

OTHER FORMS OF INHIBITION.—Vaso-motor Inhibition.—The suggestions put forth under this heading are tentative, for experimental evidence is lacking to a considerable extent. Nevertheless there are some analogies to cardiac inhibition, and this seems to be the proper place to discuss them. The general conception that stimulation of a nerve connected with a muscle must cause contraction of that muscle encounters an exception in the case of vagal stimulation, which does not cause stoppage of the heart in systole with contraction of the cardiac muscle, but in diastole with relaxation of the muscle—the opposite condition.

Stimulation of the vaso-constrictor nerves causes contraction of the muscle cells in the walls of the vessel which they supply. The constrictors are also probably concerned in maintaining the tone of the vessel. Stimulation of the vaso-dilators causes dilatation of the wall of the vessels which they innervate. The two kinds of nerve fibres are antagonistic to each other (as are the cardiac accelerator and inhibitory fibres); moreover, both kinds of fibres may occur in the same nerve trunk, and an effect in a given instance will probably depend upon the relative proportion of the kind of fibres present and their susceptibility to stimuli.

One hypothesis that quite naturally suggests itself is that the vaso-dilator fibres inhibit the tonic action of the vaso-constrictors. The difficulty, however, is encountered that the vessels of any organ are dilated to a greater extent by excitation of the vaso-dilators than they are by paralysis of the vaso-constrictors. In spite of the destruction of the vaso-constrictor nerves, the vessels after a period recover their tone. That the tone is not even for a time abolished completely is shown by the fact that a local dilatation can be produced by certain chemical irritants. Thus it seems evident that some peripheral mechanism exists, a mechanism which, it is true, can be paralyzed by the local application of such a drug as chloroform.

Hill suggests that it is highly probable that the vascular muscles are maintained in a state of tone by the tension of the blood within the vessels. This would be, as he suggests, in close analogy with the fact that the heart is excited to contraction by a rise of internal tension. If this hypothesis is accepted, it may then be supposed that the vaso-constrictor nerves increase the excitability of the vascular muscle to the stimulus of blood tension, while the vaso-dilator nerves diminish the excitability. The vaso-dilator fibres would thus be brought into analogy with the cardio-inhibitory nerves. These lessen the irritability of the heart toward the intracardiac tension (Hill and Bernard, *Jour. Physiol.*, 1897) and relax the cardiac muscle.

On this hypothesis, section of the vaso-constrictor nerves abolishes that tonic condition of exalted excitability to internal tension which is maintained by the vaso-motor centre. It does not, however, entirely destroy the excitability of the vascular muscle to tension, and with time the tone is fully restored. On the other hand, the vaso-dilator influence completely relaxes the muscle by altogether inhibiting its excitability to tension. It is conceivable that the quality as well as the tension of the blood may be the exciting cause of vascular tone. An increase in the alkalinity of the blood favors the development of tone. Certain glands, such as the suprarenals, appear to secrete a material into the blood which produces vascular contraction (Hill).

Inhibition of Secretions.—Secretion, in general, is due to two factors: to the blood circulating through the glands, modified to a certain extent by such conditions as blood pressure, rate of flow, etc.; and to the presence of secretory nerve fibres, although the latter have not been satisfactorily demonstrated in all cases. The blood brings to the gland material which, after a certain amount of elaboration, forms a greater or less portion of the secretion.

Assuming that there is some reason in what has been stated regarding vaso-motor inhibition, there seems to be a correlative connection between it and the process of

secretion. This, taken in connection with the action of the secretory nerves, means that the changes going on in the gland are influenced by a nervous mechanism which has the power of regulating the chemical activity of the gland, and at times may totally suppress the secretion.

Positive evidence regarding the inhibition of glandular secretions is lacking to a large extent, but the view above set forth provisionally seems to have some connection with the general subject of inhibition. The influences of some drugs and of psychical or emotional phenomena also have a bearing in this direction, especially with regard to the salivary glands.

Inhibition of the Movements of the Stomach.—Openchowski, in 1883, found that the cardiac orifice of the stomach could be dilated by stimulating a nerve at the lower portion of the œsophagus. He called it "nervus dilatator cardiacus." It was found that this nerve was formed by the union of strands from the two vagi. Langley, in 1898, carried the investigation further. His method was to inject curare into a vein, in order to paralyze the motor nerve endings in the striated muscle of the œsophagus. Atropine sulphate was also injected into the vein, in order to weaken the œsophageal motor nerve fibres and to paralyze the inhibitory nerve fibres of the heart. Stimulation of the vagus under these conditions produced inhibition or dilatation of the cardiac sphincter of the stomach. When the above-mentioned drugs were not injected or if atropine alone was used, the experiment failed. The body of the stomach, also the pyloric sphincter, gave variable results. Occasionally there was inhibition (relaxation) of the fundus and of the whole stomach, but this result was by no means constant.

