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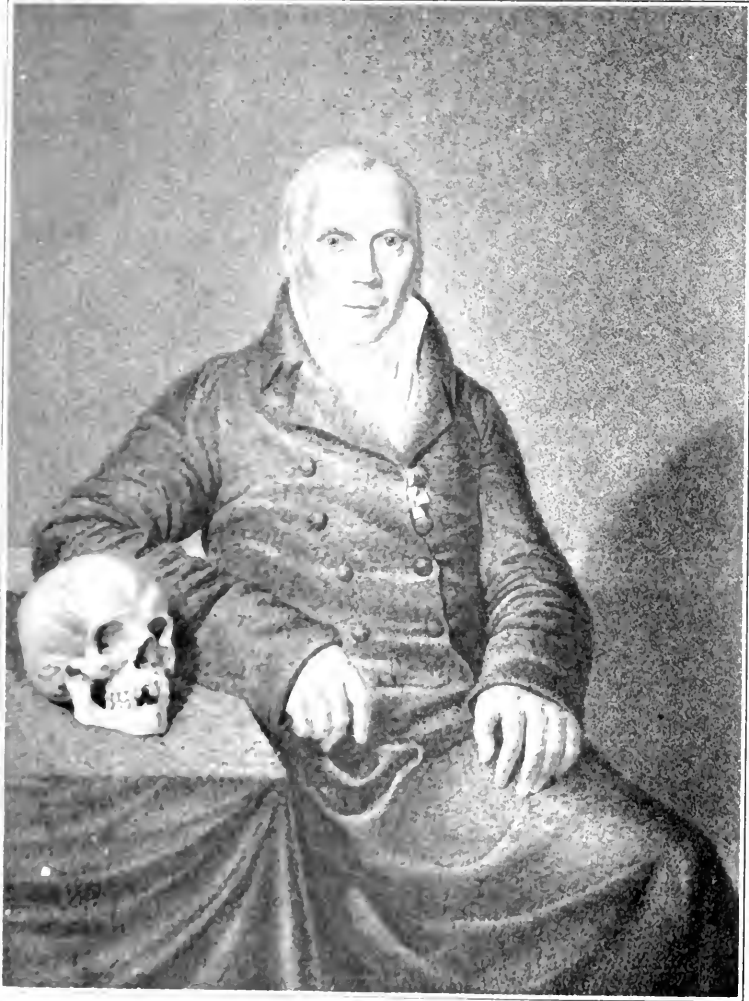
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JOHN DEWEY, R.H.

The Journal OF Nervous and Mental Disease

An American Monthly Journal of Neurology and Psychiatry, Founded in 1874

Original Articles

CRITICAL HISTORICAL REVIEW REIL'S RHAPSODIEEN¹

BY WILLIAM A. WHITE, M.D.

Reil's "Rhapsodies on the Application of Psychic Methods to the Cure of Mental Disorders" is a work of peculiar historical interest at this time, representing, as it does, an early attempt to formulate the principles of psychotherapy, a department of medicine which has had such a rapid growth in the present generation. This present movement had its inception in the use of hypnotism by Charcot (1825-93), followed by Liebault and later by Bernheim. The limits of hypnotism were passed and the new psychotherapeutic principles branched out in several directions, particularly under the leadership of Janet (1859-), and Dubois, finally culminating in a technique far removed from hypnotism, the method of psychoanalysis which had its origin and vital impulse in Freud (1856-), but has later shown tendencies to splitting along lines represented by Adler and Jung. The growing importance of this movement is made apparent by the agitation for the incorporation of courses in psychology, psychotherapy and psychiatry in the medical curriculum, the appointment of psychologists to positions in hospitals for mental disease, and the general increase in the demand for physicians trained in mental medicine in connection especially with certain medico-legal questions, particularly the problem of juvenile delinquency, the elimination of defectives from the school system.

¹J. C. Reil: Rhapsodien über die Anwendung der psychischen Curmethode auf Geisteszerrüttungen, Halle, 1803.

the treatment and education of sub-normal and exceptional children, and in the mental hygiene movement now spreading over the country. Not only is there a distinct demand for physicians trained in mental medicine, but also for nurses and social workers in connection with general dispensary and social service work.

With this renaissance of psychotherapy, for it seems that all movements that appear new are in reality only *re*-births, it would seem fitting to critically review one of the most important works on psychotherapy of a hundred years ago. Such a study, if approached in the proper spirit, cannot be otherwise than helpful in assisting us to understand the full import of the present movement by throwing light on the path along which progress towards it has been made. By the proper spirit I mean the spirit that prompts to an effort at understanding rather than the spirit that discusses old and discarded theories as nonsense. The pen that writes history should be dipped in the ink of understanding and not in the acid of criticism. To criticize and make light of the past is like scoffing at our parents for we are children of the past and that past has made our present possible. If we approach the present inquiry in this spirit we will find much that is profitable and much too that may well humble us, for we will see in this century old work ideas clearly expressed that we had come to believe were the products of our own times.

In trying to give a comprehensive idea of this work I shall preface what I have to say by a short account of the author. I shall also refer, from time to time, to contemporary medicine and events of importance, but in both instances only to give the work its proper setting in the spirit of its age.

Johann Christian Reil was born in the village of Rhaude in the eastern part of Friesland on February 28, 1750. He was the son of a Protestant clergyman and it was originally intended that he should follow in his father's footsteps. From the first, however, he showed a disinclination for theological discussions and an interest in the sciences. His parents were wise enough not to oppose his natural inclinations and sent him to college at Norden where he remained until twenty years of age. From here he went to Göttingen to study medicine. He did not fit in here at all well because of the dogmatism, conservatism and restraint which were intolerable to him and so after a short residence he went to Halle, the scene of the greater part of his life's activities. Here he studied anatomy and surgery under Philipp Friedrich Theodor Meckel (1756-1803) the son of Johann Friedrich Meckel for whom

Meckel's ganglion is named, and internal medicine under Johann Friedrich Goldhagen (1742-1788). He took the degree in medicine here on November 9, 1782. The thesis which he sustained on this occasion was on the subject of what he called polycholia. He described a yellow humor in the blood which was not true bile but its principal element. The liver was charged with its elimination. Its accumulation in the circulatory fluid was a cause of disease.

He practiced medicine in his native county until 1787 when he was called to Halle as professor extraordinary of medicine. The year following Goldhagen died and he succeeded him as professor ordinary of therapeutics and director of the clinical institute.

In 1795 or 1796 he founded the "Archiv für die Physiologie" which he first edited alone, but later in association with Authenrieth. In the first number of this journal appeared a one hundred and fifty page article by Reil on the vital force ("Von der Lebenskraft"). In this work he took a position diametrically opposed to the admission of any occult force. His position was essentially materialistic. He believed vital manifestations to be explicable upon the basis of physical causes. He attempted to apply the laws of electricity and galvanism to vital phenomena and finally appealed to the idea of polarity which played such a large rôle in contemporary philosophy. Although he had been a pronounced advocate of materialism, especially from the chemical point of view, he was finally constrained to admit that there did, after all, exist a difference between ordinary and organic chemistry, however he refused to admit a dualism which was repugnant to his monistic tendencies.

His most extensive, and probably most important work was his work on fever (*Erkenntniss und Kur der Fieber*). This began to appear in 1797 and by 1802 four volumes had been published. The fifth volume, however, did not appear until 1815, about two years after his death.

In this work he developed his special idea of fever as an exaltation of the irritability of a part and sometimes also of the entire system. The blood vessels and nerves he thought most susceptible, but it might occur in a single organ. He rejected the doctrine of crises and critical days and renounced as nonsense all the species of fevers described in the books, such as maligne, putrid, gastric, bilious. It will be remembered that this work antedated by fully half a century the introduction and use of clinical thermometry.

During his active practice of medicine and surgery he seems to

have been pretty continuously interested in the mental manifestations of his patients. The work, which it is the object of this paper to review, was written in 1803 and there are many illustrations in it from his work on fever which serve to elucidate the mental state in conditions of acute illness and the delirium of fever.

In 1805 he founded with Kayssler the *Magazin f. die psychische Heilkunde* of which only three numbers appeared. This was followed by two volumes of the *Beiträge zur Beförderung einer Kurmethode auf psychischem Wege* which later he edited with Hoffbauer. The first part appeared in 1807.

He was greatly interested in hydrotherapy and founded a bathing institute in Halle in which brine, douche, shower, and Russian baths were given. He was the first German author to carefully analyze the physiological effects and advise the use of the cold bath in fevers. He was greatly interested in chemistry and strongly emphasized the importance of chemical processes in the body and advocated the appointment of a qualified chemist at each clinical institute to study the secretions.

He is best known to us because of the association of his name with the insula, but of the extent of his work in cerebral anatomy let me quote what Edinger² says of him.

"Reil, in particular, who first brought into general use the process of artificially hardening the brain, discovered a number of anatomical facts, which were the result of closest observation. As his most important discoveries must be reckoned the arrangement of the corona radiata, the nerve-tracts of the crus cerebri, whose relation to the fibers of the corpus callosum, which pass transversely through it, he was the first to recognize. The lemniscus and its origin in the corpora quadrigemina, the lenticular nucleus, the island, and many other parts were first made known through his investigations."

Goethe was a patient of his and spoke in the very highest terms of him, writing that he had observed him for two weeks without prescribing anything but a palliative. In 1811 at the opening of a theater in Halle he mentions Reil's bathing institute in the prologue and after his death Goethe again praised him in verse at the memorial exercises in July, 1814. Recently, Dr. Garrison informs me, a memorial has been erected to him in front of the University Clinic at Halle.

² *Lectures on the Structure of the Central Nervous System*, by Dr. Ludwig Edinger, tr. by Melton Hall Vittem, F. A. Davis, Philadelphia, 1896.

At the time of the European coalition Reil occupied himself in perfecting the military hospitals. After the battle of Leipsic he was made director general of the hospitals established at Halle and Leipsic. About a month after he died, November 12, 1813, of typhus which he contracted in the military hospitals where he had worn himself out trying to care for thousands of wounded and sick soldiers under the most trying and difficult circumstances.

We now come to the *Rhapsodieen*, but before taking it up it will be interesting to see just the place Reil assigned to psychiatry in the medical sciences. There are three ways, he says, in which we come into relation with the outside world and three ways in which we receive impressions from the exterior. These he designates the three receptivities: they are the mechanical, the physico-chemical, and the psychic; to them correspond three sciences, anatomy, physiology, and psychology; three divisions of the curative art, surgery, *jaterie* or medicine proper, and psychiatry; and three means of therapeutic approach, *ackology* (that is the mechanical or surgical), pharmacology, and psychic means. Thus we see that he includes psychiatry as a fundamental part of medicine and does not consider it, as it came later to be considered, as a branch apart from the general body of medicine.

The *Rhapsodieen* is a work of some five hundred pages. It is written in the rather easy style of a man whose mind is a rich storehouse of experience and who is detailing it much as he would talk. Although there is a distinct effort at arrangement of the contents and an orderly progression, still there are numerous repetitions, the same ground is gone over in a little different way, speculation and actual experience are frequently found together, and in general the treatment of the whole subject is such that my account of the contents cannot follow the order in which the subjects are presented. The work is, however, the work not only of a thinker, and of a man of wide clinical experience, but of one who was a keen observer of his patients. In my references to Reil's views as expressed in the *Rhapsodieen* I shall use his forms of expression as far as possible without actually quoting him verbatim.

He starts his book with a criticism of the asylums, and speaks of the cruel way in which patients are treated and the indolence, selfishness and intrigue that are at the bottom of this cruelty, and of the stupidity of attendants. When we recall that he is criticizing the asylums of the eighteenth century we can appreciate the depths of ignorance and superstition at which this criticism is leveled. He is convinced, however, that the public asylum is, on the whole, the

best place to treat the insane because they are, in every way, better equipped. Although physicians on the outside may be capable they have not the advantages at hand which are offered by the asylum. Believing in this way, we shall be prepared later on to note that he has much to say on the methods of organization and management of these institutions which, in his opinion, are calculated to produce the best results in the treatment of the patient. More of this later.

Just how he came to his belief in the efficiency of psychotherapy he does not tell us, but we must remember that his greatest literary work was on fevers and from the numerous references to this work in the *Rhapsodien* we know that he was impressed with the mental phenomena his patients presented. We know also of his great interest in the anatomy of the brain. These two interests, coupled with an inquiring and philosophical mind, which was constantly making for explanations of the phenomena he saw about him, is I think the key to the situation. He was not only a keen observer of abnormal states, but gives many examples, in his psychological discussions, to show that he was also a keen observer of the phenomena of what we should call today the psychopathology of everyday life. As examples of these tendencies I select the following: He cites a fever patient who on awakening complained that he had become two persons. One of his personalities lay in bed, the other was walking up and down in the study. When he ate he had to eat for two persons, the one in bed and the one up. This condition gradually disappeared when he got better. As matters of more usual and not abnormal nature he tells of the strange feelings one sometime has on awaking at night in a strange room and gives as an example of the forgetting of certain periods of our life the experience of a doctor who was awakened for advice. He had the light brought, read over the history of the patient, wrote a prescription, ordered his horses for the morning to make a call upon the patient and then went to sleep. When he awoke he had forgotten the entire incident and would have remained unconvinced except for the evidence in his own handwriting.

Believing as he did in the absolute unity of life and having strong mechanistic leanings he naturally sought an explanation for psychic events on the basis of cerebral conditions. We thus often find him speaking of oscillations of the brain, and shaking or "boil" of the body, of the brain, and of the psychic organs (I understand which I take it might be best translated by bodily and mental tissues). He speaks also of the dynamic temperature of the body or of some part. This latter, when we remember his

peculiar idea of the nature of fever and also that clinical thermometry was not yet in existence, probably could best be interpreted as irritability.

Despite these vague expressions, however, his whole attitude towards the problem was distinctly pragmatic. He observes wisely that we reason too much and observe too little and so in spite of his conceptions he is quite free to observe psychological phenomena.

He had a broad grasp of the meaning of consciousness not only from an experiential point of view, but he evidently also sensed somewhat its genetic significance. He tells us that self-consciousness unites the multiplicities of experience into a unitary self, that it reflects the environment of the immediate neighborhood and of the furthest reaches of the firmament including both past and present. We feel that we have always been the same self in the same body. It reflects also the body itself, through common sensibility, the cenesthesia (*Gemeingefühl*).³ Man views the objects of outer sense in the form of space, of inner sense in the form of time. The various organs of the body are united into one individual through the ramifications of the nervous system and the brain is the center (*Hauptbrennpunkt*) of this unifying system. We only arrive at this integration, however, gradually. The child plays with its limbs as it does with its toys, it is happy or unhappy, laughs and cries, but does not know that it is the person that represents the world and is affected by it pleasantly or unpleasantly. It only awakes later to a position of freedom and the great secret of its own self. The circle of experiences effecting us widens and widens as we grow older like the ripples from a stone thrown in the sea. The segment which we unite with ourselves, are conscious of, we cut from the endless totality of things as belonging to us. *

This correlation and integration of the individual Reil never loses sight of. He speaks not only of the harmony of action of the different parts of the body through the brain and of dynamic relations in the psyche but says the dynamic relations of the organs of the psyche are disturbed in mental disease. The abnormal consciousness lacks unity. Its different tendencies work independently or with others in false relations, the synthesis is lost, like a ship with mast and rudder gone it floats on the waves of phantasy in a strange world of time and space. The patient either does not grasp the outer world at all or not correctly and as phantasy increases his consciousness recedes, he is unable to distinguish the real from phantasy, dreams from reality.

³He was the first to introduce this idea of common sensibility into science and to give a comprehensive analysis of its significance.

This unity he says is dependent upon the integrity of the nervous system. The nervous system, the body, and the mind stand in intimate relations. During a surgical operation the whole strength of the soul hangs on the point of the knife.

Not only was Reil an observer of the psychology of ordinary events, but he discusses the psychology of certain borderland conditions, such as hypnagogic states, and appreciates their significance for the understanding of abnormal conditions. And so he tells us that in the state between waking and sleeping one often cannot tell reality from phantasy, the sound of one's own voice may seem strange and not our own. We may doubt our own personality or get it confused with others and project (*verpflanzen*) our qualities on others. Consciousness may fail to unite us correctly with time and space. The personality of the soul and the individuality of the body disappear when consciousness is lost.

The dream product is due to a partial waking of the nervous system. So in sleep talking the speech organs are awake, in sleep walking the motor apparatus, etc. As the nervous system awakens the dream approaches self-consciousness.

In these psychological discussions he speaks frequently of the polarity of the organism and uses such expressions as the plus and minus irritability between the antagonistic systems and says in one place that it is the inversion of the plus and minus vitality in the antagonistic systems that produces insanity. This idea of polarity is frequently referred to. Instinct he says is a blind tendency that moves according to a polarity that may conduct an imponderable fluid. This was all probably coupled in his mind with the animal life stream (*animalischer Lebensstrom*) which ebbs and flows, increases and disperses, balances from pole to pole. This life stream, in another place, significantly spoken of as the electric life stream (*elektrische Lebensstrom*) in his discussion of a severe form of excitement (*Lohnicht*) in which the whole nervous system is strained to the extreme point and its polarity disordered.

It is with reference to just such a theory as this that I contend that the physician should be on his guard and not lay aside his role of investigator and assume that of critic. Of course Reil, like every other, must have come face to face upon innumerable occasions with the phenomenon of opposites. Aside from his doctrine of polarity, his notion of positive and negative means of cure, and theory and athernetics of mental diseases (which probably meant types of mania), the psycho is to judge by the descriptions. How he worked it out in his own mind, though, of course I do not know and quite probably he did not either.

Many such theories come into existence, have a vogue for a time, then follows a period when they are for the most part forgotten and considered foolish, and then they are revived in a somewhat different form and with the added prestige of increased knowledge. We are familiar with the theory of the iatrochemical system of medicine in the seventeenth century which attributed disease to an excess of acid or alkali. We know to-day the theory of acidosis and the regulatory mechanism for maintaining the proper balance of acid and alkali in the body.

With regard to the polarity doctrine let me quote a few words from a recent authoritative monograph.⁴ The authors state that "every visceral organ is supplied by sympathetic fibers, which work antagonistically to the autonomic.

"Hence it may be stated that the normal progress of functioning of visceral organs is a well-regulated interaction between two contrary acting forces."

This particular verification, if it may be called such, of Reil's polarity theory is made very much more interesting by his statement that, in this relation of polarity stand the laryngeal and phrenic nerves and the great sympathetic. When we note that, from the description of the distribution of the laryngeal nerve (*Stimmnerv*) he is really talking about the vagus we get the full significance of his opposition of the laryngeal and the great sympathetic.

We have a further recent development of this same character, the path of opposites, as it has been called, in Bleuler's⁵ principles of ambivalency and ambitendency. Ambivalency he says gives to the same idea two contrary feeling tones and invests the same thought simultaneously with both a positive and a negative character. Ambitendency sets free with every tendency a counter tendency.

This may be the psychological basis which accounts for the formulation of these theories of opposites, however, that the whole matter probably has much deeper roots is strongly indicated by such a fact as this. The "black fellow doctors" of Australia believe that the fat above the kidney is magic. If by incantation it can be removed from an enemy when he sleeps he will surely lose his strength and die.⁶ This belief of primitive Australian savages is borne out by present-day knowledge of the adrenal glands.

⁴ Eppinger and Hess: *Vagotonia, A Clinical Study in Vegetative Neurology*. Nerv. and Ment. Disease Monograph Series, No. 20.

⁵ Bleuler: *The Theory of Schizophrenic Negativism*. Nerv. and Ment. Dis. Monograph Ser., No. 11.

⁶ Howitt: *Native Tribes of South-East Australia*. London, 1904, cited by Elliott: *The Adrenal Glands*, Brit. Med. J. (June 27, 1914).

With regard to the mentally ill and the symptoms of mental disease Reil was at once humble and seeking to understand. In writing of the impulsive activities of these patients, he says they seem spontaneous only because we do not know their causes and the necessities which condition them.

The psyche, he says, is brought into relation with the whole body by the nervous system and with the outside world by means of the sense organs and these impressions through the cenesthesia and the sense organs are reproduced through the activity of the brain. Upon this basis he had a very clear idea of the importance of bodily diseases, especially of the nervous system, in their influence upon the psyche. He also recognized the efficiency of psychogenic factors. He says the causes of mental disease either come from without or within. The latter includes moral and intellectual affections. They both work the same way by injuring the normal functions of the psyche in a special way. Diseases of the bodily organs affect the psyche through the cenesthesia, while he mentions purely psychic causes such as anomalous instincts and tendencies, lack of and bad mental culture, superstition, fanaticism, bigotry, etc.

As evidences of his deep insight are his statements that we fall into insanity when we seek the errors (of sense) not in ourselves but outside and his wonderfully interesting remark from a psycho-analytic standpoint to the effect that we like to create a world of phantasy in which we play a more brilliant part than we do in reality. The child likes to play mother, soldier, a king and we are amused at the fictions of the painter, poet and actor. As an example of his humbleness he says that we know nothing of the nature of dementia. Incidentally only one autopsy is mentioned in the book.

Now as to the treatment which is the real subject of the *Rhapsodien*.

In the first place, he takes the position that mental disease must be treated both through the body and through the mind. He speaks of the false treatment of insanity by blood letting, purgatives and emetics. Anything that weakens the body such as enervating diet and sexual excesses, deep grief, narcotics, belladonna, hyoscyamine, especially opium, spirituous liquors, loss of blood and tired, long sleep may produce dementia. One must treat bodily conditions by proper physical remedies and psychic conditions by psychomimics. He who wishes to be a physician to the soul must be familiar with both. Woe to the patient if the physician tries to treat his psychic pain with hellebore or his difficulty of thinking by

trying to thin the atrabiliary blood and dissolve a coagulum in the portal vein. And then, very wisely, he observes that one can quiet a patient with opium but only makes of him a fool of another sort. The normal dynamic relations of the brain are grounded in ideas and through ideas they must be rectified when disturbed.

We are convinced, he says, that psychic means of cure were known to the Greeks and Romans by many references in the writings of Hippocrates, Celsus, and Coelius Aurelianus. The Arabians also used such means as is related in the story of Al-Rachid's beautiful consort who as a result of the excessively passionate embraces of her master suffered a stiff arm. All means were tried to heal it, balsam from Gilead and Mecca, nard and amber, but in vain. Finally a new physician, Gabriel, was consulted. He cured her in a moment by pretending, in the presence of witnesses, that he was going to grasp her petticoat. This angered the beautiful maiden who grasped with both hands at the audacious doctor. She was cured and the sultan, in the hope of new embraces, richly rewarded the doctor.

In harmony with his tendencies already noted we find that he has separated therapeutic agents into three classes, viz.: chemical, physico-chemical, and psychic. The psychic means are those means which by a special direction of the psychic forces, the ideas, feelings, and desires we bring about such alterations in the organization as to cure the patient. The means of this art, he says, have not as yet been brought together into a system. The application of these means requires more knowledge and skill than the use of other means. The physician cannot test their strength as the surgeon can that of his tourniquet or as that of a powder can be tested by its size and weight. He must test them upon the ideas and feelings of his patients.

Psychic means, he is careful to tell us, are those which influence the psyche. They may be material or immaterial. They are psychic means nevertheless if they produce this result. Psychic methods of treatment are for producing a cure and it is indifferent whether they act on the body or on the mind so long as they bring about this result.

Again, there are three classes of psychic means. First, those of a material nature which affect the body directly and so, through the cenesthesia, the psyche; second, objects of sense which operate especially through association and so stir up the feelings, imagination, and desires, and the third consisting of signs, symbols and pantomime and especially speech and writing which stimulate ideas, imagination, judgment and awaken the patient to higher psychic activities.

Psychic agents which operate through the body he believed do so through the euesthesia and so affect the ideas pleasantly or unpleasantly. These means exalt or depress the organic strength locally or generally and bring about a feeling of well being and animal pleasure or pain and bodily discomfort.

The bodily stimulants that bring about animal pleasure are first a feeling of health. Wine and opium bring this feeling temporarily, warmth, especially of the sun, rubbing softly with the hand or something soft, and the warm bath. The most pleasant bodily feeling is that which comes from copulation.

The two poles of the body, the head and the sexual organs, stand in noteworthy opposition. Shaking up one end through copulation and pregnancy frees the other of accumulations.

Bodily irritants that produce animal discomfort are mostly disease-producing agents. Some of them are hunger, thirst, heat, cold, loss of sleep, poisons, strong tickling, itching, vesicants, etc. Water is also emphasized as an element for which man has a natural fear.

These disagreeable agents act through the euesthesia, awaken attention, compel the cataleptic to look about, steady the unstable, etc. They stir up the feelings of grief, dejection, fear and other affects with which the mind busies itself and gives a new direction to the activities.

Objects of sense appeal mostly to the senses of vision, hearing and touch. An unbroken succession of objects can be used or a single object. In the latter case there must be interest. We cannot furnish interest but objects for which the patient has interest. All sorts of objects may be used as those that awaken fear and hope, such as glowing iron, or emotion as will coins in a miser, and sensory impressions which through their power awaken the feeling of curiosity, as thunder and lightning.

Objects may be presented to the patient to name and to give their noteworthy characteristics. He says, in this connection, that this is best done by one for whom the patient has regard. During the time the patient is thus engaged the disorder is in abeyance. He describes the use of the different sense organs. Smell and taste are more important than touch, hearing and vision. Touch stimuli include objects that are smooth or rough, cold or warm, light or heavy. Music is a valuable way of appealing through the ear and is especially effective. He advises a theater in the asylum.

By using symbols, especially speech and writing, the brain may be controlled to oscillation. The cataleptic can be awakened, the delirious calmed, fear, passion, awe, love, trust can be called forth. Normal tendencies can be cultivated and bad ones dealt with.

All of these discussions show a profound grasp of the subject but when we come to examples of their application we shall see some strange and very naïve use made of the principles.

He seems to have believed that a very potent form of treatment was to demonstrate to the patient the absurdity of his false ideas. A patient who thought himself a king was argued out of this belief by showing him that he did not even have power and authority enough to terminate his own imprisonment, and also how they laughed at others with the same idea. A woman who thought she had killed her son was cured by telling her that he was seriously ill over her crazy idea. Here, of course, the appeal was clearly on the emotional side. Somewhat more bizarre are the following: A patient refused to eat because he believed himself dead. A casket was placed beside him containing an apparent corpse. The patient saw with astonishment that the corpse sat up and ate. He also ate and was cured. Another patient who thought himself dead was being borne in a casket. Some peasants met it on the way and made all sorts of shameful remarks. This so angered the patient that he sprang out and attacked them. A man thought his legs were of glass. He was cured by his maid who struck him a blow with a stick. Angrily he sprang up and so proved they were not glass as they bore his weight. Another patient thought he had a glass nose and on this account would not go out and would only sleep sitting up. His doctor advised a case for it and as he was applying it broke a glass he had concealed. The patient was distracted but the doctor reassured him and said the glass nose had been replaced by a flesh nose as a milk tooth is replaced by a permanent one. The patient verified this by looking in the mirror and by feeling and pulling his nose and was cured. A patient who believes he has a frog in his stomach can be made to vomit in a basin in which a frog is concealed, or one who believes he has a rabbit in his head may have an incision made in the scalp and then be shown a bloody rabbit. It must be said in all justice that these cases are all quoted, in other words the evidence is heresy.

He says of play that it would be a poor means of treatment to employ for one bowed down by misfortune. On the contrary danger to husband or wife or near relatives might serve to arouse the patient. When one begins to compare their sorrows with another's they are on the road to recovery.

He cites the example of a man who attempted suicide by shooting. He only wounded his cheek, which bled profusely. The wound healed and he got well. Another was about to throw himself

from a bridge into the river when he was set upon by robbers. He used all his strength to run away and that was the end of his suicidal tendencies.

Among these anecdotes I find two that I have been familiar with for many years. I wonder if they originated with Reil or have only been passed on by him. To a visitor to the asylum one patient pointed out another and commented upon how crazy he was because he thought he was the Son of God and demonstrated how crazy his belief was by adding that he himself was God the Father. Another patient induced a visitor to ascend to a high gallery where the view to be obtained was beautiful. When they arrived there he told him to jump off and prove that he had faith. The visitor answered that it was a much more difficult thing to jump up. The visitor went down stairs and the patient awaited his attempt to jump up.

He lays a good deal of stress upon commanding obedience and to that end the necessity for subjugating the patient. He thinks that in taking a patient to the hospital it is a good plan to take him at night, in a covered wagon and in a roundabout way so as to make the whole procedure as impressive as possible. This effort led at times to rather childishly simple means. For example he cites the case of a patient who would not eat. The doctor visited him in the evening with an impressive array of attendants with clanking chains and putting his supper before him, with fiery eyes and in a thundering voice told him if he did not eat torture awaited him. It is recorded that the patient ate and recovered.

When obedience is obtained then a regular regimen can be carried out. Attention must be awakened and if ordinary impressions do not do this they must be made stronger. If obedience and attention are both present then the patient is on the road to recovery. To do this it may be necessary to resort to impressions that terrify, such as hot irons, the surprise bath, and placing the patient in positions of apparent danger in which he has to make a great effort to save himself. With regard to the principles involved in these methods I can do no better than quote Meyer⁷—the only reference that I have seen to this work in English. He says, speaking of the treatment of paranoiac conditions:

"In the face of all the tendency to hopelessness, even the earliest writers on fixed and systematized delusions give interesting advice as to attempts to cure. One of the most complete statements is con-

⁷ Meyer: *The treatment of Paranoia and Paranoid States*, Chap. XIV, in White and Lehne: *The Modern Treatment of Nervous and Mental Diseases*, Lea and Febiger, Philadelphia, 1913.

tained in Reil's 'Rhapsodies on the Use of Psychic Treatment in Mental Disorders' (1803), which contains a very excellent discussion of the fixed ideas in partial insanity and their management. He believes that for the psychical treatment of these disorders all that is needed is the wiping out of the fixed idea (page 324). With it, all those impulses, yearnings, and improper activities disappear which arise from it as from a spring. If the idea is silenced, be it only for more or less prolonged intervals, and if thereby the 'trembling cord' (or abnormal part of the nervous system) be given temporary chances for rest, the dominant irritability and sensitiveness on which the morbid tendency is based is diminished, in a measure as the normal balance of forces in the organ of mind returns, and with it the freedom of deliberation and the determination of volition according to the laws of reason. The patient is enabled to realize the lack of foundation of his fixed idea or to put it aside as something irrelevant until it finally fades by itself. This, of course, depends on many factors: The dulling of excessive irritable tendencies of the body which attract the attention of the hypochondriacal too readily; the removal of accidental causes in the body and outside of it, for instance, cenesthetic irritation, or objects of love or of hatred; appropriate helps during the earliest development of the fixed idea which fight its taking root, and finally the pushing of matters which next to the fixed or dominant one have the greatest interest for the patients; all this, according to the rules mentioned in regard to mental disorders in general. All ideas, however much they fascinate us by their interest, finally will fade in the course of time, if they are aroused by events outside of us and not by permanent stimuli in and outside the body. In these cases, therefore, everything depends on gaining that amount of time which cures the trouble thoroughly before the brain or its excessive tension has received injuries which by their nature would be incurable.

"Reil insists that we should cultivate in the patients obedience and respect for the persons who are expected to arouse their senses and to prepare them for the treatment according to principles which hold for the treatment of all mental disease. The physician must get hold of their hearts, now by seriousness and severity, now by leniency and by sympathy with their fate, especially where misfortunes are at the bottom of their trouble. Thus the physician becomes enabled, either by reasons and cautious admonition or by coercion, to hold them down to such steady physical or mental work as will push aside their fixed ideas and bring such intervals that they fade out by themselves. The work must have sufficient variety

in order that the patient cannot associate it too readily with his fixed notions. The work must be adapted to his capacities and likings and must thereby be attractive. Should we not be able to find any topics which would absorb the patient by their natural interest, Reil proposes to arouse the patient by exposing him to various dangers and emergencies from which the patient would naturally want to escape; he would put him in a place where his attention is thoroughly absorbed by his being forced to escape water jets, risks of falling into ditches, etc. (a procedure which Reil says could better be organized in public institutions than in private homes). Crude as this may seem the fundamental idea he has in mind is quite correct. What he means is that we should never surrender the hope of being able to get hold of some vital interests by which we might be able to absorb the patient's attention sufficiently to make him forget his fixed ideas, and for this he would not mind appealing to very fundamental interests of self-protection. It is a matter of great satisfaction that our modern tendency to appeal to attractiveness rather than to obedience and coercion also in the domain of ordinary education has put at our disposal a fine array of means of profitable distractions which justly has changed most of the old methods of school discipline of general life, and make unnecessary the artificial and after all barbarous and ludicrous scheme of Reil.

"Reil also gives accounts of clever and rapid treatment of many of these diseases, which remind one of what laymen and even physicians sometimes expect the psychiatrist to use. Thus Reil reports (page 327) the case of a young man who was reasonable with the exception of the fixed idea that he was a Swedish prince. He was sent for treatment to a woman who had acquired a great reputation in the care of the insane. She put him beside her at the first dinner. He spoke and acted for some time in a consistent and natural way until all of a sudden he digressed to his fixed idea. At the very same moment he received such a slap in the face that he saw stars. This treatment which he certainly had not expected from a woman, and especially not on the first day after his admission, acted so profoundly upon him that he never mentioned his notion again. In the same way, the passions of fright, love, and hope, which are based on important objects of religion, honor and fear of harm are described as contributing to remove the fixed idea. When Orestes had revenged the death of his father with the blood of his mother Clytemnestra, he became subject to the delusion that their souls followed him armed with torches and snakes. The oracle advised him to take a trip on the ocean with his friend Pylades. They

landed in the Chersonese and there he was exposed to the danger of being sacrificed to the gods of the land. He escaped death and learned that he was saved by his sister Iphigenia. Both passions, fright and joy, so acted upon him that he turned to Greece restored and able to take up the reins of government. A merchant in France, following some commercial losses, had developed a fixed idea that he was going to starve in poverty. At that time the Reformation broke out in Germany and this attracted the attention of the patient more and more. He defended popism by speech and writing and was cured of his delusion. At times it is possible to persuade the patient that he has attained his purposes; or it may be possible to convince him of the absurdity of his premises, etc."

Reil is strong, however, in his denunciation of cruelty to patients. He would only use severe methods when there is a distinct object to be attained by their use, but neither would he hesitate to use any measure, because of its severity, if it was for the good of the patient. He believed the patient should have regard for the physician. He cites the case of a patient with paraplegia who was cured by the assurance of his physician that he would be well in six days. The prediction came true and served not only to make the patient believe in the doctor but also to make the doctor believe in the patient.

He writes most intelligently of work as a therapeutic agent and believes our asylums should make their patients work. He mentions hand work, art work, and mental work as progressive stages in the development of attention. We should proceed from the simple to the complex, from the looker on to being the actor. Dancing and swimming have the advantage that they are valuable exercises for both mind and body. Work should be changed often enough so the patients do not lose interest and revert to their fixed ideas. Such work as spinning he thinks too monotonous and uniform.

Throughout these discussions he makes remarks that show deep insight and some are of distinctly psychoanalytic interest. He says that a certain procedure in the present state of our knowledge is not possible because the nature of psychic means and their causal relations are little known, so we cannot count on anything exact, their use has to rest in the art of the physician in particular cases. The most important thing is that the patient, from the beginning, falls into the hands of a skillful physician. Failure at first means that subsequent efforts are more difficult. In applying means of cure we must not count too much on the stupidity of the patient

and must not deceive him. If the physician loses the trust of the patient then the patient should go to another physician, even to another a-sylum.

Of the important part that desire plays he seems to have had some notion when he remarks that we can usually help the patient most quickly when we satisfy his wishes, and perhaps he saw somewhat the real meaning in the case he cites of the patient who gave himself up to drink and sexual excesses because his health could not be made any worse than it already was. The idea of the conflict is pretty clearly put by one patient of Pinel's whom he quotes as saying that he had a conflict between the terrible thing that his instinct would do and the deep abhorrence of his reason. His keen insight for little signs that betray what is going on within is evidenced by his quoting the experience of Galen who discovered the love of a Roman lady for the actor Pylades by noting the change that came over her face as he accidentally mentioned his name in her presence.

Of dementia he says he doubts if it is a simple loss of understanding. Like blindness it is a symptom and may be due to many things. Of idiocy he says a chaos is included in this classification.

The Rhapsodiceen ends with an exceedingly interesting discussion of the principles of construction and administration of an a-sylum. It should be so constructed that all of the powers for healing are brought together in harmonious action. The first step is the separation of the curable and incurable in a hospital and an a-sylum respectively. A good plan is to receive only curable cases at first so that the real object is not lost sight of. The hospital is to be so arranged in organization and personnel that the pharmaceutic and especially the psychic methods of therapy will be most completely practiced. Reil saw this need clearly and strove for the erection of a university psychiatric institute in Halle and later in Berlin, but without result.

He deploras that a-sylums are mostly used for society to bear its burdens. Hospitals, poorhouses, prisons, houses of correction, in all the patients lack fresh air, exercise, diversion, in short all physical and moral means for cure. The reformation of a-sylums will include a free plan for the use not only of pharmaceutic but of psychic means of cure.

The hospital, he emphasizes, should have a mild name like *Penionanstalt für Nervenkrankte* or *Hospital für die psychische Kurmethode*. One may conceal the reception of the insane and take other that require psychotherapy. The convalescents should

be separated so they will not see themselves mirrored in those about.

The asylum, he says, should be pleasantly located, the wall about it only breast high with a fence on top so as not to obstruct the view. It should contain everything that a residence for the well should have. There should be one principal building and a number of smaller ones one story high. This permits of classification and then it does not look like a prison. The windows without gratings and the windows and doors without bolts and chains. He suggests spring locks to do away with the prison appearance and feeling. On the ground floor are located the cells for the dangerous patients each with a small window and a small door to open and observe the patient. The insane he remarks have a specific odor. The rooms should be tiled and plastered so as not to absorb and so they can be readily washed. They should be simply furnished and warmed in winter. All means of cure should be available—shower and surprise baths, douches, caves, grottos, a magic temple, a large place for exercise and for gymnastics, and a place for concerts and theatricals. He has more confidence in public asylums under state control than in private asylums which may be used as private prisons. He believes in good feeding and in work. Work lessens the wandering of the imagination and makes for health, appetite and sleep.

The hospital, which you will note he distinguishes from the asylum, should receive those patients needing psychic treatment and not only the insane. It should also receive those mentally disordered from various illnesses, such as fevers. These patients need only physical treatment, but the physician should have experience with mental disease so that he can study the influence of physical ills on the mental disease and use this knowledge to help cure. He recommends a psychologist. The psychologist may be combined in the person of the physician or not—that is a matter of indifference—in any event he must make his own work as it is not yet developed. His function, he very well expresses it, is to look after the pedagogics of the soul.

He thinks we should get more profit from the insane in the asylums. One finds here people without masks and sees what they are and can become when the wheels are out of order. The medical use of psychology is too little known. These hospitals should be schools for physicians to get instruction in the therapy of the psyché. They should also furnish a rich harvest for psychology to which they have as yet contributed little.

So much for the Rhapsodieen, a work filled with the wisdom of a profound thinker and a keen observer, and which Neuberger,

the Professor of the History of Medicine in Vienna, says is one of the most noteworthy books of the whole world literature. Very possibly Reil was influenced in his thinking along these lines by Pinel (1745-1826) whose great work, "Traité médico-philosophique sur l'aliénation mentale," was written two years before the publication of the *Rhapsodien* (1801). That he was familiar with Pinel is amply evidenced by the numerous references to his writings all of which seem to refer to a German translation published in Vienna in 1801 under the title of "Abhandlung über Geistesverirrungen." Quite appropriately he has been referred to as the German Pinel. It is probable too that he was somewhat influenced by the organology of Gall (1757-1828), although he only mentions him once casually.

From the reference it would appear that Reil was also familiar with the work of Willis, probably Thomas Willis (1621-75) who is credited with the first description of paresis, but he probably also refers to a noted contemporary who had a private sanitarium for mental diseases near London. He also cites Coeleus Aurelianus and the works of Celsus who wrote so learnedly on the treatment of the insane, probably in the first century. This seems to me especially significant as Celsus laid such stress on the use of music, quiet and lovely surroundings, and baths.

It seems that he was devoted to some considerable extent to philosophy, and the *Rhapsodien* gives a reference indicating that he had some acquaintance with the writings of Kant. It is in connection with philosophy that he is most frequently mentioned and by a strange fate it is because of that his writings seem to be so little known. He is set down as a vitalist and summarily dismissed from further consideration.

Aside from the discussion as to whether he was or was not a vitalist, and it has been vigorously disputed by his pupil Madai, the real question must be directed to what he accomplished. If he mooned his life away spinning tenuous theories, no matter what, why then he can be of little interest. But if on the contrary he was a man of action, a man who brought things to pass, then he is of interest and his life has a valuable message to give us.

Even vitalism cannot be considered at present to be in disrepute, Professor Thompson in his presidential address* to the Zoological Section of the British Association for the Advancement of Science in 1911, says of it "the hypothesis of a vital principle, or vital element, . . . has come into men's mouths as a very real and urgent question, the greatest question for the biologist of all." Vitalism

* Science, October 6, 1911.

was born in Reil, if vitalist he was, by the feeling that man has always had when he faced the great mystery of life, that there was something that could not be all explained by the laws of chemistry and physics. Professor Thompson, further on, in his address just quoted, in speaking of mechanistic explanations says: "But I know well, that though we push such explanations to the uttermost, and learn much in the so doing, they will not touch the heart of the great problems that lie deeper than the physical plane. Over the ultimate problems and causes of vitality, over what is implied in the organization of the living organism, we shall be left wondering still." And what after all is the *élan vital* of Mr. Bergson but the eighteenth century *Lebenskraft* of Reil in a twentieth century dress!

After all the problem presented by vitalism very probably belongs to that group which I call pseudo-problems in the same spirit that Meyer⁹ speaks of the contrast of mental and physical as "medically useless." Philosophy serves as a means of expression for the philosopher,¹⁰ it need not necessarily form a basis of action. So long as it is only a means of expression and does not get in the way when action is demanded, so long as the philosopher does not stumble over his philosophy in his dealing with reality it matters little what that philosophy is. The philosopher in his effort to grasp the entire scheme of things is simply not willing that his desire should be thwarted by the limitations of his vision and so succeeds by inventing vital force to account for all beyond. Used only in this way it need not hamper progress. It is by a man's deeds that he is known. In this respect Reil does not fail us. A man of indefatigable energy, constantly productive, prominently known as a physician over a wide territory, the recipient of honors, occupying official and teaching positions, an able ophthalmologist, who made important observations on the lens and confirmed the existence of the macula lutea, a skillful surgeon who said "surgery is not the art which heals by the hand; the head must guide the hand"; an internist, of whose patients a contemporary (Börne) said "Those who do not get well lose their life but they never lose hope"; and a psychiatrist, who in the words of Neuburger was "the pathfinder of psychotherapy," and as an anatomist "the founder of the new brain anatomy." He died at the height of his career and in the performance of his duty, of typhus, the same disease that claimed his

⁹ Meyer: Objective Psychology or Psychobiology with Subordination of the Medically Useless Contrast of Mental and Physical. *Jour. A. M. A.*, Sept. 4, 1915.

¹⁰ Rank and Sachs: The Significance of Psychoanalysis for the Mental Sciences. *Psychoanalytic Review*, Vol. II, Nos. 3 and 4, et seq.

predecessor in the University of Halle, Goldhagen, and his beloved pupil Madai.

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THE FAMILY FORM OF PSEUDO-SCLEROSIS AND OTHER CONDITIONS ATTRIBUTED TO THE LENTICULAR NUCLEUS¹

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The conditions attributed to disease of the lenticular nucleus are numerous. In addition to Wilson's progressive lenticular degeneration we must include the pseudo-sclerosis of Westphal and Strümpell, Huntington's chorea, Parkinson's disease, spastic pseudo-bulbar paralysis with contractures and choreo-athetoid movements of Oppenheim and Vogt, and Freund and Vogt, Oppenheim's dystonia musculorum deformans, and progressive athetosis: I venture to add to this list v. Bechterew's hemitonia apoplectica and certain forms of carbon monoxide poisoning. Pélissier and Borel have reported a type from the service of Dejerine which they regard as the unilateral type of lenticular degeneration. The symptoms were tremors with muscular rigidity confined to the right limbs, dysarthria and dysphagia, without signs of implication of the pyramidal tracts. There was no true paralysis; the tendon reflexes were not distinctly exaggerated and the plantar reflex was in flexion. The condition was like that of Parkinson's disease, but the commencement at the age of eighteen years and other features of the case, such as dysarthria and dysphagia, led to the exclusion of this diagnosis. A case with somewhat similar features I report in this paper.

Dejerine says the symptom-complex of Wilson's disease has occurred without lesions of the lenticular nucleus. He is unwilling to attribute any positive symptoms to disease of this nucleus, as often bilateral lesions are found in this region in cases in which clinical signs were wanting, and he believes a lenticular lesion produces symptoms only when it implicates the internal capsule. It is impossible to accept this conclusion unconditionally, and yet it is impossible also at present to explain why lesions of the lenticular nucleus sometimes do not produce symptoms, why in other cases they cause distinct symptoms as those of progressive lenticular de-

¹ Read by title at the forty-first annual meeting of the American Neurological Association, May 6, 7 and 8, 1915.

generation, and why the clinical picture of lenticular disease assumes so many variations.

Wilson, from his clinical and experimental work on the corpus striatum attributed to this structure little more than a "steadying influence" exerted by the lenticulo-rubro-spinal projection system on the innervation of the cortico-spinal or pyramidal system. It is in a way concerned with the maintenance of "tone" of the skeletal muscles.

When we consider the pseudo-sclerosis we find it has not occurred in more than one member of a family except in the cases reported by Rausch and Schilder, and Oppenheim, referred to later, and in both instances in two sisters, and in the cases of Cielwajdler. One sister reported by Rausch and Schilder showed the first symptoms in her twenty-sixth year and the disease had existed seventeen years. There were the brown pigmentation of the edge of the cornea, insufficiency of the liver, tremor, adiadochokinesis, and scanning speech. The disease began in the second sister in her twenty-third year and had lasted four months. The symptoms were very similar in the two sisters. Hypertonia was not present in either case. Rausch and Schilder regard the Wilson type of progressive lenticular degeneration as a special form of pseudo-sclerosis, and it is important to note that Wilson also in his article on the subject in Lewandowsky's *Handbuch* says progressive lenticular degeneration seems to be nearly related to pseudo-sclerosis.

I report in this paper another family which I think should be placed in the family form of pseudo-sclerosis. The resemblance between the two affections is shown in that one brother reported by Higier had the Wilson type and the other brother the pseudo-sclerosis. The muscular rigidity, the propulsion, the slowness of movement and bradykalia suggested paralysis agitans in the first, and the resemblance to paralysis agitans was striking in two brothers of the family studied by me, as shown later. Higier thinks the differences between the two diseases may be only quantitative. The distinctions between them are presented by Higier as follows: He says pseudo-sclerosis

Begins in persons who are not hereditarily affected, between the fourteenth and twenty-sixth years, at times later, as well as in the early thirties; develops slowly to a symptom-complex resembling multiple sclerosis, and usually ends fatally before the fourth decennium. The chief symptoms are:

(a) Tremor of the body and strongly oscillating tremor of the head, arm, and leg, which usually lessens in rest or even ceases.

(2) Muscular rigidity and spasticity, seldom intense, most marked in the face, occasionally also in the external ocular muscles.

(3) Slow and scanning speech.

(4) Epileptiform and apoplectiform attacks.

(5) Pigmentation of the skin and inner organs of a dirty brown color, and at the periphery of the cornea of a brownish green color.

(6) Diminution, rarely pseudo-sclerotic enlargement, of the liver and clearly palpable or visible spleen.

(7) Psychic disturbance, consisting of irritability, tendency to acts of violence, failure of intelligence and progressive dementia.

Negatively are: preserved muscular power, integrity of sensation and the vesico-recto-genital functions, absence of muscular hypertonia and of changes in the tendon and cutaneous reflexes, absence of nystagmus and optic atrophy. It is difficult to understand the distinction made between hypertonia and spasticity.

Wilson's disease is exquisitely a family disease, not congenital and not hereditary. It begins between the tenth and twenty-seventh years, develops slowly without remissions and ends occasionally acutely or subacutely (after four to thirteen months) more commonly after three to nine years. Occasionally the disease lasts still longer, in Sawyer's case it lasted seventeen years.

The features are:

(1) Tremor of the distal parts of the limbs, more or less rhythmical, bilateral, of small amplitude and increased by excitement and attention. In long-standing cases the tremor occasionally appears as tonic-clonic spasms, although ceasing during complete rest.

(2) Rigidity of the limbs, especially of the flexors, but also of the face, trunk, bulbar muscles (dysarthria, dysphagia), exceptionally also of the ocular muscles, and shown by slowness of movement and contracture-like resistance to quick passive movements. The contracture positions without true contracture are more pronounced in the proximal parts of the limbs.

(3) Slow, scanning, nasal speech.

(4) Cirrhosis of the liver and enlarged spleen, which seldom cause symptoms.

(5) Psychic disturbances as excitability, mental impairment, involuntary laughter, apathy or pronounced dementia, hallucinations, delusions.

(6) In severe acute cases fever, severe loss of power and wasting.

Negatively: Integrity of the inner speech, of muscle strength and sensation, of the pupils and extra-ocular muscles, of bladder and bowels, absence of spastic paresis and wasting, absence of Babinski's sign, normal tendon and abdominal reflexes, no nystagmus and no changes in the eyegrounds.

Oppenheim observed in his cases of pseudosclerosis that the tremor was not in the muscles which cause fixation of the joints necessary for maintenance of a certain position, as Strümpell believed to be the case, but was in the flexors and extensors of the wrist, and the tremor was exaggerated by active movement and psychic excitement. He does not think spasticity excludes the diagnosis, and makes this diagnosis in one of his cases in which spasticity was present. He mentions that ankle clonus was present in the case of Fickler and Schütte; Oppenheim's sign in A. Westphal's case; and Babinski's sign in Hösslin and Alzheimer's case. He makes the diagnosis in two sisters. Alcoholism in a progenitor has been seen by A. Westphal, Hösslin and Alzheimer. Oppenheim sides with those who put pseudo-sclerosis and Wilson's disease in one group. Rigidity is more prominent in Wilson's disease but is not entirely missing in pseudo-sclerosis, and varies in intensity in Wilson's disease. Both are extrapyramidal diseases. Mental symptoms are not so prominent in Wilson's disease but they were absent in a recent case of Strümpell's of pseudo-sclerosis and in one of Oppenheim's three cases; and slight in another. Epileptiform and apoplectiform attacks are by no means constant in pseudo-sclerosis.

Bostroem when he wrote his paper on pseudo-sclerosis said 25 cases of pseudo-sclerosis had been reported, of which 22 were with autopsy and these 22 he used for a study of the disease.

Tremor was present in all cases; twice it resembled paralysis agitans, once chorea. Volitional movements and emotional disturbance increased the tremor, and it was observed when the patient was at rest. Disturbance of speech was present in every case but one (Fleischer) and was unlike that of multiple sclerosis; it was seen only once (A. Westphal), in 10 cases it was poor articulation, stammering, indistinct. The eyegrounds were always normal, pupillary reactions were preserved, and nystagmus was not observed. The abdominal reflexes were normal in all cases but two. The patellar reflexes were exaggerated four times, and were lively three times; in other cases they were normal. Hypesthesia was present in three observations. The expression of the face in 10 cases was termed *bleu* or was described in some similar term. The

muscles were often rigid, and the gait was normal only in two cases, spastic in four cases, in the other cases tremulous or impossible. Difficulty in swallowing was present in 10 cases. The constant mental symptoms were irritability, excitability, confusion. Impairment of intellect was present in 15 cases. Intestinal catarrh was present in 7 cases. The age of onset was not always given. In most cases it was between the tenth and twentieth year, the latest onset was in the twenty-fifth year. Where death was not from an intercurrent disease it was always rather sudden and unexpected. The duration of the disease was from one to twelve years. Syphilis occurred in a few cases. Babinski's reflex was absent. Cirrhosis of the liver was constantly found at necropsy.

Bostroem found marked lesions in the lenticular nuclei, dentate nuclei, and cortex of the cerebrum and cerebellum. The right lenticular nucleus was not affected: its nerve cells in places had disappeared and the glia had proliferated. Normal ganglion cells were scarce. Alteration of the vessels was important. Similar changes were found in the dentate nuclei and cortex. He concluded that the alteration of the liver and that of the brain were produced by a common cause from the same source, and that it must be a toxin of intestinal origin. Syphilis, he thinks, can be excluded.

Bostroem's case was thought at one time to be paralysis agitans. His findings showed that the lesions were extra-pyramidal.

Contrary to his view that the disease depends on gastro-intestinal intoxication is its occasional occurrence in families.

Stöcker believed the mental condition would determine the diagnosis between Wilson's disease and pseudo-sclerosis. Mentality long remaining intact or only slightly impaired in the form of some euphoria speaks more for Wilson's disease, while early developing dementia or change of character, especially marked irritability and attacks of temper, also epileptic and apoplectic attacks give the diagnosis of pseudo-sclerosis. Stöcker thinks much is included under pseudo-sclerosis which does not belong there.

Woerkom reported a case of pseudo-sclerosis in which he found large neuroglia cells in the cerebral cortex, basal ganglia and dentate nuclei.

In Hösslin and Alzheimer's case of pseudo-sclerosis the whole central nervous system was abnormal, but especially the corpus striatum, optic thalamus, regio subthalamica, pons and nucleus dentatus. Nervous tissue had disappeared in places, but glia changes especially were striking, and glia cells were very large. There was also degeneration of the pyramidal tracts.

In A. Westphal's case the father was alcoholic. The patient had a spastic parietic gait which Westphal says was present in most cases of pseudo-sclerosis. He found changes in the glia nuclei in size, shape and chromatin substance, in the basal ganglia and nucleus dentatus like the findings of Alzheimer.

Schutte's patient had a bilateral ankle clonus. Schütte found great changes in the cortex of the frontal lobe, *i. e.*, destruction of the medullated fibers and nerve cells, and overgrowth of glia cells. Unlike Westphal's and Hösslin and Alzheimer's cases the changes in the basal ganglia were slight.

Mingazzini, in the report of a case of a symptom-complex resembling Parkinson's disease, attributes this complex not only to a cyst which destroyed a part of the caudate nucleus, the anterior fifth of the lenticular nucleus and internal capsule, but especially to the implication of an extrapyramidal tract, *viz.*, the fronto-cerebellar tract which probably passes through the anterior part of the internal capsule, by which he seems to mean the anterior limb of the capsule.

He quotes Pelnár as saying that when the lesion is in the cerebral peduncle the tremor partakes of the character of athetosis.

Mingazzini believes the lenticular nucleus is differentiated in function according to its various parts. The cells of this nucleus, as shown by Ayala, are different in the putamen from those in the globus pallidus, and symptoms vary according as one or the other part of the corpus striatum is affected.

The symptom-complex of the corpus striatum (Anton, C. Vogt, Oppenheim) is bilateral athetosis, spasm, without paresis and without disturbances of sensation. It is the result of defect of the caudate nucleus and putamen (*status marmoratus*).

Zingerle says Förster attributes the muscular spasms of paralysis agitans to the cerebellum, and believes they result from lesion of the cortico-cerebellar tracts, so that the normal inhibitory impulses from the cerebral cortex do not reach the cerebellum. Kleist holds much the same view.

Dy-tonia musculorum deformans Oppenheim regards as related to idiopathic athetosis, and he has seen the former in members of the same family. Its position is uncertain, but there is a possibility that it may be dependent on lesions of the lenticular nucleus.

In the cases of dystonia musculorum deformans which I reported in 1913, the disease was a family affection. Two of the patient's sisters had been in the Philadelphia General Hospital and died there. All three were of feeble mental development. One of the sisters

had been recorded as having "chorea," the other had choreiform movements and walked with a peculiar swinging gait and every now and then a shrug of the shoulder. Her movements were irregular and clumsy and much like those of her brother. One sister died in 1905; the other in 1907.

The case of acquired spasticity and athetosis that I reported in 1908 was one of unusual interest. At that time the boy was twelve years old and had been under my observation five years. During this period spasticity and athetosis had developed slowly in all four limbs, finally reaching such intensity that the boy was confined to his chair. He first came under my observation December 15, 1902, when he was seven years old, and at that time the father stated that the boy walked, ran and jumped as other children, until four months before he was brought to me, but since that time he had gradually been getting lame in the left lower limb. I found he was unable to stand without supporting himself by bending back the knee. When he attempted to walk the feet were wide apart, the knees were close together, and the lower limbs were spastic. There was no spasticity of the limbs when the boy was at rest. The lower limbs were somewhat weak when he was walking, but very little, if at all, when he was sitting. The grip was good in each hand, and the voluntary power of both upper limbs was good. The patellar reflexes were prompt, but there was no clonus. The plantar and Achilles reflexes were normal.

By 1908 the lower limbs had become very spastic, but at times this spasm yielded, so that the limbs could be moved at most of the joints freely, though not to a fully normal extent. The right lower limb was usually kept extended with the foot in the equino-varus position. The left lower limb was partially contracted in flexion at the knee. The lower limbs were not distinctly wasted. The spasticity and athetosis of all the limbs were intense, the tendon reflexes were exaggerated and Babinski sign was present on each side. The case is described more fully in the original report and is illustrated by two cuts.

In the hemiplegia apoplectica of v. Bechterew paralysis does not occur, or is of very short duration, and later only weakness is found; while convulsive tonic movements are intense, and may appear immediately after the apoplectic insult or some little time later. The spasms become weaker when the patient's attention is not fixed upon the movements, and are increased by excitement. The position of the affected parts varies from time to time according as the spasm predominates in certain muscles. These tonic

spasms differ from muscular contracture in that the contracted parts can be brought into other positions by the contraction of antagonizing muscles. Many muscles, often antagonists, are in a state of hypertonicity, and the spasms vary in intensity from time to time in different parts. The spasmodic limbs do not assume the usual positions seen in hemiplegia. Some of the affected muscles are hypertrophied. V. Bechterew believed that the predominance of the spasms over the hemiparesis indicated that the affection was one in which the pyramidal tract was irritated but only slightly injured, that the lesion probably was near the internal capsule, and that it could not be in the cortex, as irritation of the cortical motor area causes clonic spasms.

I reported in 1899 a typical case of hemitonia apoplectica and I believe this condition should be ascribed to the group of lenticular affections.

For a long period of years I have observed a family the members of which I think have pseudo-sclerosis. Two brothers have a symptom-complex that strongly suggests paralysis agitans, but the resemblance between pseudo-sclerosis and paralysis agitans has already been noted. The condition of one of Higier's cases resembled paralysis agitans, and this resemblance has been observed also by Bostroem. The family cases of pseudo-sclerosis observed by me are described below. The ages of the different members may be slightly inaccurate. The sister's condition resembles that of slight spastic paraplegia, but she does not have the upward movement of the toes in the Babinski reflex.

Edward, 47 years old, has used alcohol freely since he was 17 years of age. When about 30 years of age he noticed weakness of his lower limbs, more of the left lower limb, and gradually he became weaker in all the limbs, so that he was unable to walk any considerable distance or to make great physical exertion, but was by no means paralyzed. He stated that the tremor began after the weakness. He has never had any pain in the limbs and was able to walk in the dark as well as in the light. In 1904 it was noticed that he dragged the right foot after he had been walking some distance, that both upper limbs were in continual coarse tremor, and that the lower limbs were somewhat spastic. The patellar reflexes were increased, but there was no ankle clonus and no Babinski sign. Sensation was not affected. The liver has seemed to be of normal size. There has been no disturbance of speech, although speech is rather slow. He denies syphilitic infection.

His condition on January 13, 1915, when he was in my service, I found to be as follows:

Touch and pain sensations are normal in the face; ocular movements are normal. The pupils are equal, and react promptly to

light and in convergence, but the excursion to light is not very great. He wrinkles his forehead, closes his eyelids, draws up the corners of his mouth in a normal manner. The tongue is protruded centrally, and is moved normally; it is not atrophied.

The masseters contract well. No tremor of the head is seen except what is communicated from the shaking of the limbs. He is without tremor when at complete rest and not aware that he is under observation. If he notices he is being watched or if spoken to the tremor becomes very marked.

He holds the forearms partly flexed on the arms, and the hands (especially the left) slightly flexed on the forearms and in the position of the obstetrical hand. There is also ulnar deviation of the fingers. The tremor is quite rapid and is largely a to-and-fro movement from the elbow, and to some extent also, from the wrist. In quality it resembles that of paralysis agitans, as does also strikingly the position of each upper limb.

Touch and pain sensations are normal in the upper limbs. There is much resistance to passive movement in each upper limb, especially at the elbow, but there is also resistance in passive extension of the fingers in each hand. The biceps tendon reflex is a little prompter than normal on each side. The finger-to-nose test is well performed on each side. There is therefore no dysmetria.

Adiadochokinesis is good in each hand, but the movements are slow and they are interfered with by the tremor. The sense of position is normal in the fingers. Voluntary movement temporarily arrests the tremor in each hand. There is no muscular wasting.

The trunk shakes, but only from movements communicated from the upper limbs. The left upper abdominal reflex is distinct, but the other abdominal reflexes are uncertain. The cremasteric reflex on the left side is distinct, but not so distinct on the right side. The liver and spleen do not appear to be enlarged. The lower limbs are well developed, they are distinctly rigid and passive movement is very difficult, especially at the knees. The patellar reflex is much exaggerated on each side. There is no patellar and no ankle clonus. The feet perspire very freely. The Babinski reflex is with flexion of the big and other toes on each side. Touch and pain sensations are normal in the lower limbs.

The Achilles reflexes are about normal. When standing the man has a marked tendency to flex each knee and to incline forward at the hips, assuming a position very suggestive of paralysis agitans.

He can, when he first rises from the chair, assume an upright position, but he soon, especially if a little fatigued, takes the position of partial flexion.

He drags his toes along the ground, and his slippers are worn at the toes, equally so on both sides. The gait shows some festination. He has no atrophy anywhere.

John, a brother of the man just described, was 44 years old in 1914. He is now in the service of Dr. Mills but has been frequently observed by me. He has used alcohol freely. He contracted



FIG. 1. Edward, aged 47 years. Symptoms began when the man was about 20. Tremor and attitude those of paralysis agitans. Rigidity of limbs. N. Babinski. Toes are scraped a little on the floor in walking.

syphilis about nineteen years ago. His facial expression is very suggestive of paralysis agitans. His pupils are equal and respond promptly to light and in convergence. He has had a tremor of the upper limbs for nineteen years, suggesting that of paralysis agitans, and not ceasing during voluntary movements. The tendon reflexes of the upper and lower limbs are prompt, and the patellar reflexes may be a little exaggerated. There is no upward movement of the toes in testing the Babinski reflex. The muscular power of the limbs is fair. There is no ankle clonus. The patellar reflexes may be a little exaggerated.

The tremor began in the right lower limb, then affected the right upper limb, then the left upper limb, and finally the left lower limb.

In standing the body is bent slightly forward and the head is slightly flexed. The upper limbs are slightly flexed at the elbows. The tremor is especially distinct on voluntary movement. Pain, touch and temperature sensations are normal. He is not capable of great physical exertion. The gait is somewhat spastic and festinating. The writing is illegible on account of the tremor. No atrophy is found anywhere. There is no disturbance of speech.

He walks with the body bent forward, arms partially flexed, and shoulders rounded, but his condition is not as pronounced as is that of Edward.

Catherine, aged 48 years, was examined by me January 9, 1915. She is a sister to the two previously described men. The father died from phthisis. The mother had one sister and one brother, but neither had any difficulty in walking. Nothing is known of the father's family.

Catherine noticed the first symptoms about seven years ago; she began to be clumsy with her feet in going upstairs or in hurrying for a car, and has been getting steadily worse; her condition is worse now than it was one year ago. She complains that her lower limbs feel heavy. She can still walk in the street, and recently walked two squares. She has no bladder and no rectal disturbance. She is the oldest member of the family. One brother who is forty years of age, has dragged his feet about five years.

In Catherine the pupils are equal and respond promptly to light and in convergence. The ocular movements are normal. The patient wrinkles the forehead, closes the eyelids, and draws up the corners of the mouth normally. The tongue and masseter muscles are normal. Tactile and pain sensations are normal in the face. The face has something of the same lack of expression seen in her brothers, especially when she smiles.

The finger-to-nose test is well performed on each side. Tactile and pain sensations are normal in the hands, stereognosis, sense of position, diadochokinesis are normal in each hand. The hands when extended show a fine tremor as in Graves' disease. The biceps jerk is a little exaggerated on each side, the triceps jerk and wrist reflexes are not distinctly obtained. The grasp of each hand is good.



FIG. 2. John, aged 45 years. Tremor of limbs like that of paralysis agitans has existed about 10 years. Facies suggestive of paralysis agitans. No Babinski. The man walks with the body bent forward and upper limbs partially flexed.

The power in the lower limbs is as good as could be expected in a woman of her slight build. The patellar reflexes are distinctly and equally exaggerated. The soles of the shoes are worn away at the toes. The Achilles reflexes are a little exaggerated. There is no Babinski sign, and the toes do not move in either direction from irritation of the sole of the foot. Tactile and pain sensations are normal in the feet. In walking the toes are scraped along the ground. No spasticity is present on passive movement. The body is inclined forward a little when she walks.

One brother, about 43 years old, seems to be normal. He has two children, eight and two years old respectively, and is healthy.

The following case must be regarded as one of extrapyramidal hemispasticity, probably from areas of rarefaction in the lenticular nucleus. In some respects it resembles the case of Pélissier and Borel to which I have already referred. The notes unfortunately are lacking in some details.

J. C., 70 years old, domestic, began to get feeble at the age of 74 and was admitted to the outwards of the Philadelphia General Hospital. She never had a paralytic stroke but had difficulty in moving about, and did not have much use of one side, presumably the right, and used a cane. The inability to use the limbs developed slowly and she became almost helpless. Her mentality failed and she appeared senile. Her loss of memory made it impossible to obtain any history from her. She had almost constant flexion and extension movements of the right forearm, and similar movements in the right lower limb. Both patellar reflexes were increased. The arteries were sclerotic.

Notes taken by me in 1914 are as follows: The right upper and lower limbs are greatly contracted. The right fingers are slightly flexed. The hand is held at a right angle with the forearm and the forearm is strongly flexed on the arm. The fingers and hand can be fully extended but the forearm can be extended only to a right angle.

There is a constant tremor of right upper limb which seems to be more pronounced at the wrist. This tremor is of small amplitude and involves the fingers at times independently of the wrist. The movements of the fingers are of slight flexion and extension.

The biceps and triceps reflexes of the right upper limb are probably increased but are not readily obtained on account of spasticity. Occasionally there is a slight jerking of the right lower limb. The latter is contracted in flexion to the greatest possible degree. The thigh is strongly flexed on the abdomen, the leg is strongly flexed on the thigh, and the foot points downward. Contracture of the right lower limb is so great that the leg cannot be brought to a right angle with the thigh. Attempt to do so causes much pain. The right patellar reflex is present but not very active, as judged by the contraction of the quadriceps muscle. Pin pricks in the right leg or right forearm produce an expression of pain. She is not

word deaf. Apparently she is not motor aphasic. She says whole sentences correctly but is confused.

Important features of this case are hemispasticity and contractures of the right upper and lower limbs to an extreme degree. Extreme spasticity suggested that the lesion was near rather than in the internal capsule.

A necropsy was obtained. No degeneration of the pyramidal tract of either side could be found but numerous minute areas of rarefaction were found in the left lenticular nucleus, some also were found in the left optic thalamus. These areas were not numerous in the right basal ganglia. The areas were very small and did not take well the Weigert hematoxylin stain or the acid fuchsin. These were the only lesions I was able to detect, and as they were in the left basal ganglia they seem to explain the right-sided spasticity.

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SPEECH CONFLICT—A NATURAL CONSEQUENCE IN
COSMOPOLITAN CITIES—AS AN ETIOLOGICAL
FACTOR IN STUTTERING. A PRELIMINARY
REPORT BASED ON 200 CASES¹

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Stuttering has been recognized as a disease for many centuries and many theories have been advanced concerning its etiology. Numerous writers upon the subject differ in regard to the importance of the causative agents.

In order to throw some light on the etiology of stuttering as met with in the cosmopolitan city of New York we went over the histories of the last two hundred cases of stuttering that were admitted to the neurological department of Columbia University at the Vanderbilt Clinic and propose making a few deductions from our statistics. This article will be devoted to the study of nationality of the patients and the apparent conflict of language due to the overwhelming majority of foreign-speaking parents whose children, in learning English, develop a stuttering habit.

However, before discussing this point at length let us devote a few moments to the opinions of well-known authorities upon the etiology of stuttering.

Most all authors agree in believing that there is usually a predisposition on the part of the patient toward stuttering no matter what may be the exciting cause. Dr. Hudson Makuen¹ states that "the most important factor in the etiology of stammering is heredity and this, notwithstanding the fact that stammering is an acquired affection, in the sense that speech itself is an acquired faculty. Heredity, however, must be held in great measure responsible for the various anomalies of the cortical speech mechanism, which sooner or later give rise to the affection under consideration; these anomalies are largely congenital and vary in degree all the way from the grosser, and it may be organic physical conditions of the brain, to the minor, and so far as we can determine, functional anomalies, which result in an in-

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stability or a weakness of the speech areas, with an ever present tendency toward the development of the affection."

Gutzmann² beside agreeing that heredity is a very important factor tells us that he considers stuttering more or less a matter of temperament, claiming that most stutterers are excitable and hasty. He also remarks that it is not only heredity but psychic infection which takes place when a child hears a mother, father, brother or other relative stutter. Heredity, he thinks, can only be taken into consideration as the prime factor when the patient never saw or heard the disturbing relative.

An interesting case of heredity came to us at the clinic a few days ago. A girl of 13, who has stuttered ever since she first started to talk, was discovered to have had a grandmother, uncle and aunt in Ireland (maternal relatives) who stuttered, but none of whom she had ever seen, as she was born in this country. We have here in America numberless children who are far separated from the foreign forebears, thus giving us an opportunity to study pure heredity, if only reliable data could be obtained when such cases present themselves.

Some authors like Schrank³ believe that stuttering is mostly found among the mentally deficient and feeble-minded children; but from our experience we are inclined to think that this is a quite unwarranted belief, for the majority of our patients possess intelligence of normal degree while only a small percentage come from the classes in the public schools for mental deficients. We rather find with Gutzmann that non-intelligent children are more inclined to lisp than to stutter.

Blume⁴ holds that the most immediate cause for stuttering is a disproportion between thinking and speaking, *i. e.*, that the command of language does not keep pace with the development of the thinking powers, or that the process of thinking is too fast for the undeveloped articulatory organs to express. Then he further contends that it is possible that just the opposite is the case— that a conflict arises between the organs of speech and the process of thinking when the thought itself is slow, which causes the muscles of the speech organs to become rigid, thus accounting for the twitchings and contortions so characteristic of some stutterers.

This disparity between the thinking process and speech is very noticeable at the early age of three or four when the child attempts to use his unexercised muscles of the speech organs. One child in our clinic, for instance, clearly shows this in a most in-

structive way. When he attempted at three years of age to express the word "automobile" for the object, he simply said "bile," "bile," "bile," but a half year later he added the syllable "mo" making the word "mo" "mo" "bile," thus keeping a repetition of three syllables for the word. This and other similar peculiarities if overlooked by the parents may lead to stuttering. Gutzmann observes that deaf mutes who are taught orally never stutter because they learn speech under constant supervision of a teacher and they thus combine the idea with the word after the speech muscles have been trained.

It has been noticed that the number of stutterers increases at school age (anxiety), at second dentition (weakening diseases) and at puberty (organic and psychic changes).

Liebman⁵ considers nervousness as the real foundation (both hereditary and acquired) for stuttering and lays special stress on the abuse of alcohol and masturbation. All investigators find that the percentage of stutterers is much greater for the male sex. Gutzmann believes that this fact is due to the different methods of breathing employed by males and females. Liebman attributes the less stuttering of females to their greater dexterity and grace of movement and to the well-known fact that girls learn to speak much easier and earlier than boys. Kussmaul⁶ even goes further in declaring that all muscular actions of the female are easier and more pleasing than those of the male, thus giving her at an earlier age greater taste, finer tact, more graceful positions and a greater fluency of language, all of which enable her to enter society at an earlier period than the male of the same age. Kussmaul also believes that chronic stuttering is caused by a congenital weakness of the syllabary coördination apparatus so noticeable in young children.

