CHAPTER XX

PSYCHOLOGICAL DISORDERS

THE forms of illness considered in this section are related essentially to the behaviour of the individual. They represent failure to make a satisfactory adaptation to life, environment and the other members of his social group. All students in general medicine have been impressed by the incidence of psychological factors in physical illnesses and how they influence their duration. Here we are concerned only with those conditions in which the psychological symptoms predominate. These can be studied in common with all other forms of illness, and failure to do so results, inevitably, in a lack of understanding of the factors involved. The major forms of mental illness have acquired for the student a sense of mystery, aggravated by the conflicting views and theories of the various schools of thought. The less severe forms include neurotic, emotional and personality disorders : individuals vary in their types of reaction to various forms of stress. Therefore many factors, constitutional, environmental, physical and psycho-biological may be involved ; the significance of each can be evaluated only in relation to the other factors.

§ 875. **Psychopathology.** In order to understand the nature of psychological symptoms one must have some knowledge of *mental mechanisms*. The following account is a brief summary, involving the minimum of theory. Mental health depends upon the maintenance of a state of equilibrium between the conscious and the unconscious. Normally, these work in harmony and the individual adapts himself to his environment. The experience and stress of everyday life, with its struggles between desires and their gratification, within limits that allow a satisfactory adjustment of the personality, inevitably give rise to a state of mental *conflict*. Conflict is then a condition of normal mentation which is maintained by the formulation of a satisfactory solution. Difference of opinion has arisen regarding the nature of the conflicting forces. Freud originally considered they had a sexual basis, but it is obvious that this limitation is erroneous. Conflicts are accompanied by emotional tension and are the cause of much waste of mental energy. Most are solved successfully on the conscious level, are finally disposed of and give rise to no symptoms. Unfortunately, for various reasons, inherent or acquired, many patients are unable to deal with their conflicts in this manner, and devise various methods to maintain the state of equilibrium above-mentioned. These methods are common, invariably uniform in pattern, and are described as *mental mechanisms*.

Suppression and *repression* are the most common methods. Suppression is a conscious effort to forget what is unpleasant and is always accompanied by a focusing of the attention on something else. Repression is an attempt to expel from consciousness the factors that offend ; they are transferred to the level of the unconscious. There they continue to exist and seek expression. Each repressed thought with its emotional component constitutes what we speak of as a *complex*. Invariably the personality elaborates methods on the conscious level to prevent expression of the repressed ideas ; consequently exaggerated personality traits become prominent. Prudishness, for instance, results from the repression of normal sexual impulses ; prejudices are developed by the individual to prevent the expression of repressed ideas. The establishment of such mechanisms need not disturb the mental equilibrium,

but certain types of interaction of these forces give rise to various nervous symptoms : persistent anxiety, fatiguability, hysterical or obsessional manifestations.

In all cases the energy remains latent and expression cannot be allowed an outlet unless in disguised form. This is achieved by *sublimation*. By this mechanism the energy is directed into some other activity combined invariably with an altruistic motive, such as religion, art and music. Another method of obtaining expression is by *rationalisation*. This is an unconscious mechanism and leads to the elaboration of various explanations in defence of beliefs or actions which are really the result of unrecognised motives. An attempt is made to justify such beliefs or actions by reasoning and great emotion may be displayed in their defence. The tendency to rationalise with regard to politics, religion, alcohol, tobacco are examples in everyday life. *Compensatory* mechanisms occur psychologically as well as physiologically : the aggressive, boisterous manner unconsciously adopted to compensate for excessive shyness is very familiar.

All mental life is influenced by *symbolisation*, often to such a degree that we fail to appreciate its significance. Music and art are symbolic representations of the feelings and ideals of the various artists. Similarly much of the play activity of children is symbolic. One method whereby repressed complexes achieve expression is when they are symbolised and submitted in disguised form. Many symptoms can be thus explained. Many dreams are symbolic, but the interpretation of such symbolisation is often exceedingly difficult.

Another form of defence mechanism is known as *projection*. Here the complex is regarded by the personality as no longer belonging to itself but as the product of some other real or fictitious person. By this method the activities of others are interpreted by the motives that determine the patient's own conduct. To explain their behaviour they project on others their own motives. This is the basis of many delusional ideas. The chronic alcoholic readily develops delusions regarding his wife and family and may attribute to them his own behaviour. Sometimes the desires are projected into imaginary persons. The aim of this, as of other mechanisms, is to make life more pleasant and avoid tension.

The method of repression may be replaced by that of *dissociation*. The mind becomes disintegrated, portions are separated off and function independently. On this basis are explained somnambulism and fugues. In the case of the psychotic, delusional ideas may be dissociated ; this explains how patients with gross delusional ideas of their high status in life will perform most menial tasks.

The elaboration of excessive *phantasy* formation constitutes a common mental mechanism. Some degree of phantasy or imagination is common in normal life. Such elaborations in health remain subject to conscious criticism. It is also frequently seen in childhood with the elaboration of imaginary playmates. In certain forms of mental illness, particularly schizophrenia, it assumes an objective reality and thus repressed complexes attain an imaginary fulfilment.

The above-described mental mechanisms are substitutes for a logical adjustment, and may tend to produce deviation from reality ; this is particularly evident in the pernicious mechanism of phantasy. The greater the degree to which they are developed the more profound are the symptoms, and the more serious the outcome.

§ 876. General Factors. Effects of constitution and environment are not readily separated ; their influence varies according to the balance of the other factors and may vary at different periods in the life history. Similarly there is a constant inter-reaction between physical factors and the nervous mechanism. It is important to appreciate that mental ill-health is the sum total of a number of factors, and not the result of any one alone. The occurrence of mental illness in members of the same family has drawn attention to the influence of heredity. There is evidence that, as in certain forms of physical illness, there is probably inherited a diminished resistance to the development of certain types of mental illness. Of these the manic-depressive variety shows the greatest family incidence ; the schizophrenic to a lesser degree. Mendelian researches suggest that the former is due to a dominant gene and schizophrenia to a recessive.

Psychotic illnesses are rare before adolescence, when physiological changes are marked ; conflicts between instinctive desires and social standards then become much more active and demand fresh adaptations. At this age the incidence is high and remains so for some years. Similarly there is an exacerbation at the involutional period, when further endocrine changes occur, with marked emotional components. The association of mental illness and pregnancy led formerly to the classification and description of puerperal psychoses. It is now generally accepted that such a physiological event acts by reducing the general resistance, and that a mental illness developing at this time is determined by the previous personality and the other factors already discussed.

Apart from toxic-infective conditions, physical factors in themselves are rarely direct causes of mental illness. Exceptions are found with disorders resulting from trauma, which produces direct injury to the brain, and those due to vascular changes, generally of an arterio-sclerotic nature. Acute general infections may give rise to delirium followed, as in the case of influenza, by lassitude and depression. Such an illness may also release other symptoms, of a schizoid or cyclothymic nature, depending on the personality and make-up of the individual. Divergent views exist as to the rôle of focal sepsis and the frequency with which it is responsible for the development of mental symptoms. That such arises in certain cases, and must be dealt with, is agreed, but unless there is clinical evidence of toxæmia, improvement may not follow surgical treatment. The rôle of alcohol in the production of mental illness is limited : the acute alcoholic psychoses and Korsakoff's psychosis are the direct results of alcohol. A detailed investigation of the history and personality of the individual will generally show chronic indulgence in alcohol to be symptomatic rather than causative of a mental illness.

PART A. SYMPTOMATOLOGY

It is often alleged that symptoms of mental illness are much less clearly defined than those of bodily illness. Such symptoms represent the reactions of the individuals as an integrated whole, not of single mental processes. Consequently in their interpretation attention must be paid to all factors in order to appreciate fully the setting in which the symptoms have appeared. The fact that symptoms may have a symbolic meaning tends to confuse the student, but no matter how disguised, these symptoms are always germane to the mental state.

The more important symptoms may be considered as they involve predominantly behaviour, consciousness, emotion, thought-processes, sensation, memory and personality.

1. Behaviour	.	Overactivity, stereotypy, retardation, negativism, morbid impulses.
2. Consciousness	.	Confusion, dream states, delirium, disorientation, stupor.
3. Emotion .	.	Elation, euphoria, depression, anxiety, apathy, emotional instability.
4. Thought .	.	Delusions, obsessions, ideas of reference.
5. Perception	.	Hallucinations, illusions.
6. Memory .	.	Amnesia, hypermnesia, paramnesia.
7. Personality	.	Depersonalisation, transformation of personality, dissociation, fugues, multiple personality.

§ **877. Disorders of Behaviour.** *Overactivity* is characteristic of all forms of excitement, mania, schizophrenia and general paralysis. The activity is invariably purposeful, but not necessarily productive. In states of mania there is a concomitant talkativeness; distraction by external stimuli is profoundly exaggerated in the form of *flights of ideas*. Rhyming and punning are frequent accompaniments. In schizophrenic behaviour repetition of movement or speech may occur over a prolonged period and is known as *stereotypy*. Repetitive movements cause *mannerisms* to develop in the form of gestures and the embellishment of various ordinary movements. *Perseveration* should be distinguished from stereotypy: even against his own will there is an inability in the former to avoid repeating an action or a word which the individual has just used. Perseveration is a frequent symptom in organic brain disease. *Retardation* of psycho-motor activity is seen typically in melancholia. It may be accompanied by *negativism*—a refusal on the part of the patient to co-operate, even to the extent of doing the opposite of what he is told to do. Profound degrees of retardation may merge into a state of *stupor* : then *flexibilitas cerea* may develop. It is so called because of the wax-like position of the limbs which may be maintained in the most uncomfortable position for prolonged periods. *Morbid impulses* are the result of an irresistible urge to carry out some action. Failure to do so is accompanied by tension and restlessness ; its performance is usually devoid of reflection or of any consideration for the interests of themselves or others. Among such impulsive forms of behaviour are pyromania—impulse to set on fire ; kleptomania—impulse to steal ; dipsomania—impulse to drink to excess ; these are variations of obsessional behaviour.

§ **878. Disorders of Consciousness.** Consciousness implies ability to be aware of ourselves and our environment, involving the ability to synthesise and integrate as well as evaluate new experiences. It is dependent, in part, on attention. If the power of attention is impaired there develops *confusion*, perplexity and bewilderment. Such is found in the most acute stages of mental illness and in the toxic-infective group of psychoses. *Dream states* and *twilight states* are usually of psychogenic origin and last for varying periods of time. The disturbance of consciousness may be sufficient to cause the individual to lose knowledge of his surroundings, as in epilepsy and hysteria. In hysteria fugues or dissociated states may follow. *Delirium* may be psychogenic but is most frequently of toxic origin. All degrees of clouding of consciousness may develop, together with vivid hallucinations, visual and auditory. Invariably there is marked *disorientation*, indicating an inability of the individual to appreciate his position in respect of time, or place, or his relationship to other persons. Profound degrees of delirium are usually followed by a complete amnesia for the acute periods. In *stupor* there is an absence of all spontaneous activity or of any response to stimulation. It may develop in benign melancholia, the catatonic form of schizophrenia, certain toxic states, epilepsy and hysteria. In the psychogenic variety, rapid

emergence from stupor to activity may be seen, once the precipitating factors have ceased.

§ 879. **Disorders of Emotion.** Emotional disturbances are assessed by the intensity, duration and degree of harmony between the mood and the content of thought. *Exaltation* is an exaggerated degree of elation, typical of mania when it is accompanied by psychomotor overactivity. *Euphoria* implies, in addition, an abnormal feeling of wellbeing. Feelings of *depression*, characterised by hopelessness or despair, may be of all degrees : the less severe are apparent in the neuroses, whereas in melancholia the degree may be profound. When depression develops as the result of obvious external factors it is termed reactive. *Anxiety* implies more than fear. The latter ceases when the danger passes, whereas in anxiety the danger is usually described as being within. *Apathy* indicates a lack of either pleasure or sorrow. On the other hand the response may be apparent but may show a marked deviation from that normally seen, *e.g.*, news that would cause sorrow to the average person may be the occasion for elation and laughter. This inappropriateness of affect is typically found in schizophrenia. *Emotional instability* is characterised by rapid variations in the affective state without any apparent cause ; it occurs in organic conditions.

§ 880. **Disorders of Thought.** A *delusion* is a false belief, quite impervious to argument or reason, and one that would not be shared by persons of the same race, education and status in life. Various psychological mechanisms have been elaborated in an effort to explain such ideas. In certain cases the significance of the delusional idea and its method of elaboration are obvious ; in many they remain a matter of speculation. Hallucinations may frequently form the basis of subsequent delusional ideas. They are classified for descriptive purposes as delusions of unworthiness, self-reproach, poverty—depressive ideas ; of grandeur, mania, G.P.I. ; of persecution—paranoid. When the delusions are based around a central theme from which deductions have been logically made to form a coherent organisation of ideas, the delusional system is said to be systematised. *Insight* is the degree of conscious appreciation which the patient has of his abnormal symptoms and the nature of his illness, and is measured by the extent to which he is prepared to discuss these symptoms and recognises them as abnormal. An *obsession* is an idea that obtrudes into the mind, the individual being perfectly aware of its absurdity and control over his will. It differs from a delusion in that the nature of the idea is recognised as absurd, and the patient endeavours to rid himself of it. *Ideas of reference* are misinterpretations ; the patient becomes convinced that various happenings or things recorded in the press relate to himself. When he believes that some force or other agency directs his activities so that he may perform certain acts even against his will, such are described as *passivity feelings*—commonly found in schizophrenia. *Nihilistic* ideas are associated with a marked disturbance of affect and

take the form of beliefs that the individual has no body, that he is dead or that the world has ceased to be.

§ **881. Disorders of Perception.** *Hallucinations* are sensory perceptions without any external cause. This contrasts with *illusions*, in which real perceptions are misinterpreted. Illusions are experienced by all at some time or other, and are common when there is clouding of consciousness. Hallucinations are frequent in the early stages of mental illness and are particularly common in toxic-infective conditions. Although physical factors may be present, the content is often influenced by previous psychological experiences. Hallucinations without any disturbance of consciousness—in other words, occurring in a clear setting—are of more serious import : in organic conditions hallucinations may show a nocturnal frequency. Hallucinations affect all senses, those of hearing are by far the most common. They may consist of indeterminate noises, but more often consist of words spoken by voices which may or may not be recognisable. In schizophrenia these voices may be said to arise from within and may be attributed to one of the internal organs. Hallucinations of sight are less frequent and usually occur with some clouding of consciousness ; they often accompany toxic-infective illnesses, particularly delirium tremens, in which the hallucinatory experiences are very vivid and accompanied by intense fear. Hallucinations of smell are found in more chronic types of illness — chiefly schizophrenia ; they are usually unpleasant and are associated with a sense of guilt. Hallucinations of taste are uncommon and are often associated with those of smell. Illusions of taste are more frequently experienced. Hallucinations of touch—haptic or tactile—occur in toxic-infective conditions, especially delirium tremens and cocaine addiction.

§ **882. Disorders of Memory.** Loss of memory is known as *amnesia* (§§ 716, 888). This may be for limited periods, not necessarily always sharply defined, and is then accompanied by some disorder of consciousness. It is a common result of head injury, a seizure or a hysterical attack. Amnesias connected with events the recollection of which is unpleasant, are frequent in hysteria. Anterograde amnesia denotes a loss of memory for recent events—retrograde that for remote events. An anterograde amnesia not accompanied by any disorder of consciousness is usually indicative of an organic syndrome. Generalised loss of memory is found in secondary dementia.

Paramnesia indicates a falsification of memory. In certain illnesses, particularly Korsakoff's psychosis, the memory deficiencies are filled in by the patient without any relation to fact ; this is *confabulation*. *Hypermnesia* denotes an abnormally acute memory. Incidents with a strong emotional colouring may be recalled with greater ease. It is seen in hypomania, in paranoid states, and in certain prodigies, and may be seen even in gross mental defect.

§ **883. Disorders of Personality.** With *depersonalisation* the patient ceases to believe in his own existence : not only do external things appear

unreal or strange—*derealisation*—but there is a subjective feeling that he has lost his own reality. He does not believe that he is someone else—*transformation of personality*—but rather he has ceased to identify his own personality. *Splitting of the personality* is seen in schizophrenia. There is a disintegration of the personality coupled with independent activities of their functions so that grotesque incongruities of thought and action become possible. *Dissociation* is a mental mechanism to avoid conflict whereby a group of mental processes may be separated from the stream of consciousness and so functions on its own. Examples of dissociation are somnambulism, automatic writing and fugues. In *fugues* the secondary personality may generate such activity as takes the individual varying distances from his usual habitat. More complete degrees of dissociation give rise to *double* or *multiple personality*, in which the patient assumes a new disposition and character which may alternate with his normal recognisable self. The personalities then produced display, as it were, a complete ignorance of each other.

PART B. CLINICAL INVESTIGATION

As in the investigation of other bodily systems it is imperative to adopt some scheme of examination. To obtain an adequate understanding of the patient's mental make-up we largely depend on our ability to get the patient to talk of his problems ; this must be encouraged and directed by judicious stimulation and questioning. The personal factor enters into the examination to a greater degree than in the investigation of other systems. Whether the patient is co-operative or not, make it a constant rule to interview the relatives or friends in order to obtain an independent account of the patient's illness. Keep an open mind on the problem, and remember that statements of relatives need not necessarily be correct.

The close interrelationship between mental and bodily illnesses makes obvious the necessity for a detailed physical investigation.

Collect all data in an orderly manner and in chronological sequence even though the interpretation may be difficult.

§ 884. The first requirement is a clear understanding of the patient's *symptoms* and the development of these from the earliest time that any abnormality was noticed. Find out how far the present condition differs from his previous character and conduct : behaviour which indicates madness in one person is only eccentricity in another. Ascertain, where indicated, any peculiarities of behaviour, over-activity, violence, depression, suicidal preoccupations, excessive phantasy formation, etc. Investigate any *etiological factors*, domestic, business or financial difficulties, etc., so that you may judge whether or not such are adequate to cause the symptoms. Details of the *family history* must be obtained, particularly as to the incidence of alcoholism, drug addiction, a family tendency to eccentric behaviour or peculiar personalities, and other evidence of mental illness. The *previous medical history* and any earlier mental breakdown must be noted : obtain details of the previous personal history, *i.e.* early development, the presence of neurotic traits, school career, work record and habits. The *environment*, particularly during early life, should be enquired into especially with regard to (a) parental over-anxiety for the patient's health in early childhood,

(*b*) lack of harmony in the family, quarrels, separation of parents, (*c*) faulty education or upbringing, spoiling, temper outbursts, (*d*) ethical and religious training, sexual development in adolescent and adult life.

Finally enquire into the patient's *previous personality* : Was he of (1) the syntonic type, popular, a good mixer and sociable ; (2) the schizophrenic type, reserved, shy, given to day-dreaming ; or (3) the paranoid, inclined to be suspicious and see hidden meanings in things ?   Endeavour to get an impression of the patient as a whole, so that you may form an opinion as to his endowments and make-up.   All such points are of enormous importance in evaluating the prognosis of a mental illness.

The success or failure of a psychiatric examination is often dependent on the physician's mode of approach.   Never be in a hurry : any careless, inept, insistent or rapid questioning will only confuse and silence the patient and defeat your object. Endeavour to gain his confidence.   To overcome this reserve, let him talk about things in general, then of his thoughts and feelings and finally of any hallucinations or delusions.   Allow the patient to give his own account of his symptoms and their development.   In making a mental examination, the following scheme is suggested as a guide ; from the results thus obtained you are able to make any necessary judgments.

(1) Record your observations on the *patient's reaction* to the interview.   Does he look ill ?   Pay attention to his facial expression and to his dress.   Is there over-activity or retardation ?   If retarded in his movements, does he resist passive movements ; is there negativism ; flexibilitas cerea ; are mannerisms evident ?   (2) Consider next the *patient's conversation*.   Is the enunciation clear ; is there evidence of slurring, as in G.P.I. ?   Note the stream of mental activity ; are questions answered promptly and relevantly ?   Is there excessive volubility ; jumping from one topic to another (flight of ideas) ; are there self-invented words (neologisms) or there may be diminished volubility, with evidence of retardation of the mental processes.   In stupor, the patient may refuse to speak or answer questions—mutism.   (3) From the patient's appearance, one may get an impression as to the *mood or affective state*.   If it is constant, is it appropriate to the emotional state ?   Carefully note any discrepancy or fluctuation in the mood, such as a smile in a situation which should produce a depressive response.   Augment observation by direct enquiry— " How do you feel ?   How are your spirits ? " etc.   (4) Much may be obtained from the *content* of the patient's conversation. He is therefore encouraged to talk freely. General enquiries should be made to determine his reaction to those with whom he comes in contact.   Are delusional ideas present ?   What is the patient's reaction to his environment ?   Is he suspicious ?   Does he think that he is treated badly or in any special way ?   Is he persecuted ?—paranoid.   Are there passivity feelings, that people can influence him to do things ?   Does he feel that his thoughts can be read ?   Can he read those of others ?—schizophrenic.   Are there grandiose ideas— of enormous power or wealth—mania, G.P.I. ?   Are there depressive ideas such as those of self-reproach, that he has done great wrong, committed the unpardonable sin, that there is no hope, that life is not worth living, found in melancholia ?   Is there evidence of illusions or of hallucinations ?   The type, degree of vividness, time of occurrence and content must be noted as also the patient's impression of these. Ascertain if there is obsessional preoccupation either in thought or action.   How far do such control activity : do they emanate from within the mind or from an outside force ?   In regard to delusions, illusions or hallucinations, estimate how far such perversions of the mind influence or are likely to influence the acts or conduct of the individual.

Ascertain if the patient is correctly orientated as to time, place or person.   Determine any memory defects, both as regards recent and remote events.   What is his attitude towards such—does he fill in the gaps by confabulation (Korsakoff's) ? What is his level of general information ; is it adequate, considering his social class ; is there evidence of deterioration from the former level ?   Finally, does the patient regard his condition as an illness for which treatment is desired ?   Has he any in-

sight ? This is of value in assessing the prognosis and in recommending treatment. The essential facts in the illness can now be summarised and an opinion formed as to diagnosis, prognosis and treatment.

PART C. DIAGNOSIS, PROGNOSIS AND TREATMENT OF MENTAL ILLNESSES

§ 885. Classification. PSYCHONEUROSES and PSYCHOSES in their characteristic forms may appear to be distinct entities, easily differentiated from one another. However, in some cases the line of demarcation is not always so clearly defined, and the one may merge into the other. The essential difference is the degree to which the personality is involved : in *psychoneurotic illnesses* the personality remains intact, there is ability to differentiate between reality and subjective experiences and the patient retains insight into the nature of his illness and is anxious to get well. The *psychotic patient*, on the other hand, shows distortion and disintegration of his personality, he loses his sense of reality, frequently lives in a world of phantasy, and his beliefs are not amenable to reasoned explanation.

The resultant forms of illness are not to be regarded as disease entities, but rather as *types of reaction* to various forms of stress. These may appear in several forms :—

GROUP I.—COMMON MINOR MENTAL ILLNESSES.

I. Anxiety Neurosis	§ 886
II. Neurasthenia	§ 887
III. Hysteria	§ 888
IV. Traumatic Hysteria	§ 889
V. Obsessive-Compulsive Neurosis..	§ 890
VI. If there is Abnormal Behaviour without gross Psychotic Symptoms, turn to	§ 891

GROUP II.—MAJOR MENTAL ILLNESSES.

I. If there is Excitement or Exaltation, turn to	§ 892
II. If there is Depression or Retardation, turn to	§ 894
III. If there are Hallucinations or Bizarre Delusional Ideas accompanying the affective changes, turn to..	§ 897
IV. If the dominant system of ideas is that of Persecution, turn to	§ 898
V. If there is Addiction to Alcohol, Drugs, or there is Delirium associated with fever or other physical disorder, turn to	§ 899
VI. If Organic features are prominent, turn to..	§ 902

IN CHILDREN.

If the patient is a Child, turn to ..	§ 907
If abnormal Nervous or Mental Symptoms appear in early life unaccompanied by mental retardation, turn to	§ 907 B
If there is Mental Retardation or Mental Defect in a child, or if the condition has persisted from childhood to adult life, turn to ..	§ 907 C

GROUP I. COMMON MINOR MENTAL ILLNESSES

Psychoneurotic illnesses comprise mental disturbances (anxiety, fugues, phobias) or physical symptoms (paralyses, anæsthesiæ)—for which no organic cause can be discovered. They are in general terms the result of mental conflict, dealt with by repression. The conflicting forces can often be traced to instincts of self-preservation, gregarious or herd instincts, to reproductive instincts, or to ethical teachings implanted in childhood. The various methods have been discussed already by which such repressed factors obtain expression and produce different types of neurotic symptoms.

The patient complains of loss of interest, inability to concentrate and various fears. The condition is ANXIETY NEUROSIS.

