of measles, and covers the whole body. It appears during the middle of the first week, and first disappears with the fever. In the second week small effusions of blood take place, which give to the exanthem a dark, livid color (petechiæ). *The enlargement of the spleen* is marked towards the end of the first week, and lasts until during convalescence.

In the first few days before the appearance of the eruption, the diagnosis is based upon the existence of an epidemic of the disease, the height of the temperature, and the catarrh of the conjunctiva; it is established as soon as the characteristic eruption and the enlargement of the spleen appear.

§ 302. **Cholera** is endemic in the rice-growing districts of India, but only occurs in Europe epidemically. The duration of the disease varies from a few hours to a few days. Its outbreak occurs suddenly or after a prodromal diarrhœa without other special affections.

Its principal symptoms are: in *mild* cases only a painless, very copious, *watery diarrhœa*, which is comparatively stubborn, and increased thirst. In *severe* cases violent, *very copious diarrhœa*, which, after a few passages, is only made up of a thin, colorless liquid, in which white flakes (cast off intestinal epithelium), are suspended (rice-water stools); *vomiting*, in the beginning of the contents of the stomach, but soon of rice-water-like masses, similar to those voided with the stools; *diminution* or *suppression of urine*, very violent *thirst*; cool, dry skin; *corpse-like coldness of the extremities*; *absence of the pulse* in the peripheral arteries; oppression and anx-

iety; very marked prostration; the voice becomes husky (vox cholericæ); painful *muscular cramps*, particularly in the calf of the leg.

Taking into account the fact of the existence of an epidemic of cholera, a mistake cannot be made in its diagnosis.

[§ 303. **Cholera Nostras.**—A similar picture, but very much milder, is presented by cholera nostras, a very acute gastric and intestinal catarrh which occasionally occurs during the warm season of the year. Some cases of poisoning also present phenomena similar to cholera.]

[§ 304. **Cholera Typhoid.**—By cholera typhoid is understood a febrile reaction of the system which not unfrequently follows an attack of cholera. It varies in duration, and is accompanied by inflammatory affections (pneumonia, croupous nephritis, with albumen and tube-casts in the urine, diphtheritis, *i. e.*, death of a circumscribed portion of the intestinal mucous membrane, with fetid diarrhœa). The diagnosis may easily be made from the previous history and from the presence of the above-mentioned local diseases.]

§ 305. **Dysentery** is an epidemic, in some neighborhoods endemic disease of uncertain duration, and is characterized by a contagious catarrh of the large intestine with various grades of necrosis (the so-called diphtheritis), of the affected mucous membrane.

Its principal symptoms are: *fever*, without any certain type; *diarrhœa*, at the commencement apparently harmless, feculent, but soon made up principally of masses of mucus, shreds of necrosed mucous membrane and blood; the passages are scanty and have a stale smell, and only in chronic cases are fetid; *abdominal pains*: these are proportional to the severity of the diarrhœa, and become aggravated to an unbearable degree before each passage

from the bowels; *rectal tenesmus*, violent urging to stool, recurring as often as thirty times a day, and is very painful and aggravated at each passage.

In chronic cases the fever is absent, the abdominal pains and tenesmus are less severe, and constipation alternates with the diarrhœa. The diarrhœa, in addition to fœcal masses, contains much mucus as well as pus, and occasionally blood, from the ulcerations produced by the necrosis of the mucous membrane.

Its diagnosis is unmistakable.

From the contagious dysentery the non-contagious, so-called *catarrhal* or *sporadic dysentery*, may be differentiated by the absence of an epidemic, by its milder course, and the absence of masses of necrosed mucous membrane in the passages.

§ 306. **Cerebro-spinal Meningitis** is an inflammation of the meninges of the brain and spinal cord, which now and then occurs in aggravated cases, forming a little epidemic, without being traceable to any epidemic influence.

This disease, whose duration, in case it ends in convalescence, is very indefinite, is divided into two stages, the stage of irritation and the stage of stupor, which, however, are not always separated from each other by a marked boundary. It principally attacks young, robust individuals.

Its chief symptoms are *high fever* without a distinct type; great psychical irritation; *delirium*; later *unconsciousness*, coma, vomiting, abnormal *contraction* followed by dilatation of the *pupils*; pain in the *head*, nape of the neck and *back*; the latter is very intense and is aggra-

vated by motion; tenseness and *contraction of the muscles of the nape of the neck and of mastication*; tenseness and spasms of various groups of muscles; general hyperæsthesia of the skin; frequently diarrhœa; various exanthemata, as herpes, roseola, or petechiæ.