Inhibition of the Movements of the Intestines.—The discordant results obtained as to whether the vagus is a motor or inhibitory nerve to the intestines are probably due to the influence of various disturbing factors, among which may be mentioned the influence of anaesthetics and the exposure and handling of the intestines, with the circulatory changes thereby induced. More important than these, according to Starling, are the inhibitory influences originating either in the higher parts of the intestine and travelling down the intestinal wall, or started by any sensory stimulation of the intestine itself and transmitted reflexly through the cord. Such influences may largely be cut out by cutting both splanchnics and avoiding any lesion above the point observed.

If these precautions be taken, stimulation of the vagus in the neck, after paralysis of the cardio-inhibitory fibres by means of atropine, will always produce an effect upon the intestinal movements; the effect, which may be little marked at first but increases with each succeeding stimulation, is twofold: (1) an inhibition with very short latent period (less than one second), leading to the dropping of one or two beats; and (2) an augmentation of the rhythmic contractions, which gradually develops after the lapse of from ten to thirty seconds, and lasts for some length of time after the cessation of the stimulus. The vagus effect may come on simultaneously at all points of the small intestine, and is not abolished by ligaturing the second part of the duodenum or the upper part of the jejunum. The vagus fibres must therefore reach the intestine at all points, and do not run down from the stomach or duodenum between the two coats (Starling).

Inhibition of Reflex.—As is well known to physiologists, some reflexes may be controlled or at times altogether prevented. The most favorable conditions for a reflex involve the activity of those parts only which form the reflex arc—a sensory surface, afferent nerve, centre, efferent nerve, and the part to which the latter is distributed (muscle or gland). Involvement of any other portion of the central nervous system usually hinders a purely reflex act. Examples of reflex acts are too familiar to make it necessary to mention them. It is a well-known fact that a cough or sneeze may be checked, although the desire to perform the act is wellnigh irresistible. The cerebrum probably excites the greatest inhibitory action over reflexes. The case of Cranmer, the martyr, may be cited as an example. In spite of

the natural tendency, he held his hand in the fire until it was consumed, thus inhibiting the power of reflex.

Inhibition Referred to the Cerebral Cortex.—The power exerted by the cerebrum in inhibiting reflexes, and its action upon the cardio-inhibitory centre, have already been referred to. The cortex is known to possess the power of originating movements; it has also, perhaps, a function no less important, namely, that of inhibiting movement. The restlessness of lunatics, with lack of mental balance, and the restlessness of dogs which have been deprived of their cerebral hemispheres, as shown by the experiments of Goltz, may be due to the diminution or loss of this inhibitory function. The condition of hypnosis may be the result of, or associated with, a temporary total deprivation of volition, due to an increase of the inhibitory function, as suggested by Schäfer.

Bubnoff and Heidenhain (1881) showed that inhibition was an active function of the cortex. They occasionally got arrest of action after weak excitation.

Sherrington (1893) has shown that electrical excitation of certain parts of the cortex may not only, as has long been known, produce contraction of definite muscles, but that simultaneously inhibition of tonically contracted antagonists may also be brought about. It is probable that the inhibitory action, whatever it may be, is exerted upon the lower nerve centres in the cord and bulb (Schäfer).

Inhibition of Pain.—Assuming that pain may actually be inhibited, the sensory side of the nervous system and the cerebrum would represent the parts involved. Kant has described that he learned to inhibit the pains of his gouty attacks. Other instances may be found, but one of the most interesting cases is that of a so-called "painless man," who had been on exhibition in various shows as "the human pin cushion." He was under the observation of, and his case described by, Witmer (1897, "Twentieth Century Practice of Medicine"); "He could be cut with a knife, or stuck with pins and needles, without showing the slightest sign of pain. I have known him to hold a red-hot coin in his hand without wincing, until it had burnt itself deep into the flesh. It is impossible to say positively whether this subject inhibited the expression of pain, or whether he inhibited the pain itself. He said he felt pain on ordinary occasions, when he had not made up his mind to be insensible to pain; but he reported that when once he had decided not to feel the pain of the stimulus, the pain was no longer felt. There were areas of the skin which he could not render insensible to pain. I am inclined to believe he inhibited the sensation of pain and not its external manifestations." *Pierre A. Fish.*

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INNERVATION means the nerve supply and nerve control of some part or other of the organism. This definition embraces every kind of nerve influence and includes therefore the exciting as well as the inhibitory action on the part concerned. It moreover includes the activity of all those sensory (afferent) nerves or nerve apparatuses that serve to transmit sensory impulses from the organ concerned to nerve centers of both the peripheral (sympathetic) and the central nervous systems. If, however, any nerve or nerve apparatus, although situated in the immediate vicinity of a given organ or even within the organ itself, has no connection with the elements of the same, and therefore exerts no influence whatever on its

function, such nerve or nerve apparatus must be excluded from the "innervation" of this organ. Usually when we speak of the innervation of an organ we include the nerve control of all its tissues. For instance, innervation of the small intestine means the nerve control over its glands, muscles, blood-vessels, and connective tissue, as well as that nerve supply which conveys sensory impressions from the intestine to nerve centres of the peripheral, and central nervous systems. If we speak of the "innervation" of a muscle the term should include the nerve control over its blood-vessels and its sensory supply, although often the motor action on the muscle fibre alone is meant.