§ 886. I. **Anxiety Neurosis** (Synonym : Psychoneurotic Anxiety State) is the commonest form of Psychoneurosis. Many cases, diagnosed Neurasthenia, are really examples of Anxiety Neurosis.

Symptoms.—(1) Anxiety is the chief symptom, and this, acting through the autonomic nervous system, produces all kinds of visceral symptoms. Fears of bodily or mental illness, of suicide or death, are common. Acute panics, lasting minutes or hours, characterised by paroxysmal terror and emotional distress, occur. Between these panics the patient's emotional tone is one of anxiety. He fears to meet people, fears to walk in the traffic, and may sit in the house all day. Sleeplessness, arising from his anxiety, adds to the patient's distress ; when sleep occurs, nightmares are often present. (2) Visceral symptoms, visceral reactions secondary to the panics and prevailing anxiety, are almost constantly present. Besides the physical concomitants of fear (viz., dry mouth, shaking, tachycardia, frequency of micturition) all kinds of gastro-intestinal symptoms may arise—vomiting, nausea, diarrhœa, water-brash, constipation, etc. Seminal emissions, blurring of vision, twitchings of muscles also occur. To these morbid fears, which are of infinite variety, various names have been given—fear of open spaces (agoraphobia), fear of closed rooms and buildings (claustrophobia). These are not different diseases but are part of an anxiety state, varying according to the patient's history. Fear of dirt, of knives and scissors, of medicines, of travelling in tubes, lifts, omnibuses, etc., are also met with. The patient cannot explain why he dreads these things, but realises their absurdity.

Diagnosis.—Anxiety as a symptom is common in *obsessional neurosis, melancholia* and *schizophrenia.* The presence of the other characteristic features of these conditions simplifies the diagnosis. Anxiety neurosis results when the reaction produced is out of proportion to the cause, real or fictitious. It is the commonest form of psychoneurosis.

Etiology.—(i) Hereditary, constitutional, and environmental factors. (ii) The patient is usually emotionally unstable ; prolonged anxiety becomes a habit. (iii) A sexual basis was propounded by Freudians to

explain such reactions, but there is no doubt that anxiety neuroses may develop from mental conflicts arising from many sources, of which the chief are domestic, financial, sexual, and business worries.

The *Prognosis* is better than in any other form of psychoneurosis. Apart from psychological treatment much will depend on how modifiable the other etiological factors may be.

The patient complains of tiredness, lack of concentration, irritability, feelings of pressure in the head, and other subjective symptoms for which you can find no organic cause. The disease is NEURASTHENIA.

§ 887. II. **Neurasthenia** (Synonym : Chronic Nervous Exhaustion), as. a clinical entity is rare, and the term is one of the most abused in medicine. Mainly characterised by fatigue, some degree of anxiety is also usually present, and the relative importance of each has to be assessed. *Symptoms.*—(1) The chief symptom is tiredness, a ready mental fatigue and physical prostration without discoverable lesion. The tiredness of the neurasthenic differs from ordinary exhaustion in that it is not relieved by a night's rest, and it is not always precipitated by factors which cause exhaustion in the normal individual. (2) There is fatigue of cortical inhibition and control, manifesting itself by abnormal irritability over trifles, lack of emotional control and motor restlessness. All kinds of visceral sensations, normally inhibited by cortical control from reaching the sensorium, become manifest and the patient is conscious of the beating of his heart, peristaltic movements of his intestines, etc. (3) The patient becomes egocentric and introspective, the whole of his consciousness filled with his abnormal physical sensations. So full is he of his illness that he cannot devote his attention to outside affairs and he suffers from lack of concentration, which he wrongly attributes to mental failure. (4) There is a peculiar kind of headache, which is described as a pressure rather than a pain, or an aching tightness radiating from the frontal region into the back of the neck or the spine. At other times the feeling in the head is described as a " woolliness " or " cloudiness." The discomfort is never actual pain, but is described as something worse and less bearable than pain. (5) Sleeplessness adds to the patient's misery. (6) Symptoms referable to the autonomic nervous system and endocrine glands occur, tachycardia, tremor, vaso-motor instability and loss of weight. The blood-pressure is invariably lowered in severe cases, with giddiness, coldness and clamminess of the extremities and tachycardia, pallor or syncope on suddenly assuming the erect position. (7) The menstrual periods in women may be irregular. All kinds of disturbances in the sexual sphere occur and may dominate the clinical picture. Sexual impotence, premature ejaculations, spermatorrhœa, all occur in men. The urine usually contains a heavy deposit of phosphates and is alkaline. Phosphates may be deposited in the bladder and appear in the urine at the end of micturition, the patient mistaking the phosphate deposit for seminal fluid and imagining that his virility is draining away.

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The patient complains of loss of interest, inability to concentrate and various fears. The condition is ANXIETY NEUROSIS.

§ 886. I. Anxiety Neurosis (Synonym : Psychoneurotic Anxiety State) is the commonest form of Psychoneurosis. Many cases, diagnosed Neurasthenia, are really examples of Anxiety Neurosis.

Symptoms.—(1) Anxiety is the chief symptom, and this, acting through the autonomic nervous system, produces all kinds of visceral symptoms. Fears of bodily or mental illness, of suicide or death, are common. Acute panics, lasting minutes or hours, characterised by paroxysmal terror and emotional distress, occur. Between these panics the patient's emotional tone is one of anxiety. He fears to meet people, fears to walk in the traffic, and may sit in the house all day. Sleeplessness, arising from his anxiety, adds to the patient's distress ; when sleep occurs, nightmares are often present. (2) Visceral symptoms, visceral reactions secondary to the panics and prevailing anxiety, are almost constantly present. Besides the physical concomitants of fear (viz., dry mouth, shaking, tachycardia, frequency of micturition) all kinds of gastro-intestinal symptoms may arise—vomiting, nausea, diarrhœa, water-brash, constipation, etc. Seminal emissions, blurring of vision, twitchings of muscles also occur. To these morbid fears, which are of infinite variety, various names have been given—fear of open spaces (agoraphobia), fear of closed rooms and buildings (claustrophobia). These are not different diseases but are part of an anxiety state, varying according to the patient's history. Fear of dirt, of knives and scissors, of medicines, of travelling in tubes, lifts, omnibuses, etc., are also met with. The patient cannot explain why he dreads these things, but realises their absurdity.

Diagnosis.—Anxiety as a symptom is common in *obsessional neurosis, melancholia* and *schizophrenia.* The presence of the other characteristic features of these conditions simplifies the diagnosis. Anxiety neurosis results when the reaction produced is out of proportion to the cause, real or fictitious. It is the commonest form of psychoneurosis.

Etiology.—(i) Hereditary, constitutional, and environmental factors. (ii) The patient is usually emotionally unstable ; prolonged anxiety becomes a habit. (iii) A sexual basis was propounded by Freudians to

tion. *Occupational therapy.*—If the patient is unable to concentrate on reading, the periods of rest prescribed may be usefully employed in the practice of rug-making or some handicraft. Occupational therapy of this kind helps to restore confidence (§ 905). *Diet.*—If the patient is physically below par, careful feeding with extra amounts of cream and milk foods, and small doses of malt and cod-liver oil are indicated. *Massage.*—Daily massage and exercises will build up the general muscular tonus. For stronger patients exercise in the fresh air, short of fatigue, will be helpful. *Drugs.*—In nearly all cases the administration of such a mixture as sodium bromide gr. 7, liquor arsenicalis ♏ 1, tinct. belladonnæ ♏ 6, aq. aurantii ad fl. oz. ½, thrice daily after meals, will help to stabilise the emotions of the patient. Alcohol is seldom advisable and tobacco should be limited. Strychnine, in even small doses, nearly always makes the patient worse by increasing general hypersensitiveness. *Change of Environment.*—When the patient has recovered sufficiently, a holiday in a dry, warm climate may be prescribed. He should not be rendered anxious by needless restrictions and warnings.

To summarise, the methods of treatment are : (1) *Explanation* and analysis of the symptoms, (2) *Persuasion*, by all kinds of encouragement and reassurance, and, lastly, (3) *Re-education*, by general methods, until the patient's adaptations to his environment are normal.

There are physical signs of loss of function but without signs of organic disease. The disease is HYSTERIA.

§ 888. III. **Hysteria.**—The results of a hysterical type of reaction to a distressing situation are extremely varied but present a clear clinical picture. The hysterical reaction is a manifestation of a childish need for dependence on others, and the hysterical individual solves her problem usually by the production of some physical symptom, with unconscious desire that it will remove her from the scene of her difficulties. She is, however, entirely unaware how her symptoms have arisen. The temporary solution of the problem brings her a characteristic composure and indifference ("la belle indifférence" of Janet) and a measure of mental relief, wrongly attributed by her friends to fortitude or resignation. Such patients are commonly extremely egocentric and selfish ; there may be an outward show of great emotion, but there is probably very little real emotional content.

Clinically, the disease shows characteristic physical and mental symptoms :

(1) PHYSICAL SYMPTOMS, characteristically produced by suggestion, curable by suggestion and without objective evidence of structural nervous disease. The mimicry of organic nervous disease may be very close but is never complete, and there is usually some paradoxical phenomenon present, revealing the true cause of the symptom, *e.g.*, hoarseness may be present in speaking, yet the cough is clear.

(2) MENTAL SYMPTOMS such as amnesia, delirium, twilight-states, stupor, fugues, somnambulism, and self-mutilation.

It should never be forgotten that hysteria and organic disease may co-exist in the same patient. This is especially true of the traumatic cases.

1. PHYSICAL SYMPTOMS.

(*a*) MOTOR SYMPTOMS.—When *Rigidity* is present it is proportional to the force used to overcome it, on attempted passive movement. The associated contraction of the antagonistic muscles can be palpated when the patient attempts voluntary movement. *Flaccid hysterical palsies* are commoner than rigidity. When the leg is affected it trails behind the patient, who hops on the sound limb with the dorsum of the affected foot dragging on the floor behind him. All kinds of bizarre *hysterical gaits* are met with, which may be associated with remarkable spinal curvatures occasionally simulating hip-joint disease. In these conditions (i.) there is never any alteration, either quantitative or qualitative, in the deep or cutaneous reflexes, although the plantar response may be absent at the toes, (ii.) the muscles react normally to electrical stimulation, and (iii.) there is no wasting, apart from that occasioned by disuse.

Hysterical tremors and tics vary in degree and are increased by attention. Hysterical tremor may closely simulate the tremor of paralysis agitans or disseminated sclerosis, but other features of these diseases are absent. Paroxysms of violent tremor may pass over into hysterical fits. Slighter forms accompany paralysis and rigidity of hysterical origin. Hysterical blepharospasm is fairly common.

In *Hysterical Aphonia* the patient whispers but can phonate normally on coughing. On laryngoscopic examination the cords are not sufficiently approximated to produce a sound.

In *Mutism* there is complete abolition of speech, although the organs concerned are used normally for clearing the throat, coughing and mastication.

Hysterical recurrent cough is fairly common.

(*b*) SENSORY SYMPTOMS.—Sensory loss affects only *cutaneous sensibility* and is usually complete. Sense of position (which is outside the patient's knowledge) is unaffected, as evidenced by accurate co-ordination of movement. Sensory loss may be of the " stocking " or " glove " distribution in the limbs. The upper level of a hysterical analgesia has the following characters : (i.) It is horizontal. (ii.) It varies from time to time on successive examinations. (iii.) The transition from analgesia to normal skin is abrupt, without any area of impaired sensibility or hyperæsthesia, as in organic disease. In hysterical hemianæsthesia the corneal reflexes remain intact and the sensory loss ceases abruptly at the mid-line in front ; whereas in organic disease it is continued for a short distance across the mid-line in front. In hysteria there is often affection of all the spinal senses on the side of the hemianæsthesia. For Janet's " Yes-No " test, see § 706.

Hysterical blindness is often sudden in onset and may be complete or

incomplete. In the complete form the patient commonly avoids obstacles placed in his path. In the incomplete forms perimeter charts show an unequal constriction of the visual fields in the two eyes (hysterical amblyopia) or a spiral "fatigue" field. Diplopia can be produced by pressure displacement of one eye. The pupils and optic discs are always normal. *Hysterical deafness* can be recognised by the fact that the patient can be wakened from sleep if called by name, but when awakened he cannot hear. *Hysterical anosmia* is common in plumbers after gas explosions, and includes loss of sensation to ammonia vapour, which is a function of the fifth, not the first nerve.

(c) VISCERAL SYMPTOMS.—Digestive disturbances are not infrequent and to the relatives most alarming. *Hysterical globus* is the sensation of a lump in the throat interfering with swallowing. *Hysterical ærophagy* may lead to enormous abdominal distension with simulation of pregnancy or ovarian cyst. *Hysterical vomiting* is seldom accompanied by any profound loss of weight : there is no nausea and the expulsion of certain foods from the stomach will not prevent the retention immediately afterwards of others more palatable. In a few cases nothing is retained and progressive emaciation results. In diagnosing these conditions great care must be taken to exclude the presence of organic disease. The chronic abdominal pains of hysterical women are often the cause of repeated laparotomies, for " adhesions," " fixation," etc. The patient, unaware of the true cause of her malady, often invites operation with amazing eagerness.

Anorexia Nervosa is characterised by loss of appetite or a persistent refusal of food. It is a more serious condition, found more frequently in young women, and progressive emaciation may develop even to the point of death. The refusal of food is at first involuntary but soon all desire for food is lost. The condition should be distinguished from the anorexia seen in melancholia and from the cachexia of endocrine origin.

The term *Effort Syndrome* describes a clinical picture that may develop in a variety of nervous conditions. The symptoms comprise breathlessness, giddiness, palpitation, tachycardia, sweating, pain and exhaustion, and these develop during or are aggravated by exercise (§ 34). They occur most frequently with anxiety or with varying degrees of depression, but they may be superadded to a hysterical or a psychopathic personality. The physical methods of treatment, graduated exercises, occupational therapy, etc., will obviously be augmented by psychological treatment of the primary disability.

(d) CUTANEOUS SYMPTOMS.—Blueness, coldness, variable œdema, are all met with in hysterically paralysed limbs. Dermographism is common. Anomalous skin eruptions produced by the patient by rubbing, corrosives, or by burning (§ 608).

(2) MENTAL SYMPTOMS.

Hysterical amnesias are frequently for limited periods of time and follow a marked emotional disturbance. Similarly *delirious states* follow an emotional upset ; the degree of confusion is variable and the flow of talk is of a nonsensical type. The *twilight state* (Ganser syndrome) occurs essentially among prisoners and represents an attempt to appear irresponsible ; the purposeful nature is obvious. *Stupor* may be maintained for prolonged periods but terminates rapidly once the precipitating factors have ceased to exist. *Amnesias, fugues,* and *somnambulism* are evidence of dissociation. The dissociated portion of the personality functions independently and for the time being controls the patient's activities. *Self-mutilation* is met with and suicidal threats and attempts may be made ; the latter are invariably dramatic.

(e) HYSTERICAL FITS never occur between definite hours of the day, as do epileptic fits, and never during sleep. They take place in the presence of an audience, there is never any incontinence or tongue-biting, and the patient never injures herself, although others may be injured. The eyes are usually screwed up and the hands

clenched, and the movements are " purposive." Hysterical fits may follow upon true epileptic fits. They may be accompanied by outbursts of unrestrained laughing and crying.

Etiology.—(i.) Constitutional factors are important. (ii.) Hysteria often occurs in families with a history of schizophrenic, alcoholic or other psychopathic disorders. (iii.) It is more common in adolescence and at the menopause, and (iv.) in females than males. (v.) It occurs in a hysterical type of personality, characterised by egotism and an attitude of posing or make-believe. Such patients show a marked emotional susceptibility and are readily influenced by and imitate those who appeal to them. (vi.) Mental stress is the exciting factor ; the symptom achieves some aim or desire (often not consciously appreciated by the patient) and thus allows a maintenance of self-respect otherwise impossible.

Prognosis.—Individual symptoms are usually easy to cure but the liability to recurrence is great. The prognosis depends on how far the personality can be modified and the etiological factors readjusted.

Treatment.—Treatment directed merely to the relief of local symptoms is inadequate, though by suggestion, persuasion, and re-education it may be temporarily effective ; somatic symptoms respond readily to suggestion. It is not, however, enough to remove the symptoms ; efforts must be made to elicit their mechanism ; until this is discovered and treated no permanent benefit is derived. The employment of all psychotherapeutic methods (§ 905) may be necessary at some time or another to achieve this end. The chief obstacle to effective treatment is the mental indifference of the patient ; this prevents an appreciation of the causes which have led to the development of the symptoms. Environmental factors must be considered and readjusted as far as possible. The thought of return to the arena of conflict is, in some cases, insupportable, *e.g.*, the childless woman will not return to her drunken husband. In such cases, you must do what you can to make the patient's environment more tolerable. In all cases, she should be encouraged to do some kind of useful work.

§ 889. IV. **Traumatic Hysteria** (Synonym : Traumatic Neurasthenia). The symptoms of this neurosis must be carefully distinguished from those of *Unresolved Cerebral Contusion* (see § 696. VII).

Immediately following upon an accident, which may be trivial, or more usually some days or weeks after the accident, the patient develops hysterical symptoms. The condition is particularly likely to occur in injuries to the head or spine. There is always an additional element of anxiety in the symptoms, due to the uncertainty in the patient's mind as to the outcome of litigation and the possibility of his return to work. It occurs in workmen, especially those engaged in dangerous occupations and who work at a height from the ground. Such cases often come into Court in connection with the Workmen's Compensation Act.

Symptoms.—Mentally, the patient becomes extremely introspective, with a profound conviction of the seriousness of his complaint. He becomes sleepless and irritable, and his anxieties are increased by his

uncertainty of his ultimate recovery and return to work, and the financial straits into which his illness throws him. Physically, all kinds of hysterical phenomena are met with, tremors, paralysis, spasms, including convergent ocular spasm, hysterical gaits and attitudes, and hysterical affections of the special senses and cutaneous sensibility. There is commonly loss of weight, tachycardia and low blood-pressure. Pains of all kinds are complained of, and these may indeed be due to associated organic disease, *e.g.*, Spondylitis. The distinction from malingering is often difficult. In malingering there is conscious attempt to deceive others for gain ; unlike the hysteric, the patient is not deceived as to the mechanism of his symptoms.

Treatment.—A period of rest in bed for two weeks, with a full neurological and X-ray examination, will prepare the way for cure. If no organic disease is found the patient should be informed of this and his symptoms should be tactfully explained to him. Hypnotics and sedatives may be necessary to secure the sleep essential in treating such cases. Explanation should be combined with reassurance and re-education. Graduated gymnastic exercises, physical work, ladder-climbing, weight-lifting, may all assist in the cure. The symptoms, however, do not usually entirely clear up until legal proceedings are finally settled, and the patient has proved or failed to prove his case against those he deems responsible for his illness. Even after such a settlement, symptoms occasionally persist, owing to the anxiety occasioned by his illness.

The patient is dominated by some thought or action recognised as senseless and accompanied by a feeling that it must be resisted. The condition is OBSESSIVE COMPULSIVE NEUROSIS.

§ 890. V. **Obsessive Compulsive Neurosis** (Syn. Psychasthenia). Almost everyone has experienced at some stage in life obsessions or compulsions of a mild degree. They are frequently present in minor degree in childhood and are rarely to be taken seriously then. The condition is an attempt to ward off unknown evil by a process akin to magic. When present in later life they are of much greater significance and may be so severe that the greater part of the patient's life is spent in attending to these symptoms. The condition is characterised by : (1) *Anxious preoccupation with some obsessive idea.* The patient may ask himself over and over again some religious or metaphysical question, *e.g.*, " What was the beginning of everything ? " Some are disturbed by the reiteration of certain words or phrases in their mind. These are frequently symbolic and may be so severe as to exclude other interests. (2) *Morbid compulsions.* It is easy to appreciate how ritualistic actions may develop as a means of combating the fears associated with the obsessive ideas, *e.g.*, a fear of dirt and contamination may necessitate constant washing and scrubbing of the skin to ensure cleanliness. Patients may feel compelled to touch objects, to do things in a certain order, to steal something intrinsically worthless, which they do not need (kleptomania), to commit homicidal acts or sexual assaults, to take alcohol (dipsomania) or drugs. There is, sometimes, only fear that these imperative acts will be committed, and the act is never actually carried out.

Prognosis.—When the onset is insidious and there is no marked affective disturbance the prognosis is poor. The course of the illness is invariably prolonged. It has been frequently stated that it is not uncommon for obsessional-compulsive states to be followed by a psychosis. This seems doubtful. If the obsessional symptoms are

part of a depressive illness and accompanied by the other characteristic features of an affective disorder the prognosis is reasonably good.

Treatment.—The hereditary basis is marked. When the morbid impulse or obsessional idea is part of a depressive illness, the treatment is as for melancholia. The more severe forms of insidious onset are not readily amenable to psychotherapy, which is necessarily prolonged.

The patient exhibits ANOMALIES OF BEHAVIOUR, *characterised by* INADEQUATE SOCIAL ADAPTATION, ANTAGONISM TO OTHERS, *or by* PATHOLOGICAL SEXUAL IMPULSES WITHOUT *gross* PSYCHOTIC SYMPTOMS *or intellectual impairment. The condition is* PSYCHOPATHIC PERSONALITY.

§ **891.** VI. **Psychopathic Personality.**—*Symptoms* often appear in early life, generally in the form of excessive emotional displays, temper tantrums, pathological lying, and antisocial behaviour of a criminal kind, stealing, wilful destruction, etc. (§ 907). As puberty normally requires numerous fresh adaptations between instinctive desires and social standards, at this time the expression of a psychopathic personality invariably becomes more pronounced. Antisocial actions become more frequent, more acute, and are generally of an episodic nature and quite uncontrollable : they are devoid of reflection or any consideration for feelings of themselves or others, and their execution produces no sense of remorse. These abnormal acts generally occur in a setting of clear consciousness with no other abnormal psychotic manifestations, so that it is extremely difficult to exercise control. The intellectual level is invariably within normal limits.

Etiology.—The chief etiological factors seen are the effects of heredity and environment. A similar picture may be seen associated with organic diseases of the brain, *e.g.*, epilepsy, encephalitis lethargica.

Prognosis.—The prognosis is serious, particularly if treatment is not instituted before adult life.

Treatment.—This as it applies to problems in childhood is described in § 907. At this stage prevention offers the greatest measure of success. Ascertain the factors that determine or aggravate the outbursts. If environmental factors are prominent, effect a change in this direction. Where antisocial acts of conduct are serious, admission to hospital may be necessary. The provision of colonies for the supervision and treatment of these patients has been repeatedly advocated. Once adult life is reached the results of psychotherapeutic treatment are disappointing.

GROUP II. THE MAJOR MENTAL ILLNESSES

§ **892.** I. STATES OF EXCITEMENT and EXALTATION. Acute mental excitement may be a **transient** phenomenon in the following conditions, where it is clearly traceable to some bodily disorder. DELIRIUM (§§ 469 and 901) ; ALCOHOLIC and DRUG INTOXICATION (§§ 899 and 900) ; HEAD INJURIES (§ 716) ; THYROTOXIC CRISES (§ 186) ; EPILEPSY (" Equivalents ") (§ 721).

Continuous mental excitement is found in :—MANIA (§ 893) where the mental condition is the only, or at any rate, the principal symptom ; AGITATED MELANCHOLIA (§ 895), where the agitation is accompanied by severe depression ; ACUTE TOXIC CONFUSIONAL PSYCHOSIS, where hallucinations and delusions are prominent features of the excited state, together with symptoms of profound exhaustion ; SCHIZOPHRENIA (§ 897), when it is accompanied by delusional ideas frequently grotesque in nature ; and in GENERAL PARALYSIS (§ 902), when accompanying physical signs are apparent. When a patient is confused and delirious, investigate for drug intoxication, such as that following the cumulative effects of a sedative, especially bromides, taken for weeks or months ; URÆMIA may produce similar symptoms (§ 372).

The patient is continuously excited, restless, garrulous, showing flights of ideas, or lacking in control. The disease is MANIA.

§ 893. Mania is classified as " Simple," " Acute," and " Chronic."

Simple Mania.—In this mild form of excitement one of the principal features is a loss of self-control. This is accompanied by an exaggerated sense of well-being. The patient is talkative, restless, and optimistic. Often he is interfering and irascible. There is a general failure of judgment and instability of purpose.

Acute Mania may supervene suddenly—(1) during convalescence from exhausting diseases (as previously mentioned) ; (2) in the course of other diseases of the nervous system—*e.g.*, G.P.I. ; (3) in the course of some other form of mental illness. Its onset is usually rapid, tongue-tremor being often met with in the early stage. The stage of excitement is soon reached—loquaciousness, sleeplessness, continual restlessness, incoherence in which delusions and ideas succeed each other with great rapidity, sometimes relating to moral and religious, at other times to intellectual topics. After lasting some weeks or months, recovery (sometimes quite suddenly) ensues ; sometimes it is followed by moral or mental obliquity or dementia ; it may pass into chronic mania. The temperature is normal throughout. In many cases there is a tendency to relapse and sometimes an alternation with melancholia.