Schmalz⁷ considers a cramped condition of the vocal cords as a primary cause of stuttering. Merkel⁸ believes that stuttering is of a purely psychic origin, while Rosenthal⁹ and Benedict¹⁰ consider it a coördination neurosis. The basic factor, according to Rosenthal, is the congenital weakness of the respiratory and vocal apparatus in the medulla oblongata, which suffered a nervous shock in early childhood and never recovered and which later on, by the mere intention to speak, causes incoördinate movements. Wineken¹¹ thinks that in all stutterers the will power is bounded by doubt (language-doubt).

Tonsils and adenoids and other organic abnormalities such as cleft-palate, highly arched palate, defective teeth, tongue tie,

turbinal hypertrophies, etc., cannot usually be reckoned as etiological factors but may often be concomitant elements.

Kaffemann¹² found adenoids in 46 per cent. of stuttering children. Schellenberg¹³ in 50 per cent., Winckler¹⁴ in 30 per cent. and Gutzmann in 40-50 per cent.

During the past year we have made special investigations with reference to the tonsils, adenoids, deviated septums, catarrhal disturbance of stutterers and lispers that lead us also to believe that although they cannot be considered immediately etiological yet they are so responsible for weakening the nervous system that they may justly be the exciting cause of the mental disarrangement that the stutterer shows.

The experiences of many writers prove that stuttering has a central localization within the brain although it may be impossible to demonstrate it anatomically.

Kussmaul,¹⁵ H. Schmidt,¹⁶ Lichtinger¹⁷ and Rosenthal¹⁸ publish cases where after hemiplegia the aphasia was followed by stuttering, thus intimating an anatomical lesion.

Moutier¹⁹ published details of a case of hemiplegia where the aphasia was preceded by a peculiar type of stuttering.

Abadie²⁰ found also a case of dysarthric stuttering after pseudo-bulbar paralysis which, on account of the difficulty of swallowing, produced a peculiar utterance.

Scrofula is also believed to be a prolific cause of stuttering by many authors. Kleneke²¹ went so far as to say that stuttering is a consequence, a symptom or a reflex action of manifest or incipient scrofula.

Coen²² believes that all stutterers show some nutritive disturbance of the organism or some under-development of the thorax. There is great exception taken to this theory because it is a well-known fact that many stutterers are Herculeans in stature and health. Coen's theory, however, leads us to remember that faulty breathing is present in almost all cases of stuttering and may be, as he says, the secondary pathological symptom which is caused by disturbance in the medulla oblongata, the center of breathing. The pneumographic curves of a stutterer's breathing show a type of breathing that differs entirely from the curve of a normal breath. It has, however, not yet been fully decided whether this faulty breathing of the stutterer is due to his speech disturbance or whether it is of central origin, as Coen says.

Berkhan²³ considers that rickets is the main etiologic factor in stuttering and says that the changes of palate and jaw in rickets are similar to those met with in idiots, imbeciles and deaf mutes. It is our experience that rickets is an etiological factor in motor aphasia but not in stuttering.

The psychological phases of stuttering may be of two kinds—(1) the psychic affects such as anxiety and fear; (2) psychic infection (imitation). While authors of the standing of Gutzmann believe that the psychic depression of stutterers is never the primary condition but is always due to the constant brooding over their speech defect, Freud,²⁴ Steckel²⁵ and other psychologists believe that stuttering is the outward expression of an inward mental conflict. Frank²⁶ considers it as an anxiety neurosis that is produced in psychopathic children by fright in their early years.

Laubi's²⁷ theory of stuttering is based on his observation that some children, when learning to talk, *may possibly* develop language slower than others and that they are thus made conscious of the articular organs; this is enough of an exciting irritant to turn a predisposition into real stuttering. He cites instances where this slow development of language leads to interruptions and repetitions of letters and syllables.

Hoepfner²⁸ compares the act of stuttering with the complicated process of learning to walk. The child first creeps, then stands, then attempts to take a few steps with assistance until finally he walks alone. If having accomplished the act of walking alone his attention is constantly directed to his movements the walking becomes unsteady and his steps will be slow and less skillful. Even adults who attempt to watch their steps find that their control becomes unstable. Just so, Hoepfner claims, a stutterer is delayed by strong cramp-like movements when he endeavors to overcome any defects by reflecting upon them.

Fröschel²⁹ thinks that the nucleus of stuttering lies in the psychic condition of the patient who becomes conscious of the ataxically disturbed speech movements. He further states that in a number of children who are predisposed to stuttering, there is lacking that equilibrium which normal children possess with reference to the right proportion between speaking and thinking; these normal children do not express more thoughts than they can quietly give utterance to in words but with the unbalanced equilibrium of the former, the mechanical apparatus receives different stimuli and thus a repetition of syllables or sounds occurs.

Fröeschel suggests three different stages of stuttering—the first stage is that of the single repetition of sounds and syllables at the ages of 4-7; the second stage is that of exaggerated, conscious motions (voluntary movements of the speech organs) at the ages of 6-10; the third stage (cramp stage) is preëminently the tonic cramp of the articulatory organs and other concomitant muscles.

Nadolieczny²⁰ considers the exigencies of the first few school years as the purely psychic, momentous factors of stuttering. He finds that stuttering occurs mostly at the stage where speech development is not quite finished (4 years or about) and then again from 6-8 years of age, at the entrance to school life. The disproportion between the mental image and the mechanical expression for it and the endeavor to overcome the difficulties of language may easily bring about interruption of smooth language and cause the repetition of syllables. This ataxia lasts much longer in the neuropathically predisposed child and when further exciting agents, such as fear, anxiety, sudden fright, etc., are added he becomes a stutterer.

Kraepelin²¹ suggests that the psychic disturbances are two-fold—*expectation neurosis* and *anxiety*, the former of which causes the unconscious twitchings (impulses to activity) of the muscles of speech and the latter increases the stuttering because the fear of being laughed at, reproved or scorned increases the anxiety.

Scripture²² states in his "Stuttering and Lipping" that the most frequent cause of stuttering is a nervous shock. Severe falls are just as often the cause of the mental shock as are the ghost stories and other practical jokes, and with very young children, terrifying experiences, such as are found at amusement resorts. Then there is the mental contagion by intentional or unintentional imitation; the condition of exhaustion that follows after diseases such as whooping cough, scarlet fever, measles, etc., and a neuropathic disposition.

The analysis of our statistics of 200 stutterers makes us conclude that speech conflict is an etiological factor in stuttering. Our statistics, as given at the end of the article, show that among 171 male patients there were 33 whose stuttering was apparently brought about by speech conflict exclusively, while in four cases negligent lipping in their own language had previously existed. Among the 29 female patients there was only one to whom this cause could be attributed. The most striking feature concerning

these stutterers from speech conflict is the fact that their stuttering was acquired at the ages of 5-7 years. Only in one instance was this later; the age was 9 years and this was explained by the fact that the patient came from Russia at the age of 7 and was therefore only confronted with the problem of speech conflict at a later age than other children.

Sixteen children started stuttering at the age of 6; 17 at the age of 5 and four at the age of 7.

It is interesting to see in our statistics that the onset of stuttering, either psychic or organic, may be from the ages of 1-15, while the stuttering from speech conflict occurs only at the ages of 5-7.

Of the stutterers from speech conflict four had Italian parents and three German parents; in all other instances the mother language of the children was Yiddish, the parents being Russians or Austrians (2 cases).

We compare the speech conflict in foreigners to that disproportion between thinking and expressing orally that exists with young children in learning to talk in their own language. In the child's own language speech conflict is an etiological factor at the ages of 2-4, while in the foreigner we find this to be true at the ages of 5-7. At this age the foreign child enters kindergarten or primary school and is confronted, for the first time, with an exclusively English-speaking surrounding. Let us explain right here that we do not claim that *every* foreign child because of being confronted with the problem of learning a new language must stutter; likewise no one would expect that a native-born child would become a stutterer just because it has to go through the ataxic stages of speech utterance at the ages of 2-4. In both instances, of course, there must be besides the exciting cause of speech conflict, a basic predisposition of either hereditary or acquired nervousness.

The ancestors of the Russian Yiddish emigrant to this country were subjected to unusual nervous strains which will make themselves felt for generations to come. Just think, for instance, of the pogroms in which the nearest relatives of these emigrants were ruthlessly mutilated, wronged or killed; these very people themselves losing all their belongings and cast out to wander. Bear in mind also the fact that the Jewish nation, on account of its constant, nomadic social conditions, with the hard experiences of Ghetto life and the struggles against prejudices has developed a more highly nervous temperament to be handed down to the children of its race than that of other nations.

The children of these Yiddish emigrants to our shores speak, in their homes, a language whose very fundamental principles differ from English more widely than any other foreign tongue. What little English they hear from parents or relatives forms, to their minds, only another link in that conglomeration of jargon already known.

When these same children arrive at the school age and are sent out to meet those of their own age trying to learn a new language, they are confronted with almost the same problem as when they were first learning their own language, except that a new, more exciting conflict arises between thinking in Yiddish and expressing in English. Now the instructor, with the idea of correcting the faulty pronunciation of the Yiddish child who tries to speak English, demonstrates to him the different positions of the tongue, teeth, lips, etc., for the English consonants and vowels. In performing these acts the normal child will very likely be inclined to revert to that ataxic stage where only interrupted or repeated syllables were attempted; this interrupted form of speech, however, disappearing when the child has mastered the command of the motor organs of speech for the new language and when he becomes so familiar with the language that he is no longer required to translate his thoughts from the one to the other. But all of these preliminary stages for the child of a more or less nervous disposition work as a constant shock and may bring about the acts of real stuttering. And moreover, as Liebman very aptly puts it when describing the critical period of speech conflict in the child's mother language, the child is not only required to *increase* his vocabulary in a new language but is confronted with a new fear, that of speaking to a foreign teacher whose superiority appalls him. This often accounts for the disturbances of coördination in speech, which show themselves in the hesitation of the foreign child, sometimes on account of not quite understanding the question and often on account of having to translate his answers before expressing them, causing him to give confused replies and all of this heightened by his timidity before the teacher or the fear of the other pupils' ridicule. At home, again, his mind is kept in constant conflict because of his reverting from the English of school and his new companions back into the Yiddish of his parents.

Our hypothesis that speech conflict is an important cause of stuttering in cosmopolitan cities does not contradict any of the

above mentioned theories. We do not claim that this so-called speech conflict will cause an entirely normal child to stutter, but we consider it rather the exciting cause to a child so predisposed. We may, of course, with Makuen assume that these children have inherited or acquired organic or functional disturbances of the central organs of speech which a speech conflict will be liable to unbalance. We also believe with Gutzmann that speech conflict in itself would not produce stuttering unless the child had a rather labile temperament.

Blume's theory that the disparity between the thinking process and the mechanical expression of the same causes stuttering quite fits with our theory of speech conflict for, as we have already said, here the child of 5-7 in grasping the new language is at the very same stage as the child of 2-3 who is attempting to grasp its own language.

We may compare the child's first trials in the foreign language with the ataxic speech (Hüpfner) of the normal child who, on becoming conscious of this hesitating method of expressing himself, often becomes a stutterer.

Nadoleczny shows us that the intention of overcoming this discrepancy between the word pictures and the mechanical expressions of them leads to repetition of syllables in even normal children and to stuttering in neuropathically disposed children. Here we have to deal not only with the conflict of speech in the Yiddish child but also with that of the conflict of language. When a nervous, predisposed child tries to overcome this double conflict stuttering is liable to be brought about.

We also assume, with Kraepelin, that the speech conflict is responsible for an anxiety neurosis which, of itself, may lead to compulsory movements of the articulatory organs such as met with in stuttering. And again, with Kussmaul, we agree that this constant conflict between thinking in the old and expressing in the new language may cause a chronic irritation and a consequent weakening of the syllabary coördination apparatus.

In the stutterer from speech conflict the will power is bounded by doubt (Winekin). In predisposed cases the *nerve* exerting speech conflict, with its constant changes of thought and word expression from one language to the other—at home on the one hand and in school on the other—produces a regular coördination neurosis (Rosenthal-Benedikt), that may also be called a localized anxiety neurosis (Schrank).

This speech conflict will also cause stuttering in those children who, according to Laube, have been slow in developing speech or have been afflicted with the interrupted speech before mentioned.

With Liebman we consider the nervous predisposition of the child a basic factor. The same disparity in percentage of male and female stutterers holds good for this matter of speech conflict; by their greater lingual dexterity and earlier development of most of the faculties females overcome more readily the difficulties of language. Where their ataxic articulatory movements in early speech development may occur but do not last very long, the male with the same trouble may become a stutterer.

CONCLUSION

I. In 38 cases out of 200 stutterers examined the etiological factor is proven to be a conflict between the mother tongue at home and English to be learned in school. This speech conflict as an etiological factor in stuttering is almost exclusively met with in the Yiddish child and particularly in the male sex.

II. Those foreign children who, during their first three years in school, show great difficulty in mastering the English language and reveal such symptoms as hesitation, repetition of syllables, etc., should be sent to a speech clinic for careful examination and correction of the defects which, if neglected, may lead to distressing stuttering. Teachers, themselves, should have a fair knowledge of the disturbances of speech in order to understand that critical period when speech conflict is apt to produce an unfavorable result in the child's speech. Great care should be taken by the teachers to avoid any steps in their work that might in any way produce fear in the child; love, sympathy, indulgence and patience should fill the hours of labor with these little pieces of humanity that have been battered and knocked about by this struggle for existence under such trying circumstances.

III. It would be well if those children who show the disturbances of this speech conflict could be instructed in special classes in the schools, so that children not thus afflicted would not be disturbed by psychic infection.

We wish to express our heartiest thanks to Professor Starr for his kind cooperation in transferring to us the material and in putting at our disposal apparatus with which we are enabled to carry out our investigations.

(To be continued)

Society Proceedings

AMERICAN NEUROLOGICAL ASSOCIATION

FORTY-FIRST ANNUAL MEETING, HELD IN NEW YORK CITY, MAY
6, 7 AND 8, 1915

The President, DR. GEORGE W. JACOBY, in the Chair

(Continued from vol. 42, page 827)

THE DEVELOPMENT AND OPERATION OF THE LAWS FOR HOSPITAL OBSERVATION OF CASES OF ALLEGED MENTAL DISEASE OR DEFECT IN MASSACHUSETTS

By Henry R. Stedman, M.D.

Wide scope of Massachusetts laws. The provision a very useful one. Advantageous in non-criminal as well as criminal cases. Steady increase in such commitments. Opinions of committing magistrates and superintendents of hospitals. Distinction from temporary-care acts. Greatly increased facility for accurate study of obscure cases, unbiased opinions and saving of expense to state the chief advantages.

Dr. H. W. Mitchell, Warren, Pa., said he did not wish to be considered as holding any brief for the commitment of persons committing crime, and subsequently pleading insanity as a defense, nor did he wish to intimate that the decision of the question involved could be better determined by the resident physicians of insane hospitals than by others. He desired to confine his discussion to the methods employed, and not to the personal equation of the physicians. For some years he had had personal familiarity with the operation of the so-called "observation laws" operative in the states of Vermont, Maine, and Massachusetts, together with some experiences in Pennsylvania, where law of this character was not on the statute books, but where by tacit approval of attorneys and court, the principle involved had been put into application in several instances. He wished to mention particularly the operation of the law in the state of Maine, where for several years as superintendent of a state hospital, he had had official connection with the workings of the law which provided that all persons pleading insanity as a defense of crime committed, must be sent to a state hospital for the insane for observation and detention upon order of court.

The period of detention was variable and could be determined at each term of criminal court, to which the superintendent was expected to make report as to whether or not it was necessary to keep the alleged insane person longer for purpose of observation before forming opinion as to the person's mental capacity. A tentative opinion would be presented to the court, and the physician could be summoned by either side desiring his testimony. This arrangement was inexpensive to the commonwealth, was not prejudicial to the interests of the alleged insane person, but did offer exceptional opportunities for ascertaining the exact mental condition of the person in question, and allowed full opportunity for the examination and observation that is required to form the basis of a positive opinion.

One who has been obliged to visit a jail, or have short interviews with the alleged insane, often interrupted by others present, who may, or may not, wish to have the truth ascertained, need only recall such experiences to form an opinion as to the comparative advantages of the observation law in permitting competent examination. In the speaker's personal experiences with many cases in which the medical testimony had been based upon the hospital observation, there had been no ground for the oft repeated criticism of the character of the medical testimony, as evidenced in many notorious trials, and he believed that the method discussed by Dr. Stedman offered more relief than any other from the criticism, sometimes just, sometimes unjust, that has been current concerning the testimony of psychiatrists.

In conclusion, Dr. Mitchell wished to emphasize the protection which would be furnished to the good repute of the family, and of the person whose first offense was the result of insanity, by a more liberal application of the observation plan in instances of persons whose mental condition might properly be questioned, and he cited instances where several persons suffering from general paralysis, previously of good character, had been passed through the courts, and committed as criminals, only to be transferred soon to hospitals for the insane. A competent observation law generally enforced, would protect the family and the reputation of the individual in question from the stigma of criminality, and would conserve the interests of the community. He most heartily favored a general application of the observation law, and Dr. Stedman's endorsement of the same.

Dr. E. E. Southard could only corroborate what Dr. Stedman had said about this group of cases. He would like to add, however, that the Industrial Accident Board had sent to the Psychopathic Hospital a considerable number of very interesting traumatic psychoses. He thought that it was the first time in Massachusetts at least that traumatic psychoses had had an entirely unprejudiced study since heretofore these cases had been subject to partisan examinations from the standpoint of either the plaintiff or the defendant or both.

A number of Psychopathic Hospital cases had astounded the lawyers of both sides when it had been shown by Psychopathic Hospital officers that the patient seemed to be both simulating and mentally diseased (in this connection Dr. Southard wished to call especial attention to Professor Martin's test for the sensory threshold of faradism in the traumatic psychoses and in so-called occupation neuroses. Traces of disease could be found by the Martin method which were apparently not accessible to any other method). Fortunately the seven-day temporary care period has now been altered to ten days.

Dr. Morton Prince said he was a member of a committee of the Institute of Criminal Law and Criminology which was appointed to report a bill to regulate expert testimony. The committee consisted of lawyers and physicians. The former were Edwin R. Keedy (professor of law, Northwestern University), William E. McKell (Dean of the law school of the University of Pennsylvania), and Albert G. Barnes (Judge of the Superior Court at Chicago). The latter were Adolf Meyer, Harold N. Moyer, W. A. White, and Morton Prince, all members of this Association.

The present report relates particularly in one respect—as showing an attempt on the part of the legal profession and the medical profession to cooperate. The Institute of Criminal Law and Criminology had had the problem of expert testimony under consideration for about two years and had studied it in all its phases. Its committee has finally drawn up a bill which has been adopted by the Institute after prolonged

consideration and discussion and after being submitted to the criticism of members of the bar pretty widely. It has been submitted to the criticism of the New York Bar Association and other criticisms have been taken into consideration. The bill as finally adopted it is hoped will satisfactorily solve the problem and will serve as a sort of model bill to be introduced in the legislatures of the various states. It is therefore hoped that if it works satisfactorily it will be generally adopted.

At any rate it represents an attempt on the part of the two professions to get together and reconcile their differences and difficulties. This at least is a gain and all of us hope that eventually something will be done to reform present methods. In Massachusetts there has been a great deal of antagonism between the views of the members of the bar and those of the medical profession, and this is probably true in all of the states.

Dr. Prince thought the bill recommended by the Institute of Criminal Law and Criminology deserves serious consideration on the part of this Association and hoped that it will be carefully studied and if it meets with the approval of the members of this Association that they will give it their support.

The essential points of the bill are: (1) A provision for the appointment of "disinterested qualified experts" by the court in addition to those employed by either party; (2) a provision for the examination in criminal cases of the accused by the expert witnesses for the prosecution; (3) a provision for the commitment of the accused in criminal cases to a hospital for observation subject to examination by all the experts on both sides; (4) a provision for written reports by all experts, and (5) a provision for consultation between all experts and a joint report if desired.

Dr. Walter Channing, Brookline, Mass., said in regard to the work of Dr. Stedman, that they feel in Massachusetts they owe a good deal to him for what he has done in improving the laws which were revised in 1909. These laws are more liberal, as far as admissions are concerned, than those of any other state, and the result of this is that patients are admitted at a very early period. If we did not have these laws, the Boston Psychopathic Hospital could not do a large part of its best work. Patients are received and discharged in rapid succession. Another indirect result is the increase in the out-patient clinic. Many cases which might go to the insane hospital a little later now go to the out-patient department. It seemed to Dr. Channing that it would be a great step in advance if the laws relating to insane hospitals should as far as possible be made uniform throughout the country, the best of them being selected from each state. He was sure that nothing could do more for the prevention of insanity. Until something of the sort is done, we shall go on with our present pernicious practice of admitting large numbers of persons who might at an earlier period have been treated outside.

PRELIMINARY REPORT ON THE TREATMENT OF PARESIS BY INJECTIONS OF SALVARSAN AND DEFINITE DOSES OF NEOSALVARSAN INTO THE LATERAL VENTRICLE

By Graeme M. Hammond, M.D., and Norman Sharp, M.D.

Selection of cases for operation. Cell count in the spinal and ventricular fluid before operation. Details of the operation. Injection into the ventricle of serum taken from salvarsanized blood. Injections with blood-serum treated with definite dosage of neosalvarsan. The immediate effect of the operation on the patient. The cell count in the spinal and ventricular fluid two weeks after operation. The later effect on the mental and physical symptoms.

A CASE OF WILSON'S DISEASE—PROGRESSIVE LENTICULAR DEGENERATION—WITH PATHOLOGICAL FINDINGS

By Frederick Tilney, M.D., and G. M. Mackenzle, M.D.

This case presented a typical syndrome of progressive lenticular degeneration, as described by Wilson. It ran a moderately acute course, terminating in death in fifteen months. The outstanding clinical features were the marked hypertonicity of the somatic musculature and the evidence of extreme toxicity. A preliminary report of the pathological findings in the brain is given and with this the histological findings of the spinal cord, liver, spleen, kidney, thymic remains, thyroid, heart, lungs and suprarenal bodies.

Dr. H. H. Hoppe, Cincinnati, said the subject of Wilson's disease in its strict sense seemed to him a closed chapter. He has a case in his service in Cincinnati which presents quite a number of the features of Wilson's disease. It varies from the type in respect to the age, this woman being probably 44 or 45 years of age. Also that instead of the hypertonicity being associated with a constant tremor, it is associated with constant athetoid movements. It is not typical of the movements of athetosis. The facial muscles as well as those of the tongue and neck are involved and are always in a state of hypertonicity and in constant motion. The arms and legs are constantly in a state of motion and the feet are inverted. The mouth is not held in the condition that has been seen here in the pictures, but it is possibly due to the fact that the woman's case has not advanced sufficiently. There are no pathological changes in the reflexes, excepting that they are increased. The woman's mental state is practically normal, excepting that she is always in a state of rather pleasant frame of mind. The other feature in the case that varies from Wilson's disease is the history that some years ago she had a similar attack and that there was a remission to a sufficient degree to allow her to go back to work. So that Dr. Hoppe has come to the conclusion that she has some extrapyramidal disease that is bilateral and possibly a type approaching Wilson's disease. The chief variation from the Wilson's disease is instead of there being a tremor in the extremities there is a constant athetoid movement of the extremities. There is no change in the size of the liver. There is no jaundice. There has never been any fever.

Dr. Mired Reginald Allen, Philadelphia, said he had read S. A. K. Wilson's two reports. Wilson has so limited the anatomic concept of his disease, and so exactly described what it is pathologically as well as clinically, that it would be very difficult to make a hard and fast diagnosis of uncomplicated Wilson's disease outside of the autopsy room. One might say that he considered a certain case to be Wilson's disease and then at autopsy might find, as has been found in a number of cases, the pyramidal tracts damaged by extension of the pathological process inward. This would vitiate the diagnosis of a pure uncomplicated Wilson's disease. So far as the age of the incidence of Wilson's disease is concerned the twelve or thirteen cases that he reports show great variation in age as also great variation in duration. Dr. Allen said he would like to report a rather interesting observation. Dr. Richard M. Pearce and he have tied off the bile-ducts in monkeys and rabbits and then in twenty-four to forty-eight hours have removed the greatly distended gall-bladder. The brain has then been removed and coronal sections 3 mm. in thickness through the lenticular region have been placed in this bile and kept forty-eight hours in a refrigerating chamber at a temperature varying between 1° and 2° C. They have found that the outer part of the lenticular nucleus stands out in marked contrast to any other nuclear structure or to the

cortex. The question naturally arises whether there be something in the liver condition which may possibly be the primary etiological factor in these cases and which liver abnormality may cause to be thrown into the circulation either an excess of a normal substance or a perverted secretion, which, coming in contact with the central nervous system, has a particular predilection to the outer part of the lenticular nucleus and stimulates in that structure this peculiar change.

Dr. Schwab said he wanted to call attention to the fact that a lesion of the lenticular nucleus of the extra-pyramidal system does not necessarily produce Wilson's disease. Two other facts are essential: one is cirrhosis of the liver and the other the non-participation of the blood vessels. In the pathological findings Wilson himself insists on these two facts and there is no doubt that there are any number of cases of lenticular disease produced by many kinds of lesion which do not in any sense conform to the clinical type which Wilson has so accurately described. A few years ago in conversation with Wilson he insisted that the lesion was not necessarily a lesion of the lenticular nucleus, but a result of some toxic process existing a long time before which produced the lesion of the liver and caused the symptoms with the non-participation of the blood vessels. There are numerous cases, for example of syphilitic processes, of the lenticular nucleus which produce the clinical picture of Wilson's disease which are not Wilson's disease.

Dr. Charles K. Mills, Philadelphia, said the case was well reported and illustrated and the paper was another valuable contribution to the study of what is properly called Wilson's Disease. What he particularly arose to say was rather along the lines of the last speaker. It seemed to Dr. Mills in the development of this whole subject that the difficulty was that of losing sight of the most important matter, namely, that lenticular disease assumed different forms. Our minds turn too exclusively to Wilson's cases and his symptom-complex resulting from lesions of the lentacula associated with the cirrhosis of the liver. What we really need is a rewriting of the whole subject of lenticular disease considered from the standpoint of the location and extent of the lesions in the lentacula or rather of striate disease from the standpoint of the location of lesions in the caudate or lenticular nucleus.

It comes out in the study of pure cases of lenticular disease what he had for a long time believed and taught, that the lenticular nucleus is an organ with important functions. It is also, Dr. Mills believed, an organ subdivided into functional areas. The important thing is to get clear light upon lenticular disease from the standpoint of the limitations and localizations of lesions. Dr. Mills had seen a considerable number of cases of lenticular disease, writing a paper on the subject with Dr. Spiller some years ago and being constantly alive to the interest and importance of the subject for more than twenty years.

It is true, as the last speaker said, that in part or almost in whole the symptoms of Wilson's disease can be seen in cases of syphilis of the nervous system. The case reported by Dr. Mills recently in a paper on bilateral caudato-lenticular degeneration in a case of syphilis was a striking illustration of this fact. The symptom picture developed in an adult progressively over a number of years, seven or eight in all, and was in its fullness the picture of the subacute infectious disease to which Wilson's name has properly been given. His own view was that the striatum is far from being a vestigial organ, as one of his distinguished friends in Philadelphia believes. He thought that cases with special symptoms and lesions differently but definitely located were proof of this contention.

The argument which was incidentally used by Dr. Allen and which has often been used in discussion of this subject, was of little weight when the cases were thoroughly studied. The fact that there may be pyramidal disease as well as lenticular disease in the same case had very little weight in Dr. Mill's judgment, although it has been much used by writers to show that an extrapyramidal symptomatology does not exist. It is the business of the focal diagnostician by his studies and opportunities at necropsies to separate the pyramidal and extrapyramidal symptomatology of these cases and usually this can be done.

Dr. J. Ramsay Hunt said the case that had just been reported was a very beautiful confirmation of Wilson's disease in the strict sense in which that term should be used. To Dr. Hunt one of the most interesting by-products of Wilson's paper was the relation of paralysis agitans and allied disorders to the lenticular nucleus. Last year, Dr. Hunt presented to this association a paper on Juvenile Paralysis Agitans which resembled very closely the descriptions of Wilson's disease. It differed, however, in the chronicity of the cases and the very slow and progressive course. It was really like that of paralysis agitans only beginning in child life. Since then an autopsy on one of the cases showed no signs of cirrhosis of the liver, and no macroscopic evidences of lenticular degeneration. Dr. Hunt asked whether the clinical picture at all suggested the neurological picture of Parkinson's disease, apart from the question of temperature and toxæmia which were present. Did the rigidity and tremor which were present suggest to him the familiar muscular conditions of Parkinson's disease? Sanderson reported not long ago a case which was similar to Dr. Hunt's which was also seen by Dr. Wilson and they regarded it as perhaps allied to lenticular degeneration. Dr. Hoppe's case as he described it suggested rather the type which was described by Oppenheim and Vogt and which was associated with a marbled appearance of the outer portion of the lenticular nucleus.

Dr. Archibald Church, Chicago, said the necessity of autopsical research was impressed upon him by a case a year ago in St. Luke's Hospital. A young man of nineteen years had gradually gotten into the condition and presented the postures and clinical aspect described by Wilson. The case corresponded to his clinical outlines, with the exception that the reflexes were decidedly brisk, so that at times a clonus seemed imminent but never occurred. Careful examination was made of the liver by the usual clinical methods in which matter he had the help of Dr. Arthur Elliott, who made a number of tests of liver function. They are not very delicate, still they were carried out in a great deal of detail and persistence and gave them no evidence of any liver involvement, nor could the liver be palpated or otherwise distinguished as abnormal. The young man is still alive, so the absolute diagnosis is lacking. One or two other peculiarities in the case mentioned, that is the tremor, was not so constant, only occurring on passive or voluntary activity of the extremities. The open mouth occurred only when the patient indulged in some emotional expression, when his mouth opened and remained that way for ten or twenty minutes. Dr. Church believed that Wilson's disease of the original type probably does not cover all cases assignable to the same group.

Dr. Frank T. Patrick, Chicago, said one of the cases came to autopsy and most of the case, exception was taken at the time of presentation to paralysis. A few weeks later a friend of Dr. Patrick who presented the case in the center said in relating his case a friend of his suggested it might possibly be a case of Wilson's disease. He sent after this patient to come in to the city and he was repeatedly examined and diagnosis made and autopsy and the true disease found. So in that case the picture of paralysis was correct.

Dr. Tilney, in closing, said that the tremor was definitely of the agitanus type, although there were other adventitious movements in the active voluntary motions very similar to chorea. Dr. Tilney said he could readily see how Gowers called his cases tetanoid chorea. The movements, however, are of the agitanus type, except that they were increased on voluntary motion.

HISTOPATHOLOGICAL FINDINGS IN A CASE OF LANDRY'S PARALYSIS; DEMONSTRATED BY LANTERN SLIDES AND MICROPHOTOGRAPHS

By E. D. Fisher, M.D.

Points for discussion: (a) Differentiation from poliomyelitis; (b) Does the clinical history confirm the diagnosis? (c) Unclassified microorganisms as etiological factors in meningeal and parenchymatous diseases of the nervous system.

Dr. Carl D. Camp, Ann Arbor, Mich., stated that some time ago he reported a case of acute unilateral ascending paralysis which came to necropsy and there were found in the peripheral nerves very much the same degenerative changes that were described here. At that time he also noted the abnormality of the anterior horn cells and regarded it as a secondary phenomenon to the changes in the nerve.

Dr. E. E. Southard, Boston, thought the changes in the cases were peripheral and not central. His late colleague, Dr. Emma Mooers, had found neuritis in a monkey *B* infected from a characteristically poliomyelitic monkey *A*. Material from monkey *B* had produced a characteristic poliomyelitis in monkey *C*. Monkey *B*, however, had, after elaborate study, demonstrated only neuritis and no central changes whatever. Dr. Mooers's work had accordingly brought proof that there might be a true neuritic form of the disease called poliomyelitis.

Dr. Sidney I. Schwab, St. Louis, asked whether the possibility of the neuritis being of bulbar type was considered. Lately in the St. Lou's Children's Hospital they have had such an instance in which the bulbar type was so acute that the process was very similar to the type of paralysis Dr. Fisher described.

Dr. Israel Strauss, New York, considered that Dr. Fisher had thought this a case of Landry's paralysis. Of course we are all aware that cases of Landry's paralysis occur in which no pathological lesion had been discovered. But in the case presented by Dr. Fisher Dr. Strauss thought we must bear in mind the fact that in the epidemics of poliomyelitis we have had cases which presented the symptoms of polynneuritis. In fact that type is being recognized to-day as a distinct class, in which the virus affects the peripheral nerves more than it does the central nervous system. We have even found in typical poliomyelitis a certain amount of degeneration in the peripheral nerves. From the lantern slides Dr. Strauss admitted that the histological appearance of the sections of the cord were not altogether typical of poliomyelitis.

There is, however, only one proof available for deciding whether this case is poliomyelitis or not. The microscopical is not the test. The only positive method is the intracerebral inoculation of a cord emulsion into the monkey. Dr. Strauss does not believe there is any other method by which this question could be solved.

Dr. Singer said he would like to call attention to the close similarity in the picture of the findings in the central nervous system with those of central neuritis. They correspond closely with the changes found in pellagra, in

some cases of alcoholism and in other intoxications. The chronic interstitial changes with well-formed fibrous tissue shown in the sciatic nerve, as it would seem to him, could hardly have been due to an inflammation present only six weeks.

Dr. Fisher, in closing, said in regard to the question of diphtheria that was thoroughly investigated and nothing of that kind found. Every possible examination was made. Wassermann reactions were carefully carried out by the health department and in their own laboratory. Cultures were tried and found negative. As far as the history of the case was concerned the boy was perfectly well up to about six weeks before his death. He complained of a little weakness. He was a very active boy, a messenger boy, and rode a bicycle in his business. It does not look as if he had much neuritis at any time previous to their observation. They can exclude anything like chronic neuritis as far as clinical symptoms are concerned. It appeared like an ordinary case of polyneuritis. It pursued the usual course described in Landry's paralysis. Later the upper extremities were affected. There was marked atrophy of the hands. Then difficulty in swallowing and ocular palsy occurred. The patient almost died at one time from difficulty of respiration, and twenty-four hours later died from respiratory failure. In regard to the microscopical findings Dr. Fisher said he would leave it for Dr. Neustaedter to make reply to the questions put. These specimens have been examined by Dr. Dunklap, Dr. Flexner and others, who excluded poliomyelitis. It might have been a primary neuritis with ascending changes passing into the central nervous system.

Dr. Neustaedter said he would take exception to the diagnosis of poliomyelitis. When the type is slow and begins in the nervous structures, there is set up an entirely different picture in the anterior horn. There is much perivascular infiltration and pericellular infiltration. If this were a case of poliomyelitis Dr. Neustaedter would expect these characteristics, and the lesions should have led to the patient's death much earlier.

OBSERVATIONS ON HEREDITARY SYPHILIS AFFECTING THE NERVOUS SYSTEM

By Carl D. Camp, M.D.

Varying clinical types of hereditary syphilis affecting the nervous system. Methods of diagnosis. Relations of hereditary syphilis to the psychoneuroses.

Dr. William W. Graves, St. Louis, said that an individual who did not present the generally recognized signs of congenital syphilis, such as Hutchinson's teeth, interstitial keratitis, etc., the possibility of syphilis in him was too often excluded. In his experience, congenital syphilis alone was not a frequent factor in the causation of the epilepsies; neither was it a frequent factor in those cases we call reblemmed. The chief mental characteristic which he had found in congenital syphilitics was precocity. The main physical characteristic of the congenital syphilitic is deviation from parental types. The parents and other ascendants should be used as standards in our studies and if they fall on the wrong side we cannot fail to be impressed with the deviating characteristics of the progeny of syphilitic parents. One needs only to study congenital and other parents, tubercle and other known to be syphilitics in comparative anthropological and clinical way and he will soon learn the great value of such studies in the recognition of syphilitic progeny and syphilitic ascendants. Hebb's parents, as a rule, beget a healthy progeny. Remembering the fact that we find gross deviations in all of the progeny when these are compared with the parents, we should seriously consider the possibility that syphilis in the parents has been responsible for the deviations,

Hence it is that family studies will enlarge our horizon in the recognition of congenital syphilitics.

Dr. Carl D. Camp, Ann Arbor, wished to emphasize the point that the negative Wassermann reaction on the blood of the parents is not a sufficient evidence of the absence of syphilis of the child.

Dr. Hugh T. Patrick, Chicago, asked whether in any of these cases of hereditary syphilis Dr. Camp had had a negative reaction on the blood and a positive reaction on the spinal fluid.

CIRCUMSCRIBED PURULENT MENINGITIS LIMITED TO FRONTAL LOBE; DUE TO SINUSITIS

By Samuel Leopold, M.D.

Reports of two cases with necropsy. Unusual limitation of lesion. Study of the physical signs. Advisability of early operation.

Dr. Southard, Boston, said he had never been able to parallel the results of meningitis in human cases with experimental meningitis in the guinea-pig. He had tried to bring evidence from human cases of different degrees of resistance to infection on the part of various loci in the meninges. His colleague, Dr. Solomon, at the Psychopathic Hospital, had recently done work with the Lange gold sol test in postmortem cases, showing a chemical differentiation in the different parts of the cerebrospinal fluid system.¹ For instance, the ventricular fluid had had a different gold sol index from the subial fluid and again from the spinal fluid.

Dr. Carl D. Camp, Ann Arbor, said in a case which was found, at necropsy, to be an acute meningitis covering the frontal lobe due to extension of the infection from ethmoidal sinusitis there was, as a symptom, an oval swelling of the scalp in the median line. This was due, apparently, to a thrombosis of the superior longitudinal sinus. In this case the meningitis was acute, the patient dying in twenty-four hours.

Dr. S. Leopold, in closing, said a lumbar puncture was only made in the second case. The first case was moribund, a boy of 14, who died two hours after Dr. Leopold saw him. In the second case a lumbar puncture showed the absence of tubercle bacillus and a differential of the blood showed the presence of 89 per cent. polynuclears.

Dr. H. H. Hoppe, Cincinnati, said this subject was one of intense interest in a practical way. In the first place when we see these cases of localized meningitis it is impossible to tell what form clinically the meningitis is going to take. He called attention to acute mastoid disease in young children and the rather quick development of the facial paralysis and sixth nerve disease. In all of those cases it was a question as to whether or not we are going to advise some operative interference for the relief of the brain condition. Two weeks ago Dr. Hoppe was asked to see a case of rather sudden development of brain symptoms. The woman had acute headache on the right side, persistent vomiting, pulse below 60, very little fever and a history of ethmoid cell involvement suggested by the discharge of pus from the posterior nares. The case was so threatening that he took the young woman in his own car to Cincinnati and placed her in a hospital for nose and throat cases, thinking that some very quick operative interference might be necessary. The only objective signs were dropping of the right eyelid and a congestion of the right papilla. There was found very acute swelling of the middle turbinate bone on the right side. This was operated on the same day with quick relief of the general symptoms. The headache improved, the vomiting ceased and

¹ Boston Medical and Surgical Journal, Vol. CLXXI, No. 24, December 10, 1914.

the patient felt very much more comfortable. The operation on the middle turbinate was followed by secondary swelling and after twenty-four to thirty-six hours the symptoms returned. With subsidence of the swelling the symptoms disappeared, but returned after eight or ten days and when Dr. Hoppe left Cincinnati that was the condition of the case. The case is a very practical one. What are we going to do for these cases? This woman evidently has a localized meningitis somewhere on the surface of the right frontal lobe. Are we going to open up at once or give an abscess a chance to form? The x-ray examination was absolutely negative.

MENINGITIS SYMPATHICA

By Israel Strauss, M.D.

Occurrence in otitis media, mastoiditis, inflammatory sinus thrombosis, suppuration of the accessory sinuses of the cranium and brain abscess.

Character of the changes in the cerebrospinal fluid. Aseptic character of the fluid. Importance from a diagnostic and prognostic standpoint.

Differential diagnosis from meningitis infectiosa circumscripta and meningitis infectiosa universalis.

A CASE OF CENTRAL AND PERIPHERAL NEUROFIBROMATOSIS (VON RECKLINGHAUSEN'S DISEASE)

By Peter Bassoe, M.D., and Frank Nuzum, M.D.

Case of a boy 15 years old at death. From age of four years attacks once a year, lasting two weeks to three months, of pain in back near right scapula. Dragging of left foot noted after first attack. At ten years had eight eye muscle operations. Lump on left side of neck noted three years before death, a pelvic tumor three months before death. Findings on examination suggested basal brain tumor and cord tumor. Several subcutaneous nodules led to correct clinical diagnosis.

Necropsy: Large neurofibromata in both cerebello-pontile angles. Large tumor of cauda equina. Numerous small tumors on various cranial and spinal nerves, also tumors on nerve roots, in places invading the cord. Large tumor outside rectum.

A FREQUENCY LIST OF MENTAL SYMPTOMS FOUND IN 17,000 INSTITUTIONAL PSYCHOPATHIC SUBJECTS (DANVERS STATE HOSPITAL, MASSACHUSETTS)

By E. E. Southard, M.D.

The reader discusses briefly the findings of the Index Catalogue of symptoms established by Dr. Charles Whitney Page at the Danvers State Hospital. Comparisons are drawn between the frequencies in the whole series and in certain constituent series, notably a series of 100 autopsied cases, which series has again been split into a "normal-looking brain" series and a series with gross organic brain lesions. Special attention is drawn to the imprecision of the term "dementia."

Dr. Singer, and the paper was an extremely interesting one from many points of view. He did not quite understand the method under which this work was done. It apparently included all cases which had been committed to the hospital since its origin. Dr. Singer asked whether any particular definition of the term dementia was agreed on before this investigation was

begun, and especially whether it was that definition suggested by Dr. Southard. Dr. Singer was in accord with Dr. Southard as to the difficulty in drawing a conclusion from old records. It would be interesting to know whether the cases of more severe dementia would not show the greater histological changes even if they did not show gross change in the cortex as Dr. Southard seemed to claim.

Dr. Southard confirmed remarks concerning the difficulty of making the diagnosis, dementia. Dementia is probably to be best regarded as the syndrome and not as a symptom. Even the modern hospital records were inadequate in the matter of dementia. Dr. Southard felt that most dementias were either amnesias or attention disorders, or combinations of the two. He further commented on the errors in the catalogue method. He thought the *order* of frequency was of more significance than the absolute numerical frequency of the symptoms.

THE PHILADELPHIA NEUROLOGICAL SOCIETY

APRIL 23, 1915

The President, DR. S. D. W. LUDLUM, in the Chair

CEREBELLAR DIPLEGIA

By Williams B. Cadwalader, M.D.

John S., 4½ years old, was first seen in March, 1915, at the Orthopedic Hospital and Infirmary for Nervous Diseases. He was the second child, one older brother and one younger sister being healthy. His parents were healthy and stated that he had been born at the full term without complications, but had developed slowly, both mentally and physically. He was nearly one year old before he could sit up, and at that time his parents first noticed that his hands "trembled." He has not yet learned to stand, because of great unsteadiness of his legs and trunk.

On examination the child was found to be well formed and nourished. He could not stand and support his weight on the legs without assistance, because of severe incoordination. When steadied by the examiner holding both the patient's hands and he attempted to walk, the legs were thrown about in a wildly ataxic manner. On voluntary movement of the upper extremities there was a marked intension tremor. Muscular power of all the extremities was normal and equal, but there was extreme hypotonus of all the muscles. The tendon reflexes were equal and active. The cranial nerves were normal. His eyes were normal except for concomitant squint. Articulation was very indistinct and his mentality was below normal.

Occasionally he has vomited for no apparent reason. His parents said that he had had two attacks in which consciousness seemed to have been disturbed but not entirely lost, yet their description was too vague to decide whether or not he had had any convulsive movements.

The most striking features of this case were marked hypotonus, asynergia, ataxia, disordered phonation and articulation, titubation, attacks of causeless vomiting, seizures of unknown character, normal tendon reflexes, marked mental impairment, probably congenital in origin and caused by defect of development of the cerebellum.

ARTERIOSCLEROSIS WITH SYMPTOMS RESEMBLING PSEUDO-BULBAR PALSY OF GRADUAL ONSET

By George E. Price, M.D.

John McB., age 62 years, laborer by occupation; birthplace Pennsylvania.

His family history was excellent, both parents living to be over seventy. Five sisters and two brothers are living and in good health, one sister died at the age of 33 years and one brother was killed when 23.

The past medical history is uneventful. He had the usual diseases of childhood, but no other illness. Venereal infection was denied, but when younger he used alcohol to a considerable extent.

The history of his present condition is as follows: Five years ago he experienced some difficulty in walking. His legs seemed weak and he had a dull aching in his back and lower extremities. Next he noticed a staggering in his gait and also commenced to have difficulty with his speech. All these symptoms gradually increased up to the present time and in addition he has some difficulty in swallowing. There is also dribbling of urine. He further complains of occasional headache and more or less constant dizziness, the latter being accentuated when he stoops.

Upon examination the gait was found to be both spastic and ataxic. Romberg sign was marked. The pupils were small, equal and reacted sluggishly to light and accommodation. There was marked arcus senilis and occasional slight nystagmoid movements upon lateral excursions of the eyeballs. No external ophthalmoplegia.

The speech was thick and drawling, resembling that of pseudobulbar palsy. The tongue was protruded in the mid line without difficulty. The musculature of the face was normal. No cranial nerve involvement. There was ataxia of both upper and lower extremities, but no adiadochokinesis. The reflexes were preserved, the patella tendon reflexes being increased. There was no ankle clonus, but Babinski's sign was present on both sides. Sensation was normal; there was no astereognosis. There was no muscular wasting.

The lungs were negative. There were no cardiac murmurs, but the first sound of the heart was diminished, the muscle tone being decreased. The pulse rate was slow, the radials being much thickened.

Blood pressure (seated) systolic 150; diastolic 120.

An eye examination by Dr. Kammerly was as follows: Media clear; optic discs normal; retina normal. Veins in both eyes full, showing sluggish return circulation.

Urine: pH : Acid reaction; specific gravity 1.021; no sugar, no albumen. Few leucocytes, few epithelial cells. No casts.

A Wassermann examination of the blood and spinal fluid was negative.

Diagnosis: The absence of specific history and the negative Wassermann report would exclude multiple syphilis.

The age of the patient and the absence of optic atrophy would be opposed to multiple sclerosis. There was no intention tremor and the speech was not scanning, but thick and drawling.

The age of the patient and the cardiovascular condition point toward progressive degenerative changes in both hemispheres secondary to arteriosclerosis or to multiple sclerosis, with probable similar changes in the spinal cord.

Dr. C. M. Berry said this case was especially interesting to him since he had been studying some specimens some time ago in Dr. Spiller's laboratory of what was diagnosed as a case of cerebral arterial sclerosis. The patient was considered a competent man, among them Dr. Spiller, and the case was diagnosed as cerebral arterio-sclerosis. He had the typical

gait with short steps. The patient had hemiplegia with some mental changes. At autopsy no gross changes were found in the cerebral vessels. For that reason Dr. Spiller was kind enough to let Dr. Byrnes have the brain to study in more detail. About 200 sections were made of the brain. Nowhere was there even in the cortical vessels any gross changes. There was, however, a moderate round cell infiltration, particularly about the left chiasm, about the anterior surface, and about the cerebellum. The round cell infiltration suggested luetic infection. He had marked nephritis. The question arises whether a condition simulating arteriosclerosis can be due to a toxic state. Dr. Byrnes saw a case in Washington, in which was a nervous condition supposed to be caused by infection. There was no history of lues, but the patient had chronic appendicitis. Strange to say after appendectomy the condition entirely disappeared. Undoubtedly toxic states can produce these definite changes. Other cases have been described by neurologists.

FAMILIAL MYOCLONUS

By John H. W. Rhein, M.D.

The patients were two brothers, in whose family two other members, a sister and a brother, were similarly affected. The patients were 37 and 39 years of age, respectively. In the case of Marion, aged 39, the symptoms began at 12 years of age and in Robert, aged 37, they began at 12 years of age. In both cases the disease began with a tremor of the right hand extending to the right leg and head and then to the left arm and leg. Robert has not been able to walk for several months on account of the violence of the movement when he attempts to walk and on account of some weakness not true paralysis in the legs. The movements are the same in both cases and consist of to and fro movements of the arm and hand, rotary movements of the head, the head turning to the right, the muscles of the trunk causing jerking back of the shoulders and a rotary movement of the trunk. The legs are affected to a less degree, more in Robert than in Marion. The tremor practically affected the entire musculature but was more apparent in the right arm, neck muscles, trunk and left arm. The movements are mild during rest and become very greatly exaggerated upon emotional disturbances and upon voluntary effort. In the case of Robert there had been contractures in the knee joint which were broken up under ether and did not return. The tendon of the quadriceps femoris was probably cut also.

There was no spasticity of the knees although there was some slight rigidity apparent at times in the case of Marion. There were no contractures except of the tendon Achilles on one side, the right in the case of Robert and the left in the case of Marion. The knee jerks were large and equal on both sides in the case of Robert and slight and equal in the case of Marion. There was no Babinski phenomenon or ankle clonus in either case. There was no nystagmus or extra-ocular paralysis and the pupils responded normally. There were no sensory disturbances.

In the case of Robert the tongue was pushed slightly to the left and was the seat of a tremor. The jaw muscles were affected in both cases. Both calf muscles were atrophied in the case of Marion and the left thigh and leg in the case of Robert. The mental condition of these patients was good. There was some difficulty in speech, consisting of a jerky articulation. There was no true dysarthria or dysphasia. There was no dysmetria, dyssynergia, or adiadochokinesia.

The family history is as follows: The maternal grandfather died of apoplexy and the maternal grandmother of cirrhosis of the liver and senility. The paternal grandparents died of unknown causes in middle

life. One maternal aunt died at childbirth and one maternal aunt and two uncles were living and well.

There were no paternal aunts or uncles. Their father died of apoplexy and their mother of dropsy, having had intermittent attacks of melancholia. There is no history of nervous disease in the mother's or father's family.

One brother died at birth and another of diphtheria. There were another brother and one sister who were affected with the same disease.

The diagnosis in these cases is not clear. At first sight a diagnosis of paranyctonus multiplex was suggested, but in this disease voluntary acts quiet the spasm and in these cases the reverse is true.

Unverricht has described a familial form of this disease associated with epilepsy. There was an absence of any history of the latter in these cases.

The absence of hypotonia, dyssynergia, dysmetria and adiadochokinesis take these cases out of the category of those described by Hunt under the title of dyssynergia cerebellaris progressiva. These cases above described resemble to a certain extent progressive lenticular degeneration or Westphal's pseudosclerosis. The absence of pronounced contractures and spasticity, and the duration of the disease is against the diagnosis of the former; while the lacking of dementia which is looked upon as characteristic of pseudosclerosis by many is against the diagnosis of the latter.

The cause of the symptoms in these cases is extrapyramidal as there were no exaggerated reflexes and the Babinski phenomenon was absent. It is not improbable that the lenticular nuclei are the seat of the lesion in these cases.

Dr. William G. Spiller said he thought, with Dr. Cadwalader, that these cases should be placed in the pseudosclerosis class. The pseudosclerosis is a condition concerning which we are learning much. It seems to be a lenticular degeneration with changes in the cortex from autopsies obtained. Dr. Rhein spoke of absence of mental disturbance. It is true in most of the cases of pseudosclerosis there has been mental disturbance. Dr. Spiller thought those who state that there must be mental disturbance in pseudosclerosis are going further than facts justify. Recent work has demonstrated that pigmentation of the cornea and of the liver is a part of pseudosclerosis. He did not know whether Dr. Rhein found anything of that kind in his cases. Dr. Spiller said the cases of pseudosclerosis he had reported at a previous meeting were in one family.

Dr. Charles K. Mills said the case presented looked in many respects like one of some form of lenticular disease. It would be remembered, however, that the speaker believed we have a cortico-striate or strio-cortical apparatus concerned with tonic and it seemed to him that a cortical sclerosis, peculiarly situated might, as might also a lenticular sclerosis, give the symptomatology exhibited by the patient who has no sensory symptom, and he believed no marked motor paralysis. A peculiar tremor seem to be the most striking phenomenon in the case, without abnormal reflexes. We might have a lenticular or cortical affection without any marked mental reduction, or at least not any more decided than is present in some cases of lenticular disease.

Dr. Cadwalader said that he had presented the first case just shown by Dr. Rhein before this Society in December, 1912, and it was recorded in the proceedings under the title of "Pseudosclerosis." Dr. Cadwalader referred at that time to certain similarities which it bore to Wilson's progressive lenticular degeneration.

In October of 1914 he had reported this case together with another in the Journal of the American Medical Association as one of Wilson's

lenticular degeneration, and he still believes that it belongs to this general group.

The difference between pseudosclerosis and lenticular degeneration on clinical grounds is by no means clear. Dr. Cadwalader could not agree with Dr. Rhein in regard to his statement that his patients did not have spasticity. It is by no means marked, but is, in Dr. Cadwalader's opinion, perfectly distinct. The term "spasticity" perhaps is not a good one; "rigidity" might be better.

Strümpell has pointed out that the degree of spasticity is greater in Wilson's disease than in pseudosclerosis, and considers this one of the distinguishing features. Cases have been reported with autopsy by German authors, in which lesions similar to those of pseudosclerosis were found in the cerebellum, cerebral cortex and different parts of the basal ganglia. In one of these cases the alterations of the neuroglia tissue were more marked in the lenticular nucleus than in other parts of the brain. It may be that spasticity is more pronounced when the alterations are greater in this region. It seemed to Dr. Cadwalader that Wilson's progressive lenticular degeneration and pseudosclerosis must be grouped together and considered as modified types of the same general disease. It is true that this point of view may appear to be somewhat premature, nevertheless, recent investigations would seem to indicate that this will ultimately prove to be correct.

Dr. Charles K. Mills said he would like to say an additional word regarding the term tonicities which was called out by what Dr. Cadwalader had said about the remarks of Dr. Rhein. The cases of Wilson's disease, so-called, after all only represent one type of acute or subacute disease of the lenticula associated with disease of the liver. Most of the symptoms present are due to aberrant muscular tonicity. The tremor in one of these cases seemed to Dr. Mills—unless it is simply an asynergy of cerebellar origin and of course he did not think it was this—the peculiarity of speech in another of the cases and most of the symptoms presented belonged with symptoms which come under the general head of aberrant muscular tonicity. We confine our discussions and descriptions too much to hypertonicity as shown in a spastic or rigid musculature.

Dr. Rhein stated that he did not look upon his cases as being typical ones of pseudosclerosis, as in his cases there was no dementia, which was characteristic of these cases, nor marked spastic condition of the muscles. In Dr. Rhein's cases there was little or no spasticity. There was at times apparent resistance at the knee joint in one of the cases, which he looked upon as the result of the muscular contractions due to the tremor.

MULTIPLE SARCOMA OF BRAIN

By John H. W. Rhein, M.D.

Dr. Rhein exhibited the brain which was the seat of a multiple sarcoma. The patient was admitted to one of the state hospitals for the insane, having been found unconscious along the roadside. His condition at the time of his admission was one of partial amnesia. He was talkative but unable to give his name. He had a partial insight into his condition. He stated that he could not get the words but believed that sooner or later that faculty would come to him. When shown an object and told to name it he would say, "I cannot for the world tell you, but I think it will come sooner or later."

The patient was 56 years old and the history otherwise is lacking except that there were inequality of the pupils and slight impairment of motion of the right leg. The brain was referred to Dr. Rhein by Pro-

fessor A. Hewson from the anatomical laboratory of the Philadelphia Polyclinic Hospital for study.

On cross section there presented in the occipital region an encapsulated brown mass. The superior portion of the tumor, however, appears to have invaded the brain tissue. The tumor extends from the base of the occipital lobe upwards for a distance of 5 cm. and measures in its cross section 4 cm. by 5 cm. It involves the cortex of the pole of the occipital lobe as well as the lateral cortex. Anterior to this tumor is a circumscribed mass measuring 2 cm. by 1.5 cm. by 1.5 cm., presenting an area of soft material which can be readily separated from the brain tissue itself. Still anterior to this and situated in the temporal lobe is a third circumscribed area or tumor encapsulated and measuring 4.5 by 3.5 cm. by 2.5 cm., presenting on cross section a mottled appearance. In its internal portion is a formed clot. Microscopic study was made of these tumors and they were found to be cylindrical-celled sarcomas.

The organs have not yet been studied but there was no external evidence of sarcoma. Hence, it cannot be stated whether the growths in the brain were primary or not.

Dr. John H. W. Rhein presented a brain showing cerebellar-pontine angle tumor measuring two inches in diameter which compressed the pons and pressed upon the cerebellum on the left side. The tumor had no connection with the brain and could readily have been removed if the diagnosis had been made early enough. The symptoms obtained from the physician who had not made careful notes consisted of incoördination of the lower extremities, attacks of migraine, some ocular paralysis. The patient could not walk without throwing herself all about the room. There was no paralysis of the extremities or facial paralysis. Sensation was undisturbed. The symptoms were of five years' duration and occurred in a woman of 25.

Dr. Ezra Allen (by invitation) read a paper entitled A Study of Cell Division in the Cerebellum and Demonstration of a New Technic of Staining Mitotic Figures.

REGENERATION OF PERIPHERAL NERVES

By J. Greenman, M.D.

For the purpose of this discussion Dr. Greenman presented a bit of work which was done in order to secure exact data as to the number and size of fibers in an interrupted nerve which had been permitted to regenerate; and to compare the data thus secured with the number and size of fibers in the corresponding nerve of the opposite side.

The proximal 10 mm. of the peroneal nerve of the albino rat was invariably used for experimental purposes. No branches are normally given off from this portion of the nerve.

Direct comparison of the peroneal nerves of the two sides of the body indicates that there is substantial symmetry on the two sides as respects their numerical composition and size of fiber. It was assumed, therefore, that the nerve of one side might be used for operation and that of the opposite side for control.

The technique of operation is of interest in this connection because the difficulties which were overcome have suggested certain practical applications in surgery to be discussed later.

Cutting the Nerve. In the first experiments the peroneal nerve was exposed and cut, and the wound closed in the usual manner by sutures and sealed by means of collodion and cotton.

The specimens after complete regeneration were in many instances extremely unfavorable for the process of photographing and counting fibers in the sections. A large mass of connective tissue usually formed about and between the cut ends of the nerve. Into this mass of connective tissue the newly formed fibers ramified in many directions, making it difficult if not impossible to secure sections of the nerve in which the number of fibers could be determined.

Crushing the Nerve.—Interrupting the fibers by crushing the nerve was tried. In these cases the perineurium was left intact as a tube connecting the divided ends of the nerve fibers crushed within it. This operation was followed by rapid regeneration of the nerve fibers within the tube of perineurium and a connective tissue mass interfering with the parallel arrangement of the nerve fibers was rarely formed at the point of lesion.

This method, however, made it in most cases difficult if not impossible to locate the exact position of the lesion at the autopsy.

Wire Clamp on Nerve.—In order to locate the exact point where the fibers were interrupted, a No. 26 silver wire loop about $1\frac{1}{2}$ mm. in length was clamped about the nerve dividing the fibers within the perineurium. This wire loop was allowed to remain on the nerve. Regeneration followed, the new formed fibers bridging over the wire loop to continue distally along the line of the old nerve trunk.

Sections of these nerves showed parallel fibers which in most cases were easily counted.

This method of interrupting the fibers was followed in all subsequent work.

The immediate effect of the operation was invariably to cause a paralysis which resulted in a flexion of the toes and a rotation of the foot inward. This deformity disappeared rapidly in many cases after the lapse of six to ten days and it was difficult to detect any abnormality in the movements of the animal. This disappearance of the clinical signs of paralysis suggested a readjustment of muscular control so as to mask in a measure the paralysis produced by the operation.

An examination of the operated nerves of a number of animals immediately following the operation showed that in every case at the end of the fourth day there was complete degeneration of the segments distal to the lesion.

The animals used varied in age from 31 days to 276 days and were killed at periods varying from 27 to 105 days after the operation.

The right (operated) and left (intact) peroneal nerves were removed, fixed and sectioned. The animals were examined in groups according to age at the time of killing. Sections from the proximal, middle (nearest to point of lesion) and distal portions of this 10 mm. segment of operated nerve were examined. Sections from the middle portion of each intact (left) nerve were examined.

The method of examination was to make photographs of the sections and count the fibers by the Hardesty method of pricking a hole in each fiber of a photographic print and recording the number automatically on a counting machine, the procedure being controlled by reference to the section itself under the microscope.

From each section of a nerve the forty largest fibers were selected and the sectional area of each fiber, axis cylinder and sheath was determined by projecting the fiber at a magnification of 4,000 diameters upon ground glass and accurately outlining by hand the axis cylinder and its surrounding sheath. The sectional area of these outlines was then determined by the planimeter.

Of more than 300 animals operated, 44 furnished the data from which these results were obtained.

Omitting a discussion of the details, the principal facts established are as follows:

The peroneal nerve of the normal albino rat of 135 grams body weight contains 2,288 myelinated fibers in its proximal end and 2,323 medullated fibers in its distal end. The middle zone is estimated to contain 2,300 fibers. There is an increase of 1.5 per cent. of the proximal number as we pass from the proximal to the distal end of this 10 mm. segment of peroneal nerve due to branching. The number of fibers is approximately the same for each side.

The number of medullated fibers increases with body weight during the first 270 days of life. Older animals have not yet been examined.

After operation not only is there complete degeneration along the distal segment of the nerve but also some retrograde degeneration from 2 mm. to 3.2 mm. on the proximal side of the lesion.

The general effects of the operation are more pronounced on older animals.

Following the degeneration in the operated nerve, regeneration, accompanied by branching of axons, takes place and there is an increase of from 64 to 249 per cent. in the number of fibers on the proximal side of the lesion, more than 7,000 fibers appearing in some cases just proximal to the lesion in a nerve which should show about 2,300 fibers.

The number of fibers found on the distal side of the lesion is less than on the proximal side, but the number always exceeds that found in the left or intact nerve.

On passing from the most proximal end of the operated nerve the number of regenerated fibers rapidly increases as the region of the lesion is approached; the number decreases as we pass from the lesion distally. Over 13 per cent. of the excess regenerated fibers arise from a point more than 7 mm. above the lesion.

Sectional Area of Fibers.—The average sectional area of the ten largest fibers in the middle zone of the peroneal nerve of a normal albino rat of 135 grams body weight was found to be 113.6 square micra.

The average sectional area of the ten largest fibers from the intact (left) nerve of an operated albino rat of 156 grams body weight is 65.7 square micra.

One of the results of operation is, therefore, a loss in sectional area of nerve fibers of the corresponding intact nerve. In this instance the loss is 42 per cent.

The intact nerve (left) of an operated animal contains fewer fibers than the same nerve from a normal control animal of the same age. This loss is one of the effects of the operation and was found to be 16 per cent. in the cases examined.

It now remains to be determined whether this loss in number and in sectional area of fibers in the intact (left) nerve of an operated animal is a general effect upon the entire peripheral system produced by the operation, or whether it is due to the arrest of growth or atrophy during the period between operation and killing or whether it is an effect transmitted from the operated nerve across through the cord to the opposite side.

The sectional area of the ten largest fibers on the proximal side of the lesion is 77.8 square micra or 15 per cent. less than the area of the fibers of the intact nerve.

The sectional area of the ten largest regenerated nerve fibers on the distal side of the lesion is 29.9 square micra or 54 per cent. less than the area of the fibers in the intact nerve.

In the normal albino rat of 135 grams body weight the axis-sheath relation of the fibers of the peroneal nerve is as follows:

Area of axis	51.8 per cent.
Area of sheath	48.2 per cent.

In operated animals in which the fibers of both intact and interrupted nerves are all diminished in total area, the axis sheath relation is such that in the intact nerve and in the proximal and distal ends of the operated nerve the area of the axis is relatively less than in the fibers from the normal animal.

One of the most important points here developed is the fact that operation reduces the number, size and axis sheath relations of fibers on the intact side.

Surgical Application.—The rapidity and perfection with which a nerve regenerates within its own unruptured perineurium after the crushing process above referred to has led Dr. J. E. Sweet to suggest an artificial method of protecting a regenerating nerve from becoming entangled in an obstructing mass of connective tissue.

A series of albino rats, all 100 days of age, was operated by Dr. Sweet. The same segment of peroneal nerve was selected for operation and the same for control as in the previous experiments. In each case the nerve was cut and sutured with human hair and a short piece of celloidin tube impregnated with lamp black was placed over the point of suture. The animals were killed after 50 days and it was Dr. Greenman's privilege to make the examination of the regenerated nerves, and compare them with their intact controls.

The characteristic regenerated fibers were found in the tube in nine operations out of eleven. These regenerated fibers appear in parallel bundles throughout the tube with very much less of the interlacing which occurs when a nerve is sectioned and sutured and permitted to regenerate without protection from connective tissue masses.

Sections through the celloidin tube show within this tube an outer layer of organized lymph gradually giving place to connective tissue structure on its inner wall surrounding the nerve.

The fibers in the intact nerve of eleven animals have been counted and show an average of 2,080 fibers at the middle zone of the 10 mm. of nerve for a white rat of 150 days of age and 237 grams body weight.

In three of these animals the number of fibers in the operated nerve, as well as in the intact nerve, has been determined and presents the following results:—

Age	Body Weight	Fibers in Intact Nerve	Fibers in the Operated Nerve
151 days.....	267.5	2,129	2,581
151 days.....	265.0	2,057	3,930
154 days.....	241.5	2,048	2,343
Average 152 days.....	258.0	2,078	2,951

While the operated nerves show a considerable increase in the number of fibers, about the same average as in previous work, the extreme limits in number of fibers found in previous work, 7,611 in one instance, is not reached in any of these cases.

The determination of the number of fibers in the other operated nerves of the series must yet be made before it is safe to say that the average number of regenerated fibers is less when operation is done in this manner.

In nine operations out of eleven our examination of the tube contents leads one to conclude that the indestructible protecting tube favors rapid and direct regeneration and does eliminate to a marked degree the connective tissue interference.

The further treatment of this subject will be given by Dr. Sweet who devised this method of protecting regenerating nerves.

Dr. J. E. Sweet said there are certain problems in medicine and surgery which can be approached by animal experiment; others that can only be studied in the clinic; still others which can only be definitely solved by a proper balancing of both methods. For example, the study of ununited fracture is a clinical problem; we cannot, as yet at least, study it experimentally for normal bone will heal after fracture, and the experimental animals are all normal animals. The problems confronting us in relation to the peripheral nerves are largely clinical problems. Normally nerves will regenerate and unite after being severed; a number of cases are on record of union even after considerable loss of substance and no operative interference. Just as in ununited fracture, the reason why some nerves will not unite may depend upon conditions quite apart from the operative technique; these reasons for failure not being understood cannot be experimentally reproduced, therefore the problem is a clinical problem.

Suppose a severed nerve has been operated upon and has healed. It may have healed and function may return, but a careful study of the result would show that it was functioning, in spite of the operation, not because of the operation. Or it may not heal properly, function does not return; is this perhaps because the operation was not properly done? Or is it because, perhaps the muscles supplied by the nerve have so completely atrophied that no physiological demand exists for the function of that nerve?

A clinical success does not necessarily mean that surgery has been perfect. To illustrate, Dr. Sweet often has his students, both undergraduates and postgraduates, perform an end-to-end anastomosis of the intestine. The dog recovers promptly, shows no untoward symptoms whatever, clinically it is a success; but an autopsy may show a condition of adhesions such that the only permissible conclusion is that nature has overcome all the difficulties interposed by surgery.

This, then, seemed to him to be the fundamental problem in the surgery of the peripheral nerves; when we succeed, clinically, do we succeed because of, or in spite of, surgery? When we fail, do we fail because something was wrong with our technique, or because some unknown conditions are present in the muscles or the nerves which make success impossible?

When Dr. Sweet learned of Dr. Greenman's work it seemed to him that his method of study offered a means of determining what we might expect from our technique alone. Further, Dr. Greenman's experience, that he was unable to accomplish the desired result by using the standard surgical method of direct suture of the nerve, with the specimens that he had procured from these attempts, offered at once a control and also the proof that mere clinical success is not necessarily the highest criterion of surgical technique. These rats all recovered clinically, but the results, when examined by Dr. Greenman's method of study, are far from ideal.

The method therefore adopted was to use the same nerve in the same animal in which Dr. Greenman's results were obtained. These results were then turned over to Dr. Greenman and judged by him in comparison with his standard of success.

An idea not new in surgery was adopted, the idea of enclosing the nerve in some sort of a tube which would keep the surrounding connective

tissue from growing in between the nerve ends and thus interposing an insurmountable barrier to the regenerating nerve fiber. The principle is not new, but the tendency of surgeons has been to provide some sort of a tube which would eventually become absorbed, such as decalcified bone, or a vein taken from the patient, or a hardened, formalized artery from an animal. Since all absorbable substances are replaced by connective tissue, he proceeded purposely to the extreme of using a tube which should not be absorbed,—and used celluloid tubes. The tubes were further impregnated with lamp black, in order that they could be identified in the sections. The nerve was cut, sutured with a single delicate silk thread or a human hair and a celluloid tube slipped over the anastomosis. The results are as follows:

Successful9.
 Negative1. No tube found. Tube may have been there.
 Failure1. Nerve not in tube. May have been pulled out.

He concludes that it is surgically possible to so unite a severed nerve that we can be certain of a surgical success, not only as judged by the standard of functional result, but also by the standard of microscopic examination; while such a conclusion is not epoch making, he feels that it means this, that a neurologist can be free of the haunting fear that maybe the surgeon slipped, somewhere, and can look for the reasons for failure in a given case within the realms of his own domain, such as muscle atrophy, disuse atrophy, or in that field alone understood by the neurologist, the functional disturbances of the peripheral nerves.

Dr. Spiller said this work was interesting both from the laboratory and clinical viewpoints. The work of Dr. Greenman had shown that after a nerve is cut there is a very great overgrowth of nerve fibers in the central portion of the stump, greater near the point of section. He seems to have proved that the view is incorrect that the regeneration of a cut nerve is entirely in the peripheral end. Dr. Spiller said Dr. Greenman had made the statement that without the tube he found something like 7,000 nerve fibers in the central end of the nerve at the point of section. If he used the tube he had much fewer. The conclusion would seem, therefore, that if a tube be not used there is a greater growth of fibers, possibly because sclerotic tissue interferes with regeneration and spurs the nerve on to the formation of more fibers.

There was one other point to which he would refer, and that is the left peroneal nerve is considerably smaller in an animal in which the right peroneal nerve has been cut than in a normal animal. That is a fact of clinical interest. This result would seem to be dependent upon the spinal cord. It may be, therefore, that some of the nerve cells which supply the right peroneal nerve are associated with those which supply the left peroneal nerve. The clinical importance of this is in relation to work done in arthritic muscular atrophy. Raymond showed many years ago that if he took a certain number of animals and produced joint disease in all of them he obtained no muscular atrophy in those in which he had previously cut the posterior roots in connection with the joint affected. Dr. Allen, now of California, had repeated that work.

Dr. Greenman said when there is obstruction in the way of the regenerating nerve nature seems to make every effort to replace these nerve fibers by this enormous increase in the number of fibers which attempt to find their way through the connective tissue at many points. When a tube is used the path of the regenerating nerve is not obstructed by connective tissue, and we have the regeneration of a nerve with fewer fibers. In such a case it seems to be a perfectly plain instance of follow-

ing the line of least resistance, but where there is a large amount of connective tissue the nerve branches vary many more times and give this large increase in number of fibers. As to the reduction in size of the control nerve fibers as the result of operation, there are several factors which should be considered. They operate on an animal 100 days of age and kill it at 50 days of age. The operation may have interfered with the normal processes of growth in that 50 day period. This may account for the reduction in size on the control side; then again the operation may produce a general effect on the whole peripheral system, causing a reduction in size of all fibers or the effects of operation on one side may be transmitted to the opposite side through the cord, resulting in reduction in size of fibers only in a selected region. Experiments are under way to elucidate these points.

THE PSYCHOLOGY OF STAMMERING

By G. Hudson Makuen, M.D.

Stammering is an affection characterized by the inability to freely use oral language in the expression of thought and feeling.

It appears in two more or less distinct stages, an initial or acute stage and a chronic stage. The initial stage usually begins during childhood, and the patient is often unconscious of his difficulties, while the chronic stage is characterized by increasing difficulties of speech and a full consciousness of their existence. As the patient begins to realize his difficulties, the secondary manifestations, such as mental confusion, anxiety, fear, and the accompanying autosuggestions, arise and seem to assume causal relations to the affection and tend to aggravate and perpetuate it.

In seeking the underlying or primary cause of stammering, the difficulty has been to find one that will explain all the various phenomena of the affection. The most recent suggestion as to the etiology of stammering and the one that seems best to meet the conditions is that the affection is due to a weakness or irritability of the auditory speech center, and this condition has been called a transient auditory amnesia.

