more thick and indistinct; and the muscles of deglutition respond so feebly to innervation that the act of swallowing is rendered clumsy and difficult, and the patient is in

FIG. 2829.—Case LX. Chronic Dementia. Uncomfortable attitude maintained for a long period. Automatic nerve-muscular activity. (From photograph taken by author.)

danger of choking. Finally, the larger muscles of the extremities begin to weaken; the drooping head, shoulders, and arms, and the shuffling, clumsy gait indicate the steady progress of the brain disease.

Warner says: "In a strong and healthy man the head is held erect and symmetrical, unless some central condition or external agent changes the posture. In a strong man the centre of the forehead is in the mid-plane of the body, the antero-posterior and the transverse axes are horizontal, with both eyes on the same level; this is a normal position of quiescence" ("Physical Expression," International Scientific Series, p. 185).

In cases of progressive dementia, in the advancing stages of paresis, this failure of innervation is quite commonly seen in the drooping of the head.

In many cases the lower jaw drops on account of relaxation in those muscles which support it; this gives to the face an elongated expression, and quite frequently occasions the open, stupid-looking mouth so often seen in dementia.

Defective innervation, as we have seen, finally extends to all the muscles, and produces that peculiar drooping of the body, shoulders, arms, and even fingers, and that almost indescribable, but when once seen never-to-be-forgotten, clumsiness of gait and attitude so characteristic of demented patients.

III. *Physical Expression of the Insane, Caused by or Representing States of Automatic Cell Activity in the Cerebrum, Occurring not Infrequently in Acute Insanity, and Quite Constantly in the Chronic Forms of the Disease.*—A high volitional power distinguishes man from the lower animals. Even the most highly developed of these lower orders possess limited volitional powers. In them life is largely automatic, and distinct purposive direction of their actions is slight. Many of their acts that seem to display a high degree of intelligence and to suggest the power of voluntary selection prove, on close examination, to be merely the result of an unreasoning instinct which would not have admitted of any other course. In man, on the contrary, while his daily life is largely made up of various automatic activities, still the range of purposive selection is large, so that the "mechanism of thought and feeling" is made to serve the best interest of the individual through the guidance of the will.

In some way, at present obscurely understood, will power and functional activity of the cortex are mutually interdependent. Hence disturbance of these centres in insanity, caused by impaired nutrition, defective functional activity, or more gross structural lesions, weakens the will power of the individual. The functional activity of the cortical centres may be completely disarranged by insanity, and, as a result, the normal exercise of the will may be disturbed, if not entirely suspended. At the same time, however, the activities of the basal ganglia, no longer under the guiding and controlling influences of the cortical centres, continue automatically. As a result,

FIG. 2830.—Case LXV. Melancholia with Stupor. Showing persistent morbid attitude maintained for hours. (From photograph taken by author.)

purposeless thought and action of an automatic character are quite apt to follow those serious disturbances of the higher cerebral centres during attacks of severe acute and chronic insanity.

Automatic activity of the cerebral centres in health is subject to the direction of the will, and its results display

purpose. Automatic activity of these same centres in disease of the mind seems to be less under the guidance of the will, and the resulting action appears purposeless.

FIG. 2831.—Case II. Dementia Præcox. Cataleptic stage. Muscular rigidity. Negativism.

In proportion as the will power is weakened by the brain disease do meaningless automatic activities of thought and action prevail.

In passing through the wards for the chronic and demented insane, one is struck with the evidences on every side of automatic activity. Here you will notice a man walking backward and forward in a mechanical way for hours together, until he has worn a beaten path in the floor; there will stand one who picks away at a certain place on his clothing for an indefinite period until he has worn the garment through to the skin. Quite frequently one will hear curious meaningless noises repeated in a mechanical way—singular repetitions of certain words or sentences wholly meaningless. It is not an uncommon thing for chronic patients to have some peculiar word or phrase, or even a single articulate sound, and to repeat it in an irrelevant way for years. In like manner you will meet with patients who make strange motions with the arms and hands, and take singular attitudes in a mechanical way. It is difficult to arouse the attention of such patients; their monotonous repetition of words and movements continues just the same, regardless of the presence of others, and with little reference to any attempts made for their diversion. All this variety of automatic action and speech would seem to indicate that the healthy functional activity of the higher cerebral centres has been disturbed and partially suspended, and that the lower centres are acting mechanically and without the normal volitional control.

Prolonged automatic activity in thought, speech, and action, among the insane, suggests a serious lesion in the higher brain. The more mechanical and purposeless the words and acts of the patient, the graver is the prognosis.