Chronic Mania is suspected when a patient's restless excitement, incoherent conversation, and disordered conduct continue, although sleep and appetite have fully returned and are accompanied by improvement in the physical state. Delusions become more prominent and auditory hallucinations may be a feature. The condition is rarely seen before middle life.

Acute Delirious Mania is an acute maniacal condition which may follow upon one of the other varieties of mania or develop suddenly in a person in apparent health. It is attended by pyrexia, usually running a rapidly fatal course, no lesions being found after death. It is happily rare. The symptoms come on abruptly, and quickly amount to frenzy, accompanied by outbreaks of great violence and refusal of food. The temperature ranges irregularly from 100° to 104° F., and in the course of one to three weeks the disease terminates in great bodily prostration, and often in death. The majority of these cases are nowadays better described as **Acute Toxic Confusional Psychosis.** The toxic nature of the illness is evidenced by the rise in temperature, the vivid numerous and fleeting hallucinations, the intense confusion, and the state of muttering delirium which supervenes. The patient has all the appearance of one suffering from toxæmia, the complexion is pale and muddy with perhaps a malar flush, the mouth and tongue are dirty, and there is sordes on the lips. From acute mania it is known by the fever, the rapid wasting, and more rapid and fatal termination. It resembles some cases of typhoid fever very closely, acute pneumonia and acute meningitis, but their distinguishing signs are absent.

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The *treatment of mania* consists mainly of rest in bed, preferably in the open air, and in the administration of food. Narcotics and depressants are invariably required. Paraldehyde is of great value in inducing sleep. Sulphonal has been recommended to allay the excitement, but the danger of methæmoglobinæmia (§ 32) must be remembered and its use over a long period discouraged. In recent years innumerable modifications of the barbituric acid group have been elaborated and are frequently used for continued narcosis. The degree of somnolence maintained is such that the patient can be aroused for meals. The drug most frequently employed is somnifaine 2 c.cs. intramuscularly two or three times daily, after an initial induction of sleep by the hypodermic injection of morphia gr. ¼, hyoscine gr. 1/100. It should be remembered that the threshold between the therapeutic and toxic doses is low and complications may readily ensue. To prevent such, the administration of glucose and insulin has been recommended ; the degree of success achieved thereby is, however, not always complete. Hydrotherapy in the form of the continuous bath is extremely valuable. Constant supervision is necessary as there is a danger of collapse. The temperature of the water may vary between 96° and 98° F. The successful management of maniacal patients depends on tactful and patient handling. By such means it is usually possible to ensure adequate nourishment and rarely is tube feeding necessary. The principal indications in the treatment of *acute toxic confusional* psychosis are to control the extreme restlessness by hypnotics, to promote elimination as freely as possible and to maintain the patient's strength. The bowels should be well washed out with a high enema at least twice weekly, and the patient should be given copious fluids, by stomach tube if necessary. The mouth should be kept clean and the general medical and nursing indications are similar to those required in the treatment of any acute toxic and febrile illness.

§ 894. II. MENTAL DEPRESSION and RETARDATION may occur in : (1) MELANCHOLIA, where the signs and symptoms of depression are constant, and are the dominant features of the illness ; (2) SCHIZOPHRENIA, where the affective change is inadequate, or bizarre delusional ideas are prominent ; and (3) GENERAL PARALYSIS, in which disease the accompanying *physical* signs are the determining features.

The patient is continuously depressed, self-reproachful and hopeless. The disease is MELANCHOLIA.

§ 895. **Melancholia** is a morbid condition of miserable self-consciousness and self-abnegation without hope. The onset is usually insidious, and commences with extreme self-consciousness, combined with sadness, as indicated by depression, without adequate cause, and the patient is irritable when remonstrated with. He loses interest, finds increasing difficulty in concentration, develops fears of impending calamity which cannot be named and becomes sleepless. Self-reproachful ideas are conspicuous and often refer to minor events that may have occurred years previously. The diagnosis is strengthened by a history of a previous attack, or an intervening period of high spirits and bounding energy. A family incidence of depression puts the diagnosis beyond doubt. Always regard such patients as potential suicides. The degree of affective response differentiates such patients from those suffering from hypochondriasis.

Melancholia may be simple, acute, or chronic. (1) **Simple Melancholia** is characterised by a lack of interest, loss of feeling for others, inability to concentrate as before and a dulling of the mental processes. It consists simply of misery, sleeplessness, self-reproach, and inability to continue at work. This form is common in the overworked or much-worried, and in women at the climacteric. There are no hallucinations, but self-reproachful, depressive ideas are common and characteristic. Suicidal preoccupations are usual in these cases and they constitute a large proportion of the

suicides that occur each year. Adequate precautions, which are sometimes neglected on account of the simplicity of the affection, should not be omitted. Otherwise the prognosis is favourable. (2) **Acute Melancholia.**—The symptoms already mentioned are present but to a more marked degree. There is marked psychomotor retardation and the picture is that of the most profound misery. Delusional ideas are marked and are of a self-accusatory nature, *i.e.* they think they are the most wicked individuals, that they have committed the unpardonable sin, etc. Hypochondriacal ideas are also prominent and refer to alleged dysfunction of bodily organs. Auditory hallucinations may be prominent. Food is frequently refused because of ideas of unworthiness and the general condition deteriorates. Insomnia is marked. (3) In some cases **Melancholic** or **Benign Stupor** is met with. The patients lie in bed speechless, motionless, and are often negativistic. Their habits are faulty ; in some retention of urine and fæces has to be specially watched for. Their limbs may be flaccid or in cataleptic rigidity. Although they may appear oblivious to external stimuli they retain as a rule a surprising degree of appreciation of their environment while in this state. They resist external interference, but are not usually violent. It is equally common in both sexes, but is more frequent in the young than in the old. Sometimes it follows a severe and exhausting illness, and sometimes it follows acute mania. (4) **Chronic Melancholia.**—In this condition, the symptoms of depression persist, but they are obviously less acute than in the other forms. Although the patient still has the same despairing attitude towards life, sleep returns, food is taken satisfactorily, and the physical state improves. (5) **Agitated Melancholia.** The characteristic picture is that of severe depression without retardation. The age of onset is usually the involutional period though an earlier incidence is not unknown. Anxiety is marked and is accompanied by extreme motor restlessness. The patient paces up and down wringing his hands and repeating the same despairing remarks over and over again. Auditory hallucinations and delusional ideas are prominent. The absence of retardation increases the degree of suicidal risk. The general physical condition deteriorates because of the difficulty in feeding and the expenditure of much energy.

Recurrent Mania and **Recurrent Melancholia.**—In many instances there is a tendency for a patient to have repeated attacks of mania or melancholia. In such cases it is often remarkable how faithfully reproduced are the general symptoms and the individual peculiarities which have characterised former attacks. For many years it has been recognised that there is a close alliance between mania and melancholia. In the history of almost every attack of depression one finds evidence of an elated phase having been experienced, and similarly, attacks of elation may be preceded or followed by depression. For this reason both mania and melancholia now come under the one classification, namely, **Manic Depressive Psychosis.**

Course and Prognosis.—The melancholic process is longer than the maniacal one. The duration varies considerably but lasts an average of some three to twelve months. However, cases of melancholia may recover even after a very long time—up to fourteen years has been recorded. Relapses are frequent. Heredity is an important factor and the nutrition of the body at the time is another. The danger of exhaustion and intercurrent infection is great in the agitated variety ; about 10 per cent. of such terminate fatally in spite of the most careful attention. The presence or absence of an adequate cause, the type of onset, the form of the illness and the absence of other features (arterio-sclerosis, etc.) are the important factors to consider in estimating the prognosis. The slower the advent of the disease, the slower is the recovery. There is a distinct suicidal tendency in all cases of melancholia. The risk is less if the degree of retardation is marked, but is greatly increased in the convalescent stage. Never relax observation because the patient says he will not attempt to injure himself ; most attempts to commit suicide are of an impulsive nature.

Etiology.—Hereditary factors are prominent and have already been discussed. There is a distinct constitutional basis in the majority of these patients as characterised by their pyknic build : their bodies are round with an abundance of fat, poor

muscular development, a rather broad face on a short neck and small hands and feet. The predominant disposition may be either pessimism or optimism and unbounded confidence. These characteristics do not explain the etiology; much depends on the degree of stress to which an individual, so endowed, is subjected. An important factor is a general depression of the vital powers from bodily disease, *e.g.*, fevers, heart disease, and in particular, influenza. The illness is more frequent in women than men. The first attack of mania develops invariably before thirty, whereas depression is more frequent at or after middle life.

Treatment.—In the simpler cases, such as those referred to under Simple Melancholia, a few weeks' or months' rest under supervision, with a pleasant companion and complete absence of the conditions under which the disease arose, will generally set the patient right. Prolonged narcosis (§ 893) is frequently very beneficial, particularly in the less acute forms. Occupational therapy (§ 905), especially in the convalescent stages, is of value in creating interest and increasing the degree of self-confidence. Feeding is necessary, and in case of refusal it may be done by means of (*a*) a spoon, pouring the fluid into the cheek beside the teeth, or (*b*) by the nasal or stomach tube. The quantity thus administered should consist of one or two pints of milk; to this should be added one or two eggs, a dessertspoonful of sugar and fruit juice. Where artificial feeding is maintained over long periods the feed should be varied and may include soups and meat juices. Sleep must be secured; strychnine tonics may be prescribed before meals. As constipation is usually present, the bowels require attention. Hydrotherapy in the form of the continuous bath is valuable when agitation is marked. Suicide can only be prevented by adequate and constant supervision. If this cannot be obtained at home, then treatment in hospital should be arranged. Convulsive therapy, electrically induced (§ 897), may affect very materially the course of a manic-depressive illness. It influences both phases, though the response in the depressive phase is more easily achieved. The degree of improvement in agitated melancholia is frequently dramatic. Operative measures—prefrontal leucotomy (§ 897)—have been carried out in certain cases where anxiety and agitation have been marked. Beneficial results have been obtained.

§ 896. **Hypochondriasis,** though it cannot accurately be isolated as a clear-cut neurotic or mental disorder, frequently gives rise to such a characteristic clinical picture that a description of the condition is warranted. It is a morbid condition of the nervous system which has features common to both melancholia and to some of the neuroses.

The patient suffers from prolonged emotional disturbance interpreted in terms of general malaise and of particular physical symptoms. Although most hypochondriacs may be shown to suffer originally from a depressed reaction to their environment, it is usually found that they also have some underlying physical disability. They refer all their difficulties to this, and in time become intensely preoccupied with the numerous abnormalities which they discover in their state. Thus, while we must presume that most hypochondriacs are badly adjusted to their environment, we can recognise that most of their symptoms are based in the first instance upon very real somatic disturbances arising from such conditions as chronic dyspepsia, visceroptosis and " floating kidney." Very soon the whole lives of such patients are coloured by their ideas regarding the deficiencies of their internal organs. Many of them go from doctor to doctor reciting their symptoms and gleaning from each a few fresh catchwords about their state. Male hypochondriacs appear to be excessively worried most frequently about their sexual functions and fear impotence. Female hypochondriacs are more usually concerned with peritoneal adhesions and " floating kidney." Many such women contrive to be operated upon frequently in order to be relieved from a condition which is basically due to emotional disturbance and maladjustment.

Diagnosis.—It is impossible to enumerate all the symptoms of hypochondria, and it must be understood that a great number of neurasthenics and true melancholics are intensely hypochondriacal. Nevertheless, it can be recognised that there exists

a definite number of patients whose symptoms appear to be purely those described above.

Etiology.—Hypochondriasis is occasionally seen in women, about the menopause, but more often in men of middle age. It is rare before puberty or before thirty, and generally makes its first appearance between thirty and forty. There is often a neurotic family history, including insanity. Digestive disorder (gastro-intestinal or hepatic) is always present, and may be looked upon as its most frequent cause— a fact of interest in connection with the marked prostration and depression which attend gastric and abdominal disorders. Flatulence and dilatation of the stomach are common.

Treatment is difficult unless one has the time to examine thoroughly the patient's mental state, his environmental circumstances, and to discover the reasons for his failure to react adequately towards these. The dyspepsia should be relieved, the bowels should be carefully regulated and otherwise treated. These means, with regular exercises, change of environment and cheerful society, may break through the vicious mental attitude if they are supplemented by reasonable discussions with the patient on his circumstances and his method of adjusting himself to them.

The patient becomes apathetic, withdraws from outside interests, day-dreams continuously or develops delusional ideas. The disease is SCHIZO-PHRENIA.

§ 897. III. **Schizophrenia** (Syn.: Dementia Præcox). This form of mental illness is characterised by an abnormal emotional reaction, accompanied by varying degrees of apparent deterioration in the personality. It has been reported in early life, but is more frequently met with between the ages of fifteen and thirty-five. See § 907 B for symptoms in adolescence. There is frequently a family history of nervous or mental disorders, and the patient may show one or more stigmata of degeneration, *e.g.*, deformities of the ears. The onset is invariably insidious and no adequate cause can be demonstrated. The previous personality is that of a reserved, unsociable individual of few interests. Four types are found. (1) *Simple :* The characteristic feature is the gradual loss of interest in the environment. As time goes on such patients withdraw further from reality and substitute a world of phantasy, showing itself in indifference and apathy. Delusional ideas and hallucinatory experiences are infrequent and many of these patients lead a simple life outside hospital care. (2) *Hebephrenic :* Here delusions and hallucinations are prominent. The oddity of the delusional ideas—that half of their body has ceased to function, that their blood has gone—and the indifference with which they recite such, are characteristic. Hallucinations are both auditory and visual. Attacks of depression alternating with acute outbursts of excitement occur in the course of the illness. During the latter suicidal or homicidal attacks may be made. Other symptoms frequently seen are echopraxia and echolalia in which the actions or words of bystanders are imitated, although questions may not be replied to. (3) *Katatonic :* The progress of the illness is more rapid in this form. Extreme affections of volition are found and vary from outbursts of excitement to depression and a stage of stupor. In the stuporose state no interest is displayed in anything. The patients sit in one position ; if the limbs are placed in an awkward position they will remain there for an indefinite period (flexibilitas cerea). Such patients have to be dressed and undressed and require attention in all respects. They pay no heed to the calls of nature, and may require to be tube fed for long periods. Although indifferent and apparently insensitive they are able to appreciate nevertheless what is going on in the environment. From this state they will pass into one of excitement, possibly without warning. Impulsive attacks, homicidal or suicidal in nature, are frequent and must be guarded against. (4) The *Paranoid* form is characterised by prominent delusional ideas. They are not systematised as in paranoia, are much more bizarre in nature and are accompanied by hallucinatory experiences. It is more common to meet this type after thirty years of age than before.

Etiology.—Hereditary and constitutional factors are again conspicuous. In stature these patients are thin, long-limbed and of poor physique. Their mental make-up is that of a reserved, shy individual with few interests and friends. The symptoms may not become manifest till after some debilitating illness or period of mental stress.

Course and Prognosis.—In the main the outlook is poor. Such patients constitute 40 per cent. of the chronic cases in mental hospitals. Remissions occur of comparative or complete return to health; in others the degree of improvement is less marked. Of the clinical types the katatonic variety is the most favourable. A sudden onset, a previously good personality and an adequate cause, when found, make the prognosis less ominous.

Treatment.—When the illness has developed, then hospital treatment is advisable for the safety of the patient and the community. Excitement is delayed by hydro-therapy and sedative measures. Efforts must be directed to prevent further deter-ioration in habits. In this respect occupational therapy, properly directed, is of the greatest value. Various special forms of therapy have been advocated at different times, by the induction of fever (malaria, pyrifer), vaccines, polyglandular extracts, and continued narcosis. The variety of such testifies to their inefficacy.

In recent years active therapeutic measures have included (*a*) electrically induced convulsions, (*b*) hypoglycæmia, (*c*) operation—prefrontal leucotomy. The first two require the closest supervision and should be given only by experts. A combination of both methods is sometimes used, the convulsion being induced after a light degree of hypoglycæmic coma has been attained. Convulsive therapy is more effective where the affective disturbance is marked and hypoglycæmia where there are gross delusional ideas. Early treatment gives a much better therapeutic result. *Electrically induced convulsions* have superseded those produced by Cardiazol as being less unpleasant and not accompanied by anxiety : by means of electrodes placed on the head, a small electrical current is passed through the brain (100–150 volts for 0·2 sec.) and a convulsion follows at once, with tonic and clonic phases, the period of unconsciousness lasting a few minutes. These are induced at three-day intervals ; improvement is unlikely if it is not manifested after 10 to 15 treatments. Complications that may arise include fractures of bones and dislocations of joints, but the incidence of these has been over-emphasised. They result from muscular spasm and the dangers may be materially diminished if the treatment is combined with curare. In treatment by *Hypoglycæmia*, the aim is to produce a severe reaction by the introduction of insulin. The average dose of insulin to produce coma appears to be 60–80 units, but over 200 units have been necessary in some cases. The coma may be allowed to last for 1½ hours. It is terminated by a nasal feed of 33% glucose, or, if necessary, the giving of intravenous glucose. This form of treatment is given on successive days with one day's rest a week, and the course of treatment consists of 60 coma doses. This method is much more dangerous than the former ; in both, the presence of physical disease is a contraindication. (*c*) Prefrontal leucotomy is a surgical procedure. The prefrontal area is exposed and association fibres are severed. The method as at present practised is unscientific but there is no doubt that certain patients are considerably improved.

All the thinking processes of the patient are permeated by an idea of per-secution. Such an idea may be logical. The disease is PARANOIA.

§ 898. IV. **Paranoia** is the term used for a variety of mental illness in which the patient's whole mental life is dominated by a delusion—usually one of persecution. Disorder of judgment is the characteristic feature, and in consequence the patient interprets every incident which he observes or takes part in as fresh proof of a plot against him. There are two classes of paranoiacs. In the first, which is of a milder character and rarely needs care in a mental hospital, the patient's own personality does not take any part in the delusion, but he is possessed by some wild theory which

he preaches in and out of season; in the second class, which is a grave form of mental illness, the patient's own personality is all-important, and delusions of persecution are common. This delusion is liable to lead the patient to assassination of some prominent person or even to attempt suicide in order to call attention to his case. Megalomania is apt to develop as the disease progresses. Hypochondriasis, in which the patient's attention is focussed on his health or lack of it, is sometimes a sub-variety of paranoia, but does not lead to any disorder of conduct likely to cause harm to the community. *Folie à deux* is a condition in which one patient, usually a paranoiac, persuades another with whom he or she is very intimate of the reality of the supposed plot against their lives or characters. The second patient, some-times called the passive element, though mentally ill, is more likely to recover. In true paranoia there is no recovery, although occasionally a remission may occur. When the paranoiac disorder is dominated by active hallucinations the condition is called **Paraphrenia,** and mostly arises in patients past middle life.

V. *The patient is addicted to alcohol or a drug, or the brain is affected by a toxæmia. The disease is* ALCOHOLISM, DRUG HABIT *or* DELIRIUM.

§ 899. **Addiction to alcohol,** opium or other drugs, may be sympto-matic of an anxiety neurosis, obsessive-compulsive neurosis, psychopathic personality, manic-depressive psychosis or general paralysis. The con-tinual abuse of the drug leads to a gradual deterioration of the personality, although this seldom advances to the stage of certifiable mental disease. Alcoholism or excessive indulgence in alcohol is met with clinically in five forms—(1) Acute alcoholism, (2) Chronic alcoholism, (3) Dipsomania, (4) Delirium Tremens, (5) Korsakoff's Psychosis.

(1) **Acute Alcoholism** is due to an excessive quantity taken in a few hours. It gives rise to mental disturbance, ataxia, and even a temporary flaccid paresis of the limbs. Later, narcosis with a marked lowering of body temperature may develop. From a medical point of view the effects of an acute alcoholic debauch are so transient as to be of no importance except in medico-legal cases. Acute drunkenness must not be confused with diseases causing cerebellar or sensory ataxia (see p. 1006) or Ménière's Disease (see § 692, vertigo). Certain neurotics are abnormally sensitive to small doses of alcohol, and, for months after severe head injuries, even small doses of alcohol may produce intoxication. The stupor of con-cussion, apoplexy, uræmia, opium poisoning, etc. (§ 716), and the mut-tering delirium (§ 469) of pneumonia and other diseases, may be mistaken for drunkenness, a serious error which is best avoided *by keeping the patient under observation in bed* and suspending your judgment.

(2) **Chronic Alcoholism** is due to the persistent imbibition of moderate doses of alcohol over a long period. It acts as a poison on the nervous, muscular (voluntary and involuntary) and epithelial elements, and hinders tissue oxidation, thus leading to fatty degeneration.

Symptoms.—(i.) The patient is able to take doses of alcohol which, in the normal person, would produce drunkenness. (ii.) Irritability, even violence, and progressive deterioration of personality appear, especi-ally when the patient is amongst his family circle. (iii.) Carelessness and lack of concentration become evident in the patient's work, and (iv.) he strongly resents any suggestion that these failings are due to alcohol.

(v.) Later, *other mental symptoms* appear, such as alternating depression or excitement, unfounded suspicions or delusions of persecution ; the patient ceases to speak the truth and dementia gradually develops. Delirium tremens (see below) supervenes from time to time, and sometimes epileptiform convulsions. (vi.) The physical symptoms are : (*a*) gastric catarrh with anorexia for food and morning vomiting, (*b*) gastric dilatation, (*c*) hepatic cirrhosis, and (*d*) myocardial and arterial degeneration. (*e*) There is often obesity and plethora, or the gastritis or cirrhosis leads to marked loss of flesh. (*f*) Coarse tremors of the hands, tongue and lips, with tremulous dysarthria. (*g*) The kidneys may show interstitial nephritis. (*h*) Polyneuritis may occur (§ 794).

Secret drinking is the term applied to chronic alcoholism occurring in persons who are thought to be " above suspicion." It occurs especially in women about the menopause, who commonly secrete empty bottles in the wardrobe, under the bed, etc.

(3) **Dipsomania** or paroxysmal drinking is frequently symptomatic of a psychopathic personality or of manic-depressive psychosis. It is also found sometimes in epileptics. The condition is often hereditary and may develop in middle life. Between the paroxysms the patient may be quite normal with no desire for alcohol, or even distaste for it. Then comes depression and an uncontrollable craving for alcohol. The attacks may show a definite periodicity.

(4) **Delirium Tremens** arises in chronic alcoholics : (1) after a debauch, (2) with pneumonia or other acute infection, or (3) after sudden withdrawal of alcohol, *e.g.*, when the patient is sent to hospital for treatment of a fracture. The *symptoms* are : (1) restlessness and complete insomnia, (2) terrifying visual hallucinations of animals, especially insects, spiders, rats, snakes (zoöpsia), producing intense fear and impulsive outbursts, (3) occupational delirium with disorientation in space and time, and (4) coarse tremors of the fingers, face and tongue. (5) The temperature is usually slightly raised, and (6) furring of the tongue, dryness of the mouth and anorexia are usual. A first attack will last three to five days, the patient waking to consciousness with amnesia for his delirious period. Second attacks may last two or three weeks.

The *Diagnosis* of delirium tremens is referred to in § 469. The history of alcoholism and the type of hallucinosis are of value but care should be taken not to overlook an acute pneumonia, especially of the apex. The *Prognosis* of delirium tremens is generally favourable if the temperature is not much elevated, and the strength of the patient can be maintained. Second and third attacks are commonly longer in duration and may leave residual mental impairment.

(5) **Korsakoff's Psychosis** occurs most frequently in chronic alcoholics past middle life, but may follow an attack of delirium tremens. It is met with in other toxic conditions also and is frequently seen after a severe head injury. It affects women more frequently than men and is invariably accompanied by neuritis.

Symptoms.—(1) Memory defects are characteristic. There is a gross impairment for recent events ; the gaps are made up by confabulations, frequently of a most

plausible nature ; (2) disorientation in space and time ; (3) auditory and visual hallucinations, (4) moods fluctuate rapidly between one of euphoria and one of anger and irritability, and (5) signs of polyneuritis. The prognosis is frequently not good, some impairment of memory and of the intellectual faculties persists. The duration of the illness extends over months.