Whatever may be the ultimate or predisposing cause of stammering, it is a fact that stammerers appear to be unable to arouse into consciousness the precise auditory images of certain elements of speech which are absolutely essential to their prompt externalization. There are doubtless many factors which combine to bring about this condition, but the condition itself seems to be in many respects amnesic or aphasic in character, and the treatment of the affection which is based upon this theory appears to give the most satisfactory results.

The cure of stammering consists largely in the restoration or development of a more vivid and distinct auditory imagery for speech sounds.

Stammerers are made up of what someone has called congenital aphasics. They begin life with a weakness in the psychomotor speech centers, and unless they receive the necessary help in the development of normal speech during early childhood, they acquire a faulty action in both the central and peripheral mechanisms of speech which renders them liable to the development of that particular form of defective speech which we call stammering.

Dr. J. Hendrie Lloyd said there were several ways in which a neurologist might approach this subject. In the first place, Dr. Makuen's theory that stammering is a form of auditory amnesia is an interesting, and to Dr. Lloyd a rather novel one. Dr. Lloyd was in full accord with Dr. Makuen's idea that the auditory center is the primary speech center, and in a former paper before this Society Dr. Lloyd put forward this view.

Bastian's idea of a "primary couplet," composed of the auditory center and the motor, or glosso-kinesthetic, center, as the primary speech zone, is in accord with this opinion, and of these two centers Dr. Lloyd thought the auditory center was the more important. It is in that center that we acquire our first knowledge of and our strongest hold on speech. It is in that auditory center that the child learns its mother tongue. Moreover, the auditory center exercises a peculiar control over speech. Its integrity is absolutely essential to the exercise of the function of speech. This is so especially in the child, while it is learning to talk, and it continues so all through later life, for motor speech depends upon our memories of auditory speech: it is simply a process of reproducing auditory memories by vocalizing them.

If stammering results from a defect in that auditory center, we may suppose that in the stammering child that center for some reason has failed to undergo a complete development, and that the auditory speech-memories are defective. They are not entirely deficient, but they are sluggish. The child is unable to summon them into consciousness with the rapidity and precision that are requisite in uttering speech, and stammering results. One difficulty in the way of accepting this theory may be that in the adult who from disease acquires sensori-motor aphasia, we do not see stammering in its typical form reproduced; nevertheless, Dr. Lloyd thought that in some sensori-motor aphasics we see something very much like stammering. This for him remains a subject for further investigation; and in the future he intends to observe more carefully whether in these sensori-motor aphasics, in whom the auditory as well as the motor center is involved, he can detect a true condition of stammering. It must be borne in mind, however, that an undeveloped organ does not act precisely like a developed organ that has been injured, hence there may not be a perfect analogy between the two conditions, *i. e.*, in the stammering child and in the aphasic adult.

The query has arisen in Dr. Lloyd's mind, can stammering ever be due to a lenticular lesion? The lenticula, as we know, is now very much in the limelight. Kinnier Wilson holds that lenticular lesions cause a sort of jerky action in the pyramidal fibers. Dr. Mills thinks the defect is in a tonectic series of fibers. There seems to Dr. Lloyd to be a possible analogy in stammering, although it is rather remote. As stammering usually begins in childhood, we should have to suppose that the lenticula had in some way gone wrong in early development. As he believes that the lenticula is largely a vestigial organ, he should have no difficulty in supposing that it is capable of promoting disorder, rather than of serving any good purpose, but he is not prepared to say that it is a universal cause of stammering. He only throws this out as a suggestion.

It must not be overlooked in this connection, moreover, that a very bad form of stammering is sometimes seen in connection with organic or developmental disorders in the nervous system. There are certain obscure forms of ataxia, call them cerebellar or what we please, in which there is widespread disorder of the motor functions in the limbs and in which we see grave speech defects, not unlike stammering. The same can be said of cerebral diplegia, in which a grave defect in the enunciation of speech, very much like an exaggerated stammering, is seen. In some of these organic stammerings, however, the defect is entirely motor; it can not be ascribed to an auditory amnesia; it is due to the same lesion that has impaired to a large extent the whole of the pyramidal system. Nevertheless, some of these patients are entirely aphasic. Dr. Lloyd therefore concludes that there may be various forms of stammering, not all of them explainable by one cause.

Finally, a word about the psychical or emotional states seen in many stammerers. Dr. Makuen has called attention to them, and has pointed out their important influence in confirming what we may call the stammering psychosis. These are especially states of apprehension, fear, and mortification. Dr. Lloyd would liken them to morbid fears, or phobias, seen in certain states which we call psychasthenia. In the stammerer they have to do exclusively with the exercise of the organs of speech, hence they are kineesthetic; or more properly *kinetic*; that is, they belong to the morbid fears which are evoked by the ideas of certain movements. Such morbid fears of movement are seen in other conditions than stammering. Moebius has described a motor disorder which he calls *akinesia algera*, which depends apparently upon an inhibitory imperative conception. The patient dreads to move for fear of pain, which, however, is entirely imaginary. The affection is allied probably to the intention psychoses, such as claustrophobia, agoraphobia, etc. Dr. Lloyd formerly suggested that the word *kinesiphobia*, fear of movement, better expressed the mental state in these patients, as there is no real pain, but only a morbid fear of pain to be caused by the movement. It is a fear of pain analogous to the fear of contamination, called mysophobia, and is as unreal in the one case as in the other. Dr. Lloyd's term, however, has never gained currency, although he still thinks it is not a bad one. In stammerers there is a similar inhibitory idea, the fear not of physical pain, but of mental pain, such as mortification; but the two kinds of pain, physical and mental, are strictly analogous in the psychical sphere; and they may act in an identical way to cause morbid phobias.

Dr. Makuen, he thought, was entirely right in ascribing to this phobia a controlling influence in stammerers, and he showed a true insight into the psychology of these cases when he claimed that cure must begin by correcting the psychosis.

Dr. Charles K. Mills said that the subject introduced by Dr. Makuen was one which greatly interested him, particularly in connection with the recent discussions of tonic innervation and a cerebral tonectic apparatus. It seemed to him that some cases of stammering are analogous to that affection of which he showed an example here two or three meetings since, and of which he had seen other instances, namely, the so-called perseveration. This man shown at the meeting referred to has now almost complete preservation of power in his arm and leg, and yet on grasping, either when commanded or spontaneously, the entire musculature of his arm often becomes so contracted or hypertonic that the limb will not relax for a long time. Muscular sense and all forms of sensibility are normal. The patient is incapable, because of some very special lesion which is probably destructive and in the frontal portion of his brain, of properly innervating the tonectic apparatus or this is over innervated.

Although Dr. Makuen's idea of auditory amnesia as an explanation of the stammering is interesting and ingenious, it did not seem to Dr. Mills to be sufficient. There is probably, in at least some of the cases of stammering, an inability to rhythmically innervate with muscular tone the motor apparatus for speech. Many stammerers seem to be perfect so far as any auditory perception and the peripheral organs of speech are concerned. Therefore, the speaker thought the case was not made out for the theory of transitory auditory amnesia as the cause for stammering. Not a few of these cases have perfect articulatory and phonatory organs. It may be that the vocal cords are sometimes spasmodically closed or too much relaxed, but this is because they are aberrantly innervated. That they possess motor power is proved not only by the results of training, but by their incidental use of language fluently.

Psychic influence—under the view of aberrant tonic innervation as a cause of stammering—as might be expected, plays an important part. Emotion interferes with volition in cases of this sort.

With regard to the part played by the lenticula the speaker believed that this could not always be determined. The cerebral tonectic apparatus, according to his view, was a mechanism intercalated between the afferent or sensory pathway and the motor projection system. Its business was to adjust or correlate sensory stimuli and motor discharges, giving to the latter rhythm or tone. This tonectic apparatus was both mid-frontal and striate and therefore lesions or functional disturbance, either of the cortex or lenticula, might give rise to the phenomena of stammering. Indeed, as tone is primarily dependent upon sensation, although it may be secondarily upon idea, an affection of the sensory pathway or of the pyramidal motor apparatus might, of course, give a form of stammering, that is, of a form of disturbance of phonation, articulation and enunciation. In this far the view as to the part played by transitory auditory amnesia might have some force; nevertheless, he did not think it was the important matter in most cases of stammering.

Dr. Francis X. Dercum said that there was danger in being carried too far afield by speculation and thus losing sight of important clinical distinctions. Personally he cares less for explanations than for concrete facts. In his mind there is not the slightest resemblance between an aphasic patient and a stammerer. There is not the slightest loss of word memory in the stammerer. The latter reads and writes in spite of his speech difficulty. One of the striking features of the motor aphasic is the associated alexia. Again there is no resemblance between the speech of cerebellar disease and the speech of the stammerer, and this is equally true of the speech of the diplegic. Especially is it true of the speech of bilenticular disease or of the other forms of pseudobulbar palsy among which bilenticular disease used to be grouped. The stammerer suffers from a neurasthenic-neuropathic affection, a psychasthenia, and he presents all of the earmarks of the phobias, tics and anomalies of will and inhibition commonly observed in psychasthenia. The defective inhibition is doubtless to be explained in terms of the tics. In other words the phenomena presented by the stammerer are psychasthenic. In keeping with this the young lady whom Dr. Makuen showed this evening presents a tic involving both shoulders; at irregular intervals her shoulders were suddenly raised or heaved upward and forward, while the young man presents a tic of the right arm consisting in sudden irregularly recurring adductions of the arm to the side. Similar movements, though less decided, were also noticeable in the left arm. In other words, the patients presented by Dr. Makuen are not stammerers alone, they also present the phenomena of tic, or, better still, tic convulsif. Dr. Makuen's well-known success in the management of stammerers depends fortunately not upon theoretical explanations but upon his sound practical methods of retraining. Still the difficulties are at times unsurmountable. We know how difficult it often is to get certain cases of tic well, but the existence of tic in these cases proves that there are similar factors at work as in psychasthenic cases.

Dr. Makuen regretted that he had neither the time nor the ability to adequately reply to all the points raised in the discussion. He had seen many interesting examples of the condition to which Dr. Lloyd refers, namely, that of fear in stammerers.

He has a man under his care now who is 38 years of age, a mining engineer, bright, and but for his affliction a splendid business man. He came to Philadelphia and went directly to the Adelpia Hotel, where, tired and hungry, he ordered a dinner in a quiet corner of the cafe, and

a man happened to come in and take the chair opposite to him, whereupon he was thrown into such a paroxysm of fear lest the man should try to engage him in conversation that he left the table before his dinner arrived. Moreover, he says that he has gone hungry for days during business trips, because of his desire to avoid experiences of a similar nature. He says that those of us who do not stammer cannot possibly appreciate the feelings of those who do under circumstances such as described. Dr. Lloyd's paper had given Dr. Makuen much food for thought, and he thanked him for it.

In reply to Dr. Mills' remarks with reference to the causation of stammering, Dr. Makuen thought that the tonectic theory or the theory of tonic innervation can scarcely explain all of the various phenomena of the affection. For example, the young woman presented at the opening of the meeting can talk perfectly well under certain conditions. She can talk in concert with her teacher without any trouble whatsoever, but as soon as she is obliged to arouse her own auditory images of the inflected sounds of speech she fails completely. There seems to be something more than the lack of tonicity or tonic innervation, and this appears to be that without which no vocal sound is possible, namely the prompt recall of a clear auditory image or character of the sound to be emitted.

The conscious volitional recall or redintegration of the auditory image under certain disturbing mental or emotional conditions seems to be quite impossible, the patient being unable to focus his attention upon the images with sufficient steadiness to enable him to externalize certain important elements of speech.

Referring to Dr. Dereum's remarks, Dr. Makuen said that he thought causes and results are often confused in considering the etiology of stammering. There are, to be sure, psychasthenic symptoms in all these cases and stammering itself is one of them, but may not many of these symptoms be the results of the stammering rather than causal factors? This ground seems to be all the more tenable, because many of the pathogenic symptoms, such as the various tics, tend to clear up as soon as the patient is relieved of his stammering.

Dr. Makuen does not claim that the stammerer has verbal amnesia but only auditory amnesia or amnesia for the auditory or vocal elements in distinction from the kinesthetic elements, of which many of the consonant sounds are examples. The sounds of speech that are registered as kinesthetic memories give the stammerer but little trouble, but those that are registered as auditory memories are the ones that seem not to be forthcoming at the required time.

TRANSLATIONS

VEGETATIVE NEUROLOGY. THE ANATOMY, PHYSIOLOGY, PHARMODYNAMICS AND PATHOLOGY OF THE SYMPATHETIC AND AUTONOMIC SYSTEMS¹

BY HEINRICH HIGIER

WARSAW

Authorized Translation by Walter Max Kraus, A.M., M.D.
[New York].

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¹ Vegetative oder Viscerale Neurologie, Ergebnisse der Neurologie und Psychiatrie. Vol. II, No. 1. Verlag von Gustav Fischer, Jena.

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II. INTRODUCTION

Under the terms "animal" or "somatic" nervous system are considered all of those tracts which supply sense organs, or voluntary muscles. On the other hand, all nerve fibers which supply the secretory parts of glands as well as automatically acting organs having a smooth musculature may be considered under the heading

“sympathetic,” or more generally speaking *vegetative nervous system*. Examples of these latter are the intestines, the genital apparatus, the pupil, the blood vessels, the ducts of glands and the skin.

When the question arises why physicians in general know so little of the anatomy and physiology of the sympathetic system, and value it so lightly, in comparison to the cerebrospinal system, and why the vegetative nerves which supply vegetative organs are so little spoken of in all text-books and systems of medicine, this answer naturally presents itself.¹ That as a rule that branch of medical knowledge which plays a small rôle in clinical medicine is neglected by the majority of physicians. There are, to give a well-known example, large groups of muscles, as for instance the deep muscles in the neck and back, the semispinalis, multifides, and intertransversarii, which, for the same reason, are only known by name, or are entirely unknown to clinicians.

This reason for ignorance is on closer observation not only not justifiable, but also without foundation. True, much mystery surrounds the vegetative nervous system, the reason being that the nervous control of vegetative organs and muscles is partly autonomic, and partly influenced by afferent and efferent connections with the central nervous system, connections which cause a quite different reaction from that of the cerebrospinal system. Injury or transection of the ganglia and peripheral fibers does not cause so intense a reaction as the same interference with the cerebrospinal ganglia and fibers. These are but mild and transitory manifestations of the removal or injury of the connecting links.

The sympathetic plays an enormous rôle in the economy and metabolism of the organism because First: it not only partially supplies the motor and secretory functions of those parts of the body which are *unessential* to the maintenance of life (the extremities), but also regulates organs which are *essential* to life, organs which must not cease functioning for one moment—the heart, lungs, liver, stomach, thyroid, adrenals, sweat glands and blood vessels—and second: its ganglion cells and nerve fibers are widely distributed throughout the entire trunk, and lie through almost the entire extent of the internal and external coverings and organs of the body. The fact that the vegetative system undergoes change in its functional activity at every step is sufficiently shown by the marked manifestations of a physiological nature which every emotion produces, as for example, palpitation, pallor, weeping, incontinence of feces, mydri-

¹ A notable exception is to be observed in the recently published *Diseases of the Nervous System* by Jelliffe and White (trans.).

asis and erection. Pathologically the disturbances are seen in *every infection and intoxication*, as for example, goose flesh, tachycardia, blushing, sweating and dry mouth; as well as in such common diseases as tabes with its pupillary inactivity, stenocardia, gastric crises and bladder disturbances.

In spite of this there is scarcely any pathology of the nervous system of the internal organs, any "visceral neurology" in comparison to the much detailed pathology of the peripheral or cerebro-spinal nervous system, whose smallest branch has its clinical significance. This on the whole applies as well to pathological anatomy, which has only concerned itself with isolated tumors, and traumatic lesions of the cervical sympathetic and the sympathetic cord, as to therapy which has but little to say outside of a few operative procedures upon the sympathetic in Graves' disease, epilepsy, and glaucoma.

During the last few years scientific interest in the sympathetic and autonomic nervous systems has increased enormously, as the many works of an embryological (Frorup, Kuntz) comparative anatomical and histological (Broek, Jacobsohn, Onuf, Collins, L. Müller), physiological (Gaskell, Langley, Lewandowsky, Bumke, Kreidl, Karplus), pharmacological (Loewy, Falta, Rudinger, Fröhlich, Noorden, Meyer), and clinical nature have shown (Head, McKenzie, Eppinger, Hess). In these connections the question of the vegetative system will be critically examined. Only the most significant of the large groups of facts at our disposal will be considered. A detailed discussion of this difficult chapter, including the fundamental elements of its physiological and anatomical relations, of which the majority of physicians are ignorant, is justifiable, since the new results of histological investigation and of experimental pharmacology have given an entirely new grouping to the older clinical and pathological material. Nowhere is the comprehension of clinical syndromes and the solution of many important psychological problems so intimately connected with physiological and pharmacological viewpoints as in the realm of vegetative functions.

Research to-day has opened up, so far as the vegetative system is concerned, a field so wide that its limits are yet hidden in the haziness of the future. Many efforts will have to be made in the future in order to light up this subject in all its extent. The most important aspect of scientific research which has thrown light on the vegetative system is undoubtedly the question of the relation of this to the mind, to metabolism, and to the glands of internal secretion. It has taken but a very short time to accomplish a large amount of work on the

subject of the pathology of the vegetative. This work has extended into the most varied branches of medicine, produced a mass of stimulating problems, and has incited the spirit of research to restless endeavors. The nature of the discussed matter, which in many respects is but in statu nascendi, leaves little doubt that our résumé must be incomplete, and, especially in the general considerations, can but suggest a few guiding points, special questions, which have particular significance and relation to the practical side of the subject.

For the same reasons, a detailed review of the literature, especially the older literature, must be given, on account of the abundance of facts it contains. The experimental literature, clinical and purely morphological, is the basis of this work. Only its most important aspects will be considered and even these can not be gone into in great detail. A thorough discussion of the history of the subject is without the purpose of this work. Only such special works as will give new and extensive reference to the literature will be mentioned.

Though many things must yet be made clear, there is enough material at hand to permit a fairly precise review of the question of vegetative neurology.

My personal experience with the vegetative nervous system will soon appear in a special article "A Discussion of The Vagus—Sympathetic Relations."

III. COMPARATIVE ANATOMY OF THE VEGETATIVE SYSTEM

The completely developed human nervous system is an end product of a much complicated phylogenetic, and a not less complicated ontogenetic development, extending over a long period of time. As Edinger and v. Monakow, Van der Broek and Frosiep have justly observed, it cannot be understood either in its construction or in its functions without a review of the relations existing between the numerous successive phases of its development. Interesting points of view are derivable from embryology and comparative anatomy which help in understanding the progressive development of the function of the vegetative system.

All actions of animals, all movements of the external and internal muscles result from conduction of stimuli of external or internal origin to the nervous system.

The various parts of the nervous system which receive these stimuli are designated as the "Urhirn" or archeopallium of Edinger. This exists alike in all animals from fish to man, and only varies in

size according as one or the other sense is more important for the preservation of life of the particular animal.

All activities in the "Urhirn" are reflexes, not only the many mechanisms for movements, but also those for inhibition. These latter make it possible for the animal when subjected to the influence of all kinds of stimuli, to avoid being in continual activity. On the basis of various phylogenetic standards, the central nervous system was regarded merely as an apparatus for seeking and absorbing nourishment; it was stimulated by the sense organs and the nerves of instinct or visceral nerves. The oldest and simplest movements, both exteroceptive and interoceptive, are, in this sense, for the purpose of maintaining life, protecting the body, or guarding against harmful stimuli. The gradually developing new "anlagen" develop at the expense of the old, assuming functions which in lower stages of development were only performed by the old structures, and which in higher stages of development become rudimentary.

One of the earliest organized forms of the "urhirn" of the central nervous system (invertebrates) is that of the loosely connected pairs of ganglia, the ganglion system.

In the lowest vertebrates the so-called metameric system, together with the "anlage" of the vertebrae, is built up on the ganglion system of invertebrates. This keeps on developing, partly at the expense of the ganglion system. The metameric system develops from more or less similar segments of the spinal canal, each of which has a well-coordinated innervation which supplies the corresponding segment of the body. In every metamere, which has an autonomic central apparatus, there is also a related nervous equipment for the orderly use of the extremity of this metamere. Following this stage of development there is, as in fish, a more extensive differentiation of the brain canal into five brain segments, the telencephalon, diencephalon, mesencephalon, metencephalon, myelencephalon, in which a cortex is yet entirely lacking, and in which the dominating rôle and sharing of the highest nervous connections belongs to the mid-brain or mesencephalon.

In the next highest vertebrates (reptiles) there is built up upon the now very important mid-brain, what has been designated as the cortico-somatic cerebral system, the new brain or neopallium of Edinger. This is the most important part of the cerebral cortex.

In the lower mammals there remain isolated, relatively independent nervous connections which have been left from the ganglionic metameric and mid-brain systems.

In the higher mammals, the psychic growth finds its anatomical

expression in the addition to the cortico-somatic system of a cortico-associative system with scattered association areas located throughout the much extended and folded surfaces of the cortex. This system, according to v. Monakow, represents in man the preliminary worthy conclusion of phylogenetic development.

In this organization, old and new phylogenetic functional systems work by the side of and with each other in wonderful fashion. This holds not only for visceral and sensory stimuli and for impulses coming from them but also for the corresponding motor impulses. The new brain (neopallium), present at first only in traces, finally comes to equal the "urhirm" or archeopallium in dimension. In monkeys and man, it even surpasses it in size. Thus, as has been stated, the urhirm becomes related by fiber systems with a most important apparatus which gives the power to correlate sensations with each other more thoroughly, to retain sensations for some time, to make movements voluntary, and to relegate to the background the reflex and automatic vegetative life. This leaves an animal with more of a "soul" and freed from the continual activity of its reflexes.

What has been said of phylogenetic development holds also for the ontogenetic, which on the whole is but a much abbreviated recapitulation of the former. Even in the human fetus, it is found that the myelinization rule of Flechsig bears this out. Myelin sheaths develop first in the ganglion system, then in the metameric system, then in the mid-brain system, and finally in the cerebral and cortico-associative systems.

In considering the world of instinct and desire which is so intimately related to the vegetative system, one must conclude, from a biological viewpoint, as v. Monakow has justly done, that all nervous functions have had their phylogenetic origin in the activity of the oldest sense cells and the direct descendants of these cells. Among these must be included the little known paraganglion cells, the chromaffin cells and above all the cells of the sympathetic and autonomic ganglia, *i. e.*, the ganglionic system.

Undoubtedly one finds in the ganglion system of quite low animals a well-defined localization in the sense that the various viscera, glands, excretory and sex organs, as well as the circulatory and respiration apparatus, etc., have a separate and delicately constructed representation.

The ganglion system which in higher animals retains the lowly rôle of serving the vegetative nervous functions, successively obtains a second representation in the metameric system, the spinal

cord, a third in the brain stem (central gray matter, mid-brain and probably in the corpora quadrigemina and optic thalamus), and finally a fourth, which is double, in the cerebral cortex. This is a quite diffuse and spatially narrowly bounded, possibly strictly focal area of cerebral surface, lying near the cortical orientation system or the cortico-somatic system which serves the purpose of innervating individual vegetative organs.

Finally, since cortical localization of vegetative functions in the brain is to be discussed more fully below, we may say that as far as we know definitely, the cortex of the cerebrum only serves conscious perception (*Gnosia*), conscious action (*Praxis*), and the thought innervations necessary to these.

IV. MACROSCOPIC AND MICROSCOPIC ANATOMY OF THE VEGETATIVE SYSTEM

What may be learned from the macroscopic anatomy of the sympathetic, which not only is the Alpha and Omega of the visceral system, but also the bearer of the burden of the mechanical work of our vegetative life?

Two parts may be distinguished: the cord and the branches.

The cord, usually spoken of as the sympathetic cord, is divided into three parts—cervical, thoracic and abdominal.

The branches also are divided into three parts—those to arteries, those to the periphery, and the communicating branches.

The fact that the sympathetic cord is a symmetrical organ, lying immediately in front of the vertebrae and parallel to it must not be overlooked. Its extent is from the base of the skull to the coccyx. It is extrapleural and extraperitoneal, and ends at its lower end in a loop, a thread or an unpaired ganglion. In lower animals, as fish, which preserve their segmental structure to a marked degree, the sympathetic cord has a ganglion at the level of each vertebra, giving it the appearance of a string of pearls. Every sympathetic ganglion lies, in the majority of cases, either on the vertebra, or on the costal process, and for that reason is called a sympathetic or vertebral ganglion. This is in contrast to the spinal ganglia, belonging to the cerebrospinal system, which are associated with the posterior sensory root and are, on account of their anatomic position in the intervertebral space, called spinal or intervertebral ganglia.

(To be continued)

THE DREAM PROBLEM

BY DR. A. E. MAEDER

ZÜRICH

(TRANSLATED BY DRs. FRANK MEAD HALLOCK AND SMITH ELY JELLIFFE)

(Continued from vol. 42, page 767)

ON THE QUESTION OF SYMBOLISM IN DREAMS

When I look over my interpretation of symbols during the last two years, it is clear to me that gradually, and at first quite unconsciously, a change came about in my interpretations. The content of the symbol is no longer monovalent, but has come to be of wider meaning. The sexual interpretation has become, so to speak, the first step, in some respects only the preliminary step and instead the significance of the contemporary situation of the dreamer has been drawn into the matter more and more. An opportune discussion of the so-called actual conflict in neurosis by Jung (in the Psychoanalytic Conference), nearly two years ago, confirmed me in my orientation and helped me in this change of view. On the actual conflict I shall still say something in this paper to-day. I will now enter more fully into the question of the interpretation of symbols. It can be best demonstrated by means of an example.

In the third edition of the "Dream Interpretation" Freud gives a short symbol interpretation, which I would like to use as a starting point. This is the dream of a young man (p. 207): "He is in a deep tunneled passage, in which there is a window, as in the Semmering tunnel. Through this he sees, at first, an empty landscape, and then he composes a picture into it, which is there immediately and fills out the void. The view is now that of a field deeply ploughed up by an instrument and the fine air, the idea of the work so well done, the blue black clods of earth, make a pleasing impression on the dreamer. Then he goes further and sees a book on pedagogics open before him. He is

surprised that in it so much attention is paid to the child's sexual feelings, and that makes him think of me [Freud]." The interpretation given is that this is a phantasy of the young man who takes advantage of his intra-uterine opportunity to spy upon the coitus between his parents. The associations of the young man are not given.

It is not difficult for us to recognize the tunnel picture as an exteriorization of certain parts of the body, *i. e.*, the uterus and the vagina. The ploughing of the field is a well-known coitus symbol. This dream interpretation is evidently built on the knowledge of these two symbols but gives us no solution for the second part of the dream, which contains the open book on pedagogics.

I accept this interpretation as a preliminary step of the interpretation itself. In his "Transformations and Symbols of the Libido" Jung has called our attention to the problem of re-birth. I myself became better acquainted with this subject summer before last, by means of my analysis of the visions of the Florentine B. Cellini. In this dream here there seems to be a similar symbol, for as soon as I accept this hypothesis, the whole dream, part I and part II, becomes entirely clear. "The young man is still in the uterus and looks out," would be the meaning of the first picture, which in conscious speech might be thus expressed: he is still on the path of his mental regeneration (development) —for the idea of re-birth is an archaic picture for mental development, as Dieterich has shown. The young man looks out and sees a field being ploughed thoroughly. The field is not merely a sexual symbol but is also a symbol of the field of activity, the young man's own life task. To plough the field does not mean merely coitus, but "to do his work." The young man sees a new life, full of work, before him after his cure is completed (birth). The emotional element of the dream fits very well to this. By this process of thought the meaning of the last part of the dream has also become clear; the dreamer's new field of work has been more definitely pointed out; he will seek occupation as a teacher, out of love for his analyst, and bearing in mind the events of his own psychoanalysis. To guide others is to guide oneself.

This interpretation gives us a picture of activity ascribed to the rôle of the analyzer; to the patient himself it gives an orientation in his efforts and the course of his cure. Of what use, pragmatically considered, would be to him the interpretation of

the dream as the spying on the sexual intercourse between his parents? Freud's interpretation I regard as a preliminary step of the actual interpretation. It is, so to speak, the picturesque material which must be translated into the intellectual,—it gives the "whence" of the symbol, but not the "whither." To put it differently, it gives the retrospective, but not the prospective. Jung once expressed this idea picturesquely, when he said "the unconscious speaks a pidgin English which must be translated into the language of cultured men." Adler's saying that the sexual speech of neurosis is a "manner of speaking" is probably to be taken in the same sense.

This two-sided nature of the symbol I explain in my analyses as follows: The searching out of the symbols may be compared to contemplating a tree of which one considers the subterranean parts, the roots, and the upper part, the trunk, branches, leaves, etc. In the case of the symbol, the sexually symbolic is like the root, the intellectual content of the symbol is like the trunk and branches.

You will permit me another brief example as illustration: rain magic and fertility magic among savage peoples, and which are preserved even to-day in some customs of our peasants here, when regarded retrospectively prove themselves to be entirely frank coitus symbols. But they are not such only—they are more than this. They represent a frank attempt on the part of primitive man to represent and to influence a process of nature, that is, fructification. He is only using, because of his distinctly anthropomorphic tendency, materials from a procedure well known to him, in order to gain a new conception. This is the outcome of prospective reflection. As a matter of fact, we may regard the concept of magic as the mythical stage of meteorology and of chemistry as applied to agriculture. Thus modestly appear the beginnings of our distinguished sciences.⁵

It was my original intention to show, by means of Parsifal, how the Freudian symbology stops short on its way to the right goal of its task, and thereby becomes unfruitful, but I must reserve this intention for a later publication, as it would make this paper too long, and I shall therefore content myself with pointing out that tracing back the grail and the lance to the feminine and masculine genitals gives us an explanation only as to the original source of these symbols, but not as to their real con-

⁵ See the rich ethnological literature for clues to literature and as reference book W. Wundt's "Folk Psychology."

tent. A recent analysis of the Prometheus myth gave me lately a quite analogous experience; that is to say, the Freudian myth analyses really contain only the beginning of the actual analyses; this explains, to a great extent, why they are so little understood by those who are not initiated. These analyses are like the decipherings of the alphabet of an unknown language, but they do not arrive at a knowledge of the words themselves. Proofs of this I shall give shortly.

In the interpretation of symbols we must not stop short at the concrete sexual act; it is our task to connect the prospective conception with the retrospective. Freud himself, as I gladly admit, was the first to give this interpretation by correlating rescue phantasies of the neurotic with birth dreams. For the ultimate interpretation of the rescue phantasies leads directly to the motive of re-birth. Putnam, two years ago, gave a discourse in our circle which, as I believe and regret, was little understood. In it he very clearly indicated the position just taken. The last sentence of his address, which might well serve as a motto for this part of my paper, was this: "Rightly we boast of having thrown light, from one side, on the significance of the church-steeple. But there still remains to us the more important task of learning to understand its other significance with equal precision."

It is not difficult to understand why some change in our methods has become necessary. What made psychoanalysis as a method so fruitful till now was the systematic introduction of genetic thinking into psychology. Research is directed primarily towards origins, towards the past. But research would become paralyzed if it remained for any length of time one-sidedly retrospective. A new field of work is now before us and awaits our efforts. The prospective road leads to reality; it promises us, therapeutically, the most important insight, just as the retrospective road once meant for us a great scientific gain. Biology, which has traced the phylogeny of the under jaw of man back to the gill arches of the fish, after making this important discovery returned to the lower jaw of man in order to examine and better understand its structure and function. We, ladies and gentlemen, are in a similar position now, and must clearly admit it, in order to continue our work. The fine American lectures which Jung has just published, are a clear expression of this necessity.

The prospective capacity, which after the numerous experiences of the last few years, we may ascribe to the libido (and here the merits of Jung are to be prominently accentuated), and from which we assume that it develops a lively activity in the unconscious, stands in close relation to the function of the symbol. We have progressively learned to interpret the symbolism as the mythical organ of knowledge, and the symbol itself as expression of as yet vaguely grasped reality. I must remind you of the first mythical step in knowledge by Auguste Comte, and the important contributions of H. Silberer. In his book "On the Formation of Symbols," Silberer presents an early type of the symbol which he defines as follows: "The first type of the symbol originates when the idea, unhindered by disturbing concurrent ideas (concurrent affect-accentuated complexes), is visualized on the basis of this apperceptive insufficiency as an idea which has arisen on an intellectual basis."⁶

This first type of symbol offers a theoretical basis for my conception—entirely empiric—of the preparatory and preparing function of the dream (or of the unconscious). The possible suitable solution of the conflicts are gropingly searched for and expressed by the symbol. We must here eliminate entirely the question of the intuition, which plays so prominent a part in the philosophy of Bergson. All this aspect of the symbol spreads beyond the confines of the thus far accepted "censor," and shows the necessity for testing and broadening our conception of dream psychology.

THE TENDENCIES OF THE VIENNA AND ZÜRICH SCHOOLS IN PSYCHOANALYSIS

Freud has given me occasion to suppose, in a recent publication, that I must have expressed myself in my work on the function of the dream so as to be misunderstood,⁷ for he there ascribes to me ideas which, as a matter of fact, are not mine.

In this publication, to be found in Vol. I of the *International Zeitschrift für Psychoanalyse*, 1913, there is a dream, in the analysis of which, among other things, there is to be found an indirect confession of a deed done the day before. Freud here shows that this dream has a deeper meaning than only the com-

⁶ Silberer's orientation is closely allied to ours in Zürich, although the two points of view have arisen independently.

⁷ *Jahrbuch*, Vol. IV.

paratively unimportant confession read out of the translation of the symbol. "So it is proved that there is no necessity to admit there are confession dreams, just as it is senseless to speak of reflection dreams or warning dreams." This assumption is regarded as a regression to the preanalytic period.

I consider Freud entirely right when he shows that such a dream is not yet analyzed if the confession was read out of it and when he speaks of the regressive point of view of such an analyzer. But I must contradict him if he assumes such a point of view to be mine. I am glad to be able here to express clearly that this is an entire misunderstanding. In order to clear up the situation, I have decided to interpret this dream myself according to the material at our disposal. I suppose the analysis, which I will now make for you, would be the same if made by some Zurich colleague of mine. Thus it will be possible for me to contrast the two interpretations which now exist in the psychoanalytic movement.

I must begin by saying that the particular dream is that of a nurse, and was analyzed by a lady patient of Freud's, and that Freud himself accepted the interpretation and carried it somewhat deeper.

A lady suffering from doubt and compulsion neurosis demands of her nurses not to be permitted out of their sight one moment, as otherwise she begins to worry about what forbidden thing she may have done during the time she was not watched. One evening she is resting on the couch; she fancies she sees that the nurse on duty has dropped asleep. She asks: "Did you see me?" The nurse starts up and answers: "Yes, certainly." The patient now has grounds for a new doubt and repeats the same question after an interval. The nurse again asserts she was awake and at that moment the maid brings in the evening meal. This happens on a Friday evening. Next morning the nurse tells a dream which scatters the doubts of the patient. The nurse's dream: She was given the care of a child and she lost it. On the way she asks people on the street if they have seen the child. Then she reaches a large sheet of water and goes across a small foot path. (Later she adds that on this path the nurse is suddenly before her like a mirage.) Then she finds herself in a neighborhood she knows well and there meets a woman she knew as a girl, and who at that time was a saleswoman in a grocery store, but later she married. This woman is standing

before the door and the dreamer asks her: Have you seen the child? But the woman is not interested in this question and tells her she is now separated from her husband, adding that even in marriage there is not always happiness. Then the dreamer awakes, quieted, and thinks the child will probably be found at some neighbor's house.

I must put aside a good deal of material and direct the reader to Freud's previously mentioned publication. I content myself with repeating the interpretation there given and shall then give my own.

The lady's interpretation of the dream establishes that the nurse is disturbed at having failed in the fulfilment of her duties and is afraid of being dismissed on that account. Therefore the dream contains a sort of confession. We must emphasize that in the morning the nurse tells the lady the dream, and added that Friday is often an eventful day for her. (It was a Friday when the incident occurred.)

This interpretation is accepted by Freud, but he broadens and completes it, since he discovers the "deeper meaning of the dream," the dream-forming wish that originates in the unconscious. The wish appears as follows: "Very well I did close my eyes and so compromised my reliability as a nurse; now I shall lose this place. Shall I be as stupid as X. who went into the water? No, I won't be nurse any longer, anyway, I mean to marry, be a wife, have a child of my own. Nothing shall prevent this." This last interpretation is not actually built on ideas of the dreamer, but as Freud says, "on our knowledge of dream symbolism." (The water, the whale in the myth of Jonah, the narrow path.)

In the interpretation which I will not put before you, I shall, as in my first example, distinguish between an objective and a subjective phase.

The child who has been lost is, of course, the patient entrusted to the nurse; the dreamer might lose her place and thereby come to the same condition as X. who committed suicide (mirage). The married woman who is asked about the child and who is only interested in her own affairs is, first, the sick lady, who bothers the nurse quite a little with her neurosis. It is evident that the nurse has a typical aunt-transference to this lady, in which there is a distinct element of defiance. (The analyzing lady has not recognized herself in the dream, because she is represented in

too uncomplimentary a manner.) The qualification of the saleswoman in the grocery store must refer, in this phase, to the employer from whom the dreamer receives her food. Freud draws attention to another source, which is certainly correct—that is, infantile symbolism, the qualification no doubt also applies to the aunt, and also to the mother of the nurse. But the married woman without doubt is also the aunt, as Freud assures us. (The dreamer knows the place well; also notice the circumstance that she ignores the nurse's questions about the child, like the aunt who was greatly opposed to a former suitor of the nurse.) Therefore we get this meaning: neither my employer nor my aunt bother much about me, they are only interested in their own affairs. The circumstance that the conversation takes place before a door in a well-known spot, leads me to suppose that this refers to the mother and to the dreamer's own birth. Therein we find an accusation against the mother, but also an excusing of herself from the fault committed. I have been made this way, have been brought up so, it is not my fault. This makes comprehensible the last sentence of the dream, the child will probably be found at some neighbor's house; I need not take the matter so seriously.

Now we will take the dream in its subjective phase: the child entrusted to her, and which she lost and was seeking across the sheet of water, whence she met the mirage, is her own valuable personality, still a child, which ought to grow up and was lost as the day before she had again showed herself to be unreliable in her work and defiant, irritable towards her patient. We may assume that the incident of the day before the dream was only a repetition of innumerable faults which were reawakened on this day of misfortunes (Friday). The nurse finds herself before a difficulty typical to her and she reacts typically. Witness the aunt-mother transference.

The lost child must be found, the submerged moral personality must be born again, and she actually stands near a great water, to which belongs the thought of the Jonah myth. The joke of wriggling Jonah, which belongs in the original material, has not been used in the interpretation given us, but it belongs here. The nurse does similarly, she wriggles out of her difficulty; she does not take the matter seriously; why bother herself? The child will be found at some neighbor's house. I can't act differently, I have not been taught (accusation of aunt, mother).

Rebirth (alias moral development) the nurse does not succeed in obtaining; she is content with some superficial consolation. Therefore, we don't expect to find any liberation, any relief from her depression. As a matter of fact we know that after the dream she remains defiant, does not confess her fault, is irritable and so forth,—that is, she remains stuck in her typical predicament. But the nurse must also be identical with the former seller of foods, for we expect to find after the definition of the dream which I have to-day set forth, that on sufficient analysis all figures in the dream will resolve themselves as personifications of tendencies of the libido. It is so here also, since the nurse does not sufficiently trouble about her patient; she sleeps during her hours on duty; probably she dreams a good deal about her own affairs. The marriage and separation of the woman in the dream no doubt refer to her own unfortunate love-affair, as Freud has shown.

This dream, then, gives us a pictured representation of the nurse's psychic situation at the time of the occurrence we are reporting. It expresses the insufficient attempts of the dreamer to develop the ethical personality. It contains references to a new birth; but also to the failure of the same and at last the dreamer assumes the attitude of resigned indifference. According to my conception this is not merely a confession dream, although Freud ascribes that opinion to me. The dream may be recognized indirectly (in that it is told to the lady) and also directly (by the analysis) as a confession. But in the psychic ménage of the dreamer it has a greater significance than either of these, for it pictures in symbolic speech, a typical psychic reaction of the dreamer to a given stimulus from the outer world. Its meaning goes much beyond its cause. The loss of the place would not have been of such great importance to the nurse; such employment is easy to get. It deals with the actual conflict of the dreamer, or rather, it deals unmistakably with her actual life-problem. I think I am speaking entirely in Jung's meaning of the "actual conflict" and similarly as Riklin has done in an apparently greatly misunderstood essay in the *Correspondenzblatt f. Schweizer Aerzte*, except I would prefer the expression "actual expression of the life-task" to "actual conflict."

I would be greatly pleased if the contrasting of these two different interpretations of the same dream might serve to bring about a better understanding of my conception, all the more as I

am convinced there is no difference of principle involved, but only a broadening, or rather a deepening, in that we take the question from its strictly sexual into the general psychological field.

In order to be rightly understood, I will try to outline my attitude to Freud's interpretation. The nurse fails in one place, she is not capable of adjustment, her libido undergoes retrogression. Experience teaches us that in this situation of the libido, sexual excitement easily takes place (notice the onanism of neurotics, following discomfitures of any kind). In a girl, the wish for love, marriage, and a child, which is justified biologically as well as psychologically, can fulfil itself in phantasy. This confirms Freud's interpretation. If I ask myself, how can it be possible that two different interpretations of the same dream may be correct, there comes to me an idea that I have long harbored, without following it out sufficiently thoroughly and systematically. It is this: The wish of the girl for love and a child is an expression of the pleasure-principle, whilst the picture of the nurse's faulty adjustment to life and her reaction is the work of the reality principle. The dream, as I interpret it, describes the faulty adjustment to reality. The two fundamental principles of psychic happening, as formulated by Freud, ought to be demonstrable in the psychic phenomena; therefore in the dream as well as elsewhere. For the last two years I have gradually received the impression that in psychoanalysis we have first learned to know the pleasure principle and its numerous manifestations, thanks to Freud; whereas, the reality principle as the younger child has been somewhat neglected, and that its furthering is essentially the work of the Zürich school with Jung at its head. The following from Freud's interpretation seems to me a confirmation of this. "The wish, 'I want a child,' seems to be more adapted to help the nurse over the unpleasant situation of the reality." It looks like a distinct accentuation of the pleasure principle on Freud's part. You are aware that the principal idea of my contested article on the "Function of the Dream," is as follows: "In the dream there is at work a preparatory arranging function which belongs to the work of adjustment." This is a clear expression of the emphasis I place on the reality principle.

The two main principles here mentioned are after all only an expression of the two typical forms of activity of the libido, progressive and regressive. They are metaphorically expressed, two channels at the disposal of the libido current. The important

point is the proper distribution of the same. They are also comparable to two voices which, more or less harmoniously, sing the song of life. In neurosis, as in the first phase of cure by analysis, the voice of regression drowns the other; this can be proved in numerous dreams which are to be found in literature; I have therefore avoided giving examples. It is true that in all these dreams traces of the drowned voice of progression are demonstrable. It is to this point, it seems to me, that the analyst of the future should attach the most importance, for we are first and foremost healers, and therefore it is our duty to point out to our wandering patients the light that shines in the distance. This gleam of light is to serve them as a lighthouse in the storms of passion. In the course of the treatment the voice of progression will gradually become louder, until it finally takes the dominant note. The connection between pleasure and displeasure principle and the cathartic function, on the one hand, and between the reality principle and the preparatory function on the other can here be merely indicated. An outburst of anger, to avoid internal tension, the striving for satisfaction by replacements, are frank unloadings (cathartic cleansings); the weighing and representing of the solution of a conflict prepares for freedom and leads to reality.

I am at the end of my presentation. You will be justified in remarking that I have not tried to test the subject from all sides; I have, for instance, passed over the dream as a guardian of sleep, and left polemics aside. I did not do so in order to lighten my task; I may say for my justification that I primarily desired to handle those points which have become somewhat clear to me, I have also striven to bring as much positive material as might be useful for the discussion. I hope that the gaps I have been obliged to leave may be filled out by my colleague to your satisfaction.

Periscope

Jahrbücher für Psychiatrie und Neurologie

(Vol. 34, Parts 1 and 2)

1. Study of the Histories of German Brain-pathology. MAX NEUBERGER.
2. Korsakow's Psychosis in Japan. TOYOTANE WADA.
3. Daily Variations in the Electrical Conductivity of the Human Body. DR. V. PFUNGEN.
4. Involution Phenomenon in Cases with the Clinical Picture of Brain Tumor. EMIL REDLICH.
5. The Influence of Political Events in Mental Disorders. C. GROSZ and M. PAPPENHEIM.
6. Dystrophy Adiposus-genitalis in Chronic Hydrocephalus and in Epilepsy. J. ROTHFELD.
7. Changes in the Official Diagnosis Plan for Insane Institutions. H. SCHLÖSS.

1. *German Brain-pathology.*—A résumé of the early ideas regarding encephalomalacia and its relation to encephalitis, thrombosis and embolism.

2. *Korsakow's Psychosis in Japan.*—Wada reports two cases of Korsakow's psychosis and calls attention to the infrequency of this among the Japanese, as only seven cases have been reported. The relation of Korsakow's psychosis to alcohol appears to be less constant than in other countries, as in none of the reported cases was alcohol an etiological factor. Although alcohol is freely used in Japan, alcoholic psychoses are very rarely observed.

The two cases observed by the author developed as a result of nephritis and were characterized by loss of memory, retrograde amnesia and disorientation as to time, without confabulation and polyneuritis.

3. *Variations in Electrical Conductivity.*—The experiments of v. Pfungen show that the electrical resistance of the human body varies with the different physical and mental states of the person. When accumulations of fecal matter occur in the colon the electrical resistance of the body is high, showing in some cases 186,000 ohms. With evacuation of the bowels the resistance was reduced to about 70,000 ohms.

Mental states, as anxiety, fear of death or disease, etc., produce a lowering of the electrical resistance to 10,000 ohms or less—in one instance to 4,800 ohms.

4. *Involution Signs in Brain Tumor.*—Redlich's case began with psychical symptoms, especially forgetfulness, and rapidly developed a complete clinical picture of brain tumor, with local symptoms as left hemiparesis, hemianesthesia, and left hemianopsia indicating a location in the right hemisphere.

Although no evidences of lues could be found and the Wassermann reaction was negative, mercury was tried on two occasions and aggravated the symptoms. Under potassium iodide the condition improved and the symptoms nearly disappeared, leaving a slight atrophy of the left optic nerve, so that patient could return to his work for nine months. Then the symptoms returned and a tumor of the thyroid developed. At the autopsy was found a malignant tumor with sarcomatous degeneration of the thyroid gland, and a large tumor in the right parietal lobe having the histological characters of a diffuse glioma.

5. *Political Events in Mental Disorders.*—Grosz and Pappenheim describe

some of the psychoses which occurred during the Balkan War. The political situation appeared to give special color to the delirious and confusional states of alcoholism, etc., in persons who otherwise had no fear of the war. In general it may be said that the "political symptom" was only an accidental factor in modifying the hallucinations and was without influence in the production of the psychoses.

6. *Dystrophy Adiposus-genitalis in Hydrocephalus and in Epilepsy.*—Redlich reports five cases of hydrocephalus with dystrophy adiposus-genitalis, of which three were also associated with epilepsy. The dystrophy symptoms are explained as possibly due to the pressure on the hypophysis by the hydrocephalus in cases having some disturbance of the functions of the hypophysis or other ductless glands. The epilepsy may also be explained by a similar disturbance of the hypophysis by the increased pressure of the hydrocephalus.

7. *Official Diagnosis Records.*—Proposed changes for recording vital statistics and diagnoses in insane institutions. Of local interest only.

E. A. SHARP.

Review of Neurology and Psychiatry

(Vol. XII, No. 7)

1. A Case of Amaurotic Family Idiocy. W. E. HUME.
2. The Action of Adrenalin and Epinine on the Pupil in Epilepsy. R. M. STEWART.

1. *A Case of Amaurotic Family Idiocy.*—The case described bears all the characteristic clinical and pathological features of this disease. The article is accompanied by five microphotographs and three colored drawings. The case was in the service for a time of Mr. Wardale, senior ophthalmic surgeon to the Royal Victoria Infirmary, Newcastle-upon-Tyne.

2. *Action of Adrenalin on the Pupil.*—The patients experimented on were mostly insane epileptics at the Prestwich County Asylum.

Instillation of suprarenal extract into the eyes of an epileptic immediately after the cessation of a fit, may give rise to:—

1. Dilatation of both pupils, about 35 per cent.
2. Dilatation of one pupil only, 17 per cent.
3. No change, 43 per cent.
4. Contraction of one or both pupils, 17 per cent.

These conclusions were derived from the study of the pupillary phenomenon in fifty patients subject to major epileptic attacks, and some 400 observations were made. In none of the cases was any effect produced by the instillation of adrenalin during an interparoxysmal period.

The duration of the mydriasis was subject to a wide variation. Frequently the pupil remained dilated for fifteen to thirty minutes, and then gradually returned to normal, but in some instances it remained dilated for some hours, and not infrequently a patient would have another fit before the mydriasis had passed off.

Observations were also made in Jacksonian epilepsy, congestive attacks in G. P. I., organic hemiplegia and a few other affections. Mydriasis was produced in all cases in which there was evidence of sympathetic derangement or abnormal function of the ductless glands.

The writer concludes his article as follows:

With regard to epilepsy, not infrequently a disturbance of the normal sympathetic mechanism takes place, which may be readily shown by the employment of suprarenal extract as a clinical test; further, this disturbance may be unilateral or bilateral, and is subject to variations which cannot at present be explained.

It is necessary to consider whether this sympathetic derangement plays any part in the production of epileptic fits.

The inconstancy of adrenalin mydriasis in epileptics, the wide variations to which it is subject, and its occurrence in other convulsive types, make it probable that the convulsive seizure and the sympathetic disturbance are related, not as cause and effect, but as concomitant effects of a single pathological process, which has yet to be determined.

C. E. ARWOOD.

Archiv für Psychiatrie und Nervenkrankheiten

(52 Band, 1 Heft)

- I. Recent Syphilis Investigation and Neuropathology. G. STEINER.
- II. A Contribution to the Study of Aphasia, with Special Reference to Amnesic Aphasia. F. A. KEHRER.
- III. The Distribution of Fiber Degeneration in Amyotrophic Lateral Sclerosis, with Special Reference to Changes in the Cerebrum. E. WENDEROWIC and M. NIKITIN.
- IV. Clinical and Anatomical Contribution to the Study of the Occlusion of the Posterior Inferior Cerebellar Artery. K. GOLDSTEIN and H. BAUMM.
- V. Heredity in the Psychoses. (Continued article.) PH. JOLLY.

I. *Syphilis and Neuropathology*.—On the basis of renewed interest in syphilis derived from the discovery of its causative spirochete, Steiner discusses the present status of the pathological anatomy of the disease. He points out the desirability of studying the greatest possible number of cases in all stages of the disease after a definite method, particularly in relation to the various reactions of the spinal fluid and the results of animal inoculation. The question of the relation of so-called meta-syphilis to the disease is given due weight, as are the various problems of "neurorezidive." He finds that these phenomena occur in the greatest number of instances in the early secondary stage, and that they are distinctly more frequent after salvarsan treatment than after mercury. The opinion now generally accepted is expressed: that the so-called meta-syphilis is to be regarded rather as a late manifestation of the disease itself than as a special and differentiated affection. The article gives an admirable summary of the knowledge of the disease in its various relationships, and is followed by an excellent bibliography.

II. *Aphasia*.—This article is too technical to permit of adequate review. It offers a valuable discussion and data on the obscure and difficult subject of amnesic aphasia.

III. *Amyotrophic Lateral Sclerosis*.—Wenderowic and Nikitin find distinct degenerations in the brain as well as in the spinal cord and in the brain stem in a carefully studied case of amyotrophic sclerosis. The chief interest and the chief emphasis of the paper lies in the degenerations found in the brain, apparently far removed from the course of the pyramidal tracts; especially were lesions found in the corpus callosum as well as in various parts of the cerebral cortex, particularly in its motor regions. The authors feel justified in denying the existence of motor areas in the insula and in the gyrus fornicatus, since no degenerations were found in those regions. Perhaps the most important part of the paper lies in the study of the corpus callosum in relation to associated motor functions of the two hemispheres.

IV. *Cerebellar Artery, Posterior Inferior*.—Goldstein and Baumm, following the study of several cases of occlusion of the posterior inferior cerebellar artery, present a valuable résumé of the symptomatology of this some-

what unusual lesion in relation to disturbances of sensation, its distribution, disturbances in the distribution of the vagoglossopharyngeal, taste disturbances, sympathetic involvement, lesions of the restiform body and of the cerebellar tracts. The paper is of distinct value in its detailed description of the effects of this somewhat unusual lesion. An elaborate table is appended to the article.

V. Jolly (Continued article.)

(52 Band, 2 Heft)

- VII. Contributions to the Pathological, Anatomical, and Clinical Study of Cerebral Hemorrhagic Pachymeningitis. E. CIARLA.
 VIII. Heredity in the Psychoses. (Article concluded.) PH. JOLLY.
 IX. The Failure of the Corneal Reflex in Organic Nervous Disease. R. WOLFF.
 X. Family Cortical Spasm. J. RÜLF.
 XI. Pathological Anatomy and Pathogenesis of Granular Ependymitis. M. S. MARGULIS.

VII. *Pachymeningitis Hemorrhagica*.—Ciarla has made a study of upwards of 150 cases of hemorrhagic pachymeningitis of the brain, and finds that the condition produces symptoms, difficult if not impossible to differentiate from various other conditions. The apoplectic and epileptic seizures frequent in dementia præcox may not occur in spite of the existence of pachymeningitis; and, on the other hand, in the absence of such a pachymeningitis, these seizures may occur.

VIII. *Heredity in Psychoses*.—Jolly offers a detailed and painstaking study of heredity in connection with the study of twenty-one families in which various psychoses occurred. He draws the general important conclusion that the former view is now untenable, that there is a strong tendency for families so afflicted to die out in relatively few generations. His study shows that no degeneration or advancing depreciation of the family stock could be demonstrated. The degeneration of the race from a psychopathic standpoint, if such occurs, is not due to the appearance of endogenous psychoses, but rather to an injury of the germ-plasm, above all by alcohol and syphilis. A detailed statement of the types of psychoses occurring in the various families leads to interesting conclusions regarding heredity. The difficult subject can only fitly be determined with fair scientific accuracy by the collection and intensive study of a great number of families.

IX. *Corneal Reflex*.—The corneal reflex in organic diseases of the nervous system is studied by Wolff on the basis of a large series of carefully observed cases. He has carried further the original observation of Oppenheim, made in 1900, who pointed out the importance of this phenomenon in the diagnosis of organic disease.

X. *Cortical Spasm*.—Rülf calls attention to a case of cortical spasm, of which he finds but a single other instance in the literature. The patient, as well as his three sisters and his father, suffered from a peculiar spasmodic affection affecting the leg, body, upper extremity, face, mouth, and speech muscles, in a way suggestive of Jacksonian epilepsy. From the fact of its appearance in several members of the family, however, it appears unlikely that the spasm could be due to an organic lesion of the motor region. The writer is rather inclined to the hypothesis of a centrally caused motor neurosis, and would classify it as a family form of cortical spasm. The article discusses the question of hysteria and organic disease as possible explanations.

XI. *Glandular Ependymitis*.—Margulis reaches certain definite conclusions on the ground of his investigation of granular ependymitis. He finds

that the papillæ in the affection have a distinctive structure composed of a central portion built up of a network of glia fibers and glia cells, and that these papillæ may be further classified as cellular or composed more particularly of fibrils, depending in general upon the character of the glia tissue of the ependyma. Occasional granulations of the ependyma have no pathological significance. A great number, however, and a wide distribution constitute the pathological anatomy of granular ependymitis, which is an active and progressive process of congenital origin dating from intra-uterine life. The process takes a position between chronic inflammation and new growth, and is to be regarded as a congenital, progressive gliosis of the central nervous system.

(52 Band, 3 Heft)

- XV. A Retrospect in Connection with the Twenty-fifth Jubilee of Prof. Dr. Emil Sioli as Director of the Frankfurt Insane Hospital. A. ALZHEIMER.
- XVI. The Cerebrum of the Rabbit. FRANZ NISSEL.
- XVII. Psychoneuroses in Heart Disease. LILIENSTEIN.
- XVIII. The Anti-social Actions of Epileptic Children. RAECKE.
- XIX. The Use of Pyrogenetic Methods in Psychiatry. A. FRIEDLÄNDER.
- XX. A Contribution to Operative Treatment of Epilepsy. VEIT.
- XXI. A Contribution to the Mistaken Diagnosis of Hysteria. HANS WACHSMUTH.
- XXII. On Supernumerary Phalanges. P. GEELVINK.
- XXIII. Dementia Paralytica among the Jews. MAX SICHEL.
- XXIV. A Case of Motor Apraxia. NOEHTE.
- XXV. Association Experiments in Young Epileptics. R. HAHN.
- XXVI. A Contribution to Our Knowledge of Mental Disturbances in Eclampsia. FRANZ JAHNLE.
- XXVII. Clinical Diagnosis and Pathological Findings in General Paralysis. OTTO MARKUS.
- XXVIII. The Significance of Lowy's Phenomenon in the Diagnosis of Cerebral Arterio-sclerosis. JULIE BENDER.
- XXIX. Psychic Disturbances During Labor. PAUL KIRCHBERG.

XV. *Sioli*.—This number constitutes a Festschrift for Professor Emil Sioli. Alzheimer reviews the work of Sioli during his twenty-five years' incumbency as Director of the Frankfurt Hospital for the Insane.

XVI. *Rabbit Cerebrum*.—Nissel offers an anatomical study of the cerebral mechanism of the rabbit, being the substance of his work when connected with the Frankfurt institution.

XVII. *Heart Disease and Psychoneuroses*.—Lilienstein pleads for a better classification of the psychoses, and urges that the term paranoia be sharply limited, and that catatonia, dementia præcox, and hebephrenia be separated from this category. The same is true of the terms melancholia and dementia. Likewise in the future various heterogeneous disturbances should not be classed under neurasthenia and hysteria; and especially the psychoneuroses which occur in heart cases should be placed in a group by themselves and sharply separated from the endogenous psychoses.

XVIII. *Epileptic Children and Anti-social Acts*.—Raecke cites a number of cases of epilepsy in children to illustrate the epileptic temperament apart from the attacks, and urges a more careful treatment of these cases, and if necessary their detention in proper institutions to guard against danger to their associates.

XIX. *Heat in Treatment of Psychoses*.—Friedlander dwells on the hopelessness of much of the treatment in psychiatry, and discusses the possibility

of a further trial of various heat-producing agents. He believes that the pyrogenetic treatment of the psychoses has a scientific foundation in the fact that intercurrent febrile diseases often influence psychoses favorably. Practically, the experience of various physicians has demonstrated the possibilities of such treatment artificially produced. Various drugs are alluded to in this connection, and the hope is expressed that further researches may be made, inasmuch as the results hitherto obtained offer some expectations for the future. In connection with salvarsan, mercury, and iodides, he believes that pyrogenetic treatment may be used with advantage.

XX. *Operation in Epilepsy*.—Veit reports two cases of epilepsy in which operative measures were taken. In one, the operation was undertaken for the removal of a bullet and to prevent further complications which might be caused by the projectile. The epilepsy itself was not helped. In the second case, operation likewise did not affect the epileptic attacks. Insistence is laid upon the necessity of long-continued bromide treatment after operative interference.

XXI. *Hysteria Diagnosis*.—Wachsmuth in this paper gives a series of cases of mistaken diagnoses. The contribution is of value from a clinical standpoint.

XXII. *Supernumerary Digits*.—As a possible contribution to the study of the stigmata of degeneration, Geelvink calls attention to the rare anomaly of supernumerary phalanges. He finds the deformity peculiarly hereditary, although the rarity of the affection has prevented its careful study in many families. The cases are not sufficient in number to determine the point as to the Mendel rule concerning dominants and recessives, although after analogy with other deformities, it may be presumed that a dominant would be shown.

XXIII. *Paresis among Jews*.—Although syphilis is recognized as an essential factor in the production of general paralysis, this fact does not explain the disparity in certain regions between the incidence of syphilis and dementia paralytica. It is evident that some other factor or factors must enter into the determination of the disease. Recently, Westhoff has expressed the view that paresis is a race disease which attacks particularly the higher races, and especially the Germanic races, including the related Slavs and Celts. This theory appears to have many contradictions. A study of the incidence of the disease among the Jews shows that the Jews of different countries and regions vary in their predisposition. Interesting statistics are given on this point. It is concluded that the assumption of a race predisposition cannot be proved. The same factors predispose among the Jews as among others. Possibly the frequency of the disease in that race is due to the fact that they have for a shorter period been exposed to the poisons of syphilis and alcohol than others. It is noticeable that Jewish women are seldom infected by the disease. It is finally concluded that the disease occurs with practically the same frequency among the Jews and those of other races, and that the observed differences are to be attributed to external causes rather than to the influence of race.

XXIV. *Motor Apraxia*.—Noehte describes in detail and with full comment a valuable case of motor apraxia.

XXV. *Association in Epileptics*.—Hahn narrates a series of association experiments with young epileptics in an attempt to show whether the mental defect observed in these cases is simply a defect of development, or whether it occurs in conjunction with more or less normal development.

XXVII. *Eclampsia*.—Jahnel studies in this article the mental disturbances occurring in eclampsia, and makes the somewhat obvious point that the eclamptic psychoses which he describes may only be diagnosed by the proof of a foregoing eclampsia. It is to be borne in mind that convulsive

seizures of other than eclamptic character may occur, and during the puerperal period may be mistaken for true eclampsia. Epilepsy has, for example, often been confused with eclampsia. The attempt has been made to distinguish the psychoses occurring in connection with eclampsia from those related to epilepsy. A distinction should also be made between the delirium of alcoholism and that of eclampsia. Various forms of puerperal psychoses are to be distinguished by the absence of eclamptic symptoms.

XXVII. *Paresis Diagnosis*.—Markus believes that the surest diagnostic point in the diagnosis of paresis is the Wassermann reaction in the blood and spinal fluid. In by all means the majority of cases of paresis, these reactions are positive. Nonne maintains that they are positive in all cases. Markus believes that a small number do not show the reactions, and that in these cases a pathological investigation may alone determine the diagnosis. For scientific reasons the two series of investigations should be undertaken wherever possible definitely to determine the diagnosis. In the special cases cited where the pathological examination determined the diagnosis of paresis, the Wassermann reaction in blood and fluid was positive, whereas in those cases in which the histological examination pointed to other disease, the Wassermann reaction was negative.

XXVIII. *Arteriosclerosis*.—Löwy, on the basis of a study of the blood pressure in the temporal artery, has stated that its increase on bending the head forward may be regarded as a specific sign of cerebral arteriosclerosis. Bender investigated 40 cases, 15 with various psychoses, 25 with demonstrated arteriosclerosis, among which 6 came to autopsy. In only two of these cases was Löwy's phenomenon demonstrated. The others showed no change in blood pressure. It is the opinion of the writer that the positive cases were not due to arteriosclerosis, but to certain psychic complications, and that the phenomenon might with equal frequency occur in purely functional disorders.

XXIX. *Parturition Psychoses*.—Kirchberg points to the infrequency of transitory mental disturbances during and immediately after childbirth. A case is reported in which an excited mental state, with disorientation and hallucinations, occurred shortly before the birth and continued for some time afterward, the whole abnormal state lasting about an hour. A number of other cases are reported from the literature.

E. W. TAYLOR.

MISCELLANY

CEREBELLAR TUMORS. T. H. Weisenburg and Philip Work. (Journal A. M. A., October 16, 1915.)

The authors discuss the symptomatology and diagnosis of tumors of the posterior cranial fossa. They remark that the knowledge of cerebellar symptoms and localization has not progressed so far as the cerebral, and in few cases in the literature has an accurate localization of the lesions in connection with the local symptoms been attempted. They believe the chief function of the cerebellum is to synergize all movements of the body. The asynergy can be detected in any part or parts, and they emphasize that to make an accurate diagnosis of a cerebellar lesion it is necessary to take into account all other symptoms with those of the cerebellar. They have often made a diagnosis of a labyrinthine lesion, only to find the cerebellum involved and vice versa. It has not been infrequent to diagnose lesions of the cerebellum when only the superior cerebellar peduncle has been secondarily involved. In accordance with their views of cerebellar function, lesions of the cerebellum itself cause more strictly limited symptoms than those invading the peduncles. Most tumors of the cerebellum are gliomatous and of slow growth. Most of them tend to invade the middle rather than the outer part of the cerebellum, and the vermis is almost always involved. It is in this

that they believe are centered the synergic movements of the upper trunk or shoulder girdle, and in the lower vermis the movements of the lower trunk or the pelvic girdle. In the former the feet are not held widely apart when walking or standing, and there is no wobbling of the pelvis. The chief difficulty is that in attempting to stand or walk, the trunk leans or falls forward, backward, or to one side much more so than in the pelvic girdle cases in which there is a more irregular gait, while the body is held more erectly. When the vermis is implicated, the staggering is mainly forward or backward and when a lateral lobe is involved the sway of the body is to the side of the lesion. When the lateral lobes alone are implicated, the asynergic movements are present only on the side of the lesion in the upper limb if the lesion is in the superior lobe, and in the lower limb if in the lower one. The authors place the synergic center for eye movements in the extreme upper portion of the superior vermis, and in chronic lesions confined to the cerebellum involuntary nystagmus may occur. If the nystagmus is developed by voluntary movement the lesion is probably extracerebellar. In these cases direct stimulation of the vestibular tract showed a source of such nystagmus. The presence of cranial nerve symptoms indicate this lesion is extracerebellar. Dizziness with disturbance of hearing is not a cerebellar symptom. Involvement of the motor fibers means pressure on the motor apparatus and not a trouble confined to the cerebellum. As a rule, it indicates a pontile lesion or one in the angle pressing on the pons. Our knowledge is not definite as to the functions of the fibers in the cerebellar peduncles. It is supposed that the inferior and middle peduncles transmit impulses to the cerebellum, and the superior peduncle transmits impulses from this organ. It is probable, the authors hold, that all the peduncles transmit impulses in both directions, and the special functions of the different peduncles are mainly theoretical as yet. From our present knowledge, all we can say is that lesions strictly confined to any of the peduncles cause asynergic symptoms in all parts of the body. The special symptoms of tumors of the different peduncles are given. Such growths are mostly invading ones, apparently. In lesions of the middle cerebellar peduncle the associated phenomena consist of the fifth or sixth nerve symptom on the side of the lesion with sensory and motor phenomena on the opposite side. They have never seen a tumor limited to the inferior peduncle, though they have seen extensions of growth into one or both. In such growth the associated phenomena, if the lesion extends into the medulla, should be implication of the vestibular tract and of the ninth, tenth and twelfth cranial nerves. Lesions of the cerebello-pontile angle are not usually hard to diagnose. Cases have been seen, however, when after such diagnosis it was found that the angle had been invaded secondarily by tumors growing from the cerebellum and more rarely from the pons. The differential diagnosis is important here from a surgical point of view, as such tumors offer little hope for surgical removal. In the usual tumor growing from the cerebello-pontile angle the cerebellar symptoms are not very marked, and the asynergy will be limited to the arm and leg on the side of the growth, unless the tumor is very large. If there is, in addition to the cranial nerve symptoms, cerebellar asynergy in the trunk and limbs, it is probable that the tumor grows either from the cerebellum or from the pons, and this point is important to be noted in the differential diagnosis.

Book Reviews

THE ETHICAL IMPLICATIONS OF BERGSON'S PHILOSOPHY. By Una Bernard Sait, Ph.D. Archives of Philosophy, No. 4, June, 1914. Science Press, New York.

The fundamental principles of Bergson's philosophy are of such vital significance that an ethical application is of necessity practically implied. Still it is a matter of interest and to many perhaps one of great help that these implied principles should be developed more completely along the pathways which Bergson only suggests. In doing this Miss Sait has given us a valuable condensation of Bergson's philosophy, its fundamental hypotheses and the development of them, such a presentation as must precede a discussion of the ethical conclusions drawn from his works.

She makes very clear at first his distinction between reality and the outer expression of it. Experience or life is duration, the "stuff" of all things. This is reality and we enter reality as we are able to plunge with increasing degrees of tension into the duration within us. The present is continuous motion and change, momentary becoming. This is the fleeting quality of intuitive knowledge, which for the sake of action must be expressed in static ideas homogeneously extended in space. For this, intellect has been created, merely the instrument of reality. Intellect concerns itself only with the external forms of practical experience; though by being thus crystallized and defined this becoming, in turn, receives a clearness and fresh incentive for further coincidence with reality.

Science deals with this spatial, practical sphere of knowledge; philosophy must follow intuition in order to penetrate reality. The philosopher's purpose is to give us the vision that will incite us toward the reality. He must, having a vision of the whole, prove it genuine through the use of concepts which in turn must cover all the facts in the realm of intellect. By this intuitive penetration of reality Bergson hopes for a progressive philosophy in which all philosophers shall unite because all shall be occupied with reality.

Consciousness is our own plunging into duration, finding ourselves and the reality in which we live. It is but one qualitative degree of tension in the concentrated tension of all duration. In its deepest moments it is creative, joining the past to the present, always toward the future. It must express its creativity in the superficial realm of action so it is alternately creating, being defined in action, plunging again into intuition in a continued process of creating and being extended by the inertia of matter. In this way it has created the world and organic life. Consciousness exists through its retention of the past into the present. Man is urged to creation by a comparison of the present and possible future with the past and this is accomplished through perception aided by memory.

The mechanism of the brain allows recollection to present memory images for consideration and comparison with new images seized through perception in creative movement. Attention arrests this movement and forms syntheses and hypotheses between the new images and those of the past in an ever-widening circle of memory, which penetrates always more deeply into reality, while in the realm of action it increases in

importance as it is brought into connection with present perception. Our personalities consist of a vast interpenetration of tendencies, both descended to us and increased by self-creation. From these we must ceaselessly choose while we add to them so that life is a growth and an unfolding.

The life-principle is found in world-creative power. All things partake of the essential "stuff," duration. Material forms represent a retardation, a diminution of the life-force. Here even as in individual creation there are diverse potentialities, the past follows the present just so much of it to be chosen as is useful for further creation. All the various tendencies seeking development are, however, parts of the deepest reality, which Bergson discovers by tracing back this dissociation to the original principle beneath.

Two things, then, are emphasized in developing the ethics involved. There is the unity of the deep, underlying reality, though in the process of creative evolution it has become dissociated into these interpenetrating tendencies. Moreover, each individual tendency like the fundamental duration is continually creating, ceaselessly changing. In plunging into reality, coming in varying degrees into coincidence with the life-principle, we must come sympathetically near other individuals and we come to realize that society is made up of an interpenetration of individual tendencies. Man, then, in realizing his own reality and finding his own creative activity and individual development, must choose those possibilities that make for the general good. His own potentialities are his guide, but between them he must choose, forming judgments as to their social value. Moral standards are not fixed, are not outward laws. We have these laws as indications of progress, but life must constantly go beyond them in fresh becoming. It is our approach to the deepest reality that gives us an ever-increasing knowledge of the greatest social good and greater power of judgment, while again each expression of this in moral acts plunges the individual with fresh incentive deeper into the fundamental life-principle. This life-principle must express purpose, an inherent purpose of development.

This can only suggest Miss Sait's comprehensive presentation of Bergson's philosophy and her development of the ethical principles implied. The very flexibility of Bergson's conception allows of a pragmatic development of it in the world of conduct and we can but feel that the author here has sought in some degree to provide for a preconception of an ideal society in some future world and of a personal, objective God. In general, however, she has deduced a very practical and inspiring ethical system.

JELLIFFE.

PSYCHOLOGY, GENERAL AND APPLIED. By Hugo Münsterberg. D. Appleton and Company. New York and London.

Professor Münsterberg has spared no pains in explaining the psychophysical foundations of psychology. With elaborate detail he describes and illustrates the elementary mental processes and the more complex ones into which these combine, grouping them under *causal psychology*. His study of mental activity is one of physical cause and effect in which only explanation is sought. In order to understand instead of to explain there must be an entirely different attitude than that of *purposive psychology*, in which we enter into the aim of the subject and take a personal stand in identifying ourselves with the act of his will or putting ourselves into a relation of opposition to it, as the case may be. Mental life is examined from these two standpoints in its individual and social manifestations.