Not only the nerves and nerve apparatus directly connected with the part or organ concerned should be included in the definition of its innervation, but also those connected with it more remotely, as long as they have any control over it. For instance, the arm area of the cerebral cortex belongs within the domain of the innervation of the arm, although when speaking of the latter we more frequently have in mind the peripheral nerves and nerve apparatus connected with it.

B. Onuf (Onufrowicz).

I. INSANITY.—(Synonyms: Eng., Mental alienation, lunacy, aberration; Lat., *Insania, insanitas*, from *insanus*, unsound; Fr., *folie, insanité de l'esprit, aliénation mentale*; Ital., *insania, follia, alienazione mentale*; Sp., *insania, locura*; Ger., *Irrsinn, Irresinn, Wahnsinn, Verücktheit.*)

DEFINITION.—An actual definition of the term "insanity" is seldom found in recent works on psychiatry. The reason for this is, as Tuke* explains: that it is impossible to compass the multitudinous phases of mental disease under one rigid formula. Spitzka has endeavored to cover the ground in a "definition" one hundred and twenty words in length, but admits the futility of any definition except perhaps for medico-legal purposes. Even in the courts, however, a definition of the term is nowadays seldom called for, as most alienists have come to regard it as unwise and prejudicial to their reputation to attempt it. Chapin gives the definition of insanity as "That mental condition characterized by a prolonged change in the usual manner of thinking, acting, and feeling, the result of disease or mental degeneration." This like all other definitions of insanity is not unassailable, but is sufficiently comprehensive for a medico-legal opinion, is easily understood, and is more serviceable than most of the multitude of definitions that were once in vogue.

For further consideration of the subject the reader is referred to the chapters on the *Diagnosis* and the *Medico-Legal Aspects of Insanity* below. *H. R. S.*

II. INSANITY: CLASSIFICATION OF MENTAL DISEASES.—In the sense in which the term is generally used by writers on scientific subjects classification not only implies that the division shall be logical and the characteristics by which it is determined natural, but also at the same time presupposes the existence in the mind of the writer of a specific purpose. (See "Classification," Baldwin's "Dictionary of Psychology.")

Any attempt to classify mental diseases, *i.e.*, to group together those forms which have certain common and distinguishing characteristics, must necessarily be modified by, and to a large extent depend upon, the author's conception of what does and what does not constitute insanity, since it is obvious that the term is used in a purely conventional sense and does not admit of exact definition any more than do the common terms health or disease. Such being the case, it is plain that fundamental distinctions in psychiatry do not exist. The history of medicine as well as that of other sciences shows clearly that the effort to establish artificial distinctions may be fatally antagonistic to the spirit essential for the sound development of scientific investigation and the further advancement of knowledge. As at present we are quite unable

*See Tuke's "Dictionary of Psychological Medicine."

to establish any generic distinctions between the various forms of alienation, it is hardly possible to emphasize too strongly the importance of the fact that the aim of classification should be merely "to facilitate the complete and systematic survey" of the various forms of insanity. Any scientific classification is essentially a generalization. This predicates an accurate knowledge of the individual phenomena whose common as well as distinguishing characteristics are to be compared. As the paucity of facts in the clinical study of psychiatry does not permit the term to be used in any but a conventional sense, it is questionable whether the retention of the word classification in psychiatric nomenclature is desirable, and perhaps it might be better at present to substitute for it such expressions as "grouping of," or "general description of," mental disorders. Such terms would certainly be less definite and therefore less apt to lead to confusion.

The efforts to group together the various forms of alienation often have a real, although relative and tentative value. Work of this kind, if well done, has the temporary advantage of formulating and crystallizing opinion, but the relative success of each individual effort in this direction must necessarily be inversely proportional to the rate of progress in psychiatry, inasmuch as the true value of any grouping of the various symptom complexes is commensurate with the stimulus given to further investigation, and the greater the stimulus the sooner does the work of any given author become obsolete.