The *Treatment* of *acute alcoholism* consists in washing out the stomach or giving an emetic, *e.g.*, apomorphine, grain $\frac{1}{6}$ hypodermically. The collapse is treated with enemata of hot coffee, warm blankets and hot water bottles, care being taken that the patient is not burned before he recovers consciousness. Treatment of the *chronic* types is impossible unless the patient co-operates. A chronic alcoholic habit is rarely abandoned after forty. Institutional treatment, where one can be satisfied that the patient will not obtain alcohol, is the only method of ensuring abstinence. The method of withdrawal may be rapid or delayed. Various forms of treatment have been advocated ; none are completely satisfactory. Strychnine and atropine sulphate (hypodermically) $\frac{1}{60}$ grain and $\frac{1}{120}$ grain respectively may be given with cinchona bark (by the mouth) four times daily, until the throat is dry and the pupils dilated. At first, night and day nurses will be necessary. Sleeplessness should never be treated by morphine, which may be cumulative in its effect in chronic alcoholics with hepatic cirrhosis. Paraldehyde ℥ 120–240 per rectum, or chloral gr. 15 and sodium bromide gr. 15, by mouth, may be given safely, with hot packs. Massage and careful feeding improve the general condition. Patients should be encouraged to remain under institutional treatment for some months, during which period the psychological factors must be investigated and treated, so that the patient may endeavour subsequently to face his problems without retreating to alcohol. Regular outdoor exercise and extraneous interests are encouraged. There must be complete abstinence for the rest of the patient's life. The readjustment of any domestic or business difficulties is essential and the question of the patient's return to his former occupation must be carefully considered. If he returns to the circumstances of his previous breakdown recurrence of the habit is probable.

In *delirium tremens*, alcohol may require to be given in the early stages and gradually tapered off. The main objectives in treatment are to improve the physical state, control the restlessness and obtain sleep. Small allowances of liquid nourishment at frequent intervals are necessary to maintain strength. Such patients frequently endeavour to get away from their hallucinatory experiences and in so doing may be a danger to themselves. The closest degree of observation and tactful management are therefore essential and must be insisted upon (two or even three nurses if necessary). Beneficial results have been claimed from frequent lumbar puncture and drainage of the cerebrospinal fluid. Sleep is essential and great variations will be found in the response to sedatives. It may be necessary therefore to change these at intervals. Paraldehyde per rectum, or chloral and bromide, or nembutal four and

C.M.   N N*

a half grains by mouth or hyoscine hydrobromide gr. $\frac{1}{100}$ hypodermically may be tried with hot packs to secure sleep. An attack of *dipsomania* may be averted if premonitory symptoms are present, by injections of apomorphine, grain $\frac{1}{6}$, hypodermically, to produce nausea or vomiting. The gastric catarrh of alcoholism may be treated by tincture of capsicum ℍ 5, sod. bicarb. gr. 10, in half an ounce of infusion of gentian.

§ 900. Morphinism (Synonyms : Morphia Habit, Morphinomania) and other **drug habits**.—Hypodermically, **morphia** in small doses is a nerve stimulant as well as a hypnotic, and induces a feeling of contentment and well-being ; but in the course of twenty-four hours reaction and craving for more occur, particularly when pain is present, and by degrees the dose has to be increased until in the course of a few months twenty to one hundred times the normal dose is necessary to produce a feeling of satisfaction, and can be easily tolerated. The only *signs* by which the *morphine habitués* can be detected are contracted pupils, pallor of the face, and the frequency with which they withdraw to satisfy their craving —a difference being observed in their depression before and their gaiety and brightness afterwards.

If such a patient is suddenly deprived of the drug, the following *withdrawal symptoms* set in. The pulse, which was previously normal, becomes rapid and of low tension, and the patient prostrate, suffering agonies from tingling in the limbs, sweatings, sneezings, lachrymation, diarrhœa, vomiting, uncontrollable restlessness, faintings, sinkings in the pit of the stomach, extreme wakefulness, and a host of horrible and indescribable somatic sensations resembling extreme neurasthenia.

Consequences of the morphia habit. Enormous doses may be taken by gradual increase. At first the patient is always gay, and has great capacity for mental and bodily endurance. But if the habit be continued, the character gradually becomes altered. The patient alienates his friends by tempers and unreliability ; and, one by one, truth, reverence, and honesty disappear. If there be difficulty in procuring the drug, great craftiness is exhibited. In course of time the mental powers gradually deteriorate, and suicide is not infrequent in those who desire, but are unable, to rid themselves of the thraldom. The body also suffers, and the patients become pale and emaciated. They get careless in the use of their syringe, multiple abscesses form and death may result from septicæmia.

Prognosis.—Since most morphine habitués are psychopathic the prognosis is always serious. It is worst in doctors, dentists, chemists and nurses, who have easy access to the drug. In these, as in all cases, relapse is common, and the permanence of cure depends on continued supervision and the possibility of the patient being able to lead a sheltered life, free from all care. After a cure there may be a tendency towards alcoholism. The morphine habit probably shortens life, and death may occur from over-dosage. A habit of short duration is easier to cure than one of long duration : the actual quantity of morphia taken per diem is of little account. If carcinoma, or some other cause of an incurable and recurrent

pain be present, and especially if the patient be aged, the tendency to relapse is great and it may be impossible to ease the pain in any other way.

Treatment.—(*a*) To break the habit the patient must be willing to place himself in a Home or institution, and in bed. The closest observation and supervision is necessary to ensure that the dose of morphia during the withdrawal period is controlled. Unless this is accomplished, methods of deception will be practised that nullify all efforts. The drug may be withdrawn abruptly, or gradually over 7 to 10 days. The former method is accompanied by intense suffering and should not be practised in elderly or debilitated patients. Various methods of treatment have been devised to alleviate the symptoms. Hyoscine hydrobromide gr. $\frac{1}{100}$ is given hypodermically every hour until delirium supervenes, and after that hyoscine hydrobromide gr. $\frac{1}{200}$ is given hourly, or at such intervals as will maintain delirium for two or more days. Several such deliria may have to be induced before the patient loses the craving. In the intervals between the deliria careful supervision and feeding will be necessary, and care must be taken that no morphine is secreted by the patient or brought into the sick-room. Night and day nurses will be necessary. (*b*) The withdrawal symptoms are treated by moderate doses of sal volatile, strychnine sulphate gr. $\frac{1}{60}$, hypodermically, and *gradually tapering off the morphine.* For the vomiting and diarrhœa give bismuth, and treat sleeplessness with paraldehyde ℳ 120 to 240 per rectum, or chloral and bromide or one of the barbiturates by mouth ; prolonged baths are very beneficial. (*c*) When the convalescent stage has been reached psychotherapeutic treatment may be employed, thereby to help the patient achieve a better method of solution of his emotional problems and difficulties. Prolonged supervision and care is essential during which period occupational therapy is valuable. The patient should not return to an occupation or environment where it is easy to obtain the drug.

A **heroin** habit can cause as serious symptoms as a morphia habit.

The **cocaine habit** leads to many of the troubles of the morphia habit, but there is a greater tendency to mental symptoms and deterioration. Morphia and cocaine are often taken together ; in such cases the cocaine may, with comparative ease, be first withdrawn. Then the morphia can be reduced as above described.

The **chloral habit** is less common nowadays. It gives rise to gastro-intestinal disturbance, lowered nutrition, pains, skin eruptions, depression, irritability, palpitation, and cardiac weakness. Sudden death may occur from slight increase of the dose.

Sulphonal, phenacetin, antipyrin, and other tar products do not so readily engender a craving, but when habitually used the patient cannot do without them, and in course of time symptoms similar to those of the chloral habit arise.

The psychosis is associated with a general infection ; the condition is DELIRIUM.

§ 901. The causes of **delirium** were considered in § 469, and need only be enumerated here.

Clinical Investigation.—The first and most important point in any given case of

delirium or mental excitement to which you may be called for the first time is to ascertain the temperature. Secondly, it is important to make a thorough and complete investigation of all the organs of the body, to ascertain whether there be any local inflammatory disorder, such as pneumonia, with which delirium may be connected, either directly or indirectly. The urine also should be carefully examined for albumen, sugar, or other abnormality. Thirdly, enquiry should be made into the history of the malady and of the patient, especially as regards the consumption of alcohol and sedative drugs, particularly bromides. The latter are cumulative, and patients vary greatly in their degree of susceptibility, more particularly if arteriosclerotic changes are present. The bromide replaces the chloride ion in the blood plasma and quantitative estimations of the blood bromide can be easily made. In reference to the etiology of delirium, three important *predisposing causes* have to be borne in mind. First, there is a marked predisposition in some nervous people to develop delirium with a slighter cause than would affect others. Secondly, there is a marked hereditary tendency towards the same vulnerability ; and thirdly, excessive drinking predisposes to the occurrence of delirium after an injury, operation and many diseases which are not usually so attended.

Febrile.	*Non-Febrile.*
Diseases of the brain — especially meningitis and dementia paralytica.	Delirium tremens.
Acute visceral inflammations—*e.g.*, pneumonia, pericarditis, pyelitis.	Chronic renal disease. Post-epileptic delirium.
Acute specific fevers.	Cardiac failure.
Delirium tremens (rare cases).	Drugs—*e.g.*, bromide, medinal, hyoscine.

The clinical form is not dependent on the type of infection and the reaction to the same toxin may vary in different individuals. On the other hand, such physical illness may release a latent mental illness of the schizophrenic or manic-depressive varieties. Hence the variety of symptoms seen after childbirth and the variations in ultimate outcome.

Symptoms.—During fever : (i.) the commonest clinical picture is that of a delirium characterised by confusion, (ii.) disorientation for time and space, (iii.) illusions develop, followed by (iv.) hallucinations of sight and hearing. The hallucinatory experiences are very vivid and arouse great fear and restlessness, (v.) transient delusional ideas of a persecutory nature. *After fever :* (i.) exhaustion and great fatigue, (ii.) varying degree of depression, especially common after influenza, and risk of suicide, (iii.) an amnesia for the acute stages ; the greater the degree of confusion the more complete the amnesia. A neurasthenic condition may form the basis of more ominous psychotic illness.

A similar mental picture may be seen following *severe physical stress, pregnancy, parturition* or *severe hæmorrhage.* Mental abnormalities after *parturition* occur most frequently in those who have had a febrile reaction after labour. There is no clinical entity characteristic of this type as was formerly described.

In *cerebral syphilis* the confusional picture is typical of any delirium, and there is a marked loss of memory for recent events. Paroxysmal headaches, sleeplessness and symptoms indicative of transient involvement of the cranial nerves, *e.g.*, squint, ptosis, dimness of vision, are common. Serological investigation will confirm the diagnosis.

The *prognosis* is good if the patient recovers from the physical illness. Those who subsequently develop a schizophrenic illness have displayed abnormal personality changes previous to the physical upset.

Treatment is directed to the primary physical condition ; otherwise it is symptomatic, and the objective is to secure adequate rest and nourishment. If the confusional state is due to bromide intoxication the drug should be omitted and the intake of sodium chloride greatly augmented. A period of some weeks may be necessary before the bromide is eliminated.

VI. *There is progressive mental deterioration associated with* ORGANIC DISEASE *or* EPILEPSY. *The disease is* GENERAL PARALYSIS OF THE INSANE, *or* DEMENTIA *due to* ARTERIOSCLEROSIS, ALCOHOLISM (§ 899), PRE-SENILE CHANGES *or* EPILEPSY.

§ 902. General Paralysis of the Insane (G.P.I.; Paralytic Dementia) is characterised by progressive muscular weakness and tremor, accompanied by mental symptoms, often of a grandiose character, occurring most frequently in young men, or men in the prime of life. The treponema pallidum can be demonstrated in the cortex of the brain and in the sub-cortical tissues, at some distance from the blood-vessels. The disease results from the parenchymatous infiltration and destruction caused by this organism.

Symptoms.—Paralysis of the limbs may sometimes exist for many years without mental symptoms (*vide infra*). The characteristic symptoms and signs are changes in the personality, impairment of memory, delusional ideas, tremors, pupillary changes, speech defects, and finally convulsions and generalised weakness. Invariably mental deterioration is the earliest symptom; in some objective neurological signs, *e.g.*, Argyll-Robertson pupils, optic atrophy, or slurring articulation, are prominent from the first. The course of the illness has been regarded as showing three stages, but these are not always clearly defined, more particularly since the introduction of intensive treatment.

Early Mental Changes.—The earliest clinical manifestations are increased irritability with or without headaches, irrational behaviour and insidious changes of character. The insidious onset often confuses the diagnosis. Impairment of the power of attention develops, so that activities requiring any degree of mental concentration are evaded. Memory begins to fail, particularly for recent events, though this defect may escape recognition unless looked for. Impairment of judgment develops, and with this, conduct becomes more grossly involved. Irresponsible decisions are made and wild speculations may result. Indifference is apparent and the patient becomes careless about his personal appearance. Delusional ideas are prominent in the classical *euphoric variety*. These are of a grandiose type and generally accompanied by much overactivity. The patient believes himself to be all-powerful, of royal descent, or exceedingly wealthy. The last-mentioned idea may lead to his squandering his resources and delay in recognition may leave his family in penury. This type is less frequent than formerly described, and the most usual features now encountered are those of a *simple progressive deterioration*. Sometimes *great depression*, sullenness and loss of energy are predominant.

Various *Physical Changes* accompany, precede or follow the mental symptoms. The most common are: (i.) tremors (fine, small and rhythmical) of the face, also of the hands (giving rise to characteristic writing), and coarse tremors of the tongue (giving rise to a characteristic slurring of the speech); (ii.) the pupils in this stage are usually small,

unequal and irregular in outline. They fail to react to light, but react on accommodation (Argyll-Robertson pupil); (iii.) primary optic atrophy is not uncommon ; (iv.) the tendon reflexes are invariably increased and the plantar reflexes may be extensor in type. Sometimes symptoms of tabes are present in addition (tabo-paresis).

Serological changes : The blood Wassermann reaction is positive. Examination of the cerebro-spinal fluid shows various pathological changes. The Wassermann reaction is positive in 99 per cent. of cases ; the cell count is increased and may be as high as 400 per cu.mm. (lymphocytes). The globulin and total protein are increased and the discoloration of the test tubes in the Colloidal Gold reaction (Table LXI) is characteristic (paretic curve).

Later stages of the illness are characterised by (i.) mental enfeeblement, which replaces the mental changes in the first stage ; (ii.) increasing muscular weakness, difficulty in walking any distance, and especially in the act of turning, sometimes combined with giddiness ; (iii.) fits (congestive attacks) are almost invariably present at some period of the illness ; they vary in character, but are usually syncopal or epileptiform, with or without the loss of consciousness. Sometimes they consist of attacks of numbness of the limbs, or aphasia, or coma. They may occur in the early stages and may constitute the initial symptom. The *final stage* is that of progressive dementia. The speech becomes inarticulate, the paralysis extreme, and may be accompanied by contractures, so that the patient cannot feed himself. His mind undergoes progressive extinction, and there is loss of all its faculties. The urine and fæces are passed involuntarily.

Several varieties may be differentiated :—(1) The Expansive manic variety forms the basis of the above description. It is seen less frequently than formerly reported. G.P.I. should always be considered as the cause of a first attack of excitement in a patient over 30 years of age. (2) The Depressive variety presents a picture difficult to distinguish clinically from melancholia. The impairment of memory, the presence of physical signs and the serological findings differentiate the two conditions. (3) The Simple variety is characterised by childishness, apathy and indifference. Such patients are fatuous and express no gross delusions, The process is a simple progressive deterioration. (4) The Tabo-paretic variety includes those who show physical signs of tabes in addition to mental changes. (5) A Juvenile variety, occurring up to the early twenties, due to congenital syphilis (see § 907c).

Diagnosis.—On account of the great variety of symptoms presented by G.P.I., its diagnosis may be difficult. It is distinguished from (*a*) other forms of *mental disorder*, especially *chronic alcoholic psychosis* and *presenile dementia*, chiefly by the tremor, speech, the pupillary changes, and the spinal fluid findings ; (*b*) maladies attended by tremors and other neuro-muscular symptoms, such as *disseminated sclerosis, pseudo-bulbar paralysis* and *paralysis agitans*. Chronic *alcoholism* and *polyneuritis* sometimes are difficult to differentiate ; they are recognised by examination of the spinal fluid. *Cerebral arteriosclerosis* is associated with retinal changes and often a raised blood pressure. *Lumbar puncture is essential before an absolutely accurate diagnosis of G.P.I. can be arrived at.* The diagnosis from *tabes dorsalis* is not usually difficult.

Etiology.—Adult males, in the very prime of their strength and manhood—that is, between thirty and forty—are the favourite subjects of the disease, but it may occur at any age. It develops 10–12 years after infection, and is generally said to be three or four times more common in men. The disease is a syphilitic inflammation and degeneration of the nerve elements and blood-vessels. The skull and meninges are thickened. The cerebral convolutions are shrunken and the sulci widened, especially in the frontal lobes. Spirochætes are present throughout the brain. The vessels show syphilitic endarteritis and infiltration of the perivascular spaces with lymphocytes and plasma cells. Alcoholic, sexual, and other excesses, anxiety, and mental fatigue may be accessory causes.

Course and Prognosis.—The duration of untreated cases varies from a few months to four years. The earlier the onset of the disease after the primary infection, the more rapidly progressive will it be. Intermissions of comparative or complete return to health are characteristic of the disease. It is rare for the duration of such remissions to exceed two years. Consequently all such patients should be given pyrexial treatment unless there are contra-indications in the physical state. The prognosis in treated cases is dependent on (*a*) the duration of symptoms prior to treatment, (*b*) the form of the illness, (*c*) the age of the patient. It is imperative to make an early diagnosis as the chances of a successful outcome after treatment diminish in direct ratio to the duration of the symptoms prior to treatment. This probably accounts for the fact that the expansive type responds better to treatment than the others, as such symptoms early attract attention.

Treatment.—Antisyphilitic measures at an early stage of infection may prevent the onset of General Paralysis of the Insane. Treatment with the usual arsenicals and antisyphilitic drugs is of no avail in the fully developed disease. Tryparsamide, a pentavalent arsenical compound, penetrates the parenchyma of the nervous system, and on this account is the most useful, but in rare cases has caused optic atrophy. Penicillin has been given in doses of 8 million units or more in periods of 7 to 14 days. The results are more favourable in meningeal than parenchymatous neurosyphilis. At present a combination of penicillin and fever therapy is practised. The febrile reaction may be produced by (1) malarial inoculation, (2) chemical means or (3) diathermy. Diathermy requires special electrical apparatus and is not without risk. Malarial inoculation is most frequently practised in this country, and may be effected by mosquitoes or by malarial-infected blood (provided by the Ministry of Health). Mosquitoes are contained in a jar protected at the opening by a netting ; this opened end is placed on the patient's skin which must be perfectly clean and free from soap, etc. Defibrinated malarial blood injections may be subcutaneous, intramuscular or intravenous. The needle and syringe are sterilised by boiling and allowed to cool, as heat and antiseptics destroy the parasite. The incubation period varies from one to thirty days or more. The rigors last from a few minutes to two and a half hours. In uncomplicated

cases, after eight bouts of fever, the fever is terminated by administering 10 grs. of sulphate of quinine given twice daily for at least ten days. Treatment by Malaria is accompanied by definite risks which must be fully appreciated. It should be employed only when the patient is not over 55, and the general condition is satisfactory. Contra-indications are the presence of other infections, or diseases of the gall-bladder, liver or spleen, organic disease of the heart or aorta, and obesity. During treatment, daily blood-pressure readings are necessary to exclude hypotension; blood counts and films must be made twice weekly, and the urine examined daily for albumen and bile. The fever should be terminated prematurely if there develops : (i.) sudden loss of strength, (ii.) evidence of cardiac weakness, as shown by an increase in the pulse rate over 150 or the development of irregularity in rhythm, (iii.) a temperature above 106° which does not respond to tepid sponging, (iv.) toxic or infective jaundice, (v.) a marked increase in the number of parasites in the blood film taken during a rigor, (vi.) continuous vomiting that does not respond to treatment, (vii.) anæmia with the red cell count under 2 million, (viii.) pulmonary complications, (ix.) occurrence of seizures. Death may ensue from progressive exhaustion or anæmia, coronary thrombosis, toxic jaundice or uræmia. Provided such treatment is used in the early stages, patients are able to return to work and to continue at it for years. They should subsequently live a regular life, with outdoor exercise and amusements, and endeavour to avoid all causes of anxiety or mental strain.

§ **903. Arterio-sclerotic Dementia.**—The characteristic mental symptoms are impairment of recent memory, restlessness and mental deterioration. There is a gradual but progressive failure of the intellectual faculties, invariably accompanied by increased fatiguability. Inability to make decisions or to give prolonged attention to any problem soon becomes apparent, followed by failure to recall names or places. These symptoms are greatly aggravated by epileptiform or confusional attacks. Memory defects become obvious, at first for recent events, and there is a tendency for such gaps to be made up by fabrication. Emotional control is impaired; sudden outbursts are common over failure to perform what was formerly a simple task. A suspicious attitude is frequent and paranoid delusional ideas may be prominent. In some cases sexual urges are not controlled, and this may lead to misdemeanours. The condition progresses to dementia.

Dementia is seen as a *primary* condition in (a) advanced life (senile dementia) and (b) chronic alcoholism. It comes on as a *secondary* condition in (a) untreated general paralysis of the insane, and as the concluding stage in other forms of mental disease, notably chronic schizophrenia; and (b) after vascular and other gross intracranial lesions, especially in the frontal cortex. Even after a small lesion of the brain the mental capacity for business is hardly ever as good as before its occurrence, and the patient often becomes childish, peevish, forgetful, emotional, and by degrees, in severe cases completely demented.

Pre-Senile Dementia occurs at an earlier age, between 40 and 60 years, and runs a more rapid course. Two varieties have been described, by Alzheimer and by Pick, more easily differentiated pathologically than clinically. Extensive degeneration of the grey matter occurs chiefly in the frontal lobes ; plaques being found in Alzheimer's disease but not in Pick's disease. Progressive memory impairment, aphasic disturbances and epileptiform attacks are the prominent features.

Epileptic Dementia.—About 10 per cent. of epileptics become so far unmanageable

as to be regarded as insane. The mental aberration may be (1) pre-paroxysmal, (2) post-paroxysmal, (3) associated with petit mal only or as an epileptic equivalent. Such symptoms are invariably those of excitement, confusion, delirium, stupor, or a general mental deterioration.

§ 904. **Prognosis** of mental illness in general.—The *Course* and *Prognosis* in several of the various forms of mental disorders have been referred to. In general terms the chief points on which the prospect of recovery depends are (1) the absence of heredity, especially direct heredity; (2) the personality and make-up of the individual; (3) the presence of an adequate cause; (4) the rate of onset of the attack, being more favourable in a rapid than a slow, insidious onset; (5) the duration of the illness prior to treatment; and (6) the clinical form of the illness.

Under the Matrimonial Causes Act, 1937, mental defect and unsoundness of mind are grounds of petition for divorce. It must be shown that the person concerned is incurably of unsound mind and has been continuously under care and treatment under certificate for a period of at least five years immediately preceding the presentation of the petition.

§ 905. **The Treatment of Mental Illness** in detail has been referred to under the different forms; the general principles resolve themselves into (1) Physical methods, (2) Psychological methods, (3) Occupational therapy, and (4) Social factors.

PHYSICAL METHODS include the control of excitement, insomnia, the prevention of self-injury, adequate feeding, prolonged narcosis, hydrotherapy, endocrine preparations, and the treatment of any physical defect discoverable. They also include such specific methods as malarial or convulsive therapy and hypoglycæmic therapy.

PSYCHOLOGICAL METHODS are employed by the physician in everyday practice. The results depend in large measure on the degree of rapport between patient and physician, the influence of the latter being a dominant factor. They assume a belief by the patient that the illness can be cured. *Reassurance, persuasion, suggestion* and *analytic methods* are employed.

Reassurance : Often a free discussion with the patient of his symptoms and his problems, with an explanation as to their development and a reassurance as to their significance, will effect considerable improvement.

Persuasion : Here the aim is to convince the patient of the absence of any organic basis for his symptoms and such to be effective is accompanied by emotional force. No attempt is made to treat the cause of the symptoms ; consequently a recurrence in a fresh site is not uncommon.

Suggestion is a process of implanting ideas of a corrective nature ; by this means mental improvement ensues. The impressions desired to be made on the mind may be implanted when the patient is awake or in a drowsy hypnotic state. Many believe that suggestions are reinforced by *hypnosis*, which may be defined as a condition of partial consciousness resembling sleep, in which the subject's capacity to receive and to act upon suggestions is greatly improved. This increased suggestibility is made use of by the operator for the implanting of new and healthy conceptions and the removal of morbid ideas, the object being to influence the body through the mind. Only by trial can one determine whether a person is able to be hypnotised. Various methods of inducing hypnosis

are available and details of these may be obtained in text-books on the subject. The method should be used only by medical men, and with proper precautions. The consent of the patient and his friends should be obtained ; often a third person should be present during the treatment. In competent hands no bad effects result from its employment even over prolonged periods, but much moral and physical evil follow the abuse or misuse of this powerful agent. Its use for purposes of public exhibition should be forbidden by law. Hypnotism has been employed to restore memory in cases of hysterical amnesia, to reform alcoholics and moral perverts, to cure various neuroses, and to relieve various hysterical manifestations such as anæsthesiæ or paralyses.