But one method of approach cannot be so completely divorced from the other theoretically or for practical purposes. It is true that the author while defining the fundamental and necessary division between the two yet acknowledges their interdependence and recognizes their separation as more or less arbitrary for the sake of examination and discussion. Still the over-emphasis upon the physical phenomena accompanying mental action, which in fact denies a "sub-conscious" mental life, leaves purposive psychology inadequately described and leaves causal psychology unrelated to the full personal life. The attributing to the latter field alone the existence of cause and effect and to purposive psychology absolute freedom affords no room for the enormous influence of the unconscious past in its determination even in our choice of potentialities.

A number of chapters are devoted to the possible application of the exact measurements of causal psychology, in part already employed, to various practical spheres. In the law courts, in the adjustment of labor to task, in all departments of life psychophysical activity may be better understood and adjustments be made through these means, but how is psychology to be of practical service on such a limited basis? Not merely the activity through the brain processes, but the whole psychic nature of man, all the sum of complexes which the author would limit to these activities, must be considered in order to make applied psychology more than a limited or even futile effort. In reality, though denying the broader terminology, the author recognizes the wider view, as he shows in his references to the various psychotherapies, but here, too, he lays special emphasis upon mechanical measurements and their more superficial service to medicine.

The book, however, is of interest and value in its exposition of mental processes and their relation to individual and social life, even though one must feel that the point of view is not sufficiently comprehensive. Certain phases have been developed with particular emphasis and instructiveness. The insistence upon the reactionary effect of the motor discharge upon the mental life is one illustration of the practical significance of the elaboration of many an important phase that presents itself to such a thoughtful and carefully wrought psychological work.

L. BRINK.

MENTAL MEDICINE AND NURSING. For use in training-schools for nurses and in medical classes and a ready reference for the general practitioner. By Robert Howland Chase, A.M., M.D. J. B. Lippincott Company. Philadelphia and London. \$1.50.

This volume contains a brief but comprehensive summary of the most salient points to be considered in the elementary knowledge and treatment of mental disease. Its material is presented in a form admirably adapted to the purpose for which the book is written, as an outline for fuller study and an incentive toward it and a simple, practical source of suggestion for the busy general practitioner, but particularly for the nurse. To this end Dr. Chase outlines first briefly the anatomy and physiology of the nervous system and the fundamental psychic processes. From this he proceeds to a general consideration of insanity and its varying phenomena, freely defining and describing them, the disturbances of the various fundamental mental processes. Then more in detail he describes the various psychoses classified mainly according to their general immediate exciting causes. Each one is discussed as to its general characteristics and symptoms with some reference to its etiology, in short with a brief summary of the appearance and manifestation of each, with its prognosis and suggestions for treatment. The last two sections deal with the subject from

the doctor's and nurse's point of view respectively, full of practical advice and directions.

These are largely, however, symptomatic. This is a matter for regret in a book comprising so much valuable material in so convenient and utilizable a form. There is the spirit of sympathetic understanding of the mentally diseased and a recognition of the trend toward a broad and deep comprehension of pathological mental phenomena. Yet this latter is but meagerly suggested. The discussion is mostly of symptomatic manifestations and there is barely a hint of treatment more than this. It is the old attitude that makes its approach toward this fruitful field from the wrong side. Very little reference is made to the inexhaustible extent and activity of the unconscious, the fundamental etiology uncovered by psychoanalysis is untouched. There is not space in this volume for detailed exposition of any psychotherapy but a different point of view would have taken into account the fundamental etiology and given therefore a working basis which would have revealed those channels in which the practical suggestions made could find a depth and meaning of untold value to the patient and new interest to those who endeavor to help him.

JELLIFFE.

PROGRESSIVISM—AND AFTER. By William English Walling. The Macmillan Company. New York.

Mr. Walling is a socialist whose broad attitude of mind affords him a liberal understanding of the activities of society, economic and political, as natural evolutionary stages. The present Progressive movement he conceives as an important advance toward the ultimate goal of socialism. He does not stop, as do some idealists, merely to consider this ultimate goal, but appraises carefully the practical issues already active or foreseen by him in the course of development, which according to his opinion leads to complete socialism.

We are entering now upon the period of the ascendancy of the small capitalists. State capitalism is the designation for this stage of progress. Already there are signs of the succeeding stage, that of state socialism, when political power shall gradually pass into the hands of skilled labor and the professional and salaried workers, "the aristocracy of labor." But complete democracy will only be attained when socialism is ushered in, when the masses of unskilled workers and semiskilled shall all have equal opportunity and equalized sharing of profits.

Equal opportunity Mr. Walling insists upon as the fundamental basis of true socialism, true democracy. His book gives on the whole an instructive survey of the advance of socialism throughout the world, presenting its aims and principles in a spirit of broad and sober criticism and valuation of the same.

A failure to enter into the deeper psychology that underlies human nature prevents the true evaluation of the existing structures of society and their place in evolution. This too exalts the so-called masses to a position for which they cannot be prepared by a brief enjoyment of "equal opportunity," just and important as such opportunity may be. Moreover, there is failure to appreciate the psychology of racial advance which is achieved in epochal stages through the leadership of those whose vision and power both of ability and opportunity serve to lead on the masses who would continue upon a plane of dull uniformity.¹

¹ See J. G. Frazer: *The Golden Bough, A Study in Magic and Religion*. Part I, *The Magic Art and the Evolution of Kings*, 2 vols., 3d ed., Macmillan and Company, London. Vol. I, pp. 216-219.

JELLIFFE.

SYRIAN ANATOMY, PATHOLOGY, AND THERAPEUTICS; OR THE BOOK OF MEDICINES. Translation by E. H. Wallis Budge. Two vols. Oxford University Press, New York.

The student of Hippocratic medicine, which means every serious inquirer into the history of the development of medical doctrines, will find in this extremely fascinating and rich collection much material for serious consideration. Medicine to-day is overloaded with the grossest of animistic conceptions, from which, largely through the influence of Democritus and of Heraclitus, the ancient Greeks had freed themselves. Just how these animisms returned into medicine in such crude form through the Oriental-Latin pathways that were prominent in building up Latin culture, does not now concern us. That which is of interest in this translation of an ancient Syriac text—probably transcribed by some physician in the Galen period—is that it has preserved much Hippocratic medicine as yet less sorely spotted by the animism of the early Christian eras.

To the neurologist the author's views on nervous anatomy and brain function are of great interest.

To the student of mental medicine it is especially fortunate that a chapter on astrology should have become incorporated, and also one in folk medicine—largely in the form of prescriptions—for not alone from the standpoint of Hippocratic doctrines can we read of the gradual modifications in medical ideas—but in the simultaneous productions of the Babylonian and the native animisms one can compare them side by side.

Although the work is primarily of value to the student of the history of medicine it will prove of service from other points of view. Dr. Budge is to be congratulated on giving us such a volume.

JELLIFFE.

Notice.—Neurology has been advancing so rapidly within the past decade that it has become necessary to expand the media of communication between those interested in its progress and its achievements. To this end, three years ago special psychological problems were relegated to a new journal, the *Psychoanalytic Review*, with the hope that there would be enough space to deal with the central field of sensori-motor neurology, which the *JOURNAL* has chiefly represented. This hope has been outgrown and the editors feel that they can best give expression to the growing interest by an increase in the size of the *JOURNAL*. There will be therefore two volumes a year published instead of one. Each monthly issue will be increased from 64 to 100 pages. The price of the volume will be \$4.00. The year's series \$8.00.

The editors take this occasion to thank the many supporters of the *JOURNAL* who make this extension possible.

W. G. SPILLER,
SMITH ELY JELLIFFE.

The Journal OF Nervous and Mental Disease

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Original Articles

ON LOCALIZATION OF FUNCTION IN THE CANINE CEREBELLUM¹

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INTRODUCTION

It is only of recent years that we have arrived at a fairly satisfactory interpretation of cerebellar function. Most dissimilar hypotheses were offered during the past century,—by Magendie (17), Lussana (15), Flourens (7) and Luciani (13). While evidence of localization of function in the cerebral hemispheres has long been recognized, the proof of a corresponding division of labor in the cerebellum has been—until recently—inadequate. Even at the present day the findings of numerous workers lead them to dispute the claims of localization (Luciani, Horsley and Clarke (16), etc.).

During the opening years of the present century the expectations fostered by Luciani's researches were amply realized both in anatomical and in physiological fields, Smith (27), Bradley (5) and Bolk (4), quite independent of one another, and as a result of extensive studies in the comparative anatomy and embryology of the cerebellum, presented a new conception of its morphology. The two latter investigators each constructed a schema depicting

¹From the Laboratory of Surgical Research, Harvard Medical School, and the Surgical Clinic of the Peter Bent Brigham Hospital, Boston.

a common fundamental architecture of the mammalian cerebellum.

The views of Bolk are particularly valuable. Instead of limiting his studies to anatomical provinces he directed attention to the zoological significance of his findings and demonstrated the functional relationship existing between the muscular system and the cerebellum. Bolk showed that variations in certain divisions of the cortex accompany similar variations in corresponding muscle groups—a measurable correlation, in other words, between the development of definite lobuli and definite systems of muscles.

The demonstration of such a relationship naturally suggested convincing evidence for the theory of cerebellar localization. With such an hypothesis in mind Bolk ultimately was in a position to offer the anatomical proof necessary to substantiate the belief that each coördinated movement of the muscular system has definite cortical representation.

Somewhat later Pagano (22), using curare injections, claimed the existence of a psychic and four motor centers in the canine cerebellum. The first investigator, however, to adopt these views in well-planned and thorough physiological experimentation was Rynberk (24). By means of sharply circumscribed ablations of the cerebellar cortex involving specific lobuli or portions of the same, Rynberk found that the postoperative motor phenomena varied consistently with the lobulus or center involved. The results in a large series of animals, studied from this perspective, yielded an experimental confirmation of the more important features of Bolk's anatomical conclusions.

Luciani, Jackson, Edinger, Horsley (10), and others have shown that the cerebellar cortex is an afferent recipient organ. The intrinsic and the paracerebellar nuclei represent the only efferent mechanism of the cerebellum. This conception is perhaps best explained by Sherrington (26) who shows that this structure is really a central organ of the proprioceptive system which controls the tonus of the skeletal muscles.

Viewing the cerebellum, in a broad sense, entirely as a motor organ, Rothmann (23), and Babinski and Tournay (1) regard it as a collection of centers, capable of being differentiated. These centers are representative of voluntary or semi-voluntary, automatic or semi-automatic movements which enable the animal to maintain given postures, to walk, and to perform other motor functions in a regular and orderly manner. The phenomena

noted after certain ablation experiments (abduction or adduction of a limb, etc.) Rothmann explains as an abolition of certain

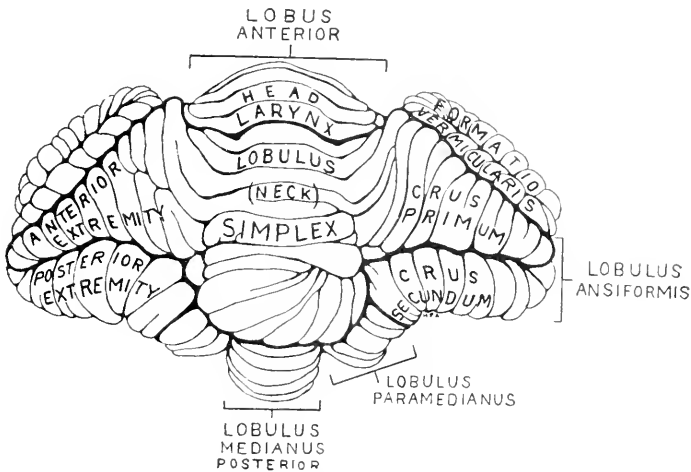


FIG. 1. Diagram of the canine cerebellum to show Bolk's new subdivisions and nomenclature.

antagonistic reflexes of the muscles which normally serve to regulate the statotonus of the extremity concerned. These are the proprioceptive reflexes of Sherrington.

REVIEW OF STUDIES ON CEREBELLAR LOCALIZATION

Since Rynberk's work many others have attacked the problem of cerebellar localization—among them Marassini (19), Luna (14), Hulshoff-Pol (11), Binnert (3), Horsley and Clarke (9) and Rothmann (23). Such studies have been continued in man by Bárány (2), Mills and Weisenburg (20), and others. In the following paragraphs a brief outline is sketched of the results obtained from these investigations.

Crus Primum of Lobulus Ansiformis.—Lesions especially involving the short lamellæ evoke symptoms in the homolateral forefoot. The entire crus is a foreleg center (Rynberk, Rothmann). The medial halves of crus primum and crus secundum embrace the centers for the fore- and hindlegs respectively (Pagano, Marassini, and Luna). The "Hahnenschritt" or over-raising of the affected foreleg appears only when the crus primum is completely destroyed (Binnert).

Crus Secundum of Lobulus Ansiformis.—Lesions involving the medial knee where this adjoins the lobulus paramedianus

usually cause slight weakness of the homolateral hindfoot. Extensive destruction of this crus together with the crus primum and and lobulus paramedianus cause also a definite disturbance of the coördinated movements involved in running in the homolateral hind foot (Rynberk). Crus secundum is the center for movements of the homolateral hind foot (Rothmann). Curare injections into the borderland between the crus secundum and the lobulus paramedianus affect the homolateral hind foot (Pagano). Destruction of this crus leads to a "Hahnenschritt" of the four limbs and to an uncertainty in the movements of the homolateral hind foot (Hulshoff-Pols). Partial or superficial lesions of this crus are insufficient to cause weakness of the hind foot. A complete destruction is necessary for this purpose (Binnert).

Lobulus Paramedianus.—A destruction of this lobulus usually leads to forced movements—rolling movements of the trunk—about the longitudinal axis of the body, and to pleurothotonos (Rynberk). Such an ablation leads to pleurothotonos and to a "Paradeschritt" of all four extremities (Hulshoff-Pols).

Lobulus Simplicis.—Lesions here usually result in a tremor of the head persisting for weeks or months (Rynberk). Those involving the midline cause retraction backward of the head with a tendency of the animal to fall backwards (Luna). Curare injections into the vicinity of this lobulus cause the head to be drawn backwards with a tendency of the body to move backwards as well (Pagano). Ablations of the vermis cause the appearance of shaking or "Neinschütteln" of the head (Luciani). Only double-sided, deep-seated lesions call forth this movement of the head (Binnert).

Lobulus Medianus Posterior.—Extirpation of this lobulus causes no symptoms (Rynberk). Curare injections into this region somewhat affect the trunk and the neck musculatures (Pagano). Destruction here causes an ataxia of the hind legs (Hulshoff-Pol). Lesions of the posterior part cause an antero-posterior swaying of the trunk with an inclination to fall backwards (Marassini).

METHOD

In operations involving subtentorial regions the surgical difficulties encountered in approaching the cerebellum are both numerous and important. Just as special methods and tricks of technique have enabled the neurologic surgeon to enter provinces only recently forbidden (cf. Oppenheim's (21) change of views

regarding cerebellar operations), so similar devices have become necessities for efficient progress in the experimental domain of surgery.

Rynberk probably was the first to suggest an approach to the cerebellum in animals through the tentorium. In his reports, however, as in the publications of other workers, there is a noticeable absence of the detail considered most essential for neurological surgery in man. Those familiar with this field are aware from personal experience or through the announcements of other investigators that infections (abscess, meningitis) following such operations form a common and serious complication. Infections of course, however trivial, defeat the object of every experiment.

The work reported here was carried out in a laboratory where the aseptic precautions of the modern hospital are rigorously observed. The intratracheal method of anesthesia was employed, and not only appeared to minimize respiratory complications but with its use lengthy operations produced less shock. During each experiment the animal was kept on an electrically heated pad. By having the anesthetist support and properly flex the head in the approach to the cerebellum the difficulties of exposure were very materially lessened.

In experiments involving the crus secundum, lobulus ansiformis, lobulus simplex, lobulus paramedianus and lobulus medianus posterior, a posterior approach proved most satisfactory. This afforded ample exposure for purposes of orientation—necessarily a very important feature—and permitted careful and exact ablations. After splitting the superficial muscles of the head and neck in the median line (*Mm. subcutaneous colli, occipitalis, intermedius scutulorum, etc.*) the homolateral flap was retracted lateralward to expose the temporal muscle. The origin of the latter was then raised from the parietal plane and the muscle drawn forward and outward. By carefully following the sagittal plane of the neck overlying the ligamentum nuchæ it was possible to separate the neck muscles (*Mm. trapezii, splenii, etc.*) to the depth of the first two or three vertebral spines without encountering the profuse hemorrhage frequently evident in such operations. To expose the occipital bone (*planum nuchale*) and the superior nuchal ridge it was now necessary to divide the insertions of the neck muscles in this region (*Mm. splenius, semispinalis capitis, etc.*). This led to considerable bleeding except when the bone was hastily scraped with a periosteal elevator and the diploetic emissaries plugged with wax. The exposure at this stage re-

vealed the dura bridging the atlanto-occipital articulation. After separating this for a few millimeters from the overlying bone, the posterior arch of the foramen magnum was rongeured away and the opening enlarged until the proper exposure of dura had been accomplished. Perfect hemostasis is essential at this stage of the operation. After opening the dura the various cerebellar lobuli were readily identified.

To excise the crus primum an anterior approach was necessary. After retracting the temporal muscle well forward the occipital ridge (superior nuchal line) was removed with sharp rongeurs. By rongearing away sufficient bone to either side of this boundary and dividing the dura the posterior aspect of the occipital lobe and the upper portion of the cerebellar hemisphere appeared in the wound. The bony tentorium made visible by these manœuvres was removed in part. Proper retraction in the cerebello-occipital angle now brought into view the entire lobulus ansiformis.

Previous to each experiment a hardened cerebellum was cut into thin sections with a brain knife and a study made of the extent and the relationships of the lobulus in question. The proposed extirpation was then practiced on fresh specimens. In this manner a very definite control of each ablation became possible.

Early in the course of the experiments an animal was anesthetized rather lightly and the cortex electrically stimulated. The muscular responses were noted and afforded a satisfactory index of the extent of the canine motor area.

In the experiments reported here the cortex was not resected, but in accord with Sherrington's suggestion a dull-edged instrument was inserted between this layer and the medullary center beneath, and moved about, at this level, over the sensori-motor sphere. An ample margin of cortex was always included to insure a complete isolation of the motor and sensory areas. Microscopical studies to control this method showed a degeneration of the nervous elements over the provinces involved.

Due to the nature of the operations it was found necessary to keep the wounds bandaged for a number of days. Light, snugly-fitting plaster-of-Paris caps proved indispensable following the sensori-motor sphere destructions. The animals usually received a generous supply of warm water by stomach tube immediately after the withdrawal of the anesthetic.

I. RESULTS FROM CEREBELLAR ABLATIONS

(a) *Experiments Involving Entire Crus Primum (Unilateral)*.—There was a noticeable difference between the fore- and hind-legs of one side as compared with those of the opposite side until about the eighth day (postoperative). This appeared during the first forty-eight to seventy-two hours as a weakness of the homolateral limbs. For the following five or six days the animal then carried the hind paw of the affected side as though it were slightly injured.

There was a perceptible limp and in running the foot in question scarcely touched the ground. These features then disappeared. On about the third postoperative day the preliminary weakness noted in the homolateral foreleg gave way to a recognizable disturbance of coördination. In walking and running—particularly during the latter—there was seen to be an excessive lifting of the paw. A short time afterward (about the fifth to sixth day after operation) there appeared associated with this hyperflexion a definite abduction of the limb. This abduction, however, was a feature only of certain phases of the cycle of coördination involved in running. The foot deviated lateralward while elevated but was not abducted during its brief stay on the ground. Tracings made of the feet during locomotion both before and after the operative procedures showed this very distinctly. While these features were still perceptible in the foreleg at the end of the second week, in the succeeding days there was a very rapid return to the normal.

(b) *Experiment Involving Entire Crus Secundum (Unilateral)*.—During the first few postoperative days, besides the usual pleurothotonos (cavity toward the side of the lesion) a weakness of the homolateral hind leg was perceptible. On the fourth or fifth day there appeared an awkwardness of this limb consisting essentially of slight abduction and stiffness in the joints. Very soon the leg was seen to drag when the animal moved about. In the second week, by walking the animal on its forefeet, on its two side legs, and on its hindfeet a more definite disturbance of coördination was noted in the part. Most striking, perhaps, was the excessive abduction of the hind leg during the brief intervals it remained above the ground. Tracings showed no appreciable changes in the relationships of the footprints. At the conclusion of the second week practically all abnormal motor features had disappeared.

(c) *Experiment Involving the Lateral Half of Crus Secun-*

dum.—A slight general weakness of all the legs was noted up to the third day. On the fourth or fifth postoperative day the animal walked and ran well, displaying very little difference between the sides. At times there was noticed a slight weakness of the homolateral limbs, but this never suggested definite disturbances of coördination. The end of the first week usually found the animal in excellent condition. Active locomotion at this period revealed no disparity between the limbs.

(*d*) *Experiment Involving the Lateral Halves of Crura Primum and Secundum*.—On the first day or two following operation there was a slight general weakness of all the limbs. After several additional days this disappeared and, in turn, slight changes suggestive of disturbances of the sense of position made their appearance in the homolateral legs. These were well seen on applying the "Verstellen" test—abnormal postures of the homolateral limbs were tolerated for much longer periods than usual. During the latter part of the first week, in advancing, both the fore- and the hindlegs on the side of the ablation showed slight degrees of abduction from the longitudinal axis of the body. Footprint tracings again failed to show features essentially abnormal. By the conclusion of the second week the gait appeared natural.

(*e*) *Experiment Involving Median Half of Crus Secundum and Entire Lobulus Paramedianus*.—Within the first few days, besides a slight general ataxia, a definite weakness of the homolateral legs was noted. It was only during this period, while the effects of operative shock were still in evidence, that the animal failed to draw up the hind limb of the affected side when it was hung over the edge of a table ("Versenkungsversuch"). Toward the end of the first week the unsteadiness appeared more confined to the homolateral hindleg. When walked on its two lateral and again on its rear legs this local weakness was easily detected. During this period and in the course of the next seven or eight days there was evident a disturbance of the sense of position. Both homolateral members retained abnormal postures for longer periods than was usual in the opposite limbs. All evidences of abnormal locomotion disappeared between the twentieth and twenty-fifth days of convalescence.

(*f*) *Experiment Involving Lobulus Paramedianus*.—Immediately after operation and continuing for a day or two a definite pleurothotonos was noted, the concavity of the spine being directed toward the side of the lesion. The degree of pleurothotonos

here, however, was never more marked than that found following many of the experiments recorded above. No outspoken tendency to roll about the longitudinal axis of the body was noted at any time. On the second or third day the animal was able to stand and feed itself, and within a brief additional period (several days) it was capable of walking and running. Characteristic disturbances of locomotion were not distinguished at any period during the convalescence.

(g) *Experiment Involving Lobulus Simplicis*.—During the first four days the animal was extremely ataxic. Unable to stand without support it was frequently found leaning heavily with its head and body against the cage wall. Eating and drinking were accomplished only with the assistance of the attendant. While the ataxia was general and affected the limbs more or less alike, the most striking impairment of the coördination responsible for attitude was seen in the persistent agitation of the head from side to side. About the fifth day the animal regained sufficient control of its musculature to enable it to make some successful attempts at running. The head and trunk continued quite ataxic, nevertheless. Sudden movements were particularly trying, frequently causing the animal to fall in one or another direction. In the course of the following week a gradual decrease of the ataxia ensued. The animal ran comparatively well and the limbs were propelled symmetrically. During the third week an incoördination of the limb and trunk musculature was noted only during jumping, sudden turning, etc. A very slight to and fro movement or tremor of the head persisted for some days longer.

(h) *Experiments Involving Only the Approach to the Cerebellum*.—Due to uncontrollable hemorrhage in two cases, the ablation experiments were conducted in two-stage operations. In each animal, during the first attack, the approach was completed as far as the dura. The wounds healed per primam and the subsequent excisions of cerebellar cortex (second stages) were conducted without additional complication.

On the second day of convalescence both dogs were able to stand and take nourishment. Neither asymmetry nor definite incoördination of the limbs was noticed. Twenty-four hours later the animals ran about the yard, jumping and frolicking in normal fashion. At no time during the postoperative period was there ever found any characteristic involvement of attitude.

Magnus and Kleijn (18) have recently drawn attention to the relations existing between the tonus of the trunk and limb

musculatures and the position of the head. Since the approach to the cerebellar cortex affects the attachments of numerous muscles in the suboccipital province, it seemed likely that surgical measures of this nature would be sufficient in themselves to influence posture and gait. The results from the two animals just mentioned, however, clearly indicate that this does not occur.

THE THEORY OF CEREBRAL COMPENSATION

The fact that time gradually minimizes—often almost effaces—the results of a cerebellar lesion has led to the assumption of a process of compensation on the part of the cerebral mechanism. Such a conception, moreover, has found substantiation in the results of several workers. Pagano (22), for example, showed that when curare was injected into the cerebellar hemispheres it evoked manifestations of motor excitement. Furthermore, if the motor sphere on one side of the cerebrum (gyrus sigmoideus) was extirpated (on the side opposite to the injection) previous to the curare treatment, localized movements in the muscles of the stimulated side no longer appeared and the rolling of the body about its longitudinal axis followed in an opposite direction. The ablation of the motor spheres of both sides completely inhibited the manifestations of motor excitement.

Previous to these experiments Goltz (8) had demonstrated that the removal of the greater part of each cerebral hemisphere (including the sensori-motor areas) in dogs did not prevent the animals later from walking, swimming, etc. More recently Sherrington and Brown (25) in their interesting investigations on the monkey, report that the recovery of a limb (arm) may take place fairly rapidly after the destruction of a large part—if not the whole—of the corresponding area of the motor cortex. This recovery, they believe, is not due to a regeneration of the area destroyed. Also it is not due to a taking over, by the corresponding area of the other cortex, of the movements of both arms. Finally, they have found, it is not attributable to a taking over by the post-central cortex of the functions of the motor cortex.

In a series of studies Luciani (13) showed that dogs deprived of one or both cerebellar hemispheres, while prostrated and ataxic for a time, ultimately regained comparatively efficient control of voluntary movements. By ingeniously combining destructive experiments Luciani finally was able to offer fairly

conclusive evidence concerning the capacity of cerebral function to compensate—in some degree at least—for any loss of cerebellar function. Animals which had regained the ability to run, swim, etc., after the removal of a cerebellar hemisphere again lost this ability when the contralateral sensori-motor cortex of the cerebrum was destroyed. The effects of these combined ablations were somewhat enhanced by extirpating the other sigmoid gyrus.

At a later date Lewandowsky (12) undertook investigations of a similar nature. The ablations in his experiments, however, were somewhat less inclusive. In reviewing the behavior of the animals in his series Lewandowsky was led to the conclusion that the disturbances of motility noted after either cerebral (gyrus sigmoideus) or cerebellar lesions alone became distinctly more marked and took longer to disappear when such resections were combined. It is important to note that though there was found to be a distinct aggravation of the disturbances in the combined sensori-motor and cerebellar ablations of Lewandowsky the symptoms nevertheless ultimately manifested improvement.

A similar relationship was shown by Ewald (6) to exist between the labyrinth and the sensori-motor areas of the cerebrum. The symptoms which disappeared (by compensation) after destruction of the labyrinth reappeared and persisted after destruction of the cerebral cortical zones.

A consideration of the several facts outlined above led us to believe that these principles might be put to use in the problem of cerebellar localization. It has already been shown that very restricted ablations of the cerebellar cortex, when properly placed, lead to recognizable changes in corresponding muscular provinces. These, however, are neither marked nor of long duration. Since the destruction of certain pathways in the cerebral cortex of animals with cerebellar lesions seriously involves the development of what we usually, for want of a better designation, term the phenomena of compensation, it appeared quite conceivable that small cerebellar lesions combined with sensori-motor destructions might lead either to an accentuation or to a prolongation of the symptoms associated with the cerebellar ablations alone.

Animals, accordingly, were prepared to accord with these considerations. A number of the dogs reported under the cerebellar ablation studies were permitted to recover completely from

the effects of the operations. In two-stage operations, then, first the homolateral sensori-motor areas (homolateral as regards the cerebellar lesion) and later the contralateral sensori-motor areas were destroyed.

II. RESULTS FROM COMBINED DESTRUCTIONS OF CEREBELLAR LOBULI AND SENSORI-MOTOR SPHERES

Most of the dogs reported under the cerebellar ablation studies were subsequently used for this investigation. In addition a number of healthy animals were subjected to sensori-motor area destructions with the expectation that the cerebellar ablations could be carried out in subsequent operations. Due to one or another complication, of the total series of animals used, only three withstood the triad of operations. The phenomena noted in two of the three survivors, nevertheless, seemed sufficiently outspoken to deserve record.

(a) *Experiment Involving Lateral Half of Crus Secundum and Both Sensori-motor Spheres.*—The behavior of an animal following this particular cerebellar cortex ablation is reported in a previous section of this paper (Exp. c.) and warrants no additional comment here except, perhaps, to emphasize that at the end of the first week active locomotion revealed no disparity between the limbs. Following the destruction of the homolateral sensori-motor area the forced movements usually observed in the wake of such injuries were noted. The animal walked in circles toward the injured side. There was likewise a weakness of the contralateral limbs, at first marked but later decreasing in intensity. This was more striking when the dog was walked on its hind and then on its forelegs, when it defecated, in shaking itself, etc. In the third week there was still recognizable a slight difference between the two sides. The tendency to circle toward the homolateral side practically disappeared on the seventeenth or eighteenth day.

When the animal had regained its normal nutrition the destruction of the opposite sensori-motor area was undertaken. During the first week following the operation, besides the circling gait (toward the affected hemisphere) and the weakness of the contralateral limbs, there developed a definite chicken strut ("Hahmentritt"). The latter feature, however, persisted for a short period only. There was also evident the usual restlessness characteristic of animals with extensive cortical lesions.

This became especially outspoken when the dog was held a short distance above the floor. Associated with the restlessness was an apparent aimlessness in its wanderings. With the head held low it trotted here and there in the yard. Though it appeared to see, it repeatedly bumped into obstacles.

Toward the end of the third week the weakness of the legs contralateral to the last sensori-motor destruction and the circling movements disappeared. At times slight disturbances of coördination in the hind-leg homolateral to the cerebellar ablation were suggested by a certain awkwardness of the limb. This feature, however, never became measurable and if a greater degree of ataxia existed at any time it was obscured by the more accentuated effects of the recent cerebral lesion.

(b) *Experiment Involving Entire Crus Secundum and Both Sensori-motor Spheres.*—The behavior of an animal subsequent to this cerebellar operation is outlined in an earlier section of this report (Exp. b, Cerebellar Ablations). Following the homolateral motor destruction the symptoms noted in the cerebellar experiment were again evident. It was remarked that during the first day or two (after the second cortical destruction also) the animal failed to draw up its hind leg promptly when it was hung over the edge of a table ("Versenkungsversuch"). After a seemingly complete recovery the opposite sensori-motor sphere was destroyed (contralateral to the cerebellar ablation). The weakness of the opposite limbs (*i. e.*, opposite to the cerebral lesion) and the circling movements, as usual, were marked the first days of convalescence.

On the fifth day, however, a striking phenomenon was noted. In running the hind leg homolateral to the cerebellum was seen to drag frequently, due apparently to a disturbance of equilibrium between the flexor and extensor groups of thigh muscles. Hand in hand with the disappearance of the circling movements and the weakness in the affected limbs this local involvement of coördination became more evident. While running, the hind limb deviated outward and, in walking the animal on its hind legs, this member appeared ataxic. A tracing made during this period showed, as usual, no particular variations from the normal arrangement of the footprints. Toward the end of the third week the forelegs appeared equally strong, and no true weakness could be detected in the hind limbs. There still persisted in the homolateral hind leg, nevertheless, a very evident disorder of

coördination (dysmetria)—a disorder such as is seen in an animal subsequent to a more comprehensive lesion of the cerebellum. This was noticeable for many weeks.

Frequent inspections of the dog for peripheral infirmities were always negative. The muscles, joints, and paws offered no clues to corroborate the suspicions of trauma and infectious involvement, and the general health and nutrition continued good. Five weeks after the concluding operative measures there was still observable a disproportion between the functional capacities of the two hindlegs.

Among workers in experimental physiology, Rynberk (24) in particular has shown that the additional destruction of neighboring lobuli in the cerebellum greatly accentuates the impairment of coördination noted after the ablation of a single division of the cortex. In accord with such a finding are the results obtained from the two experiments, one involving a resection of half of the crus secundum, and the other a destruction of the crus as a whole. The local disorders of muscular innervation in the former were vague and indefinite; in the latter they were easily discernible. Though the awkwardness of the hind limb noted in the first animal was only transitory, it seems fair to attribute it to the experimental cerebellar lesion, for it has been shown in an earlier paragraph that the trauma resulting from a surgical approach to the posterior fossa, in itself, affects in no way the posture and gait of the animal.

(c) *Experiment Involving Entire Lobulus Simplex and Both Sensori-motor Spheres.*—The behavior of the dog following the cerebellar ablation is noted in a previous section. Besides the usual immediate results subsequent to the sensori-motor sphere destructions there followed certain noteworthy phenomena. The animal as a whole became quite ataxic, and the head oscillated rapidly in either direction—as it was seen to do after the primary cerebellar injury. Later the incoördination seemed more restricted to the head and to the homolateral limbs (as regards the cerebellum). In the course of a number of weeks it became inconspicuous in the extremities, but continued in the head and neck. Like an intention tremor this feature was chiefly noted when the animal attempted purposive movements, such as drinking from a pan, seizing a particle of food suspended in the air, etc. Two and one half months following the final operation there was still discernible an unsteadiness of these parts, more

appreciable in the coarse tremor of the head from side to side. The abnormal features which followed the original lobulus simplex (cerebellar) destruction, it should be emphasized, disappeared within a month.

In summing up both the observations noted here and those already recorded by others (cf. section II), it becomes evident that in the hands of different investigators circumscribed lesions of the cerebellar lobuli have yielded somewhat varying results. This, perhaps, can be partly accounted for by the fact that no two workers have excised exactly the same areas of the cortex in their experiments. Viewed in a more general way, however, these results indicate that the complex movements necessary for standing, running, etc., are represented in more or less local areas in the cerebellar cortex.

It is recognized, of course, that movements in which several parts of the body are involved at the same time cannot be completely represented by an area or a center for movements of any one of these parts. This means, as Mills and Weisenburg (20) have stated, that cerebellar localization is more compound in its cortical representation than is cerebral localization. In view of the work of Horsley and his co-workers, and others, it is more than probable that this localized representation of movements is purely afferent in nature.

CONCLUSIONS

1. The question of a localization of function in the cerebellar cortex is still in dispute. The results of these experiments tend to support such an hypothesis.

2. Previous investigations have shown that the gradual amelioration of symptoms, which follows removal of the cerebellum, does not occur in animals in which the sensori-motor spheres of the cerebrum have also been destroyed.

When the sensori-motor areas are destroyed some weeks subsequent to a primary ablation of the crus secundum (lobulus ansiformis) or the lobulus simplex of the cerebellum, the symptomatic evidences of the latter injury, which have subsided, reappear once more and persist over a long period. The results of these experiments accordingly indicate the considerable value of this combination of lesions in the study of canine cerebellar localization.

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THE VALUE AND MEANING OF THE ADDUCTOR RESPONSES OF THE LEG¹

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In two previous papers I have described a series of periosteal reflexes invoked by percussion of the bones of the lower extremities and marked by the response of the adductor muscles. Conclusions reached in these papers have been added to, amended and altered by the results of the routine examination of patients for these reflexes in two years of active psychiatric hospital work. Therefore, this paper is written to represent the facts and to evaluate them. In addition, I wish to make in passing some observations on the adductor responses of the arms, these responses being, so far as I know, in general new to the literature.

There is a fairly copious literature which concerns itself with the adductor responses of the legs. Since the viewpoint of the writers has been different than my own, and, moreover, since their technique and examination of the reflexes described have differed still more widely, their work has but few points of contact with mine. The pioneer workers on reflexes gave their attention mainly to those elicited from tendons. Nevertheless, Erb, Westphal and Strümpell also mentioned the homolateral adductor response elicited from the internal surface of the knee joint. Strümpell also pays some attention to the contralateral adductor elicited from the patellar tendon. This response, the classical contralateral adductor, aroused the attention of Sternberg, Hinsdale and Taylor, Risien-Russell, Purves, Féré, Marie, Marinesco, Ganault, Huismans, Keller and others, and opinion on its pathogenesis and meaning has varied very much. It may be said that in general the authors have considered this response a pathological one and indicating some disturbance of the nervous system. Other adductor responses were described by Berolotti and Volabra (a contralateral elicited from the sole of the foot), and by Noica and Strominger. The attention paid, however, has been scattering and unsystematized.

¹ Taunton State Hospital Papers, 1915, No. 1.

Technique. It is necessary to emphasize the method used in eliciting the responses described in this paper since no point in the elicitation of reflexes is more important than the posture of the parts concerned. Indeed, the posture is constituted by what Sherrington calls the neural pattern. Therefore, a definite posture means a definite arrangement of neuron relationships, and it is as necessary to maintain the same posture as it is in laboratory technique to use the same chemicals. It is also necessary to state, since this law of neurological technique is most often violated, to have the parts stimulated and the parts reacting nude. For the adductor reflexes in general the patient lies on his back as much relaxed as possible. The legs lie somewhat abducted and slightly outward rotated in what may be called the normal posture. It is absolutely essential that the adductors be relaxed, since it is obvious that if they be contracted their movements cannot be observed. (This, of course, does not apply in such conditions where adductor contracture is an involuntary process.) This point will bear emphasis because where people are shy, timid or apprehensive, the first group of muscles that they contract is the adductors, in what seems to be an instinctive effort to protect the genitalia. With an ordinary Taylor reflex hammer and using force that does not invoke pain, the following sites are stimulated: 1st, the internal surface of the knee joint; 2nd, the external surface; 3d, the internal malleolus; 4th, the sole of the foot near the arch; 5th, the tendo-Achillis; 6th, the anterior-superior spine. In eliciting the 7th, the response of the patellar tendon, it is necessary partially to flex the thigh upon the hip and the leg upon the thigh. It will be noted that all of these responses are elicited from bony surfaces except those from the Achilles and patellar tendons.

The direction of the blow must be considered. In the responses elicited from the external surfaces, such as the external condyle and anterior superior spine, the blow is mainly inward though in the latter case inward and downward. In those responses elicited from internal surfaces, such as the internal condyle, the middle of the shaft of the tibia, and the Achilles tendon, the blow is directed outward. In those elicited from inferior surfaces, such as the sole of the foot and the patellar tendon when the knee is bent, the blow should be upward and toward the middle line of the body. As will be shown later the direction of the blow has much to do with the elicitation of these responses and plays perhaps an important part in their pathogenesis.

Responses.—The reflexes described in my previous papers and here re-presented can be divided as follows:

1. A group where the homolateral adductor is more lively than the contralateral, more frequently and more easily elicited provided that there is no difference in the reflexes of the two sides. The sites of stimulation for this group are as follows:

(a) The internal side of the knee joint; that is to say, the internal condyle and the internal surface of the head of the tibia. This is probably the most common of the adductor responses.

(b) The middle of the shaft of the tibia. This response runs closely second to the above.

(c) The internal malleolus which gives a response not nearly so often as the above two.

(d) The Achilles tendon. From this site the response is about equal in frequency to that elicited from the internal malleolus.

2. A group where the contralateral adductor is more lively than the homolateral, more frequently and more easily elicited, providing, as in the above group, that there is no difference in the response of the two sides. The sites of stimulation for this group are as follows:

(a) The sole of the foot. This is a rather common reflex and closely rivals in frequency those elicited from the internal condyle and middle of the tibial shaft of the previous group.

(b) Patellar tendon. This, as has been before stated, is the classical contralateral adductor; that is to say, stimulation of one patellar tendon gives an adductor response of the opposite side much more frequently than it gives a homolateral adductor response. This response is relatively infrequent except in pathological cases.

3. A group where the relationship of the homolateral and contralateral adductors cannot be said to have a constant ratio. That is to say, sometimes one finds the contralaterals more lively and at other times the homolaterals. The sites of stimulation for this group are:

(a) The external surface of the knee joint which gives a response about as often as does the patellar tendon.

(b) The anterior-superior spine. This response, I find, is somewhat more frequent than that elicited from the external condyle and the patellar tendon. In my previous paper I placed this group with the second; that is to say, I stated that the contralaterals were more frequently and more easily elicited than the homo-

laterals. Experience has amended this into the statement above made.

Summarizing the order of frequency of these responses, it is roughly put as follows: First, that from the internal condyle; second, that from the middle of the shaft of the tibia; third, the contralateral adductor from the sole of the foot; fourth, the one from the Achilles tendon; fifth, and occurring about as frequently as the fourth, that from the internal malleolus; sixth, the responses elicited from the anterior-superior spine; seventh, that elicited from the patellar tendon, the classical contralateral adductor response; eighth, and about equal in frequency with the above, the response elicited from the external condyle, the external surface of the head of the tibia.

RELATIONSHIP TO OTHER REFLEXES

(a) *Relationship to the Knee Jerk.*—In a general way it may be stated that these responses parallel in activity the knee jerk. That is to say, they appear under conditions in which the knee jerk is increased. However, this parallelism in frequency is but a rough one for there are conditions in which very active knee jerks are not accompanied by prominent adductors and especially are not accompanied by the appearance of the contralateral adductors. That is to say, the appearance of the adductor responses, especially the contralaterals presupposes active knee jerks, but the reverse relationship does not obtain.

The above relationship must be elaborated upon in order to meet the facts in the case. *The important factor in this parallelism is the activity of the knee jerk on the side of the responding adductor, not on the side of the surface stimulated.* That is to say, in the homolateral adductors the side stimulated and the side responding being the same, the adductors and the knee jerk will have a direct parallelism. In the contralateral adductors, the side stimulated and the side responding being different, the important fact is the activity of the knee jerk on the side responding. Marinisco, Marie, and I have described cases in which, with the knee jerk absent on one side stimulation of that side, even from the patellar tendon itself, produced lively adductor responses on the opposite side, whereas, of course, there were no adductor responses on the side stimulated.

It is not to be understood that because of this relationship there is some causal dependency of the adductor responses upon the knee jerk. In fact, the relationship may well be one of coin-

vidence. Up to the present time, however, I have never observed a case, where, with the knee jerk absent on one side, any adductor responses could be elicited from that side.

(b) *Relationship to the Ankle Jerk.*—These responses have no relationship whatever to the activity of the ankle jerk; that is to say, they may be lively with the ankle jerks lively, they may be absent when the ankle jerks are absent, but on the contrary, they may be present when the ankle jerks are absent, and absent when the ankle jerks are present. All possibilities are obtainable. In fact, and especially in cases of early tabes, with lively knee jerks and absent Achilles, homolateral and contralateral adductors may be elicited even from the Achilles tendon itself. That is to say, the site of a tendon reflex will give an adductor reflex even when the tendon response is absent.

(c) *Relationship to Babinski, Oppenheim and Gordon Signs.*—The adductor responses bear no definite relationship to these. In this they are not different from the knee jerk which, as is well known, may be markedly diminished when these signs are present; as, for example, in compression of the cord from Pott's disease.

(d) The above applies to the relationship to ankle clonus. Summarizing the above statements, the adductor responses have, in my experience, appeared only when a knee jerk was obtainable on the side of the adductor responding. These responses are independent of the knee jerk of the side stimulated but are directly dependent upon the knee jerk of the side responding. Of course, when the side stimulated and the side responding are the same, they are then dependent upon the knee jerk of the side stimulated. The above relationship is understood to be probably coincidental and not causal. These responses are independent of the Achilles reflex and also of Babinski, Oppenheim and Gordon signs, as well as ankle clonus.

Incidence in Health.—In my first paper I detailed the proportionate appearance of these reflexes in healthy subjects, the group studied at that time being the members of the first and second year classes in the St. Louis University Medical School. Further experience with normal subjects has led to the following conclusions: Adductor responses are not prominent in young and healthy adults. The homolateral adductors from the internal condyle and middle of the shaft appear in a very moderate degree in a considerable percentage of normal young men. (It is obvious that normal young women subjects are not easily accessible for

research reflex studies. However, it is unlikely that there is any marked difference between the sexes.) A contralateral adductor of very moderate activity from the sole of the foot appears in a somewhat smaller percentage of normal subjects. Bertolotti and Volabra found this reflex present in about 45 per cent. of normal subjects. As they used the hammer of Dejerine, and, moreover, since their subjects were picked from a clinic, the disparity between their results and mine, of about 15 per cent., is not difficult to explain. Sick people, that is to say, persons presenting themselves at a clinic, no matter for what trouble, are not to be classed as normal persons, and the hammer of Dejerine is a heavy hammer not to be compared with the Taylor instrument. Contralateral adductors from the knee joint, from the external condyle, and the anterior-superior spine did not appear amongst normal young men. It is true that three of the students examined gave these responses, but further examination showed that these young men could not be called normal. The homolateral adductor from the Achilles tendon appears occasionally in healthy subjects; the contralateral from the same source almost never.

It is necessary at this point to emphasize the fact that the term "normal subject" has been misused by some of the authors. For example, Hinsdale and Taylor in their work on the contralateral adductor from the patellar tendon used as subjects patients presenting themselves at a nerve clinic. It is true that care was taken to rule out organic disease, but nevertheless persons suffering from neurasthenia, "angst-neurosis," and chorea are not normal persons. Even when examining people outside of a clinic a complete physical examination is necessary in order to insure in so far as is possible that one is dealing with healthy persons. In the above mentioned study of the medical students of St. Louis University, heart and lungs were examined, pupils were tested, and all the common neurological signs were investigated in order to insure normality.

Summarizing, the only adductors presenting themselves in health are those from the internal condyle, the middle of the shaft of the tibia, the contralateral from the sole of the foot, and homolateral response from the Achilles tendon. These are present in a relatively small percentage and are not marked in activity, nor are the reflexogenous zones from which they are elicited broad. These are, as a rule, usually sharply circumscribed. The responses from the external condyle, the anterior-superior spine, and the patellar tendon are not found in normal subjects.

Incidence in Infancy.—This question I wish to leave for the time without very definite statement. In sick infants, that is to say in babies suffering from malnutrition and from acute infections, contralateral adductors are frequent. It is obvious that there is great difficulty in exactly testing reflexes in infants but in sick babies stimulation of one side will often cause a movement towards the middle line of the other leg which, of course, is very good evidence of an adductor response. Concerning normal infants, my experience has not been sufficient to allow of any statement. In children above the age of one year and older, the adductors are no more prominent than in adults.

Incidence in Fatigue.—This important question was studied in the following manner: Twenty young men competing in the St. Louis Marathon Race of May, 1912, were examined on the night before the race and immediately after they reached the club-house upon the completion of their twenty-six mile run. It is obvious that these men were, therefore, examined at two different periods. First, when their muscular efficiency was at its height, that is to say, just before a race, when each man was trained up to his best efforts. That these men were fit and not overtrained is evidenced by the fact that seventeen of them finished in fairly good condition after twenty-six miles of running along miserable roads and in a heat of nearly ninety degrees Fahrenheit. Second, they were examined at a period of most complete fatigue, that is to say, immediately after they reached the club-house at the conclusion of the run.

(a) *The Adductor Reflexes in Athletes at the Conclusion of Training.*—No contralateral adductor appeared except in two cases when that from the sole of the foot was elicited. Homolateral adductors were present in five cases from the internal condyle and the middle of the shaft of the tibia. In all the other cases no adductor response of any kind was elicited. Moreover, the knee jerks and ankle jerks were only moderately active in the great majority of the men.

(b) *The Adductor Responses Under Conditions of Complete Fatigue.*—At the conclusion of the run seventeen of the men, that is those who finished, were examined. Of these none showed any adductor responses whatever. That is to say, complete muscular fatigue caused the disappearance of the responses. In accord with all other observers who examined men doing similar work I found that the knee jerks and ankle jerks were markedly diminished.

The above facts are very important. It will be shown later that in certain so-called functional diseases where fatigue is considered by many to play a part, the adductor responses are lively. It is obvious then that such fatigue must be entirely different from that caused by intense muscular work since, in the latter case, the adductor responses disappear.

Incidence in Disease.—In a general way it may be stated that disease or affection of the upper or cortical motor neuron is, in the organic diseases, a necessary condition for the appearance of the adductor responses. The type of cases most frequently seen in institutions for the insane have necessarily been given the greatest attention since the greater part of the work done by me has been in such institutions.

1. *General Paresis.*—In general paresis the adductor responses are very prominent *especially in the early stages of the disease*. The majority of uncomplicated cases of general paresis, that is to say, where no degeneration of the posterior columns has occurred, show lively adductor responses, both contralateral and homolateral. This, of course, is parallel with the increase in the knee jerks seen in such cases. In cases of tabo-paresis the knee jerks disappear and so do the adductors. In certain cases the ankle jerks disappear while the knee jerks are still lively, and in such cases the adductors are still present and are lively. There are transition cases in paresis; that is to say, the process in the spinal cord has commenced but has not yet brought about an abolition of the knee jerks, and in such cases the adductor responses may be absent while the knee jerks are still present. Thus it may be stated that in the one great organic psychosis the adductors are a conspicuous feature, at least in certain phases of the disease.

At this point it is logical to consider a condition which many writers have discussed but which no one, so far as I know, has studied with as much thoroughness as William W. Graves, of St. Louis; namely, that of latent syphilis. Graves has shown that the chronic syphilitic presents, even in the periods when he complains of no particular symptoms and before the appearance of tabes or paresis or any marked aortitis, certain physical signs. These signs are pigmentation of the skin, a certain pallor which Graves calls "cachectic pallor" (though I should prefer the term, spastic pallor), inequality or irregularity of the pupils which, however, still react well to light and accommodation; inequality

of the reflexes or disparity between one group, say the arm reflexes, and another, the leg reflexes, and certain changes in the cutaneous sensibility, particularly areas of hypalgesia. In such cases the adductor responses are frequently of great liveliness, as I have found in the study of Graves' cases. This, of course, is in line with the belief now entertained that paresis is an extension of chronic syphilis, and in many respects merely represents a further stage of it, not to be differentiated by any such term as parasyphilis.

2. *Incidence in Tabes Dorsalis.*—It can be said without further detail that when the knee jerk has disappeared or is diminished in tabes that the adductors disappear. Furthermore, in those occasional cases when the ankle jerks have disappeared but the knee jerks still persist and are lively, the adductors may be lively. I have had at least four well-marked cases showing this.

Cerebral Hemorrhage, Thrombus or Embolism Causing Hemiplegia.—Ganault especially studied the reflexes in this condition and, in general, my conclusions agree with his as to the incidence of the adductor responses. These conclusions are as follows: On the side of the paralysis, the adductor reflexes are livelier than those on the opposite side although they may be present and frequently are present on both sides in a manner not found in normal subjects. This, of course, is in accord with the experience that all the reflexes *bilaterally* are increased in hemiplegic conditions. Furthermore, such cases demonstrate in a very remarkable manner the fact that the liveliness of the adductor response is coincident with the liveliness of the knee jerk on the side responding, independent of the site of stimulation.

There exists, however, a complication in hemiplegia which frequently makes the different results seem unwarranted. That is to say, there are many cases of hemiplegia in which the adductor responses on the paralyzed side are apparently absent, while those on the opposite or non-paralyzed side may be lively. *In such cases it will almost invariably be found that there exists contracture of the adductor muscles*, a very common phenomenon even in early hemiplegia and almost invariably present in late hemiplegia, and in part responsible for the gait of the hemiplegic. If the adductor muscle be contracted, that is, exists in a state of chronic activity (if such a term may be used), then further stimulation of it will result in little or no movement according to

the degree of contracture; that is, if the muscle by virtue of its contraction up to its limit is incapable of further movement then no amount of stimulation by tapping the bone on one side or the other will cause movement, and if by virtue of its state of contraction it is capable of only a small amount of movement, then the side free to move, the opposite side, may move more when stimulated. *The adductor contracture in hemiplegia is in itself a phenomenon* to a certain degree similar to that obtained by stimulating the lower extremities, and indeed has a pathological and physiological value similar to that of the adductor responses. In many cases of adductor spasm stimulation of the bones on one side or the other will cause but little visible movement, yet if the hand be placed on the adductors concerned they will be found to contract in a very sharp, somewhat convulsive manner, very much unlike the response found in normal persons.

3. *Incidence in Certain Miscellaneous Organic Diseases.*
 (a) *Tumors of the Brain.*—These responses do not seem to be very prominent in those cases which have come to my observation. However, my experience with brain tumors has been rather scanty and most of the cases have been such where mental symptoms predominated so that the diagnosis of tumor was not made until after the entrance of the patient into the asylum. Such cases are largely frontal and consequently the tumor does not exercise a direct effect upon the reflexes except through pressure.

(b) *Multiple Sclerosis.*—The adductor responses are very prominent in this condition and frequently approach a clonic state. This, it will be observed, is on a par with the tendon reflexes in general.

(c) *Compression of the Cord from Tumor and Pott's Disease.*—Here, the adductor responses follow the same general principles as do the knee jerks; that is to say, are lively when the degree of pressure is slight and disappear when the reflexes in general are diminished or abolished.

(d) *Fracture of the Skull.*—My opportunities for studying these cases have been limited to but four cases. In one of these with the gradual appearance of pressure symptoms due to a rupture of the middle meningeal artery, the adductor responses on the side concerned appeared about the same time as did Babinski sign and disappeared when, after tying of the artery and rest in bed, the cerebral condition had largely disappeared. In the other three cases the adductor responses were not conspicuous but in

these cases there was no conspicuous change in the knee jerks, and, in fact, in one of these cases there was a general diminution of all responses. A larger experience with this condition would undoubtedly show that there was a coincident relationship between the changes in the knee jerk and the adductor phenomena.

(c) *Diseases of the Peripheral Motor Neuron.*—In alcoholic neuritis of which many cases have been studied, the adductor responses are absent. In anterior poliomyelitis, of which I have studied but a few cases, the adductors disappear when the lumbar cord has been affected.

FUNCTIONAL PSYCHOSES

(a) In dementia præcox a certain number show moderate homolateral adductors and occasionally one finds contralateral adductors from the internal condyle, the shaft of the tibia, and occasionally from the patellar tendon. These latter cases are few and I cannot explain them. In general, in dementia præcox the adductor responses are not conspicuous.

(b) The above is true of manic depressive insanity. There is an irregularity in the liveliness of the responses in this condition; that is to say, some cases present lively reflexes and others moderately active reflexes. The adductor responses vary in the same way as do the knee jerks in this condition, but it must be stated that both in dementia præcox and manic depressive there are many cases with knee jerks that in point of liveliness approach those elicited in general paresis, and yet in these cases the adductor responses very frequently are only moderate and rarely excessive. That is to say, in the functional psychoses and in the functional neuroses many cases of lively tendon reflexes are not accompanied by lively adductors. This form of disassociation is found much more often in the "functional diseases" than in the organic.

(c) *Senile Dementia.*—This term is so loosely used in the asylums in general that no one single group of cases is concerned. Frequently the term is used to cover a rather extreme degree of the normal childishness, forgetfulness, and helplessness of old age. Sometimes it is used when arteriosclerotic insanity is revealed by autopsy, and it also includes that group of delusional, hallucinatory states for which the term had better be reserved. Such being the case the discrepancy in the adductor responses found in the condition so labeled must be left open as to causa-

tion. In general, it has seemed to me that those cases in which the arteriosclerotic disease was evident, even when no hemiplegia was directly concerned, presented lively adductor responses in a far greater percentage of cases than did those presenting merely the childishness and helplessness of old age. In other words, old age in itself was not responsible for the appearance of the adductors but cerebral arteriosclerotic changes were. Those senile delusional states that were not associated with cerebral arteriosclerosis, in general, did not seem to give undue adductor responses.

FUNCTIONAL NEUROSES

(a) *Hysteria*.—In hysteria, as is well known, the knee jerks are very frequently extremely lively and indeed often accompanied by what seems to be movement of the whole body. Nevertheless, as has been pointed out, the response is rarely of a spastic kind and presents certain differences, perhaps discernible only to the experienced, from that found in organic disease. In hysteria, the adductor responses are more frequent than they are in the normal person but rarely approach the condition found in paresis. The homolaterals are frequently lively but, in such cases, there is more of a movement of the leg and less visible contraction of the muscle itself. That is to say, there seems to be something of a *voluntary effort to move the leg inward* rather than an *isolated, quick, sharp contraction* of the adductor group of muscles such as is found in the organic diseases. The contralaterals are not so conspicuous though occasionally there is seen the same movement as that described above, a movement which suggests voluntary innervation of the adductors.

(b) *Neurasthenia*.—What has been said of hysteria is, to a large extent, true of neurasthenia except with the following reservations:

1. There is a group of cases usually classed under neurasthenia in which the reflexes are rather inactive. These cases, it seems to me, belong to true fatigue states, especially caused by overwork of a physical kind. In such cases, the adductor responses are not prominent.

2. In the true neurasthenic conditions the reflex responses are usually very active. These conditions are usually marked by worry, fatigue, visceral symptoms, tremors, feelings of inaptitude, failure, etc. In a mild degree they are frequently seen amongst those whose work is largely cerebral and whose strain is largely

mental. In such conditions the reflexes are usually exaggerated and in such cases the adductor responses are relatively common. However, the contralateral responses from the Achilles tendon, from the patellar tendon, the condyle and the anterior-superior spine are almost never found. When they exist some other condition should be suspected, such as incipient general paresis, which is often mistaken for neurasthenia, latent syphilis, hyperthyroidism, etc. As a result of my experience, *I believe that the adductor responses, whether homolateral or contralateral, elicited from the patellar tendon, the anterior-superior spine, and the external condyle practically exclude neurasthenia as a diagnosis.* There may be neurasthenia present in such cases but there is some other organic condition also present.

There are many questions as to the physiology and pathogenesis of these responses that need answering. Of these only a few will be dealt with in this paper. The questions to be considered may be arranged as follows:

1. What is the bearing of these responses upon Pflüger's classical laws concerning the sort of reflexes? The answer is *that if these responses are to be regarded as reflexes* then they controvert his views.

(a) The law of homonymous conduction for unilateral reflexes (that is, if a stimulus applied to one side causes movement only on one side that movement will be on the side of stimulation) is contradicted by the contralateral from the sole of the foot which frequently is the only response.

(b) The law of bilateral symmetry (that is, a response elicited by stimulation of one side when it spreads further and to the opposite side, awakens only the symmetrical mechanisms) is contradicted by the contralateral adductor elicited from the patellar tendon. Here, one gets a knee jerk on the homolateral side with a contralateral adductor but no contralateral knee jerk.

(c) The law of unequal intensity of bilateral reflexes (that is, if bilateral muscular response is elicited by unilateral stimulation, the homolateral response is greater) is contradicted by the contralateral from the sole, from the patellar tendon, and occasionally by those from the external condyle and the anterior-superior spine.

Sherrington after pointing out that these "laws" did not obtain in animals says very pertinently "that these so-called laws of reflex irradiation were so generally accepted as to obtain an eminence which they hardly merit."

2. What is the essential difference between adductor responses and the tendon reflexes? The main difference lies in the far wider zone of elicitation and this difference is so marked in degree as seemingly to constitute a difference in kind. It is only occasionally (Colm) that a knee jerk can be elicited in any site far distant from the patellar tendon and so far as I know it is never bilateral from unilateral stimulation. The Achilles reflex can be elicited from the sole of the foot (Graves) but this is merely another way of stretching the Achilles tendon, while the adductors are elicitable by the stimulation of many areas and are often contralateral and bilateral. In this, they resemble a contralateral periosteal arm reflex which I have described as occasionally elicited from the clavicle and which is also adductor in its nature. In other words, the adductor type of response elicited from bones is not directly dependent, at least, upon any segmental relationship of the sensory surface stimulated; seems, on the whole, to be selective in that it occurs far more frequently than other types of response, and is frequently contralateral and bilateral.

These adductor responses present another point of difference from the tendon reflexes in that they are not so constant in health and, in fact, most of the contralateral and bilateral reflexes appear only in disease, either organic or functional. This gives them a value which, while not in any sense replacing the tendon responses, supplements their value.

3. What is the relationship of these responses to mechanical vibration of the pelvis? This has been a moot question in the discussions concerning them. For many of the authors the adductor responses are due merely to the stimulation by vibration of the pelvis. Others have stoutly contradicted this view. For example, Bertolotti and Volabra in their consideration of the causation of the response called it merely mechanical and said the crossed reflexes are best obtained in a position which permits a greater disturbance of pelvis and spinal column, whereas Risien-Russell, Hinsdale and Taylor by maneuvers which eliminated the jar of the pelvis as much as possible still obtain these responses. Without entering any further into the history of the discussion here follow some observations which have a tentative bearing upon the direct causation.

1. The homolateral responses are best elicited by blows which, on the whole, are directed outward. Take, for example, the internal condylar, the middle tibial, and the Achilles sites of stim-

ulation. From these points the contralateral is a less frequent phenomenon and one present only with great activity of the homolateral response.

2. The contralateral is best elicited from sites where the blow is directed upward and inward. For example, the sole of the foot and the patellar tendon in the position described in this paper. From these sites the homolaterals are less frequent and less lively.

3. From the external condyle where the blow is directed inward and the anterior-superior spine where the blow is directed inward and downward, the predominance of one or the other adductor responses cannot be determined. This fact, that the direction of the blow has very much to do with the type of response, makes it seem possible that the stimulation which brings about the adductor response is indirect in its application. For the present I wish to state that I believe that the *real afferent limb of the arc arises either at the hip or in the pelvis, and not at any one of the sites stimulated*. This receives some proof so far as the last part of the statement is concerned in the fact that with an absent knee jerk or ankle jerk, stimulation of the patellar tendon or the Achilles tendon may bring about adductor responses. It receives at least additional standing as to value when one considers the meaning of the adductor responses.

4. What is the meaning of the adductor responses? It is necessary here to consider first two other matters which bear upon the subject. First, the question of contracture following, for example, hemiplegia. In this, as is well known, the arms usually take a flexor attitude, the legs usually take an extensor attitude. It is not generally appreciated that in the case of the legs the contracture in the adductor muscles appears early and is a prominent symptom. Indeed, in certain conditions, such as, for example, Little's disease where the lesion is bilateral, the scissors gait is a common phenomenon, and the scissors gait is nothing more or less than an overwhelming contracture of the adductor muscles. Likewise, in primary lateral sclerosis, there is some tendency though not to so marked a degree. That is to say, in the leg two groups of muscles contract and these are the extensors and the adductors. This contracture has received various explanations. The earliest theory advanced by Charcot was that the sclerosis in the pyramidal tract was responsible. This, of course, is now completely discarded, and the general opinion held is that with the influences of the cerebrum gone other influences which play particularly upon the groups of muscles contracting

begin to be felt. For Hughlings Jackson, Luciani, Lewandowski and others, the cerebellum entered into the situation and caused contractures by playing unopposed upon these certain groups of muscles. For others, such as Hitzig, von Monakow and Oppenheim the contracture is produced by the influence of the sensory impulses upon the lower system. This latter explanation seems very unsatisfactory to me in view of the fact that when two groups of muscles are affected in cerebral injuries one loses function and the other enters into a state of enhanced and unopposed function. This would make it seem likely at least that the cerebral injury brought paralysis to one group of muscles and permitted unopposed the influence of some other center upon the other group. Sherrington finds in the nerves of the otic labyrinth, "tonus labyrinth of Ewald" and in the afferent nerves of muscles the sources of the influence which Hughlings Jackson refers to the cerebellum. In general, Sherrington stands in accord that in these cases of hemiplegic contracture and the like, the cerebrum loses control of one group of muscles, the so-called phasic group, while another group, the so-called tonic group, comes under the unopposed influence of other nervous centers. At this point it is necessary to consider Sherrington's views as to the distribution of tonus. The common opinion expressed is that tonus exists in all muscles during life. For Sherrington, the contraction of one member of a pair of muscles is accompanied by the inhibition of the tonus of its antagonist. Further, he believes "the selective distribution of the jerk phenomena under the ordinary conditions employed for their elicitation to single members of antagonistic couples, for example, gluteus, crureus, masseter, and their absence under those conditions from the opposite members of the couples, is suggestive that under the condition taken, *reflex tonus may be confined to one member of an antagonistic pair; namely, to that member which is then in reflex tonic operation; e. g., counteracting gravity for the preservation of an habitual pose of the animal.*"

It is upon this last statement that I wish to lay emphasis,—the habitual pose of the animal. In man, in his habitual pose, the muscles which counteract gravity so far as the lower limbs are concerned are the extensor muscles and the adductors. These constitute the tonic groups, whereas the other muscles are the phasic groups; that is to say, these latter change the position from moment to moment while the former groups tend to maintain the habitual position and are in constant action. As Sherrington

points out, it is the phasic group of muscles which is paralyzed in cerebral injury whereas the tonic group is increased in tonus and this causes the phenomena of the increased reflexes.

Second, one may here consider the decerebrated animal of Sherrington. The decerebrated animal, especially if placed in a position where gravity exerts its influence to the best advantage, takes a position very much like the hemiplegic contracture. That is to say, there ensues a pose which is largely extensor so far as the lower limbs and tail are concerned. Sherrington does not mention the condition of the adductor muscles in these animals but it is unlikely that the adductors would play so important a part in maintaining the pose of an animal as they do in the case of man.

The opinion is advanced tentatively that *the adductor responses belong to the tonic responses of muscles habitually maintained in tonus by some influence other than the cerebrum; that in health this tonus being less important for the preservation of attitude than the tonus of the extensor group of muscles, is not to any great extent demonstrable as the adductor response, but that in disease of various kinds, but having as their general feature either the functional or the organic, injury to the cerebrum, these responses become manifest in the manner described.*

RÉSUMÉ

1. The adductor responses are present in health as mild and occasional homolateral and contralateral responses from sites described above.

2. Fatigue does not increase them but diminishes them to the point of abolition.

3. The appearance of contralateral adductor responses especially from the patellar tendon, the external condyle, the anterior-superior spine, and to a lesser degree from the Achilles tendon is a phenomenon of disease, not necessarily organic, but usually such.

4. These responses bear at least a coincidental relationship to the knee jerk of the side responding and have no apparent relationship to the knee jerk of the side stimulated or to the Achilles tendon of either side.

5. The site of stimulation is probably not so important as the direction of the blow and the resultant stimulation of either hip joint or pelvis, and that the part thus indirectly stimulated (either hip joint or pelvis) acts as the afferent limb of the reflex are whose motor limb stimulates the adductors.

6. The adductor muscles probably belong to the tonic group of muscles; that is to say, those muscles innervated in the greater part, though not completely, by influences other than the cerebrum, and that with the disappearance or diminution of the cerebral influence the tonus of these muscles is so increased that their reflex activity becomes greatly enhanced, resulting in the phenomena herein described, that is, the homolateral and contralateral adductor responses.

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SPEECH CONFLICT—A NATURAL CONSEQUENCE IN
COSMOPOLITAN CITIES—AS AN ETIOLOGICAL
FACTOR IN STUTTERING. A PRELIMINARY
REPORT BASED ON 200 CASES¹

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OF NEW YORK CITY

(Continued from page 46)

STATISTICS OF 171 MALE STUTTERERS

(German-Hebrew and Austrian-Hebrew means: of Jewish race, born in
Germany or Austria, not speaking Yiddish as mother tongue,
but German)

No.	Name	Age	Onset and Etiology	Nationality	Parentage and Mother Tongue
1	B. G.	13	Began to speak at 2 yrs., to stutter at 4 yrs.	U. S.	Ger.
2	E. E.	14	Began to stutter at 7 yrs. after pneumonia. High arched palate, loss of uvula.	Ger.	Ger.
3	B. G.	5	Began 10 months of age following fright to stutter.	U. S.	Yidd.
4	B. J.	23	Fall at 3 yrs., followed by stuttering.	Ger.	Ger.
5	C. S.	21	Imitation of stuttering brother. High arched palate, deviated septum, hypertrophied turbinates.	U. S.	Hebr.
6	E. R.	11	Began to stutter at 6 yrs. Speech conflict.	U. S.	U. S.
7	F. H.	25	Imitation of father and two stuttering brothers.	U. S.	Ital.
8	F. J.	13	Began to stutter at 2 yrs. after scarlet fever.	U. S.	U. S.
9	G. R.	8	Speech conflict.	U. S.	Russ.
10	G. J.	10	Stutters since childhood after measles. Deviated septum.	U. S.	Yidd.
11	G. M.	12	Began to stutter at 6 yrs. Speech conflict.	U. S.	Ger.
12	G. M.	6	Stutters since 2 yrs. after pneumonia.		Russ.
13	G. B.	9	Father stutters. Fell into cellar. Imitation and shock.	U. S.	Yidd.
14	G. A.	14	Began to stutter at 6 yrs. Speech conflict.	Austr.	Austr.
15	G. J.	12	Began to speak at 2, to stutter at 6 yrs. Had convulsions at 6 months. Speech conflict.	U. S.	Yidd.
16	G. B. T.		Speech conflict. Onset at 5 yrs.	Russ.	Russ.
					Yidd.

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STATISTICS OF 171 MALE STUTTERERS.—Continued

No.	Name	Age	Onset and Etiology	Nationality	Parentage and Mother Tongue
17	G. M.	14	Speech conflict. Began to stutter at 6 yrs.	U. S.	Russ. Yidd.
18	H. G.	18	Began to stutter at 10 yrs. after unknown illness.	U. S.	Austr. Hebr.
19	H. W. T.		Began to stutter at 10 yrs. Imitation.	U. S.	U. S.
20	H. L.	10	Began to stutter at 6 yrs. Speech conflict.	U. S.	Ger.
21	H. E.	16	Began to stutter at 5 or 6 yrs. Speech conflict.	U. S.	Ger.
22	H. O.	11	Began to stutter at 1 yr. by imitation.	U. S.	U. S.
23	H. H.		Began to stutter in earliest childhood, following measles and whooping cough.	U. S.	U. S.
24	F. D.	11	Began to stutter at 5 yrs. following unknown illness. High palate.	U. S.	Ital.
25	E. B.	13	Began to stutter at 1 yr. by imitation.	U. S.	Russ. Yidd.
26	E. F.	18	Began to stutter at 4 yrs. following fright.	U. S.	Ger.
27	E. G. H.	8	Began to stutter at 4 yrs. by imitation.	U. S.	U. S.
28	J. B. G.	19	Began to stutter at 4 yrs. by imitation.	U. S.	U. S.
29	J. A.	12	Onset at 6 yrs. Speech conflict.	Russ.	Russ. Yidd.
30	K. E.	14	Onset at 2 yrs. Imitation.	U. S.	Ger.
31	K. S.	14	Onset at 4 yrs. Imitation.	U. S.	Russ. Yidd.
32	K. L.		Onset at 9 yrs. Speech conflict.	Russ.	Russ. Yidd.
33	K. E.	11	Onset at 4 yrs. after fall.	U. S.	U. S.
34	K. J.		Onset at 6 yrs. Speech conflict.	Russ.	Russ. Yidd.
35	K. N.	9	Onset at 4 yrs. after whooping cough.	U. S.	Ger. Hebr.
36	L. J.	2	Few months ago after fall on head.	U. S.	Austr. Yidd.
37	L. T.	13	Onset at 2½ yrs. after scarlet fever.	U. S.	Ger.
38	L. M.	26	Onset at 4 yrs. after scarlet fever.	Ital.	Ital.
39	L. H.	14	Onset at 5 yrs. by imitation.	Ital.	Ital.
40	L. Ch.	7	Onset in earliest childhood. Imitation of elder brother.	Russ.	Russ. Yidd.
41	L. J.	21	Onset at 1 yr. after whooping cough. Also imitation of elder brother and sister.	Ital.	Ital.
42	L. L.	13	Onset at 6 yrs. Speech conflict.	U. S.	Russ. Yidd.
43	L. B.	6	Onset at 5½ yrs. by fright.	U. S.	Austr.
44	L. B.	9	Onset at 3 yrs. by fright.	U. S.	Russ. Yidd.
45	B. L.	16	Onset at 7 yrs. Speech conflict.	Russ.	Russ. Yidd.
46	L. W.	15	Onset at 11 yrs. Imitation.	U. S.	Ger. Hebr.
47	M. P.	21	Onset unknown. Speech defect.	Hungarian.	Hungarian.
48	M. E.		Onset at 1 yr. with kidney trouble.	U. S.	U. S.
49	M. M.	16	Onset at 7 yrs. Speech conflict.	Russ.	Russ. Yidd.
50	M. C.	14	Onset at 3 yrs. after whooping cough, aggravated by imitation of younger brother and fright by drunken father.	U. S.	Irish

STATISTICS OF 171 MALE STUTTERERS.—Continued

No.	Name	Age	Onset and Etiology	Nationality	Parentage and Mother Tongue
51	M. C.	22	Onset at 10 yrs. following diphtheria.	U. S.	U. S.
52	M. W.		Onset at 5 yrs. following fright and scarlet fever.	U. S.	U. S.
53	M. B.	14	Onset at 4 yrs. after scarlet fever, aggravated by imitation.	U. S.	Ger.
54	M. H.	11	Onset at 6 yrs. following measles.	U. S.	Austr. Hebr.
55	M. J.	20	Onset at 5 yrs. Speech conflict at school.	Russ.	Russ. Yidd.
56	M. E.	15	Onset of 6 yrs. following fright, aggravated by imitation.	U. S.	Russ. Yidd.
57	M. H.	14	Early onset. Imitation. Measles, whooping cough and scarlet fever.	U. S.	U. S.
58	M. B.	14	Onset at 6 yrs. following fall on head.	U. S.	Ger. Hebr.
59	M. W.	15	Onset at 2 yrs. after scarlet fever.	U. S.	U. S.
60	N. H.	6	Onset at 2½ yrs. after fall. Feeble-minded.	Eng.	Eng.
61	N. J.	12	Onset at 4 yrs. after fright.	U. S.	Ger.
62	N. L.		Onset at 12 yrs. after fright.	U. S.	Russ. Yidd.
63	O. H. G.	15	Onset about 6 mos. ago. Imitation.	Irish	Irish
64	O. D.	14	Onset at 5 yrs. Speech conflict.	Russ.	Russ. Yidd.
65	O. E.	13	Onset at 6 yrs. Neurotic family.	U. S.	Irish
66			Speech conflict. Onset at 5 yrs.	U. S.	Ital.
67	P. A.	15	Onset at 7 yrs. Environmental. Parents died early. Bad surroundings.	U. S.	U. S.
68	P. T.	13	Onset at 5 yrs. Speech conflict.	U. S.	Ital.
69	P. G.	13	Early onset following diphtheria.	U. S.	Eng.
70	P. A. H.	20	Onset at 10 yrs. Unknown cause.	Irish	Irish
71	P. J.	12	Onset at 5 yrs. following complication of diseases.	U. S.	Ger.
72	R. R.	12	Onset at 5 yrs. Speech conflict.	U. S.	Russ. Yidd.
73	R. J.	16	Onset at 4 yrs. Unknown cause.	Russ.	Russ. Yidd.
74	R. M.	11	Onset at 5 yrs. after severe illness.	U. S.	U. S.
75	R. J.	20	Onset at 10 yrs. following injury, aggravated by imitation of two stuttering brothers.	Austr.	Austr.
76	R. T.	13	Onset at 11 yrs. Imitation.	U. S.	Russ. Yidd.
77	R. C.	26	Onset at 10 yrs. Fright.	U. S.	U. S.
78	R. L.	18	Early onset. Imitation of uncle.	U. S.	Russ. Yidd.
79	S. O.	8	Onset at 7 yrs. after fright at school. Highly arched palate.	U. S.	Ger.
80	S. L.	15	Early onset. Imitation of mother.	U. S.	U. S.
81	S. S.	18	Onset at 3 yrs. following fright. Highly arched palate.	Austr.	Austr. Yidd.
82	S. A.	18	Onset at 5 yrs. Speech conflict.	Ital.	Ital.
83	S. R.	8	Early onset. Imitation of uncle.	U. S.	Ger.
84	S. M.	6	Four yrs. Poliomyelitis followed by stuttering. Grandfather stuttered.	U. S.	Austr. Hebr.
85	S. S.	16	Stutters since childhood. Complete atresia of left external auditory canal. Air conduction absent.	U. S.	Ger. Hebr.