In all attempts at classification the standpoints to be taken into consideration are four in number: (1) etiological; (2) psychological; (3) clinical; (4) pathological. The relative value of these determining factors in any so-called classification is essentially conditioned by the aim of each individual writer. Unfortunately, some authorities, with a singular disregard for accuracy of expression, have attempted to classify forms of alienation on such a basis that only one or two of these factors have been considered. As a result of this error there have been so-called etiological classifications, clinical classifications, etc. It may be justly said that attempts to classify mental disorders on such a basis have almost invariably shown a disregard of the fundamental postulate that every scientific classification necessitates a consideration of all the known factors which enter into the study of the natural history of a disease.

(1) With our present meagre knowledge the etiology of alienation can hardly be considered a prominent factor in the grouping of mental disorders. Unfortunately, alienists have frequently shown a tendency to be satisfied with the statement of such general causes as are commonly enumerated under the head of etiology. The clinician now realizes fully the necessity for substituting for these general descriptions more definite and exact knowledge. No reader can have failed to be impressed with the fact that within the past decade writers have begun to avoid such indefinite expressions as "lack of proper nutrition," "proneness to alcoholic indulgence," "unsuitable hygiene," "bad family history," etc., and to adopt a nomenclature which has more in common with the phraseology used in the general medical clinic. It is only necessary to refer to the recent studies in which attempts have been made to determine the relationship of alcoholism and syphilis to general paresis, of the puerperal condition to the various mental disturbances connected with it, or of the effects of previous injury to the subsequent traumatic psychoses, to show that efforts in the right direction are being made to determine more specifically the connection between cause and effect. In a study of the etiology of mental disorders investigators are confronted by two classes of difficulties. It is not only necessary to isolate the causative factor in any form of alienation but the individual reaction to this cause must be explained. Writers who have failed to appreciate the necessity of taking into account this personal equation have only added materially to the confusion that already exists in clinical psychiatry. This point has been emphasized of late by the recent studies of Binswanger and others upon

the etiology of the acute psychoses. Although the immediate results so far are negative, such work cannot fail to be of signal advantage in forming a basis for further investigation. As is well known, many attempts have recently been made, particularly by the Italians and Germans, to show that a definite causal relationship exists between certain clinical forms of the acute psychoses and bacteria or their toxins. Even if the truth of these general propositions were established it would still remain for the clinician to explain why the brain of one individual was a *locus minoris resistentie* for the poison, while that of another person was unaffected by it. Until these problems are solved the generalization essential for every classification remains impossible, and the alienist must frequently be embarrassed by the necessity of admitting that a single pathogenesis may make itself manifest by a great variety of symptoms, and that the converse of the proposition is no less true. It is hardly necessary to emphasize the fact that with our present knowledge heredity has no claim to be considered a prominent factor in any scheme of classification; and the same holds true in regard to the relative frequency of mental disorders at different epochs of life. Thus, although it is doubtless useful to note the fact that certain forms of alienation would seem to be more common at the time of puberty, of the menopause or vice versa, to go further and to attribute so much importance to an observation of this character as to suggest it as a possible basis for generalizations would be as ill-advised as the belief that our actual knowledge of measles is made greater by classifying it as one of the diseases of childhood.

(2) The attempt to analyze the mental symptoms of the insane upon a psychologic basis, although of some value, is of greater interest to the psychologist than to the alienist. The points of view of the two observers are essentially different. Those who are interested in this method of study are advised to consult the standard works on psychology or books written on the line of that of Störring in which the relative importance of the psychological phenomena is indicated ("Vorlesungen über Psychopathologie," 1900).

(3) Although pathologists have actually demonstrated that out of all the cases of mental disease there are only a few in which lesions cannot be definitely demonstrated in the central nervous system, the relation of these structural changes to the symptoms of the disease is too indefinite to afford a basis of classification. Moreover, since none of the changes occurring in the central nervous system in the insane are distinctive, nothing has been gained from the numerous attempts to differentiate between the forms of alienation associated with or those accompanied by actual demonstrable changes in the brain. A moderate degree of familiarity with psychiatric literature is sufficient to convince the reader that the study of mental diseases has advanced too far for a grouping on this basis to have any present value. On the other hand, too little progress has been made in estimating the distinctive character of the lesions to warrant the building up of any systematized study upon so weak a foundation.

(4) So-called clinical classifications are of little value, and one cannot but agree with Bevan Lewis and others that a disproportionate amount of attention has been given to this method of study. It would be impossible within the present limits to refer to even the more recent attempts that have been made by alienists to divide into groups the various clinical pictures. Unquestionably within the last decade the most suggestive and stimulating efforts in this line have been made by Wernicke and Kraepelin. Notwithstanding the fact that the points of view of these two authorities are essentially different, many new paths in clinical psychiatry have been opened up by their efforts.