Psycho-analysis is a method of investigation of the unconscious mind which has been advocated by Freud and modified subsequently by his pupils. It consists of a minute study of the patient's previous life by special methods—dream analysis, hypnosis, and free association. The patient is requested to state every thought and word that casually occur to him whilst under examination, in the hope of discovering some hidden psychic trauma of early life. Freud emphasises unduly the sexual content of the unconscious mind : he considers that dreams have definite symbolic meaning requiring special interpretation, and that complexes are discovered by their elucidation. Jung has extended the method by " word-associations," using 100 selected stimulus words and observing the character and time of the words of response. Any delay in reaction as shown by a stop-watch indicates that a repressed complex has been affected which when brought to consciousness and fully explained assists in curing the patient. The results of analytic treatment are difficult to assess, but the method is more successful in psychoneurotic than psychotic forms of illness. Psycho-analysis is not employed in patients past fifty years of age or those with organic disease. It requires a certain degree of intelligence and ability to co-operate on the part of the patient and its application is limited owing to the time and expense involved—many cases requiring an hour's sitting daily over a period of months. Although possessing therapeutic value in some cases otherwise intractable, psycho-analysis occasionally upsets patients and does harm. It is therefore best left in the hands of experts of acknowledged experience and repute.

OCCUPATIONAL THERAPY has been defined as the treatment under medical care of physical or mental disorders by the application of occupation and recreation with the object of promoting recovery, of creating new habits and of preventing deterioration. The value of work in health is generally conceded, and much time and energy is now spent in directing healthy adolescents into their appropriate sphere of activity. In the treatment of the sick occupational therapy includes more than mere occupation. It should find expression also in the social and recreational outlets of the hospital. Occupation should consist of much more than the mere doing of something " diversional " ; being busy is not necessarily therapeutic. When properly applied the method arouses interest

and the successful completion of some form of work naturally helps towards self-confidence. This is particularly seen in those suffering from depressive illnesses. In the schizophrenic much may be done to delay and prevent the development of deterioration. Since the outbreak of War its application in the treatment of physical diseases and injuries has received a great stimulus. There is no doubt that much more might be achieved in this direction.

SOCIAL FACTORS : Because of the great frequency of environmental factors in the etiology of mental illness, it is generally necessary, at an early stage, to decide where the patient is to be treated. No hard and fast rules can be elaborated as to when the patient should enter hospital.

§ 906. Certification.—The **question of removal** to a mental hospital depends on many things, chiefly (i.) the manageability of the patient ; (ii.) the means at home for control ; and (iii.) the character of the mental disorder and its potentiality for homicide or suicide.

The patient is not legally certified. Any mental patient, however mentally ill, can be taken care of by his or her relations *without certification,* provided it is done without payment or restraint, they being responsible for the patient's safety.

Cases of slight eccentricity and *uncertifiable* mental aberration may be received into the house of a medical man or other householder for payment ; but directly a case becomes *certifiable* (in the opinion of the Commissioners) it must be treated in a place approved by the Board of Control. The penalties for breach of this are very heavy. No medical man or other householder may retain in his house more-than one certified patient at a time without special permission from the Commissioners.

Additional provisions for the reception of mental patients were made in the Mental Treatment Act of 1930. *Voluntary patients* may be received not only in private mental hospitals and registered mental hospitals, but also in State institutions. It is necessary that the patient should sign a form of request for admission. He is free to leave on giving seventy-two hours' notice of his intention to do so. Otherwise patients can be admitted under certificates or in the category of *Temporary patients.* In the latter case they are admitted to mental hospitals without a Magistrate's Order and on the recommendations of two medical men, one of whom must be specially appointed under the Act, and it must be stated in the recommendations that the patient is in such a condition that he is unable to express himself as being either willing or unwilling to receive treatment. This absence of volition in the case of Temporary patients is an important condition.

The patient is legally certified. **Procedure for Removal of Persons of Unsound Mind under the Lunacy Act.**—The procedure for removal is somewhat intricate, and it is useful to remember that the duly authorised officer of the Local Health Authority is a most convenient person to apply to, bearing in mind that it is no part of his duty to undertake private cases, but that, nevertheless, if he be approached with due regard to the importance of his office, he may save those concerned a great deal of trouble, and supply them with all the necessary forms and particulars as to modes of procedure. He is also in constant relation with the justices.

A person deemed to be of unsound mind and found *wandering at large* not under proper care, can be apprehended by a constable or the duly authorised officer of the area, and taken to the institution. Any person deemed to be of unsound mind can, for his own safety or that of others, be removed from a dwelling-house by a duly author-ised officer to the institution. In either case the patient can be detained there for three days upon the certificate of such constable or duly authorised officer, and, further, upon the certificate of the medical officer of the institution, for a total of fourteen days. Meantime the procedure under No. 3 (*a*) below can be instituted. This method is now often utilised for persons in all classes of life who are dangerous and away from their friends.

The Urgency Order (1, below) can be used in urgent cases. This holds good for seven days from its date ; if not urgent (2) is the usual method.[1]

A patient can be removed to a mental hospital in England or Wales in the following ways :

    (1) Under an Urgency order signed by a relation (or guardian) and one doctor.

    (2) Under a Reception order of a Justice obtained by petition of a relative on two doctors' certificates (used also for certification in a case for single care).

    (3) Under a Summary Reception order of a Justice.

        (*a*) On information from a duly authorised officer that a person is deemed to be a person of unsound mind and a proper person to be taken charge of and detained under care and treatment, a Justice calls in one doctor, who certifies unsoundness of mind.

        (*b*) On information from the police or a duly authorised officer that any person wandering at large is deemed to be of unsound mind, a Justice calls in one doctor who certifies unsoundness of mind.

    (4) Under an order after Inquisition, being a written authority from the " Committee " of the person, together with an office copy of the order of the Court of Chancery appointing the " Committee." The " committee " is a legal phrase for the guardian appointed by the Court.

    (5) Under a written application by a relative, or responsible person, supported by two medical recommendations.

    (6) Under the Criminal Justice Act, 1948 :

        (*a*) A Court may include in a Probation Order a requirement that an offender shall submit to treatment in a Mental Hospital for a period not exceeding 12 months from the date of the Order.

        (*b*) A Court of Summary Jurisdiction has the power to make an Order for the detention of an offender in a Mental Hospital. This Order has the same effect in law as a Summary Reception Order.

The procedure in Ireland and Scotland is somewhat different, as is also that under the Mental Deficiency Act, *vide* § 907.

Testamentary Capacity.—A knowledge of what constitutes the testamentary capacity of a patient is of great importance to the practitioner, because it is often on his evidence that courts of justice decide such matters. The testamentary capacity of a person of unsound mind depends practically on three questions :

    1. Did he at the time understand the nature of a will and its effects, and did he understand the extent of the property of which he was disposing ?

    2. Did he provide for his relatives, or, if not, why did he leave them out ?

    3. Had he any delusion bearing on testamentary matters ?

If these questions can be satisfactorily answered and proven, the will is valid, however eccentric the patient may have been, or even if he was at that time certified as of unsound mind. The fourth question—undue influence—is a non-medical question.

The patient is a child, showing signs of MENTAL DISORDER.

§ 907. VII. Mental Abnormalities in Children may be classified as :

    A. PSYCHONEUROSES and BEHAVIOUR DISORDERS.

    B. PSYCHOSES.

    C. MENTAL DEFICIENCY.

A. (1) The *nervous child* corresponds in childhood to the anxiety neurosis in the adult. Anxiety is frequently displayed by children. It may occur in the form of acute anxiety attacks with concomitant signs and symptoms to the adult ; more often it appears to become absorbed into the constitution. Such children are generally

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[1] All the forms necessary are procurable from Shaw, Fetter Lane, London, or from the duly authorised officer. Names of Justices for individual areas can be obtained from the local Clerks to the Justices. A list of these can be found in the Local Government Manual and Directory (at all reference libraries).

the offspring of nervous parents from whom the children absorb their anxiety. In the majority of children with such symptoms, there is nothing intrinsically wrong ; the condition is the result of environmental factors. Hysterical manifestations of a minor degree are common ; headache, nausea and vomiting ; usually they are the result of suggestion. Marked symptoms, such as paralysis, anæsthesia, etc., are much less frequent ; when they do occur, the psychological mechanisms are usually superficial. Having satisfied oneself as to the absence of a physical cause, disregard of the hysterical symptom, and refusal to allow any gain from it are often sufficient to cause the symptom to cease. Obsessive compulsive features are present in minor degree in most children, and are rarely to be taken seriously. Simple explanation and reassurance are usually adequate.

(2) *Habit disorders* of varying degree form a large proportion of children's problems of psychiatric interest. In the earliest stages habit training comes from parents, later from the school influence and school companions. Morbid as well as healthy reactions may be impressed. The most frequent habit disorders are enuresis, nail-biting, stammering and sleep-walking. Hubert has recently drawn attention to the pronounced hereditary tendency so frequently found in these conditions. Enuresis often occurs in several members of a family ; it may be the result of anxiety, lack of education or negativism. Sleep-walking also commonly occurs in more than one member of a family ; when psychological in origin the goal usually suggests the interpretation. Stammering is common in timid, over-anxious children, factors already increased by their disability. Speech training is advocated together with the readjustment of psychological difficulties. Amongst the grosser forms of behaviour abnormalities come lying, unmanageability, temper tantrums, stealing and truancy. Isolated instances probably occur, at some time or other, in the life of all children ; but their repeated occurrence makes them pathological and renders further investigation necessary. Lying may be of two varieties : (a) defensive to protect from consequences, (b) the result of phantasy, and is then a projection of wishes and desires into realisation in words. Temper tantrums are usually the result of methods of handling, and are developed as a means of achieving some end.

These problems in children indicate, as a rule, some difficulty in adaptation, and a frustration of some desire. Beyond obtaining, in a general way, the child's attitude towards the problem, in most cases it is undesirable and unprofitable to submit the child to a more detailed psychiatric investigation ; very rarely is this necessary. More can be gained by a study of the environmental factors, the setting in which the child moves, and the attitude adopted towards him, by those with whom he comes in contact. Educational difficulties are responsible for numerous problems. Some are the result of varying degrees of retardation, but on the other hand great intellectual capacity is not synonymous with good mental health. These difficulties are investigated by means of psychological tests (see § 701). The value of such an investigation is seen particularly in studying delinquency. Many of these children show difficulty in school adjustment, and the restlessness and discouragement thus created play no small part in determining their conduct.

The detailed investigation of adult psychiatric problems now employed has revealed the great frequency of neurotic symptoms in childhood. The "problem" adult is frequently the end result of the "problem" child. Consequently greater attention must be paid to these symptoms while it is possible to eradicate them. Discrimination is necessary as to how much the child should be treated, and how much the environment. Only in a few cases is psycho-therapeutic treatment called for. A readjustment of the environment is frequently necessary ; to obtain this, the temporary removal of the patient to new surroundings may be necessary. One should endeavour, then, to modify the conditions that either suggest ideas of misconduct, or that may reawaken the ideation which creates the impulse to misconduct.

B. **Psychoses.**—Psychoses in children are rare. Especially is this so prior to the development of secondary sexual characteristics. Thereafter affective disorders, manic-depressive and schizophrenia, are sometimes met with. The clinical picture

in the former condition is the same as that found in adults (§ 895). Where children are affected there is usually a strong family history of depressive conditions. Schizophrenia is characterised by an abnormal emotional reaction. Such patients lose interest and become apathetic; news that previously would have caused sorrow now provides cause for laughter. The most prominent feature is the incongruity between the emotional state and the thought processes. These patients withdraw from reality; phantasy formation becomes prominent and acquires for them an objective reality. Numerous theories have been elaborated to account for the condition. There is no definite evidence of organic changes. The onset is in most cases of an insidious nature, beginning in childhood; the previous personality is that of a reserved, seclusive type with few friends and interests. During childhood peculiarities of behaviour occur which separately seem of no importance, but, viewed collectively later, they show their true significance. Meyer has suggested that the condition is the result of inadequate adaptation of the individual to his environment; that it is the result of faulty habits of reaction whereby the problems of life are inadequately dealt with, culminating later in the substitution of phantasy for activity. Insufficient attention has been paid to these oddities of behaviour, and when advice has been sought the patients have been unable to co-operate in treatment. The aid of the specialist should be sought before the stage of readaptation is past.

Congenital forms of *General Paralysis.*—Not infrequently they occur, after the age of seven, in the offspring of adult general paralytics. The condition is characterised usually by deterioration in a previously alert and active child. Memory changes occur, and marked intellectual impairment develops in a short space of time. The younger the child when the symptoms appear the more chronic the course of the condition. Physical signs in the form of speech abnormalities, Argyll-Robertson pupils, tremors and active tendon reflexes are found. Serological examination gives the same findings as in the adult (§ 902). Treatment by malaria plus arsenical compounds is less effective than in the adult. Unless the condition is diagnosed and treatment instituted in the early stages the prognosis is very poor.

Behaviour difficulties of all degrees of severity may be sequelæ of encephalitis lethargica (§ 698). The milder forms are characterised by nocturnal wakefulness and excitability, disobedience, irritability, stealing and outbursts of temper entirely unprovoked. Frequently the child is aware of the impulse to do wrong but is unable to control it. Young children show a greater degree of mental impairment, whereas older children show a moral change. In the Apache group the symptoms are more severe. The children become aggressive, untruthful, quarrelsome and often subject to outbursts of acute excitement. Many of these require institutional treatment, and the ultimate prognosis is not good.

Under the Mental Treatment Act, 1930, provision is made for the reception, into Mental Hospitals, as voluntary patients, of children under sixteen years of age, whose condition is such that they are likely to benefit from treatment there. Application must be made by the parent or guardian, and it must be accompanied by a medical recommendation by the family physician, or by a physician approved for the purpose by the Minister of Health.

C. **Mental Deficiency.**—Four degrees of mental deficiency have been defined in the Mental Treatment Act. They vary largely according to the degree of social incapacity, viz., idiots, imbeciles, feeblemindedness and moral defect. The first three vary according to mental capacity and are differentiated by means of special psychological tests. As the result of numerous experiments carried out on normal school children, these tests have been grouped according to the period of life at which accomplishment may be reasonably expected, and they have been elaborated into a definite scale (§ 701). For each year of life a combination of tests is employed, the average of which gives a more representative value than any one test alone. If the child cannot do the tasks proper to its age, but can only accomplish those proper to a younger child, its mental age is reckoned to be that of the younger child, in other

words, so much less than its real age. Normally the mental age and the chrono-logical age should correspond ; the ratio of the one to the other is termed the *intelligence quotient.* Apart from the actual results achieved by the child, valuable data are obtained from a study of its application in the performance of the various tasks. It may be taken that idiots have a mental age under three, imbeciles under seven, and feebleminded under twelve. If the child has attended a Council School in England a rough indication of its ability may be formed by ascertaining the standard to which it reached. Thus the average age in the infants' school is under five years and in Standard I seven to eight years, with an increment of one year for each succeeding standard, Standard VII being reached by normal children at thirteen or fourteen.

CONGENITAL APHASIA (§ 744) though uncommon is of considerable importance, as the sufferer may be wrongly regarded as mentally defective.

MENTAL DEFICIENCY may be primary—*i.e.*, due to factors causing defective germ plasm ; or secondary—due to causes acting upon the fœtus or infant. 75–80 per cent. of mental defectives belong to the primary group. The pathogenesis of certain types is not yet clearly defined, consequently it is impossible to be dogmatic regarding their appropriate groups.

The main clinical varieties of PRIMARY MENTAL DEFECT are : 1. *Simple* or *Genetous* Idiocy—a large group without characteristic features enabling it to be further sub-divided. It includes children without any obvious abnormality of the cranium or limbs, only in the face or palate. In some the facial expression may be fairly intel-ligent, but most of the lower grade present an animal expression, thick lips, pug-nose, large coarse ears, broad, thick, depressed bridge of nose, narrow or hairy fore-head, and underhung jaw.

2. The *Mongol* or *Chinese* type of congenital deficiency is so called from the resem-blance of the face to that of the Chinese, the palpebral fissures sloping downwards and inwards. With flat face, flat back to the head, and constant protrusions of the tongue, this form of idiocy presents an unmistakable physiognomy. The fingers also are stunted and the little fingers incurved. Congenital heart disease occurs in about 30 per cent. They may be regarded as " unfinished " children, as they are often born of mothers who have suffered from continued ill-health during pregnancy ; some-times they are the youngest of a large family, or born of parents advanced in life. These children are imitative, and therefore educable to a limited extent, but they make no progress beyond a certain point.

3. *Microcephalic idiocy* includes children whose heads have a smaller circumference than the normal, which averages about 19 inches. The head may measure 17, 15, or even 12 inches ; the forehead is narrow, and slopes backwards, corresponding with the deficiency of the frontal development of the brain. The small skull is the expression and not the cause of the small brain. The features are frequently normal, eyes large, and nose aquiline. These children rarely make much improvement, for they have but little power of attention, though some of them are imitative. The majority are imbeciles.

4. *Sclerotic amentia* due to an overgrowth of neuroglia occurs in two forms—(*a*) nodular (tuberose), and (*b*) diffuse. (*a*) *Tuberose sclerosis* is characterised by mental defect, epileptiform attacks, and adenoma sebaceum, a skin eruption appearing on the face as a rule between the ages of 4 and 6 years. (*b*) *Diffuse sclerosis* may give rise to an increase in the size of the brain, producing what is frequently described as hypertrophic amentia. The condition may be differentiated from hydrocephalus by the level of maximum enlargement ; also in hydrocephalus the enlargement is generally more marked and is accompanied by a bulging of the fontanelles and sutures. Weakness, epileptiform seizures, and varying degrees of mental defect are the con-spicuous features.

5. *Oxycephaly* is accompanied by a marked deformity of the skull (§ 13). As the sutures are united prematurely, the cranium is expanded upwards so that the frontal region is greatly increased in height, and the head is short from before backwards. The

bones of the skull are abnormally thin and ocular changes are frequent. There may be synostosis of the fingers and toes. Varying degrees of mental defect are not infrequent, but the changes in the cranium may exist without any mental defect. The condition may occur in more than one member of a family.

The main clinical varieties of SECONDARY MENTAL DEFECT are :

1. *Hydrocephalic*, often due to the occlusion of the foramina of Magendie or Monro, causing distension of the ventricles with fluid and atrophy of the cortex. The bones become widely separated and the head is globular in shape. Most cases are quiet and docile and there is frequently muscular weakness or paralysis. Epileptiform convulsions are frequent, but tend to decrease as the condition becomes stationary (§ 830).

2. *Epileptic.*—Infantile convulsions, indistinguishable in many cases from those of ordinary epilepsy, may result from many causes. Where no cause can be ascertained it is looked upon as idiopathic. A large proportion of such occur in the offspring of epileptic, psychotic or psychopathic individuals. When the fits develop in early life, before the age of 7, intellectual development is arrested and mental defect frequently results (§ 721).

3. *Paralytic.*—The majority of cases in this group result, as a rule, from trauma at birth and only very occasionally from an injury during early life. There is some support for the view that certain cases are of intra-uterine origin, and not dependent, merely, upon the result of intra-cranial hæmorrhage. The resultant lesion is dependent on the site and degree of damage. Accordingly hemiplegia, diplegia, or epileptiform attacks may be concomitant symptoms. Sometimes these cases are associated with spasticity or choreiform movements and symptoms are produced due to a cerebral scar (§ 762).

4. *Inflammatory.*—This follows from encephalitis and meningitis, from scarlet fever or other exanthema, and the mental defect may not supervene till later, as is also seen after epidemic encephalitis (§ 698).

5. *Syphilitic.*—Signs of congenital syphilis are often present ; in some there is evidence of gross brain damage such as paralyses, seizures, deafness, and blindness. The degree of defect consequently varies greatly and treatment offers little hope of improvement (§ 552).

6. *Amaurotic Family Idiocy* occurs chiefly, though not entirely, in Jews, often in more than one member of the same family, sometimes in successive generations. The symptoms appear during the first three to six months of life and lead to idiocy accompanied by a progressive paralysis and blindness. The characteristic cherry red spot is visible, on ophthalmoscopic examination, in the region of the macula (§ 763).

7. *Schilder's Disease* may occur in various members of one family. The symptoms may appear in early life or during childhood in those previously of normal mental development. Mental enfeeblement together with blindness, deafness and a spastic paraplegia are the conspicuous symptoms. The disease is the result of extensive cortical demyelinisation and effective treatment is unknown.

8. *Mental defect from deprivation of the senses.*—The mind is cut off from environmental stimuli owing to sight and hearing being affected from acute infections, trauma or hæmorrhage. The defect may be remedied by means of special training.

9. *Cretinism* may be endemic or sporadic. The head is usually large, flat at the top, spread out at the sides. The hair is coarse and dry and the voice squeaky. Under treatment by thyroid these cases make remarkable progress (Figs. 8*a*, *b* and *c*), but the treatment must be continued during the whole of life. And see § 191.

Etiology.—The influence of heredity is noticeable in these children; they frequently come from a neuropathic stock. Their family history invariably shows varying degrees of mental abnormality in both the immediate and more remote members. The exact influence of syphilis is difficult to assess. A positive Wassermann reaction is rarely met with. It has been suggested that the association of tuberculosis and mental deficiency is indirect, probably dependent on the intermediation of poverty.

Minor ætiological factors are injury, anxiety and worry. There is support for the belief that the early application of forceps is preferable to an indefinitely prolonged labour. Of the factors operating after birth the chief are glandular deficiencies, epilepsy, brain disease, injuries, sense deprivation and infectious diseases.

The *prognosis* of mental deficiency is always grave. The degree of defect, the clinical type, and the environmental factors are the chief points to be considered. The variety of simple aments do better than the special forms. Many backward children are made more defective by the home atmosphere, and much would be achieved if relatives would treat such children from the point of their mental maturity rather than their actual age and physique.

Treatment in all cases consists in utilising to the best advantage what abilities there are. Recovery cannot be expected. Idiots and imbeciles usually require institutional treatment or private care. The results of training are, in some cases, surprisingly good. Much can be accomplished for feeble-minded children in Special Schools; the conditions there permit of a great amount of individual attention. The aim is to emphasise the physical and personal training, and to organise the behaviour of such children into helpful and useful activity. Much attention has been given to the question of sterilisation. The Departmental Committee recommended recently that voluntary sterilisation should be legalised in the case of (*a*) one who is mentally defective or has suffered from mental disorder, (*b*) one who is believed to be likely to transmit mental defect or disorder. In certain European countries and in some of the States in the U.S.A., compulsory sterilisation has been enforced. The proposal, so far as this country is concerned, is to create facilities for performing the operation only on those persons who agree to it. As yet sterilisation is illegal, except as a therapeutic measure.

The Mental Deficiency Act is devised to protect and control defectives, and thus to prevent them from doing harm to themselves and to society. Mild cases of defect can be received in approved homes without certification. Other cases can be placed under single care, or in houses and institutions certified under the Act, including state institutions. Two medical certificates are necessary for all grades, and for an idiot or imbecile the order of the parent or guardian suffices, but for the feeble-minded and moral defective the intervention of a Justice is required in addition. The requisite forms for the Act may be procured from Shaw, Fetter Lane, London.

CHAPTER XXI

EXAMINATION OF PATHOLOGICAL FLUIDS AND CLINICAL BACTERIOLOGY

In this chapter the methods of obtaining various pathological fluids, how to examine them, and their characters, are briefly described, and an epitome of the chief bacteriological data required for clinical work is given.

§ 918. Sterilisation of Syringes.—To eliminate the virus of homologous serum jaundice (" syringe jaundice ") and spores, all-glass syringes and stainless steel needles (No. 14 Record or No. 20 Luer) are placed in a large test-tube, the mouth of which is plugged with cotton wool. To sterilise, place in a hot air steriliser at 160° C. for not less than 1 hour; alternatively in an autoclave at 120° C. (15–20 lbs. pressure) for 20 minutes. Otherwise boil in water for not less than 5 minutes, or immerse the barrel and plunger separately in 70–75 per cent. alcohol and rinse in sterile water or saline subsequently—but these methods do not necessarily destroy spores or the icterogenic virus.

§ 919. Methods of Obtaining and Examining Pathological Fluids.—Fluid from the serous cavities is best obtained with a 20-c.c. all-glass or Record syringe and an exploring needle of larger bore than the ordinary hypodermic needle to permit a thick purulent fluid being drawn through it. Sterile precautions must be adopted. The needle and syringe are sterilised before use. The operator thoroughly cleanses his hands by washing and scrubbing, and uses a sterile towel to dry them. The patient's skin is sterilised with ether or tincture of iodine. To render the puncture as painless as possible inject intradermally a small quantity of 2 per cent. procaine hydrochlor. B.P. (novocain) with a sterile hypodermic needle and syringe at the site of intended puncture; through the intradermal wheal insert the exploring needle. In the case of non-purulent fluids, a portion collected for pathological investigation should be added to a sterile tube containing a small amount of 3 per cent. sodium citrate solution. This prevents clotting and so facilitates accurate protein content estimation, cytological examination, and demonstration of tubercle bacilli.