STATISTICS OF 171 MALE STUTTERERS.—*Continued*

No.	Name	Age	Onset and Etiology	Nationality	Parentage and Mother Tongue
86	S. S.	12	Onset at 5 yrs. Speech conflict.	Russ.	Russ. Yidd.
87	S. W.	12	Onset at 8 yrs. Croup.	U. S.	Irish
88	S. A.	10	Cause unknown. Early onset.	U. S.	Ger.
89	S. P. M.	13	Onset at 7 yrs. Speech conflict.	Russ.	Russ. Yidd.
90	S. H.	11	Early onset. Cause unknown.	U. S.	U. S.
91	S. J.	23	Onset at 6 yrs. after scarlet fever.	U. S.	U. S.
92	S. R.	16	Onset at 2 yrs. Father stuttered when young and does so still when excited.	Ger.	Ger.
93	T. D.		Onset at 4 yrs. after fright.	U. S.	U. S.
94	F. J.		Onset since adolescence. Lowered morality. Irregular life.	U. S.	U. S.
95	V. E.	9	Onset at 5 yrs. after whooping cough.	U. S.	Russ.
96	W. L.	19	Early onset. Unknown cause. Speech conflict.	U. S.	Ger. Hebr.
97	W. A.	18	Onset at 9 yrs. Unknown cause.	U. S.	U. S.
98	W. W.	11	Onset at 7 yrs. following "brain fever" and black measles.	U. S.	U. S.
99	W. M.	8½	Onset at 6 yrs. Speech conflict.	Russ.	Russ. Yidd.
100	W. T.	16	Onset at 8 yrs. Imitation.	U. S.	Ger. Hebr.
101	W. S.	9	Onset 5 months ago. Imitation.	U. S.	Russ. Yidd.
102	W. G.	17	Early onset. Unknown cause.	U. S.	U. S.
103	W. H.	4	Onset at 2 yrs. following pneumonia. Enlarged tonsils and adenoids.	U. S.	U. S.
104	W. M.	21	Onset at 7 yrs. Speech conflict.	Russ.	Russ. Yidd.
105	W. D.	26	Onset at 6 yrs. Speech conflict.	Russ.	Russ. Yidd.
106	W. J.	16	Onset at 4 yrs. after measles.	U. S.	Ger. Hebr.
107	V. E.	9	Onset at 5 yrs. after pneumonia. Lipping.	U. S.	U. S.
108	M. B.	6	Negligent lipping. Speech conflict. Stutters more in last few months.	U. S.	Russ. Yidd.
109	E. B.	6	Unknown cause. Since earliest childhood.	U. S.	Irish
110	F. A.	14	Whooping cough.	Germ.	Ger.
111	R. A.	12	General nervousness. Speech conflict.	U. S.	Russ. Yidd.
112	M. W.	11	Onset at earliest childhood. Unknown cause.	Russ.	Russ. Yidd.
113	M. M.	18	Onset at 8 yrs. Unknown cause.	Ger.	Ger.
114	H. G.	18	Shock from operation.	U. S.	Russ. Yidd.
115	G. V.	18	Imitation.	Ital.	Ital.
116	F. C.	3	Mental deficiency.	U. S.	Irish
117	G. H.	38	Multiple sclerosis.	U. S.	U. S.
118	G. D.	16	Onset after fright.	U. S.	Ger.
119	F. C.	13	Onset at 6 yrs. Speech conflict.	Russ.	Russ. Yidd.
120	H. C.	8	Speech conflict. Onset at 5 yrs.	U. S.	Russ. Yidd.
121	R. C.	8	Onset after typhoid fever.	U. S.	Ger.
122	G. D.	11	Onset after exhaustive illness.	U. S.	Ger.

STATISTICS OF 171 MALE STUTTERERS.—Continued

No.	Name	Age	Onset and Etiology	Nationality	Parentage and Mother Tongue
123	H. B.	18	Since early childhood. Cause unknown.	U. S.	U. S.
124	B. M.	14	Imitation.	U. S.	Ger.
125	S. B.		Cause unknown.	Ger.	Hebr. Ger.
126	T. G.	13	Onset at 6 yrs. from fright.	U. S.	Hebr. Russ. Yidd.
127	H. W.		Psychopathia.	Ger.	Ger. Hebr.
128	E. Z.	11	Cause unknown.	Ger.	Ger.
129	J. Z.	16	Onset at 5 yrs. from fright.	Russ.	Russ. Yidd.
130	L. Z.	15	Imitation.	Russ.	Russ. Yidd.
131	E. G.	16	Since early childhood. Cause unknown.	U. S.	Dutch
132	J. L.	11	Onset at 5 yrs. Speech conflict.	U. S.	Russ. Yidd.
133	H. A.	17	Onset at 6 yrs. Speech conflict.	U. S.	Russ. Yidd.
134	G. F.	12	Onset at 5 yrs. from negligent lisping. Speech conflict.	U. S.	Ital.
135	A. S.		Onset at 10 yrs. from fright.	U. S.	Austr. Yidd.
136	S. L.	18	Onset at 15 yrs. from shock.	Russ.	Russ. Yidd.
137	A. L.	9	Onset at 5 yrs. Speech conflict.	U. S.	Russ. Yidd.
138	I. L.	18	Imitation.	U. S.	Russ. Yidd.
139	B. M.	17	At early childhood from lisping.	U. S.	Austr. Yidd.
140	F. M.	13	Masturbation.	Ger.	Ger.
141	C. M.	16	Onset at 5 yrs. Speech conflict.	Russ.	Russ. Yidd.
142	H. M.	23	Onset at earliest childhood. Cause unknown.	U. S.	Irish
143	S. P.	6	Onset at 5 yrs. from negligent lisping. Speech conflict.	U. S.	Russ. Yidd.
144	S. R.	9	Onset at 3 yrs. Cause unknown.	Ger.	Ger.
145	A. R.	23	Imitation, heredity, masturbation.	Ital.	Ital.
146	G. S.	19	Onset at childhood. Heredity.	Ger.	Ger. Hebr.
147	A. F.	13	Masturbation.	Ital.	Ital.
148	W. F.	23	Fright. Onset at 5 yrs.	U. S.	Russ. Yidd.
149	B. G.	11	Chorea.	Russ.	Russ. Yidd.
150	M. G.	18	Onset at 7 yrs. Speech conflict.	U. S.	Russ. Yidd.
151	F. H.	19	Cause unknown.	U. S.	U. S.
152	C. H.	28	Onset at earliest childhood. Cause unknown.	Russ.	Russ. Yidd.
153	S. G.	20	Onset at 6 yrs. Speech conflict.	Russ.	Russ. Yidd.
154	G. K.	13	Imitation.	U. S.	U. S.
155	G. K.	8	Mentally deficient. Lisper.	U. S.	Irish
156	W. K.	14	Unknown cause.	U. S.	Ger.
157	S. K.	18	Shock from accident.	U. S.	Russ. Yidd.

STATISTICS OF 171 MALE STUTTERERS.—Continued

No.	Name	Age	Onset and Etiology	Nationality	Parentage and Mother Tongue
158	G. K.	15	Fright.	Russ.	Russ. Yidd.
159	P. B.	18	Adolescence.	U. S.	U. S.
160	G. B.	12	Masturbation.	U. S.	Ger.
161	L. B.	14	Onset at 5 yrs. from lisping. Speech conflict.	Ger.	Ger.
162	M. B.	15	Fright.	Russ.	Russ. Yidd.
163	J. C.	19	Onset at 7 yrs. Shock from fall.	Russ.	Russ. Yidd.
164	A. C.	18	General nervousness. Onset at early childhood.	Austr.	Austr. Ger.
165	A. S.	21	Unknown cause.	Ital.	Ital.
166	F. D.	19	Hysteria.	U. S.	French
167	J. B.	20	Onset at 5 yrs. Speech conflict.	U. S.	Russ. Yidd.
168	B. F.	6	Onset a few weeks ago. Speech conflict.	U. S.	Austr. Yidd.
169	B. M.	14	Onset at 4 yrs. after complication of diseases, including scarlet fever.	U. S.	U. S.
170	M. B.	16	Onset at 4 yrs. following fall. Sister stutters.	Roum.	Roum. Yidd.
171	D. G.	13	Onset at 6 yrs. Brother of 5 has started to stutter. Speech conflict.	Russ.	Russ. Yidd.

STATISTICS OF 29 FEMALE STUTTERERS

No.	Name	Age	Onset and Etiology	Nationality	Parentage and Mother Tongue
1	M. S.	6	Since earliest childhood. Only child. Mother had two previous miscarriages.	U. S.	Ger.
2	L. W.	13	Onset at 1 yr. after scarlet fever. Chorea.	U. S.	Ger.
3	S. W.	13	Onset after measles and broncho-pneumonia.	U. S.	Russ. Yidd.
4	V. W.	13	Imitation.	U. S.	U. S.
5	M. T.	5	From lisping.	Ital.	Ital.
6	S. A.		Onset at early childhood after fall. Lisping also.	U. S.	Ger. Hebr.
7	R. R.	10	Onset 10 months ago after excitement.	U. S.	Russ. Yidd.
8	E. R.	16	Onset at 6 yrs. Speech conflict.	Ger.	Ger.
9	P. S.	13	Basedows.	U. S.	U. S.
10	R. O.	29	Onset at 9 yrs. after severe digestive trouble.	U. S.	Russ. Yidd.
11	E. G.	14	Onset at 3 yrs. after fall.	U. S.	Irish
12	F. O.	8	Nervousness. Masturbation.	Ital.	Ital.
13	M. M.	11	From lisping.	Hung.	Hung.
14	I. McD.	12	From fright.	U. S.	Irish
15	C. M.	24	Onset at 8 yrs. from fright.		
16	L. G.	11	Onset at 1 yrs. following attack of ant. poliomyelitis.	Ger.	Ger.
17	K. E.	24	Onset at 6 yrs. from imitation.	U. S.	Ger.
18	K. R.	14	Imitation. Adolescence.	U. S.	U. S.
19	R. D.	12	Imitation.	U. S.	U. S.
20	F. S.	11	Onset at earliest childhood. Cause unknown.	U. S.	Russ. Yidd.

STATISTICS OF 29 FEMALE STUTTERERS.—Continued

No.	Name	Age	Onset and Etiology	Nationality	Percentage and Mother Tongue
21	I. F.	7	Onset at 2 yrs. Had pneumonia three times before 3 yrs. of age.	U. S.	U. S.
22	T. F.	8	Onset at 5 yrs. after fright.	U. S.	Austr. Yidd.
23	J. B.	15	Adolescence.	Russ.	Russ. Yidd.
24	M. C.	17	Fright.	U. S.	Bohemian
25	R. G.	15	Adolescence.	Russ.	Russ. Yidd.
26	M. O.	21	Onset at 4 yrs. following shock.	U. S.	Irish
27	S. O.	16	Onset at 6 yrs. Speech defect.	U. S.	Russ. Yidd.
28	A. P.		Onset at 7 yrs. after fright.	Russ.	Russ. Yidd.
29	A. S.	13	Onset at 2 yrs. after fright.	Ital.	Ital.

ETIOLOGY OF STUTTERING IN 171 MALE STUTTERERS

Speech conflict	37
Imitation and heredity	26
Accident, fright and shock	23
Protracted unknown illness	6
Scarlet fever	5
Speech conflict and negligent lisping	4
Imitation and shock	4
Measles	3
Pneumonia	3
Whooping cough	2
Whooping cough and imitation	2
Diphtheria	2
Masturbation	2
Adolescence	2
Faulty hearing	1
Faulty hearing and feeble-mindedness	1
Environmental	1
Psychopathia	1
Neurotic family	1
Hysteria	1
Poliomyelitis and heredity	1
Multiple sclerosis	1
Mental deficiency	1
Lisping	1
Lisping and pneumonia	1
Kidney trouble	1
Scarlet fever and imitation	1
Scarlet fever and fright	1
Whooping cough, measles, scarlet fever and imitation	1
Mental deficiency and lisping	1
General nervousness	1
Imitation, heredity and masturbation	1
General nervousness	1
Chorea	1
Brain fever and "black" measles	1
Measles and whooping cough	1
Unknown cause	27

ETIOLOGY OF STUTTERING IN 20 FEMALE STUTTERERS

Fright and shock	7
Imitation	3
Lisping	2
Adolescence	2
Fall and lisping	1
Excitement	1
Imitation and adolescence	1
Digestive trouble	1
Speech conflict	1
Nervousness and masturbation	1
Poliomyelitis	1
Pneumonia	1
Scarlet fever and chorea	1
Measles and bronchitis	1
Basedow's disease	1
Unknown cause	4
	29

MALE STUTTERERS FROM SPEECH CONFLICT

Name	Age	Onset	Nationality	Parentage
E. R.	11	6	U. S.	Italian
G. R.	8	5	U. S.	Russ.-Yidd.
G. M.	12	6	U. S.	Russ.-Yidd.
G. A.	14	6	Austrian	Austr.-Yidd.
G. J.	12	6	U. S.	Russ.-Yidd.
G. B. T.	5	5	Russian	Russ.-Yidd.
G. M.	14	6	U. S.	Russ.-Yidd.
H. L.	19	6	U. S.	German
H. E.	16	5	U. S.	German
J. A.	12	6	Russian	Russ.-Yidd.
K. L.	16	9	Russian	Russ.-Yidd.
L. L.	13	6	U. S.	Russ.-Yidd.
B. E.	16	7	Russian	Russ.-Yidd.
M. M.	16	7	Russian	Russ.-Yidd.
M. J.	20	5	Russian	Russ.-Yidd.
O. D.	14	5	Russian	Russ.-Yidd.
P. T.	13	5	U. S.	Italian
R. R.	12	5	U. S.	Russ.-Yidd.
S. A.	18	5	Italian	Italian
S. S.	12	6	Russian	Russ.-Yidd.
W. M.	8	6	Russian	Russ.-Yidd.
W. M.	21	7	Russian	Russ.-Yidd.
W. D.	20	6	Russian	Russ.-Yidd.
M. B.	6	6	U. S.	Russ.-Yidd.
R. A.	12	5	U. S.	Russ.-Yidd.
I. C.	13	6	Russian	Russ.-Yidd.
H. C.	8	5	U. S.	Russ.-Yidd.
J. E.	11	5	U. S.	Russ.-Yidd.
H. A.	17	6	U. S.	Russ.-Yidd.
G. F.	12	5	U. S.	Italian
A. L.	9	5	U. S.	Russ.-Yidd.
C. M.	16	5	Russian	Russ.-Yidd.
M. G.	18	7	U. S.	Russ.-Yidd.
S. G.	20	6	Russian	Russ.-Yidd.
L. B.	14	5	German	German
J. B.	20	5	U. S.	Russ.-Yidd.
B. F.	5	5	U. S.	Austr.-Yidd.
D. G.	13	6	Russian	Russ.-Yidd.

Year	Number
4	15
5	26
6	23
7	8
8	2
9	3
10	8
11	2
13	2
15	2
Earliest childhood	19
Unrecorded	<u>44</u>
	171

ONSET OF STUTTERING IN 29 FEMALE STUTTERERS

Year	Number
2	2
3	1
4	2
6	3
7	1
8	1
9	1
11	1
12	2
14	4
Earliest childhood	3
Unrecorded	<u>8</u>
	29

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Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

JUNE 1, 1915

The President, DR. WM. M. LESZYNSKY, in the Chair

SUTURE OF MUSCULO-SPIRAL (SPLITTING NEUROPLASTY)
AFTER EXTENSIVE DESTRUCTION OF THE NERVE;
UNUSUAL ORDER OF REGENERATION, LIGHT
TOUCH APPEARING BEFORE THE OTHER
FORMS OF SENSIBILITY. PRELIMI-
NARY NOTE

By R. H. M. Dawbarn, M.D., and Joseph Byrne, M.D.

Dr. Dawbarn's Report.—This patient æt. 34, a cloth-cleaner, married, with two healthy children, no history of venereal disease, seven and one half months ago fractured his right humerus in the middle of the shaft. Either then, or from subsequent unfortunate manipulation, the musculo-spiral nerve was divided, where it lies in its groove in the humerus. The radiograph showed very poor apposition of the fragments, and other means failing, Lane plating was performed. The scar of the incision can be seen. It was hoped that the nerve might have only been bruised, not wholly divided, and time was given hoping for an improvement in the inability to use the muscles supplied by the posterior interosseous or arch of the musculo-spiral. After five months, at about two and a half months ago, reoperation was performed; the musculo-spiral exposed in its relationship above the external condyle, and traced backward to its groove, where it was found severed, and above the point replaced by scar-tissue for at least two inches. Dividing the ends until normal nerve-tissue was reached, increased the gap to about three inches. This interval was bridged by plastic neurotomy. The nerve was split at a low point of its distal portion, and the long graft thus made was swung backward into the gap, and its sheath sutured to that of the divided proximal end with finest linen thread. Primary union was obtained. No other nerve was injured so far as could be judged during this operation. Dr. Byrne reports already some little degree of returning sensibility, and the outlook in time seems favorable. Meanwhile an apparatus is worn to avoid a tendency to overflexion of the hand by the unopposed activity of the group of muscles and the patient is being treated by electricity and massage.

Dr. Byrne's Report. The full neurological report of this case forms a part of a series of cases under observation, and is reserved until the study is completed.

After the plating operation the patient had pain if the arm were moved or the site of injury touched. This pain radiated down the arm to the back of the hand and thumb. Since the nerve was sutured patient

has suffered from slight occasional "jabs" of pain referred to the site of operation. He was first seen by Dr. Byrne April 15, 1915, that is 146 days post operative (plating) and 17 days after nerve suture. Examination showed atrophy of the long extensors with dropped wrist, some atrophy and fibrillation of the first dorsal interosseus. The scar of the skin wound half an inch long lies over the space. No pain was felt unless arm is jarred or site of wound touched. There was loss for all forms of sensibility over the radial portion of the back of the hand and wrist and extending over the radial area on the thenar eminence and dorsum of thumb. On the back of the hand the ulnar limit for light touch and heat at 152° F. roughly corresponded to the extensor tendon of the ring finger. The ulnar boundary for prick loss at 2 was $\frac{3}{4}$ inch less than that for light touch loss whilst the boundary for prick at 12 and for ice corresponded roughly with the tendon of the middle finger. The area of loss for all forms of sensibility included the radial area on the thenar eminence, but that for prick loss at 12 was represented by a space one inch wide by $2\frac{1}{4}$ inches long lying between the metacarpal bones of the index and middle finger, extending up to the level of the web of the thumb and index finger where it tapered off like a night cap, inclining over into the middle of the first interosseus space.

Light touch was preserved in four different small areas on the dorsum of the hand. One of these, *A*, chart April 15, was $\frac{3}{4}$ inch in diameter and located over second interosseus space and metacarpal of middle finger at the level of the web of the first interosseus space. Similar smaller patches $\frac{3}{4}$ inch or less were found as follows: *B*, on same level as *A*, but separated from the latter by $\frac{1}{2}$ inch and resting over metacarpal of index finger; *C*, slightly to ulnar side of thumb metacarpal and slightly distal to middle of shaft of that bone; *D*, one inch proximal to *C* and $\frac{3}{4}$ to $\frac{1}{2}$ inch ulnar to it. The interrupted line in the chart enclosing *A* and *B* indicates that by increasing the stimulus from .0055 to .0095 the areas became fused. The small area *E* showed sensibility for prick at 2 preserved well within the general area of loss for prick at 2. In the study, April 19, similar small islands, *A*, *B*, *C*, were found in all of which sensibility for cold, ice, was preserved. The location of these areas does not correspond with any of the similar areas of preserved sensibility for light touch. The indentation at *B* seen in boundary for cold loss on dorsum of hand, gives a clue to the meaning of these islands of preserved sensibility. Later observations render it almost certain that at a slightly earlier period there existed an island of preserved sensibility for cold at *B*, which was not discovered at the examination, April 15, because inexact methods were employed.

The chart, April 24, shows significant indentations in the bounds for touch, prick and ice. The ulnar boundary for light touch loss has fused with the radial boundary of island *A* of chart for April 15, and the upper wrist boundary shows an indentation that has taken up island *B* of chart for April 16. The area of prick loss at 2 has narrowed also, showing an indentation which evidently corresponds to island *E* for April 15. Most significant of all in chart of April 24 is the marked indentation of the boundary for ice loss at the site of the tabatier. Here the indentation manifestly fuses with island *A*, April 19. At this date islands for light touch began to make their appearance on the thenar eminence followed by usual alterations in the boundaries for touch loss. Finally chart, May 29, shows the following significant conditions. I. An area *B*, $1\frac{1}{4}$ inches wide by $2\frac{1}{4}$ inches long, on dorsum of hand

corresponding to space between metacarpal bones of index and middle fingers at the level of the web of the first interosseous space in which light touch is preserved after shaving, but all other forms of sensibility are lost. On this area the pulling of a hair caused only a sensation of touch and the compass tests, though not quite satisfactory, have shown so far little if any defect. II. An area, *B*, where light touch is absent and sensation for prick and ice preserved. III. Small areas, *E* and *F*, in which sensibility for all degrees of heat and cold is lost but prick preserved. IV. Areas *G* and *H* where sensibility for prick is preserved and that for all degrees of heat and cold lost. V. Area *A*, $\frac{1}{4}$ by $\frac{7}{8}$ inch, at root of thumb on palmar aspect, where sensibility for prick and for all degrees of heat is lost and that for touch and all degrees of cold preserved. A similar smaller area is found at *B* on the thenar eminence. VI. Between *B* and *A* on the thenar eminence is another area, *C*, where sensibility for prick is present whilst that for light touch and for all degrees of heat and cold is absent.

Conclusions are: I. that division of the musculospiral nerve in the upper arm gives an area of loss for all forms of sensibility, epicritic and protopathic, over an area that roughly extends over the dorsum of the thumb, the thenar eminence, in part, and the radial half of the dorsum of the hand and lower wrist. Head and Sherrin (*Brain*, 1905, 28, 116) deny this, insisting that in order to get other than epicritic loss in the dorsum of the hand following section of the radial nerve at the wrist, section of one of the branches of the external cutaneous is necessary. Our conclusion here does not fairly controvert the statement of these authors as the circumstances responsible for lesion of the musculo-spiral in our case might well have caused lesion of the external cutaneous or of one of its branches. There was no evidence of loss of sensibility on the forearm beyond slightly impaired sensibility on a very small area for the weak faradic current and this was doubtful. There was no loss for light touch, after shaving; compasses were perfect and there was no evidence of a line of change for a dragged pin point. II. Pain referred to the arm and hand disappeared when the nerve was sutured. This observation has an important bearing in the light of the author's theory (*N. Y. M. J.*, May 1, 1915) of the mechanism of neuralgic and all forms of paroxysmal pain caused by injury or disease of the nerves. The prime cause of all such pains is interference with normal conduction along the nerve paths. This results in a storing of potential in the cells of the sensory root ganglia with consequent overflow centrally spontaneous or otherwise, causing the paroxysms of pain. When the ganglion cells become exhausted of their stored potential the pain disappears until a reaccumulation of potential occurs. The anesthetic and manipulations incidental to the operation, suturing the nerves, thoroughly exhausts the sensory neurone bodies of their stored potential. This, and not the restoration of anatomical continuity, causes the immediate disappearance of the paroxysms after operation, and under such circumstances it takes some time, usually days or weeks, before the potential has time to reaccumulate in the ganglion cells. Meanwhile protopathic sensibility has returned to some extent and this, which is itself in the main caused by storing of potential in the ganglion cells, prevents that continued storing of potential which ultimately manifests itself in pain paroxysms. Paroxysmal pains of neural origin always result from defects in conduction, especially in the pain and temperature paths, as demonstrated. This holds for all the true neuralgias and this hypothesis explains the results,

good and bad, obtained by diathermy, nerve sections, electricity, etc., as well as the spontaneous cures. III. The dissociation areas observed prove clearly that in the peripheral system separate and distinct sets of fibers conduct impulses for (a) light touch with possibly a separate set for compasses; (b) prick and (c) for each of the various forms of heat and cold, although Dr. Byrne has only seen one or two instances in which epicritic sensibility for cold was apparently preserved where sensibility for ice was lost. IV. The irregular mode of regeneration with the appearance of island areas of returned sensibility with consequent indentations in the boundary of lost sensibility makes us ask the question: how much of this is due to the procedure employed at operation and how much to the peculiarities, overlapping, of the nerve supply of the region.

Head, after experimental section of the radial nerve at the wrist and both branches of the external cutaneous, in his own arm, found an area of dissociated sensibility similar to areas *A*, *B*, *C* and *B* in our chart, April 15. His area was in the region of the tabatier, and on the dorsal aspect of the wrist. The question arises, was the external cutaneous injured in their case at the time of plating the bone, and if so, were the areas of disassociation existent from the time of operation, and not the result of regeneration. Experiments would seem to indicate that these islands were result of regeneration possibly in areas supplied by a nerve (ext. cutan.) that had been injured but not severed. But with this they had the unusual return of epicritic sensibility for light touch before the return of that for prick and for heat and cold. Head's area would be relevant here, but for the fact that there were found other areas in their case—those of loss for prick and for gross heat and cold. The conclusion is that the irregular form of regeneration was due in part to the form of neuroplasty, and partly to injury without severance of the external cutaneous nerve, and partly to the peculiarity, overlapping, of the nerve supply of the areas affected. Even this guess leaves much to be desired and a fruitful field invites further research into the normal mode of regeneration in nerves.

EXCISION OF BRACHIAL PORTION OF ULNAR NERVE FOR
 MULTIPLE NEURO-FIBROMATA, WITH RECIPROCAL
 GRAFTING OF THE ULNAR NERVE INTO THE
 MEDIAN NERVE, AND OF A PORTION OF THE
 MEDIAN INTO THE ULNAR; HYPERALGESIA
 OF MEDIAN AREA; MECHANISM; PAR-
 OXYSMAL NEURAL PAINS

By R. H. M. Dawbarn, M.D., and Joseph Byrne, M.D.

The patient, a young German, æt. 26, cook, single, had no venereal history, nor trauma. Apparently there spontaneously developed, beginning six years ago, a long swelling over the region of the ulnar nerve, and extending from high in the axilla to a point well below the elbow; involving in fact the entire brachial portion of this nerve. This was accompanied by considerable and steadily increasing tenderness of the diseased area, for which condition relief was asked. The tumor mass was in places as large as the fist, and was translucent. The muscular power of the hand, where supplied by the ulnar nerve, while not wholly lost, was largely so, with obvious wasting of the interossei muscles and of the thenar and hypothenar eminences. Electrical reaction (faradic) was absent or greatly impaired compared with the normal side. The muscles involved left no doubt as to

which nerve was involved in the neuroma. One curious anomaly was observed; namely, that even immediately after the excision was performed the man was able to extend his terminal phalanges fully. One would of course have expected extension of the first and second, and flexion of the last phalanges, in this condition, but Dr. Byrne thought it not unlikely that here the gradual loss of control of the finger ends by the ulnar led to a gradual resumption of more complete control by the common extensors (posterior interosseus nerve). The condition must, Dr. Dawbarn thought, be very rare. In operating on this case, in order to do bloodless work and yet get abundant room in the axilla, Wyeth's pins, back and front, were used with rubber cording above them. The tumor was followed to its ending in normal ulnar nerve tissue. This was in the highest part of the axilla, above, and one inch distal to the internal condyle below. A second and separate incision, the scar of which could now be seen, exposed the median nerve high in the forearm. Next the healthy lower end of the divided nerve was tucked through a slit made beneath the pronator and flexor group of muscles and so brought into easy apposition with a strand split off from the exposed median nerve. Sutures of the finest linen thread were used to unite the sheaths. The proximal end of the ulnar nerve, high in the armpit, was inserted into an opening in the sheath of the median and sutured there. The long incision healed by primary union. It was united by the clip and strip method, using Michel's clips for 24 hours only; the adhesive strips were removed after ten days. The clips did not irritate as when left in for five days. Dr. Dawbarn said that the results of this method were so uniformly ideal that he had ceased practically to suture wound edges.

Dr. Byrne said that the interesting feature of this case was the hyperalgesia which followed the surgical trauma of the median nerve. True hyperalgesia of the peripheral nerves was a rare condition. It was formerly called *causalgia* and mentioned as such by Weir Mitchell in his classic *Injuries of the Nerves*. In this case there were: first week, sensory symptoms; second week, burning sensation at the roots of nails in thumb and index fingers; third week, whole median area on palm and fingers exhibited hyperalgesia, the boundaries of which were in contrast to median and ulnar areas. The hand was pink-lilac, glossy, tense. This lasted two weeks and then abated. This was due to injury of the median nerve. Dr. Byrne thought his theory of pain in tabes and gastric crises served to explain hyperalgesia and all paroxysmal pains of neural origin. This was overstimulation of potential in the related cells of the sensory ganglia. This overloading of potential resulted in the spontaneous discharge of afferent impulses brainward which caused paroxysms of pain referred to the areas of distribution of the related peripheral fibers. The anesthesia and manipulation incidental to the operation in this case discharged the stored potential in the sensory ganglion cells and before it had time to reaccumulate, conductivity had been reestablished in the median nerve.

Dr. Dawbarn presented, as his third case, an account of a thigh amputation, low down, in a middle-aged man, the operation having been made necessary by severe trauma. The surgeon made a common blunder. He did not shorten the sciatic nerve at the time of amputation and the patient could not bear the pressure of the artificial limb. Whenever he attempted to walk he had violent spasms in the thigh stump. After five years he came for relief and Dr. Dawbarn suspected a neuroma. He drew out the terminal five inches of the sciatic nerve. It was very large and vascular. The irritation of the neuroma had led to hypertrophic changes. The lesson to be drawn was that in every amputation there should be a

shortening of several inches of the pain-bearing nerves, for example, in a mid-leg amputation, the anterior and posterior tibial and internal and external saphenous, and musculo-cutaneous, should be shortened. Formerly he had doubted whether it was wise to shorten the nerve, because of the possible danger of atrophy of the trophic nerves of the skin, but he had found this did not occur. The blood vessels had a very rich nerve supply, both sensory and trophic, and this was carried by them to the skin. Thus the trophic supply was not cut off from the skin. This should be emphasized by surgical teachers.

Dr. Byrne said that Weir Mitchell stated that the nerves should always be shortened. After injury nerve degeneration passed inward as well as outward. Several facts lent support to the theory of the storing of potential in the sensory ganglion cells, but the actual proof of the spontaneous passage of impulses inward awaited future workers.

HERPES ZOSTER OTICUS, WITH FACIAL PALSY AND ACOUSTIC SYMPTOMS

By Norman Sharpe, M.D.

The previous history of this patient was negative except for excessive beer drinking. The present illness occurred in the early part of February with an onset of severe pain in right ear, headaches, dizziness, tendency to stagger, and diplopia. After a week of these symptoms he noticed small pimples and facial palsy on the right side and with the palsy and eruption came lessening of the headache and pain and diplopia disappeared. Examination at this time at the N. Y. Eye and Ear Hospital showed loss of taste sense on the right half of tongue, small red spots on the right side of mouth and right pillars of the fauces. Three weeks after onset the pain disappeared and headaches were only occasional and very slight. He came to the Neurological Institute one month after because of the facial palsy. Several small recent scars were found in the concha of the right ear and there was right facial palsy, lateral nystagmus, and the right corneal reflex was diminished. There was slight hypalgesia round the concha of the right ear and almost complete loss of hearing on that side. The urine was normal, the Wassermann negative for blood and cerebrospinal fluid, the globulin was negative and there were 62 cells. Dr. Dench found both tympanic membranes thickened and depressed. Two months after onset taste had partially returned, palsy was still evident, but nystagmus had disappeared. Hypesthesia and hypalgesia had disappeared. The superficial and deep reflexes were normal from the first. The patient was one of the class of cases, described by Hunt, of herpes zoster, attacking the sensory ganglia of the cephalic extremity. He emphasized the fact that in zoster, though one ganglion was primarily involved the adjacent ganglia did not entirely escape. This should be borne in mind in order to understand multiple nerve complications. In placing the lesion in this case the site eruption was in the distribution of the seventh, ninth and tenth nerves. The tenth nerve could be eliminated because of absence of nausea and vomiting and by the fact that there was no eruption of the mastoid and postero-mesial surface of the auricle. Other symptoms pointed to the geniculate of the seventh, as loss of taste and facial palsy. Loss of hearing pointed to involvement of the auditory ganglia or of the eighth nerve. This occurred by extension from the inflamed geniculate ganglion. The involvement was not entire. There was also slight involvement of the glosso-pharyngeal nerve; and diminished corneal reflex pointed to involvement of the Gasserian ganglion. The case

was one of herpetic zoster attacking the geniculate ganglion of the facial nerve, with extension to the auditory nerve and slight involvement of the glosso-pharyngeal ganglia and the Gasserian ganglion of the fifth nerve.

REPORT BY DR. H. CLIMENKO

D. E., 17 years old, single, student.

Family History.—Negative.

Personal History.—Measles and whooping cough.

Present History.—On March 8, 1915, patient awoke with a sore throat. Three days later he had a catarrh of nose. On March 14 patient had neuralgic pains in the left side of the back of the head. This increased in severity and on March 18 he had severe pains in left ear. On March 21 Dr. Mindel was consulted and found the ear negative. He prescribed aspirin. The pain in the ear was, however, so severe that he did not sleep during the night. The next morning he found the left side of the face paralyzed. Two days later the temperature rose to 102°. The patient became constipated, pain in the ear was severe and relief was obtained on lying down and that time the herpes appeared. Together with the appearance of the herpes patient vomited whatever he ate, suffered from dizziness, buzzing in the ear, and things moved from left to right.

On April 5 pulse was 80, resp. 24, nystagmus was lateral and rotatory. Herpes of left auricle, canal, tympanum. Tenderness of auricle; complete paralysis of left seventh nerve. Slight Romberg.

Watch at about 5 inches; Deviation test negative. No caloric response in left ear. Caloric nystagmus in right ear at 45 seconds. Hypalgnesia at middle branch of left fifth nerve.

THE CUTANEOUS ZONE OF THE FACIAL NERVE

By J. Ramsay Hunt, M.D.

Dr. Hunt reviewed the symptomatology of the sensory system of the facial nerve¹ viz., (I) the geniculate otalgia (idiopathic, reflex, post-herpetic and tabetic); (II) pain in the ear and mastoid region with hypesthesia of the concha, in cases of facial palsy (Fallopian neuritis); (III) the sensory system of the facial as a reflex mechanism in facial twitchings and spasms; (IV) herpetic inflammations of the geniculate ganglion, a syndrome characterized by herpes zoster oticus, facial palsy and auditory symptoms. Anatomically, the sensory system of the facial nerve consists of the geniculate ganglion; a posterior root, the nerve of Wrisberg and peripheral divisions on the distal side of the ganglion, viz., the great and small superficial petrosal nerves with their deep tympanic branches, the chorda tympani, and somatic sensory fibers coursing in the trunk of the nerve and destined for the central portions of the external ear (the cutaneous representation of the VII nerve).

Dr. Hunt referred to the confirmation of his views by many observers, and, notably the case of tic douloureux of the geniculate system reported by Clark and Taylor to the Neurological Society in June, 1909. This was an obstinate and very severe otalgia of geniculate origin, cured by section of the nerve of Wrisberg. It had been observed by a number of trained neurologists who were agreed as to its distinctly neuralgic character and

¹ JOURN. NEUR. AND MENTAL DIS., 1909, p. 321.

limitation to the area which Dr. Hunt had outlined for the geniculate system. After section of the sensory root of the seventh nerve the relief from pain was immediate, complete and permanent. A more definite clinical proof of the pain functions of the sensory facial or a more complete confirmation of the views concerning geniculate otalgia, as expressed by Dr. Hunt,² could hardly be desired. The pain in this case was localized in the depths of the ear and on the anterior wall of the external meatus with occasional stabbing pains in front of the ear. Following the nerve section all sensory examinations of the face and external ear proved negative with the exception that *the former area of pain seemed to the patient to be a little less sensitive in the tests.*

In a subsequent study,³ Dr. Hunt had also described various syndromes and complications resulting from herpetic inflammation of the geniculate, auditory, glossopharyngeal and vagal ganglia. An attempt was made at that time to indicate the respective cutaneous and intra-oral zones of the seventh, ninth and tenth ganglia by the herpes zoster method. The geniculate area was found to correspond to the following anatomical landmarks on the external ear; the concha, tragus, antitragus, incisura intertragica, antihelix, fossa of the antihelix and the superior portion of the external surface of the lobule. The cutaneous area of the ganglia of the ninth and tenth nerves correspond to the posterior portion of the tympanum, the posterior wall of the auditory canal and a cutaneous strip on the postero-mesial surface of the auricle and the adjacent mastoid. More recent studies have made it probable that the geniculate has also a slight representation within the auditory canal and on the tympanic membrane as well as on the posteromesial surface of the auricle and the adjacent mastoid, thus sharing with the ninth and tenth nerves in the innervation of these areas.

The intra-oral zones of the glossopharyngeal and vagal ganglia are represented clinically by herpes zoster pharyngis and herpes zoster laryngis respectively, which correspond to the mucous membrane distributions of the ninth and tenth nerves. There is evidence to show that the geniculate may also retain an intra-oral remnant of innervation indicated by the occasional presence of herpes in the chorda distribution and in the region of the soft palate in conjunction with the typical distributions of cutaneous herpes in the geniculate area.

In the description of the zones the importance of anomalies, variations and overlap of innervation were especially emphasized by Dr. Hunt as well as their vestigial characteristics. Since the last publication by Dr. Hunt in 1910, fourteen cases of isolated herpes zoster oticus have been available for analysis, including eight personal observations. Of this number all were associated with facial palsy and eight with auditory disturbances as well. As was the case in the earlier series recorded, the eruption of herpes was distributed on one or more of the following landmarks of the external ear, viz., *the concha, antitragus, tragus, incisura intertragica, antihelix, fossa of the antihelix, superior portion of the lobule and the external meatus.* In two of the cases the herpetic vesicles were also distributed on the *posteromesial surface of the auricle and adjacent mastoid.* This area, therefore, represents topographically the geniculate zone on the external ear.

It was found that the herpetic eruption varied considerably in size and distribution in different cases, so that this vestigial sensory zone was regarded as presenting many anomalies and variations, as might be expected from its phylogenetic history and gradual submergence beneath the

² Arch. of Otolaryngology, 1907.

³ Arch. of Intern. Med., June, 1910.

encroachment of the trigeminal and cervical areas. For the same reason the absence of any clear-cut area of anesthesia was doubtful from the fact that the geniculate zone was vestigial and its area interlaced with and was conjointly innervated by the other nerves of this region—ninth, tenth, fifth, and auricular branches of the cervical nerves.

From a study of the anatomy and phylogeny of the facial nerve, Dr. Hunt concluded that the fibers for the cutaneous zone course with the motor fibers in the Fallopiian canal, finding their way to the auricle by way of the auricular branch of the vagus, the posterior auricular nerve, and, with the motor fibers destined for the innervation of the minute intrinsic muscles of the external ear. These muscles, Dr. Hunt stated, like the cutaneous sensory zone, are more or less vestigial in character. Dr. Hunt said that he regarded it as especially significant that the cutaneous sensory zone, which is phylogenetically very old, should correspond so closely in distribution to the small cutaneous muscles of the external ear which are themselves vestigial and regressive.

Some observers, notably Dejerine, had included certain hypesthetic areas of the face and occipital region in the geniculate area. Dr. Hunt, however, said he believed that these objective sensory disturbances were produced by concomitant inflammatory changes in the Gasserian and upper cervical ganglia, and therefore did not properly belong to the geniculate zone. The objective sensory disturbance within the geniculate zone in cases of facial palsy, herpetic inflammation of the ganglion and after-section of the nerve of Wrisberg, were, for the reasons stated above, very slight (hypesthesia), and might even be absent, because of the vestigial character of this cutaneous zone and the overlap from adjacent distributions of the fifth, ninth, tenth, and cervical nerves.

Dr. Hunt stated that, like the comparative anatomist, the students of cranial nerve components had found somatic sensory fibers in the facial nerves, but, true to the old anatomical tradition, had referred them to the neighboring trigeminal and vagal systems. Recently, however, Norris had demonstrated such a cutaneous component in the facial nerve of Siren, and Judson and Herrick had described similar fibers in amblystoma. Dr. Hunt believed that if the eye were fixed upon the possibility of a vestigial cutaneous component in the seventh nerve, that these might be demonstrated in the entire vertebrate series.

Dr. Leszynsky said as he recalled the original case referred to by Dr. Hunt, there was no involvement of the auditory or facial nerve. The pain was limited to a small area anterior to the meatus and was different from any form of trigeminal neuralgia.

Dr. Strauss said he saw the patient referred to by Dr. Climenko and noted the remains of the herpetic vesicles. There were scars within the auricle and in testing him for pain, he noted a certain degree of hypalgesia.

Dr. Tilney said that in listening to Dr. Hunt he had been convinced, somewhat against his will. He came prepared to attack the proposition that there was a sensory zone in connection with the facial nerve in man. There were still, he thought, questions to be answered in this connection. Dr. Hunt had yet to prove where the fibers from the geniculate ganglion terminated, in order to demonstrate to which component they belonged. It had been held by such men as Herrick, Strong, Landiere and others, who had done much to advance the component theory of the nervous system, almost to its ultimate conclusions, that the seventh nerve did not contain general somatic sensory components but comprised only afferent special cutaneous fibers from the lateral line, splanchnic sensory fibers from the tongue and, perhaps, the palate for taste, and afferent branchial motor to the facial musculature. Dr. Hunt's correspondence with Profes-

sor Herrick was more recent than any views of his with which Dr. Tilney was familiar, and Herrick, according to Dr. Hunt, seemed inclined now to concede a somatic sensory area in the seventh nerve innervation. Dr. Hunt's arguments were cogent and he had given excellent reasons for believing that this cutaneous facial area corresponded phyletically to the old zone of the spiracle. From the clinical standpoint, however, it seemed that cases of otic herpes might not be exclusively due to involvement of the geniculate ganglion. The clinical history of this syndrome showed, in the majority of instances, that we were dealing rather with a pluri-ganglionic disease. The interpretation that Dr. Tilney would give of the cochlear and vestibular symptoms would be an involvement of the ganglion connected with the divisions of the eighth nerve, namely the ganglion of Scarpa and the ganglion spiralis. Furthermore, the pain and hyperesthesia so commonly present along the distribution of the trigeminus would indicate some involvement of the Gasserian ganglion; in certain instances there was evidence of vagal involvement. One saw vago-spastic conditions as well as vagotonic symptoms—nausea, vomiting and bradycardia were not unfrequent accompaniments. Anatomically one could recognize the relation of the auricular nerve of Arnold to the ganglion nodosum of the vagus. This latter nerve had been ascribed by anatomists to the innervation of the ear in an area between the tragus and antihelix, the region in which the herpes most frequently occurred, so that it might be possible that we were dealing with an inflammation of the ganglion nodosum, not only because of the vagal symptoms present, but because the distribution of Arnold's nerve corresponded so nearly to the herpetic zone of Hunt. Dr. Tilney said he was very much indebted to Dr. Hunt for the light which he had brought to bear on this subject and believed that his argument held good.

Dr. Climenko said that the eighth nerve could be excluded in his case. There were no auditory symptoms at all.

CASE OF FAMILY PERIODIC PARALYSIS; DEATH OCCURRING IN ATTACK

By Joseph Byrne, A.M., LL.B., M.D., M.R.C.S. (England).

This rare but sharply defined clinical entity presents the following characteristics, viz., *periodic paralysis, occurring in families*. The attacks come on usually in sleep, after unusual exertion, excitement or dietetic indiscretion, and affect groups of muscles, *e. g.*, the extensors of the knees or the whole musculature of the limbs, trunk and neck. They last from an hour to a week, the usual duration being from ten to forty-eight hours (Taylor) and then disappear, leaving the individual in an apparently normal state of health in the intervals. During the attacks the reflexes, superficial and deep, are absent in the paralyzed areas and there is absence or alteration of electric excitability, and absent or diminished mechanical irritability in both nerve and muscle. The mind remains unaffected. There are no objective sensory disturbances and but few and occasional subjective ones, such as discomfort from position, thirst, itching, etc. Attacks vary in extent and severity but the severe cases give one the impression of a patient with a broken neck lying in bed, motionless, able to speak and think clearly but utterly unable to help himself beyond indicating his wants and giving directions to have his head or limbs moved in this or that direction, so as to promote comfort.

Westphal in 1885 first described in detail a typical case and refers to similar cases observed by Cavaré (1853) and Romberg (1857). Hartwig

(1874) and Samuelson (1876) each reported cases. In 1882 Schachnevitich described a like condition in father and son, the father dying from the disorder at 55. Here we have the first evidence of the hereditary nature of the malady. In the same year Gibney reported two cases associated with malaria, but these cases showed atrophy and sensory signs and are not regarded as true instances of family periodic paralysis. Fischl (1885) reported a case and Cousot (1886 and 1887) five cases in one family. Griedenberg (1887) reported one case, Goldflam (1890, 1891) saw eleven cases in one family. He reported some of the cases in accurate detail and tried experimental methods to determine the etiology and pathology. Pulaski (1899) reported a typical case. Oppenheim (1891) saw Westphal's case of 1885 again. He investigated the electrical changes and observed during an attack signs of temporary dilations of the heart with mitral insufficiency. Burr (1892-3) observed attacks causing hemiparesis. Hirsch (1894) and Rich (1894) each reported one case. Rich verified Oppenheim's observation of temporary dilation of the heart.

Other cases studied were by Goldflam (1895), etiology; Bernhardt (1896), two cases associated with muscular dystrophy; Mitchell, one case in 1899; Putnam (1900) a case in which he concluded the condition was due to a defect of coordination; Crafts and Irwin (1900) found the feces in ethereal extract caused paralysis lasting forty-eight hours in rabbits and guinea-pigs, the toxin showing alkaloidal characteristics, the muscle showed hypertrophy and vacuolation of fibers, the urine was toxic for rabbits but caused no paralysis, the blood showed marked lymphocytosis in attack, the saliva was normal; they believed the toxin acted on the spinal centers. Singer and Goodbody (1901) studied a case in which the heart was enlarged to the left in attacks. They found that experimental alterations in the diet, such as increase or withdrawal of carbohydrates, had no effect. They found muscle changes, but regarded them as artefacts; blood, normal in attacks and intervals; extract of feces non-toxic for rabbits; urine toxic for rabbits. The attacks were remarkably reduced by diuretics, *e. g.*, imperial drink, digitalis and potassium acetate. Buzzard (1901), reported three cases in a family. The patient studied had a feeling of "pins and needles" all over the body in attacks. Buzzard points out that the paralysis does not resemble curarized animals, since in these latter no electrical changes are found as demonstrated by Bonath and Lukes. He regards the condition as due immediately to two factors, *viz.*, (*a*) chemical or physical change in the muscle plasm and (*b*) lymph stasis.

Atwood (1912) studied three cases in a family in which nine cases had occurred in four generations. Death occurred during an attack in a cousin of one of his patients from inability to eject vomitus from the oropharynx and in another following bleeding to secure a specimen of blood. Atwood found marked intestinal infection by *B. acrogenes capsulatis*. The urine in attacks showed increase in acidity, indican and sulphate partition with a trace of albumin. He believes the cause is a toxin in the circulating blood. Eliminative treatment seemed to act well.

Gardner (1913) reports a single isolated case with negative family history, though the mother had bilious headaches. The attacks appeared as a rule on Sundays when the patient played football after feasting on Saturday afternoon on sausages, cheese and beer. Head suggested that the pork in the sausages might have caused anaphylactic shock. Gardner rejects this suggestion and considers the condition a toxic one due to a congenital defect of metabolism and similar to periodic attacks of acetonaemia, oxaluria, uric acid explosions, cyclic vomiting of children, which show acetonaemia and ophthalmoplegic migraine. In this case the attacks were controlled by restricted diet and elimination by the bowels and kidneys.

Types.—Emphasis has been laid on the different types of this condition,—the Goldflam, the Holtzapple, and the Clarke type. It may be well to outline briefly the main features of the attacks as described by each of these authors. In the first set of Goldflam's cases there was no neurotic heredity, transmission took place through males and females, the first attack occurred between the ages of fifteen and twenty years, the frequency of the attack was weekly, to yearly, being more frequent in youth, the paralysis involved the extremities, trunk and neck, the duration of the attacks was from twenty-four to seventy-two hours, beginning in the evening or night; there was constipation, thirst, sweating, drowsiness; consciousness was retained; there were no sensory disturbances except acute itching which appeared in the intervals and just as the attack was about to terminate; speech and bladder functions were normal. The physical examination showed flaccid paralysis; reflexes: plantar, abdominal and cremasteric present; knee jerks absent; sensation normal; urine undiminished. Electrical examination: faradic quantitatively diminished in arms, absent in legs; no reaction from muscles in arms and legs; facial nerve normal; myotatic irritability lost. Between the attacks nerve and muscle irritability was normal except in the intrinsic muscles of the hand which showed R. D. Goldflam occasionally observed that paralysis was limited to certain groups of muscles; that attacks might be aborted or delayed by exercise; that relapses might occur in the state of improvement; that the heart might become arrhythmic with a systolic basal murmur, accented second sound, faint first sound, but no cardiac enlargement; that the pulse might be slow or there might be inability to swallow or a dangerous asphyxia.

The Holtzapple type shows the condition occurring in a family afflicted with other neurotic disorders which may possibly be regarded as equivalents of the paralytic attacks. One case suffered from migraine until thirty, when this was replaced by periodic attacks of paralysis. Holtzapple observed a family for twenty-two years, covering four generations. Seventeen cases of paralysis occurred in this family, eighteen cases of sick headache, five cases of paralysis associated with headache, fourteen cases of uncomplicated paralysis and thirteen of uncomplicated headache. Six died in an attack of paralysis, one in Holtzapple's presence. The conditions of the attacks of paralysis were essentially similar to those described by Goldflam.

The Clarke type seems to be a milder form in which there occurs abruptly and without warning a more or less complete inability to move any of the voluntary muscles. There are no electrical changes. Reflexes and sensation are normal. In some cases the muscles supplied by the cranial nerves are involved, *e. g.*, eyes, tongue, pharynx, lips and muscles of inspiration. The cases occur mainly in females, but the first instance occurred in the male grandparent. Some of the males, not affected, showed hereditary taint, two had diabetes, four had acetonuria. The attacks occurred unexpectedly, *e. g.*, while the patient was sitting in a car, walking, or resting. They involved striated and unstriated muscle. Micturition seemed to prevent or terminate the attacks.

The cases herein reported occurred in a family of eight, five males and three females. So far the females have escaped. Three of the males have had attacks. The eldest, thirty-six years, and the third eldest, thirty-two years, have so far escaped.

History.—Father, Jewish, born in Russia, died nineteen years ago, at 40. He was one of twins, was healthy until a few years before death, when he had stomach trouble which was alleviated by staying at Carlsbad. He returned to New York and six months after return had a supper of

delicatessen and beer. He awoke at 4 A. M. feeling very ill. At 7 A. M. he became paralyzed, followed by loss of speech; he tried to vomit but failed to do so; he was unconscious all day and died at 6 P. M. after convulsions. This was the only attack the patient had. The mother, Russian Jewess, had diabetes mellitus for past four years. She appears healthy but is uncommunicative. Her grandfather died suddenly thirty-seven years ago, cause unknown. Father's brother died twelve years ago, of illness similar to father's. Nothing is known of collaterals. In the family under consideration three sisters are alive and well, one has five healthy children; five brothers, A. is 22.5 years old; B. 25 years, C. 32 years; D. 36 years. A, the youngest was seen in December, 1914. He is a student and had five attacks of paralysis in five years, the first attack coming on at 17.5 years. All were severe but the last was worst and lasted twenty-four hours. The patient's words are: "The attack is preceded by headache, indigestion and fever. The joints and muscles stiffen and the limbs become heavy. In from one to three hours I am completely paralyzed, entirely helpless with the exception of being able to roll my head from side to side. Even the slightest movement elsewhere is impossible. My mind is clear, I can speak and understand what is going on. My body is abnormally heavy to those who lift it. I want my body turned and moved every few minutes. I would like to vomit, but cannot. I cannot urinate. After an emetic the vomitus is green. After vomiting my condition is better and improvement sets in with the desire to urinate. When I take a purgative it acts if I do not vomit it, but I have no desire to go to stool until the paralysis passes away. In the last attack I had cramps in the stomach. I was placed on the toilet and my bowels moved. This helped me, as in one hour I fell asleep. I awoke after three hours and could then move a little. Half an hour later the paralysis was entirely gone but some weakness in the joints and muscles of the limbs remained. An hour later I was out of bed and walking around. On the night previous to the last attack I slept little on account of fever and indigestion, and I was somewhat delirious. On other occasions should I eat a heavy meal half an hour before going to bed my limbs are very stiff in the early morning. This passes away and when my stomach is in good condition I have no such trouble."

The order of the paralysis is: Lower limbs, trunk, upper limbs, neck. Power returns as follows: Hands and arms, thigh rotators and feet, simultaneously. Patient tried to urinate but could not in an attack. Patient A. has a peculiar deformity of the hands. At the metacarpophalangeal joint the four fingers are markedly deviated to the ulnar side, leaving a large prominence on the radial aspect of the knuckle of the index finger. The fingers are "double-jointed." This is apparently inherited from the father, who had similar hands. One brother, B., has similar hands.

Patient B., height five ft. eleven in., weight 145 lbs., has had two attacks, the first at twenty-two and last at twenty-five. They were similar to those of A. He is a clerk, and became quite helpless at office and had to be carried home. He has slight neuropathic traits. C., thirty-two years, has had no attacks so far. D., thirty-four years, has had over a dozen. In one year he had three attacks. He liked to vomit in attacks as he thought it relieved him. He had an attack April 6, 1915, which proved fatal. E. has had no attacks, he is healthy, married, and has one healthy child.

History of D's. Fatal Attack.—Patient never drank. He smoked cigarettes in moderation. Habits regular and temperate, but he frequently dined at restaurants. This was regarded by his family (orthodox

jews) as dissipation. Was in the army in Porto Rico in his first attack, at twenty years. The last, thirteenth, proved fatal, on April 6, 1915. On April 5 there was a heavy fall of snow; the patient stayed home on account of grippe cold. He had high fever and his doctor prescribed powders and advised rest for a week. Though forbidden meat he took roast beef, and had chicken broth and two bottles of zoolak. On April 6 he was irritable in the morning; at noon he went to purchase zoolak and on his return met his employer, who had come to enquire about him. This episode upset the patient. At 1 P. M. he took two bottles of zoolak and went to bed. At 6.30 P. M. he was stiff, although he could still stand and walk. He knew the attack was inevitable. He took a mustard foot bath with relief. By 7.30 P. M. he was completely paralyzed. The order of paralysis was lower limbs, trunk, upper limbs, neck. He was given a bottle of citrate of magnesia to move the bowels. At 10.00 P. M. he was put on a commode and the bowels moved freely, there being nothing unusual about the movement. It was liquid, well mixed, of greenish golden color, no marked odor. No excess of mucus or undigested food. After this his clothing was changed. He complained of cold. At 11.30 the patient was seen by Dr. Byrne.

Inspection.—Well developed, muscular young adult, well formed and symmetrical. No stigmata with the exception of a large, coarse nose, and condition of incomplete hypospadias, the glans penis presented two openings, the upper one being the true meatus, the lower about 5 mm. in depth. No urine had ever escaped through this to the patient's memory. Ears, hard palate, teeth, well formed, regular. The forehead sloped slightly and the cranial dome was somewhat low and deficient looking. Hands and feet well formed. Limbs and trunk perfect. Between attacks is well but of late has few erections and no sexual desire. Ejaculation is premature but effective. Patient lay in bed utterly helpless except that he was able to talk. The mind was clear. He complained that his head was heavy and asked to have it placed straight on the pillow. He had a numb feeling in the feet and felt fidgety. He felt heavy as lead. He had generalized headache and burning sensation in mouth and tongue. He tried to cough but could not. He tried to vomit but without avail. The effort represented a much enfeebled activity of the oropharyngeal muscles. Nothing came up. He complained of mucus in the throat which was relieved by swabbing. His respiration was peculiar; the abdomen protruded to an unusual degree and retracted abruptly as if forcibly drawn in, whilst a fraction of a second later the anterior chest wall ballooned outward. This was one of the most remarkable features of the attack. Respiratory rate 18, full and deep. The average duration of inspiration was 1.4 sec. expiration 0.8 sec. pause 1.6 seconds. These were fairly normal but there were occasional marked pauses lasting 3 or 4 seconds. Pulse 84, full, soft, regular. Heart: Auscultation, first sound impure, due to irregular muscular action of ventricle, second sound relatively accentuated, but really diminished, aortic second sound feeble, pulmonary relatively accentuated, no other abnormal sounds. Abdominal organs appeared normal; tongue moist and clean. Skin sallow, warm and dry but otherwise normal. Temperature 100.6° F.

Neurological Examination.—Motor: Can wrinkle forehead and close eyes tightly. Shows teeth poorly but equally on both sides and with manifest effort. Strains when asked to open mouth and does not separate teeth more than .5 inch. Facial expression on laughing feeble but symmetrical. Putting out tongue costs an effort. Unable to trill tongue against hard palate. Cannot trill lips. Can whistle feebly. Says "Ah" but cannot raise pitch. Swallows with difficulty. Cannot open mouth against resistance. Can make slight lateral movements of head. Trunk and limbs

powerless, but barely noticeable movement of wrist. Position of hands $\frac{1}{4}$ closed. With wrist extended he can almost close hand. Interossei and lumbricals powerless. Can rotate left thigh but not right. Can wriggle toes a little. Trunk muscles flaccid. Attempts to cough, laugh, or vomit are feeble. Does not urinate. No flatus passed at any time.

Reflexes	R	L	
Epigastric	o	o	
Abdominal	o	o	
Cremasteric	x	X	Diminished on both sides.
Anal	x	X	
Bulbocavernosus	o	o	
Elbow	o	o	
Wrist	o	o	
Knee	o	o.	
Ankle	x	X	Exaggerated on both sides.
Ankle clonus	o	o	
Plantar	o		At times dorsal flexion of ankle with knees flexed, small toes gave response, great toe motionless.
Oppenheim	o		Small toe turned down, great toe motionless.
Gordon	Toes turn		Small toes up as a whole, great toe motionless.

Myotatic irritability absent on neck, trunk, hands and limbs, but present on calves, though absent in anterior tibial and peroneal groups. Slight fibrillation of calf muscles after irritation by hammer taps.

Sensation, General.—Feels fidgety. Numb in feet. Heavy as if lead. Burning in mouth and tongue. Headache general. No marked itching. Touch: Light, no loss; deep, no loss; localization good in both. Pain: Prick, no loss; no over-reaction. Pressure: Pain normal, testicular and ocular sensibility good. Heat: Gross no loss, no over-reaction. Intermediate no loss. Cold: Ice no loss, no over-reaction; intermediate no loss; discrimination good. Vibration: Unimpaired. Passive position good. Special Senses—Eyes: Vision good. Movements well executed, slight convergence on looking up. No nystagmus. Pupils dilated, equal, regular, react to l. and a. Vessels normal. Taste: Preserved on anterior tongue, equal. Smell: Normal. Hearing: Good, equal.

The patient was left about 1.30 A. M. with instruction for continual watching, by younger brother, himself a victim of disease. The patient asked to have throat swabbed out and later made signs to have this done. Later about 2.30 A. M. patient became very quiet and turned blue. The brother tried to swab throat, but patient became rigid and bit off the swab. The brother tried artificial respiration, but the patient died. The cause of death was failure of the respiratory mechanism through involvement of the diaphragm or exhaustion of the diaphragmatic neuromuscular mechanism; the latter is the more probable. Autopsy was refused.

Pathology. Few significant facts have been found. Oppenheim found waxy degeneration of muscle during attack; Goldflam found general hypertrophy and vacuolization of muscle. Goldflam and Bernhardt regard the condition as organic. The objection to this is that the attacks minimize with advancing age. The blood (Goldflam and Taylor) has been found to show leucocytosis. The urine (Crafts and Irwin) has

been found toxic for guinea-pigs. Biller and Rosenbloom found diminished creatin and creatinin with increased undetermined nitrogen. Mitchell, Flexner and Edsall found total anacidity of the stomach and digestive processes at a standstill, even for starch, with gastric motility abolished, with diminished output of kreatinin one or two days before the attack, but consider this latter a result rather than cause of attacks. Singer and Goodbody found the urine diminished, but otherwise normal.

The disease must be classed with conditions due to inborn errors of metabolism such as albuminuria, cystinuria, pentosuria, etc. It develops along with other defects than those related to metabolism. The attacks are associated with improper diet or mode of living affecting the defective mechanism. It has been taken for hysteria with fatal results to the sufferer. The lives of the patients should be most carefully regulated. Individuals in a family afflicted, who themselves escape, do not seem to transmit the condition, but consanguineous marriages should be especially guarded against.

In treatment the alkalis (citrate of potash) seem to shorten the attacks. Flexner and Edsall got negative results from diet, lavage, intestinal antiseptics, quinine, bromides, strychnia, bicarbonate of soda, and hypodermoclysis. Purgatives and diuretics seem to act favorably. One thing is certain, that persons afflicted should have at hand some effective means of carrying on artificial respiration such as the pulmotor, the O'Dwyer tube or some similar contrivance. As the attacks are self-limited the indications for all methods calculated to keep the heart and respiratory mechanisms going are unequivocal.

Dr. C. E. Atwood said that Dr. Byrne's remarks respecting mode of death in cases of family periodic paralysis were of especial interest. In the family which Dr. Atwood had reported, one patient choked to death during an attack, from vomited matter which he was unable to clear from the throat. Another died in syncope when a vein was opened to obtain a specimen of blood. Another was burned to death by fellow soldiers in the Russian army who thought his attack of paralysis was an evidence of malingering. During attacks which Dr. Atwood had, himself, witnessed, the patient's heart action was weak. This was shown especially when the patient was held in a sitting or standing posture, faintness occurring or even fainting; and during two attacks in one of his patients, a cardiac bruit was distinctly heard and there was some increase of the area of cardiac dulness, from dilatation. The intercostal muscles were involved in severe attacks and the breathing was usually shallow. Family periodic paralysis is a rare disease. Its pathology is not known. The pathogenesis of attacks from the standpoint of pathological chemistry had occupied a number of observers without definite results. The doctor would urge that a careful personality study or psychoanalysis of each patient be made if for no other purpose than to bring about an improved adjustment of the patient toward life and environment, which the nature of his disease tended to alter, and to enable him to sublimate into useful and interesting occupations when he had become discouraged by the frequent losing, perhaps, of remunerative positions, on account of the inconvenient occurrence of attacks. There was a neurotic element present which deserved careful study; but hysteria could be eliminated.

Dr. Tilney asked Dr. Byrne what part of Russia his patient came from.

Dr. Byrne said he was not able to answer. He had only seen the brother since the patient died. He was frightened to death on account of

the fatal ending of the case. There was, as Dr. Atwood said, a distinctly neurotic element in these cases.

THE RELATION OF LANDRY'S PARALYSIS TO POLIOMYELITIS

By M. Neustaedter, M.D.

The disease was described in 1859, by Landry, with the following symptom complex: Individuals, who up to the time of their illness were in perfect health, developed a flaccid paralysis in the lower extremities, preceded by a general malaise and paresthesias in the affected parts. Within a few days the muscles of the trunk and then those of the upper extremities became involved in the same manner. And, finally, the muscles of deglutition, articulation and respiration became paralyzed and the patient died of respiratory failure within a few days or weeks. Occasionally, some cases presented a mild degree of these phenomena and survived without leaving any residual paralysis. In these cases the muscles last affected were the ones to first recover their function. Landry pointed out that there was no atrophy of the muscles and no electrical changes in them and that he found no pathological changes upon autopsy. A great many cases, however, had been reported that varied from the first description. Muscle atrophy with electrical changes were frequently observed, sensory disturbances were not uncommon, involvement of sphincters were at times reported and a unilateral or bilateral facial palsy of Bell's type had been described.

Owing to the more advanced methods of examination, the conception of the etiology and pathology of the disease had undergone marked changes. Landry was inclined to ascribe the affection to a toxic process. The fact that in the majority of cases there was an enlarged spleen, swelling of the lymph glands, hemorrhagic foci in the lungs and intestines and a nephritis, pointed to a toxic or infectious process. Chantemesse and Ramon had observed a large number of cases of paralysis, clinically not dissimilar to Landry's, in an epidemic form at an institution for the insane, suggesting a possible infection. Baumgarten found in one case *Bacillus anthrax* in the blood and Curschmann had cited a case in which typhoid bacilli were found in the spinal cord, of which pure cultures could be grown. Centanni found in a case of interstitial neuritis, bacilli in the endoneural lymph spaces. Eisenlohr had reported a case of Landry's, due to a mixed infection. He had found a *Staphylococcus pyogenes* and a *Staphylococcus cercus albus* in the spleen and sciatic nerve. In another case he had found several types of bacilli. Remmlinger had found the *Streptococcus longus* and Marinesco, diplococci which were partially enclosed in leucocytes. In a case of Marie and Marinesco a bacillus similar to anthrax had been found in the blood. A virulent pneumococcus had been shown to be present in the cases of Roger and Jesus and of Courment and Benne. MacNamara and Bernstein had grown a tetracoccus from the blood and cerebrospinal fluid of their case, and Sheppard-Hall a streptococcus from this case. F. Buzzard had isolated a coccus from the dura which produced a flaccid paralysis in animals. Wochensius had found a *Staphylococcus pyogenes albus* in the spleen and peripheral nerves.

On the other hand, in recent years, cases of Landry's paralysis were reported in which no germs were found. Such cases had been reported

by Seifert, Schultz, Thomas, Kapper, Workman, Hunter, Burghart, Mesny and Mentier, Pfeiffer and E. D. Fisher. The pathology of the disease was no less uniform. Not only in former days, but also in recent years, the microscopical findings were negative in some cases, as reported by Ormerod and Prince, Seifert, Kapper, Hun, Girandea-Levy and others. Goebel and Burghardt reported cases with very slight changes. In some cases disseminated foci of an inflammatory character were found in the bulb only, in others again exudates with capillary hemorrhages in the spinal cord only. Wappenschmidt placed particular weight upon hyaline thrombi in his cases, tending to prove the theory of Recklinghausen and Klebs, that they were due to the action of bacterial toxins. In a few instances a marked swelling of the axis cylinders in the anterior pyramids was noticed. Widal and Le Seurd mentioned a neuritis of the roots as the only change.

Since the peripheral nerves began to engage the attention of investigators of these cases, some authors had been able to demonstrate extensive neuritic changes as the basis of this disease. Dejerine and Goetz, Nauwerck, Barth, Ross, Putnam, Klumpke, Beinert, Kolly, Pehnar and E. D. Fisher reported such types.

In recent years the greater majority of cases reported were characterized by myelitic, or rather poliomyelitic changes in the cord and midbrain, namely by a perivascular and pericellular infiltration of various types of cells, hemorrhages, thrombosis and softening. In a few instances, however, a combination of the neuritic and poliomyelitic changes were reported, as in the cases of Krewer, Mills-Spiller, Guizzetti, and Knapp and Thomas. In these cases, Krewer argued, the inflammatory process of the peripheral nerves was extended to the cord and bulb and this gave rise to the symptom complex of Landry. With such a varying etiology and pathology of a disease, a uniform nosological character could certainly not be thought of. The disease might follow diphtheria, pneumonia, typhoid, variola, anthrax, influenza and manifest itself as a puerperal polyneuritis. Some even reported cases that developed after cystitis, alongside of uremia; others claimed alcohol and syphilis as an etiological factor and a few had observed the affection to follow traumata, complicated by septic cellulitis.

Another important fact was that one did not know the point of entrance of the germ, nor had one any proof of its manner of dissemination. Furthermore there was no proof whether the toxin alone, or the virus, or both, were responsible for the changes in the tissues.