The diagnosis is based, in addition to the fact that an epidemic of the disease exists, particularly upon the presence of the headache and backache, the contraction of the muscles of the nape of the neck, the high fever, and the brain symptoms, as well as the absence of all local diseases.

§ 307. **Septicæmia** is a disease produced by the absorption into the blood of putrid (septic), matters from a portion of the body affected with putrid degeneration. The decomposition sets in in extensive mortification of tissue (contusion, freezing), as well as in all varieties of pus formation. Traumatic fever may, therefore, be considered a light form of septicæmia.

Its principal symptoms are: *fever*, occasionally low but mostly high, with irregular remissions, *without chills* or shivering; great apathy and weakness, occasionally delirium; markedly *enlarged spleen*; frequently profuse *diarrhœa*; *purulent inflammations of the serous membranes* (pleura, pericardium, synovial sacs, meninges); separation of recently healed fractures by the *formation of pus*.

The diagnosis is based upon the existence of one of its causes in connection with fever without chills, enlarged spleen and diarrhœa, and is made certain by the appearance of one of the previously mentioned local affections.

§ 308. **Pyæmia**, poisoning by pus, has its origin in the absorption of pus (*i. e.*, of the smallest organized bodies found in it), into the circulation and its deposit in the capillaries (of the lungs, liver, brain, etc.), where it forms the nucleus of a new local formation of pus (metastatic abscesses).

Its principal symptoms are: *high fever* with marked remissions and *chills, which recur at irregular intervals*; great weakness, apathy, and clouded intellect; *icteric color of the skin* of various degrees of intensity; occasionally diarrhœa; albuminous, scanty urine; *enlarged spleen*. If metastatic abscesses occur in the lungs bronchial catarrh sets in; when they occur in the liver there is pain in the hepatic region. Inflammations going on to the formation of pus and exudations into the serous cavities (pleura, pericardium, joints, peritoneum); increase of the inflammation in the neighborhood of the original suppurating surface, frequently but not necessarily.

The diagnosis is principally based upon the fever with chills, the icterus and the enlargement of the spleen, in connection with the presence of a suppurating surface.

The symptoms of septicæmia and pyæmia are frequently intermixed. Such an intermixture is particularly frequently presented by *puerperal fever*. The primary cause is here found in the lacerated surface of the uterus caused by the loosening of the placenta and the disturbances produced by the development of the fœtus.

b. The Chronic Infectious Diseases.

§ 309. **Syphilis**.—Lues or syphilis, acquired and congenital (hereditary), are only different manifestations of the same malady, so that, therefore, not only parents who

are suffering from acquired syphilis may give rise to the congenital variety in their children, but a healthy individual may become infected from another who has congenital syphilis.

§ 310. **Syphilis Acquisita.**—The syphilitic contagium enters into the system through even a slight wound of the skin or mucous membrane. At the point of infection all symptoms of a reaction to the poison may be absent, or a simple ulcer, which soon heals, may form immediately, or a simple ulcer forms, the base of which becomes hard (indurated) after the lapse of three to four weeks, and leaves a hard scar on healing, or an induration first occurs after the lapse of three to five weeks, which cracks open and becomes transformed into a slowly healing ulcer.

Four to six weeks after the local affection the symptoms of the general infection of the system set in, the so-called *secondary* symptoms, a portion of which are persistent, and another portion, after remaining for some time, disappear, again to reappear after an interval of indefinite duration.

By the *secondary* symptoms are meant :

Enlargement of the glands (indolent buboes), which takes place first in the neighborhood of the point of infection, and then spreads all over the body (in the inguinal, axillary, and maxillary regions, and in the forearm). They remain persistent during the entire duration of the disease.

The Exanthem.—It first appears as a simple roseola, which later takes on a darker, *copper-colored* hue in consequence of an effusion of blood, and becomes covered

with thin epidermis scales. The older, larger plaques of the roseola develop into the syphilitic psoriasis. The exanthem appears in preference on those portions of the body which are exposed to the air. The syphilitic psoriasis, contrary to the common psoriasis, frequently affects the palms of the hands, and does not appear in the popliteal space and in the bend of the elbow.

Condylomata.—They are irregularly round, flat, raised, oozing, or suppurating excrescences, which only appear on portions of the body, especially the skin, which are kept moist (on the sides of the scrotum, the labia majora and minora, in the anal folds, between the toes, beneath dependent mammary glands, at the angles of the mouth, and on the inner surface of the prepuce).