The **pleural** cavity is best explored at the seventh or eighth space in the post-scapular line or at a site where localised dullness is maximal. For details see § 119.

Pericardial fluid is obtained by inserting a needle in the fourth or fifth left interspace at the extreme left limit of cardiac dullness. It should only be attempted when a moderately large effusion is present. See paracentesis pericardii, § 46.

The **peritoneal** cavity is explored for fluid by **paracentesis abdominis** midway between the umbilicus and pubes, or in the right iliac fossa midway between the anterior superior iliac spine and the umbilicus. The puncture must be made over a dull area and with an empty bladder. The patient is propped up in bed with two or three pillows; a many-tailed bandage placed around the abdomen, and tightened to maintain the abdominal pressure as the fluid drains away: otherwise the patient may collapse from the rapid dilatation and congestion of the splanchnic area. After sterilisation of the skin, anæsthetise it and the subjacent abdominal wall with 2 per cent. procaine at the proposed site of puncture. A small incision is made in the skin with the point of a sterile scalpel. Then insert a small trocar and cannula into the abdominal cavity. The trocar is withdrawn and, if fluid escapes, sterile rubber tubing is attached to drain the fluid into a receptacle at the side of the bed. The cannula is fixed in position with gauze and strapping. If the flow of fluid stops, and ascites is still present, alter the direction of the cannula in an attempt to restart it, or turn the patient towards the right if the puncture is in the right iliac fossa. When no more

fluid can be obtained, the cannula is withdrawn, the site of puncture painted with tincture of iodine and covered with a sterile collodion dressing.

Liver Biopsy may reveal conditions such as Kala-azar, Boeck's sarcoidosis, cirrhosis, hæmochromatosis, primary or metastatic growth and reticulo-endothelial disorders. Using a Gillman or Terry's instrument, insert the needle under local anæsthesia through the 7th right intercostal space in the anterior axillary line, the patient holding his breath during the puncture. A core of liver tissue 3 cms. in length is obtained and suitably fixed for histological section. With a hæmorrhagic tendency, estimate the prothrombin level of the blood beforehand and give Vitamin K when necessary. Only experienced operators should undertake the biopsy—fatalities or complications are occasionally met.

Liver Aspiration for the presence of pus or of Leishman-Donovan bodies is undertaken with a needle where indicated, or in the mid or anterior axillary line with a needle not longer than 90 mm. to avoid possible injury to the portal vein. When staining for Leishman-Donovan bodies, spread the contents of the needle on a glass slide. Liver aspiration must not be performed if a hydatid cyst is suspected, for fear of dissemination in the peritoneum.

Spleen Puncture is used in the diagnosis of Kala-azar, and Gaucher's disease : it should only be resorted to after other methods have failed. Leukæmia or a hæmorrhagic tendency is a contra-indication. *Method.* With the patient flat on his back and hands folded beneath the head an assistant holds the spleen firmly against the diaphragm and ribs. The skin over the intended site of puncture is sterilised with ether or liq. iodi mit. B.P. Puncture is carried out with a direct firm thrust using a No. 14 size needle and a dry syringe, the patient holding his breath. Without delay forcible aspiration is made and the needle then immediately withdrawn sharply in one motion. The patient is kept recumbent for $1\frac{1}{2}$ to 2 hours and the pulse rate checked at intervals for signs of hæmorrhage.

Gland Puncture is employed to detect plague bacilli, trypanosomes, and treponema pallidum. The technique is similar to that of puncture in any other region.

Lung Puncture.—When no sputum is available, and an area of infection can be located, lung puncture may provide material for examination and culture.

Lumbar Puncture is employed to (1) collect specimens of the cerebro-spinal fluid for examination, (2) relieve intracranial and intrathecal pressure, (3) drain or wash out the spinal canal, for which purpose it may be combined with cisternal puncture, and (4) as a preliminary to the injection of sera, drugs and antibiotics. It is advisable that all patients should remain in bed after lumbar puncture for twelve to twenty-four hours. In certain conditions, notably cerebral tumour and disseminated sclerosis, this should be made an absolute rule, and the patient should not even be allowed to sit up for several hours afterwards. Lumbar puncture should be performed with the patient lying on his side with his back over the edge of a firm couch or bed. The head is on the same level as the sacrum and is flexed well forwards ; the knees are drawn up and the back arched. The best site for the puncture is the interspace between the third and fourth lumbar vertebræ. A line joining the highest points of the iliac crests crosses the spine at this level. After sterilising the skin at the intended site of puncture, anæsthetise it with an intradermal injection of 2 per cent. procaine hydrochlor. and then infiltrate the subjacent tissue. The operator, after sterilising his hands, presses deeply into the interspace between the third and fourth lumbar spines and pushes the point of the lumbar puncture needle through the anæsthetised skin either directly in the middle line, or slightly to one side of it. The needle, with the bevel downwards, is then passed forwards and slightly upwards towards the spinal canal which it should reach at a depth of 4 to 6 cm. without encountering any resistance except at the ligamentum flavum. When it is felt that the needle has entered the spinal canal the stylet should be withdrawn, and after a few seconds the first drops of cerebro-spinal fluid should appear. If no flow results the stylet is replaced, and the needle pushed a little farther on. If the needle strikes bone, it should be withdrawn a short distance and inserted in a slightly different direction. When the puncture is

made solely for diagnostic purposes as little fluid as possible should be removed, and the sample should be free from blood. The fluid normally runs out slowly (about one drop per second) : but when under increased pressure, as in hydrocephalus and meningitis, it may spurt out ; the intrathecal pressure can be roughly judged by the rate of flow ; an accurate reading is obtained with a special manometer. In normal patients in the horizontal position the pressure varies from 60 to 150 mm. of cerebro-spinal fluid. For examination (§ 920) 5 c.c. are enough, but for treatment (below) 10 or 15 c.c. up to 50 c.c., according to indications, may be removed. The following precautions are essential : (1) strict asepsis ; (2) the rate of withdrawal should be slow, not more than 4 or 5 drops a second ; and (3) the patient should lie down for several hours afterwards. An additional safeguard is the employment of the smallest possible needle, which will inflict the minimum injury on the spinal theca, and so prevent the escape of cerebro-spinal fluid. There is one contra-indication. When there is increased intracranial pressure due to a cerebral tumour, the sudden reduction of this pressure in the cavity of the spine which results from the withdrawal of fluid may cause the descent into the foramen magnum of a part of the cerebellum. Especially is this so when the cerebellum has already been moulded to form a " cere-bellar cone " in its efforts partially to slip into the foramen magnum to relieve the intracranial pressure. When this accident occurs, there may be direct compression of the medulla, the symptoms of which range from syncopal attacks to sudden death. A further danger is that the reduction of the pressure may start hæmorrhages into a soft growth, or allow arrested bleeding to begin again.

Cisternal Puncture is useful (1) when the spinal subarachnoid space is blocked by tumour or adhesions ; (2) as a means of irrigating the spinal subarachnoid space (in combination with lumbar puncture); and (3) as the best route for injecting anti-sera or other remedies in meningitis. It is also valuable as a means of determining the presence or absence of spinal subarachnoid block—firstly, by the introduction of 1 c.c. of lipiodol into the cisterna magna, followed by X-ray examination of the spine ; the level to which the opaque lipiodol has fallen indicates the upper level of the block (§ 757) :—secondly, by a careful manometric study of the fluid in the cisterna magna and that in the lumbar cul-de-sac, and a comparison of the physical and chemical characters of the fluid obtained from these two situations. The cerebro-spinal fluid is tapped by a needle, introduced between the cerebellum and the medulla. The usual method is : Shave the hair from the external occipital pro-tuberance downwards to the neck. Sterilisation of the skin should be thorough, but, as the operation may have to be repeated, not too drastic. Do not use iodine on very young patients. The most convenient position for the patient is lying on the left side. Make certain that the line of the spine and head is straight ; the head should be slightly bent forwards, and supported on a firm pillow. A general anæsthetic is not necessary ; local anæsthetisation of the skin is usually employed. The utmost care is necessary to prevent the patient from moving once the operation is begun. *First Stage :* Place the index finger of the left hand on the external occipital pro-tuberance, and pass it down the neck till the tubercle of the atlas vertebra, the next bony point, is found. Introduce the needle half a centimetre above this point. The direction of the needle should be towards, or a little above, the outer end of the left eyebrow. No fixed mark can be given ; aim at touching with the point of the needle that part of the occipital bone which forms the posterior margin of the foramen magnum. It is better to go too high, than too low, with the point of the needle. *Second Stage :* As soon as the point of the needle is felt to be against the bone it is slightly withdrawn, its direction altered and the point depressed so that it just clears this edge of bone when it is again advanced. Several advances and withdrawals may be required before the point of the needle is free of the bone and gripped by the occipito-atlantoid membrane. The stylet is then withdrawn, and the needle pressed forwards till a flow of fluid is obtained. The depth at which the bone is met should on every occasion be noted, for the final advance must not exceed an extra 1·5 centi-metres. The total depth of the puncture varies so greatly that no representative

figure can be given. Two figures should be remembered : half a centimetre above the tubercle of the atlas, the point of introduction, and 1·5 centimetres, the maximum extra depth required after last touching the occipital bone. The specimen should be collected in two sterile tubes. After the operation keep the patient at rest lying down.

Epidural Treatment (used in obstinate sciatica).—The epidural space is reached by piercing the posterior sacro-coccygeal ligament ; the superior mesial protuberance and two lateral tubercles of the sacrum can readily be felt. The injection is made in the middle line between the two tubercles. After a preliminary injection of 20 c.c. of a 1 per cent. solution of procaine, inject sterile normal saline from 60 to 80 c.c. Thereafter the patient should rest for twenty-four hours.

Treatment of Increased Intracranial Pressure by Means of Hypertonic Solutions.—Hypertonic solutions lead to a withdrawal of water from the tissues, a reabsorption of cerebro-spinal fluid, and a pronounced fall of C.S.F. pressure—the fluid reaches the perineuronic spaces *via* the perivascular spaces and is absorbed by the capillaries of the brain. To obtain a reduction of intracranial pressure, (1) rectal administration is on the whole the most useful. 1 oz. magnesium sulphate and 1 oz. olive oil are diluted to ½ pint with water : this should be run into the rectum by means of a catheter and funnel, and effort made to retain it for half an hour or longer. (2) A more rapid reduction is obtained with intravenous injections of sterile solutions of 30–50 c.c. of saline (30 per cent.) or of dextrose (50 per cent.).

Veni-Puncture.—Blood may be required for serological, cultural, chemical and other purposes. Veni-puncture is also necessary for transfusions, intravenous medication and simple bleeding. The most convenient site is one of the superficial veins of the front of the elbow. Apply a tourniquet to the upper arm just sufficiently firm to obstruct the venous return, and ask the patient to clench his fist. The veins stand out clearly ; in fat persons the veins are often felt even when not seen. In difficult cases, warm the limb in hot-water or by a hot towel. Cleanse the skin with ether. Introduce the needle into the vein in a direction nearly parallel to the skin surface. Fill the all-glass syringe ; loosen the tourniquet and withdraw the needle, cover the puncture hole with collodion on a pad of wool. The blood is transferred to a suitable sterile tube, dry if serum is required, containing an anti-coagulant if whole blood is wanted. Bayer's venules are convenient in practice. In infants the external jugular vein is used. The nurse holds the child on her lap, with the head low and turned to one side. Crying distends the vein further.

Sternal puncture with biopsy of the bone marrow is of great value in the diagnosis of leukæmia (especially aleukæmic leukæmia), Addisonian anæmia, aplastic anæmia, myelosclerosis and multiple myelomatosis. It is useful in the recognition of Gaucher's disease, kala-azar, trypanosomiasis and rarely of carcinomatosis with metastases in bone. Negative results exclude leukæmia, and Addisonian anæmia, when the peripheral blood pictures are inconclusive. *Method.*—A Salah needle with stylet, furnished with an adjustable guard, is used. In an adult premedication is unnecessary, but in children syrup of chloral may be given half an hour beforehand. The site of puncture is the body of the sternum opposite the second or third interspace, a little to one side of the mid-line (in males shaving the chest wall may be indicated). The patient lies on his back with a thin pillow beneath the head. The skin, subcutaneous tissues and periosteum are anæsthetised with 2 per cent. procaine (novocain) solution. The Salah needle, previously sterilised and with the guard set at 1 to 1·5 cms. above the skin level, is then pushed through the outer diplöe of the sternum into the narrow cavity with a boring movement. This is accompanied by a characteristic " crunch " and the needle will stand upright when let go. The stylet is withdrawn, and with a 2-c.c. syringe about 0·5 c.c. of marrow fluid is gently aspirated. Dilution with blood must be avoided. Suction of the marrow is often associated with a twinge of pain if the point of the needle is in the marrow cavity. Films are made on slides and suitably stained. Some of the marrow may also be fixed and sections cut. The puncture wound is covered by a dry or collodion dressing. In young children marrow is best

obtained by puncture of the iliac bone 2–3 cms. below and behind the anterior superior iliac spine.

Sputum may be required for direct microscopical examination for bacteria, for malignant cells, or for cultural investigation. The value of a general bacteriological examination largely depends on the care taken to obtain the specimen as free as possible from contamination. A mixture with saliva or pharyngeal secretion gives unreliable results which are difficult to interpret. The material required is the phlegm coughed up from the chest; when this is scanty the best sample is obtained on rising in the morning. First the mouth and throat should be washed out by rinsing and gargling with plain water. The sputum should be expectorated directly into a sterile bottle which is sent to the laboratory with the least possible delay.

Fæces.—Only a small quantity is required for bacteriological purposes, but for full chemical analysis a larger specimen, *e.g.*, an ounce, should be sent. For bacteriological examination any mucus present should be included in the specimen. For the recognition of dysentery amœbæ the stool must be fresh and not allowed to cool; transmittance in a thermos flask may be necessary. For occult blood, see § 303.

Urine.—For cultural examination a catheter specimen should be obtained from females. In the male, a specimen for bacteriological examination may be collected under reasonably aseptic conditions as follows : the urinary meatus is washed with soap and water and dilute antiseptic (*e.g.*, perchloride of mercury 1 in 1000). The patient is then instructed to pass an ounce or so of urine, which is discarded; the remainder is collected into a sterilised bottle. If direct examination alone is required, the centrifuged deposit from an early morning specimen is the most satisfactory. For tubercle bacilli, when passed in small numbers and at irregular intervals, the standing deposit from a " twenty-four hours' specimen " gives the best chance of their demonstration.

Pus.—Pus may be collected in a sterile tube, or with the aid of a sterile swab. As large a specimen as possible should be collected, up to about 1 c.c. When pus is being evacuated from an abscess it is best to collect the specimen at the earliest possible moment, as later it is often mixed with blood, and sometimes contaminated.

How to Examine Pathological Fluids.—The source of the fluid is as a rule known, but certain cysts—hydatid, pancreatic and ovarian—give characteristic features. The possibility of an abdominal fluid being urine, as in hydronephrosis, should not be forgotten. For *cytological* and *bacteriological* examination about 10 c.c. of the fluid should be stood in an upright tube overnight, or spun in a centrifuge; the supernatant fluid is then poured off for chemical investigation, while with the deposit cultures are sown, films are made, both wet and dry, and if necessary animal inoculations carried out. Wet films should be examined with the $\frac{2}{3}$rd and $\frac{1}{8}$th objectives, to detect cells, crystals and hydatid hooklets. Stained films will show the type of cells, and the nature of any micro-organisms. It is difficult to diagnose isolated malignant cells, but in the case of malignant disease of the pleura or peritoneum, large multinucleate cells showing well-marked mitotic figures (the so-called Foulis' cells) are occasionally seen in the associated pleural and ascitic effusion.

Chemical examination of the clear fluid should include estimation of the specific gravity, reaction and the quantities of albumen and sugar present. For *sugar* the albumen should be removed by boiling and filtering; the same tests are employed as in urine analysis. For *albumen* see § 379.

Characters of Pathological Fluids (Table LX). In the pleural, pericardial and peritoneal cavities, inflammatory effusions (exudates) are to be distinguished from dropsical effusions (transudates). The presence of a large jelly-like clot formed rapidly on standing, a specific gravity above 1016, a protein content over 2 per cent., and a relatively high cellular content indicate an exudate. In a transudate, clot formation is slight or

Table LX.—Physical and Chemical Characters of Pathological Fluids.

Constituents, etc.	Serous exudation as in Ascites or Pleurisy.	Transudation.	Hydatid Cyst.	Pancreatic Cyst.	Ovarian Cyst.	Hydronephrosis.	Cerebro-spinal Fluid (Normal).	Distended Gall-Bladder.
Colour.	Greenish yellow.	Clear yellow or greenish yellow.	Clear and colourless or opalescent.	Colourless. Often mixed with blood.	Variable—clear yellow to black.	Clear and watery.	Clear.	Clear—or stained with bile.
Specific gravity.	Usually over 1016.	Rarely over 1012.	1006 to 1010.	Variable often—1008 to 1010.	From 1002 to 1005 (low sp. gr. points to cyst of broad ligament).	1008 to 1020.	1006 to 1007.	Low.
Spontaneous coagulability.	Very marked. Clots in 24 hours or earlier.	Slight. May clot after long standing.	Absent.	Absent.	Absent. Consistence variable—watery to colloid.	Absent.	Absent.	Absent.
Chemical composition.	Alkaline. Much albumen, 2 per cent. or more (serum alb. and globulin). Small quantities { Sugar. { Uric acid.	Alkaline. Albumen 1 per cent. or less (serum alb. and globulin).	Alkaline. No albumen or albumen negligible quantity. Much sodium chloride. Succinic acid.	Digests albumen in alkaline medium. Serum albumen present.	Alkaline. Albumen (serum alb. and globulin, and metalbumen).[1]	Traces of albumen, urea, and uric acid.	Trace of albumen and mose. Small amount of a reducing agent. Protein 0·02%. Sugar 0·05-0·07%. Chlorides 0·73%.	Mucin present; may contain bile.
Microscopic Examination.	Very little débris. { Red blood cells. { Leucocytes. { Endothelial cells.	Even less débris than in serous exudation—similar constituents.	Characteristic hooklets, scolices, cyst membrane, haematoidin crystals.	Often cholesterin crystals.	Cylindrical ciliated epithelial cells, squamous cells, colloid concretions, red blood-cells, leucocytes, fat globules, cholesterin, fatty acid crystals, and haematoidin.	Sometimes renal epithelial cells, uric acid crystals.	A few lymphocytes, 1 or 2 per cu. mm.	May have cholesterin crystals.
Remarks.	May be variable quantity of pus present. Occasionally it is red with blood as in cancer.[2]	May be sanguineous, rarely, chylous.	Diagnosis made by microscopic examination.	The ability to digest albumen is a positive test; but in very old cysts the power is lost.	Metalbumen and ciliated cells the diagnostic points.	Only diagnostic points are presence of renal cells and these may be absent; or urea.	In acute meningitis the fluid is cloudy, with more albumen and no sugar. Micro-organisms found aid diagnosis.	

[1] Metalbumen is thus tested for: Acidify fluid with acetic acid, boil and filter to remove other forms of albumen. Add to the filtrate three times its bulk of alcohol. Stand for twenty-four hours. Filter. Squeeze out precipitate and suspend in water. Filter. Filtrate has following reactions: (i) On boiling it becomes turbid, but no precipitate falls; (ii) on adding acetic acid no precipitate forms; (iii) on adding acetic acid and strong sulphuric acid a violet colour is produced; (iv) on adding acetic acid and pot. ferrocyanide the fluid is thick and yellow.

[2] Ascitic fluid usually shows the characters above described; "hæmorrhagic ascites," where blood is found in the fluid, occurs chiefly in cancerous peritonitis, and has been considered a fatal sign. Middleton reported cases of chronic peritonitis associated with hæmorrhagic ascites in alcoholics, who recovered.

Table LXI.—Cerebro-Spinal Fluid.

Condition.	Appearance of Fluid.	Pressure of Fluid in Recumbent Posture.	Protein per cent.	Cells per cu. mm.	Type of Cells.	Organisms.	Wassermann.	Colloidal Gold Curve.	Sugar per cent.	Chlorides.
Normal.	Clear, colourless; no clot on standing.	60-150 mms. water.	0·02-0·05.	0-5.	Lymphocytes.	None.	Negative.	0000000000 or 0011100000.	·05-·07.	0·72-0·75.
Tuberculous meningitis.	Clear, colourless; spidery clot on standing.	Increased.	Up to 0·30.	10-400.	75 per cent. lymphocytes.	Tubercle bacilli in clot.	Negative.	Normal.	Diminished.	Fall to below 0·66.
Cerebro-spinal meningitis.	Hazy or turbid; dense clot on standing.	Increased.	Up to 0·30.	10-2000 or more.	Polymorphs.	Intra-cellular gram negative diplococci.	Negative.	Normal.	Diminished or absent.	·60-·70.
Pneumococcal, streptococcal and staphylococcal meningitis.	Hazy, turbid or purulent; dense clot on standing.	Increased.	Up to 0·30.	10-1000 or more.	Polymorphs.	Gram positive cocci.	Negative.	Normal.	Diminished or absent.	·60-·70.
General paralysis of insane.	Normal.	Increased.	0·05-0·10.	20-400.	Lymphocytes.	None.	Positive in over 99 per cent.	Curve such as 5555443200.	Normal.	Normal
Tabes dorsalis.	Normal.	Normal.	0·03-0·08.	10-80.	Lymphocytes.	None.	Positive in 70 per cent.	Curve such as 1233210000.	Normal.	Normal.
Meningo-vascular syphilis.	Normal.	Normal.	0·03-0·08.	10-80.	Lymphocytes.	None.	Positive in 50 per cent.	Curve such as 0014320000.	Normal.	Normal.
Encephalitis lethargica.	Normal.	Usually increased	0·02-0·05.	0-10.	Lymphocytes.	None.	Negative.	Normal or luetic.	Normal or slightly raised.	Normal.
Disseminated sclerosis.	Normal.	Normal.	Normal.	Normal or slightly increased.	Lymphocytes.	None.	Negative.	Normal or 1121000000.	Normal.	Normal.
Acute anterior poliomyelitis.	Normal.	Normal or increased.	Raised to 0·10 from end of first to end of sixth week.	10-1000 from pre-paralytic stage to end of second week.	Polymorphs, then Lymphocytes.	None.	Negative.	Curve such as 0123210000	Normal.	Normal.
Cerebral tumour.	Normal.	Increased.	0·02-0·10.	Normal.	Lymphocytes.	None.	Negative unless due to syphilis.	Normal.	Normal.	Normal.
Spinal blockage (Loculation or Froln's syndrome); and some forms of polyneuritis.	Clear, straw to amber; dense clot.	Diminished or normal below block	0·30-4·00.	Normal, or slight increase.	Lymphocytes.	None.	Negative unless due to syphilis.	Normal.	Normal.	Normal.

absent, the specific gravity usually below 1012, the protein content under 1 per cent., and the cytological content small. The transudate of cardiac œdema has a higher protein percentage than that of renal œdema. Blood in distinct amount in these cavities suggests neoplasm, but occurs with tuberculous disease of the pleura and with peritonitis associated with cirrhosis of the liver. A few blood cells, sufficient to give the fluid a rosy tinge, may occur with simple acute inflammation. The character of the cells in a pleural fluid may aid diagnosis of the cause of the effusion ; thus, an excess of lymphocytes points to tuberculous pleurisy, the predominance of polymorph cells to pyogenic or other causes.

Guinea-pig inoculation of a sterile pleural effusion may establish its tuberculous origin when tubercle bacilli cannot otherwise be demonstrated in it. The clot ground up in normal saline in a sterile mortar, or the centrifuged deposit form the best material for inoculation. A positive result is obtained only in about 70 per cent. of cases, whose subsequent history proves to be tuberculous ; in some cases several animals should therefore be used. Cultivation of the deposit or clot on a medium specially selective for tubercle bacilli, such as that of Lowenstein-Jensen, is successful in a high percentage of cases and frequently in a shorter time than a positive animal inoculation result.

The special characters of the various fluids and cysts are given in tabular form ; but a few words should be said here about the cerebro-spinal fluid.