Wernicke has assumed that the hypothesis based upon the localization of the physiological functions of the cerebral cortex is applicable to the problems of clinical psychiatry. He believes that psychical symptoms can be analyzed by a method analogous to the one employed

in his well-known study of disturbances of speech. Disturbances of the intellectual activities are conceived of as localized disturbances and as due to derangements of the associative mechanism. Variations from the normal in the associative mechanism of the brain may be looked upon merely as disturbances of action. The scheme adopted by Wernicke is as follows: The memory picture is formed in the cortex of the projection field and is there primarily identified. The simple sense perceptions awaken a secondarily identified outgoing perception A. AZ represents the intrapsychic associative mechanism in which the secondary identification takes place. Z is the area where the secondary identification gives rise to the outgoing impulse. AZm represents the psychomotor projection field of the cortex. According to this conception the mechanism of the psychical processes may be represented by the scheme S A Z m. The psychic sensory disturbances (sA) are comparable with the anæsthesias, paræsthesias, and hyperæsthesias; the intrapsychic disturbances (AZ) with loss, disturbance, and excess of function, respectively; the psychomotor disturbances of function (Zm) with the akineses, parakineses, and hyperkineses.

Consciousness is a function of the associative mechanism and may be considered in its threefold relationship to the outer world, the body and self-allopsychic, somatopsychic, and autopsychic. Disturbances may occur in any one of these realms either singly or combined. These fundamental considerations are developed at length to form a basis for the clinical observations. (See reviews by C. Winkler: *Centralbl. f. Nervenkrankheiten und Psychiatrie*, xxxiii., p. 569; also Worcester: *American Journal of Insanity*, vol. lvii., No. 4.)

Kraepelin's grouping* is based on the principle that

*TABLE OF KRAEPELIN'S LATEST CLASSIFICATION OF THE FORMS OF INSANITY. (Sixth Edition.)

- Infectious insanity.
 - A. Febrile delirium.
 - B. Infectious delirium.
 - C. Infectious states of weakness.
- Exhaustive insanity.
 - A. Collapse delirium.
 - B. Acute confusional insanity (amentia).
 - C. Chronic nervous exhaustion.
- Poisoning.
 - 1. Acute poisoning.
 - 2. Chronic poisoning.
 - A. Alcoholism.
 - B. Morphinism.
 - C. Cocainism.
- Thyrogenic insanity.
 - A. Myxoedematous insanity.
 - B. Cretinism.
- Dementia præcox.
 - Hebephrenic forms.
 - Katonic forms.
 - Paranoid forms.
- Dementia paralytica (paresis).
 - Depressive form.
 - Expansive form.
 - Agitated form.
 - Demented form.
- Insanity in cerebral diseases.
 - General diseases (cortical gliosis, diffuse sclerosis, late hereditary syphilis, arteriosclerotic disease, perivascular gliosis, subcortical encephalitis, multiple sclerosis).
 - Circumscribed diseases (tumor, abscess, hemorrhage, embolism, thrombosis, injury).
- Insanity of the age of involution.
 - A. Melancholia.
 - B. Presenile delusions of prejudice.
 - C. Senile dementia.
- Manic depressive insanity.
 - Maniacal states.
 - Depressive states.
 - Mixed states.
- Paranoia.
 - General neurosis.
 - A. Epileptic insanity.
 - B. Hysterical insanity.
 - C. Fright neurosis.
- Psychopathic states (degenerative insanity).
 - A. Constitutional morbid peculiarities of character.
 - B. Imperative insanity (imperative ideas, phobias, hypochondria, folie du doute, mysophobia).
 - C. Impulsive insanity (pyromania, kleptomania, homicidal mania).
 - D. Sexual perversion.
- Defective psychical development.
 - A. Imbecility (moral weakness).
 - B. Idiocy.

connected with the origin, development, and termination of disease every factor must be considered. In cases in which nothing definite is known in regard to the etiology not only the whole clinical course is taken into account, but the deductions which are important for prognosis should also be utilized in the attempt to differentiate one malady from another. Kraepelin first considers the forms of alienation which are due to external causes. Among these are classed the mental disturbances following infectious diseases, the so-called exhaustive psychoses, in so far as they are due to severe physical derangement, and finally, the poisonings. Contrasted with the poisonings due to external agencies are the auto-intoxications. Of these we have definite knowledge in regard to one only, viz., mental disturbances associated with diseases of the thyroid gland. Kraepelin holds that there are reasons for believing that dementia præcox and general paresis may also sooner or later be grouped with the diseases originating in auto-intoxication. Next come the insanities associated with organic diseases of the brain. The insanities of senile involution and those in which there is marked tendency toward psychical impairment—paranoia and the maniacal-depressive insanity (see *Mania*)—are grouped separately. Then follow the general neuroses, the epileptiform and hysterical insanities closely connected with these, the psychopathic conditions, and, last of all, those conditions which are characterized by inhibition during the development of the psychical functions, namely, idiocy and imbecility.