The nervous system manifests a striking tendency to mechanical repetition of any process once initiated within its centres. One epileptic attack is likely to be followed by another, and a number of seizures renders the prospect of still others quite certain, until in a short time the disease becomes firmly established. Both mania and melancholia manifest tendencies to repetitions of the attack, and each new attack renders the probability of another quite certain, until recurrency or permanent insanity is established.

In the advanced stages of fevers, such as typhoid and scarlatina, the higher functions of the mind are often sus-

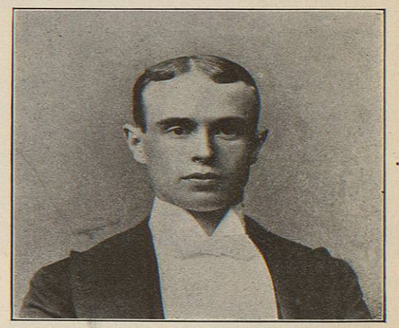

FIG. 2832.—Case II. Dementia Præcox. Remission.

pended, either from exhaustion or because the cortical centres have been disturbed by the severity of the febrile action. In these grave physical conditions the automatic

and purposeless repetition of words and muscular movements becomes quite noticeable. Subsultus tendinum, carphologia, tiresome utterance of some particular sound or word, indicate that the higher cerebral functions have

FIG. 2833.—Case XIV. Dementia Præcox. Cataleptic state. Muscular rigidity and negativism.

FIG. 2834.—Case XIV. Dementia Præcox. Remission.

been suspended, and that the lower centres are acting at random and without the direction of the former. In this case the prognosis is grave because the vital forces themselves are waning and volitional activity is suspended through exhaustion of the cortical centres.

In chronic insanity the prognosis as to mental recovery of the patient may be equally grave, for the reason that healthy functional activity of the cortex has been permanently disturbed by the disease, which, though not necessarily fatal to life, is most assuredly so to mental restoration.

For the reasons just outlined the chronic insane are very likely to develop objectionable habits. The study of the physiological origin of many of the habits of this class of the insane would be most interesting and instructive.

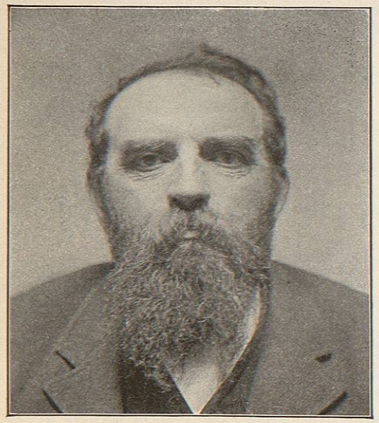

FIG. 2835.—Case V. Dementia; remission following a confusional attack. Muscular tonicity restored. Ocular convergence.

FIG. 2836.—Case V. Dementia; an acute confusional attack. Entire absence of normal muscular tonicity; ocular divergence.

Two laws underlie every form of nervous activity, and furnish a physiological reason for the constant tendency toward automatic and habit action exhibited by the chronic insane in whom inhibitory impairment always

FIG. 2837.—Case VIII. Dementia Præcox. Stuporous state with muscular rigidity and negativism.

exists. 1. The discharge of the nerve centres occurs along those tracts which offer the least resistance. 2. The more frequently the discharge occurs along a given line, and the weaker the inhibitory resistance, the easier does a repetition of the discharge become, and the more certain its permanent automatic establishment.

If, for any reason, in those conditions of mental disease which are characterized by a weakening of the will power, one especial route is established either by reason of delusion or by mere fortuitous circumstance, the probability is that this particular route will continue to be the one most frequently traversed by nervous force in its passage from the brain to the periphery. A delusion, an hallucination of sight or hearing, some peculiar condition in the patient's environment may have first initiated certain actions which, by being unresisted, and hence repeated, lead to the establishment of a habit. Probably in some such simple and purely fortuitous way are developed the pulling out of the hair, tearing the clothing, walking in a beaten path, making singular motions or uttering meaningless sounds—in fact any of the countless strange habits of the insane. It matters little whether the performance of these habits is painful or disagreeable, no other alternative seems open to the patient when, through weakness of will and intelligence, the morbid route has once been established. Some morbid sensation in the scalp or chin to act as an excitor, or merely the absence of anything of an intelligent character to engage the attention, may lead to the plucking out of the hair or beard, which impulse, meeting with no resistance, soon develops into a persistent habit. A delusion about the bed may lead the patient into the habit of standing up all night, and if not interrupted, nothing short of restraint will prevent exhaustion, so persistent will the impulse become to remain on the feet.