§ 920. **Cerebro-Spinal Fluid** should be a clear, colourless, watery fluid, alkaline in reaction and with no clot formation. A trace of albumen (0·025 grm. per cent.) is normally present, and also a trace of sugar (partial reduction of Fehling's solution). In acute meningitis the fluid may exhibit varying degrees of *cloudiness*, from slight turbidity to almost pure pus, and in pyogenic infections the causal organism may be demonstrated in stained films. The presence of *blood* may result from a head injury, cerebral hæmorrhage, or trauma of the venous plexus on the anterior surface of the vertebral canal at the time of the lumbar puncture. Recent hæmorrhage (as in the latter) can be distinguished from old hæmorrhage by centrifuging some of the fluid ; if the supernatant layer be clear, with no sign of hæmolysis, the blood present is probably the result of trauma at the time of the lumbar puncture ; old hæmorrhage is almost always associated with some degree of hæmolysis, and the supernatant fluid is tinged yellow. Further, if the blood-stained cerebro-spinal fluid be collected in successive small amounts in three or four test-tubes, in recent hæmorrhage caused by trauma at the time of the puncture, that in the first one or two tubes will be more deeply blood-stained than in the third or fourth. In old hæmorrhage the blood admixture in all tubes will be about equal.

BACTERIOLOGICAL examination may be made on direct films, or films of the centrifuged deposit ; cultures should also be put up. Pneumococci, meningococci, streptococci, staphylococci, B. Pfeiffer and gonococci may be demonstrated in this way. Tubercle bacilli may often be found in the " spider-web " clot, which forms in the fluid on standing, by staining with the Ziehl-Neelsen method. Guinea-pig inoculation or culture on Lowenstein-Jensen medium may confirm the diagnosis in an obscure case.

The normal CYTOLOGICAL content is two to four mononuclear cells (lymphocytes or endothelial cells) per cu. mm. The total cell count is best made with the Fuchs-Rosenthal counting chamber. It is well to stain the fluid before, as a differential count can then be made at the same time as the total number per cu. mm. is estimated. To ½ c.c. of the cerebro-spinal fluid in a clean dry test-tube add 0·05 c.c. of a 0·2 per cent. solution of toluidin blue or methyl violet. Shake the tube and allow the mixture

to stand for ten minutes. This gives a dilution of ten parts in eleven of the cerebro-spinal fluid, which can be allowed for in the subsequent calculation. The nuclei of the lymphocytes and polymorphonuclear cells take up the stain and can be distinguished by their characteristic shape; the red cells are uninfluenced.

A *differential count* can also be performed on a Leishman stained film of a centrifuged deposit of fluid. A slight *increase in lymphocytes* (5-10 per cu. mm.) in the cerebro-spinal fluid occurs in any form of syphilitic nervous disease after the earlier stages and especially in the more chronic forms, such as tabes or chronic meningeal syphilis. It may also occur in disseminated sclerosis, cerebral tumour and abscess, poliomyelitis, encephalitis lethargica and some forms of polyneuritis. A greater increase in lymphocytes (10-50 per cu. mm.) is common in syphilitic nervous disease of all forms during the onset or the progress of the disease. It also occurs in tuberculous meningitis and in the other conditions mentioned above. A slight increase of both lymphocytes and polymorphonuclear cells (5-10 per cu. mm.) is characteristic of brain abscess or of inflammation of the cranial sinuses with involvement of the dura mater. A larger increase comprising both these types of cell occurs in tuberculous meningitis. Marked polymorphonuclear increase is the rule in all forms of cerebro-spinal meningitis, whether due to pyogenic cocci, the meningococcus, or to any of a variety of bacillary forms, *e.g.*, B. Pfeiffer. In these conditions the causative organism can usually be demonstrated in the fluid.

Chemical Tests.—For these, the clear fluid obtained after centrifuging should be used. *Protein.*—Mestrezat's method is preferable. In this the degree of opalescence produced by the precipitation of the protein in the fluid by trichloracetic acid is compared with that of a series of standards ranging from 0·01 to 0·1 G. per cent. 2 c.c. of the fluid are put into a tube of similar weight and diameter to those used for the standards. 0·3 c.c. of 30 per cent. trichloracetic acid is added; the tube is set aside for twenty to thirty minutes, then shaken up and compared with the standard scale. The normal protein content is 0·02-0·03 G. per cent.

Globulin.—The Nonne-Apelt reaction consists in pouring 1 c.c. of the cerebro-spinal fluid on to the surface of 1 c.c. of a neutral saturated solution of ammonium sulphate. A normal fluid gives a faint opalescent ring at the junction of the two surfaces. A definite opacity indicates an increase of globulin.

Chlorides.—These are estimated against a standard silver nitrate solution, using potassium chromate as an indicator. The chlorides are precipitated as insoluble silver chloride and the indicator, potassium chromate, forms red silver chromate as soon as all the chloride is used up. The silver nitrate solution is made by dissolving 5·814 G. of pure silver nitrate in a litre of distilled water (or 2·5 G. AgNO$_3$ in 430 c.c. of distilled water). This solution keeps indefinitely in a brown bottle. For the test, exactly 2 c.c. of cerebro-spinal fluid is measured by a delivery pipette into 15 or 20 c.c. of distilled water, and 2 drops of 10 per cent. potassium chromate added. The silver nitrate solution is run in from a graduated burette with constant stirring. A permanent change of colour from lemon to orange yellow indicates the end point. Each cubic centimetre of silver solution then used indicates 1 G. of chloride per 1000 c.c. of cerebro-spinal fluid (or 100 mgm. per 100 c.c.). The normal chloride content should fall between 725 and 750 mgm. per 100 c.c. of fluid.

Sugar.—A routine qualitative test is sufficient. One c.c. of the cerebro-spinal fluid is boiled with 0·25 c.c. of Fehling's solution. Normal fluids give a heavy reddish-yellow precipitate which on standing sinks to the bottom of the test-tube, leaving the supernatant fluid pale blue.

Lange's Colloidal Gold Reaction.—Normal cerebro-spinal fluid causes little or no alteration in a colloidal gold solution, but precipitation of the gold may occur with cerebro-spinal fluid from cases of general paralysis of the insane, tabes and some forms of meningitis (Table LXI). Precipitation in these conditions occurs in different dilutions, though these to some extent overlap. Ten dilutions of cerebro-spinal fluid are used in the test, ranging from 1 in 10 up to 1 in 5120. Numbers denote various appearances of fluid depending on degree of gold precipitation.

0 denotes no change (rose-red colour); 1, very slight change to deeper red, scarcely lilac; 2, lilac to purple; 3, deep blue; 4, light blue with purplish precipitate; and 5, complete decolorisation of the top fluid with a heavy bluish precipitate.

A report 0011100000 would be the reading of a normal cerebro-spinal fluid, and indicates that there is no gold precipitation in most of the dilutions, but a very slight one in the dilutions 1 in 40, 1 in 80 and 1 in 160. In the paretic response—typical of general paralysis of the insane—precipitation occurs in the eight strongest dilutions, diminishing gradually, e.g., 5555443200. In the luetic response, seen in tabes and cerebro-spinal syphilis, precipitation occurs in the higher middle dilutions, e.g., 1233210000. A positive curve of either response may be given by some cases of disseminated sclerosis; the Wassermann Reaction here is negative.

§ 921. Bacteriological Examination.—The subjects of serum-therapy and immunity have been dealt with in §§ 519 to 521.

In practice it will be found that in the majority of cases the microscopic examination of direct specimens of pathological material is all that is possible; the cultivation of every micro-organism demands too complicated an amount of apparatus. *Direct films* give invaluable information and present no great difficulty. The apparatus required is of the simplest: a microscope with $\frac{2}{3}$-, $\frac{1}{6}$-, and $\frac{1}{12}$-inch objectives, some slides and cover-glasses, a platinum loop, a Bunsen flame or spirit lamp, a few test-tubes, and some glass jars and bottles. The stains should include methylene blue, methyl violet (6b), carbol fuchsin, neutral red, and Leishman's stain, together with absolute alcohol, Gram's iodine solution (1 per cent. iodine in a 2 per cent. aqueous solution of potassium iodide), sulphuric acid (25 per cent.), spirit (70 per cent.), and distilled water. With these it is possible to examine films of pus, sputum and urine, also swabs from throat and nose. They provide valuable means of diagnosing B. tuberculosis, B. anthrax, Streptothrix actinomyces and Vincent's angina, and are useful for B. diphtheriæ, though in this case it is necessary to make cultures as well. The type of pyogenic organism in pus can also be seen, and suitable therapy decided on. For collecting specimens for cultural purposes the following are required: Sterile swabs, test-tubes, culture media, citrate solution, syringes and needles, platinum loop, and capillary pipettes for serum from suspected chancres.

Films for microscopic examination may be made as follows: Take a clean dry slide, place on it a small piece of the material to be examined, and with the platinum loop smear it evenly over a surface the size of a farthing. If the material is very thick it may be mixed with a drop of water to help it to spread. Allow the film to dry in the air, and then heat it over the flame to a degree just sufficient to coagulate the proteins of the material and cause it to stick to the slide; this temperature makes the slide feel uncomfortably hot to the back of the hand. The slide is then left to cool, when it may be stained in one of the following ways: (1) *Methylene Blue* is a simple stain suitable for pus and for throat swabs. Pour a few drops of an aqueous solution of methylene blue on the slide and leave for $\frac{1}{2}$ to 1 minute; wash the slide well in water, and examine with the $\frac{1}{12}$-oil immersion objective. (2) *Gram, Jensen's modification,* is a differential stain for bacteria. Cover the film with 0·5 per cent. methyl violet (6b) in water, and leave on for 2 minutes; wash the violet off with Gram's iodine solution and leave the iodine solution on for 2 minutes. Pour off the iodine solution and wash the film in absolute alcohol till no more stain can be washed out; this stage must not exceed 3 minutes. Then wash in distilled water and flood the slide with 1 in 1,000 neutral red in distilled water, and leave this on for $\frac{1}{2}$ to 2 minutes as required; wash in water, blot, and dry. Examine with the $\frac{1}{12}$ objective. Gram-positive organisms are stained purple or black; Gram-negative organisms are stained pink.

(3) *Ziehl-Neelsen Stain for Bacillus Tuberculosis.*—Flood the slide with filtered strong carbol fuchsin and heat gently until steam rises. Allow the preparation to stain for five minutes, heat being applied at intervals to keep the stain hot. Do not allow the stain to evaporate and dry on the slide. Wash with water, and

microscopic stage should be warmed (by standing the microscope in the incubator before use). A drop of mucus from the stools, or a scraping from the wall of a tropical abscess, or from the ulcerated mucous membrane obtained via a sigmoidoscope, is diluted with warm saline solution and placed on the slide. The amœba will then be seen actively moving. Often no active amœbæ are present in a stool, yet the patient may be passing numbers of amœbic cysts ; these are round refractive bodies containing four nuclei, and stain faintly with iodine (§ 304).

The **urine** may contain the following organisms, demonstrable bacterio-logically in infection of the urinary tract—B. coli, B. proteus, staphy-lococci (aureus and albus types), streptococci (usually fæcalis type), gonococci, typhoid or paratyphoid (carrier state), and tubercle bacilli.

Blood.—*Direct examination* of blood films may be necessary for the discovery of such blood parasites as malaria, trypanosoma, anthrax, filaria, the spirochæte of relapsing fever, kala-azar, etc. *Cultural examination* is required in septicæmia, malignant endocarditis, typhoid fever, etc. For convenience, 10 c.c. of blood, taken from a vein with a dry sterile syringe, is added to 0·5 c.c. of sterile 5 per cent. sodium citrate solution in a sterile test-tube. After mixing gently, 5 c.c., 2 c.c., 1 c.c., 5 drops and 1 drop of this citrated blood are inoculated into separate tubes of glucose-broth. The tubes are incubated at 37° C. and examined for growth at the end of 24 hours, 48 hours and 7 days. Especially valuable in infective endocarditis is blood culture with pour plates. To $\frac{1}{2}$–1 c.c. of blood in a sterile Petri dish is added 6–8 c.c. of nutrient agar, cooled to 45° C. after melting : these are mixed by gentle agitation and after allowing to set, are incubated. When typhoid or paratyphoid is suspected, an additional culture should be made of 3 c.c. of blood in a tube of bile broth or sterilised ox bile ; subculture on to MacConkey's or litmus lactose agar medium is made after 24 hours' incubation. If undulant fever be a possibility a parallel set of glucose-broth cultures should be incubated in an atmosphere of 10 per cent. carbon dioxide. It may, in some cases, be necessary to incubate cultures anærobically. Relative anærobic condi-tions are obtained by boiling and cooling the tubes of glucose-broth prior to adding the blood and then covering the surface with a layer of sterile liquid paraffin.

§ 922. **Widal's Serum Reaction** illustrates the phenomenon of immunity (§ 519). An infecting organism acts in the human body as an antigen, a substance which stimulates the formation of antibodies. These antibodies are of various types ; among them are agglutinins which cause the infecting organisms to mass together in clumps, *i.e.*, to agglutinate. The test, originally described for typhoid fever, is now applied to many other bacterial infections, notably the paratyphoid fevers, the dysenteries, Malta fever, food poisonings and infections with B. abortus. A somewhat similar technique is used for typing the pneumococcus and meningococcus. In typhoid the reaction may occur any time after the first week, rarely by the third day, and persists for several years (§ 493). Inoculated persons may give a positive result for many years. In doubtful cases the strength of the reaction is estimated, and this is repeated after a week. With an active infection the strength of the reaction will increase, while an old case, a carrier, or an inoculated subject will show no change.

Dreyer's modification (a macroscopic agglutination) is the best means of perform-ing the test. Serum obtained by veno-puncture from the patient is diluted 1 in 10,

using a Dreyer's dropping pipette. Into a small metal rack, provided with three rows of five small holes, are placed the special agglutination tubes with pointed ends. With the Dreyer standard pipette ten drops of the diluted serum (1–10) are placed in the first tubes of each row, five in the second, two in the third and one in the fourth. Normal saline is added as follows—five drops to the second tube in each row, and eight, nine and ten drops to the third, fourth and fifth tubes in each respectively. Fifteen drops of dead B. Typhoid emulsion, B. Paratyphoid A and B emulsions are added to each of the tubes of the first, second and third rows respectively, and the contents mixed by inversion. The last tube in each row contains no serum and acts as a control. The resulting dilutions of serum in the other tubes are 1–25, 1–50, 1–125, and 1–250. The rack is placed in a water bath at 55° C. for two hours, and then examined. Complete agglutination is indicated when the bacilli form a white flocculent precipitate at the apex of a tube ; partial agglutination, by fine flocculi in the tube just visible to the naked eye but without sedimentation. The result is expressed according to the highest dilution (titre) of the serum in which agglutination results. In a positive case it may be necessary to carry the dilution of the serum to a much higher figure than that in the first test before no or only partial agglutination is obtained.

(The Standard Agglutinable Emulsions are obtained from the Department of Pathology, University of Oxford.)

§ 923. **Treponema Pallidum (Spirochæta Pallida)**.—*Precautions :* The operator is advised to wear rubber gloves in all cases. Serum should be obtained *from below the surface* and, so far as possible, contamination with the surface organisms which may include spirochætes other than *Spirochæta pallida* avoided. The presence of blood in the specimen renders the examination for spirochætes more difficult. The specimen should be obtained from the margin of the lesion or sore, especially if it is ulcerated. If a local antiseptic has been applied to the lesion, it may be impossible to discover the spirochætes until a wet dressing of lint or plain gauze soaked in boiled water (or N. saline) has been applied to the sore for three days prior to collection of the specimen of serum.

Procedure.—(a) Cleanse the sore and its immediate surroundings with a swab of non-medicated gauze or lint moistened with warm water or with N. saline. (b) Apply a pad of non-medicated lint wrung out in very hot water to the surface of the sore and keep in contact for about a minute. (c) Now apply a pad of plain lint moistened with absolute alcohol or methylated spirit, and keep in contact for about half a minute. (This often causes some smarting, but is less painful to the patient than scraping with an instrument.) (d) On removing the spirit pad the surface of the sore looks dry and glazed. Now squeeze the base of the sore, when clear serum will exude from the surface : collect a few drops of this into the capillary tube provided for the purpose. (e) Hold upwards the end of the capillary tube furthest removed from the serum, and seal, allowing the end just to touch the flame. The serum will then travel up the tube towards the sealed end, and the other end can be sealed without heating the serum in the tube. Send the specimen to the laboratory as quickly as possible. A film of this serum is made. The spirochæte pallida may be examined by the method of " dark ground illumination " or by staining methods. A description of the organism is given under Syphilis (§ 552, and Fig. 133).

§ 924. The **Wassermann Reaction** can be carried out on any body fluid—most frequently with blood, less often with cerebro-spinal fluid. The test depends upon the fixation or adsorption of complement by a factor present in syphilitic serum, as follows : Syphilitic serum + antigen + complement, results in the adsorption of complement. *Syphilitic serum* contains an immune thermostable substance, upon which depends the intensity of the positive Wassermann reaction. *Antigen* consists of a mixture of alcoholic heart extract and a solution of cholesterol. It was formerly thought necessary to employ a specific antigen, in the form of an extract of syphilitic liver, but later researches have shown that the test is equally reliable with a non-specific antigen. *Complement* is present in varying amounts in all fresh serum. In order to supply it

in known quantity, the complement in the test serum is destroyed by heating, and fresh complement is added in the form of guinea-pig's serum. The adsorption of complement, which occurs when these three substances interact at 37° C., is believed to be a colloidal phenomenon, possibly resulting in a fine precipitate, not discernible by the eye. To make the reaction visible, the method of using sensitised sheep cells has been devised. When the red blood corpuscles of a sheep are injected into a rabbit, an anti-substance is formed in the blood of the rabbit which is capable of hæmolysing the sheep cells. This substance is called hæmolytic amboceptor. When sheep cells, sensitised in this way, are added to a serum in which complement has been destroyed by heating, no hæmolysis takes place, and the fluid becomes, on shaking, an opaque, pinkish colour. If, on the other hand, fresh complement is added, the cells become hæmolysed, resulting in a clear red fluid.

Now, as stated above, syphilitic serum mixed with antigen and with complement, causes the complement to be adsorbed, so that none is left to enable the amboceptor to hæmolyse the sheep cells. In the case of normal serum, however, there is no adsorption of complement, with the result that the fresh complement added is free to produce hæmolysis. An opaque, pinkish fluid, therefore, indicates that the specific syphilitic immune substance was present, and that the test is positive, while a clear red fluid indicates that it was absent and that the test is negative. By altering the nature of the antigen, tests for other antibodies (*e.g.*, gonococcal, hydatid, tuberculous) can be carried out.

Interpretation of the Wassermann Reaction.—(1) Blood. It is often helpful for the practitioner to consult the pathologist, for there are borderline cases where the exact position is more easily conveyed by word of mouth than by written reports.

As a general rule the following terms are used: Strong Positive, double plus: this may be taken as proof of syphilitic infection. Positive, one plus: a valuable contributory sign when the diagnosis is in doubt; if found repeatedly it may be accepted as proof of syphilitic infection. Weak, or a Doubtful Positive, or a Doubtful result, plus over minus. The test should be repeated, often after a provocative dose of N.A.B., and a thorough clinical examination of the patient made. A diagnosis of syphilis should never be made on such a result alone. Negative, Complete Negative, Minus. A patient with active secondary or tertiary syphilis seldom gives a negative Wassermann. Early cases frequently give this result. In Tabes and G.P.I. a Positive is usual but not constant. (For *Fallacies*, see page 715.)

(2) Cerebro-spinal fluid. A positive result is proof of central nervous syphilis; a negative does not exclude it. In G.P.I. a positive is the rule. In Tabes, especially during remissions, negatives are often obtained. In meningo-vascular syphilis a high proportion of positives is obtained.

Flocculation Tests.—Sachs-Gorgi, Sigma, Kahn, etc. These tests differ from the Wassermann in that only syphilitic antigen and patients' serum are used. There is direct union of antigen and antibody without the need for complement and with a visible result. Suitable quantities of serum and heart-cholesterol extract are mixed and kept at a fixed temperature; after a certain time flocculation is observed in the positive tubes. The significance and interpretation may be taken as identical with those of the Wassermann, when dealing with blood; with C.S.F. the tests are less delicate.

Paul-Bunnell Reaction.—This is a diagnostic test for glandular fever dependent on the discovery that the blood in this affection contains heterophil antibodies in the form of an agglutinin for sheep's red cells. Normal serum may possess agglutinin to a titre of 1 in 16: in glandular fever the titre is usually 1 in 64 or higher by the end of the first week, and remains high during the active phase of the disease. Sometimes it is only transient, occasionally delayed, and rarely absent. This latter suggests that glandular fever is caused by different viruses some of which do not give the typical serological reactions. The patient's serum is inactivated by heating for fifteen minutes at 55° C. and is then put up in serial dilutions, to each of which is added a known volume of a 2 per cent. suspension of freshly washed sheep's cells.

The test is read after incubation in a water bath or incubator for one hour at 37° C. followed by overnight in a refrigerator at 2–4° C. A raised titre occurs in serum sickness, but other than this the reaction is specific for glandular fever.

§ 925. **Basal Metabolism.**—The determination of the basal metabolic rate is of value in diagnosis, prognosis and in estimating progress at various stages of treatment. In cases of exophthalmic goitre it establishes with certainty the degree of toxicity due to the thyroid condition. In cases of hypo- or hyper-thyroidism it is of value as a guide to treatment. It may be defined as a measure of the capacity of the individual to consume oxygen under certain definite conditions which by precise adjustment permit of comparison with a standard normal.

There are many methods of determining the basal metabolic rate. The more elaborate include gas analysis and need to be conducted in hospital and in close proximity to a well-equipped laboratory. These are more accurate, as all factors are taken into consideration and only highly-trained technicians are employed. For general clinical purposes, a method carried out by any physician and at any bedside is obviously of greater practical value. Such a method is offered by several types of apparatus (e.g., the portable Benedict apparatus). The precautions necessary are :—(a) That the patient should be fasting and should have been resting in bed for the preceding twelve or fourteen hours ; (b) That he should practise for a day or two the use of the nose-piece and mouth-piece. These are at first uncomfortable ; but after a little practice he will grow thoroughly accustomed both to the method of breathing and to the strangeness of the mechanical devices in the mouth and nose. This precaution is of the first importance—for mental or physical unrest at the time of the test will materially impair its accuracy.

The apparatus consists of a cylindrical spirometer with the necessary attachments to the mouth-piece and for administering the supply of oxygen. It also contains soda lime, through which both the inspired oxygen and the expired air pass—thus removing all the CO_2. The readings on the scale represent accurately the amount of oxygen consumed. These readings are interpreted by means of a table which accompanies the apparatus and which makes allowance for variations of temperature, barometric pressure, height, weight, age and sex. One is then able to ascertain the percentage of oxygen consumed per minute above or below the normal. This is expressed as the B.M.R. (basal metabolic rate), plus or minus, as the case may be.

§ 926. The **Zondek-Aschheim Pregnancy Test** has proved reliable for the diagnosis of pregnancy as early as the fifth week, when clinical signs are still inconclusive. The test depends upon the fact that the urine of pregnant women contains an anterior pituitary lobe hormone which induces the formation of hæmorrhagic Graafian follicles and of corpora lutea in the ovaries of sexually immature female mice. The specimen of urine used should be an early morning one and collected not earlier than one week after the first missed menstrual period. In hydatidiform mole and chorion epithelioma the amount of hormone excreted is greatly increased compared with that in a normal pregnancy. The inoculation of urine diluted 1 in 100 or more will still produce the characteristic ovarian changes and this is of valuable diagnostic aid.

Five immature female mice, twenty-one days old on the date of commencing the test, are injected subcutaneously over three days with six doses of urine, each of 0·3 c.c. The animals are killed on the fifth day, and the ovaries examined macroscopically and if necessary microscopically. Characteristic changes in any one of the animals indicates a positive result.

The **Friedman Pregnancy Test** is a modification of the Zondek-Aschheim test and is carried out on a juvenile female rabbit, or one that has been segregated for three months. Ten c.c. of the urine to be tested (an early morning specimen) are injected intravenously into a marginal ear vein and the animal killed after 48 hours, laparotomy performed and the ovaries examined. A positive result is indicated by the presence of corpora hæmorrhagica in the ovaries. The test becomes positive on the seventh to the tenth day after the first missed menstrual period and is extremely accurate, although it does not, in using a single animal, allow for individual variation in response.

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The **Xenopus Pregnancy Test** (Toad ovulation test) depends on the production of ovulation in female Xenopus lævis—an African toad—following the injection of the anterior-putuitary-like hormone in the urine of pregnant women. Three or four toads are inoculated with 2 c.c. of urine into the lymph sac under the dorsal skin, and a positive result is indicated by the shedding of eggs in 12 to 24 hours. The reliability of the test does not differ from that of the Zondek-Aschheim or the Friedman reaction, and the animals need not be killed to obtain the result. A related test is by injection of 10 c.c. of a patient's untreated urine into the dorsal lymph sac of the adult male toad *Bufo arenarum* Hensel indigenous to South America. In 2–4 hours masses of spermatozoa in the toad's urine indicate a positive result.