For further information on the subject of classification the reader is referred to the various text-books on insanity as well as to the works mentioned below.

Stewart Paton.

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III. INSANITY: GENERAL ETIOLOGY.—In considering the etiology of a given case of insanity, only too often do we mingle cause and effect, thereby confusing ourselves and spreading false impressions among the laity. It is a daily occurrence to hear both the physician and the family speaking of the cessation of the menses as the actual cause of the alienation of some young woman, whereas in reality such cessation is only one of many somatic symptoms that may accompany the mental affection, the psychical and bodily manifestations proceeding *pari passu* under a general storm-cloud, that involves every cell and fibre of the body in varying degree. Surely then we should look deeper before ascribing to a single minor physical symptom the dignity of the entire upheaval. It might be approaching a little nearer to the truth to attribute such disturbances to the hæmic depravity which is so frequently present in such instances, but how much better to explore more fully the, now hidden, pathogenic fields that induce the anæmia itself.

The etiology of mental affections in very numerous instances is obscure, reaching back through the protoplasm of the fetus and the tissues of the mother and father, to those of preceding generations unto the third and fourth degree—and even beyond. Such predisposing causes do not, however, exist in each and every instance of alienation. An individual starting with a healthy mind in a healthy body may also become the victim of a mental disturbance should he violate the laws of nature to such a degree as to overset the nervous equilibrium, or should he have the misfortune to meet with a cerebral trauma, or to admit into his system a toxin, be it of syphilis or of some acute disease, in sufficient quantities to overcome the normal tissue resistance.

Again, in another series of cases, persons who have inherited only a moderate degree of stability, but who, owing to favorable environment and education, have

been able to pass successfully through the minor trials of the struggle for existence which are common to all mankind, may nevertheless fall victims to mental disturbances when some unusual stress is laid upon them, either in the way of intense and prolonged intellectual strain, a shock, corporeal or psychical, as a result of tissue changes induced by an acute toxæmia or prolonged cachexia.

Briefly, then, it may be said that the main causes of insanity are twofold—direct or indirect. In many instances these may be and frequently are commingled, rendering a clean-cut differential etiology difficult and sometimes impossible to determine.

Inasmuch as the far-reaching effects of neuropathic ancestry in its widest sense are, probably, of greater importance than the direct causes of *vesania*, we will first consider the former, remembering always that the two are very frequently blended in the same individual.

I. PREDISPOSING CAUSES.

Heredity.—The carrying-over from an ascendant to a descendant of the marks of a corporeal degeneration, such as webbed fingers or toes, or a deformed hard palate, are readily recognized and termed a stigma of degeneration. Were the brand marks of mental infirmity as clearly defined, much difficulty would be spared the alienist in the comprehension of mental deficiencies. Unfortunately such is not the case. For although the grosser defects of the mind, as they exist in the idiot and the lower grades of imbecility, are as unmistakable as those we are apt to regard as more strictly corporeal, the gradations between the mental level of the hopeless imbecile up to that of normal man are innumerable, and when these deficiencies appear, for example, merely in a lowered standard of ethical conduct, in a passionate disposition, or in an inability to reason quite as logically as the majority of mankind upon an abstruse subject, one can readily see how extremely difficult it is for the physician to pronounce definitely upon the mental condition of a person who shows such slight departures from normal mentalization.

Statistics of *heredity* among the insane differ according to the locality from which they are taken—varying from ten to ninety per cent. Much depends upon the nationality and consanguinity of a community, as well as certain local conditions, as, for instance, the prevalence of drunkenness, of an insufficient or improper quality of the food supply, of syphilis, of extremes of heat and cold, and other changing factors.

Except in rare instances there is no direct inheritance of insanity—that is to say, the children are not born insane; it is only that the protoplasm is tainted with seeds that, under favorable circumstances, may at some future time grow and bear blighted fruit in the form of a psychosis. Under proper precautions in the way of education and environment such a development may not occur at all, and the man or woman may pass through life with his or her mental faculties performing their functions in an average normal manner.

In fact, in mental disorders we have an heredity analogous to that of tuberculosis. The child of consumptive parents does not necessarily develop the disease, but if exposed to injurious surroundings which lower the general vitality, as insufficient breathing space tainted with the effluvia of human lung exhalations, it falls a victim to the disease more readily than one who has inherited more resistant tissues. In the psychoneurotic, as generation succeeds generation and there is no admixture of sounder blood strains, the tendency toward imperfect mental development becomes more and more accentuated, psychical maladies in the family become ever more frequent, until the lowest forms of mental infirmity appear and the house becomes extinct. An admixture of purer blood always has the tendency to correct both mental and psychical deficiencies and to induce a return to the standard level. When both mother and father are defective mentally, especially when there is consanguinity,

the prospects for a perfect mentality in the children are ominous.