Poliomyelitis: The symptomatology of this affection was by no means uniform. In all cases, it was true, fever was the first symptom, but only one third were accompanied by gastrointestinal disturbance. Headache and pain along the spinal column, were, as a rule, a constant accompaniment. Meningeal symptoms were present in the large majority of cases. Stupor was rare. The intellect was clear. The focal symptoms, as was well known, were not uniform. The spinal, cerebral, bulbar, pontine, cerebellar and mixed types had become recognizable. In the spinal type there was, of course, the flaccid paralysis of one or more extremities, with marked atrophy, according to which segments might be involved. It was rarely of an ascending character. In cases that ended fatally there was a simultaneous involvement of the bulb and spinal cord. The cerebral cases, it was quite obvious, resulted in a spastic hemiplegia, with or without epileptiform convulsions. The purely bulbar or pontine types showed cranial nerve involvement. A peripheral facial paralysis was the most common result. Ataxia and tremors with nystagmus were found in the cerebellar cases. In the mixed types the symptom complexes varied with

the site of the lesions. Some authors described a polynuritic type, but this was rare and was observed only in large epidemics, and finally a large percentage of so-called abortive types were recorded. It was not to be gainsaid that the etiology was uniform. The disease was preëminently an infantile one, it occurred in epidemic form and showed very definite seasonal variations in its incidence. All agreed that it was both infectious and contagious. Flexner and Noguchi had definitely proven that there was a distinct coccus that produced the disease. Many important data about the character of the virus were available. The fact had been established by Dr. Neustaedter that the nasopharynx was the point of entrance into the system. The pathological changes of poliomyelitis were uniform in every case, no matter what part of the central nervous system was affected, and this was true of clinical and experimental cases as well. Macroscopically there was a pronounced hyperemia of the cord and meninges; the vessels of the brain were congested; and there was a fair amount of edema of the brain and cord. There was little, if any, increase of the cerebrospinal fluid. On section the brain and cord had a moist, translucent, edematous appearance, and the gray matter of the cord was often swollen so that it projected above the level of the white matter. Frequently punctate hemorrhages could be discerned with the naked eye. The virus was propagated by the lymphatic system and there were foci of congestion in various glands. Histologically, the disease was characterized by a perivascular, interstitial and pericellular infiltration of round mononuclear, polymorphonuclear and endothelial cells. The ganglion cells involved were those of the anterior horns, Clarke's columns, spinal ganglia, nuclei of the cranial nerves and basal ganglia and the cortex. Chronologically, the perivascular lymph spaces of the pial vessels in the anterior longitudinal fissure of the cord and the pericellular lymph spaces of the spinal ganglia were the first ones to be involved, sometimes as early as the third day of infection. Next came the involvement of the central vessels of the cord, then the vessels of the white matter. Hemorrhages were always present. It was important to show whether the germ or its toxin, or both, were at work. Whatever exotoxin there was, was evidently a negligible quantity nor was the endotoxin very toxic. Lastly, the cytological findings in the blood and spinal fluid were typical. The blood showed leucocytosis with many mononuclears. The spinal fluid was clear, contained 85 per cent, or more lymphocytes, the cell count ranging from 30 to 600 cells per cmm, the globulin content was increased. The conclusions of Dr. Neustaedter, were, therefore, (1) Landry's paralysis was a clinical entity with varying pathological changes, which might be peripheral, myelitic only, or neuro-cellular. Poliomyelitis was a pathological entity with varying symptom complexes. There might be flaccid paralysis with muscular atrophy, or spastic paralysis, or cranial nerve involvement; also ataxias and tremors, or mixed types.

Dr. Hunt said he was inclined to make a clinical distinction between poliomyelitis of the Landry type and the true Landry's paralysis. He recognized, however, that the clinical type of Landry's paralysis might be caused by a number of conditions, among them poliomyelitis. He said he had one case that was different from poliomyelitis in its clinical course and in which pathological study failed to reveal any evidences in inflammatory lesions. He had always felt, therefore, that there was a true Landry's disease, of obscure etiology and bearing no relation to poliomyelitis.

Dr. Strauss asked Dr. Hunt how he would make the clinical differentiation.

Dr. Hunt said the man whom he referred to was a mulatto, who came from the South Sea Islands. On admission to the hospital he had weak-

ness of the legs, gradually progressing; no temperature (or occasional subnormal temperature). From day to day the motor weakness gradually increased and gradually ascended. As the weakness progressed there was gradual obliteration of the tendon reflexes. The muscle responses were retained and also the electrical reaction, although diminished. The man finally died of respiratory failure on the ninth day. There was a gradual increasing motor lethargy and the mental state was of apathy, increasing with the progress of the disease. There was no disturbance of the sphincters. A very complete post-mortem examination showed no lesions in the spinal cord, except an occasional degeneration of the anterior horn cells. The peripheral nerves showed degeneration and there were curious changes in the muscles. He regarded the condition as a profound intoxication of the peripheral motor neurones.

Dr. Strauss said he would like to say in response to Dr. Hunt that he firmly believed there were cases of acute ascending paralysis that were not poliomyelitis. He thought there were cases in recent literature that had been studied carefully enough and these had shown no lesion in the cord, and we could conclude that they were not cases of poliomyelitis. Poliomyelitis should show lesions in the cord which were characteristic.

Dr. Neustaedter, in conclusion, said that he was inclined to view Landry's paralysis as a clinical entity, a syndrome, without any definite etiology or uniform pathological picture. Poliomyelitis, was, on the other hand, a pathological entity, its etiology was known, but was of divers symptom complexes. That poliomyelitis could not be reproduced at times was a known fact. Various factors might militate against the experiment. The refractiveness of the animal was a frequent factor. But, because one was unable to reproduce it in some instances, one was not justified in denying the presence of poliomyelitis as long as the pathological picture was characteristic.

CHICAGO NEUROLOGICAL SOCIETY

OCTOBER 21, 1915

The President, DR. JAMES C. GILL, in the Chair

SOME FUNDAMENTALS IN TESTING MENTALITY

By William Healy, M.D.

This paper dealt with a considerable number of points concerning the giving and the fair interpretation of mental tests. In illustration of some of the points, one form of the recently developed "Yerkes Ideational Test" was shown.

Mr. S. C. Kohs said he was glad to have heard Dr. Healy's paper, but that there were some points on which he could not agree with him. Referring to Dr. Healy's statement that the Binet scale was wholly inadequate for diagnosing special ability or special disability, the speaker doubted whether it had ever been claimed, by those properly qualified to make the assertion, that the Binet scale was adequate for any fine, sharp distinctions. He maintained, on the contrary, that the scale was intended to determine intelligence levels, and even at that, the measurement was only rough.

Dr. Healy had also stated that the Binet scale does not indicate for what the individual is fit. In reply to this Mr. Kohs, who had spent some two years at Vineland, cited the work of the psychological laboratory which drew up an industrial classification based on mental ability as indicated by the Binet

scale. The inmates of the institution, some four or five hundred, had already been measured by the scale and their names had been arranged in order of mental ability. The institution employees were then asked to state what every individual was doing and also what he was capable of doing. The institution employees who were caring for these patients knew nothing of the results of the Binet examination. The responses were correlated and the following was found: The higher the patient in intelligence level the more complex was the work he was able to perform, and in general, the smaller was the amount of supervision necessary. Although this was only an institution experience, nevertheless, it would probably work as well outside. Experience with the Binet led the speaker and his associates to believe that the Binet test was a very valuable thing in telling us on what level of complexity an individual could work, and also, all other things being equal, what amount of supervision would be necessary. Of course, he was speaking mainly of the feeble-minded. How that classification would correlate with the normal individual, he could not definitely say, since no experiments along this line had ever been made.

The point that the Binet scale is not good as a gauge for adults may perhaps be true of the normal. The speaker's knowledge, however, of the feeble-minded led him to believe that the examinations made upon those who had been put through the tests at years widely separated showed the reactions to be practically the same. In some cases the mentality was lower, but not enough to make the deviation at all marked.

Mr. Kohs concluded by indicating that the multiple joint test, demonstrated by Dr. Healy, was open to every objection launched against the Binet test. The criticisms of the Binet scale can be very easily transferred to any other test or scheme of tests.

Dr. Sydney Kuh said that if he were to make any criticism of Dr. Healy's excellent paper, it would be that he had perhaps not been quite emphatic enough in bringing out some points that he had made. The fact that the child is a failure at school is not only not evidence that that child is feeble-minded, but a child may be a failure at school and still be far above the average of intelligence. In fact, if it were not objectionable to mention names at a meeting, he might speak of a man whom anyone present would class amongst the six greatest living alienists, who was known to have been a failure at school. The fault is not always with the child. Dr. Kuh has known instances where the fault was clearly with the teacher. It takes not only an intelligent child, but an intelligent teacher to bring out the best that is in the child. He has also known other instances where the fault was distinctly with the parents. Some children are only able to learn when prodded; others can only work when left alone.

So far as the criticism of the Binet scale was concerned, Dr. Kuh fully agreed with what Dr. Healy had said. The fault is not with the Binet scale, but with those who expect impossible things from it. The application of a very little common sense would tell us that the results that are obtained by educational methods depend not solely upon the intelligence of the child, but also on the environment and influences which affect the child. The influence of environment is liable to be even more pronounced in at least a certain group of feeble-minded than it is in the normal individual, because of the greater suggestibility of some of those who are below normal mentally.

Dr. Healy has spoken of the Petrick case. The speaker was one of those who examined this young man, and he thought that the statement that his mental age was seven was simply an illustration of what mistakes one can make if one uses the Binet scale carelessly. Petrick, so far as the speaker could judge, was away beyond the age of seven. He was not nearly so feeble-minded as he wanted the examiners to believe. He was very dis-

tinctly simulating feeble-mindedness, and the only reason the speaker could bring for considering him feeble-minded was the exceedingly feeble-minded way in which he simulated feeble-mindedness. He showed a distinct defect in his intelligence by the awkwardness with which he simulated. Of course, those who have examined criminals, amongst whom the tendency to simulation is great, have often called attention to the fact that one can recognize the underlying feeble-mindedness by the way in which the simulation is done.

Just a word with regard to the influence of the emotional state upon the results—which influence enters into the Binet as well as any other test, and one that is practically never considered. Anybody who has made a study of these things will know that there are certain individuals who under the strain of a test can do things that they are incapable of doing at other times. On the other hand, there are others who, under the emotional strain of an examination, do not come anywhere near displaying their normal intelligence.

Dr. Kuh fully agreed with Dr. Healy when he said that the Binet test is of very little value without a very thorough study of the social history, and a careful investigation of the opportunities and environment under which the individual tested has grown up, but this also applies to all other tests, in his opinion.

Dr. H. I. Davis was also one who had examined Pethrick. After a short time in the presence of this young man, the speaker knew he was simulating. Among the first questions asked Pethrick was, What is your name? and Where do you live? And in a very offhand way he said: Please write it down for me. He wrote his name—Russell Pethrick—on a card (which the speaker showed), and then asked how to spell Parnell. Despite this, the speaker was satisfied that Pethrick was feeble-minded. By sheer force of deprivation Russell Pethrick could not be anything but feeble-minded. He could never be normal. His hearing is very poor and eyesight is poor. He could never see the blackboard at school. By sheer deprivation of these senses he could never be normal. There was nobody around him to put forth any special effort to overcome his shortcomings. As said before, however, he had enough intelligence to attempt to simulate and to try to cover up certain things.

Dr. Wm. O. Krohn had also examined Russell Pethrick. While it has been said that he only had the intelligence of a child of seven and a half years, still his account books and everything pertaining to his daily work were the same as the average boy of his age. In playing cards Pethrick could count accurately and rapidly. He also appreciated the jeopardy of his condition, because as soon as the verdict was in, he went in and hugged his acquaintances in the jail. He had the same difficulties in learning at school as every child who has defective hearing and sight.

Dr. Krohn wished to emphasize, if possible, still more forcibly the difficulties of applying any scale arbitrarily. He referred to the case of a colored boy who at the end of his second year of highly creditable work in Englewood High School, had stolen some journal brasses from a railroad yard and was sent to Pontiac. While there he assisted in teaching the younger boys in the school. After one year he was let out on parole; came back here and got in trouble again. Laboratory tests, it was stated, revealed that he was only eight years in intelligence, and yet he had passed successfully and with credit the second year of the Englewood High School two years before. Any test applied arbitrarily has its failings.

It seemed to him, furthermore, not that the test itself is invalid for the purposes, but, as had been suggested, its devotees try to make it reach further than originally conceived or planned. The over-enthusiastic zealot of any ism is the worst enemy of that ism, and by claiming more for any system than is warranted leads it into disrepute. Binet's test certainly has its place.

The point scale has even a better place. But no matter what the test, we must study the individual, as Dr. Healy suggested. Many children are "ear-minded" when they come to school. At home they have learned from stories, from parents who have instructed them by talking. They can only learn through the ear. They find it hard to learn through the eyes, alone, from books and blackboard and consequently do not attain the standard of that grade.

Another point, with regard to the child being interested. The speaker had a child brought to him the other day, with the idea of putting him in a school for the feeble-minded. He was twelve years of age, and could not spell cat, but he could spell all the names of automobiles. He was interested in them. He was put in a shop on Michigan Avenue, and he is clever and bright, and can read all the automobile catalogues of parts and prices. That is a question of the concrete as against the abstract, already referred to by Dr. Healy.

Dr. L. Harrison Mettler wished to emphasize two points which had been brought out indirectly by Dr. Healy. It seemed to him that in testing the mind by the Binet method or the apparatus shown by Dr. Healy, one is harking back to the old idea that somehow or other the mind is an entity that can be measured. In the earlier days of philosophy and ancient history they had the mind all mapped out. It was arranged in psychology like a sort of checkerboard whereby you could determine what you had and did not have. Then later it was determined that there were no such things as faculties, but mere cerebral reactions. If one reads modern psychology, its growth and development, correctly, one comes to the conclusion that there is no such entity as mind in the sense of being a measurable thing. Each man presents his own individual reactions. Those reactions are dependent upon physiological conditions, various toxins and so forth, as well as fibers and tracts about which we know as yet comparatively little. In the future there probably will be no books written upon insanity as a disease process. There will be no psychiatric diseases; but every man who is unfortunate enough to lose his mind will present his own individual clinical picture, depending wholly upon his physiological state and his past history and present environment. This is absolutely different amongst us all. So it seemed to Dr. Mettler that the marked trend in the newer psychology is to a study of the entire physiology of the individual, and not to a harking back to some fixed standardization, or sort of rule of thumb, as worked out by Binet and some others. Though it seemed to the speaker that we were working along a wrong line, he admitted it is well worth testing out. He furthermore said it was refreshing to hear a man with the authority of Dr. Healy take such a careful and conservative view as to insist upon the many factors that must enter into the determining of a man's mental state.

The other point Dr. Mettler wished brought out more strongly was that a psychological examination differed from all other examinations. It is one thing examining a like thing, one mind examining another mind. It has been well remarked that every patient who is having his mind examined is at the same time examining the examiner's mind. The latter must remember that he, as well as the community, and the general mental status of his environment are also under examination by the patient or his representatives. This point ought to be emphasized very strongly. For example a patient's morality, his sexual trends, his desires and modes of activity must all be considered in connection with the general status of the community in which he lives and has had his development.

Before a community can say absolutely, except upon the very broadest, coarsest lines, what is a normal mind that community itself has got to come up to, or represent, the highest standard of morals, of intelligence, of learning,

and in fact of everything that is known in the moral and intellectual history and activity of the world. To affirm the normal is a mighty task, and we are far from the end of it. The speaker believed that there was no such thing as a normal mind as commonly understood; only an ever growing and progressing state of cerebral reaction. The end of this growth no one can yet foresee. But at all events it is not yet in sight and hence nothing in the way of strict normality can be predicated of it at this time.

Dr. Meyer Solomon wished to refer to a point made by Dr. Krohn, that of imagery. We know that some individuals are able to take more with the ear, some with the eyes. Dr. Solomon stated that he witnessed Dr. Healy examine an individual who was unable to pass a Binet scale in the ordinary way, but with the employment of visual memory tests the child was able to pass the scale. That brings home clearly that the Binet-Simon scale is really an auditory imagery test to a great extent. Only a few of the things in the Binet scale bring out the visual memory of the individual. Also, in the immigrant, where we have all sorts of individuals from all parts of the world, they do not use the Binet-Simon scale. It has been a failure there absolutely, and they must use tests of the sort that Dr. Healy has helped to construct. One race is not like the other. This is one thing which should be impressed upon us, that in a city like Chicago we have a combination of all races, and since the environment and racial bringing up are big factors, we see it here also as with the immigrant—the Binet-Simon scale is not applicable in too many cases. With all, we may say, however, the Binet-Simon scale is a great aid. In children under ten years of age, having language defect, in the majority of instances it works. In individuals over that age it is a problematical proposition, and there we must take into consideration the life history more than at the previous age.

One other thing which we should always remember is the medical aspect. The tonsils, adenoids, and vision and general health have a great deal to do with mental states in many instances.

Dr. Clara Schmitt said one point had come up two or three times, namely, the use of language in our tests. The speaker knew Dr. Healy did not undervalue in his work the place of language in mental life, and we should be careful not to undervalue its place in mental tests. Surely the higher processes of mental life, reasoning, and so forth, can take place most largely only with language. We cannot get very far in reasoning with concrete experiences. You could not arrive at a law of much far-reaching effect with only concrete experiences. Language certainly does belong to the highest phases of intellectual life. It is true that we have a great many people who are expert in all the concrete phases of human life, and yet very inexpert when they come to the spoken or written symbols. Yet that is a very important ability indeed, and it is there that we find a great deal of trouble in our work with school children. There are a great many children who can test up very well with all concrete tests, yet never can learn to read. That sort of symbolization is not possible with them. We don't want to lose sight of the fact that this constitutes a very serious defect.

Dr. Frances Dickinson said that she remembered when she taught school in Chicago thirty-three years ago that in September she used to have all the left-overs who did not pass the examinations—about fifty-five to sixty pupils. There were no two alike. The trouble is that there are so many children in school who have handicaps, and the teacher tries to teach all children in a class alike. The consequence is that some of them fail. There was not a feeble-minded one in the lot. All the speaker had to do was to use sense enough to find out what each child lacked, and treat them individually. Much depends on the teacher.

Dr. Edward H. Ochsner said that, as always, the essayist had given us a

great deal of food for thought. One or two of the points brought out he wished to refer to. First, that history does repeat itself. When the speaker first began to practice medicine, there were certain members of the profession who felt that they could diagnose almost everything with the microscope. It took a long time for the laboratory worker to discover that he too could make mistakes, and it is refreshing indeed that in the very infancy of this new science a man like Dr. Healy will come before us and tell us that feeble-mindedness must be judged from every possible point of view; that the laboratory alone is going to leave the investigator in the lurch many times. The one thing that neurologists and psychologists need to learn just at present more than any one other thing is, that feeble-mindedness is a big subject which cannot be measured by one single foot rule. These cases must be investigated from every possible angle.

The second point to which he wished to refer was the fact that it was extremely pleasing to those who worked so hard to get the bill for the commitment of feeble-minded persons enacted into law to have a man of Dr. Healy's ability, experience and standing in the community to come before the Society and say that the law, which became effective on the first of July, is a commonsense, workable measure. If it is a sane and reasonable and workable law, you have such men as Dr. Healy and such women as Dr. Towne and many other good citizens of the state of Illinois to thank for it. One of the reasons why it is a good law is because every person in the state of Illinois who was supposed to know something about feeble-mindedness was requested to assist in the drafting of the law. If we could get all kinds of people to interest themselves in every important measure which comes before the legislature, this state and this nation would be a very much better place to live in. If we could get lawyers, and doctors, and psychologists, and sociologists, and judges, and farmers, and laborers, and mechanics, to get together and discuss and draft a law on the questions of labor and capital, the problem could be reasonably solved within five years. And so on with all of the important problems that have so much to do with the welfare and happiness of the people of this country.

Dr. Healy, in closing the discussion, said he was much interested in Mr. Kohl's remarks, also in what he has come to do for us in this community, in his work at the House of Correction. It is to be hoped that he will be able to answer some of the problems which have been suggested in the speaker's paper. By follow-up work he may be able to tell us something of how far we are going to be able to rely on tests for telling, by an examination in adult life, how the individual ranked mentally during childhood. At present that is not at all certain. Dr. Healy stated that he was very familiar with the work done at Vineland in gauging of individuals by the Binet tests. However, it must be remembered that there they are working with institutional cases, cases which have been already sent to them with a diagnosis made, cases which are obvious, not with the peculiar and difficult types so frequently seen outside institutions. Also, a word should be spoken concerning the use of these tests as applied down there to adults. No doubt the Binet tests do grade their cases very satisfactorily, but can the same be said of adults on the outside, where the social opportunities and world-experience have been so completely different?

Concerning the Pethrick case, the speaker felt there was a great deal to it when the social investigations which had been made were turned into his hands; facts gathered by people who were not biased on either side.

Dr. Schmitt brought up the question of language and the point that we should not undervalue it as a medium of thought. Of course, we should not. We may remember the famous controversy between the Duke of Argyll and Max Mueller concerning whether thoughts came before words in the history

of the world or in the development of the individual. It is an important point to note that language does play a vital part in our thought processes. An estimation of an individual's mentality is never complete without taking this into account. And yet, as the speaker had endeavored to point out, there were many other tests that were of value for deciding whether or not a person was of normal mentality.

Just such a point comes out in regard to the "Yerkes Ideational Test" exhibited this evening. The early users of this test, as well as the speaker and Dr. Bronner, have found that there are types of individuals, both in the normal and feeble-minded classes, who can do this test satisfactorily; that is, who can get the idea, the scheme of it, in their head so that they can solve the problem over and over, and yet who cannot frame the idea or scheme in language that serves as an adequate guide to the solution.

NOVEMBER 18, 1915

The President, DR. J. C. GILL, in the Chair

AN EXPERIMENTAL STUDY OF SUGGESTIBILITY IN CHILDREN

By Clara Harrison Town, M.D.

Dr. Town said that the term suggestibility as used in this study signifies a mental influence which caused the person influenced to think and to act without the evidence of his own will.

After a brief summary of previous experimental studies of suggestion in the waking state, a report was made of a recent study. A group of five suggestion tests, all devised by Binet, were used with a group of forty twelve-year-old boys and a group of thirty fifteen-year-old boys. The aim of the study was primarily to determine whether there is a marked difference in the degree of suggestibility at these two ages, and, further, to determine whether suggestibility in one test indicates suggestibility of like degree in other tests. The average suggestibility, with the A.D., S.D. and P.E., the coefficient of variability and the P.E._M were calculated for each group for each test. All averages not justified by P.E. and P.E._M were omitted from final analysis. The probable error of the difference of averages for the two age groups for each test was also calculated, and unless it justified the differences they were not recognized.

The averages of three of the five tests are worthy of consideration, those of the other two tests are invalidated by the size of their probable errors. The importance of the probable error is shown by the fact that age differences in achievement might have been inferred from these averages had they been considered without reference to their probable errors. Such inference would be unjustified.

Only one test showed a reliable age difference. This was Test 4, which depended entirely upon the arrangement of test material for its suggestion.

The correlations between the results of Tests 1, 4 and 5 for the twelve-year and for the fifteen-year group were worked out by the "Product-Moments" Method of Pearson. There was a correlation between Tests 4 and 5 for both age groups. This was the only correlation found. It is significant that both of these tests were based upon judgments of visual stimuli, though the suggestion was in one case purely personal and in the other was given by a suggestive arrangement of material. There was no correlation between the results of the tests, one of which was based on a judgment of weight and the other on a judgment of visual stimuli, although the suggestion in both cases was given by a suggestive arrangement of material.

Dr. Moyer said that his thought was a possible differentiation of those adult disorders of the nervous system's psychological mechanism, in which it is believed that suggestibility is a prominent factor. Could these tests be used in such abnormal cases? He asked if any studies had been made on abnormal people, and he thought it certainly would be better to have a test than a man's individual judgment about it.

Dr. Town replied that that is why Binet devised these tests. He tried to devise tests that would be applicable to just such cases as Dr. Moyer considered. She was not sure whether such tests had been made or not on abnormal people; she had seen no published reports.

Dr. Harold N. Moyer asked whether the system described by Dr. Town could be used in adults also; whether suggestibility seems to be greater in the child than in the adult; and whether the system would be of any value in studying the psychology of adults in relation to suggestibility, such as we understand it in a medical way. Could tests be devised that would be simple for clinical application?

Dr. Town replied that most of the tests previously made on suggestibility have been made on adult subjects, and that suggestibility seems to be greater in the child. The tests she had described were very simple. It only takes fifteen minutes to put a boy through all five. She could not say just how serviceable the tests would be, if applied as Dr. Moyer suggested, but thought they might be decidedly so. She is going to try a group of adults and compare them with the children later. It may turn out that adults are just as susceptible.

Dr. Meyer Solomon asked whether the visual images that take place would have anything to do with it. One might be susceptible without having an imagery. He said that in these tests, as in all tests, if the persons were not interested, you could not depend upon the reaction, whereas a thing that made an appeal to the subject might show that he was not susceptible at all. If it were a playful game, to a certain extent, it might not show the capability of the child at all.

Dr. Town said the judged differences between lines of the same length are so very, very slight that the visual images are not probable. The boys tested are generally interested. The judgment tests do appeal to them. Theoretically, what Dr. Solomon had said about a playful game might be so, but she did not have any indications of that in her work.

Dr. Clara Schmitt said that children are very anxious to adjust themselves to the situation.

THE HISTORY OF A FEEBLEMINDED FAMILY

By Josephine E. Young, M.D.

Inherited deformities of a mother and two children were shown in this family, namely, atypical tower skull, pupillary distance of 95 mm., with divergent strabismus and moderate degree of optic nerve atrophy, very high shoulder girdle, positive Wassermann tests, and mental defects.

Other cases of inherited single deformity, such as polydactylism, congenital absence of patella, deformities of hands, and of inherited multiple deformities, such as dyostosis cleido craniatis and dystrophic periostalis hyperplastica, all mentally normal, are cited. Two distinct types of multiple deformity, Mongolism and acrocephalic syndaktylium, always occurring sporadically with mental defect are also cited.

The etiology of abnormalities is discussed with special regard to latent foci and disturbance of internal glandular secretion, the latter more particu-

larly in relation to cretinism and hymus idiocy. All types and groups of abnormalities considered theoretically in the light of De Vries's mutation of species in plants.

Dr. Harold N. Moyer asked Dr. Young if she had found any description in the literature of that race of idiots called Shah Dabla's mice. The original article was published by an Indian surgeon in the Calcutta Medical Gazette. The speaker wrote to him and in reply received a copy of the paper, which he still has, and some original photographs of these idiots. They are a peculiar race. Their name is suggested by the shape of the head—resembling that of a mouse. They are a localized race of idiots, connected with the shrine. They are feeble-minded and seem from generation to generation to have bred true. They are protected by the priests of this shrine, and I suppose arrangements are made to continue the breed indefinitely. They do the begging for the shrine.

Dr. Young, in closing the discussion, said that as in all the literature only 22 cases of acrocephalic syndactylism had been found, and these had only recently been collected, it was possible that there might be other cases similar to those reported which diligent search would reveal.

COÖPERATION OF PSYCHOLOGIST AND PHYSICIAN

By Clara Schmitt, Ph.D.

The physician can be of help to many types of patients who seek his advice only in so far as he is a psychologist. The practical psychologist can be of great use in determining mental capacities and educational régime for the problem children who seek the advice of the physician. The following case illustrates the kind of coöperation possible. It was worked out between the author and the late Dr. D'Orsay Hecht.

Bertha N., nine years of age, became the victim of an obsession two days before the calling of the physician. The obsessive act consisted of the insertion of the finger into the throat, causing suffocation and brutality to the throat. Physically the child was frail in appearance; the gait was spastic-ataxic, that of a diplegia; choreatic movements of both hands; a cerebral diplegia, a generalized rigidity but more in the legs; vasomotor system a little but not much impaired; sensory system normal; superficial reflexes exaggerated; a Babinski reaction on the right, uncertain left; slight drooping of upper eyelid; reaction to light and accommodation somewhat sluggish; tongue tremor of choreiform character and slight speech defect. The advice given was that the child be observed for masturbatory practices; a mental examination to determine ability and educational possibilities; and a system of training and control.

The mental examination showed the child normal in mental ability. The examination also discovered a motor control so poor that the child was thereby unable to carry out many of the promptings of a very active mind. There was great emotional instability. Careful observation did not confirm the suspicion of masturbatory practices. The explanation arrived at for the obsessive act was that the child was constrained to it by reason of having been pushed out of her customary place in the family life which was organized about her interests and needs, by a throat operation upon her younger sister.

The patient was accepted at a private school and given some special attention. She improved rapidly in motor control, in emotional control and made normal progress in scholarship. The tremor of the fingers is still serious enough to interfere with writing. This impedes her work somewhat.

This patient was saved to a life of usefulness and happiness by a fortu-

nate diagnosis and proper educational care. One adviser had diagnosed her as mentally defective and recommended an institution for feeble-minded children. Another advised that she be not permitted to attend school but live a simple life in the country. The latter recommendation did not recognize the fact that she had a very active and capable mind, much hampered by the poor motor possibilities.

Dr. Schmitt said that the school to which the little girl had been sent was the Francis Parker School on the North Side. It is not designed for educating such cases. They have only a few children in each room.

Dr. Harold N. Meyer thought the analysis of the case by Dr. Schmitt was very interesting. At present our child study is not very broad. As commonly carried out, it consists in the application of Binet test and removal of adenoids. This was the first report in which the motor deficiency in the hands was the predominating defect in the education of a child in a normal way, and yet, after all, it is only what we see every day and all about us. The ability to use the hands for fine coordinated movements varies enormously.

Dr. Meyer Solomon thought the paper of Dr. Schmitt was very interesting. He thought that perhaps the family conditions might have been responsible, to a great extent, for the type of reaction displayed by the child. In view of the fact that the child was defective in the motor sphere, perhaps the mother was responsible by loving her too much, in this way bringing on this egotistical projection of herself into situations in which she demanded attention. There was no doubt in the speaker's mind that if the child had been permitted to remain at home, eventually she would have been unfit to hold her proper place in the world, and it is really due to Dr. Schmitt and Dr. Hecht that the child will be able to successfully fight her battle in life.

The whole problem opened up by the paper is one which ought to be forced home upon the profession more and more. The fact that from now on, at any rate, we are not going to look after the physical aspects only, but that the mental are coming more and more into the field of neurology, the speaker thought was encouraging, since we know that the functional neuroses and psychoneurotic states are far more frequent than the organic, and the outlook for these patients is far better. It brings us a great deal of hope for the future treatment and outcome in these conditions.

Dr. James C. Gill asked if he understood the essayist correctly, namely, that the limbs were spastic and a Babinski present.

Dr. Schmitt said that Dr. Gill had understood her correctly. It was hoped that the child would learn to control her hands sufficiently for writing, but she has now been in school for three years, and thus far has not gained sufficient control. Her writing is so poor that it interferes with her school work to some extent.

Just another incident in regard to the motor control in this little girl. Her writing was so poor that Dr. Schmitt recommended that they get a typewriter for her, and that maybe she could learn to use that. She is able to hammer out a few times on the piano. So it is hoped that the typewriter will help her in her school work.

Dr. Gill asked if there was a double Babinski in this case, to which Dr. Schmitt replied that it was positive on the left side.

Translations

VEGETATIVE NEUROLOGY. THE ANATOMY, PHYSIOLOGY, PHARMODYNAMICS AND PATHOLOGY OF THE SYMPATHETIC AND AUTONOMIC SYSTEMS¹

BY HEINRICH HIGIER

WARSAW

Authorized Translation by Walter Max Kraus, A.M., M.D.
[New York].

(Continued from page 80)

The ganglion system described in the section on comparative anatomy is most conspicuously seen in the thoracic and upper lumbar regions where the segmental structure of lower animals is preserved more than in any other place. Thus, the twelve thoracic vertebrae have twelve corresponding ganglia.

In the cervical and lumbar regions, where the embryonic arrangement is lost, the ganglia fuse, a fact which may be seen by their mulberry-like form.

Thus it is found that in the neck there are fused growths of ganglia, superior, middle and inferior ganglia, while in the lumbar region several of the ganglia are incomplete and insignificant-looking.

So much for the sympathetic cord, its vertebral ganglia, and their relation to the spinal ganglia of the spinal cord.

In regard to the branches, the following is the usual classification:
I. Arterial branches or vascular plexi.

(a) Cranial or carotid plexus. This begins at the upper cervical ganglion, and passes cranialwards, surrounding the carotid arteries. It supplies the cranial cavity with sympathetic fibers.

(b) Thoracico-aortic plexus. This supplies the heart, aorta, lungs and esophagus.

(c) Aortico-abdominal plexus. This encircles the three large unpaired branches and supplies the abdominal viscera and the mesentery with fibers.

¹Vegetative oder Viscerale Neurologie, Ergebnisse der Neurologie und Psychiatrie. Vol. II, No. I. Verlag von Gustav Fischer, Jena.

Other smaller plexi are the laryngeal, thyroid, cardiac, pulmonary, esophageal, celiac, mesenteric, renal, spermatic, hypogastric, uterine, vesical and cavernous.

II. Peripheral branches connect with the important cardiac branches of the abdominal cavity. The cardiac branches are given off from the third cervical ganglion and from the cardiac plexus. The splanchnic branches are given off from the lower six thoracic ganglia and go from the thoracic to the abdominal cavity, where they supply the gastro-intestinal tract and its appendages.

III. Communicating branches connect the sympathetic ganglia with the anterior spinal roots. This makes an important connecting path between the sympathetic and central nervous systems.

In the make up of the sympathetic, the third part of the central nervous system, there are to be found other large structures of obscure nature, as paraganglia, chromaffinic glandular structures and the prevertebral celiac, cardiac and stellate ganglia. Of these more will be said below.

What has been said thus far includes the main points of import in the gross anatomy of the human sympathetic system.

It now becomes a question of accounting for the close relations of the sympathetic to vascular and spinal structures. What is the significance of the sympathetic cord? Is it a special single nerve, or a conglomeration of various nerves? What purpose do the sympathetic plexi, and the large thoracic and abdominal ganglia lying next the vertebral ganglia serve? What is the relation of the rami communicantes to the sympathetic cord on the one hand, and to the spinal cord on the other? These are the main questions which we wish to try to answer on pure anatomical bases.

The dorsal spinal cord, and the near-by sympathetic will serve as a paradigm for the explanation of these important questions. These sections have retained more than any others the metameric type, as revealed by comparative anatomical and embryological studies. They offer opportunities to study the characteristics of the vegetative system from a morphological point of view, thus leaving out the necessity of using the evidence to be gained by delicate biogeochemical reagents. These latter reactions will be considered later. The metameric type of structure is entirely lacking in the cranial part of the vegetative, while in the cervical and sacral parts it is, as has been said before, but poorly developed.

In long past epochs, as phylogeny teaches, the "urhirn" alone played the rôle of ruling functions controlled by the nervous system. Each segment of the nervous system probably had its own separate

spinal and sympathetic nerves, each metamere was autonomous, and had little to do with its neighbors. The somatic regions of a segment included the ganglion cells of the spinal cord which subserved the function of transmitting the impulses to and from voluntary muscles, and of receiving impulses from the overlying skin. The vegetative regions supplied the automatically acting involuntary muscles with motor nerves, and the organs of its own segment with sensory nerves. Visceral receptor nerves are found not only in mucous membranes, which are normally considered sensitive to stimuli, but also in all the tissues and organs, as the liver, lungs, blood vessels and kidneys. The receptors for this part of visceral innervation probably pass in the paths from the spinal ganglion cells, and go thence to the central system via spinal ganglia.

The central origin in the spinal cord of the vegetative tracts is most probably in Clarke's columns, and in the lateral segments of the gray matter (the lateral horn of the spinal cord). From there, the nerve fibers pass out via the anterior roots as thin, white and medullated, centrifugal fiber bundles (*ramus communicans albus s. efferens*). They pass to the vertebral ganglia (see Fig. 1).

The fibers are always interrupted in a ganglion, the so-called "synapse." They then leave the ganglion cells as another gray, motor, unmedullated fiber bundle (*ramus communicans griseus s. afferens*). They are centrifugal, but never centripetal. These go uninterrupted to the peripheral vegetative end organ, be it the pupil, heart, lung, stomach, sweat glands, hair muscle or vascular muscle.

The white rami branch off in the ganglia of the sympathetic cord in such a way as to yield three to five branches which entwine themselves about a corresponding number of ganglia (Langley, Onodi). Every ganglion cell of the sympathetic cord has but one axis cylinder. This, as a gray fiber, proceeds to the periphery (Van Gehuchten).

The communicating tracts there are divided in their course into a white and gray branch, or more generally speaking, into a pre- and post-ganglionic part. As a rule the white rami go from the spinal cord to the sympathetic cord, and the gray rami go from the sympathetic cord to the viscera, or via the spinal nerves of the end organs at the periphery.

In a cross-section of a metamere, the following is found:

1. The spinal anterior horn with its motor root for the innervation of voluntary muscle.
2. The spinal posterior sensory horn and the neighboring trophico-sensory spinal ganglion for the reception of internal and external, interoceptive and exteroceptive stimuli.

2. The vegetative spinal lateral horn with a ramus communicans albus, a sympathetic ganglion and a ramus communicans griseus. These are intended for glandular and hollow muscular internal organs (visceral fibers), and for the end organs of the skin (pilo-motor, secretory and vasomotor fibers).

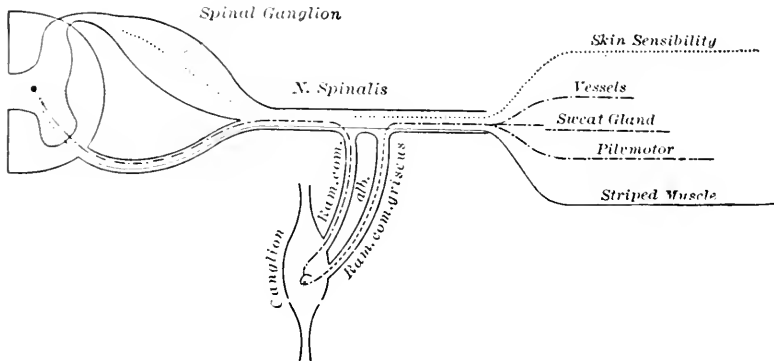


FIG. 1

Stimulation of the sympathetic nerves is usually not perceived in consciousness (normal failure of sensations from vegetative end organs) but it increases the tone and activates the nerves innervating smooth muscle.

An attempt will now be made to identify the three metameric divisions in other regions, including the vegetative system where the regular metameric structure is found in modified form, or is entirely lost. The following, partly developmental, partly anatomic considerations, show that the original structure is lost and that many new structures have appeared.

(a) The unequal distribution and inconstant position of the vertebral ganglia or synapses in which the interruption of the sympathetic fibers takes place, causing the spino-peripheral sympathetic fibers to be divided into two parts.

(b) The inconstancy of the rami communicantes in contrast to the regularity and constancy of the intervertebral ganglia.

(c) The unequal distribution of the important sympathetic centers in the cerebrospinal gray matter.

(d) The incongruity between embryonic metameres and later cranial and spinal segments.

These four questions will be briefly considered theoretically and practically. (For pictorial representations see Fig. 1 and Table I.)

I. *The Unequal Distribution and Inconstant Position of the So-called Synapses.*—Every communicating branch, after leaving the spinal cord, is interrupted in a ganglion cell of the sympathetic, and thus forms two neurones, in contrast to the single neurone of the somatic nervous system. But all medullated sympathetic fibers are not interrupted in the sympathetic cord. Many fibers go through the ganglia undisturbed to proceed upward and downward to the next ganglion where the medullary sheath is lost and the fiber is interrupted, becoming post-ganglionic. In this way, even the sympathetic cord becomes a path for white sympathetic fibers.

The sympathetic nerve or ganglia, the N. internodius, which joins the vertebral sympathetic, has like these latter a connective tissue sheath of Schwann. A cross section of this nerve is not like that of an ordinary nerve but contains both sheathed and unsheathed fibers as well as ganglion cells. Therefore the N. internodius is not a nerve in the ordinary sense, but a much extended ganglion, with white rami communicantes included. This applies both to the cervical and abdominal sympathetic cord (N. splanchnicus), both of which represent a union of many white rami communicantes into large nerve bundles. The sympathetic cord is, therefore, a morphological but not a functional entity.

Many fibers destined to supply the viscera, after taking the above described course in the sympathetic cord, proceed to groups of ganglion cells in the body activities. Examples of such fibers are those to the heart and uterus. An example of the ganglion cell groups is the celiac plexus with its semilunar ganglion. Ganglia of this type have been designated prevertebral ganglia by Langley and may be differentiated from the above described vertebral ganglia by the fact that they only supply viscera and that their post-cellular fibers never connect with spinal nerves.

The sympathetic plexus, of later phylogenetic origin, may be regarded as conglomerations of pre- and post-cellular fibers. From this point of view we must regard the carotid plexus which accompanies the carotid artery to the cranial cavity as a conglomeration of fine post-cellular fibers which proceed cranialward from the cervical sympathetic. Prevertebral ganglia are to be differentiated from the vertebral ganglia only by their position. They receive pre-ganglionic medullated fibers, and give rise to post-ganglionic gray fibers, just as do the vertebral ganglia. Many ganglia, as the superior cervical ganglia which supply both viscera and skin glands, are to be regarded as a combined type of vertebral and prevertebral ganglia.

But it must be added that all fibers do not end in the prevertebral ganglia. Many go distalward, uninterrupted, to reach the immediate vicinity of their end-organs and are there interrupted, the white fibers becoming the gray. These ganglia are called peripheral or terminal ganglia. They exist in connection with such organs as the heart, intestines and salivary glands. Many fibers even pass through three ganglia on their way to their end organs. Thus, for example, the white dilator fibers of the pupil arise in Budge's cilio-spinal center, proceed as white rami communicantes through the stellate ganglion and enter the superior cervical ganglion. Here they are interrupted and become gray rami communicantes, going to the pupil.

Since the ganglionic interruptions, the synapses, do not occur at typical localities, but are found not only in the sympathetic cord, but also in prevertebral and peripheral ganglia, it has become the custom to follow the classification of Langley in regard to the topography of these structures. He divides the ganglia into three orders, vertebral, prevertebral and peripheral.

II. *Inconstancy of the Rami Communicantes.*—In man, not every spinal segment gives rise to a communicating branch. Thus, for example, the cervical part of the spinal cord, corresponding to eight metameres, gives rise to none or only isolated white rami and to but three cervical ganglia, the superior, middle and inferior. The superior ganglion receives its precellular, partly longitudinal, intra-spinal fibers from the upper dorsal segments. Many other sympathetic ganglia as well receive fibers from several (5-6) lower segments (Langley). On the other hand, the sacral sympathetic gets its white rami not only from the mid dorsal and lumbar roots, but also from higher segments (Gaskell). In man, no white rami are given off below the third lumbar nerves. Hence, as may be seen on Table I, the cervical and sacral sympathetic are to be regarded as undoubted collected white rami communicantes.

On the other hand, according to Gaskell, the post-cellular gray rami springing from the ganglia join the nearest spinal nerves. These carry fibers for the most part to blood vessels, glands and muscles of the skin. This occurs even in the sacral and cervical sympathetic portions of the sympathetic, though they do not have white rami from their corresponding spinal cord segments.

III. *Unequal Distribution of the Vegetative Centers in the Gray Cerebrospinal Axis.*—The vegetative-automatic centers are not equally distributed in the posterior segments of the gray matter of the region from the mid-brain to the sacral part of the spinal cord.

They lie compactly in various regions from which the customary topographical designations are derived. These centers of origin are mesencephalic, bulbar, dorso-lumbar (from the seventh cervical to the third lumbar segment) and the sacral (from the second to the fourth sacral segment). This is not meant to give the impression that the remaining parts of the cerebro-spinal axis do not contain centers for automatically acting organs, but that they are probably there, either rudimentary in man or occupying but very little space (Table I).

IV. *Incongruity of the Embryonic Metameres with the Later Cranial and Spinal Segments.*—Every ganglionic segment supplies nerve fibers to that part of the body which represents its ontogenetic and embryonic metamere, not to that part which corresponds to it in life (post-fetal stage). This is the cause of the enormous shifting and apparent variations from the fundamental type.

But a few examples of this will be given, examples which in discussing the sensibility of the sympathetic system will be found to be of very great practical importance.

For example, the testicle descends from the renal region into the scrotum, which leads to the apparently incongruous fact that the scrotum and the testicle, which seem to be derived from the same body segments, are supplied one from the lower sacral nerves, the other from the upper lumbar nerves. This accounts for testicular pain in nephrolithiasis and for increased irritability of the external genitals and maintained irritability of the testicle in conus and caudal lesions.

The phrenic nerve arises from the spinal cord in common with the fourth cervical nerve. It supplies, among other things, the diaphragm and the liver, thus accounting for pains in the arm in cholelithiasis and diaphragmatic pleurisy.

Following the development of the upper extremities which are placed between the second and third ribs, we find that the second rib is supplied by the four lower cervical nerves, while the third is supplied by two thoracic nerves (this accounts for pain in the upper arm in stenocardia).

The urinary bladder is supplied by the upper lumbar nerves in that part which is developed from the allantois, while its lower part, developed from the cloaca, is supplied by the middle sacral nerves.

In considering organs which are vegetative in function par excellence, the vagus takes a prominent place, since this nerve arising in the medulla, that is a cranial nerve, supplies all of the thoracic and most of the abdominal viscera. This happens because the nerve in

the lower animals from which man has developed extended far caudalward, and because these organs, though far distant from the origin of the nerve, lay closer to the head in these animals. This applies particularly to the heart, lungs and stomach. As a matter of fact, the apparently irregular location of the three vagal nuclei in the medulla is in reality quite like that of the corresponding motor sensory and vegetative centers in the cord, when it is recalled that the nucleus ambiguus is motor, the nucleus solitarius, sensory, and the dorsalis, visceral, and that the medulla is but a continuation of the spinal cord with this difference, that the central canal is widened into the fourth ventricle and the posterior columns and posterior horns are pushed lateralwards.

As is well known, the somato-motor vagus nucleus supplies the voluntary muscles of the pharynx and larynx, the somato-sensory nucleus the meninges, and the mucous membranes of the external auditory canal, the larynx and bronchi, the visceral nucleus, the heart, lungs, stomach, liver, pancreas and upper parts of the intestines.

What we find of practical value from the morphology of the vegetative system, when we consider the descensus splanchnicus (developmental progress caudalward of organs) as an example, is that the rami communicantes of the visceral vagal nucleus, from which arise the autonomic fibers for the intestine, after passing through the synapse of the jugular ganglion near the base of the skull (corresponding to a sympathetic vertebral ganglion), travel from one half to one third the length of the body to reach the peripheral ganglion cells in its end organs.

After this rather lengthy departure from the main plan of this chapter, we shall now return to the subject in hand and give a brief recapitulation of the anatomic relations of the most important ganglia of the body.

The uppermost ganglion of the sympathetic cord, the superior cervical ganglion or first sympathetic ganglion, receives its pre-cellular fibers from the last cervical segment (C 8) and the upper dorsal segments (D 1-3). These supply the skin glands, blood vessels and pilomotor muscles of the head as well as the dilator pupillae muscle and Muller's flat orbital muscle.

The inferior cervical ganglion and the stellate or first thoracic ganglion supply accelerator nerves to the heart and most probably vaso-constrictor fibers to the pulmonary vessels. The preganglionic fibers arise from D 1-5.

The largest ganglion of the abdominal cavity, the celiac, gives off

the most important branches in the celiac plexus, the major and minor splanchnic nerves. The first is made up of fibers from the fourth to the ninth dorsal ganglion, the latter from the tenth to the twelfth ganglia. They all leave the thoracic cavity by an aperture in the diaphragm and go to the celiac ganglion as precellular fibers. From there, they go as the mesenteric nerves to supply the stomach glands, liver, pancreas, spleen, kidneys, adrenals, and intestines (as far as the descending colon).

The inferior mesenteric ganglion receives precellular fibers from the upper lumbar cord (L 1-3) and sends its unsheathed post-ganglionic fibers to the colon and via the hypogastric nerves to the anus, bladder, vesical sphincter and genitals.

Furthermore mention must be made of the fact that the middle part of the dorso-lumbar sympathetic cord sends fibers to end organs in the skin, the blood vessels of skeletal muscles and of all the viscera between the mouth and rectum.

(To be continued)

Periscope

Monatsschrift für Psychiatrie und Neurologie

(Vol. 34, No. 4)

1. The Feeling of "Strangeness." A. KUTZINSKI.
2. Contribution to Heterotopia of the Gray Substance in the Brain. S. OSEKI.
3. Concerning the Explanation of Suggestive Symptoms. BUNNEMANN.
4. Cystic Tumor of the Brain with Symptoms of Hydrocephalus Internus.
FR. A. MEYER.

1. *Feeling of "Strangeness."*—The theories of this condition which have been advanced by Wernicke, Juliusberger, Goldstein and others are shown to be fallacious. It is due to a loss of a part or all of the physical or body ego. We have gradually come to automatically adjust our body complex in our consciousness so that we are not usually aware of it. As a result of a disturbance of the relationship a part of the body complex may become altered and strange. At first the patient says, for example, "I feel as though my brain were dead," but as the condition becomes more aggravated an actual delusion is formed and the patient says, "My brain is dead." A number of case abstracts are given.

2. *Heterotopias.*—Three cases of heterotopia of the gray matter beneath the ependyma of the lateral ventricles are described. In two of these were well-developed ganglion and pyramidal cells. Heterotopic gray matter is found most often in brains of cases of mental disorder, especially hydrocephalus, epilepsy and idiocy. They are formed at about the sixth month of fetal life while the arrangement of the gray and white matter is in progress.

3. *Suggestion Reactions.*—The author assumes that a great deal of confusion exists as to what constitutes suggestion. When a hypnotized person is told that a piece of paper laid on his hand is red hot iron and the skin shows a burn beneath, this is called suggestion. But what, asks the author, is suggestion? By a series of deductions and a comparison with primitive principles he shows that the only way to understand such phenomena is to conceive of a sensory stimulus, a sensory "appraisal" of the stimulus and a sensory reaction.

4. *Cystic Brain Tumor.*—Following a severe fall upon the buttocks a boy of thirteen years developed symptoms which pointed strongly to a left-sided internal hydrocephalus. Death occurred after two years. Section showed an infundibular tumor of ectodermal origin with large cysts in both frontal lobes. The case is thoroughly described clinically and anatomically, but is admittedly such a rarity that little of diagnostic value can be derived from it.

(Vol. 34, No. 5)

1. The Function of the Middle Lobe of the Cerebellum. M. ROTHMANN.
2. Psychiatry and Child-teaching, with Special Reference to the Question of the Psychopathic Child. E. STIER.
3. Schizophrenic Symptoms, Muscular Excitability and Mucosal Reflexes in a Case of Neurosis from Lightning Stroke.—The Determination of Indemnity in Such Cases. K. DEGENKOLB.

4. The Disease of the Sisters Weilemann. M. CHRISTINGER.
5. Tumor of the Base which Became Regressive after Palliative Trepanation. E. RÖPER.

1. *Cerebellum*.—Experiments upon dogs show that destruction of the anterior lobe of the cerebellum without going into the nuclei causes astasia of the head with a tendency for it to be drawn backward. Later a weakness of the cheeks and tongue with a peculiar ataxia of the lips and inability to bark. The extremities also show ataxia, especially the shoulder region. Deeper partial extirpation shows that the innervation of the tongue and larynx is in the cortex of the ventral portion near the fourth ventricle. Extirpation of the lobus medianus posterior produces ataxia of the extremities and head and weakness of the rump muscles. If only the very anterior portion is affected a head tremor results. Total destruction of the middle portion of the cerebellum causes at first total loss of locomotion which later partially disappears, but leaves weakness and ataxia of head and limbs. In man the middle lobe of the cerebellum is prominently developed on account of his erect posture.

2. *Psychiatry and Education*.—The advances in the study of feeble-mindedness and allied conditions have been so rapid that, in spite of the splendid work of Kraepelin, of Ziehen and others, we find ourselves without a satisfactory classification of psychopathic children. As a primary division the author recognizes: (1) weakminded children, (2) psychopathic children and (3) children both weakminded and psychopathic. As psychopathic he classes those who show abnormalities in the philogenetically older life-elements—instinct and affect. The weakminded are such as show gross intellectual defect. The psychopathic are divided into two groups for which he suggests the words "hyponitent" and "hypernitent." The former show reduction in intensity of the instincts and emotions—they are usually of a neuropathic type. They are weak in all their fundamental physiological processes, they lack initiative, are subject to anxiety and feeling of uncertainty. The hypernitent have exaggerated instincts and emotions and frequent perversions. They usually require constant institutional supervision. A few suggestions as to treatment and prognosis are given, but the main object of the paper is a discussion of the relationship of psychiatry to the problem of the care of the defective children and to encourage coöperation of those working in the two fields.

3. *Lightning Neurosis*.—A case is described of a man fifty years of age who received a shock when a building two hundred yards away was struck by lightning. The symptoms which followed were somewhat similar to those of schizophrenia and there were also certain neurological symptoms, the most important of which were altered electrical reaction in a number of the muscles and loss of the palate and pharyngeal reflexes in the mouth. A large part of the article deals with the aspect of the case from the standpoint of degree of disability and amount of insurance recoverable. The question of the mechanism of electric shock from a relatively remote lightning stroke is also discussed.

4. *The Weilemann Sisters*.—An interesting observation of three sisters whose disease followed an almost identical course. Epileptic attacks began in early life and deep dementia supervened. The neurological picture approached most closely to Marie's hereditary ataxia but showed some distinguishing features. The main symptoms were epileptic attacks, secondary dementia, cerebellar ataxia, choreo-athetosis, hypotonia, infantilism. All three cases came to autopsy and showed atrophy of the cerebellum and cerebrum. Microscopically there was a superficial gliosis of the brain cortex—no disorder of the cerebellum.

5. *Brain Tumor*.—A man of forty-four years presented a typical picture

of brain tumor which had existed already two years. In 1898 a trephine operation did not disclose the tumor, but brain puncture obtained a large quantity of fluid. A year after the operation very pronounced mental and physical symptoms still existed. He showed right-sided weakness, hemianopia and almost complete blindness. Memory and intelligence were much reduced, there were well-marked aphasia and alexia. Twelve years later he came to the clinic in a greatly improved state. Hemianopia still existed and there was slight ataxia of the right side, but otherwise little of importance. Mentally he had regained almost his normal state. Symptoms of gastric carcinoma were present at this time and an operation found the condition hopeless. He died soon afterward. A large cystic defect in the left globus pallidus indicated the location of the tumor which had existed.

(Vol. 34, No. 6)

1. Motor Aphasia and Apraxia. H. LIEPMANN.
2. The Treatment of Brain Tumors and Indications for Operation. L. BRUNS.
3. The Infection and Auto-intoxication Psychoses. K. BONHOEFFER.
4. Constitutional Waking Dreams—a Contribution to the Pathology of the Consciousness of Personality. K. HEILBRONNER.
5. Our Knowledge of Allo-esthesia. DUSSER DE BARENNE.
6. Disorders of Grammatic Speech in Brain Disease. K. GOLDSTEIN.
7. Abducens Paralysis of Reflex and Otitic Origin. W. STERLING.

1. *Aphasia and Apraxia.*—A brief but comprehensive exposition of the author's theories of apraxia given in his usual clear and readable style. There is nothing in the article which has not already been published, but he lays further stress upon the apractic nature of motor aphasia.

2. *Brain Tumor.*—The indications for operation are given and the relative operability of the different forms of tumor and of different localities is discussed. Our better surgical technique and the great strides that have been made in cerebral localization have widened the possibilities of operative relief. A few years ago a tumor of the cerebellum was considered inoperable—now operations on cerebellar tumors almost outnumber those on the brain. A more or less complete cure results in about ten per cent. of cases operated upon. When, however, one considers that only about thirty per cent. of cases of brain tumor are operable, the percentage of surgical cures to the total number of brain tumors is only three or four. The palliative trepanation for relief of pressure seldom cures or arrests the tumor, but often ameliorates the distressing symptoms and prevents the occurrence of blindness.

3. *Infection Psychoses.*—Regarding the infection psychoses the author asks and answers four questions. There are no specific psychoses for different diseases. The attempt to draw an analogy with toxic psychoses, which vary with different toxic agents, has failed. There is no ground for saying that any psychosis may be caused by infectious disease. When such conclusions have been drawn it has been because too much importance has been laid upon the often accidental occurrence of an infectious disease before the outbreak of the psychosis. Infection psychoses cannot be divided according to the course of the infectious disease into initial delirium, infection delirium, collapse delirium and exhaustion psychosis. The disease-picture in any of these periods may be identical with that in others. The whole group of infection psychoses presents no symptoms or groups of symptoms which are not found in other psychoses of exogenous origin, especially toxic, but also traumatic and circulatory. Even if we speak of psychoses of endogenous origin the only clinical picture which is never found in the endogenous psychoses is that of the Korsakoff amnesic syndrome or of a true delirium.

4. *Waking Dreams*.—A case is described of a young man who was subject to waking fantasies almost constantly. He fancied himself in all sorts of situations—saw himself dead and lying in a grave. These dreams were very vivid and occupied most of his time. He was a healthy individual and there were no other evidences of mental defect. The most conspicuous feature of the condition was the marked lability of the personal consciousness, which Bonhoeffer has grouped among the degenerative disorders. A comparison of the condition with that of hallucinatory states and deliria is gone into and the medico-legal aspects touched upon. There is no doubt that such patients should be treated as mentally ill and receive at least a certain amount of supervision. There is also some hope of much improvement with proper treatment and education.

5. *Alloesthesia*.—Alloesthesia is a condition in which a touch or pain stimulus to one side of the body is felt in the corresponding location on the other side. The stimulus may or may not also be felt at the location where applied. The author undertook interesting experiments upon animals which consisted of hemi-section of the cord combined with strychninization of a more caudal lying segment causing hyper-excitability of this region. The experimental conditions seemed to be satisfactorily analogous to previously described clinical cases and showed that the symptom of alloesthesia results from blocking of the sensory paths of one side of the cord combined with a state of hyper-excitability of a segment of the same side of the cord lying caudal to the point of section. If the section and the strychninization were more than three segments apart the stimulus was felt on both sides.

6. *Agrammatism*.—The grammatical construction of speech depends upon two different elements. The train of thought must be arranged into a syntactic chain with proper arrangement of its divisions. The outward expression depends for its correctness upon an intact speech apparatus. Grammatic disorders dependent upon the one are symptomatically quite distinct from those caused by the other. The "speech forms" of agrammatism are various. The so-called telegraphic speech is due to disorder of the motor speech-field. Sensory agrammatism is a result of amnesic and of central aphasia. Agrammatism due to disorder of thought is most commonly found in trans-cortical aphasia and is shown by disorderly arrangement of words which, in themselves, are correctly formed.

7. *Abducens Paralysis*.—Two cases are described in which purulent otitis media was accompanied by abducens paralysis. The symptom in each case followed lumbar puncture. Vomiting was also a prominent symptom. Various theories of the cause of the paralysis are discussed, of which the reflex theory seems to apply best to the author's cases.

J. W. MOORE.

Journal of Mental Science

(Vol. 58, No. 241)

1. The Cerebrospinal Fluid in Certain Mental Conditions. WILLIAM BOYD.
2. Insanity with Myxedema. G. F. BARHAM.
3. A Case of Double Personality. BERNARD HART.
4. Aphasia in General Paralysis and the Conditions Associated with it. EDWARD MAPOTHER.
5. "Forced Feeding." A Case Continuously Fed by the Nasal Tube for Over Nine Years. DAVID BLAIR.
6. Inherited Tendency to Insanity in Rural Population. JAMES FREDERICK CARSON.

7. Dr. Turner's Paper on Classification, and Other Matters. C. MERCIER.
 8. Comments on Dr. Mercier's Criticism of Dr. Turner's Paper. JOHN TURNER.
 9. Medical Examination of Backward Children in Schools. JOHN FORTUNE.

1. *Cerebrospinal Fluid in Mental Conditions.*—After a discussion of the properties of the cerebrospinal fluid and the accepted methods of examination, Boyd describes the results of examination of 119 cases, mostly of various psychoses. His conclusions in the case of paresis and tabes coincide with those of most observers, but he has found lymphocytosis also in cases he calls "dementia præcox" and others, "epileptics." Findings so contrary to the usual would make it desirable to have the diagnoses verified by detailed case records, which are not given in this paper.

2. *Insanity with Myxedema.*—Barham calls attention to the fact that there are cases of insanity associated with myxedema, in which the psychical symptoms do not clear up although the physical disease may disappear under thyroid treatment. Analysis of a case follows in which are demonstrated as etiological factors elements of (1) emotional conflict, *i. e.*, unsatisfactory marriage, (2) alcohol, (3) myxedema, (4) insane heredity.

3. *A Case of Double Personality.*—Hart relates a case subject to hysterical amnesias or "fugues," the lost memories being gradually recovered by hypnosis. In the process of analysis, certain repressed memories or "sore spots" were reached which caused a sudden change of demeanor in the patient. He became very antagonistic, repudiated the physician, was suspicious and non-cooperative. This state the author called the "one fifth man," the usual cooperative personality "the four fifth man." The "one fifth man" gradually diminished in potency as the buried memories were brought to the surface, and he finally disappeared completely after the analysis (which is not given) had been sufficiently carried out.

4. *Aphasia in General Paralysis.*—Mapother illustrates by appropriate cases the fact that aphasia may occur in general paralysis: (1) as a purely functional condition without demonstrable postmortem lesion; (2) as a result of special localized intensity of the ordinary morbid process constituting general paralysis; (3) from subdural hemorrhage; (4) from focal lesions caused by arterial disease associated with general paralysis.

5. *Loried Feeding.*—Blair cites a case in detail of a woman patient who was tube fed for over nine years. He advocates the nasal method and shows how this is a necessary, safe and efficient routine measure as employed in hospitals for the insane.

6. *Inherited Tendency to Insanity.*—Following a general discussion of the problem of heredity, quotations from some of the literature and statistical findings in 1,131 cases, Corson gives twelve illustrative pedigrees with accompanying charts. From these the most striking features of heredity are: (1) The persistent transmission from generation to generation seen in the longer pedigrees; (2) accentuation of the transmitted tendency by unsuitable marriage and by the associated occurrence of alcoholism, phthisis, epilepsy and other neuroses; (3) tendency to elimination by the contending influence of a sound parent resulting in improvement and gradual return to normal in later generations; (4) association of insanity with one sex to a much greater extent than with the other is seen in some of the pedigrees.

7. *Classification and Other Matters.*—A rather bitter and personally sarcastic attack by Mercier on Turner's paper on "Classification" which appeared in a recent number of *The Journal of Mental Science*.

8. *Comments on Dr. Mercier's Criticisms.*—Turner briefly replies to the criticism of Mercier in a like manner.

9. *Backward Children in Schools.* Fortune writes of the medical examination of backward school children. Out of 12,000 children, 112 were found to be feeble-minded. A printed card with spaces to be filled on one side by

the medical officer, and on the other side by the teacher, in the case of feeble-minded or epileptic children, is appended.

(Vol. 58, No. 242)

1. Production of Leucocytosis in the Treatment of Mental Diseases. R. DODS BROWN and DONALD BROWN.
2. Abnormal Development of Scalp. T. W. McDOWALL and COLIN McDOWALL.
3. Some Dreams and their Significance. SIR GEORGE H. SAVAGE.
4. Varieties of Dementia. Dementia in Relation to Responsibility. ROBERT JONES.
5. Therapeutic Value of Thyroid Feeding in Mental Diseases. RICHARD EAGER.
6. Emanuel Swedenborg, Psychologist. HUBERT J. NORMAN.
7. Physical Basis of Mental Disease. IVY MACKENZIE.

1. *Production of Leucocytosis.*—Starting with the proposition that "some forms of mental disorder are due to toxins, many of which are microbic in origin," it seems a justifiable treatment to stimulate the bodily defenses against toxemia. The authors review the literature as to the various methods of producing a leucocytosis, especially the administration of nucleic acid and its salts, and the metallic ferments, and the results in mental disease. They treated nine patients, five of acute delirious insanity, two of melancholia, one of dementia præcox, catatonic type, and one of general paralysis, in several cases of acute delirious insanity, there being produced a quite marked leucocytosis with physical improvement and decrease of excitement.

2. *Abnormal Development of Scalp.*—After an exhaustive discussion of the literature, the authors conclude that corrugations or folds sometimes seen in the scalp over the vertex of the skull are due in the majority of cases to the fact that the skull is abnormally small, the scalp being too voluminous for what it enclosed. In other words, there is an arrested development of the skull but a normal growth of the skin over it, making it necessary for the skin to arrange itself in folds. Where in some cases there is a normal sized skull, the skin condition must be explained upon the hypothesis of hypertrophy.

3. *Some Dreams and their Significance.*—Savage states that a study of dreams may assist in diagnosis, that the dream may replace the petit mal attack or represent the aura in an epileptic, in the latter case the subject passing into an automatic state. Erotic dreams may give rise to false charges of assault in neurotic persons. Dreams may be the first symptom of a mental disorder, *e. g.*, a dream of horror, ushering in a maniacal attack. The author regards "happy dreams" in cases of "chronic melancholia" as indicative of a favorable prognosis.

4. *Varieties of Dementia.*—Jones introduces a general discussion of the question from several standpoints: (1) The actual meaning of the technical term "dementia" and varieties seen in primary conditions; (2) amount of "mental weakness" the term connotes, *i. e.*, that exists compatible with responsibility or liability to punishment; (3) question as to the existence of partial as against complete insanity or partial as contrasted with complete responsibility. He concludes that the term dementia applies to those states of mental weakness which occur in persons who have been previously in full and complete possession of their normal or the average intellectual faculties, excluding idiocy, imbecility and feeble-mindedness. The actual commencement of dementia may be difficult to determine and it is also difficult to fix the line of demarcation in dementia between the amount of mental weakness consistent with responsibility (senile persons, for example) and that which may be technically the dementia of insanity.

5. *Therapeutic Value of Thyroid Feeding.*—Eager, in a paper which includes a discussion of the literature and numerous charts, both clinical and statistical, reaches some definite conclusions. The question arises as to how much the reported improvement in cases of insanity has not been due to rest and nursing rather than thyroid treatment. The treatment is costly and requires considerable close attention of physician and nurse. The extract appears to act as a powerful alterative. Cases of stupor or melancholia occurring in adolescents, where the condition is not of long standing, are the most likely to be benefited. Cases of dementia præcox or other mental disorders with a tendency to chronicity are not likely to be improved. Signs of improvement do not appear until about four to six weeks after treatment has been discontinued.

6. *Emanuel Swedenborg, Psychologist.*—While to the average person Swedenborg may be associated with the visionary period of his life as exemplified by his later writings, yet his earlier work should entitle him to a lasting place as a scientist, a philosopher and psychologist. Norman in his paper gives extensive quotations from the writings of Swedenborg tending to show, following his exhaustive anatomical study, his conception of the physiological action of the brain and nervous system and the psychological application.

7. *Physical Basis of Mental Disease.*—Mackenzie starts with two generalizations: (1) That "there is essentially no difference in kind between a physiological and a pathological process. The distinction is an arbitrary one; the course of disease is distinguished from that of health only in so far as it tends to compromise the continuation of a more or less perfect adaptation between the organism and its surroundings." (2) That diathesis or heredity "is of no practical importance from the point of view of eliciting etiology," that there is some other determining factor. Taking dementia præcox, the author says that there may be an acute disease process manifested at first by some obvious disturbances of bodily functions as may be evidenced, it may be, by such symptoms as fever, leucocytosis, etc. This may last for months or years with recovery but with a damaged brain. The patient settles down into an ordinary dement, or a patient who has recovered from his brain disease so far as possible. General paralysis, however, is regarded by the author as a truly chronic and progressive disease and does "not tend to come to a standstill in the same manner as does dementia præcox."

(Vol. 58, No. 243)

1. Presidential Address, Medico-Psychological Association. JAMES GREIG SOUTAR.
2. Mental Deficiency Bill. THEO. B. HYSLOP.
3. Dementia Præcox in Relation to Apraxia. ROBERT JONES.
4. Lunacy Service in Germany. R. G. ROWS.
5. Appendicitis in Hospitals for the Insane. JOHN FREDERICK BRISCOE.

1. *Presidential Address, Medico-Psychological Association.*—Soutar opposes the tendency to belittle British psychiatry. He feels that the fact that they "do not possess institutions like the highly equipped state-supported clinics and research laboratories which have existed for many years elsewhere," shows that their advocates fail to prove that the results are "commensurate with the financial burden." He is also not in sympathy with what he calls the "false value" attached to the possession of a diploma in psychiatry or the idea that this diploma is essential for success or advancement in the service.

2. *Mental Deficiency Bill.*—A lengthy discussion of the legislative proposals for the care and control of the mentally defective opened by Dr. Theo. B. Hyslop.

3. *Dementia Præcox in Relation to Apraxia*.—Jones, using an address by Dr. Mabile of France on the above subject as the basis for his paper, presents a brief résumé of the theory of apraxia, calling attention that the anatomical lesion is an interruption of one or the other groups of association fibers or those described as commissural. The case described by Mabile presented peculiarities such as retardation of mental reaction which might be interpreted as "ideational dyspraxia," persistence of obsessions giving rise to the symptoms "perseveration," etc. The diagnosis was in doubt, there being suggestions of dementia præcox, psychasthenia, hysteria and melancholia.

4. *Lunacy Service in Germany*.—Rows writes of the position of assistant physicians in the "asylum service" in Germany, the conditions under which they work, and their qualifications, also outlines the teaching and other facilities afforded by the clinic at Munich.

5. *Appendicitis in Hospitals for the Insane*.—Briscoe calls attention to the rarity of appendicitis among the insane and ascribes this to the system of dieting and regulation of the bowels practised in hospitals for the insane. Considerable discussion followed this paper.

(Vol. 58, No. 244)

1. Mental Organization. HENRY MAUDSLEY.
2. Presidential Address. SIR GEORGE H. SAVAGE.
3. Death Certification and Registration. SIDNEY COUPLAND.
4. Care of the Defective in America. WINIFRED MUIRHEAD.
5. Mental Disorder with Childbearing. GEOFFREY CLARKE.
6. Urethritis in General Paralysis. HARVEY BAIRD.

1. *Mental Organization*.—As opposed to the dualistic theory of mind and body, Maudsley discusses mental processes as the product of the activity of the whole body, motor as well as sensory. The present complex mental organization may be considered the result of a gradual transition, an organic evolution. The "organized federation of many nervous plexuses or so called complexes" seldom acts as a whole; parts may be unduly exaggerated, while others are weakened or inhibited.

2. *Presidential Address*.—A discussion of present-day problems, such as heredity and Freudian psychoanalysis, with a plea for the cultivation of an open mind with "prudent unbelief."

3. *Death Certification*.—A consideration of certification of death, historically and otherwise, with special reference to the insane. The paper is accompanied by a number of diagrams and statistical tables. In the discussion following, much space is taken up with the different points of view as to the meaning of "primary" and "secondary" causes of death.

4. *The Care of the Defective in America*.—A description of some of the institutions for the feeble-minded of Massachusetts, Pennsylvania and New Jersey.

5. *Mental Disorder in Child-Bearing*.—From a study of seventy-five cases of insanity occurring during pregnancy, the puerperium or lactation, Clarke summarizes his conclusions as follows:

1. That almost any form of mental disease may be met with during pregnancy or lactation, but by far the commonest varieties are the acute confusional and the manic-depressive psychoses.

2. In these two forms of mental disease the prognosis is, as a rule, good, but in other forms occurring at this time the outlook is not nearly so hopeful.

3. Except in some cases of acute delirium there is no reason to think that toxic or hemic conditions are important factors, but the mental breakdown may be looked upon as a temporary failure of the mind to adapt itself to physiological but unusual conditions.

6. *Urethritis in General Paralysis.*—Baird made a postmortem examination of sixteen cases of general paralysis and found evidence of urethritis in all cases. He comments on the favorable action of hexamethylene-tetramine, and the presence of "diphtheroids" in cultures from the urethra.

W. C. SANDY.

MISCELLANY

SURVIVAL AND VIRULENCE OF POLIOMYELITIC MICROORGANISM. Flexner, Noguchi and Amoss. (Journal of Exper. Med., Vol. 21, No. 1.)

In previous reports the authors described their findings of an organism of poliomyelitis. They here describe a strain which they have cultivated for thirteen months. This minute microorganism cultivated from poliomyelitic tissues survived and maintained its pathogenicity in cultures for more than one year. They also report that upon inoculation into monkeys poliomyelitis may fail to appear upon the first injection and yet follow from the effects of successive injections of the culture.

Inoculations of cultures into monkeys which fail to produce paralysis may fail also to induce resistance or immunity. In this respect the action of the cultures resembles that of the virus as contained in infected nervous tissues. The lesions occurring in the spinal cord, medulla, and intervertebral ganglia of the monkeys, which respond to the several inoculations of the cultures are identical with those present in the nervous organs of animals responding to injection of the ordinary virus. Glycerinated nervous tissues derived from the monkeys responding to several injections of the cultures transmit experimental poliomyelitis to monkeys upon intracerebral inoculation. The microorganism inoculated may be recovered in cultures from the monkeys which develop poliomyelitis; but cultivation from the brain tissue is attended from the usual difficulties surrounding the obtaining of the initial growth.

The microorganism cultivated from poliomyelitic tissues is adapted with difficulty to saprophytic conditions of multiplication, but once adapted growth readily takes place upon suitable media. When, however, as a result of inoculation into monkeys, the parasitic propensities of the microorganism are restored, it again displays the marked fastidiousness to artificial conditions of multiplication present at the original isolation.

The experiments reported in this paper afford additional strong evidence in support of the view already expressed, that this microorganism bears an etiological relationship to epidemic poliomyelitis in the human subject and to experimental poliomyelitis in the monkey.

JELLIFFE.

CEREBELLAR FUNCTION. L. L. Meyers. (Journal A. M. A., October 16, 1915.)