The importance of the early breaking up of bad habits among the insane will be readily understood. Fortunately the same tendency to automaticity of action may be utilized in a good as well as a bad direction. By careful supervision we may succeed in breaking up many useless and vicious habits by supplying some simple mechanical occupation for the hands, thereby utilizing the automatic nerve activity characteristic of the disease. And in doing this we may even seem to retard mental deterioration. Judiciously selected, mechanical employment among the insane has become therefore a valuable means of treatment.

It is quite obvious that photographic illustration of the entire subject of automatic nerve activity is impossible, and yet enough in this direction may be shown to demonstrate the important part played by morbid automatic cell activity in the physical expression of chronic insanity, and, to a certain extent, in some forms of acute alienation. It is evident that illustration of this part of the subject must be limited to postures. The significance of postures in health has been referred to by Dr. Francis Warner in an article on "Muscular Movements in Man," in the April number, 1889, of the *Journal of Mental Science*. He says: "Postures depend upon the ratios of nerve-muscular action, and to some extent they indicate the present ratios of static efferent force proceeding from the centres concerned. Observations show that the postures, when not due to a present stimulus, or when

FIG. 2838.—Case IX. Dementia Præcox. Muscular rigidity, ocular divergence, negativism.

produced by a weak stimulus from without, such as a sound or sight, correspond to and are signs of the general condition of the central nerve system."

The postures maintained, oftentimes for long periods, by the insane possess a special interest because they are a pretty sure index of the morbid condition of the central organ of innervation.

Cases LI., LVIII., and LX. (Figs. 2827, 2828, and 2829) illustrate peculiar and somewhat painful attitudes which were taken by patients suffering from secondary or terminal dementia. And in Case LXV. (Fig. 2830) is seen a singular position maintained by a patient in a condition of stuporous melancholia. In these and similar cases the intensely interesting question is always suggested, How came such peculiar habits to be initiated? The wards for demented patients present numerous cases of this character which will afford material for physiological and psychological study. The careful investigation into the early development of mechanical movements, attitudes, and meaningless habits among this class of patients would amply repay the time and labor expended in this direction, and throw some light on the processes of cerebration and their connection with muscular movements.

The singular postures shown in the photographs of Cases LI., LVIII., and LX. (Figs. 2827, 2828, and 2829) were gradually assumed by the patients while under the writer's care, and yet so very slowly were they initiated that they became fixed and habitual positions before any especial attention was called to the fact. In this way the real causes that led up to the final establishment of the habitual posture were lost sight of. From what was known of the patients, the impression would be readily formed that in Cases LVIII. and LX. delusions of suspicion or a dislike to seeing persons about led to a habit of hiding the face, as is often witnessed among bashful and diffident children. As these particular patients became more demented, a position which was at first assumed as the result of an active delusion finally developed into a permanent habit, simply because nervous force, flowing along this route from centre to periphery for so long a time in obedience to impulses derived from morbid ideas, and meeting with little inhibition, continued to take this route long after active thinking had ceased.

Another interesting fact concerning these strange attitudes assumed by these patients is, that they seem utterly oblivious to the discomfort and even the painfulness of these constrained positions. Cases LI. and LX. would maintain the posture for hours; and Case LVIII., from the hour of rising until bed-time, was continually in the attitude shown in the photograph. The muscles concerned in the maintenance of these postures were in a high state of tension, showing that a certain amount of "static efferent force" was being transmitted continuously from the centres within the sensorium to the periphery over these morbidly pre-established routes. Nearly all the other healthy activities of mind seemed in these cases to have ceased with the exception of the mere processes of organic life, and the entire energy of the sensorium was expended in keeping up these automatic and useless positions. Any attempt to move the arms into a more easy position was met by firm resistance, which was not spasmodic but persistent in character. That these attitudes would be painful to a person in health, any one can demonstrate by attempting to maintain similar positions for even a few minutes at a time.

The cataleptic conditions that are such a constant accompaniment of the stuporous state of *dementia præcox* afford a good illustration of automatic cerebral cell activity. During this phase of the disease the muscles become rigid and contracted and cannot be moved without quite a degree of force. The *negativism* so characteristic of the mental operations extends to all the muscles. During the remission all this muscular tension ceases and the patient returns to his normal physical expression. Cases II., XIV., VIII., and IX. illustrate the automatism and rigidity accompanying this disease at its height, with the return to a natural state upon the subsidence of the central disturbance.