There is a curious law of inheritance which it is difficult satisfactorily to explain, to wit, the passing over by a mental disorder of the second generation and its reappearance in the third—the so-called *atavismus*. Again, we frequently see insanity in a collateral progenitor—an aunt or uncle for example—reappear in the nephew or niece, though the father or mother may have shown no tendency thereto. Only rarely, however, does the same form of psychosis reappear in the children as existed in the forebears direct or indirect. As a rule transmutations take place, and a state of pathological depression in an ascendant may develop as a morbid excitement or early dementia in the offspring of the house.

Exceptions to this alteration of the character of the alienation are now and then noted. I have met with a paranoia which had developed through three successive generations, and among the frequent periodic insanities the identical form of malady may appear for generation after generation. In these instances it is always probable that the psychosis will come on at an earlier and earlier age until some of the grave forms of pubescent or adolescent insanity appear—in other words, the vital protoplasm becomes lower and lower and less capable of standing the strains of education as well as the duties and cares of daily life.

Suicide.—A suicidal tendency may appear in neuropathic families as the equivalent of a psychosis or replace it. Usually, however, there will have been some previous indication of mental perversion preceding the event, and most often this has taken the form of a more or less pronounced melancholia. Not long ago I treated a neurotic individual whose three aunts, an uncle, and father had all committed suicide at about the same age, and in the generations back were histories of neuroses, deaf-mutism, and individual peculiarities, with tendencies to melancholia. The descendants of hysterical, epileptic, neurasthenic, and eccentric parents always show a larger proportion of examples of insanity than those with a good family history. The former start in life with a defective cytoplasm, and when the environment is suitable the soil produces a crop of poisonous weeds. Such nervously deficient parents are apt to have children who are degenerates in the matter of moral tone, eccentric beings standing apart from the mass of their fellows, and who at a later age show sexual perversions, criminal propensities, and are in constant conflict with the existing order of things, and under any unusual strain become victims of a psychosis.

Alcohol and Heredity.—Perhaps the most frequent cause of mental degeneration in the descendant is alcoholism on the part of one or both parents. The abuse of alcohol induces definite and pronounced tissue alterations, not confined to but most noticeable in the nervous and vascular systems. As a result the children of such progenitors are ever prone to epilepsy, hysteria, and grave mental maladies, and should the tendency increase in succeeding generations to a pronounced degree, the family soon dies out. Drunkenness on the part of both parents at the moment of copulation is one of the most certain causes of idiocy.

In the family of a drunkard, where there are a number of children, it is often observed that the first ones are mentally sound, while the later arrivals, after the drink habit has been confirmed, are less and less apt, and if the abuse becomes aggravated the youngest members of the family are not merely deficient in mental and physical capacity, but are actually imbeciles or idiots.

There are many notable exceptions to this rule. Owing to especial or exceptional circumstances, one child may stand forth prominently in the family by reason of his mental endowments, while all the others may be defective. As Griesinger long ago observed, genius and idiocy go hand-in-hand, and after all genius is but a one-sided psychical development, as is notably illustrated in the family history of the poet Byron, with his insane and suicidal ancestry, and his own tendency toward psychopathy.

The cheapening and accessibility of spirituous liquors in recent times are undoubtedly largely responsible for the modern increase in insanity, and should their sale remain unrestricted by suitable legislation, mainly by increasing the price, by taxation, to such a degree as to render the abuse impossible by the average man, we may in the future expect to see a still more alarming augmentation of the lunacy evil. Unfortunately, also other tissue-degrading drugs that act practically in the same way as the alcohols have in recent times been brought into extensive use. Degrade the vitality of the cell protoplasm of the ancestor, and as a logical sequence that of the descendant must also suffer—a dictum that applies not only to the effects of drugs, but also to those of syphilis, tuberculosis, severe febrile affections, sexual, corporeal, as well as psychical excesses, and a whole host of other debilitating influences.

In the psychiatric clinic, one soon learns to recognize the hereditary degenerative forms of insanity by the presence of certain characteristics. Thus we note the frequent onset at the time of adolescence, the periodical return of the psychosis, the tendency to impulsive acts or to stupor, the outbreaks of active insanity when any unusual strain, as in childbirth, is laid upon the person, or even when the system is deranged by a minor physiological function, as the menses. These factors in the hereditarily burdened only too often suffice to bring about abnormal depression, hallucinatory excitement, profound stupor, or alternations of the one with the other.

Education.—This term as used here in its broader sense refers not alone to book-learning or technical training, but to all the multitudinous and varied influences that surround the child *ab incubatione*. Almost from birth the infant begins to receive and acquire impressions of various kinds, their complexity increasing as time goes on. In the earlier years of childhood the growing mind and body are susceptible to influences that later on would make no impression upon the organism. The judgment is not formed, reasoning is carried on in an imperfect manner; yet the soil is fertile and easily cultivated, and the impressions received are much more vivid than at a later date. According to the tilling it receives the ground may bear either weeds or precious grain.