Dr. Meyers says that in reviewing the literature he finds a number of symptoms have been ascribed to the cerebellum which did not originate from it at all. Lesions of the cerebellum do not cause sensory disorders as has been attested by so many observers that it may be considered a fact and the exceptional contrary statements disregarded. This is true also of the muscular sense. The phenomena following cerebellar lesions are in the motor sphere. It is pretty well established that forced movements, the circus movements and rolling movements in animals and the so-called imperative movements in man are not of cerebellar origin. The same is true of the nystagmus, the conjugate deviation of the eyes and the characteristic attitude of the head so often observed after unilateral ablation of the cerebellum in animals and occasionally in cerebellar disease of man. These phenomena are essentially vestibular in origin and due to a lesion of the vestibular complex itself or its

oculomotor tracts. Clinically, paralysis in cerebellar disease is denied by good authorities and is also indicated by the state of the reflexes which may be increased or normal. The view that the cerebellum exerts a motor effect different from that of the cerebral cortex directly on the periphery has been held by Luys and developed by Hughlings Jackson and supported by Horsley. Gowers' theory that the cerebellum acts through the cerebrum in an inhibitory way is also mentioned. Luciani holds that the cerebellum has the function simply of augmenting those of the other centers, lending them strength, tonicity, and effecting proper fusion of the cerebral stimuli. Loss of cerebellar innervation results in asthenia or weakness and arrhythmia with the resultant tremor. The phenomenon of cerebellar lesion in accordance with this theory is purely motor in character, analogous but not entirely identical with those following destruction of the rolandic zone of the cortex. A similar view has been held by Luys and developed by Hughlings Jackson. Meyers' experiments with the galvanometric testing of the cerebellar functions are detailed. He operated on cats, removing in one group the right lobe of the cerebellum, and in another group the left, keeping them under observation for one, two and three weeks. Out of all the animals he selected seven, discarding all those that did not show marked unilateral ataxia and whose wounds did not heal promptly. The animals were allowed to recover from the immediate effects. These experiments, he thinks, support his theory that the function of the cerebellum is that of control and inhibition, each half exhibiting its function on the opposite half of the cerebrum. Its indirect effects in the form of regulated movements manifest themselves on its own side as originating in the motor cortex of that hemisphere of the cerebrum, the motor impulses, passing by way of the pyramidal tracts, cross to the opposite side before reaching the spinal cord. There is a good deal of evidence also, he says, that there is a structural linkage between the cerebral hemisphere on one side and the cerebellar of the other side, and that the cerebellum is subservient to the cerebrum. The tremor appears to be largely dependent on an interaction between the cerebellum and mid-brain structures. "To sum up, the cerebellum is a complex structure having no direct effect on the periphery, but acting primarily on the motor cortex, the paracerebellar nuclei, and probably also the basal ganglia and ruber. Its primary effects are those of inhibiting, controlling and regulating the activity of these latter structures. Its ultimate effects are appropriate and rhythmic muscular action."

TACHYCARDIA SETTING IN WITH ACUTE INFECTIOUS THYREOIDITIS. D. D. Pletnew. (*Zeit. f. klin. Med.*, 1914, Band 80, Heft 3 4.)

Pletnew describes nine cases of acute infectious thyroid disorders with Basedow symptoms. He was able to establish that in the course of different infectious diseases acute, inflammatory diseases of healthy as well as of goitrous and of infected thyroid glands, Basedow's disease, occurred as complications. These infectious changes may give rise to purely local as well as to thyreotoxic phenomena, which produce tachycardia. In these cases it is not a question of hyperthyroidism, but of dysthyreosis. The toxic indications seem to play a part not only in the thyroid gland alone but in other glands with internal secretions likewise (pluriglandular affections). The Basedow goitre is very closely related to experimental parenchymatous thyroiditis.

JELLIFFE.

CONTRIBUTION TO THE ETIOLOGY OF HEINE-MEDIN'S DISEASE. F. Lust and F. Rosenberg. (*Münch. med. Wochenschr.*, 1914, No. 3.)

Wickman's theory of the transmission of the Heine-Medin's disease by means of diseased or healthy virus carriers is at variance with many epi-

demiological observances. The authors have observed 71 cases of acute poliomyelitis in the Heidelberg children's clinic from March to December, 1913. Direct contact with an infected person could only be assumed in the cases of six of these 71 patients. In the doubtful significance of infection by contact a publication by Bruno found consideration, in which he called attention to the appearance of conditions resembling paralysis among the domestic animals, especially among the poultry in the poliomyelitis district about Baden. In fourteen places where there had been poliomyelitis the authors could fix upon animals that had been attacked by paralysis shortly before. They were able to examine anatomically and histologically four such hens, and make experiments in transmission on other hens with the brains and spinal cords of the diseased hens. In the animals examined there were entirely different changes, partly in the central, and partly in the peripheral nervous system. In no cases did the transmission of a disease to another hen succeed. No more did hens, on further experimentation, under natural or artificial conditions of infection show themselves susceptible to poliomyelitis coming from humans or apes. There is no justification they think for identifying the disease authenticated in poultry and beginning with phenomena of paralysis, with poliomyelitis of humans and monkeys.

JELLIFFE.

CONTRIBUTION TO THE STUDY OF NON-INDUSTRIAL CHRONIC MERCURY POISONING. M. Friedmann. (*Deutsche Zeit. f. Nervenheilk.*, 1914, Bd. 52, H. 1-2.)

A high degree of nervousness increasing for the last four or five years to unfitness for service, and without any plausible reason, has been found in two assistants to the post office director. The following complications were present: gastro-intestinal disturbances, loss of teeth, skin affections, pharyngitis, rheumatoid pains in the joints, intention tremors, hysterical clonic convulsions, violent emotion. The trembling was characterized by violence and wide distribution. In six other cases post office assistants showed similar phenomena, although perhaps not such well-developed aspects of the disease. All had been active in the same profession for years and showed mercurial erethism. In a few cases the first phenomena appeared in three months and gradually increased. But it was only the continuance for several years of the intoxication which led to unfitness for service. In these cases the prognosis seems less clear than in the industrial form of mercury intoxication. Half of the clerks who were there and active at the same time showed themselves able to resist the cumulative effect of the poison. Nothing definite could be determined in regard to the quantity of mercury which would bring about the intoxication. The quantities of poison in any case are very small. In the post office studies tubes are used and telegrams are sent from the Morse room on an upper floor. In the mercury contacts or points there was a concession when the current was switched on or off, whereby drops of the metal were flung out and metal was also evaporated. In this manner the poison reached the atmosphere of the workroom, and even the floor was covered with little globules of the metal. The quantity of mercury spilled and evaporated daily was calculated to be about one half to two grams.

JELLIFFE.

CEREBELLAR TUMORS. E. G. Grey. (*Journal A. M. A.*, October 16, 1915.)

The proportion of patients with intracerebellar growths that show no nystagmus as a symptom has been investigated by Grey. Usually nystagmus is considered a valuable localizing sign in diseases of the posterior cranial fossa, but occasionally this signal fails. Grey has used the records of Dr.

Cushing at Johns Hopkins Hospital before September, 1912, and at the Peter Bent Brigham Hospital since that date. Of several hundred cases there were fifty-one that were localized at the operation, in eleven of which no nystagmus was observed previous to operation. The lesion in eight of these cases was a glioma or a gliomatous cyst, and all parts of the cerebellum were involved in these cases. Accessory measures for eliciting nystagmus were tried in three of the patients—moving the head as first suggested by Oppenheim and using opaque spectacles as recommended by Bárány—but without success. In one patient examined a fine nystagmus finally appeared just previous to the operation, and the records of two other patients illustrate how nystagmus which has been absent during one period of study may appear in later examinations. In his summary, Grey says that all of the cases in which it was absent contained intracerebellar new growths—32 per cent. of the intracerebellar series. This suggests that the absence of rhythmic movements of the eyes points to intracerebellar localization of the lesion. Caloric examinations were made in six of the patients without nystagmus, and resulted in characteristic nystagmus from either labyrinth in five. In forty verified cases of tumors lying anterior to the cerebellum, eight patients showed nystagmus before operation. The results indicate that in many cases of intracranial tumor the absence of nystagmus cannot be accounted for by an impairment of its fundamental mechanism.

A NEW SYMPTOM IN TABES. H. v. Baeyer. (Münch. med. Woch., 1914, No. 20.)

von Baeyer tested the sense of displacement and tension of the skin (by lifting, pulling of folds of skin) in a group of patients suffering from tabes. While the healthy man can give accurately the direction of these manipulations, the tabes patient, who can only give the region of the test, often makes a mistake. The regions in which these sensory disturbances occur are not identical with the portions in which sensations of touch and pain are lacking. This sensory quality seems to belong to the deep sensations; it is perhaps not unimportant in the treatment of ataxia.

JELLIFFE.

Book Reviews

THE FOUNDATIONS OF NORMAL AND ABNORMAL PSYCHOLOGY. By Boris Sidis, A.M., Ph.D., M.D. Boston, Richard G. Badger.

There is nothing fundamentally new in this work on psychology. Dr. Sidis brings again to our attention the fact that psychology is a science dealing objectively with the facts of mental activity and as such must leave the discussion of the nature of the reality of the external world upon which mental life reacts and of the nature of mental activity itself to metaphysics. Moreover, he frequently emphasizes his position in regard to psychophysical activity, that it is merely a concomitant of mental functioning and not, as many claim, the final explanation of psychical acts.

His explanations of the mental functions, both elementary and complex, is simple and instructive. He has elaborated an ingenious device of moments-consciousness, explaining their formation and activity from their purely sensori-motor constitution and functioning up to the highest synthetic moments of self-consciousness, which contain representative elements. This offers a purely mechanistic device for explaining rudimentary psychic life from that of the ameba to the reflexes existent in highest organisms as well as the complex mental life of the highest consciousness. The action of these moments-consciousness are supposed to explain all normal functioning and also derangement and failure of activity, all degrees of dissociation and degeneracy in their various pathological manifestations. But it is too limited in conception to cover the vital problem of complexes conscious and unconscious. For the term unconscious Dr. Sidis prefers a *subconscious consciousness*.

In his whole reference to the subconscious he but touches upon the character and extent of the submerged processes and their importance. We can scarcely expect more from a psychology that conceives of many of the psychic state not actively selected by the focus of consciousness as simply dying, ceasing to exist and that denies such a thing as the suppression of painful complexes. The book, therefore, can have only limited bearing on the practical problems confronting the psychiatrist.

JELIFFE.



DR ISAAC OTT

The Journal OF Nervous and Mental Disease

An American Monthly Journal of Neurology and Psychiatry, Founded in 1874

Original Articles

IN MEMORIAM—ISAAC OTT, A.M., M.D.

BY JOSEPH MCFARLAND, M.D.

Isaac Ott was born in Northampton County, Pennsylvania, presumably in 1847. There is some doubt about the exact date, the Index Catalogue of the Surgeon-General's library giving the date as 1844, the Directory of the American Medical Association 1847. Presumably Dr. Ott himself filled out the blank with the information for the directory, so that the latter ought to be correct, unless, as some assert, he had forgotten the precise date himself.

He went to school, among other places, at the Belvidere Academy, Hackettstown, N. J., where he prepared for Lafayette College, which he entered in 1865. He probably entered the medical department of the University of Pennsylvania two years later, for he was graduated from that institution, with the degree of Doctor of Medicine in 1869. He delighted in and also excelled in the science of medicine, which he developed to a remarkable degree though at the same time carrying on a practice. At various times he attended courses or carried on researches in the Universities of Leipzig, Berlin and Würzburg. He also worked privately with Klein in London and Bowditch in Boston.

He interested himself in teaching and occupied various positions. In 1875 he was made demonstrator of physiology in the University of Pennsylvania, and in 1877 lecturer in experimental physiology in the same institution; in 1878 he became fellow in biology in Johns

Hopkins University; in May, 1894, he became professor of physiology in the Medico-Chirurgical College, which position he continued to fill until 1914. For two years in his early connection with the Medico-Chirurgical College, he was its dean.

The energy of the man can only be understood by those who knew him. For twenty years he lived in Easton, Pa., where he carried on a considerable-sized and exacting general medical practice, yet during all that time, he conducted research experiments of an original and ingenious character and of high scientific value in a reconstructed stable on his property, acquired a large and valuable library with whose contents he was thoroughly familiar, and yet found time to come to Philadelphia three days a week to give his lectures and laboratory demonstrations, all of which being condensed into these periods, made the work extremely arduous.

To come from Easton to Philadelphia, teach continuously for about five hours, and then to return to Easton again, constitutes a day's work for which few would find themselves adapted, yet Dr. Ott did it three times a week for 20 years!

As a writer he was prolific, and an examination of the bibliographies of foreign text-books upon physiology and pharmacology shows him to be one of the best known and most appreciated of American writers upon those subjects.

His critical judgment was acute. He quickly winnowed the wheat and threw away the chaff in scientific writing, and his appraisal of his contemporaries was surprisingly thorough and accurate. He made no enemies; his personality was genial, his manner kindly, and he endeared himself to his colleagues, his students and his patients as few succeed in doing.

An attack of influenza in the late autumn of 1914 made him apprehensive of his health, and he tendered his resignation as professor of physiology in the Medico-Chirurgical College. With great reluctance it was accepted and he was made emeritus professor of physiology and director of the laboratories of experimental research, Dr. Andrew W. Downs being elected professor of physiology in his place. Notwithstanding the apparent disadvantage of his living in Easton, and the Medico-Chirurgical College being in Philadelphia, Dr. Ott actually and actively directed the research work in Philadelphia until the time of his death, compelling his subordinates to go to Easton for their directions and with their results, as he had formerly come to Philadelphia.

In December, 1915, he had another severe attack of influenza from which he again recovered but "overeager to be about and attend to


his patients, many of them not so ill as himself, pneumonia supervened and brought on cardiac complications too severe for his powers of resistance and recuperation, and which caused his demise early on the morning of the new year." His funeral, held from his residence in Easton, on January 4, 1916, was attended by a large delegation of the trustees, faculties and students of the Medico-Chirurgical College.

As the writer, who was one of the honorary pall-bearers, sat near the casket containing the earthly remains of his former colleague, an elderly gentleman approached to take a final farewell, and viewing the face of his former physician, with tears streaming from his eyes, and a heart-break in his voice, made the simple but well-justified comment "good doctor" and with bowed head turned away!

Dr. Ott was a member of but few medical societies, probably because of the fact that he made his home in Easton. He was, however, at one time the president of the American Neurological Association.

His interest in physiology and in physiological research is shown by what he leaves after him. Seventy-four titles to literary contributions follow his name in the Index Catalogue of the Surgeon-General's Library, but do not, by any means, reprint his entire work. His *chef d'oeuvre* was his "Text-Book of Physiology," the fifth edition of which was ready for the press at the time of his death and will be carried through by his successor.

Two professorships of the subject dear to his heart will bear his name. The first, with a foundation of about one hundred thousand dollars, given in his memory by his mother, is the Isaac Ott Professorship of Physiology in the Medico-Chirurgical College, the money for which is immediately available; the second, with a large foundation given by Dr. Ott himself, will be the Isaac Ott Research Professorship of Physiology in the University of Pennsylvania, the money for which becomes available upon the death of his widow.



A COMPARISON OF THE MENTAL SYMPTOMS
FOUND IN CASES OF GENERAL PARESIS
WITH AND WITHOUT COARSE
BRAIN ATROPHY¹

By E. E. SOUTHARD

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Most promising leads in psychopathology accrue from the well-known neuropathological desire to prove "structural" as many of the so-called "functional" psychopathies as possible. Though the search for truly functional psychopathies—judged by the hard tests of the post-mortem room—has to be very keen, and though the sure and uncomplicated natural experiments which bring to the post mortem room suitable cases for crucial examination are singularly rare, yet the structuralizing neurologist has not yet come at all near to destroying the functionalist hypothesis. The position that mental disease may well be a disease of function involving no more than normal and inevitable physiological changes in the nervous system is still perfectly tenable, perhaps even correct for some cases. For some time now I have been publishing in various medical journals a number of contributions to the study of normal-looking brains in psychopathic subjects. My associates and I have reported on all available material at various Massachusetts hospitals for the insane (Taunton,¹ Worcester,² Westborough,³ Boston⁴) and have made numerous references^{5,6,7} to the largest material (Danvers) which remains as yet unpublished. A large amount of work has had to be done in this search for psychoses that shall be above reproach as to their functionality. As an instance of the intriguing nature of the problem, I may say that out of 153 carefully examined cases at Boston State Hospital, Dr. Canavan and I were able to find but five entirely suited to crucial microscopic examination

¹ Being Contributions of the State Board of Insanity, Number 38 (1915,4). (*Bibliographical Note.* The previous contribution was S. B. I. Contributions Number 37 (1915,3) by M. M. Canavan, entitled "A Histological Study of the Optic Nerves in a Random Series of Insane Hospital Cases," *JOURNAL OF NERVOUS AND MENTAL DISEASE*, March, 1916.)

and that an orienting examination of these cases with the microscope has already led to disquieting suspicions.⁸

One word is due those who take the advanced and (in my opinion) entirely correct ontological view that structure and function are in such very intimate dyadic relation that they form to all intents and purposes a unity. Such a conception I have tried inadequately to develop in previous communications.^{5,6} I trust that the present series of studies will be permitted to rest outside the limits of ontological discussion.

Logically interesting, however, is the progress which can be made by the simple device of cutting an autopsy series or a clinical series in twain on the lines of supposed functionality and structurality. It may be conceded that many cases get pushed to the wrong side of the line, being called structural when they are really (on the present conception) functional, and *vice versa*. But these errors prove themselves in a manner familiar to those employing the statistical method.

The readers of this JOURNAL may recall certain papers on delusions written by Stearns, Tepper, and myself.^{9,10,11} In two of these papers the hypothesis was raised that the various (non-paretic) cases in question were really "functional" in the prevailing sense of cases without neural lesions. In a third paper I resorted to material which had to be regarded as "structural," viz., general paresis; but the conclusions founded thereon depend at least as much on the prevailing mode as did my former conclusions on somatic⁹ and environmental¹⁰ delusions in "normal-looking brain" cases.

How many of the symptoms of general paresis can safely be correlated with the lesions of general paresis as we know them? This question is exceedingly important, dealing as it does with that mental disease about which perhaps we know the most.^{12,13,14} The error in diagnosis is low,^{15,16,17} especially if compared with the error in psychiatric diagnosis at large,^{18,19} and the number of variables in our equations is correspondingly reduced.

In the study just mentioned¹¹ we concluded that the *characteristic* delusions of general paresis (found in 57 per cent. of all cases in a routine series, and in 75 per cent. of all cases showing delusions) are delusions about the patient's personality and that these delusions could be roughly correlated with frontal lobe lesions (non-autopsychic delusions failing to be so correlated). These conclusions were in general harmony with findings in dementia præcox.^{20,21}

For the present purpose I have split a certain series of autopsied parietic cases in twain on the basis of their showing or not showing substantial gross brain lesions. The series was chosen on the basis of personal examination by me at autopsy and of careful registration of all gross lesions found. The descriptions made were very particular and well-nigh finical, since they were from the beginning destined to be compared with gross findings in various psychoses at one time commonly regarded as functional (dementia præcox, manic-depressive insanity). Without here considering the medically and therapeutically interesting fact that in this random series 18 brains showed no substantial gross lesions and a bare majority, 20, yielded such lesions, I shall proceed to a brief symptom analysis from a psychopathological point of view, reserving for publication elsewhere²² various medical implications of the work. All cases, both with and without *gross* lesions, possessed the characteristic microscopic lesions developed by the Nissl-Alzheimer school.

Before tabulating the symptoms found in the two "normal-looking" and "abnormal" brain groups or in what might be termed the "mild" and "severe" cases, I must add that we are in no sense dealing with early and late phases of the disease. In fact the mild cases are often the longest cases. There is no question of a progressively severer disease in many cases. The cases progress, it is true, in one sense toward their death, and they do not very often regress. Moreover stationary cases are rarities. But a case lasting five years is not necessarily an anatomically or histologically severer case than one lasting two years.

In explanation of the first two tables, I must premise that (1) The fourth columns contain the number of symptoms (named in the first column) found and catalogued in a series of 17,000 cases clinically analyzed at Danvers State Hospital, only a small portion of which have ever come to autopsy and many of which are still alive. The analysis does not pretend to weigh the importance of the symptoms listed or their dominance in the various cases. The 17,000 list is purely a frequency list. (2) The entries in the *second* column (mild) of Table I represent symptoms in their order of frequency in a series of 18 anatomically "mild" cases of general paresis, whereas in the *third* column (severe) of Table I appear symptoms in their order of frequency in 20 anatomically "severe" cases. (3) The entries in the *second*

column (severe) of Table II represent frequencies in the 20 anatomically "severe" cases and those in the *third* column (mild) the corresponding frequencies in the anatomically "mild" cases.

It occurs to me that some question may well be raised whether anatomical appearances can be safely trusted to gauge severity of processes. Certainly we are aware that in certain cases these appearances can *not* be trusted. But I assume that there can be no doubt that, by and large, the atrophic brain is more deeply affected than the normal-looking brain. At any rate it is a question whether the microscope can be trusted much farther quantitatively at the present time. And in any event the findings both anatomically and symptomatically indicate two groups of cases, whether we choose to regard them as "mild" and "severe" or not.

Without entering the total field of symptomatology in psychiatry, I may perhaps add that I do not necessarily approve the nomenclature of symptoms here adopted and merely record the entries as they stand. The influences of Kraepelin and of Wernicke are plain in the nomenclature, despite the fact that a majority of the facts were collected before the work of either of these masters had come into close contact with practical American psychiatry.

Those symptoms have been included in all columns which occurred in 20 per cent. or more of any of the three series.

TABLE I

SYMPTOMS ARRANGED IN THE ORDER OF THOSE MOST FREQUENT IN THE ANATOMICALLY MILD CASES

	18 Mild	20 Severe	17,000
Amnesia	11	11	3,422
Motor restlessness	10	11	5,428
Disorientation	10	10	2,419
Delusions, allopsychic	9	3	6,844
Dementia	8	9	5,841
Depression	7	9	5,015
Irritability	7	6	2,714
Defective judgment	7	8	2,590
Psychomotor excitement	6	5	6,003
Delusions, autopsychic	6	7	4,807
Destructiveness	6	1	2,362
Resistiveness	6	3	2,051
Insomnia	5	4	4,354
Violence	5	2	3,244
Aphasia	5	9	1,180
Hallucinations, not specified	5	6	885
Convulsions	5	4	413
Hallucinations, visual	4	6	3,186
Sicchasia	4	2	1,597

I have italicized those figures in the 17,000 columns which represent 20 per cent or more of the 17,000.

TABLE II

SYMPTOMS ARRANGED IN THE ORDER OF THOSE MOST FREQUENT IN THE ANATOMICALLY SEVERE CASES

	20 Severe	18 Mild	17,000
Amnesia	11	11	3,422
Motor restlessness	11	10	5,428
Disorientation	10	10	2,410
Dementia	9	8	5,841
Depression	9	7	5,015
Aphasia	9	5	1,180
Defective judgment	8	7	2,596
Delusions, autopsychic	7	6	4,897
Irritability	6	7	2,714
Hallucinations, not specified	6	5	885
Hallucinations, visual	6	4	3,186
Euphoria	6	3	599
Psychomotor excitement	5	6	6,993
Incoherence	5	3	4,130
Confusion	5	1	2,120
Expansiveness	5	2	386
Insomnia	4	5	4,354
Convulsions	4	5	413
Exaltation	4	2	1,711

If we regard the ten statistically leading symptoms in the 17,000 cases as the most frequent of all psychiatric symptoms, and possibly as the most important (although I do not assert the latter), then it is of interest to inquire how far paresis partici-

TABLE III

SYMPTOMS ARRANGED IN THE ORDER OF THOSE MOST FREQUENT IN 17,000 CASES

	17,000	18 Mild	20 Severe
Psychomotor excitement	6,993	6	5
Delusions, allopsychic	6,844	9	3
Dementia	5,841	8	9
Hallucinations, auditory	5,428	2	1
Motor restlessness	5,428	10	11
Depression	5,015	7	9
Delusions, autopsychic	4,897	6	7
Insomnia	4,354	5	4
Incoherence	4,130	3	5
Amnesia	3,422	11	11
Violence	3,244	5	2
Hallucinations, visual	3,186	4	6
Irritability	2,714	7	6
Defective judgment	2,596	7	8
Disorientation	2,410	10	10
Destructiveness	2,362	6	1
Confusion	2,120	1	5
Resistiveness	2,051	6	3
Delusions, somatic	1,829	6	0

pates in the nature of mental disease at large and how far it is differentiated on this statistical basis.

The following tables bring out the answer :

In a fourth table I have placed the symptoms in order of frequency as they occurred in 17,000 cases of mental disease analyzed at the Danvers Hospital. The first ten of these symptoms occurred in at least 3,400 cases, that is, in 20 per cent. or more of the series, and the remaining nine are added to secure a statistical parallel to the facts in Tables I and II.

TABLE IV

Mental Disease in General	General Paresis	
	Anatomically Mild	Anatomically Severe
1. Psychomotor excitement	9th to 12th	13th to 16th
2. Allopsychic delusions..	4th	Not in first nineteen
3. Dementia	5th	4th to 6th
4. Auditory hallucinations	Not in first nineteen	Not in first nineteen
5. Motor restlessness	2d	2d
6. Depression	6th to 8th	4th to 6th
7. Autopsychic delusions..	9th to 12th	8th
8. Insomnia	13th to 17th	17th to 19th
9. Incoherence	Not in first nineteen	13th to 16th
10. Amnesia	1st	1st
11. Violence	13th to 17th	Not in first nineteen
12. Visual hallucinations ..	18th or 10th	9th to 12th
13. Irritability	6th to 8th	9th to 12th
14. Defective judgment ...	6th to 8th	7th
15. Disorientation	3d	3d
16. Destructiveness	9th to 12th	Not in first nineteen
17. Confusion	Not in first nineteen	13th to 16th
18. Resistiveness	9th to 12th	Not in first nineteen
19. Somatic delusions	Not in first nineteen	Not in first nineteen

Analysis of this table shows that *auditory hallucinations* and *somatic delusions* are the only symptoms which, while appearing amongst the first nineteen symptoms of mental disease in general, fail to appear among the first nineteen symptoms of general paresis in either the mild or the severe group. It will be remembered that the first nineteen symptoms in general paresis were chosen as occurring in at least 20 per cent. of the cases studied, and that but ten symptoms in mental disease at large occur in over 20 per cent. of cases. Hence the failure of *auditory hallucinations* to occur in any considerable number of cases of paresis is made more striking than the absence of *somatic delusions*. The presence of *visual hallucinations*, to be sure at the bottom of the list among mild cases, but in fair proportion among severe cases, is theoretically hard to explain, when taken in conjunction with the paucity of *auditory hallucinations*. Indications in the literature point perhaps to optic nerve lesions as

a possible basis for the *visual hallucinations*, suggesting an almost illusory origin therefor.

The fact that *allopsychic delusions* are so common, at least in the mild cases, seems to show that they are not correlated with *auditory hallucinations* either as cause or effect. It is as if there were not even pseudoreality to the *allopsychic delusions* and as if they did not appear even to the patient as representing centripetal (i. e., hostile) effects. In fact, as will appear below, these *allopsychic delusions* are associated more with refusal of food (hallucinatory tastes?, comments on indigestion?) than with *auditory hallucinations*. The study of *allopsychic delusions* in the parietic ought therefore to present conceptions of a quite disparate order to those of the victim of dementia præcox, where *auditory hallucinations* are so characteristic (see recent redeterminations of a statistical nature by Stearns²³).

The paucity of *somatic delusions* in both parietic groups is perhaps not surprising and is in line with some previous determinations including those of Southard and Tepper.¹¹ The peripheral origin of many somatic delusions or at all events their strong peripheral element, as claimed in previous papers,^{9,24} is consistent with this determination. The presence of a fair proportion of *visual hallucinations* remains astounding except on the basis of optic nerve changes mentioned above. Since Canavan²⁵ has shown a high proportion of chronic optic nerve changes in routine autopsied cases of all sorts of mental disease (parietic and non-parietic), it might be argued that *visual hallucinations* should be more common in mental disease at large. In point of fact *visual hallucinations* do seem to stand somewhat higher in order of frequency in mental disease at large than might have been *a priori* supposed. But, why, if *visual hallucinations* are really related (as some assert) with peripheral nerve changes, should not *tactile* and other *haptic hallucinations* occur more frequently in general paresis, in which the peripheral nerves are not infrequently involved? Perhaps such *haptic hallucinations* do occur but fail to reach the medical observer.

The agreement of both parietic groups in placing *amnesia*, *motor restlessness*, and *disorientation* in one, two, three order is of great interest. If we omit the anomalous *allopsychic delusions* from the mild group for the moment, then *dementia* would follow as a fourth common symptom. Further discussion is placed below.

For the purposes of Table IV we extended the list of symptoms from mental disease at large to nineteen for comparison with the nineteen symptoms which we had found to occur in over 20 per cent. of all cases of paresis. As a matter of fact the two lists of nineteen symptoms in paresis are not identical, and the differences are instructive.

The following are symptoms which occur in over 20 per cent. of the mild cases that do not occur in 20 per cent. of the severe cases.

Allopsychic delusions.....	9 in 18	3 in 20	6,844 in 17,000
Sicchasia.....	4 in 18	2 in 20	1,597 in 17,000
Resistiveness.....	6 in 18	3 in 20	2,951 in 17,000
Destructiveness.....	6 in 18	1 in 20	2,362 in 17,000
Violence.....	5 in 18	2 in 20	3,244 in 17,000

I have arranged the list arbitrarily on the basis of a vague conception of the interrelation and possibly the intergrading of some of these symptoms. I believe their mutual relations are plain: *the mild case of paresis*, in more than a fifth of all cases and often in far more than a fifth, *is reacting to his environment* (especially to his personal entourage) *most markedly*. Let us glance at the symptoms which distinguish the anatomically severe from the mild cases, since they fail to occur in 20 per cent. of the latter.

Euphoria.....	6 in 20	3 in 18	599 in 17,000
Expansiveness.....	5 in 20	2 in 18	386 in 17,000
Exaltation.....	4 in 20	2 in 18	2,711 in 17,000
Confusion.....	5 in 20	1 in 18	2,120 in 17,000
Incoherence.....	5 in 20	3 in 18	4,130 in 17,000

Here again, just as perhaps we might separate two symptoms (*allopsychic delusions* and *sicchasia*) from the other three which form a group by themselves among the distinguishing features of the "mild" group, so we may separate *confusion* and *incoherence* from the other three mutually related symptoms, *euphoria*, *expansiveness*, and *exaltation* in the "severe" group.

It was the observation of this contrast which caused me to write out the present paper for this JOURNAL, since I felt there was a general psychopathological interest to the contrast, which must very probably be based on structural differences in disease-process.

I have throughout left the impression that the structural differences in the two groups are largely those of extent. Perhaps

extent, depth, and serial involvement of cortex layers may indeed have something to do with these functional differences. Histological studies of striking instances of these phenomena may well confirm one or other of these conceptions.

Meantime we should also take into account the habitual preference of gross brain lesions in general paresis for the frontal region. With this fact in mind, a somewhat speculative account of the situation might run to this effect: That the *severe cases* with gross brain involvement *tend to leave the parietal regions* relatively intact and subject to operations *unchecked by the great inhibitory frontal areas*. The expansiveness of the paretic would accordingly resemble the hyperphantasia of certain victims of dementia præcox. The latter I have been trying to associate with the mild atrophic lesions of the parietal regions which affect certain cases of dementia præcox.²¹ General paresis very probably often possesses similarly mild lesions of the parietal regions, differing from those of dementia præcox in being exudative rather than merely degenerative. But at a time when these parietal lesions are beginning to develop in paresis, the frontal regions are doubtless often far on the road to coarse atrophy. Inhibitory power the frontal regions no longer possess, certainly over many motor activities, possibly over various conceptual processes. Thus might be explained both the resemblances and the divergences of hyperphantasia (fantastic delusions) and expansiveness (delusions of grandeur).

But now, as has been stated, a large minority of cases of paresis fail to die with coarse brain atrophy. All these cases have exudative lesions of more or less prominence, despite the absence of coarse brain atrophy. Just as the mild lesions of the parietal regions may produce (virtually as irritative symptoms) *expansiveness* and attendant *euphoria* and *exaltation* at the same time as coarse frontal destruction is leading to *confusion*, *incoherence*, and a disintegration of the patient's entire attitude to men and things, so the mild lesions of the frontal region may be leading to the above mentioned *anti-environmental* group of symptoms in the non-atrophic group. Action is not inhibited in its entirety or in its coarser manifestations. The operation of an exudative (and not yet extremely destructive) lesion in this frontal area may act in part to abolish the inhibitions which are very possibly the proper function of this area, but may also act in part to irritate, interrupt, and throw into disorder those inhibitions. The mild microscopic lesions in these non-atrophic cases

may act to bring about not the classical loss of inhibition but a perversion of inhibition, an incoördinate and irregular checking of activities, and of those *inactivities* which proper conduct often requires. On such lines could be explained with some plausibility the *resistiveness*, *destructiveness*, and *violence* which appear to be characteristic of these non-atrophic cases.

As to an explanation of the *delusions of persecution* and *refusal of food*, the situation is perhaps not so clear. The *sicchasia* may sometimes be an example of *resistiveness* and again due to delusions. If the former, then the symptom would best be explained as the result of disorder of inhibition. If the latter, I can only offer the analogy of dementia præcox, in which for some reason or other delusions (except fantastic) are rather closely associated with frontal lobe lesions. The psychopathology of delusions is obscure. I hold the opinion, however, that delusions represent more a disorder of believing than a group of false beliefs, rather more a perversion of volitional process than of intellectual process. On this line of reasoning I find it somewhat easy to reconcile the relation of the mild frontal lesions here found to delusions about the environment. Thus I would align together all five of the distinctive symptoms of the mild group with perversions of inhibition, presumably largely due to frontal lobe lesions even though these are hardly or not at all represented in the gross. In cases with more extensive frontal lobe destruction (coupled often perhaps with the establishment of *mild* lesions elsewhere in the cortex), the perversions of inhibition are replaced by frank losses thereof: the anti-environmental tendencies of the mild cases are replaced by less socially disturbing yet more profound disorder of personality.

SUMMARY AND CONCLUSIONS

The possession of a suitable statistical background (The Danvers Case Symptom Index) has rendered worth while an orienting study in the mental symptomatology of general paresis. A group of 38 general paretics whose brains were specially examined and described by the writer, has been divided into two groups according to whether there was or was not coarse evidence of brain atrophy. The cases without brain atrophy were termed "mild" and those with brain atrophy were termed "severe," although these designations are only approximations to accuracy; the groups are, however in no sense "early" and "prolonged."

Symptomatically the two groups show several surprising concordances and a number of instructive divergences. Thus *amnesia*, *motor restlessness*, *disorientation*, *dementia*, and *depression* lead both series and in that order (except that *allopsychic delusions* stand fourth in the "mild" series and are far less common in the "severe"). *Are amnesia and dementia therefore in no sense proportional to brain tissue loss?*

Nineteen symptoms occurred in 20 per cent. or over of the parietic series, viz., the five just mentioned, and nine others (*irritability*, *defective judgment*, *psychomotor excitement*, *autopsychic delusions*, *insomnia*, *aphasia*, *hallucinations* of doubtful or unspecified nature, *convulsions*, *visual hallucinations*) not always in like proportion in the two series. Five other symptoms occurred in each series, but symptoms quite sundered from one another in general significance.

The "mild" cases showed a group of symptoms which might be termed *contra-environmental*, viz., *allopsychic delusions*, *sicchasia* (refusal of food), *resistiveness*, *violence*, *destructiveness*.

The "severe" cases showed a group of symptoms of a quite different order, affecting *personality*, either to a ruin of its mechanisms in *confusion* and *incoherence*, or to the mental quietus involved in *euphoria*, *exaltation*, or *expansiveness*.

Some speculations are offered in the text as to the perversion of inhibition or incoördination of inhibition which the largely irritative lesions of the "mild" cases are presumably effecting in the perhaps more seriously affected frontal areas. When these are still more gravely affected, as to the point of atrophy, then the intrapsychic disorder might well become more manifest, *e. g.*, in the distinctive symptoms of the "severe" group just mentioned.

In a series of 17,000 clinical cases (of all sorts of mental disease, alive and dead, recovered and impaired) symptomatologically analyzed, there were but ten symptoms occurring in 20 per cent. or over: These were in order, *psychomotor excitement*, *allopsychic delusions*, *dementia*, *auditory hallucinations*, *motor restlessness*, *depression*, *autopsychic delusions*, *insomnia*, *incoherence*, *amnesia*. Each of these is represented high in general paresis (*i. e.*, in 20 per cent. or over) except that *auditory hallucinations* are infrequent in both "mild" and "severe" cases and *allopsychic delusions* are infrequent in "severe" cases. There may be topographical reasons for the paucity of *auditory hallucinations* in general paresis. The method of production of

allopsychic delusions in general paresis should be studied, since there can be no such alliance of *allopsychic delusions* and *auditory hallucinations* therein as is perhaps the rule in dementia præcox.

If we consider the next *nine* symptoms in order in 17,000 cases of mental disease at large, viz., *violence*, *visual hallucinations*, *irritability*, *defective judgment*, *disorientation*, *destructiveness*, *confusion*, *resistiveness*, and *somatic delusions*, we find only the last, viz., *somatic delusions*, not represented in either group in fair proportion, although (as above stated) *confusion* is poorly represented in the "mild" cases and *violence*, *destructiveness*, and *resistiveness* are poorly represented in the "severe" cases.

Aphasia, *hallucinations* of doubtful or unspecified nature, and *convulsions* appear to be frequent symptoms in general paresis that do not figure at all so largely in mental disease as a whole. Besides these, *sicchasia* of the "mild" group and *euphoria*, *exaltation*, and *expansiveness* of the "severe" group appear to stand out for general paresis against mental disease as a whole.

The most positive results of this orienting study appear to be the unlikelihood of *euphoria* and allied symptoms in the "mild" or non-atrophic cases and the unlikelihood of certain symptoms, here termed *contra-environmental*, in the "severe" or atrophic cases. Perhaps these statistical facts may lay a foundation for a study of the pathogenesis of these symptoms. Meantime the pathogenesis of such symptoms as *amnesia* and *dementia* cannot be said to be nearer a structural resolution, as these symptoms appear to be approximately as common in the "mild" as in the "severe" groups.

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A HISTOLOGICAL STUDY OF THE OPTIC NERVES IN A RANDOM SERIES OF INSANE HOSPITAL CASES¹

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INTRODUCTION

To fill a gap in the routine histological examinations of materials from insane hospitals, I examined in the year 1913 a series of 58 unselected cases of mental disease autopsied in the Boston State Hospital. I was personally somewhat astonished to find that 40 of these 58 cases or 68 per cent. exhibited changes in the optic nerves and those changes in most cases of an obvious and undeniably important character.

I present in tables below the general statistics of these cases, and a more particular analysis of 15 cases in which syphilis was demonstrable.

Of special interest is one case (1913.5) in which a spirochete was demonstrated in the pial sheath of an optic nerve. The nerve itself showed a slight loss of nerve fibers by the Weigert method. The case was regarded as one of general paresis. It is to be regretted that no ophthalmoscopic examination was made in this case as well as in many other histologically interesting cases. This study is, however, a purely orienting one and in view of its results, beyond question a more thorough examination of the eyes will be made in future.¹ In fact it may be advised that an ophthalmoscopic examination should be made (for scientific as well as for practical purposes) in all cases in which an autopsy has been granted or is likely to be granted. It may be wondered how often similar changes in other peripheral nerves,

¹ From the Laboratory of the Boston State Hospital. Contribution of the State Board of Insanity, Massachusetts, Number 37 (1915.3), presented at a meeting of the New England Society of Neurology and Psychiatry at State Infirmity, Tewksbury, March, 1914. (Bibliographical Note.—The previous S. B. I. contribution (1915.2) was by E. E. Southard, entitled "Anatomical Findings in the Brains of Manic Depressive Subjects," published in Transactions of the American Medico-Psychological Association, Seventieth Annual Meeting, Baltimore, Md., May 26-29, 1914.

PATHOLOGICAL CHANGES IN OPTIC NERVES

No.	Sex	Age	Mental Diagnosis	Cause of Death	Cresyl Violet	Weigert	Mauth	Changes Demonstrable	
								Optic Nerves	Spinal Cord
1913-1	M	43	G. P. Senile	Pulmonary tuberculosis	Chiasm, optic nerves, cord	Optic Cords	Cords	-	-
1913-2	M	81	Arteriosclerosis	Hemorrhagic pachymeningitis	Optic nerves, cords	-	-	-	-
1913-3	F	81	Senile	Septic cellulitis	Optic nerves	-	-	-	-
1913-4	F	83	Senile	Pulmonary tuberculosis	Optic nerves	-	-	+	(slightly)
1913-5	F	56	G. P.	General paresis	Optic nerves, cords	Optic nerves, cords, 3d nerve	-	+	+
1913-6	M	43	(Tabes) (G. P.) Korsakow's psychosis	Acute dilatation of heart	Optic nerves, olfactory	Chiasm, medulla	-	+	+
1913-7	F	64	M. D.	Bronchopneumonia	Optic nerves	Optic nerve	-	+	-
1913-8	M	49	Tabes G. P.	Lobar pneumonia	Optic nerves	Optic nerves, cords	-	+	+
1913-9	M	85	Senile (not insane).	Organic lesions	heart	Optic nerves	-	+	+
1913-10	M	62	Arteriosclerosis (P. undiagnosed)	(G. Chronic valvular heart	Optic nerves	Optic cord	-	+	(slightly)
1913-11	F	71	Senile dementia, cerebro-arteriosclerosis	Myocarditis, otitis media	Optic nerves	Optic nerves, cord	-	-	+ Lambar
1913-12	F	42	G. P.	G. P.	Optic	Optic, periphery, cord, 3d nerve	-	+	-
1913-13	F	81	Imbecile	Bronchopneumonia, decubitis septicemia	Optic, symph.	Optic, periphery	Optic	+	+
1913-14	M	39	G. P.	Bronchopneumonia	-	Optic, periph.	Optic cords, Optic	Periph. degen. optic.	-
								Except periph. nerve	

PATHOLOGICAL CHANGES IN OPTIC NERVES.—Continued

No.	Sex	Age	Mental Diagnosis	Cause of Death	Cresyl Violet	Weigert	Marchi	Changes Demonstrable	Spinal Cord
								Optic Nerve	
1913-15	F	52	Presenile (paranoid)	Ruptured aneurysm internal carotid				+	-
1913-16	M	77	Senile, arteriosclerosis	Gangrene of lung	Optic	Optic	Optic	+	-
1913-17	F	83	Senile	Cerebral hemorrhage, bronchopneumonia	Optic	Optic, periph., Sympth., 3d	Sympl., 3d optic, 3d optic, deg. optic	+	-
1913-18	F	72	Alcoholic senile	Acute vegetative endocarditis, acute fibrous pericarditis, chronic interstitial nephritis	Optic	Optic	-	-	+
1913-20	M	65	G. P.	Gangrene of foot		Optic, cord	Optic	+	+
1913-21	F	81	S. D.	Lobar pneumonia	Optic	Optics, cord	Optic	+	+
1913-22	M	64	G. P.	Acute vegetative endocarditis, lobar pneumonia	Optics	Optics, cords	-	+	+
1913-23	M	49	G. P.	G. P.	Optic	Optics, cords	Optics	+	+
1913-24	F	72	Arteriosclerosis	Acute purulent bronchitis, acute fibrinous pericarditis	Optic	Optic, cords	-	-	-
1913-25	F	51	Arteriosclerosis	Bronchopneumonia	Optic	Optics, cords	-	-	-

PATHOLOGICAL CHANGES IN OPTIC NERVES.—Continued

No.	Sex	Age	Mental Diagnosis	Cause of Death	Crossed Viaser	Weight	Marchi	Optic Nerve	Changes Demonstrable Spinal Cord
1013-26	F	38	Alcoholic hallucinosis	Mitral regurgitation, general anasarca	Optic, cords	—	—	—	—
1013-27	F	67	Senile psychoses	Bronchopneumonia	Optic	Optic	Optic	—	—
1013-28	M	65	Arteriosclerosis	Thrombus aorta	Optic	Optic	Optic	—	—
1013-29	F	53	Manic depressive	Pulmonary tuberculosis	Optics	Optic	Optic	+	+
1013-30	M	45	G. P.	G. P.	Optics	Cords, chiasm, 4th	—	+	+
1013-31	M	54	G. P., tabes.	G. P.	Optics	Optics, cords	—	+	(slightly)
1013-32	M	51	Arteriosclerosis	Arteriosclerosis	Optics	Optics, cords	Optics	+	+
1013-33	M	38	Depression (G. P.?)	Bronchopneumonia	Optics	Optics, cords	—	+	—
1013-34	M	63	Arteriosclerosis	Acute fibrinous pleuritis, acute nephritis.	Optic	Optic	Optic	+	+
1013-35	F	60	Organic dementia	Acute pyelitis and cystitis	Optic	Optic, periph., Symp.	—	—	+
1013-37	F	53	G. P.	Valvular heart disease	Optic	Cord, optics, Symp., periph.	—	—	+
1013-38	F	42	Autotoxic	Carcinoma of bladder and vaginal wall	Optic	Optics, periph.	—	—	(slightly)
1013-39	M	57	Arteriosclerosis	Bronchopneumonia	—	Optics	—	—	+
1013-40	M	81	Cerebral arteriosclerosis	Bronchopneumonia	—	Optics	—	+	(slightly)
1013-43	M	42	Brain tumor	Brain tumor	Optics	Cords and optics	+	+	—

PATHOLOGICAL CHANGES IN OPTIC NERVES.—Continued

No.	Sex	Age	Mental Diagnosis	Cause of Death	Cresyl Violet	Weigert	Marchi	Changes Demonstrable	
								Optic Nerve	Spinal Cord
1913-45	M	55	Alcoholic	Bronchopneumonia	Optics	Optics, cords	-	+	-
1913-48	M	47	G. P., tabetic	G. P.	Optic	Cords and optic	-	+	+
1913-49	M	31	G. P.	Pneumonia		Cord, optics and peripheral	+	+	-
1913-59	M	54	Brain tumor	Pneumonia	-	Cord, optics and peripheral	+	-	+ (very slightly)
1913-51	F	72	Depression	Lobar pneumonia	-	Cord, optics and peripheral	+	-	+ (slightly L)
1913-53	F	65	Korsakow	Gangrene of lung	-	Cord, optics and peripheral	+	+	+
1913-54	M	33	G. P.	G. P.	-	Cord, optics and peripheral	+	+	+
1913-55	F	51	Depression following operation	Bronchopneumonia	-	Cord, optics and peripheral	+	+	+
1913-56	F	70	Senile dementia	Pulmonary tuberculosis	-	Cord, optics and peripheral	+	+	+
1913-57	M	58	Diabetes	Diabetes and myocarditis (fatty)	-	Cord, optics and peripheral	+	+	+
1913-58	M	75	Senile	Organic heart disease	-	Cord, optics and peripheral	+	+	+
1913-59*	M	84	Senile	Carcinoma of stomach, otitis media	-	Cord, optics and peripheral	+	+	+
1913-60	F	71	Arteriosclerosis or alcohol	Fatty myocarditis	-	Cord, optics and peripheral	+	+	-
1913-61	F	32	Alcoholic	Alcoholic delirium and acute nephritis	-	Cord, optics and peripheral	+	?	-

PATHOLOGICAL CHANGES IN OPTIC NERVES.—Continued

No.	Sex	Age	Mental Diagnosis	Cause of Death	Cresyl Violet	Wegert	Marchi	Changes Demonstrable	
								Optic Nerve	Spinal Cord
1913,63	F	63	Allied to mania	Carcinoma of lung and abdomen	—	Cord, optics and peripheral	+	+	—
1913,64	M	54	Tabes?	Acute fibrinous pleuritis	—	Cord, optics and peripheral	+	+	+
1913,65	F	65	Manic depressive?	Pyelonephritis	—	Cord, optics and peripheral	+	+	(slight) + (slight lumbar)
1913,66	M	86	Arteriosclerotic	Bronchopneumonia, fracture femur	—	Cord, optics and peripheral	+	+	—
1913,67	F	74	Chronic melancholia	Septicæmia cellulitis, hand and arm (streptococci)	—	Cord, optics and peripheral	+	+	+

and especially in the cranial nerves, could be detected in routine examinations of psychopathic subjects. At present I do not know but that the optic nerve findings may be differential for that nerve. Degenerations of a chronic nature are shown in the following table:

BOSTON STATE HOSPITAL

Optic Nerve Changes in Unselected Autopsy Cases

Cases in random series, 1913	58
Cases with optic nerve changes (Weigert) (unilateral, 13; bilateral, 27)	40
Cases with spinal cord changes (Weigert)	34
Syphilitics in series	18
With optic nerve changes (unilateral, 3; bilateral, 12)	15/48
With spinal cord changes	12/48
With optic nerve and cord	11/48
Non-syphilitics in series	40
With optic nerve changes (unilateral, 10; bilateral, 15)	25/40
With spinal cord changes	22/40
With optic nerve and cord	15/40

40 cases with optic nerve changes.

4/40 were eye workers.

What are the changes seen in the fifteen syphilitic optic nerves? In general, peripheral degeneration of the nerve (see Fig. 1). To briefly particularize—in five cases:

B. S. H. No. 9825, Path. 1013.5.—Female. Age 56; diagnosis, general paresis; married twice; had two children by first, none by second husband. Had broken leg three times by falls, and had "rheumatism" for twenty years.

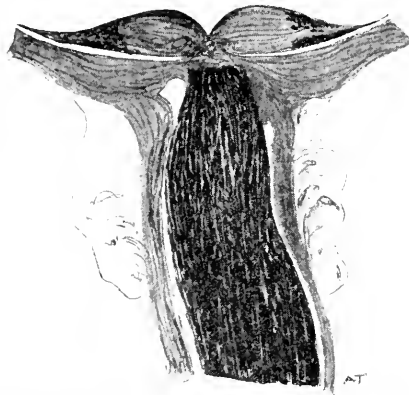


FIG. 1. Peripheral degeneration of optic nerve in a syphilitic. *B. S. H. Path. 1913.31.* Weigert's myeline sheath stain.

Duration of her mental trouble was about two years, six months. She had rather suddenly become slovenly, irritable and erotic; was sent here because she wandered away and her mem-

ory failed. Pupils were irregular and unequal, but reacted to light and accommodation. No ophthalmoscopic examination was made. Wassermann reaction not done.

She had absent knee jerks, speech defect, ataxia, tremors and Romberg, and her judgment was poor, and she gave evidence of dementia.

Sections of the brain show marked infiltration of vessels, disorder and destruction of cells, and sections of the cord show a gummatous meningitis; over mid-dorsal region, and posterior column sclerosis. The optic nerve shows slight peripheral loss of myelin sheaths and by Levaditi stain a spirochete, located in the pial sheath.

B. S. H. No. 0206, Path. 1013.8.—Male. Age 36; admits syphilis at 27; alcoholic.

Was admitted to Long Island Hospital complaining of stomach trouble when 35, at which time he could only distinguish between light and dark in one eye and count fingers with the other. Discs were in state of general pallor. Knee jerks lost, but he was not ataxic.

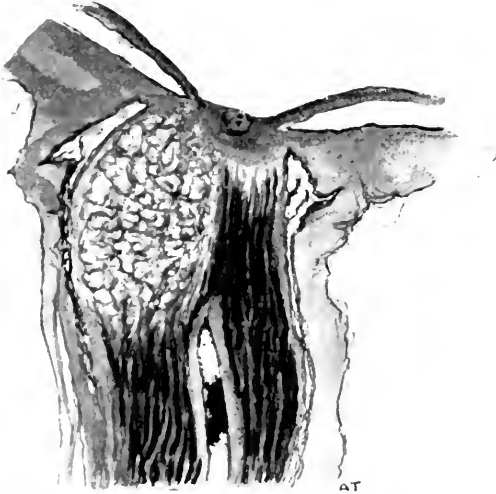


FIG. 2. Central degeneration of optic nerve of an arteriosclerotic. *B. S. H. Path. 1013.60* Weigert's myelin sheath stain.

Four months later marked optic atrophy with poor prognosis. No ataxia and no Romberg.

April 4, six months after admission, optic atrophy complete, ataxic and marked Romberg. No mental symptoms.

March 1908, eighteen months after admission, and a year after his sight was lost, he developed mental symptoms for which he was committed to this hospital.

In order of sequence, (1) optic involvement, (2) cord and (3) brain.

Sections show complete *degeneration optic nerves*; marked posterior column sclerosis.

B. S. H. No. 11690, Path. 1913.31.—Male. Age 54 yrs. Marble worker. Diagnosis, general paresis.

Widower, with one son; had not worked for three years, on account of rheumatism. When he came here he was unable to stand, pupils rigid to light, speech defect, absent knee jerks, memory loss, hallucinated, and Wassermann reaction positive.

Whole period of disease 19 months.

Section shows marked degeneration of optic nerve, central area best preserved, and posterior column sclerosis. (Fig. 5).

B. S. H. No. 11740, Path. 1913.33.—Male. Age 38 yrs. Cigar maker. Widower. Became blind—? how— but mental symptoms did not come on for some years after the blindness³ (see Knapp's report of three cases in which optic atrophy was the first symptom of paresis).⁴



FIG. 3. Pressure atrophy of nerve from middle cerebral aneurysm. *B. S. H. Path. 1913.15.* Weigert's myelin sheath method.

Came to hospital in a depression in which he refused to eat. No ataxia nor incontinence. Wassermann reaction in serum and in cerebrospinal fluid negative, though proteid content high—7 cells. *Visual hallucinations.*

Ophthalmoscopic examination shows chalky white eyegrounds. (1) Eye symptoms preceded mental symptoms. Optic atrophy and paresis. No tabes dorsalis.

Sections show complete optic atrophy, infiltration of vessel walls, and disorder and destruction of nerve cells in cortex though no sclerosis of the cord.

B. S. H. No. 10830, Path. 1913.61.—Male. Age 54 yrs. Special officer. Taboparetic.

Age of infection unknown. Married twice; no children. At 50 complained of dizziness and would fall in the street; could not get along in the dark; complained of failing eyesight, shooting pains in legs, vomiting and gastric crises. Impotence—this worried him—wished unnatural sexual intercourse. At 52 became irritable, hallucinated, and developed homicidal tendencies. Was sent to the hospital at 53; died at 54.

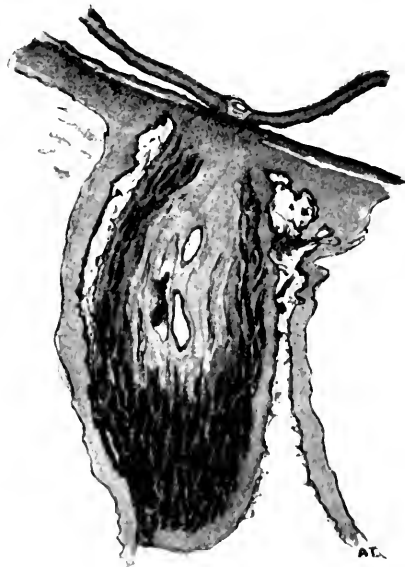


FIG. 4. Choked disc, unilateral, from multiple metastatic carcinomata of brain. *B. S. H. Path. 1913.43.* Weigert's myelin sheath method.

Neurologically: Rigid pupils, diplopia; tremor of lips, tongue, hand; gait ataxic; Romberg +; tendon reflexes absent; sphincters relaxed; important W. R. + in fluid and serum; cell count 45 to en.m.m.; globulin +; salvarsan—2 injections.

Summary: Tabetic symptoms first with slight impairment of vision and finally a psychosis. Whole period of symptoms, four years. Posterior column sclerosis definite—optic nerve changes faint.

Of the nonsyphilitic, the arteriosclerotics led, and the most characteristic change in the nerves was a degeneration about the central artery of the retina in the optic nerve (see Fig. 2).

One case of more than usual interest was:

B. S. H. No. 11321, Path. 1913.15.—Female. Age 52 yrs. A laundress, who presented certain vague and anomalous mental symptoms, with no neurological findings which suggested the cause of her illness. Ophthalmoscopic examination was not made during her life. Suddenly she fell dead while arranging her hair after dinner. There were inequalities in the optic discs then; one showed central cupping rather deeper than physiologic, the other showed a large gray protruding disc tentatively called a choked disc.

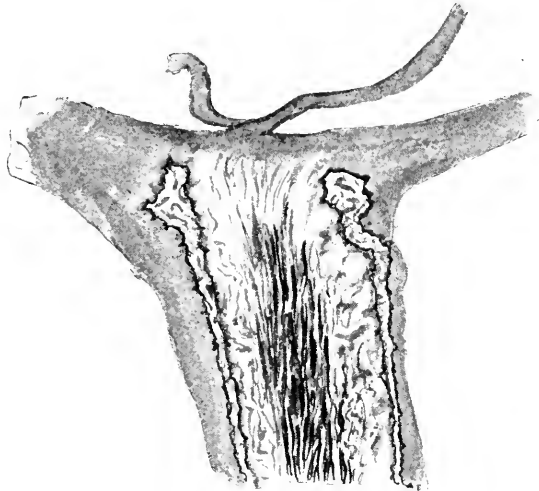


FIG. 5. Unilateral retrobulbar cyst with degeneration. *B. S. H. Path. 1913.59.* Weigert's myelin sheath method.

Postmortem, the left internal carotid had been aneurysmal and had burst. Before this it had pressed on the left optic nerve, producing atrophy sufficient to allow blood to ascend into the sheath of the nerve and produce the picture as outlined (see Fig. 3). (To be reported in detail.)

Of other lesions, the following is representative:

B. S. H. No. 10873, Path. 1913.43.—Male. Age 43 yrs. At 41 had right breast removed for carcinoma, after a swelling of 15 years duration; recurrence within two years at site and over trunk; began at this time to be different mentally; had delusions of persecution, and was shortly sent to hospital, where he began having convulsions. Pupils react sluggishly. History of convulsions. Thickness of speech. Mouth drawn to left side. Confusion. Increasing number of convulsions. Inequality of optic fundi. Unilateral choked disc (later). Inequality of knee jerk.

Section shows marked choked disc on left (see Fig. 4), faintly on right; no changes in cord. Multiple carcinoma of brain.

It may be worth while to note the methods employed in this investigation. On account of the fact that some hesitancy is sometimes felt to removing the retina for study I present a method which is cosmetically perfect so far as the restoration of the appearance of the body is concerned. There is nothing original about the method, which has been constructed from the data of various well-known handbooks.

Method: Peel the dura from the anterior fossæ, and with a chisel 8 cm. long \times 1 cm. wide cut an elliptical area from the orbital plate, the center of the ellipse to coincide with the slight inner convexity of the orbital plate, including the sides of the optic foramina. Remove bone thus encircled.

The optic nerve in its dural sheath will present at the proximal end and the fat and muscles surrounding the nerve and globe at the distal end. Lightly grasp the fat with a pair of hemostats and with a scalpel dissect the nerve from the foramen; take a deeper bite with the hemostats and cut down on them from the distal end of the ellipse to the globe. Gently pick up the dura at the proximal end of the nerve and exert traction loosening tissues from beneath.

With the left hand fix the globe in the orbital cavity by pressure from without and pierce the sclera with sharp scalpel. With the hemostats pick up the cut edge of the sclera and with curved scissors rapidly cut around the nerve head. A bit of cotton, soaked in permanganate and dried, is introduced into the eyeball, presenting a dark background for the pupil, and the cavity is closed by more filling in with cotton until inspection from the face shows a full orbit. It is often preferable to use a dark colored material which will pack better than cotton and for this purpose a bit of jute may be recommended.

After removal, examine the disc and describe any gross depressions, elevations or other obvious changes. The retinal vessel normally closely resembles one of the meningeal twigs of the pia mater.

Fix in formalin (10 per cent.) four to six or more days. *Trim specimen* in this wise (Verhoeff's direction): with curved scissors clip the sclera down to the smallest square compatible with preserving the nerve, cutting under the retina, or, at least, not detaching it from the disc. Sever the nerve within the first

centimeter behind the globe—this including the inturning of the central artery of the retina—and embed in celloidin after mordanting in Weigert Mordant I.

Mount on blocks with the disc parallel to the block, and cut down until the central vessels show from the disc to the proximal end of the nerve.

If sections are desired for nuclear staining, save some at 10 microns; otherwise, ten to twelve sections are available at 14 microns. Cut in series—mount and stain in the celloidin sheet by Weigert myelin sheath method.

The routine method for the examination of these optic nerves was in all cases by the Weigert myelin sheath method. In order to secure a nuclei stain after the first mordant of Weigert's method, I used Verhoeff's nuclear stain, a modification of the classical hematoxylin eosin stain described by him in the *Journal of the American Medical Association*, March 14, 1908, p. 76, and in the same *Journal* May 6, 1911, p. 1326. These two methods were sufficient for longitudinal sections.

Cross sections of the optic nerves were stained at a plane behind the turning in of the *arteria centralis retinae* and in a number of instances cresyl violet was used to secure evidences of lymphocytic infiltration if any. If such infiltration was evident, material from the nerve in question was examined by the Levaditi modification for spirochetes of Ramon y Cajal's silver impregnation. (The search was rewarded in one instance, 1913.5.)

In a number of instances, as suggested by clinical history or for other reasons, the Marchi method was used. No cases of acute Marchi degeneration were discovered in this series.

CONCLUSIONS

1. Forty cases or 68 per cent. of a random series of 58 cases of mental disease autopsied at the Boston State Hospital showed obvious and important chronic changes in one or both optic nerves (one, 13; both, 27).

2. In the same series of 58 there were but 34 which showed chronic spinal cord changes by the same method (Weigert myelin sheath).

3. There were 7 cases which showed very slight changes in the spinal cord (although in all instances definite changes) when there were no changes demonstrable in the optic nerves.

4. Of 18 syphilitic cases (clinical evidence in some cases sup-

ported by Wassermann reaction) there were 15 showing optic nerve changes—one eye, 3; both eyes, 12.

5. In one case a spirochete was demonstrated by the Levaditi method in the pial sheath of the optic nerve in a case diagnosed general paresis (although possibly one of cerebrospinal syphilis).

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THE RÔLE OF HALLUCINATIONS IN THE PSYCHOSES BASED UPON A STATISTICAL STUDY OF 514 CASES

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The subject of hallucinations, a term first used and exploited by the old Greek writers, is as ancient perhaps as the universe itself. Indeed, I am not so sure but that it even antedates the period "when Adam first swung himself from a bough in the forest primeval and stood upon two legs." Certain it is, when one glances and pores over the many volumes that have been brought to the attention of the medical profession by legions of authors concerning these fallacious sensory perceptions, one is forced to admit that this rather important and not altogether infrequent symptom in the field of abnormal psychology was born way back in the womb of time whereof the memory of man runneth not to the contrary, if I may purloin a phrase from the realm of the law without bringing adverse criticism upon my head. We have only to recall a few of the more familiar Bible stories and teachings, such as the "handwriting on the wall" at Belshazzar's feast and the "transfiguration on the Mount" and other incidents of like import, to establish the fact that hallucinatory experiences among the prophets and saints, as well as among the plebeian classes, who existed and inhabited this world in the prehistoric days, were not rare by any means. I am perfectly willing to grant, of course, that in a majority of these instances, we are unable to prove definitely whether or not they were real occurrences. If we accept the Bible literally, we must admit that they were, yet careful students and research workers into matters religious have seen fit to doubt the reality of some of them.

It is a well-known fact that when hallucinations are accepted as realities their influence on thought and action is overwhelming, in fact, more potent than normal sensations, reasonable arguments, and admonitions. In this connection it is quite interesting to note and a fact which particularly impressed me in going over the literature of this subject, that men somewhat deranged in mind, men suffering with hallucinations, have had a tremendous influence in making history and in shaping the destiny of nations and the fate

of empires. Legendary lore and the sacred books of all nations fairly teem with revelations and visions and profane history furnishes us with a series of such examples, while numerous accounts of hallucinations in great men and geniuses have come down to us from classical times.

The old notion for instance that Mohammed was a mere imposter appears so difficult of belief that no one of any recognized skill in historical inquiry now upholds it. If we accept as true the doctrine that men cannot excite in others feelings which are wanting in their own breasts, we must admit that a man without honesty of purpose and totally destitute of religious faith could no more found a religious system like that of Islam than a man with no ear for music could compose an opera. Be that as it may, it has always been a great difficulty to explain how this great man could in good faith say that he had seen the Angel Gabriel, and heard voices from Heaven calling him the messenger of God, and revealing chapter after chapter of the Koran. Weighing all the testimony that remains to us together, it seems likely that Mohammed,¹ at the commencement of his mission, was subject to hallucinations of hearing and sight, which taking the tone of his deeply religious feelings and his dislike to the idolatry and polytheism of the people of Mecca, were interpreted by him as a message from God. Under their influence he founded a religion which now numbers over a hundred million of votaries and which possesses to this day a singular power over the minds of its followers.

The same thing is true of Martin Luther,² the great German reformer, who suffered from many hallucinatory experiences concerning Satan, at whom he once hurled an inkstand during a sermon while laboring under extreme religious excitement. There seems to be no adequate proof that the delusions and hallucinations from which he suffered altered in any way or even modified his religious views, but it is easy to imagine circumstances under which they might have done so, and led Luther to become the founder of a new religion.

Jeanne d'Arc³ presents one of the most remarkable cases of hallucination on record. Beginning at the pubescent period, and while she was tending her father's sheep on the hills of Domremy, the voices which she heard were interpreted, in accordance with the intelligence of the times in which she lived, as those of angels. They continued with little remission through all the eventful and terrible scenes of war and carnage through which she eventually passed. They brought solace and comfort, and sustained her in the final ex-

periences to which she was consigned by the barbarous usages of the age.

Socrates⁴ told the Athenians that he was continually influenced to heroic actions and good deeds by a demon. These influences to do good were attended by no voice, but he was restrained from all evil and danger by a warning voice which was never passed unheeded by him. By strictly observing and attending to the instruction of the voiceless good demon, he could so influence his friends, pupils and even strangers as to compel them to do his bidding at a distance or when separated by walls.

Swedenborg,⁵ who made even more decided claims than Mohammed to hold communion with another world, and indeed, said in so many words that he could converse with angels and the spirits of men in Heaven at his pleasure, suffered undoubtedly from hallucinations and at times fell into fits of reverie and trance. When Columbus⁶ was cast upon the shores of Jamaica, he heard a voice reproaching him for his discouragement and lack of faith. Of Cromwell⁷ it is stated that on one occasion he was lying in his bed very much fatigued when the curtains were drawn aside and a woman of gigantic stature appeared to him and prophesied his future greatness. As everyone will recall, Brutus,⁸ at the Ides of March, surrounded by darkness and solitude, seeing vividly an apparition which he addressed, demanded an explanation of her intrusion, to which she replied, "I am thy evil genius. I shall meet thee again at Philippi."

General Rapp⁹ relates, that going one night unannounced into Napoleon's tent, he found him in so profound a reverie that his entrance was unnoticed. After some time the Emperor turned around, and without any preamble, seized General Rapp by the arm, saying excitedly and pointing to the sky, "Do you see it?" The General did not reply but on the question being repeated he said he saw nothing. "What," replied the Emperor, "You cannot see it! It is my star! I see it on all occasions! It orders me to go forward! It is a constant sign of good fortune."

Lord Herbert,¹⁰ in writing his book on the "Falsity of Revealed Religion," devoted to it every spare moment he could snatch from business. In doubt as to its publication, he, on one occasion, prayed audibly for a sign to guide his decision, and affirms that he had no sooner concluded his prayer than he heard a loud but agreeable sound from Heaven proceeding from a clear sky which he interpreted as a sign of approval. I could go on in this way indefinitely for there is a mass of material to be had which consists for the most

part of picturesque cases like those quoted above more satisfactory to the raconteur, perhaps, than to the student. I believe that these experiences may certainly be referred to a neurotic or psychopathic make-up, but the narratives are in general so confused and contradictory, and so seldom come to us at first hand, that it is difficult to arrive at any satisfactory conclusion concerning them. This is, however, a rather unimportant phase of the subject, except from a historical point of view, but inasmuch as it shows in no small degree the importance of hallucinations as occurring in the lives of those men whose names are indelibly stamped in the pages of history, I have dwelt at considerable length on it.

Let us turn now to something more material, more worth while, more important, and something which is absolutely necessary if we are to interpret these manifestations correctly and in a strictly scientific manner. I refer to the study of the nature, origin and mechanism of hallucinations. Of all the clinical symptoms of psychiatry there is none which even to the laity is so characteristic of mental disorder as hallucinations and still it is more difficult to explain the psychical mechanism of this remarkable phenomenon than that of any other psychopathic condition. Indeed, ever since mental diseases have been made a subject of special study, we have endeavored to arrive at some definite conclusion concerning the origin of false sensory perceptions. Up to the present day, however, no satisfactory explanation has been given, a fact which is sufficiently well shown by the comparatively large number of theories which have been offered by many authors. That this should be so is not to be wondered at. The great difficulty of explaining the psychical mechanism of any psychopathic symptom or condition we will appreciate if we consider that our knowledge of any normal psychical processes consists only of hypotheses. All our modern psychological doctrines, ingenious and evident as they may appear, including the generally accepted theory of association, are after all more or less speculation without absolute and irrefutable proof. One might even go so far as to say that it is idle play to try to explain the mechanism of a diseased condition as long as we do not possess the clear knowledge of its physiological analogue. The two sciences, psychiatry and psychology, however, form in more than one respect a mutual complement, and a thorough and accurate study of any psychopathic symptom is apt to throw additional light on the corresponding psychical processes and vice versa.

The first attempts to explain the physiological process of false perceptions were very misleading and consisted only of vague gen-

eralities. Two main points were considered in the elucidation of the problem—on the one hand, the sensory character of the phenomenon, and on the other, the great part played by the mental state in determining what the hallucinatory object should be. The ideational centers were assumed to be locally separated from the sensory centers, and this being the case, it was but natural to relegate the imaginative factors of fallacious perception to the higher elements of the cortex and to place the sensory part to those cells where in popular parlance, "incoming impressions are transformed into sensations.."

As to the locality and extent of these centers there was a conflict of views. One writer¹¹ believed that hallucinations were provoked by a diseased condition of the optic thalami, in which he thought that the sensory impressions transmitted by the nerves and spinal cord became realized as perceptions. He even indicated five little masses of gray nerve cells within each thalamus in which the several transformations took place, one for each of the senses. Meynert¹² placed the centers lower down—that of vision for instance in the corpora quadrigemina. Ferrier¹³ and others locate them in the cortex itself.

It soon became evident to the more keen observers and thinkers that the chief concern did not lie as to where the two centers were located, but rather the finding out of just what started the impulse in the centers in hallucinations where no stimulus is supposed to exist. Many writers ascribed and many still ascribe the initial impulse to the ideational centers, the so-called "centrifugal psychic theory." Thus, according to Griesinger,¹⁴ "hallucinations are subjective sensorial images, which are, however, projected outward and thereby become apparently objects and realities." Stearns³ believes that "they are perceptions of objects which have no existence except in the brain of the person perceiving them." Ireland¹⁵ states that "a hallucination is a perception of a sensation arising from changes within the organism without any corresponding change in the outer world." Tuke¹⁶ declares that "they are sensations experienced although no external objects act upon the periphery of the sensory nerves." Von Krafft-Ebing¹⁷ in a rather unique definition considers that "hallucinations are the result of excitation of the central apparatus of a sensory nerve by an adequate stimulus sufficient to give the force of a sense impression to the answering excitation which is projected outwards." Kellogg¹⁸ writes: "A hallucination is the vivid conscious revival of sense impressions without a physiological peripheral stimulus." Tanzi¹⁹ concludes

that "an hallucination is the occurrence of an internal image, which on account of its remarkable vividness is referred externally as if it had come from without and which is mistaken for an objective reality" and so on indefinitely.

While the theories of these authors had much to commend them, they were, I believe, based upon a complete misconception of the mental state in hallucination and of the physiological nature of sensation. Ideas of sensation can never rise to the level of true sensation itself. The want of the feeling of sensory affection leaves a gap which no psychic intention can bridge over. However vivid and energetic an ideational image may be, it can never receive the stamp of sensory reality, for the most characteristic feature of a sensory impression, in fact the very thing that stamps it as such, is the feeling of objectivity, of externality that goes with it.