Finally, disturbances of motility are quite frequently reflected in the varying expressions of the eyes. In mania there is increased brilliancy of the eye and marked mobility of that organ. In melancholia there is ocular parallelism or divergence, in which condition the person seems to take no interest in his environment. In dementia and in the stuporous states of melancholia and *dementia præcox* there is a dull lustreless condition of the eye. Oftentimes the eyes have a staring look, and in many forms of insanity all attempts at diversion are futile, the patient continuing to manifest that painfully stony and glaring aspect which shows how intense is the mental absorption. Indeed, one of the first symptoms of insanity observed by the friends of the patient is this peculiar expression due to ocular parallelism. They often refer to a certain strange, unnatural, or wild appearance about the eyes which is undoubtedly brought about by the divergence due to almost constant morbid preoccupation of the attention. In health the eyes are in a state of gentle convergence—such a condition being necessary to binocular vision. The least withdrawal of the attention from any object in the immediate environment is at once followed by a partial relaxation of the recti muscles, and as a result the eyes slightly depart from their condition of convergence and appear to be directed forward in nearly parallel or slightly divergent lines. Such divergence is usually quite temporary, lasting only during the mental preoccupation. So too in mental disease the eyes, either from morbid preoccupation or from deficient ideation due to structural or functional disturbance of the brain, are reduced to a condition of quite continuous parallelism, giving that appearance of abstraction so characteristic of the insane. Illustrations occur in Case XXXIII., Figs. 2816 and 2817; Case X., Fig. 2822.

Enough has been said to indicate the prominent part played by physical expression in the symptomatology of insanity. The intimate association of muscular movements and morbid states of mind serves to demonstrate the close functional relationship of the various brain areas and their mutual interdependence.

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VI. INSANITY: GENERAL DIAGNOSIS.—Border Lines of Insanity.—Insanity is made manifest in the individual by a departure from the normal in his conduct and conversation, without regard to a consonant change in the conditions of his environment. The recognition of the outbreak of mental disturbance is therefore not difficult; but when we have to go further, determine the nature of the aberration, its probable cause, and above all its probable duration and the prospect for recovery, we must have something else to guide us than the manifestation itself.

In considering the subject of the general diagnosis of insanity, we are confronted by a serious difficulty which results from the involvement of the subject, on account of the various conceptions which are current concerning what is constituted in its manifestations. That is, what is insanity and what do we mean by the term? We cannot explain its manifestations in the terminology of metaphysics, nor describe them as the result of certain morphologic changes in the cells of the brain cortex. For we must recognize that while it is true that certain morbid histologic changes are always present in the brain in those who die insane, these same changes are also found in the brains of those who are not insane, especially in the brain cortex in old people and those who have been the victims of toxemia affecting the general nervous system. Besides, there is no constancy in the relation between the degree of morphologic change in the neuron and its extent, nor any correlation of the nature of the mental disturbance and its kind. What, then, is insanity? In seeking for a standard by which to judge between sanity and insanity, we are forced to create an arbitrary and, in a measure, ideal individual, with whom we may compare all men and judge of the existence and degree of insanity in the given case, by the departure of the individual from this standard. This ideal individual can be defined most simply and completely by Herbert Spencer's abbreviated definition of life, as one who can perfectly "adapt internal to external relations." Any deviation from this standard is literally insanity, although it is not so recognized until the deviation becomes so marked as to be conspicuous, on account of so faulty an adaptation of internal relations as materially to interfere

with the welfare of the individual and his relations to those about him. The various forms which this deviation may assume will be determined by the degree of imperfection in the nervous organization of the individual and the influence of environment. That is, if the relative imperfection of structure exists only in a certain definite direction, the faulty adaptation will be in that direction; and if the environment of the individual be such as to increase this faulty adaptation it will be to that extent exaggerated. The definition of heredity with relation to insanity is as much involved by difference of opinion as to its significance, as is the definition of insanity. The usual conception of the relation is, that the insanity is not the result of hereditary conditions unless the immediate progenitors or collateral relatives of the individual have been insane. The equation is not so simple, however. For the parents of the insane individual may be sound mentally, but the victims of some constitutional disease which will affect adversely the development of the child. Without doubt we can definitely assert that there is a limitation of the potentiality of the different parts of the organism in each individual, and that this limitation applies to the capacity of the organism as a whole to meet the conditions in its environment.