Except in rare instances, in which hereditary tendencies are too strong to be successfully combated, if the young child is ruled with a systematic, firm, though gentle hand; if natural tendencies to evil are repressed by wise correction and proper reward, while at the same time suitable attention is paid to diet and hygiene, there can be no doubt that by the indrilling of correct principles a great deal may be done to overcome hereditary neuropathic tendencies. But that education may have a lasting effect, these children must be taken from the time that the earliest permanent impressions are recorded on their brain cells, and such surveillance must not cease until adolescence is attained.

On the other hand, if a child, the offspring of insane or neurotic parents, be submitted to the usual course of training; if, as not infrequently happens, especially among the poorer classes, he be allowed to grow up with little or no moral or home teaching; if he be subjected to the brutalities of an intemperate father or to the perpetual irritation arising from a fretful, ill-tempered, or neurotic mother, the result can readily be prophesied; the force of constant surrounding and example must inevitably obtain. To these perverting influences upon the mind are often added an unsuitable diet, a total lack of hygiene, ill-ventilated rooms, and insufficient clothing.

In the case of those of better social standing other factors have to be considered. Many hereditarily unstable children are precocious, impulsive, irritable, and difficult to control. Too often the weak mother either neglects them or humors and pampers them in every way, and yields even when the exercise of a firm hand is of the utmost importance. As a natural result the children become wayward, emotional, without will power, and as they advance in years give way to license and self-indul-

gence. After a course of excesses in social pleasures, or in *venere et baccho*, which their undeveloped nervous systems are unable to withstand, many of these unstable minds fall by the wayside during adolescence.

Furthermore, even although the neuropathic children may have received a good home training and have been taught to control their passions and instincts, when they arrive at the school age a new danger awaits them. One of the crimes of our American system of public school education is the grouping of large classes of children together with but little or no recognition of their natural individual mental capacity, physical vigor, or infirmities, and ancestral tendencies. The bright ones are incited to continuous effort by varied stimuli, the dullards are goaded to exertions beyond their capacity. Many of the children of highly neurotic parents are intelligent, but have little reserve force, and when this premature forcing of their intellectual powers is laid upon them, they respond for a time with all their ability, but at the cost of their physical health. Should the danger signals, such as listlessness, irritability, and emotional outbursts be overlooked or misinterpreted, for a time the victims may still answer to additional stimuli, supplied by the vanity of parents and teachers, but sooner or later they collapse and become mental and physical wrecks. Recuperation in such instances is most difficult, and no amount of care on the part of physician or parents can fully overcome the lost freshness of psychic vigor. In later life they become neurasthenics, weak and deficient in nerve force, or fall a ready prey to some of the many forms of psychosis upon a constitutional basis.

Give the children plenty of open-air amusements with playmates of their own age, under suitable supervision; let them have plenty of food, not too stimulating; give them few hours of confinement in close school-rooms, and psychoneurotic ailments will much decrease in frequency. On the other hand, the running wild on the streets, the companionship of vicious children of older age, the forcing of the sexual proclivities in unnatural ways, by bad example, all tend to the evolution of a morbid nervous system.

The close crowding into cities, replete with all forms of vice, in recent years has also had much to do with the more frequent development of asthenic nerves and criminality.

Masturbation about the age of puberty is frequent among the hereditarily weak; if habitually practised for any length of time it tends to induce anæmic and neurasthenic conditions. Although rarely the sole direct cause of alienation, its effects upon the undeveloped nervous system are always debilitating. Again, in addition to the physical harm there is the bad moral influence, the feeling of guilt, the constant fear of discovery, the tendency to avoid the society of others, to brooding, and to the neglect of wholesome exercise.

Civilization.—It is an undoubted fact that insanity is far more frequent and shows a steadier increase in civilized than in uncivilized countries. In England one individual in every three hundred is insane, and in the more densely populated States of the Union, as in New York, very similar figures are reached. The life of the savage is free from the cares that weigh upon the educated man; he takes no thought for the morrow, his necessities are not complex, and he is free from the multitudinous petty worries that besedge the civilization of the present era. Unless in contact with the white man he is not syphilized, alcoholized, or subject to the ravages of tuberculosis; he lives a life of freedom in the open air, his actual wants are few; he has no intellectual excesses. That civilized man is provided with better clothing, that he has more constant supplies of food, and in the cold seasons enjoys better hygienic surroundings can only to a small extent make up for the increased mental strain and the various detrimental physical conditions to which he is exposed.

Three main factors contribute to the increase in insanity among civilized nations—the constant struggle for a competence, which is daily growing more severe, the in-