§ 927. Blood Sedimentation Rate.—The sedimentation rate of the red cells was first studied by Fahræus, but there have been many subsequent modifications in technique. *Method.*—The Westergren method is the one most commonly used. 1·6 c.c. of blood is mixed with 0·4 c.c. of 3·8 per cent. sodium citrate solution, and some of the mixture drawn up into a standard Westergren tube; the latter is 2·5 mm. in diameter and closely resembles a 1 c.c. pipette, but is calibrated in mms. of length. The zero mark is exactly 200 mm. from the point, and the blood is drawn up to this mark. The tube is then set upright in a special stand and the red corpuscles begin to settle down, leaving a clear supernatant plasma. At the end of one hour, the result is read as the distance sedimented in mms. by the top of the red cell column. In men the normal range is 3–5 mm. and in women and children 4–7 mm. An increased sedimentation rate is present in pregnant women after the third or fourth month, in localised acute inflammations, in rheumatoid arthritis, in active tuberculosis and in active rheumatic disease of children (rheumatic fever, carditis, etc.). In tuberculosis, the degree of sedimentation is of some value in prognosis as it increases with the activity of the disease; in rheumatic disease of childhood, an increased rate points to a latent activity even in the absence of physical signs, and indicates continued rest to limit cardiac damage. The sedimentation rate is apparently dependent on the ratio of albumen, globulin and fibrinogen in the plasma. The test is of more value in prognosis than diagnosis, and in all cases should be interpreted in conjunction with other clinical and laboratory investigations.

THE VITAMINS

§ 928. Vitamins are present in small amounts, measurable in standardised units, in plant and animal tissues, and are essential for the transformation of energy and the regulation of metabolism. They may be divided into three groups :—

(I) Those which have been shown to be needed by man—vitamin A, vitamin B_1, four components of the vitamin B_2 complex (nicotinic amide, riboflavin, folic acid and the most recently discovered B_{12}) ; vitamins C, D and K, with their different forms and modifications.

(II) Those whose significance for human nutrition is probable but not certain—two factors of the B_2 complex (biotin or vitamin H, and choline) and vitamins E, F, and P.

(III) Vitamins needed for experimental animals—four factors of the B_2 complex (B_6, pyridoxin, pantothenic acid, inositol, and p-amino benzoic acid).

GROUP I

(1). **Vitamin A,** (" anti-xerophthalmic ") includes vitamin A, or axerophthol, the principal provitamin, β-carotene, and several other forms of vitamin A including vitamin A_2 and active carotenoids. The first recognisable symptoms of vitamin A deficiency are cessation of growth, and night blindness; the light adaptation test is used as a measure of the vitamin A requirement. Xerophthalmia, increased susceptibility to infection, and pathological changes in epithelial cells, leading to a keratinised papular skin eruption, are associated with vitamin A deficiency.

Vitamin A is prepared in crystalline form, from natural sources and synthetically. Its chief sources are animal fats and oils, especially halibut and cod-liver oils, liver, eggs and dairy produce. It can also be manufactured in the body from its precursor carotene, widely distributed in yellow root vegetables, green leaves, coloured fruits and seeds. Vitamin A_2 is present in freshwater fish.

The daily adult requirement of vitamin A is 3,000 I.U. This is represented by 1–2 teaspoonfuls of cod-liver oil, 1–2 quarts of milk, or 2–3 ozs. of liver. Lactating women whose diet is suspected of being deficient in vitamin A need a daily addition of about 6,000 I.U.

(2) **Vitamin B Group** includes the heat labile vitamin B_1 and the heat stable vitamin B_2 complex.

Vitamin B_1 (aneurin or thiamin—" anti beri-beri " or " anti-polyneuritic "). Deficiency of vitamin B_1 is associated with human beri-beri, especially when the diet consists chiefly of milled rice. Vitamin B_1 is directly concerned with intermediary carbohydrate metabolism, especially in relation to the oxidation of pyruvic acid in the brain. Excess of carbohydrate in the diet, pregnancy and lactation, increase the requirement for vitamin B_1. Deficiency appears to be the underlying factor in various forms of nutritional polyneuritis; it is also said to be associated with gastro-intestinal disturbances (anorexia, glossitis, achlorhydria) and with circulatory disorders (dyspnœa and palpitation on exertion, tachycardia, and œdema). Its chief sources are yeast and cereals, particularly the germ of whole wheat. The use of highly milled cereals, from which the germ has been removed, will markedly reduce the vitamin B_1 content of the diet. It is present to a smaller extent in some green vegetables, potatoes and in milk. The average daily requirement is about 300 I.U.; white bread contains about 30 units per 100 gms.; the national loaf 80–85 units; dried yeast 1,000–2,000 units; egg-yolk 100 units.

Vitamin B_2 Complex

(*a*) **Nicotinic amide** (niacin amide or P.P. factor) was at first identified with the pellagra preventive vitamin; pellagra is now considered to be a multiple deficiency disease, and shortage of nicotinic amide only one causal factor. Apart from pellagra it has been used empirically in cases of stomatitis, gastro-intestinal disturbance and psychoses resulting from

deficient nutrition or toxæmia : also in conjunction with sulphonamide therapy to reduce symptoms of intolerance. Its chief sources are liver, eggs, salmon, whole cereal and yeast. Daily requirement about 10–12 mgm. Therapeutic dose 50 mgm., t.i.d.

(b) **Riboflavin** (formerly called lactoflavin). Its deficiency syndrome includes seborrhœic dermatitis of the face, fissures at the angles of the mouth, glossitis, and ocular lesions (conjunctivitis, corneal opacities, keratitis). Chief sources are yeast, milk, white of egg, fish roe, liver, kidney, and leafy vegetables. Daily requirement, 1–2 mgm.; therapeutic dose 5 mgm. daily.

(c) **Folic Acid** (lactobacillus casei factor; pteroylglutamic acid) obtained in nearly pure form from spinach, has now been synthesised. It produces a reticulocyte response in pernicious anæmia and regeneration of red-blood cells in macrocytic anæmias, but is apparently ineffective in controlling subacute combined degeneration. It has been found effective in the treatment of sprue. Therapeutic dose 5–100 mgm. daily by mouth or 15 mgm. parenterally.

(d) **Vitamin B$_{12}$** obtained from purified liver fractions, has shown great hæmopoietic activity in pernicious anæmia in extremely small doses. It is not yet certain whether this material is actually the anti-pernicious anæmia liver principle. Suggested curative dose 7·5 μg.

(3) **Vitamin C** (ascorbic acid; cevitamic acid; " anti-scorbutic "). Deficiency is followed by scurvy in man and animals. One of the first signs of sub-clinical scurvy can be detected by the skin capillary fragility test. It is believed that patients with various infections, including rheumatism, require large amounts of vitamin C if normal levels are to be maintained in the blood and excreted in the urine, where its amount can be determined by titration with 2, 6-dichlorphenolindophenol. There is evidence that it is necessary for wound healing : it has been used in treating allergic conditions, in Addison's disease, hyperthyroidism, and as a detoxicating agent in various poisonings by metals and chemicals and intolerance to certain drugs. Its chief sources are fruits and vegetables, especially paprika, followed closely by lemons, oranges and tomatoes. Vitamin C is now known to be identical with hexuronic or ascorbic acid, derived from the adrenal cortex. Since Vitamin C is easily destroyed by cooking, especially in the presence of alkalies, an antiscorbutic diet should contain a large proportion of raw fruits and vegetables : canned foods do however contain vitamin C. Daily requirement 30 mgm.

(4) **Vitamin D** (" anti-rachitic "). The specific function of vitamin D is the control of the calcium-phosphorus metabolism, its action being to increase the absorption of calcium and phosphorus or to diminish their intestinal excretion. Rickets and osteomalacia and defective calcification of the teeth are the chief disorders associated with its deficiency. It is also related to the acid-base value of the diet, to the parathyroid hormone, and to the serum phosphatase. It has recently been used in the treatment

of lupus vulgaris. Various forms of vitamin D (D_2, D_3, D_4, D_5, and D_6 are now described, but the only two of practical significance are :—

Vitamin D_2 (calciferol) which is synthetic and is formed from ergosterol, found also in certain irradiated plants and fungi. Daily requirement for children 500–1,500 I.U., for nursing and expectant mothers 1,500–2,000 I.U. Curative dose 1,500–3,000 I.U.

Vitamin D_3 is the naturally occurring vitamin which can be found in foodstuffs, or derived from various precursors, provitamins D, belonging to the sterol compounds, the chemical constitution of some of which is still obscure. Its elaboration takes place on the surface of the body under the influence of ultra-violet light. Vitamin D_3 is less toxic than D_2 and probably has greater anti-rachitic power for children.

The chief food sources of vitamin D are milk, butter, eggs and green vegetables, but many foodstuffs otherwise devoid of rickets-preventing activity, can be rendered anti-rachitic by exposure to ultra-violet rays. For therapeutic purposes the richest sources are halibut liver oil, cod-liver oil, and various preparations of irradiated ergosterol, especially calciferol which, weight for weight, is 300,000 times more potent than cod-liver oil. Overdosage of vitamin D in the form of concentrates or of cod-liver oil may lead to hypervitaminosis, characterised by anorexia, loss of weight, diarrhœa, and pathological calcification of the arteries, heart and internal organs.

(5) **Vitamin K**—" anti-hæmorrhagic "—includes vitamins K_1 and K_2 and other methyl naphthaquinone derivatives. Deficiency causes lack of prothombin in the blood. Vitamin K is of clinical value in the prevention and treatment of hæmorrhagic disease of the new-born, in hæmorrhage associated with obstructive jaundice and liver damage, and in the hypo-prothrombinæmia associated with sprue and steatorrhœa. The chief sources of vitamin K_1 are green vegetables, especially spinach and alfalfa, and hog-liver fat. Fruits and other vegetables are poor sources. The synthetic analogue 2-methyl-1, 4-naphthaquinone is chiefly used in medicine. Prophylactic doses may be given to the mother (1 mgm.) or the infant (10 μg.). Curative dose 1–4 mgm. daily. Vitamin K_2 is synthesised by most bacteria, especially those of the intestinal tract.

GROUP II

(1) **Vitamin H** or biotin (" skin factor ") protects experimental animals from skin lesions associated with a diet of raw egg-white which contains an " antivitamin." Its association with human deficiency is still uncertain.

(2) **Choline** deficiency in animals is associated with fatty liver, and hæmorrhages in the kidney. Its use in human beings has been proposed in cases of a negative nitrogen balance where a high protein diet or methionine would be applicable.

(3) **Vitamin E,** " anti-sterility " (α-, β- and γ-tocopherol). The relation of vitamin E to human fertility and to muscular dystrophy is still disputed.

It is stated to have been beneficial in cases of habitual and threatened abortion, and in the anæmia of pregnancy. In animals its deficiency leads to sterility—in the female as a result of intra-uterine death and resorption of the fœtus, in the male through degeneration of the germ cells of the testes. Its richest source is wheat germ ; milk and animal tissues contain a small amount. Cod-liver oil is a poor source. The recommended therapeutic dose is 6 mgm. per day of tocopherol.

(4) **Vitamin F** (in linoleic and other essential unsaturated fatty acids). Deficiency in rats causes lesions of the tail and kidneys. Its use in human beings has been suggested for eczematous conditions.

(5) **Vitamin P** (citrin, " permeability vitamin ") is related to vitamin C and follows its distribution in fresh fruits and vegetables. It is considered to regulate capillary permeability generally, and to modify the pathological picture of scurvy. It has been used clinically in doses of 50–150 mgm. in hæmorrhagic conditions of non-specific character such as bleeding in the kidney and stomach.

GROUP III

(1) **Pyridoxin** (vitamin B_6), though its necessity for human beings has not been proved, has been given with some success in cases of pellagra which have not responded to vitamins B_1, B_2, and nicotinic amide ; and to cases of pseudo-hypertrophic muscular dystrophy and myasthenia and of pernicious anæmia in relapse. It is present chiefly in yeast and rice polishings, and to some extent in molasses, fish and liver.

(2) **Pantothenic acid** (" chicken pellagra " factor). Deficiency causes dermatitis in birds and rats and growth failure and other lesions in rats. Its significance in human beings is obscure.

(3) **Inositol** (Bios I). Deficiency in animals is said to cause alopecia. In man it is thought to be concerned with the synthetic action of intestinal bacteria on essential nutrients.

(4) **Para-aminobenzoic acid** (PABA) extracted from yeast, is sometimes called " sulphonamide antivitamin," because it can inhibit the antibacterial effect of the sulphonamide drugs. It has been suggested that PABA may have an anti-infective action in animals.

FORMULÆ OF USEFUL PRESCRIPTIONS

(referred to as F. in the text)

The proportions given are those for one adult dose unless otherwise stated.
Imperial Weights and Measures are used in the Formulæ. The metric equivalents given in brackets represent grammes for solids and millilitres for liquids.

(1) BALNEUM ALKALINUM.

Add two large handfuls (8 ozs. or 226 gms.) of common washing soda to 30 gallons (136 litres) of water at 95° F. The patient remains twenty minutes in first bath, and the time is gradually increased up to forty-five minutes. Put to bed in blankets.

Valuable for chronic rheumatism—daily for six weeks. At first the pains are increased. Also useful for chronic eczema.

(2) BALNEUM CYLLIN, VEL PICIS.

Cyllin ♏ 30–120 (1·8–7·1) *or* Liquor Carbonis Deterg. ♏ 60–240 (3·6–14·2) in 20 to 30 gallons (90 to 136 litres) of water, well stirred.

Useful for pruritus, prurigo, chronic eczema, and all itching affections.

(15) GARG. PHENOLIS c̄ COCAINA.
D.D.A.

Phenol	♏ 60 (4)
Cocainæ Hydrochlor. .	gr. 8 (0·5)
Glycerini Boracis .	fl. oz. ½ (14·2)
Aquam Rosæ . .	ad fl. oz. 12 (341)

For acute pharyngitis and laryngitis.

(16) GARGARISMA ACIDI TANNICI.

Glycerini Acidi Tannici	♏ 60 (3·6)
Aquam	ad fl. oz. 1 (28·4)

For relaxed throat and to check bleeding after tonsillectomy.

(17) GARGARISMA BORACIS COMPOSITUM.

Pulveris Aluminis .		
Pulveris Boracis . .	āā gr. 7½ (0·5)	
Tincturæ Myrrhæ .	♏ 5 (0·3)	
Mellis	gr. 10 (0·6)	
Aquam	ad fl. oz. 1 (28·4)	

(18) GARGARISMA CHLORINI.

Potassii Chloratis . . .	gr. 120 (8)
Acidi Hydrochlorici Fortioris.	♏ 60 (3·6)

Cork and set aside for five or ten minutes, then add—

Glycerini . . .	fl. oz. ½ (14·2)
Aquam	ad oz. 12 (341)

To be freshly prepared. A very prompt and efficacious remedy for scarlatinal and diphtheritic sore throat, and follicular tonsillitis. For children it should be applied with a brush every two hours.

(19) GARGARISMA POTASSII CHLORATIS.

Potassii Chloratis .	
Aluminis . . .	āā gr. 90 (6)
Aquam . . .	ad fl. oz. 10 (284)

(30) LINCTUS COMMUNIS.

Oxymellis Scillæ . .	♏ 120 (7·1)
Syrupi Tolutani . .	♏ 120 (7·1)
Syr. Pruni Virg. . .	♏ 120 (7·1)
Aquam Destillatam .	ad fl. oz. 1 (28·4)

Dose.—A teaspoonful for bronchitic cough.

LOTIONES.

(36) LOTIO CALAMINÆ.

Calaminæ	gr. 20 (1·3)
Zinci Oxidi . . .	gr. 20 (1·3)
Glycerin	♏ 30 (1·8)
Liq. Calcis . . .	♏ 180 (10·6)
Aquam Destillatam .	ad fl. oz. 1 (28·4)

For erythema and acute eczema.

The 1932 British Pharmacopœia recommends that instead of the usual symbols employed in prescriptions (ʒi. to represent 60 grains, and also to represent 1 fluid drachm; and ℥i. to represent sometimes 480 grains, sometimes 437·5 grains, and also to represent 1 fluid ounce), that the prescribers should use instead, when the Imperial system is employed, gr., fl. oz., and ♏.; and that in order to avoid the possibility of confusion between gramme and grain, the symbol G. should be used in prescriptions as the contraction for gramme; also, that the quantities should be written in Arabic numbers.

(42) LOTIO PLUMBI CUM ZINCO.

Liq. Plumbi Subacet.
Dil. . . . ℳ 60 (3·6)
Zinci Oxidi. . . gr. 20 (1·3)
Glycerini . . . ℳ 30 (1·8)
Aquam . . . ad fl. oz. 1 (28·4)

Invaluable for acute eczema.

(51) MISTURA SALINA LAXANS.

Sodii Bicarbonatis . gr. 15 (1)
Sodii Chloridi . . gr. 5 (0·3)
Sodii Sulphatis . . gr. 30 (2)
Magnesii Sulphatis . gr. 60 (4)
Aquam Menthæ
Piperitæ . . . ad fl. oz. 1 (28·4)

A morning purgative draught for plethora, obesity, gout and chronic rheumatism.

(53) MISTURA DIAPHORETICA.

Spiritûs Ætheris Nitrosi ℳ 30 (1·8)
Liq. Ammonii Acetat. . ℳ 120 (7·1)
Aquam Camphoræ . ad fl. oz. 1 (28·4)

Diaphoretic and febrifuge.

(54) MISTURA DIGITALIS CO.

Tincturæ Digitalis . ℳ 5 (0·3)
Ammonii Carbonatis . gr. 3 (0·2)
Potassii Nitratis . . gr. 5 (0·3)
Tincturæ Nucis Vomicæ ℳ 5 (0·3)
Aquam Chloroformi . ad fl. oz. 1 (28·4)

For cardiac disease.

(55) MISTURA DIURETICA.

Potassii Acetatis . . gr. 15 (1)
Spiritûs Ætheris Nitrosi . ℳ 15 (0·9)
Spiritûs Juniperi . ℳ 30 (1·8)
Decoctum Scoparii . ad fl. oz. 1 (28·4)

(56) MISTURA ETHER AMMON.

Sp. Ammoniæ Aromat. ℳ 20 (1·2)
Spiritûs Etheris . . ℳ 20 (1·2)
Spiritûs Chloroformi . ℳ 20 (1·2)
Aquam . . . . ad fl. oz. 1 (28·4)

For cardiac failure. More efficacious if accompanied by hypodermic injection of Liq. Strychn. ℳiij.

(57) MISTURA EXPECTORANS.

Ammonii Carbonatis . gr. 5 (0·3)
Tincturæ Scillæ . . ℳ 15 (0·9)
Spiritûs Etheris . . ℳ 15 (0·9)
Tincturæ Strophanthi. ℳ 3 (0·2)
Infusum Senegæ . . ad fl. oz. 1 (28·4)

For acute bronchitis in the second stage.

(64) MISTURA OLEI RICINI.

Olei Ricini . . . . fl. oz. ½ (14)
Mucilag. Acaciæ . . fl. oz. ½ (14)
Syrup. Zingiberis . . . fl. oz. ¼ (7)
Aquæ Menthæ Pip. . . fl. oz. ¾ (21)

ℳ 60 every hour for diarrhœa and unhealthy stools in children.

(66) MISTURA STOMACHICA.

Magnesii Carbonatis . gr. 10 (0·6)
Sodii Bicarbonatis . gr. 15 (1)
Phenol pur. . . . ℳ 1 (0·06)
Tincturæ Rhei Com-
positæ . . . ℳ 15 (0·9)
Infusum Calumbæ . ad fl. oz. 1 (28·4)

Tea-drinker's dyspepsia and pyrosis.

(67) MISTURA STRYCHNINÆ.

Liq. Strych. Hydro-
chlor. . . . ℳ 3 (0·2)
Acidi Nitro - Hydro-
chlorici Diluti . . ℳ 5 (0·3)
Tincturæ Capsici. . ℳ 1 (0·06)
Spt. Chlorof. . . ℳ 10 (0·6)
Aquam . . . . ad fl. oz. 1 (28·4)

The tonic for old age.

(68) MISTURA PRO TUSSI.

Tincturæ Opii Camph. ℳ 10 (0·6)
Tinct. Ipecacuanhæ . ℳ 5 (0·3)
Oxymellis Scillæ . ℳ 60 (3·6)
Aquam Anisi . . ad fl. oz. 1 (28·4)

For chronic bronchitis.

(75) PASTA[1] LASSAR.

Zinci Oxidi. . . . gr. 120 (8)
Pulv. Amyli . . . gr. 120 (8)
Paraff. Moll. . . . oz. 1 (32)

Sometimes equal parts of Paraff. Moll. and Lanolin Hyd. are used.
Mix well. A valuable protective paste for subacute eczema. For chronic conditions, Salicylic or Phenol (20 to 60 grs. (1·3–4)) may be added.

[1] Pastes are stiff ointments which act as protectives and absorb exudation.

(84) PILULA DIGITALIS COMPOSITA.

Pulveris Digitalis . .
Pulveris Scillæ . .
Pilulæ Hydrargyri . . āā gr. 1 (0·06)

Valuable in cardiac dropsy, and as a diuretic in ascites. It is apt to cause salivation unless the bowels are acting regularly.

(88) Pilula Colchicinæ.

Colchicinæ	. . .	gr. $\frac{1}{60}$ (0·001)
Ext. Nuc. Vom.	. .	gr. $\frac{1}{4}$ (0·01)
Ext. Hyoscyami	. .	gr. $\frac{1}{2}$ (0·03)
Ext. Gentianæ.	. .	gr. 1 (0·06)

Twice or thrice a day for acute gout.

(90) Pilula Podophylli Composita.

Resinæ Podophylli	.	
Pulveris Ipecacuanhæ	.	
Hydrargyri Subchloridi.	āā gr. 1 (0·06)
Extracti Hyoscyami	.	gr. 2 (0·12)

A useful liver pill in hepatic congestion.

(104) Unguentum Petrolei Comp.

Hydrargyri Ammoniati	.	gr. 10 (0·6)
Liquoris Carbonis Deter-gentis	. . . .	ℳ 30 (1·8)
Paraffini Mollis .	. .	oz. 1 (32)

A mild tar and mercury ointment, useful in many chronic skin diseases.

(105) Unguentum Salicylici et Carbolici.

Ac. Salicylici	. . .	
Ac. Carbolici	. . .	āā gr. 30 (2)
Vaselin	. . . .	ad oz. 1 (32)

Stimulating ointment for chronic skin affections with excess of dry scales.

(106) Unguentum Sulphuris Co.

Sulph. Sublimat.	. . .	gr. 30 (2)
Acid. Carbol.	. . .	ℳ 8 (0·5)
Saponis Mollis.	. . .	gr. 30 (2)
Adipis Benz.	. . .	ad oz. 1 (32)

For acne. Should be rubbed in night and morning. In obstinate cases Sapo Mollis gr. 120–180 (8 to 12), and more sulphur may be added.

(110) Vapores (Inhalations).

Directions.—A teaspoonful to be added to a pint of boiling water, to be inhaled for five minutes every night and morning from a narrow-necked jug or suitable inhaler. In this way use Tr. Benzoini Co. as an expectorant and local sedative in bronchitis and laryngitis : Tr. Iodi as a stimulant in chronic catarrh. Ext. Lupuli will allay irritability of mucous membrane. Ol. Eucalypti, Terebene, Creosote, Ol. Pini Sylvestris, may all be employed in the same way (strength ℳ 40 to Oi.), and certainly produce alterative effects in chronic catarrh if persevered with for several weeks.

If intended for Eustachian medication the following directions should be observed : About six times in the five minutes well fill the mouth with steam, close the nostrils with the thumb and forefinger, shut the mouth and expire forcibly, so as to drive the vapour towards the ears.

Nauheim Baths.

This treatment is commenced with weak saline baths at a temperature of 92° to 95° F., consisting of 1 pound of common salt, and 1½ ounces of calcium chloride to every 10 gallons of water. These should be given every other day for a week, the patient remaining in the bath six minutes. The strength is then gradually increased to 3 pounds of salt and 4½ ounces of calcium chloride for every 10 gallons of water, and the patient remains in the bath for twenty minutes, with the temperature lowered to 85° F. if he can bear it. In a fortnight or more effervescing baths are employed. In every 10 gallons of water dissolve 2 ounces of sod. bicarb., and add 3 ounces of hydrochloric acid just before the patient enters. Gradually increase the strength to 8 ounces of sod. bicarb. and 12 ounces of acid. hydrochlor.

It is simpler to employ " Sandow's Tablets " and powders, which contain the ingredients for the baths specially prepared in a convenient form for ready use.

Treatment extends over five weeks. The effervescing baths are ordered according to the discretion of the physician, and in severe cases it is sometimes unsafe to employ them at all.