Mucous Patches.—They are entirely flat, roundish patches, with a red border on the mucous membrane, and are covered with a thin whitish coating. They are not covered by epithelium, and occur especially on the sides of the tongue, on the mucous membrane of the lips and cheeks, and on the palate.

Syphilitic Angina.—It consists of a deep-red border on the arch of the palate, which is frequently covered with a thin whitish secretion.

Syphilitic Iritis.—It can only be distinguished from an ordinary iritis by an eye specialist.

The above-mentioned symptoms generally appear pretty soon after infection, and the duration of the disease may be estimated from the rapidity with which they set in. They may occur singly or all together. At any rate they sufficiently determine the diagnosis of syphilis, even when only one of them is present, if found in connection with enlargement of the glands.

Syphilis is probably present if, in addition to a general enlargement of the glands, a hard cicatrix is found on the genitalia.

In the later stages of the disease, when the above-mentioned symptoms have mostly disappeared, more profound nutritive disturbances set in (occasionally called the tertiary symptoms of syphilis). They are

Scattered shotlike neoplasmata in the skin, called *syphilitic tubercles* or *lupus syphiliticus*. They are dark red, and have a hard, shotty feel, and are very frequently found on the forehead (*corona veneris*). They either terminate in suppuration or resolution, and in either case leave cicatrices behind them.

A pustular eruption, with small or large vesicles containing pus (*ecthyma, impetigo syphilitica*), frequently occurring upon the scalp, which may develop into slowly-healing ulcerations spreading superficially and in depth.

Deep ulcerations of the mucous membranes, leaving cicatrices, and, in consequence, causing stenosis of the pharynx and larynx, destruction of the vocal cords and cartilages of the larynx.

Long-lasting periosteal inflammations, particularly of that of the cranium, tibia, clavicle, and sternum, which are often accompanied by *pains aggravated at night* (*dolores osteocopi*). These periosteal inflammations may disappear without leaving any traces behind them, or they may give rise to soft or hard circumscribed thickening of the periosteum (*gumma, tophus*), or they may give rise to thickening, absorption, or caries of the affected bones. Carious degeneration is particularly apt to affect the thin bones of the face (sinking in of the bridge of the nose, perforation of the hard palate).

Exudations into the connective tissue of the scrotum (syphilitic thickening of the scrotum, sarcocele), and of the meninges of the brain and spinal cord (compression of the neighboring nerve filaments, various neuralgiæ and paralyses).

Neoplasmata in the connective tissue (glia) of the brain and spinal cord (syphilitic tumors, syphilitic paraplegia).

Circumscribed neoplasmata in the liver (can seldom be detected during life).

A general nutritive disturbance, accompanied by emaciation and loss of the hair, is a frequent consequence of syphilis.

After long-lasting syphilitic suppurations, enlargements of the spleen and liver ensue in consequence of colloid degeneration.

The diagnosis is based, in the above-described advanced stage, either upon the history of the affections preceding it and the presence of the characteristic lesions of processes which have run their course (depressed cicatrices on the head, destruction of the facial bones, stenosis of the pharynx), or upon the presence of a number of the local affections which have not yet run their course. The occurrence of single symptoms of the previously described group may mislead.

§ 311. **Syphilis Congenita.**—Syphilis which is transmitted from parent to child makes its appearance in the following three ways:

1st. The fœtus is expelled before the normal period of gestation has elapsed, mostly already putrefied, either with or without the characteristic appearances of syphilis upon it.

2d. The fœtus is born at the proper time, and the symptoms of syphilis either develop immediately or after the lapse of a few days.

3d. The fœtus is born at the proper time apparently healthy, and first exhibits the symptoms of the malady from the second to the eighth week.

Its principal symptoms are :

In the first and second case, *pemphigus neonatorum*, an exanthem consisting of raised vesicles, which may become as large as a pea, containing a brown fluid similar to the serum of the blood (in the palms of the hands and soles of the feet, on the toes and tips of the fingers, and on the trunk). These vesicles burst and leave behind them superficial oozing excoriations. The eruption appears in crops, which follow each other until, in from eight to twenty-eight days, the child dies.

In the third case, stubborn *nasal catarrh*, with tough, purulent secretion. *Exanthem* (roseola, psoriasis over the whole body, and especially in the neighborhood of the anus). *Condylomata* near the anus. *Rhagades* at the angles of the mouth and at the anus.