Also, this potentiality is seldom equal in all parts of the organism. So that, while the individual is capable of meeting the conditions present in the environment in which he was born and grew up, he would not be equally capable of meeting the conditions of an environment differing materially from his own. Now if this is true of the normal individual, how much more is it true of the individual who for any reason is defective and whose capacity is limited? This assumption is illustrated by the facts of senility and in the irregular manner in which its processes are usually manifested, as well as in its premature appearance. It follows then that this limitation of potentiality which may manifest itself in instability, incapacity, or defect in any part of the organism must have its origin in inherent want of capacity, which handicaps the individual from the beginning of his existence. Following the well-known law of degenerative processes, those parts of the organism which are last in the order of development and most complicated in their structure will be the first to be limited in their capacity and show the evidence of lessened potentiality. For this reason, no matter what the nature of the incapacity in the parents, in the offspring the potentiality of the nervous system is, other things being equal, most likely to be limited. The recognition of hereditary influence has therefore to take into consideration the transmutation of form in the transmission from one generation to the other of constitutional or diathetic conditions affecting the parents, and even the effect of temporary causes affecting the vitality of the parents at the time of conception. That is, any condition which produces somatic degenerative changes in the organism of the parent may be manifested by brain degeneration and mental aberration in the offspring. Thus the children of the syphilitic, tuberculous, or gouty may be and commonly are the victims of degenerative disease of the nervous system and insanity. So that, while as generally understood the children of the victims of these diathetic conditions who become insane do not directly inherit the tendency, practically they do by the transmutation of the diathetic conditions between parent and child.

When we take into consideration that insanity is the manifestation of alteration, not destruction, of function, we can appreciate that the activities involved are the same in amount and kind in both normal and abnormal mental activity. In the one case they represent a response to external stimuli, the effect of which is habitual, while in the other they are excited by centrifugally generated stimuli, more or less out of accord with external relations. There is no abstract difference between the conduct of the sane and the insane. The difference lies in the nature of the experience which gives rise to the conduct, and the loss of control of the activities which are manifested in conduct. The function of the activities of the organism is to conserve the welfare of the individual by adaptation to his environment. Because the result is disastrous to the individual who is insane and it interferes with his relations to those about him does not alter this fact, but shows only that the manifestation is aberrent with failure in adaptation as the result. This failure in its turn brings exhaustion, with abeyance or destruction of function. Now when we consider further that the conditions under which society exists and men live are comparatively uniform in a given community, it follows as a corollary that capacity for continued adaptation depends upon integrity of structure and functional potentiality. So far the analogy between the different portions of the organism and the laws which govern their functional activity obtains, but when we come to consider that the nervous system is concerned in the controlling of the activities of the rest of the organism, and the direction of the sum of these activities in the maintenance of the individual, the analogy no longer obtains. And when we further consider that the most highly developed portion of the nervous system has another function in the cognition of the ever-varying conditions in the environment of the individual, and their relation so as to direct the somatic activities involved best to meet the changes in the environment, the wide difference in and the great complexity of the processes becomes apparent. Whether mental activity is represented in the most unstable cells of the cortex independently or is represented synchronously with motor generative activity, and is the reflex of the association of all somatic activities, has not been demonstrated and may not be capable of demonstration, but it would seem to be the most reasonable assumption from the data we have. The pathologic history of insanity is known to be vague and indefinite, and from the standpoint of histology furnishes very little information to the student in search of specific morbid changes which will explain the clinical manifestations of aberrant cerebral functioning. This apparent absence of definite anatomical change is to be explained by the conditions which give rise to insanity—namely, the precedence of physical disease, shock, overwork, mental strain, infection, or auto-intoxication from some source. Consequently the insanity cannot be said to be dependent upon the changes found to be present in the neuron, but rather the histologic change and the insanity follow the conditions generated by antecedent somatic changes, to which they are consecutive. However, as the degenerative process with disintegration goes on, there does follow mental reduction, and this is always in proportion to the destructive change in the neuron. All sensory and motor manifestations, physiologically considered, represent different modes of motion resulting from activity in the nerve cell, and this activity is constituted in the chemical changes which take place in the unstable complex organic material of which the nerve cell is composed. The tendency in the potential nerve cell is to manifest its activities along definite lines, the degree and nature of the activity being dependent upon the character and force of the stimulus.

Biologic chemistry teaches us that all organic compounds are unstable, and that in the functional cells of the animal organism the relative instability is much greater than in all others. Also that this instability increases with the activity with which the function is performed. Consequently we would expect to find, as we do, that the structure of the functional nerve cell is the most unstable of these compounds. It is then the corollary of this statement that the activity of the nerve cell depends upon its sensitiveness to stimuli resulting from this instability, and that its capacity for continued function depends upon its ever-recurring reconstitution. In an organism with nerve cells having a definite potentiality, this reconstitution would obviously continue as long as the organism existed. But if, through some incompleteness or irregularity in the development of the cell, due to hereditary or acquired causes of imperfection, the reconstitution is not complete, the result will be a greater instability of the compounded elements of the cell, making it more easily