If recovery does not ensue for a number of years, destructive affections of the mucous membranes and the bones of the face may appear.

3. *Infectious Diseases transmitted from Animals to Men.*

§ 312. **Trichinosis.**—A number of cases generally appear at the same time as though epidemically. It arises in consequence of the introduction into the alimentary canal of man of trichinæ, which are occasionally contained in the muscles of the pig (the cat and the rat). They here develop into individuals of opposite sexes,

whose eggs produce innumerable young trichinæ, which migrate from the intestinal tract into all the muscles of the body, where they remain and become encapsuled. Only the heart, and frequently the diaphragm, remain free from them.

The essential condition of the disease consists of inflammation of all the muscles, in consequence of their rapid invasion by so numerous foreign bodies.

Its principal symptoms are :

In *mild* cases, *vomiting and diarrhœa*, setting in in a few hours or a few days after eating the diseased meat, whereby the infectious masses are expelled from the system without producing more than a slight indisposition.

In more *severe* cases, irregularly *remitting*, occasionally high, fever (as high as 40° – 41° C.); *pains in the muscles and joints* of a drawing, *rheumatic* character; later very severe, and aggravated by attempts to move and by touch; *swelling, hardness, and stiffness* of single muscles; *œdema* in the neighborhood of the inflamed muscles, especially characteristic *in the eyelids*; *dyspnœa, suffocating spells*, and hypostatic pneumonia when the inspiratory muscles are markedly involved; *copious general sweat*.

In mild as well as in severe cases it is occasionally possible to find intestinal trichinæ, eggs, and young muscular trichinæ in the fæces by the microscope if they be examined sufficiently early.

It is only in mild cases that the diagnosis is doubtful; in severe cases it may easily be established by examining with the microscope small portions of muscular tissue excised from the patient.

§ 313. **Lyssa Humana.**—Hydrophobia in the human subject is produced by the direct introduction of the saliva of animals affected with the disease into a wound. It generally manifests itself within the first four months after infection, and leads in from one to three days to death.

The principal symptoms, which are occasionally preceded by a not characteristic indisposition (malaise; timid, restless behavior; sighing inspiration), are:

Drawing pains in the limbs, particularly along the course of the nerves of the limb where the *infection first took place*.

Difficult swallowing, later becoming *impossible*, on account of a spasmodic contraction of the muscles of *deglutition* and *inspiration* on attempting to swallow. The swallowing of solid substances is generally less difficult than of liquid. In the beginning the spasms are only produced by the attempt to swallow; later they occur as soon as a drinking-vessel is brought near to the patient, or when he sees the act of deglutition being performed by one of the bystanders.

A high grade of *hyperæsthesia to sensory impressions* (touch, concussion, a draft of air, rapid movements, loud sounds, and bright light), which continually increases in intensity.

Spasmodic attacks, with stretching of the limbs, impaired inspiration, and a noticeable high grade of anxiety. The spasms are produced by every marked irritation in consequence of the above-mentioned hyperæsthesia; later they also occur spontaneously.

In the last stage—that of the commencing paralysis—these attacks as well as the hyperæsthesia become weaker.

Occasionally partial cutaneous anaesthesia sets in in addition.

Violent spitting out of the saliva.

Absolute sleeplessness; excited behavior; delirium, attacks of mania; later, apathy and somnolence.

Paresis of the lower extremities, setting in pretty early.

Frequently *continuous urging to urinate*.

Fever, moderately high, atypic.

The vesicles which are said to frequently form under the tongue (Marochetti) are absolutely inconstant phenomena.

The diagnosis cannot be mistaken.

4. *Acute Non-infectious Diseases.*

§ 314. **Grippe** (influenza).—By grippe is meant an epidemic catarrh of the whole respiratory tract (nose, larynx, bronchi, and occasionally catarrhal pneumonia), of the stomach and of the intestines, which is accompanied by a high fever of the remitting type, and has a duration of from one to three weeks.

Its diagnosis is based upon the existence of an epidemic of grippe and the local affections. In the first few days the question of its being the prodromal stage of one of the acute exanthemata may have to be taken into consideration.

§ 315. **Acute Articular Rheumatism**.—The diagnosis of acute articular rheumatism is based upon the following symptoms: A number of the larger joints become inflamed, either at the same time or in succession, in connection with a moderately high *remitting fever*, with *marked painfulness of the affected joints* (especially on mo-

tion), *exudation into the capsules of the affected joints and inflammatory swelling of the tissues in the neighborhood.* Pericarditis or endocarditis with consequent valvular lesions frequently sets in in addition. In rare cases a mild degree of inflammation of the meninges of the brain and spinal cord occurs at the same time.

By *chronic rheumatism* is meant, on the one hand, a long-continued (chronic) inflammation of single joints which have been affected by acute rheumatism without any marked anatomical changes; and, on the other hand, a series of slight attacks of acute articular rheumatism.

§ 316. **Acute Gout** (arthritis, occurring mostly in the feet).—It is necessary to the setting in of true gout that it should be preceded by a long-continued high living, with consequent saturation of the blood with uric acid (uric acid diathesis).

The diagnosis is based upon the symptoms presented by the *attack of gout, i. e.*, upon the previous history compared with *local lesions* which have been produced. The attack is characterized by the sudden onset of violent boring pain in the joint of the great toe between the metatarsal bone and the first phalanx (seldom in other joints), redness and swelling of the neighboring skin, and high fever. The pain commences during the night, becomes less severe during the day, and increases in severity several consecutive nights. The attacks set in at irregular intervals, and after being repeated several times, leave behind them an enlargement of the ball of the great toe.

In more rare cases other joints than that of the great toe also become affected (*chiragra, omagra, gonagra*).

Chronic gout is developed from the acute variety in that the recurring attacks of gout gradually become milder, but are of longer duration and leave behind them more lasting joint affections. The affected joints are mostly swollen, painful, and hard to move.

5. *Chronic Non-infectious Diseases.*

§ 317. **Chlorosis** is a variety of general anæmia which has been preceded by a long-continued defective hæmagenesis and which is followed by certain consequences. It mostly attacks females and preferably at puberty. Its duration is uncertain.

The principal aids to the diagnosis are: *pale skin*, occasionally having a yellowish-green hue; *paleness of the mucous membranes*; *general lassitude*; *great desire for sleep*; *dyspnœa*; *predisposition to palpitation of the heart* and to bleeding of the nose; *weak, sluggish digestion*; loss of appetite; pains in the stomach (not seldom ulcer of the stomach); irregular, scanty or profuse menstruation. The only physical sign is found in a murmur over the jugular veins (nun's murmur).

§ 318. **Scorbutus**, is a disease in which certain, as yet unknown, changes occur in the blood in consequence of defective nutrition, in the course of which the walls of the capillaries are weakened, and may easily be ruptured, so that all over the body, especially in the skin and mucous membranes, effusions of blood, actual hæmorrhages, as well as infiltration of the connective tissue occur.

Its principal symptoms are: *the condition of the gums*, which are dark red and swollen, bleed easily, and occasionally become necrosed at the edges; *petechiæ and sugillations* on the skin, with their various shades of color; *hæmorrhages* from the nose, bronchi, stomach, intestines, uterus, and kidneys, the blood being dark and thin; *nodular infiltrations*, especially of the lower extremities; general prostration; dirty-white color of the face; and tearing-stinging pains in the limbs.

§ 319. **Scrofula.**—By scrofula is meant a disease of nutrition, which has been inherited or has been acquired in childhood, in consequence of improper nutrition and bad hygienic surroundings. It manifests itself by an abnormal irritability of the lymphatic system, the skin, the mucous membranes, and the periosteum. These tissues may very easily become affected by hyperplasia or inflammation. Scrofula generally appears after the second year of life, and disappears at puberty.

The diagnosis of scrofula is determined upon if, by the previous history and status præsens, it can be established that the symptoms, which will be mentioned in a moment, have appeared either all together or in various combinations, or consecutively without any particular cause.

These symptoms are: very frequently *catarrh of the conjunctiva, herpes of the conjunctiva and cornea, inflammation of the Meibomian glands*, with thickening of the lids; almost constantly, *obstinate catarrh, with swelling of the nose and upper lip; eczema* in the face, on the scalp, on the ears, and in the vicinity of slight wounds; always *swelling of the lymphatic glands*, especially *the anterior and posterior chain of cervical glands*; predisposition to *catarrh of the bronchi and intestines; caries* of the bones of the hand, the tibia and tarsal bones, and *suppuration of the lymphatic glands*.

§ 320. **Leucocythæmia**, is an insidious chronic disease of middle age, which is almost always without fever in the beginning, and later is accompanied by a continuous, mostly moderate fever. It consists of a marked increase of the white corpuscles of the blood (1: 10–12), which may easily be demonstrated by the microscope. It

originates in consequence of an increased addition of leucocytes to the blood from the markedly enlarged spleen, or from the lymphatic glands or the medullary substance of bone, or in consequence of an arrest in the transformation of leucocytes into red corpuscles. It mostly originates in the *spleen* or in the *medullary substance of bones*, and less frequently in the *lymphatic system*. A physical examination will demonstrate an enlargement of the spleen (often, too, of the liver), and of the lymphatic glands. Other symptoms are: pale, sallow color of the skin; sensation of fulness in the abdomen; *dyspnœa*; lassitude; *copious hæmorrhages* from the nose, intestines, lungs, and in the brain; finally, catarrhal condition of the mucous membrane of the respiratory and intestinal tract; a high grade of emaciation; and dropsy. Its duration is from a half to several years.

§ 321. **Rachitis** is a disease of the bones, which sets in during the first few years of life, without any ascertainable cause. It is characterized by an *abnormal functional activity* of the epiphyses and periosteum, in consequence of which the growth of the bones occurs, which produces an arrest of the *deposition of earthy matters* in the newly formed bone tissue.

In consequence, the ends of the bones become enlarged and too soft, in proportion to the development of the rest of the body; the weak bones cannot support the weight of the body, and become bent. As a further consequence, when the disease has run its course the deposition of earthy matters occurs rapidly, the bones ossify in their bent condition, the epiphyses become ossified in such a manner that the growth of the bones in length is markedly retarded.

The diagnosis of the existence of rachitis is determined upon, if children, although they have arrived at the proper age, cannot walk; if dentition is retarded; if they have abnormally large fontanelles; if the occipital bone is soft; if the joints, particularly of the hands and feet, are enlarged; if the lower limbs are bent outwards; and if the sternum, together with the cartilages of the ribs, is very prominent anteriorly, similar to the thorax of a bird (*pectus carinatum*).

The malformation of the bones varies at different ages. The lower limbs of children who have not learned to walk when the disease manifests itself remain straight, but their pelves become compressed from above downwards, and their thorax develops into the *pectus carinatum*. The lower limbs of children who have learned to walk become crooked.

After the disease has run its course the diagnosis is made from the bent bones which are present, as well as from the shortness of the limbs compared with the remaining portions of the body. The head is not absolutely large, but only in proportion to the dimensions of the remaining portions of the body.

§ 322. **Diabetes Mellitus** (*mellituria*, *glycosuria*) is mostly a chronic, seldom an acute disease, whose cause is thus far unknown, and which generally, after the lapse of one to ten (sometimes first after fifteen to twenty-five) years, ends in death. It is characterized by an abnormally large quantity of sugar contained in the blood, which is excreted by the urine.

Its diagnosis is determined by the abnormally increased *thirst* and hunger; by the dryness of the skin; the spongy

condition of the gums, with caries and *rapid falling out of the teeth*; the rapid setting in of opacities of the crystalline lens; the predisposition to necrotic inflammations; the debility and emaciation; the constipation which accompanies it; and the extinction of the sexual desire. It is established by the ingredients of the urine, which contains sugar; on an average three per cent. to five per cent. (daily one-half pound), or even ten per cent. (daily one pound); sp. gr. 1020–1040; is of a light, pale color; and may be increased to double the normal quantity (daily from six to twelve, or even twenty pounds).

[§ 323. **Diabetes Inositus.**—This rare variety of diabetes mellitus, in which, instead of grape sugar only, *inosite* (a variety of sugar which will not ferment, and which is found in muscles), is voided, or at least the greater quantity of the sugar present is inosite.]

§ 324. **Diabetes Insipidus.**—The nature of simple or watery diabetes (polyuria) is not known. It is occasionally acute (setting in during convalescence from various acute diseases, or in consequence of spontaneous diuresis, or that which is produced by medicines), but is mostly chronic. Its symptoms are similar to those of diabetes mellitus, with the exception that the urine passed does not contain sugar, and has a specific gravity of 1004–1012, while great quantities (ten to thirty pounds daily) are voided, at the same time its solid constituents, especially the urea (azoturia) are markedly increased.

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ERRATA.

- Page 28, line 23, after "urine" add (§ 84-93).
- Page 38, lines 18 and 19, for signs read *sounds*.
- Page 41, line 7, insert *comma* between physiological and normal.
- Page 42, line 14, read saccadirtes.
- Page 44, line 9, read creaking for breaking.
- Page 71, line 1, read propionic for propianic.
- Page 83, between lines 24 and 25, insert: After the external or internal use of carbolic acid the urine occasionally assumes a blackish color.



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