Problem, however, often gives rise to problem. When we have discovered a continent or crossed a chain of mountains, it is only to find another ocean or another plain upon the farther side. And so in order to account for this feeling of externality and projection outwards of hallucinations, and also to exclude those cases in which the peripheral sense organs appeared to be involved, it became necessary to add still further hypotheses to the above. In this way arose the "centrifugal sensorial theories," whereby it was assumed that the sensory channels became the seat of a centrifugal nerve current, originating in the higher ideational cortical centers, and following thence to the sensorium and from thence on downward in many cases to the sense organ, where the condition present indicated a local disturbance

It did not take long, however, to establish the fact that both of these theories were inconsistent with the generally accepted physiological beliefs and so the attempt was made by some authors to explain the phenomena on the assumption of a reverse, that is to say, a centripetal process. Schlager,²⁰ for instance, distinguishes not only between hallucinations and illusions, but creates another class, abnormal sensations, strictly so-called, which he endeavors to explain, speaking of olfactory cases, through polypoid growths in the mucous membrane of the nose, through concussion of the brain, apoplectic attacks, etc., that is to say, through inadequate stimuli. Lazarus²¹ considers that in hallucination the sensory nerves are stimulated throughout their course to the center by internal processes, but he creates a new class, "visions," which he explains on the psychical theory.

It is clear, however, that the whole controversy as to whether

hallucinations arise in the ideational or cortical centers, and whether the process travels centripetally or centrifugally becomes meaningless when once we conclude that the centers of sensation and imagination are not locally separated but occupy the same part of the brain. This is undoubtedly true and with this assumption in mind and working along these lines, James²² made a distinct advance when he evolved his theory. He holds that in the cerebral cortex the sensory and ideational elements are the same and that the difference in the process depends on the intensity of the stimulus; that from the periphery is usually more intense than that from the neighboring regions of the cortex, and because of the difference in intensity, we tell reality from phantasy. If, however, for any reason the stimulation of these centers becomes as intense as that from the periphery the mind can see no difference and a hallucination results. Parish²³ accepts this theory and says that "cerebral dissociation is the one element underlying them all."

Stating his views clearly and concisely, and based upon a careful consideration of a series of cases, White²⁴ concludes that "a hallucination is a false perception and in order to have a false perception there must be something to perceive and that something is in the environment and can only enter as a factor into the mental life through the intermediation of sensation." He further concludes that "hallucinations are secondary sensations either arising in the same sensory fields in which they might be considered as illusions, or arising in other sensory fields, in which cases their secondary character is quite clear." From time to time various additions have been added of minor importance and it remained for Boris Sidis²⁵ in a few well-chosen words to reveal the key to the whole situation. He concludes: "A peripheral process often of a pathological nature and a subexcitement of secondary sensory and ideo-motor elements constitute the main conditions of hallucinations. The peripheral pathological process and the state of dissociation are prerequisite to the formation of the hallucinatory percept, while the content of such percept is given by the system of sensori-motor and ideo-motor elements. A peripheral process alone, even if it be pathological in nature, does not give rise to hallucination."

It may seem like carrying coals to Newcastle to present a topic apparently so threadbare as this, but when we shall come to see how common they are and what an important part these hallucinations play in the lives of those individuals who are unable to adjust themselves to their environment, this study is, I believe, fully justified. Being fully aware, however, that there are few subjects on which

more has been written. I still have the temerity to contribute to a bibliography already voluminous, in the hope of offering food for reflection even though I may be unable to add anything new.

I have selected from the hospital records a group of 514 cases and studied them to see first of all, how many were the subjects of hallucinations, next, whether they were of hearing, vision, or other type, and lastly to determine whether there were any which seemed especially characteristic of any particular form of mental disease. By taking the cases in order of their admission, which include colored as well as white, male as well as female, not only all types of individuals and psychoses are met with, but all branches of the work of this hospital are embraced. It is perfectly obvious that there is no way of absolutely proving diagnoses, yet in my series of cases, a large majority of whom have been presented at the staff conference, which is held daily at our institution where the history is read in full, the records in the case summarized and reviewed and the patient himself presented and briefly examined and at which time a diagnosis is made and the opinion of the senior members of the staff given, including the superintendent, this error is practically nil. In the same way we can with no degree of certainty state that hallucinations do or do not exist. The usual reason for a physician to assume that they are present is that the patient speaks of a sensation for which no adequate stimulus can be discovered. Nevertheless, we must be guarded in our assumption that we are dealing with hallucinations inasmuch as errors may readily occur, for actual perceptions may have taken place, and furthermore, the patient not infrequently mistakes the experiences of sleep for those of the waking condition.

In making this study I have first of all consulted the history of the individual in order that I might determine the general make-up of the personality with which I was dealing, this enabling me to make a more correct interpretation of the symptoms which manifested themselves. At first I reviewed the medical certificate which accompanied each patient, but I was soon forced to abandon this, owing to the fact that I found them to be unreliable and to contain such manifestly absurd statements that no dependence could be placed in them. Practically all of my data, then, have been collected from going over the routine mental examination, which is done as soon after admission as possible and from the notes on the cases which are made from time to time by the physician in charge or his assistants. Taking all these things into consideration, it would seem, therefore, that this study has been as accurate from the stand-

point of approach as it is possible to make it, but we must bear in mind, as I have said before, that there is no way of absolutely proving anything. For this reason the records have been construed rather literally.

I present the following tables and statistics, an analysis of which will reveal some interesting information:

TABLE I
SHOWING NUMBER OF CASES STUDIED, NUMBER OF HALLUCINATIONS, AND TYPE IN EACH DISEASE

Diagnosis	Cases Studied			Cases Showing Hallucinations			Cases Showing No Hallucinations			Type of Hallucination				
	M.	F.	Total	M.	F.	Total	M.	F.	Total	Aud.	Vis.	Smell	Taste	Touch
Dementia præcox.	127	43	170	90	30	120	37	13	50	113	38	5	10	10
Arterio-sclerotic dementia.....	51	16	70	9	1	10	45	15	60	9	5	—	—	—
General paresis....	45	8	53	19	5	24	26	3	20	21	10	5	6	3
Senile dementia....	28	12	37	6	3	9	19	9	28	7	4	1	2	—
Not insane.....	26	6	32	—	—	—	26	6	32	—	—	—	—	—
Unclassified.....	19	10	29	10	3	13	9	7	16	12	3	—	—	—
Manic depressive..	11	17	28	4	2	6	7	15	22	5	2	—	—	1
Miscellaneous....	11	12	23	7	7	14	3	6	9	13	8	1	2	2
Epilepsy.....	10	5	15	5	2	7	5	3	8	7	4	—	—	—
Prison psychosis...	13	—	13	9	—	9	4	—	4	9	6	2	3	2
Cerebral lues.....	12	1	13	5	—	5	7	1	8	4	2	—	1	1
Imbecility.....	3	7	10	2	—	2	1	7	8	1	1	—	—	—
Paranoid state....	6	4	10	4	—	4	2	4	6	3	—	—	1	—
Hysteria.....	3	3	6	2	1	3	1	2	3	2	2	—	—	—
Alcoholic psychosis	5	—	5	4	—	4	1	—	1	4	4	—	—	—
Totals.....	370	144	514	176	54	230	193	91	284	210	89	14	25	10
Percentage.....						44.74			55.26	40.85	17.31	2.72	4.86	3.00

First of all, let us inquire into the frequency of hallucinations among the insane population in general. That they are very common no one denies. Esquirol²⁶ estimates that 25 per cent. of all cases of insanity show their presence in one form or another. His conclusions are not, as far as I can determine, substantiated by a systematic study and therefore we may doubt their accuracy. Collecting the statistics of some of the more modern authors who have worked along these lines we find the following: Tuttle²⁷ reports the examination of the clinical histories of 500 consecutive admissions of persons to the McLean Hospital excluding those not insane and the readmissions. Of these 189 had hallucinations of some sort. This is 37.8 per cent. Munson²⁸ reports them present in 28.5 per cent. of 1,339 cases. Lane²⁹ reports 54 per cent. in 307 cases. Stearns,³⁰ who published his results after this study commenced,

reports 38.6 per cent. in 500 cases of consecutive admission to the Boston Psychopathic Hospital. My own figures, which do not exclude the readmissions and those diagnosed as not insane, give me their presence in 44.74 per cent. of 514 cases studied. If these two classes are excluded, the percentage would of course be higher. Let us average the results of the above observers and my own :

TABLE II
SHOWING WORK OF DIFFERENT INVESTIGATORS

Communicated by	No. of Cases Observed	No. of Cases Showing Hallucinations	Percentage
Tuttle.....	500	189	37.8
Munson.....	1,339	382	28.5
Lane.....	397	166	54.
Stearns.....	500	193	38.6
My own.....	514	230	44.7
Totals.....	3,160	1,160	40.7

We see from the above table that of 3,160 cases studied 1,160 showed the presence of hallucinations. An analysis of the percentage column gives us an average of 40.7 per cent. We may, therefore, I think, consider this to be a fairly accurate and correct estimation despite the fact that the different men may interpret fallacious sensory perceptions in different lights and despite the fact that these figures represent the work of a good many different investigators.

As to the type of hallucinations and the various combinations thereof, I find that by far the larger part were of hearing only, 120 out of 230 cases hallucinated showing auditory disturbances unaccompanied by abnormalities in the other sensory realms. This is 52.17 per cent. A cursory glance at the above table will show how very common hallucinations of hearing are and what an important part they play in the psychic life of the insane, and looking back at Table I we find that out of 230 cases in which hallucinations occurred, auditory fallacious perceptions, either separately or combined, were present in 210 or 91.3 per cent. That this sense should be especially liable to hallucinations does not seem strange. It is this sense which plays a more important part in our psychical life than any other, since we think in words and express our thoughts in words. Next in frequency come auditory and visual combined, 55 cases presenting this coupling or 23.91 per cent. After these two groups is placed that of sight alone, this representing 6.08 per

cent. of the cases, and a very striking fact is that the auditory and visual disturbances, either separately or combined, make up 189 out of the total number of cases hallucinated, the same being 82.17 per cent. The combination of auditory and taste form the next largest lot. Ten cases showed the presence of this combination, five of which occurred in the dementia præcox group. There were various other combinations as is shown by Table III but not in large enough numbers to warrant a discussion, some of them occurring only once.

TABLE III
SHOWING CHARACTER OF HALLUCINATIONS

	Dementia Præcox	Manic Depressive Art-Sclerot. Dementia	General Paralysis	Senile Dementia	Unclassified	Paranoid State	Hysteria	Alcoholic Psychosis	Cerebral Leses	Epilepsy	Inebriety	Prison Psychosis	Miscellane- ous	Totals	Percentage	
Auditory, alone.....	73	3	5	9	3	10	3	1	—	3	3	1	2	3	120	52.17
Visual, alone.....	6	1	1	1	1	1	—	1	—	—	—	—	—	1	14	6.08
Taste, alone.....	—	—	—	—	1	—	1	—	—	—	—	—	—	—	2	.86
Touch, alone.....	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	.43
Auditory and visual...	24	1	4	5	3	2	—	1	4	1	4	—	2	5	55	23.91
Auditory, smell and taste.....	1	—	—	1	1	—	—	—	—	—	—	—	—	—	3	1.30
Auditory and smell...	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	.43
Auditory, visual and touch.....	3	—	—	—	—	—	—	—	—	—	—	1	—	—	5	2.17
Auditory and touch....	2	1	—	—	—	—	—	—	—	—	—	—	1	4	1.73	
Auditory and taste....	5	—	—	2	—	—	—	—	—	—	—	1	2	10	4.34	
Auditory, visual, touch, taste.....	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	.43
Auditory, visual, touch, smell.....	—	—	—	1	—	—	—	—	—	—	—	1	1	3	1.30	
Auditory, visual and smell.....	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	.43
Auditory, visual and taste.....	—	—	—	1	—	—	—	—	—	—	—	1	—	2	.86	
Auditory, visual, taste smell.....	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	.43
Visual and touch.....	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	.43
Visual, taste and touch.	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	.43
Smell and taste.....	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	.43
All senses.....	3	—	—	1	—	—	—	—	—	—	—	—	—	—	4	1.73
Totals.....	120	6	10	24	9	13	4	3	4	5	7	2	9	14	230	

It was when I attempted to tabulate the content of the various hallucinatory percepts that I found myself as a ship with no rudder to guide her. In each field they took the most diverse form. Hallucinations of hearing consisted of moanings, hissings, clanking of steam pipes, words, phrases, simple sentences, stern commands and abuses, spoken in all sorts of different voices and tones, coming from all directions, and causing various reactions on the part of the

patient. One subject of auditory hallucinations heard sweet rapturous music but it was so long and continuous as to become very tiresome. In the visual field, the patients saw flashes of light, whole country sides, there were visions of friends, acquaintances and relatives passing before their eyes with a cloudy indistinctness, glaring colors and animals, especially in epilepsy and in the alcoholic psychoses. There were frequently visions of the supernatural, of angels or spirits, and at the same time expressions of happiness or rejoicing, or those of suffering and misery were heard and a variety of other things of a like nature too numerous to be mentioned here.

I found it very difficult and almost impossible in some instances to isolate hallucinations of taste, owing to their very close relationship to those of smell, but occasionally I would run across a patient who tasted blood, poison or feces in his food. Such disturbances as these I have interpreted as belonging to the gustatory field. Hallucinations of smell were present in but few cases. They were generally of an unpleasant nature and related to odors of dead bodies, poisonous exhalations, offensive odors of other patients, or obnoxious gases, which were thought to exude through the floors or walls of the room which the patient occupied. The most frequent hallucinations of touch were the various paresthesias, electric shocks, and one patient was continually having the sensation of being stabbed by some unknown person. Based upon a careful consideration of these cases, I am forced to admit, as was to be expected, that no two cases were alike, each presenting its own individual characteristics and peculiarities and the content of the hallucinations seemed to point to no form of psychosis in particular.

TABLE IV
SAME AS TABLE I, SHOWING PERCENTAGES

Diagnosis	Number Cases Studied	Present	Absent	Audi- tory	Visual	Smell	Taste	Touch
Alcoholic psychosis	5	80	20	80	80	—	—	—
Dementia praecox	170	79.58	29.42	66.47	22.35	2.91	5.88	5.88
Prison psychosis	13	69.23	39.27	69.23	46.15	1.53	1.39	1.53
Miscellaneous	23	66.86	39.14	56.52	34.78	4.34	8.69	8.69
Hysteria	6	50	50	33.33	33.33	—	—	—
Epilepsy	15	46.66	53.33	46.66	26.66	—	—	—
General paresis	53	45.28	54.72	39.62	18.86	9.13	11.32	5.66
Unclassified	29	41.82	55.18	41.37	4.03	—	—	—
Paranoid state	10	10	60	30	—	—	10	—
Cerebral lues	13	38.46	61.54	39.76	15.38	—	7.69	7.69
Senile dementia	37	24.32	75.68	18.91	16.81	2.70	5.40	—
Mani-depressive	28	21.59	78.59	17.85	7.14	—	—	3.57
Imbecility	10	20	80	10	10	—	—	—
Art. sclerotic dement	70	44.28	85.72	12.85	7.14	—	—	—
Not insane	32	—	100	—	—	—	—	—

Taking the cases in order of the frequency of hallucinations as is shown in Table IV, we find that the alcoholic psychosis stands at the head, 80 per cent. of them being hallucinated. There was such a small number of cases studied, however, that my series is of no value from a statistical standpoint. In the four cases all presented auditory and visual hallucinations and were fairly characteristic, *i. e.*, characteristic according to most observers—animals, snakes, etc. Stearns³⁰ reports a series of 31 cases of alcoholic hallucinosis, 14 of delirium tremens and found hallucinations in every case. He makes the statement that "hallucinations are indispensable for the diagnosis of such disorders, but claims that the type of hallucinations is not a proper criterion for differentiation between these diseases."

Our attention is next directed to the dementia præcox group, the members of which form a large proportion of our population. Of the 170 cases which presented themselves for study, 70.58 per cent. were hallucinated, 66.47 per cent. showing auditory, 22.35 per cent. visual, 5.88 per cent. taste, 5.88 per cent. touch and 2.94 per cent. smell. A careful analysis of the 50 cases which failed to show the presence of hallucinations reveals the fact that ten of them were catatonic in type and remained mute, negativistic, and inaccessible during their residence at the institution. Whether or not they suffered from hallucinations I am not prepared to say but a careful survey of the notes of the patient's conduct from time to time gives us some interesting information. We find such expressions as these: "occasionally there is a passing smile"; "an exclamation of surprise"; "a threatening word or glance"; "he is seen staring at wall and conversing with imaginary people," and other phrases of like nature, giving us a vague indication of the presence of actual hallucinations. Five of the cases showed conclusive evidence of their existence, even though they were denied, three of the cases spoke a foreign tongue, and could not be examined except with the aid of an interpreter, and two were excited and violent, making an examination impossible. In other words, in only 30 cases of the entire number studied, could I, with any degree of certainty, state that hallucinations did not exist. Practically, then, the entire group showed evidence of this particular form of fallacious perception and this bears out the statements of the authorities. White³¹ says: "Hallucinations are numerous and involve especially the auditory and visual fields." Tanzi¹⁹ states: "A phenomenon of frequent occurrence in cases of dementia præcox is that of hallucinations" and Bleuler³² comes

forward with the observation that "almost every schizophrenic in institutions hears voices." Glancing at Table III we note that 71 of the cases presented auditory hallucinations alone, unaccompanied by disturbances in the other sensory realms. By far the greater number of these cases were elementary in character; a few heard voices which called them vile names and accused them of vicious practices, while a few received warnings that they were doomed to destruction. These particular types were met with in all forms, however. In 24 of the cases there was a combination of the auditory and visual hallucinations, while in six cases visual disturbances were alone present. In this latter group a very striking fact presents itself for consideration. All were of the catatonic type. It would perhaps be well to give a brief summary of these cases. Case I was a female who saw her children in the field and points to them. Case II was a male who stares continually at the fireplace and sees witches and various visions in the flames. Case III saw living creatures like needles coming out of her body. Case IV sees the spirits of her dead friends. Case V sees a pair of wings floating in the air upon which he is to ascend to the clouds. Case VI sees imaginary persons stabbing her children. In the other twenty cases of catatonics observed, twelve had visual hallucinations combined with various other sensory anomalies. It would seem, therefore, that visual disturbances, although the number of cases which presented themselves for study is quite small (twenty-six in all), are fairly common, if not peculiar to this particular type of *præcox*. The rest of the cases were scattered throughout the different sense areas in different combinations none of which seemed especially characteristic.

Next in frequency of occurrence of hallucinations is a group of thirteen cases which have been diagnosed as prison psychosis. Of these 9 were hallucinated or 69.23 per cent. In these cases the hallucinatory experiences were active and formed an important feature of the symptom complex. All of the sense fields were involved, the auditory and visual predominating. The hallucinations in the auditory field were quite characteristic, for in every case they were of a persecutory nature, voices telling them of the injustice of continued confinement, and mocking, derisive, provoking sneers inciting them to an insane rebellion against the prison routine and strict discipline of institutions. At times the patients would see imaginary persons come into their rooms to torment them, poison would be placed in their food, and batteries were being used upon them.

In the miscellaneous group 60.86 per cent. of whom were hallucinated, I have placed those cases which were present in too small numbers to be of any value. Under this heading are included the following: Constitutional psychopathy 4, involuntal melancholia 4, paranoia 3, toxic psychosis 3, Korsakoff's psychosis 2, alcoholic hallucinosis 2, traumatic psychosis 2, Sydenham's chorea 1, multiple sclerosis 1. As this group in general presents nothing of interest, I shall pass it by rather quickly. There is one case, however, which, inasmuch as it is rather unusual, warrants a brief discussion. I refer to the case of psychosis associated with multiple sclerosis, which showed both auditory and visual disturbances. It is to be regretted that more cases were not available for study, although it is generally agreed that hallucinations, or in fact, any sort of mental disorder, are very rare in this disease. Oppenheim³³ for instance states that "the intelligence is often diminished, the patient is uninterested and forgetful. High degree of weakmindedness, sensory hallucinations and delirium are, however, quite unusual." Redlich³⁴ states that "sometimes the psychic disturbances are severe; there may be a marked impairment of intelligence, even to dementia or confusion, excitement with hallucinations. These are relatively rare and their explanation must be sought in the occurrence of multiple foci in the cortex of the cerebrum." Starr³⁵ in quite an extensive discussion makes no mention of any psychical phenomena. Thus it would seem that the case studied presented unusual features, but owing to the very limited number, no definite conclusions can be drawn.

In six cases of hysteria, three or fifty per cent. were hallucinated, these being located exclusively in the auditory and visual fields. There was nothing characteristic about their content, except that they appeared to be indicative of the approaching "grand attaque." They took the form of strange animals and voices calling from afar off.

Fifteen cases of epilepsy were studied, the result being that 46.66 per cent. were found to be suffering with auditory and visual hallucinations, the other sense areas not being involved. Four of the cases had auditory hallucinations alone, while in the other three, the two senses were combined. These hallucinations were very elementary and I believe can be considered as sensorial aura since they seemed to bear a very definite relation to the attack. They took the form of some buzzing or hissing sound, or dazzling sight, or, as was noted in three of the cases, there were well-defined hallucinations of a terrifying nature, as for example, of flames, blood, or threatening language.

Regarding general paralysis of the insane there seemed to be much diversity of opinion and I have found no two authors who agree as to the frequency of hallucinations in this disease. The most varied and opposite views obtain. This is due perhaps to the ambiguity of the line drawn between hallucinations, on the one hand, and delusive ideas, illusions and paresthesia on the other; and also because of the difficulty of proving that hallucinations are really present in the advanced stages. Generally only those of a disagreeable nature are taken into account and these are regarded as causes of the hypochondriacal delusions of the patient. Krafft-Ebing²⁶ points out that "in general paralysis hallucinations are rare phenomena, so rare indeed that in their occurrence one is forced to suspect a false diagnosis, and to refer them rather to alcoholic psychosis." Parish²⁵ gives a very instructive table, taking the work of several authors and averaging the results obtained. There were 1,211 cases studied and hallucinations were found to be present in 27.4 per cent. Gelhorn²⁷ reports their presence in 32 per cent. of 100 cases observed. Dagonet,²⁸ although he indeed notes their infrequency, observed them chiefly and frequently in the maniacal excitement. Hitzig²⁹ takes the view that auditory and visual hallucinations are rare in general paralysis, but describes those of the organic sense as occurring frequently. Baruk¹⁹ believes that hallucinations occur more frequently than was formerly supposed. My own series of cases, although quite small, gives me a much higher percentage than any of the authorities quoted, 45.28 per cent. being hallucinated, the auditory fallacious perceptions predominating.

Obviously nothing can be learned from an analysis of the unclassified cases, 44.82 per cent. of whom were hallucinated. In ten cases of paranoid state studied, 40 per cent. showed hallucinations, taunting and insulting voices called after them on the street, making injurious insinuations about them, and sometimes unseen speakers incidentally let words fall which confirmed the forebodings of the patient. Some of the cases believed that their tormentors had poisoned their food from even a distance. In some of the cases the hallucinatory disturbances were varied and in others they were characterized by extreme monotony and were closely bound up with the dominant fixed idea which they illustrate. Of thirteen cases of cerebral lies 38.46 per cent. were hallucinated, all of the senses being involved.

It is in the manic-depressive group, however, that we meet with material which is not only interesting but valuable. Only 21.50

per cent. of the cases showed hallucinations, 17.85 per cent. of these were auditory, and 7.14 per cent. visual. These figures correspond very closely to those of Lind,⁴¹ who in a remarkably accurate study of 244 cases of manic-depressive, found hallucinations to be present in 14 per cent. of the white males, 17 per cent. of the white females, 30.7 per cent. of the colored males, and 33.3 per cent. of the colored females. Averaging these results, we find that in the whole number of cases studied he found them to be present in 23.75 per cent. In the whole number of cases which I studied they were present in but ten. They were not in the foreground in any of these and I have sufficient reason to doubt their existence in most of them. Those cases, in which they were found to be present, were elated and it seems quite possible and fair to presume that these supposed hallucinations are but evidences of exaltation, ecstasy, and playfulness of the phantasy, for it is a well-known fact that hallucinations are common phenomena of ecstasy, where they arise out of one side of mental activity and intense concentration to single groups of ideas, conjoined it may be with lowered sensibility. Certain it is that in mania many deceptions of sight and hearing occur which exert a powerful though transitory effect on the sufferer driving him to violent outbreaks and tending generally to bring on acute attacks. In the tumultuous rush of ideas, however, none of which can remain fixed, hallucinations, I believe, are generally of minor importance. The sufferer cannot give them more than a passing attention, they disappear in the whirl of the psychical processes, and do not remain to burden the mind with a fixed idea or delusion. Even when hallucinations do occur they are vague and indefinite and indistinct. The literature on the subject points to their rarity in manic-depressive psychosis. Remond⁴² referring to mania says, "Rarer still than delusions are hallucinations"; De Fursac,⁴³ "Hallucinations are rare and fleeting"; Diefendorf,⁴⁴ "Hallucinations are rare except in the delirious forms of the manic phase, and in the more marked stuporous depression, but even here they are neither a prominent symptom nor persistent feature"; G. Deny and Paul Camus,⁴⁵ "The existence of true hallucinations in the course of the depressed states is a rare phenomenon"; Stansky⁴⁶ states that "although hallucinations occur in the exalted phases of manic-depressive insanity, yet they do not form a typical symptom thereof, are completely lacking in the majority of cases and hardly dominate the picture, except in those delirious conditions which are counted by many authors as belonging to manic-depressive insanity." Ziehen⁴⁷ states that "mania,

a form of the affective psychoses, exhibits in many cases no disorder in the sensory fields, nor is there any remarkable lowering of the threshold of stimuli." White³¹ says: "Hallucinations are not infrequent. They are usually elementary in character, simple and transitory." Tanzi¹⁹ states that "the rarity of the occurrence of hallucinations in these cases is a further proof that melancholic delusions do not originate in the errors of the senses. True hallucinations are absent in mania."

If then it be true that they are rare in this particular psychosis, this fact at once becomes of immense importance from a diagnostic standpoint. The manic phase is very often confused with the excitement of dementia præcox. The presence of signs of deterioration in the latter disease, however, will usually make the diagnosis, although there are cases that are extremely difficult to differentiate and considerable time must be allowed to elapse before a diagnosis is established. It is in these cases that the occurrence of hallucinations in almost every case of præcox and their extreme rarity in the manic-depressive group gives us a clue and while we are not interested primarily in giving a thing a name, yet we must use them in order to classify and to pigeonhole the different cases so they will be ready for recall at a moment's notice. It would seem then that in hallucinations we have a valuable diagnostic clinical symptom and one easily elicited.

Of the ten cases of imbecility studied, only two were hallucinated or 20 per cent., the disturbances being located in the auditory and visual fields. In thirty-seven cases of senile dementia only 24.32 per cent. were hallucinated. Three of these were women and six were male. All of them were deaf and this fact, I believe, accounts for their failure to appreciate properly impressions received from external agencies and so "the clanging of bells," "the whistling of locomotives," or the "whir of the trolley car" were misinterpreted and converted into the imperfect perception of voices. Berkeley⁴⁸ says: "Definite hallucinations are somewhat rare among the aged insane and those that occur are of an elementary order." My own figures bear him out. In seventy cases in which the diagnosis of psychosis associated with arteriosclerosis was made only ten or 14.28 per cent. were hallucinated. There seemed to be no characteristic type. As was to be expected, the least frequent of all were the not insane, and despite the statements of some authors to the contrary, it seems likely that they never occur in a mentally normal person and if they occur alone, especially if the patient be not of a psychopathic make-up, they are to be looked on with

suspicion. There were thirty-two cases in my series, none of which showed any evidence of their presence during their residence here.

From this study I may deduce the following conclusions:

1. Hallucinations are among the commonest of symptoms met with in the insane, occurring in approximately 40 per cent. of the cases.

2. Of the various types, those of hearing are most frequent, these occurring either separately or combined in 90 per cent. of the cases hallucinated. Next in frequency are those of hearing and sight combined, and then come visual disturbances alone.

3. The content of the hallucinatory percepts were not characteristic for any particular psychosis.

4. Visual disturbances seem especially peculiar to the catatonic præcox group.

5. Hallucinations are common in dementia præcox, occurring in practically all the cases. On the other hand, they are rare in the manic-depressive group, seldom if ever occurring typically. This fact is of diagnostic importance.

6. Hallucinations are rare in arteriosclerotic dementia and senile dementia, occurring in approximately 20 per cent. of the cases.

7. Hallucinations are rare in sane persons, even though they be of a psychopathic make-up.

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Society Proceedings

THE PHILADELPHIA NEUROLOGICAL SOCIETY

OCTOBER 22, 1915

The President, DR. S. D. W. LUDLUM, in the Chair

Drs. J. Hendrie Lloyd and Max H. Bochroch presented a patient with symptoms suggestive of rhizomelic spondylosis.

Dr. Francis X. Dercum asked whether the case had been examined serologically, whether the cerebrospinal fluid had been studied. Dr. Dercum regards with suspicion any case that presents any abnormalities of the light reaction. The slightest departure of the light reaction from the normal with full preservation of accommodation and convergence reactions points to a beginning Argyll-Robertson pupil.

Dr. George Wilson said that he had seen the man in the hospital and it seemed to him the spondylitis was absolute. While the exaggerated ocular reflex might be explained, he thought it was stretching the point too far to ascribe exaggerated reflexes and loss of knee jerks to the same disease. He asked whether a Wassermann had been made.

Dr. Samuel Leopold said the test had been made and proven absolutely negative.

Dr. D. J. McCarthy stated that in this type of case at autopsy he had seen the rigid condition of the spine due to meningitis externa, and this condition would explain this case. At the American Neurological Association Dr. Collins reported two or three cases of this type of external pachymeningitis with complete rigidity of the spine.

Dr. George Wilson stated that when the man was in the medical ward he had a partial third nerve palsy which came on and lasted practically twenty-four hours.

Dr. William G. Spiller asked why the case was not considered one of syphilis. If the man had ophthalmoplegia, loss of Achilles reflex, a third nerve palsy, as Dr. Wilson said, the case might be one of syphilis.

Dr. Dercum stated that the pupils examined by the pocket-lamp are shown to be distinctly unequal and also that the light reaction, though present, is exceedingly slight and if beginning optic atrophy is present, the case looks more like one of tabes. The absence of the knee jerks can be accounted for by regarding the case as one of sacral tabes.

Dr. S. D. Ludlum said the X-ray pictures showed that there was considerable exostosis and malformation of the bone which looked exactly like spondylitis deformans; and that with the Wassermann negative, the spinal fluid also negative, it is hard to understand how the man could be considered to have a nervous condition of syphilitic origin.

Dr. J. Hendrie Lloyd said that he would explain the loss of the Achilles reflexes, with preservation of the knee jerks, by a diffuse condition such as we have in spondylitis deformans. It is perfectly conceivable that the nerves of exit and entrance presiding over the Achilles reflex should be interfered with somewhere in their passage through the spine. He did not think it was a case of locomotor ataxia.

A CASE OF UNUSUAL FORM OF MYOTONIA

By F. X. Dercum, M.D.

The following case is presented because of its unusual character. It is clearly not a case of Thomsen's disease but notwithstanding must be classified under myotonia.

C. A., male, age 9, was admitted to the Jefferson Hospital September 10, 1915.

The family history is entirely negative. The mother and father are both living and well. There is no history of any nervous or muscular disease. The patient is an only child.

Personal History.—He was born normally. There was no dystocia and the labor was not instrumental. He was breast-fed and learned to walk at fifteen months of age. He began to talk about the same time but did not talk distinctly. He was about three or four years of age before he could speak so that he could be understood readily. He was cleanly at the age of two, walked as well as other children and appeared to be a healthy normal child. At six years of age he suffered from an attack of measles. Was unusually ill but made a good recovery and subsequently played around actively with the neighboring children. At seven years of age he suffered from a sore throat. This was variously described as diphtheria and as ulcerated sore throat. He was very ill but was in bed for a week only. Afterward he was as active physically as before. No change was noticeable in his walk. When he was not quite eight years of age, April, 1914, he suffered from an attack of mumps. The attack appears to have been severe and he was quite ill for two weeks. According to the mother he never appeared to be entirely well after this attack and shortly afterwards he began limping with his left leg. He began to walk with the left foot slightly turned out. Carried the knee slightly flexed, looked poorly, was thin and seemed in bad health. He also began using the arms in a peculiar manner and now and then fell when walking about the house.

The involvement of the left leg began sometime in April, 1914; in November of the same year the right leg began to behave in a similar manner; soon he could not walk at all and a little later was unable even to stand. About this time he complained of pain in his right knee. This was somewhat swollen. The swelling, however, after a time subsided.

The mother noticed about this time that when he began to move his arms and legs they would suddenly become stiff and would remain in a condition of spasm so that the boy could not use his limbs. This condition persisted with but little change up to the time of his admission to the hospital.

Present Condition.—The patient is a well-nourished and well-developed boy of nine years. His color is good and there are no visceral symptoms. When asked to move his legs as the boy lies upon the bed, it is noted that they become fixed in a semiflexed position, first one and then the other. This fixation persists for a fraction of a minute; sometimes for a minute and a half or longer, when the muscles become relaxed and the boy is able to approximately perform the movement indicated. When he is placed upon his feet, it is necessary to support him to prevent him from falling. When he attempts to walk, the legs are at once drawn into awkward and fixed positions by muscular spasm. Only after one or more minutes is he able to move the limb and then he performs the movements of the act of walking very imperfectly. In other words voluntary motion induces myospasm. The arms show a similar though less marked condition.

The general neurological examination of the boy is negative. The reflexes are normal, there is no ankle clonus and no Babinski sign. When the

muscles are percussed, however, they pass into spasm, the contraction comes on slowly and persists for a minute or longer. Relaxation does not seem to be complete for several minutes.

When the muscles are examined electrically, they present greatly increased faradic excitability, the contraction approximating physiological tetanus. Tested by the galvanic current it is found that the anodal closure contraction approximates, indeed is equal to the kathodal closure contraction. In other words the boy presents a typical myotonic reaction. It should be added that there is no atrophy nor is there any hypertrophy of the muscles.

There are no sensory losses. The pupils and eye grounds are normal. Mentally the child appears to be average in development. He answers questions clearly and promptly, although his speech is somewhat slow and indistinct. The movements of the tongue appear also to be somewhat slow though the facial muscles, tongue and muscles of deglutition do not seem to be decidedly or even definitely involved.

The case is novel in Dr. Dercum's experience. It is clearly one of myotonia. The history, however, lacks a familial character; no other member of the family or relative, near or remote, suffering this affection. The fact too that the condition supervened after an attack of mumps is suggestive, though of course this relationship may be purely accidental. It is interesting, however, to note that the boy had pain and swelling in one of his knees and that possibly we have had here to do with symptoms referable to an infection. However, whatever the facts may have been, the boy suffers evidently from a muscular disease and not from a disease of the nervous system and it is one which must be classified as a myotonia.

Dr. Charles K. Mills said that this case was an intensely interesting one and he thought very unusual. It brought into the foreground the necessity of our recognizing what we have been talking about for a year or so, that is the extra-pyramidal tonectic apparatus. This case cannot be explained without the recognition of such an apparatus. It cannot be explained on the ground of a pyramidal affection or a myopathy. Recent observations on the cerebral representation and mechanism of tone in connection with lenticular affections, Thomsen's disease and other disorders of tonic innervation throw doubt on the older views as to the muscular pathology of Thomsen's disease and the purely pyramidal pathology of other nervous diseases.

Dr. Dercum said that if we looked at the case as one of Wilson's disease, we could hardly account for the myotonic reaction. This points directly to disease of the muscle substance.

Dr. F. X. Dercum presented a case of probable brain tumor.

Dr. Spiller said he did not understand why the case should be considered as nuclear in its lesions. To have nuclear lesions of all the motor and sensory nuclei of the cranial nerves on one side would be remarkable. With the history of neoplasm in the roof of the pharynx Dr. Spiller thought the diagnosis should be tumor at the base of the skull on the right side.

Dr. S. F. Gilpin and Dr. Thomas B. Early read a paper on the drainage of the cerebrospinal fluid as a factor in the treatment of nervous syphilis.

Dr. Charles M. Byrnes said that if he understood Dr. Gilpin's remarks correctly, it appears that the author's idea is that by repeated drainage of the cerebrospinal fluid he hopes so to reduce the intraspinal pressure that drugs administered by the circulatory channel may, by osmosis, eventually make their appearance in the cerebrospinal fluid. Dr. Byrnes objected to this reasoning because of the fact that osmosis does not depend upon fluid pressure, but upon the concentration and ionization of soluble salts on the two sides of a dialyzable membrane. If, therefore, mercurial and arsenical salts when administered through the circulatory channel exist in a dialyzable form, and osmosis is the only factor concerned, they should be demonstrated in the

cerebrospinal fluid regardless of variations in pressure. Furthermore, if Dr. Gilpin's hypothesis is correct, then after a course of mercurial inunctions and repeated drainage, mercury should be demonstrable in the cerebrospinal fluid, but this observation has not been made.

It seems therefore that the authors have succeeded in producing slight cytological changes in the cerebrospinal fluid by repeated drainage, and that the clinical improvement which the patients have shown might just as easily be explained by the thorough course of mercurial inunctions. It has already been shown that repeated drainage does alter the cell count and globulin content of the spinal fluid, and in Dr. Byrnes's observations the cell count from any one lumbar puncture varies considerably if the count is made upon the first or last cubic centimeter of fluid removed.

Dr. S. F. Gilpin said Dr. Early could answer the questions about the cerebrospinal fluid examinations. In taking the cerebrospinal fluid the test tube was generally filled after a few drops had escaped after the needle was inserted and 5 c.c. withdrawn. He said they were following this out quite extensively, treating quite a number of cases since they feel that they have had results. Of course he knew that it was too soon to look for anything they could count on and he would like to have at least three to five years' work on it, but as he said in the opening remarks, somebody else was working on the same idea and they thought they might as well report these cases as a preliminary report. They tried once and found no mercury in the spinal fluid, but the patient was not well under treatment. Since then they had had no chance to try it. They had to depend on the department of chemistry. Whether it is mercury or something else that passes from the blood into the spinal fluid, they are seeing results clinically that induce them to keep at work.

Dr. Alfred Gordon asked whether Dr. Gilpin observed any complications from such frequent lumbar puncture, such as frequent severe headaches. It seemed to him that a matter like this ought to be handled with great care.

Dr. Gilpin replied that they had no bad results, excepting in one patient, who complained of headache the same afternoon, but he had been treated several times since with no ill effects and he was the only one who had complained at all. They kept the patients in bed twenty-four hours after puncture.

A TUMOR OF THE PARIETO-OCCIPITAL REGION WHICH HAD CAUSED LATERAL HOMONYMOUS HEMIANOPSIA

By J. H. Lloyd, M.D., and M. H. BOCHROCH, M.D.

Dr. M. H. Bochroch gave the clinical history of the patient, whom he had seen in St. Joseph's Hospital. The man was a native of Austria, aged 42 years, a laborer. His earlier symptoms had been extreme headache and vertigo, with stiffness and pain in the neck. His gait was rather unsteady, with a tendency to go to the right. There was also cerebral vomiting. On admission to the hospital, a few weeks after the onset of his affection, he had no paralysis of any cranial nerve, but later the left third nerve was partially, and the left sixth nerve completely, paralyzed. There also developed in time a right facial paralysis of the cerebral type. Pain and tactile senses were preserved in the extremities. A right lateral hemianopsia was observed. There were also choked disks. A decompressive operation was done by Dr. Nassau, over the left parieto-occipital region, immediately over the tumor, but as the latter was entirely subcortical, it was not observed at the operation. Later the patient was removed to the Philadelphia Hospital, where he

died, and the tumor was observed postmortem. It was a very large growth in the parieto-occipital lobe.

Dr. J. Hendrie Lloyd said that he had had this patient under his care at the Philadelphia Hospital, to which he had been removed from St. Joseph's. The tumor is a very large one, and is entirely subcortical, occupying the left parieto-occipital region. It lies underneath the angular gyrus and must have cut off its fibers; and it must also have interrupted the optic radiations. It is thus in a position to support Ferrier's opinion, that a lesion of the angular gyrus is necessary for a permanent hemianopsia; but as it cuts off the optic radiations going to the occipital lobe, especially to the cuneus, it also supports the view that the visual cortex is entirely in the occipital lobe. In other words, it is not determinative as between these two opposing views. It merely shows that a lesion in this part of the human brain causes an homonymous hemianopsia.

The tumor probably made some pressure on the structures at the base of the brain and thus caused a partial paralysis of the third nerve and a complete paralysis of the sixth nerve on the side of the lesion. Ferrier found that electrical stimulation of the angular gyrus caused movements of the eyes, but these were probably excited by mere subjective visual impressions. A destructive lesion of the angular gyrus does not cause paralysis of the ocular muscles.

This patient's speech affection, which seems to have been a form of word-deafness, as well as it could be made out in a man talking a Slavish dialect, was doubtless due to the large size of the tumor, causing it to make pressure on the speech-zone, especially the temporal lobe.

The patient was also tested for the Wernicke pupillary inaction, and this was found wanting. The pupils reacted to light thrown on the blind halves of the retinae. This confirmed the diagnosis that the lesion was situated posterior to the primary optic centers, which are located in the external geniculate body and the corpora quadrigemina.

It is to be regretted that the visual fields in this case were not charted while the patient was in St. Joseph's Hospital. It was too late to do it at Blockley, as the man's mind was too much impaired. Nevertheless, an homonymous hemianopsia was determined at both hospitals by competent observers.

Dr. George E. Price said he had been much interested in this case. The man entered the Philadelphia Hospital on Dr. Price's service, and he had made the diagnosis of tumor in the occipital lobe because of the hemianopsia with absence of the Wernicke pupillary inaction sign, which test Dr. Reber had made at Dr. Price's request. The other symptoms were thought to be secondary, as the result of pressure. The case was most interesting and instructive and he was very glad to have the opportunity of seeing the specimen.

Dr. Charles K. Mills said that as is well known Dejerine has indicated and others also, but he especially, that the angular region is the center for word-seeing. Various data point in this direction. This center for word-seeing is largely a macular center. It is preëminently by the macula that letter-seeing and word-seeing are brought about. Dr. Mills had no doubt, in fact it had not been questioned in this discussion, that there is a macular distinct from the panoramic or peripheral representation. More than this, there is a half macular representation which Dr. Mills said he thought he was probably the first to point out. Many years since he observed two cases in which there was a macular hemianopsia as indicated by certain studies of the patient's powers of recognition of words and the halves of words. He was in favor of the view that there is a cortical representation of the macula in the angular or angulo-occipital region in spite of the observations of Bramwell and some others. It is possible that there may be a macular repre-

sensation which has not to do with word-, letter- or number-seeing, but with other forms of central vision. In other words, there may be a higher and a lower macular and perhaps a higher and lower peripheral representation. If this be true the lower cortical center will probably be in the calcarine region.

Dr. William G. Spiller and Dr. George P. Müller reported a case of endothelioma of the temporo-occipital lobe with partial motor aphasia from enlargement of veins in Broca's area.

Dr. D. J. McCarthy read a paper on cerebrospinal concussion.

VERBAL AMNESIA AND ALEXIA

By Dr. Alfred Gordon, M.D.

A middle-aged man without a history of syphilis and with negative Wassermann suddenly lost consciousness ten months before he died. He soon recovered. Two months later he came under Dr. Gordon's observation. He presented no paralysis. He had difficulty in recalling names of objects, but he was able to recognize when the right name was mentioned. Spontaneous speech was comprehensible for individual words. He recognized his mistake. When reminded he could repeat the name but he had to do it promptly, as otherwise he would forget it.

Reading printed matter, also his own previous writing, was difficult.

Some time later he developed a confusional state from which he recovered in a week. A later examination revealed the same verbal amnesia as before but also an inability to carry out orders. He would do correctly the first part of the order but not the last. The reading was still difficult. A third examination, made two months later, revealed an aggravation of the above symptoms and a distinct word-deafness was present. Alexia was complete. In spontaneous speech he was muddled. He had paraphasia and paraphagraphia.

The eye examination showed a pathological condition only at the last examination, viz., choked disks and retinal hemorrhages.

There was at no time motor aphasia or dysarthria. An operation was advised and accepted by the patient, especially in view of his severe headache. A soft mass was found in the left temporo-parietal region.

Suppuration soon set in and the patient died at the end of three weeks. At autopsy a gliomatous tumor was found involving the posterior portions of the first and second temporal gyri, angular gyrus and a portion of the occipital lobe. The lenticular zone, also Broca's region, were intact.

Dr. Gordon then analyzed the verbal amnesia from the point of view of Wernicke's conception of transcortical aphasia. The anatomical stipulation with regard to the latter made by Wernicke, namely, that the motor and sensory speech centers must be intact, does not find its corroboration in the present case, in view of involvement of sensory speech centers. Dr. Gordon further discussed verbal amnesia and considered it as an initial manifestation of word-deafness. He believes that an inability to recall names means a deafness to one's own words. The evolution of the symptoms in the present case justifies Dr. Gordon to make such an assumption. Finally, he considered, the case from Marie's standpoint. The motor speech center and Marie's lenticular zone were intact in the present case.

NOVEMBER 26, 1915

The President, DR. S. D. W. LUDLUM, in the Chair

Dr. George Wilson presented two cases showing neurological symptoms (muscular and optic atrophy) following severe hemorrhage from the nose and lungs.

Dr. T. H. Weisenburg said that the first patient, Alexander Stewart, he remembered very well because he was admitted while he was on duty. The point Dr. Weisenburg emphasized was that the patient had optic neuritis preceding the optic atrophy. Dr. de Schweinitz studied the man at that time and thought this unusual. The second patient came into Dr. Weisenburg's service four or five months previously and he thought at that time that the patient had an irregular form of spinal muscular atrophy.

A PATIENT WITH ISOLATED CERVICAL SYMPATHETIC PARALYSIS

By H. Maxwell Langdon, M.D.

Mrs. M. E. H., white, age 28.

Came to the clinic of Dr. John K. Mitchell with the complaint that for the preceding five or six months lumps had appeared on various parts of her body, soles of the feet, arms, etc., appearing suddenly, lasting from a few hours to two days and disappearing as suddenly.

Her family history was negative as far as the present condition is concerned; she had had measles, mumps, chickenpox in childhood and rheumatism at times for the past four years; she has one child six years old, living and well, no miscarriages. Her menstruation is always scanty and somewhat painful, and very irregular, at times six months absent, the last was August 10, 1915, and she does not believe she is pregnant. She has had a large thyroid for the past twelve years, the right lobe possibly larger than the left; pulse between 90 and 100. Has considerable frontal headache at times. Right eyelid has drooped past four years.

Physical examination except for the above conditions was negative, except as concerns the ocular structures, where the following findings were recorded: O. D. V. 6/60 with myopia corrected 6/6, O. S. V. 6/6. O. D. palpebral fissure 8 mm., O. S. fissure 9 mm.; O. D. pupil 2 mm., O. S. pupil 3 mm.; O. D. exophthalmos 13 mm., O. S. exoph. 13.5 mm. Both pupils responded well to light and accommodation, ocular rotations full and equal, with no nystagmus.

After three drops of a 5 per cent. solution of cocaine, thirty minutes elapsing: O. D. fissure 8 mm., O. S. fissure 10 mm.; O. D. pupil 2 mm., O. S. pupil 5.5 mm.; O. D. exoph. 13 mm., O. S. exoph. 14 mm.

Ophthalmoscopically the media are clear, the disks normal in color and outline, and there are no fundus changes. X-ray examination of the cervical region is negative and the Wassermann reaction is negative.

Neurological examination is negative, there being no sensory or other disturbances pointing to involvement of the cervical sympathetic system, according to Drs. Mitchell, Eshner and Cadwalader, all of whom have examined her. Her knee jerks are normal and her station good; there is no sign of clonus in any of the extremities.

It seems impossible that the lesion causing the condition can be in either the medulla or the cord, since there is no sign of any involvement of neighboring centers or tracts; the most probable cause seems the pressure of the thyroid on the nerves in the neck.

Dr. William G. Spiller stated that he was reminded by seeing this woman of a woman who was in the Salpêtrière in 1895. She differed in some respects but was like this patient in others. The woman was later reported by Dejerine as a case of unilateral syringomyelia, with hemiatrophy of the face and sympathetic paralysis of the face.

In Dejerine's patient the sympathetic paralysis and hemiatrophy of the face were caused by a lesion of the spinal cord, whereas in Dr. Langdon's patient these symptoms probably were produced by pressure of the enlarged thyroid on the cervical sympathetic cord. Dr. Langdon's patient seemed to Dr. Spiller to have facial hemiatrophy.

Dr. Samuel Leopold presented a case of paralysis of both external recti muscles following injury of the head.

Dr. Alfred Gordon said that while it was true that in the nuclear palsies the course is usually progressive, nevertheless there are cases on record of disappearance of symptoms following infectious diseases. He had in mind two cases of children who had whooping cough. They became suddenly unconscious and on recovery paralysis of the external recti was observed. Another patient, a woman, also had loss of consciousness and had paralysis of the external recti. In this case there was no bleeding from the nose or the ear. Could we not consider here, in view of the negativeness of the usual symptoms of fracture at the base of the skull, whether a nuclear palsy followed a little hemorrhage in the fourth ventricle. A slight hemorrhage there is sufficient to produce an apoplexy. A child whom Dr. Gordon still has under observation, who had had an attack of whooping cough and developed palsy of the external recti, is rapidly improving. In view of the absence of nose and ear hemorrhage, which possibly excludes fracture of the skull, we may admit in the presented case a hemorrhage in the fourth ventricle.

A CASE OF SPINAL CORD TUMOR IN WHICH THE SYMPTOMS DISAPPEARED AFTER SPINAL PUNCTURE

By T. H. Weisenburg, M.D.

Dr. Weisenburg reported the case of a patient, sixty-seven years of age, who presented the symptoms of a spinal cord tumor. This man first complained of pain in the lower lumbar region in July, 1914, the pain extending first to the thigh on the right side and then especially to the entire left leg, it being of a numb and then again of a sharp and shooting character. Accompanying this there appeared a gradual rigidity of the whole lower back, the pain and rigidity increasing to such an extent that the patient could not walk without pain. Dr. Weisenburg saw him three months after the onset. At this time the patient had great tenderness in the lower part of the spine and hip with corresponding rigidity and lack of movement, tenderness over the left leg, no distinct disturbance of sensation over the left leg, but that some diminution of sensation was present was evident from the nature of the responses. Bladder and rectal functions were normal. The abdominal reflexes were present. The left cremasteric reflex was absent. The right knee jerk was quicker than normal. The left was entirely absent. The Achilles jerks were normal. Plantar irritation showed a distinct Babinski on both sides. As a result of this examination a diagnosis was made of a dural tumor over the left first, second, third and fourth lumbar segments pressing upon the cord.

A lumbar puncture was made between the second and third lumbar vertebrae, that is below the end of the cord and supposedly below the tumor. The puncture was very painful to the patient and a large amount of bloody fluid came out under great pressure. Examination of this showed nothing but blood cells and was otherwise negative. From that time on the pains gradually disappeared and the left cremasteric reflex and the left patellar jerk came back within a few days. When the patient went home his son, a competent physician, made frequent reports and from this it was apparent that the Babinski reflex disappeared in about two months' time. After the patient returned home the pain gradually disappeared, and the weakness of the left leg became less as was also the case with the rigidity of the spine. A letter received from his son a year after the puncture stated that the patient was as well as ever, that with the exception that the left leg tired more easily than the right he was altogether normal and had been so for a number of months.

It is apparent from this that there was not present a dural tumor but an idiopathic circumscribed serous cyst and that the contents of this were liberated at the time of the spinal puncture. The interesting point about the whole case is that it teaches that in every instance where a spinal cord tumor is diagnosed a lumbar puncture should be made first of all always below the tumor for the purpose of studying the cerebrospinal fluid because, as it has been shown, the presence of a tumor higher up interferes with the free circulation of the fluid and certain pathological changes will be present which aid in the diagnosis of the tumor. Secondly, this case teaches that it is advisable to puncture at the supposed location of the tumor, for it is possible, as in this case, that the tumor may be cystic and all the symptoms disappear. Brain puncture has been advocated for the diagnosis of cerebral tumors and there is no reason why a spinal puncture, which is much easier, should not be done in spinal cord tumors.

A CASE OF HEMIPARESIS WITH PRONOUNCED ASSOCIATED MOVEMENTS

By William B. Cadwalader, M.D.

R. L. (No. 11415, U. of P. Dispensary for Nervous Diseases), male, aged 18, was referred by Dr. Edward Martin. This patient stated that his parents were healthy and that he had been weak in the left arm and left leg as long as he could remember. No details of the onset could be obtained but it seemed certain that hemiparesis had existed since birth. The pupils were normal and the eye grounds were negative. The cranial nerves all acted normally. Voluntary movements of the muscles of the lower part of the face were equally impaired on each side; and muscular contraction on one side seemed to cause a similar movement on the opposite side of the face. Strictly unilateral voluntary movement of the lower facial muscles could not be performed. With the jaws closed, the lips could not be as widely separated as they should have been normally. The muscles of the upper part of the face were not affected. All movements of the left upper extremity were paretic. The finer movements of the hand and fingers were awkward and weak. With each movement of the left, the paretic hand, the same movement was also performed at the same time by the right hand, and furthermore, with each voluntary movement of the right hand, the unaffected one, there was also performed at the same time the same movement by the left hand, the affected one, but on account of partial paralysis the muscular contractions of the left hand could not be so perfectly performed as they were

with the right hand. Unilateral movement seemed to be impossible. Only bilateral movements of the hands were observed. The same phenomena were observed in the feet and toes, though to a much less degree. This did not interfere with locomotion. The left leg was quite powerful but there was a perceptible limp in walking. The tendon reflexes of the upper and lower extremities were exaggerated on the left side and on the right side they were normal. A definite Babinski sign was elicited on the left and an abortive type of ankle clonus. Sensation of all forms was everywhere normal.

Evidently there had been a congenital defect or an injury at birth of one cerebral hemisphere. It seems as if the motor tracks of the sound side innervated both sides of the body.

The associated movements in this case were very pronounced and did not seem to be affected by the will or by closing or opening the eyes. Such pronounced associated movements as this case presented are uncommon; but a similar case was reported before this Society by Dr. Charles W. Burr in 1913.

Dr. Grayson P. McCouch (by invitation) read a paper on a relation between the myopathies and the glands of internal secretion.

Dr. William G. Spiller said that at a recent meeting of the American Neurological Association, when he (Dr. Spiller) reported the case briefly which Dr. McCouch had used in his paper, both Dr. E. W. Taylor and Dr. Joseph Collins said that they had very similar cases. The woman, comparatively young as she was, had cataract. The study of the family form of cataract is an interesting one and recently attention has been called to the association of the family form of cataract with myotonia atrophica. He thought it would be important if Dr. McCouch would trace so far as possible the family history of this woman to see how many members of her family have had cataract.

Dr. H. Maxwell Langdon said that familial types of cataract, while they are not common, are not excessively rare. Doyon, of Oxford, has reported several families with them. Dr. Langdon has seen several people with familial types of cataract. There was one family of which five or six members were students at the University Hospital and none of that family had any myopathy which would show to the casual eye. They varied in age at that time from eight or nine years of age to the early twenties. Nettleship has reported several cases with familial cataract.

Dr. McCouch said in regard to the question of cataract there was one other possible relation that occurred to him. It has been a frequent complication not only in myotonia atrophica, but still more frequent in tetany, and Rundborg attributes myotonia and tetany to hypothyroid function.

Dr. Baldwin Lucke (by invitation) read a paper on *tabes dorsalis*: a pathological and clinical study of 250 cases.

Dr. Francis X. Dercum said that it was desirable, if possible, to arrange the material of the records in such a way that we could compare the symptoms observed in the earlier years with those observed during relatively recent times. There is an impression abroad that certain symptoms, such as mal perforans, Charcot's joints, trophic disorders generally and coarse ataxia are observed at present somewhat less frequently than formerly. He would like to know whether Dr. Lucke's statistics enabled him to answer this question.

Dr. Charles K. Mills thought the paper a valuable one and that the Society should thank Dr. Lucke for it. In regard to Dr. Dercum's remarks he had the impression that *tabes* like syphilis itself has changed considerably or changed somewhat in the relative severity of the special manifestations. The changes are greater in nontabetic syphilis than in *tabes*. He thought this experience had been observed by others who had had experience now reach-

ing above forty years. Dr. Mills's experience in the nervous wards of the Philadelphia Hospital was not far short of forty years, about thirty-eight years, but, of course, the wards themselves have increased gradually in size from a very limited number of patients to the present very considerable number. Dr. Mills was inclined to think that there were more of what might be called abortive cases as regarded symptomatology, that is, more cases that did not reach the classical full-fledged type of the old or even of the more recent descriptions of the cases. Dr. Mills thought that the ataxias were not so marked or so early marked as formerly, but still it was a subject about which one should not speak at any length without really getting down to hard work and preparing the data at his command. This had been done over a limited number of years by Dr. Lucke and the material at Blockley is largely at disposal for thirty or forty years, although the manner in which the notes have been made during that time has been such as not to give the opportunity of making uniform and valuable observations.

Dr. Lucke said he would like to ascertain whether the coarse type of tabes changed in severity, but he did not think it was possible from the records. The records kept ten years ago were kept far better than they are kept to-day.

PONTO-CEREBELLAR TUMOR

By Alfred Gordon, M.D.

Middle-aged man complained for many months of headache and dizziness. The condition would improve and then grow worse again. At the first examination made a few months before the patient died there was some headache over the left frontal region, also some unsteadiness in walking. An objective examination revealed a very slightly exaggerated knee jerk on the left, but no other abnormal reflex. The eye examination was entirely negative. As the patient's serum presented a positive Wassermann, cerebrospinal syphilis was thought of. Soon a second examination was made. This time there was a slight tendency to fall to the right, a very slight deviation of the lower face to the right and a very slight ataxia of the left hand. The eyes were again negative. Repeated examinations revealed the same left-sided symptoms. However, they were so slight that they could be easily overlooked. Soon sensory disturbances on the left side of the face made their appearance. The left facial palsy became complete. *Adiadochokinesis* was complete on the left side. A nystagmus appeared in the left eye upon turning the eyes to the left. The left external rectus became paralyzed. The fundi of the eyes began to show engorgement of the veins and edema of the papillæ made its appearance. Hearing of the left ear was impaired. The diagnosis of a leftsided tumor in the cerebello-pontine angle was evident. A subtentorial decompressive operation was performed. Some relief was obtained, but the patient soon relapsed and expired. A tumor was found in the place diagnosed. It is a round-cell sarcoma. Pressure was observed on the cerebellum, pons, eighth nerve and deviation to the right of the pons and medulla was distinct. The case is instructive for the reason of the presence of extremely few symptoms during a long period. They were so extremely slight that they could be easily overlooked. Besides, eye symptoms began to appear only toward the end. Although the patient was syphilitic, the neoplasm was not syphilitic.

NEW YORK NEUROLOGICAL SOCIETY

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The President, DR. WILLIAM LESZYNSKY, in the Chair

CASE OF CEREBROSPINAL SYPHILIS

By E. G. Zabriskie, M.D.

The patient was a man 39 years of age, a locomotive engineer by trade. In October, 1913, his brother, a railway engineer, was killed in a wreck. This depressed the patient a great deal. He began to be very talkative and his ideas assumed an expansive character. He maintained that a bill should be introduced in Congress making bridge and trestle inspection compulsory. He talked about it and the accident all the time. He became extremely agitated in manner and speech and his hands were so tremulous that he had difficulty in feeding himself. Dr. Gaines, who examined him at this time, said he displayed no realization of the seriousness of his mental condition. At that time he had Argyll-Robertson pupils, unequal in size, irregular in contour, speech somewhat indistinct, knee jerks somewhat exaggerated, a slight facial and manual tremor. He was sent to the Johns Hopkins Hospital where at that time it was learned that he had in addition to the above symptoms a desire to buy tracts of land in Florida and he expected to become rich thereby. In a short time he developed marked insomnia, talking constantly and extremely nervous and agitated in his manner, so much so that for a period he was unable to feed himself. His deportment was good and his language proper. Under treatment in a sanitarium, where it was necessary to confine him, he slept well, gained weight and became quiet. On February 19, 20 and 21, 1914, he was in an elated, over-talkative condition, expressed many grandiose ideas about his future plans which were extremely visionary in character and impossible of execution. He apparently did not realize the seriousness of his mental condition. Physical examination was the same as that of Dr. Gaines. There was elicited from his past history the fact that he had a primary sore about fifteen years ago. The examination at the Johns Hopkins serological department showed a positive Wassermann in the cerebrospinal fluid, positive gold chloride reaction, positive globulin, thirty cells. Diagnosis of general paresis was made. He was given under Dr. Barker's direction five or six injections of salvarsanized serum, which were followed by a very marked clinical improvement. He was then given neosalvarsan intraspinously by the Ravot method which was followed by sphincter incontinence, spasticity of the legs, intense pains in the legs and rectum. Root pains were very similar to those at the present time. The mental symptoms had entirely subsided. The patient had been extremely uncomfortable, complaining constantly of pain and stiffness in the legs, sleeplessness, incontinence of urine and feces. He had had three further injections by the Swift-Ellis method and a series of five intravenous injections of 0.5 gm. salvarsan. His blood had become negative, but the cerebrospinal fluid had remained constantly positive. Cells and globulin remained plus. The mental attitude at the present time was that of a man constantly introspective over his sad plight and very discouraged. The physical examination showed unsteady station, spastic gait; left pupil larger than right, both irregular and fixed to light. The facial expression was dull and listless. Reflexes of the arms were slightly increased and the abdominals slightly exaggerated. Ankle jerks

were present, left greater than right. There was a double Babinski and no ankle or patellar clonus. The serological findings were: blood Wassermann positive; cerebrospinal fluid positive; cells nine; globulin weakly positive; gold chloride positive. The case was presented to illustrate the possible consequences of certain methods of administration of salvarsan.

RESULTS OF INTRASPINAL TREATMENT IN GENERAL PARESIS

By Hanson S. Ogilvie, M.D.

The cases reported in this communication presented at the original examination the classical syndrome of dementia paralytica. All gave positive serobiologic evidence of syphilitic disease in the cerebrospinal fluid, and all but two showed positive findings in the blood serum. The average duration of symptoms was one year and nine months, the shortest being six months, and the longest four years and six months. Out of the entire series only five were "socially possible" when treatment was instituted. Twenty-two cases had previously received intensive intravenous and intramuscular treatment over periods varying from six months to two years, and eight of this number had had remissions of from two to eight months with relapse.

The method of intraspinal treatment employed was a modification of the one originally described by Swift and Ellis. The curative serum was of standard strength, prepared *in vitro* according to a technique detailed by Dr. Ogilvie in a previous communication. The use of this serum in more than eighteen hundred treatments has shown it to be both safe and effectual as a curative agent in types of syphilitic nervous diseases in which intraspinal therapy is indicated. In general paresis particularly Dr. Ogilvie has found it to be far superior to serum prepared according to the method of Swift and Ellis because in this condition, more than all others, a serum of relatively greater strength and uniformity is essential.

The total number of patients treated in this series was thirty-five. The average number of treatments given was twenty-one. The minimum number required to induce a remission was six, and the maximum was fourteen. The largest number given to one patient was forty-two. Salvarsan intravenously and mercury intramuscularly were given systematically, the intravenous treatments being scheduled to alternate with the intraspinal. The results can best be described by dividing the cases into three groups: (1) those in which complete clinical remissions occurred; (2) those in which remissions were incomplete; and (3) those which failed utterly to respond to treatment.

The first group comprises twelve cases, or approximately thirty-four per cent. of the total. All of these were totally incapacitated for work of any kind, eight being confined in institutions for the insane. In each the remissions were clinically complete, nine having resumed their former vocations in life. The average duration at this time is one year and two months; the shortest being nine months and the longest one year and eight months. Biologically four of the twelve are completely negative in both the blood and spinal fluid; eight are normal as regards the cell and globulin contents, but positive to the Wassermann reaction in the stronger titrations. Aside from a disappearance of tremors, none of these showed any noteworthy changes in the characteristic physical signs except a very appreciable improvement in the pupillary light reflex in three cases. There was a marked improvement in the general health of all.

The second group comprises fourteen cases, or forty per cent. of the total. All of these were totally incompetent, either confined in institutions or kept at home in the care of nurses. The remissions induced were not complete

but sufficiently well marked to render the patients socially possible. None have been able to resume their vocations but all are able to live at home and attend to their daily functions and personal affairs without attendance. The average duration of remissions in this group is twelve and a half months. The cell and globulin contents of the spinal fluid were influenced to varying degrees, the cells, in the main, being reduced to normal. The Wassermann reaction was favorably influenced in ten cases, but none became completely negative.

The third group comprises nine cases, or approximately twenty-five per cent. of the total. Although seven of these had partial remissions lasting from one to six months, none were of the character of the first two groups, each suffered a relapse, and all should be counted as total failures both from a clinical and a biologic point of view. It is interesting to note that some of the most promising cases in the beginning were among this group that could not be influenced by treatment. Only two had been committed and four of the lot had shown symptoms for less than nine months.

Considering the results as a whole, we have twenty-six remissions, averaging over a year each, out of thirty-five cases. Twelve of these are clinically complete, and four of the twelve both clinically and biologically so. Fourteen are incomplete but the improvement was sufficiently well marked as to enable the patients to take care of themselves. Naturally the first question that occurs to one is: How permanent will the results prove to be? Our knowledge regarding many obscure phases of the subject is as yet so meager that no prediction carrying any degree of accuracy can be made. In true parenchymatous disease of the brain it is practically impossible to secure a complete negative Wassermann reaction. The four negative cases in this series were probably not of this type, but cases in which the specific process was confined largely to the interstices of the cerebral tissues. The outlook in these is probably better than in the other cases that are still positive to the Wassermann reaction, and yet many cases of remissions of several years' duration, occurring spontaneously and without treatment of any kind, are on record. Such cases were undoubtedly positive biologically throughout the entire period despite the fact that no manifestations of the psychosis were apparent. Obviously other factors determine the duration of a remission in a given case besides the presence or absence of positive laboratory findings, factors that are as definite and as elusive as those that determine the escape or involvement of the central nervous system in the beginning. The establishment of a remission is something gained, but it is merely one step in the right direction. To make it permanent difficult problems of immunity must be solved. Investigations along these lines have already been started and if carried to a successful completion, then, perhaps, we may speak of "curing" general paresis.

In judging the value of intraspinal treatment, however, one cannot take the duration of a remission as the only indicator. No two cases, and no two series of cases, are identical. The method is entitled to recognition as a rational therapeutic procedure by reason of the fact that a far greater percentage of cases of all kinds respond to it than to the older methods of treatment. In this series over seventy-four per cent. were influenced favorably to a degree not approached by the most heroic intravenous treatment either alone or with mercury. But here, as in every other department of medicine, the time to treat the disease successfully is in its incipency. The value of any kind of therapy must be judged by its cause-removing properties solely. No method of treatment possesses inherent reparative properties. If intraspinal treatment is efficacious to any degree in clinically well-established paresis, it certainly has a field of greatest usefulness if employed in the earliest stage of involvement before the parenchyma of the cortex has become the seat of degenerative changes.

In conclusion Dr. Ogilvie emphasized the importance of infinite care and proper judgment in regard to serum strength and frequency of administration. So many factors determine these most essential features in this work that it is utterly impossible to follow any fixed set of rules. Unless the clinical picture is made more complex by the presence of tabetic symptoms, a much stronger serum is indicated in general paresis than in any other condition. A vital prerequisite to successful treatment is a clear conception of the magnitude of the undertaking. Not infrequently he had heard the intraspinal method condemned on the ground that it is attended with too much hazard to warrant its use, when investigations have revealed gross inaccuracies of detail in the preparation of serum. Others have abandoned it because three or four treatments failed to bring results in a given case. An enormous amount of treatment, extending over many months, is often required before the activity of the disease is checked. Such cases can best be controlled by maintaining a steady, even course, well within the patient's tolerance, than by resorting to heroic dosage at short intervals.

INTRASPINAL TREATMENT OF PARESIS

By George Amsden, M.D.

This report is based upon 16 cases of paresis. Since the treatment was started at Bloomingdale up to April 13, 1915, 19 cases of paresis had been admitted. Of these 14 have been treated, of the remaining 5 which were not treated, 3 were in critical condition on admission and did not recover enough to make it safe to begin it. In the other two cases not treated, the relatives opposed it. Of the 14 cases treated, all but three are included in this report. One of these was treated once only. He became too excited to treat and died of an intercurrent pneumonia. Another case was treated four times. He improved somewhat, but was taken home and became violent in two weeks. The third case was far advanced on admission. He was treated six times without benefit. Inasmuch as he was treated so little and since also he was so dilapidated on admission he was excluded, and perhaps unjustly, from the cases this report is based upon. This accounts for 11 of the 16 cases. In choosing the five initial cases the whole number of cases in the hospital was canvassed. Very advanced cases were not considered. All others were accepted for treatment in which permission could be obtained. Two of them had been in the hospital one year. This represents fully the degree of selection employed in putting together the group of cases submitted to-night and represents a fair average of hospital admissions.

From the point of view of ultimate outcome it is obvious that, for analysis, the more recent cases are of less value than the older ones and tend to give the net value a better look. To avoid this as far as may be it is possible to divide the entire group into two. The first group of seven cases was treated at about the same time and about two years have elapsed since they were undertaken. The second group of nine more recent cases comprise those whose treatment began not later than early in the present year.

Of the seven cases first treated, two improved only slightly, while five reached a high level of improvement. All of the five cases which reached a high level of improvement retained this improvement for upwards of a year or more, three have since relapsed seriously, while two maintain this improvement.

Of the second group of nine, more recently treated cases, five attained a high or fairly high level of improvement, and three of this five have retained it for a considerable period.

Roughly, therefore, this entire group of sixteen cases would indicate that about sixty-two per cent. of cases greatly improve but that all but about twelve per cent. will not retain improvement for a prolonged period. These cases, therefore, lead us to infer that this method of treatment can claim relatively little as an ultimately curative measure. Its favorable results, if any, can be spoken of in terms of remission. At the outset, an attempt to estimate the value of any treatment of paresis in terms of remission is embarrassed by the fact that we have no satisfactory study showing data as to remissions in untreated cases whose diagnosis was determined with the precision now applied to treated cases. We are compelled, therefore, to consult our general impression as to the variations in untreated cases and keep in mind the danger inherent to such a criterion.

In attempting to figure out the value to be placed upon the remissions Dr. Amsden considered their duration and quality. In the first place the gross indications are that about 38 per cent. of the unselected cases to which this method is applied may be expected to show no improvement at all, but on the other hand, they are not essentially injured by the treatment. It seems reasonable to suppose that the remainder, about 62 per cent. of the cases treated, will show a marked improvement. Perhaps the only untoward result he had was a case of severe anemia. They had, however, admitted cases in delirium which had probably previously been treated too vigorously. The duration of the remissions in his cases has in 25 per cent. been over a year. In about 19 per cent. the duration was between a half and one year. In the remainder, about 19 per cent., the remissions lasted three months at least.

The quality of the improvement as to physical condition offers relatively little of interest. Pupillary conditions remained essentially the same, in some cases improving. Reflexes were unaltered after treatment. Tremor might be diminished, and speech and writing defects were very likely to be improved unless they were very marked before treatment. Practically all the cases in the 62 per cent. referred to gained insight and in most cases this was quite thorough. A certain boyishness or undue enthusiasm was present in one or two of the patients, who were most successful in their work after they left the hospital. For the most part, however, the prevailing mood was one of seriousness, which in some instances at times attained to a mild anxiety. Otherwise Dr. Amsden was unable to characterize the quality of the remissions as much different from normal well being. A word should be said, however, as to the relapses. In three cases amounting to nineteen per cent. the relapses for a considerable time amounted to whining depression, in which the individual suffered a good deal. The appreciation of the situation was keen, as contrasted with the complacency which we notice characterizes the untreated cases. In two cases the relapses were not much different from those of untreated cases. In these cases, therefore, about 44 per cent. enjoyed a period of well-being closely approximating the normal for periods ranging from six to fifteen months. One patient has been in good condition for fifteen months, has done excellent work for a year up to the present time. One other patient, who lives in retirement, is still in good condition after fourteen months.

From the standpoint of the family, the resultant condition found in treated cases is by no means negligible. In all of the 62 per cent. a degree of well-being was reached in which the patients were capable of giving good information about their affairs and of exercising good judgment, at least for a short time. In at least three instances, in these cases, the status reached was one of considerable importance in arranging their affairs. In one instance the patient has been notably successful and has added very substantially to his income. On the other hand, if there is derived from this treatment an advantage to the family, either in enabling patients to set their estates to

rights or in exceptional instances in returning to earning capacity, it is not yet clear as to whether this may not be offset by prolongation of the burden which apparently these patients must eventually be to their family.

Dr. Amsden analyzed these cases also for the purpose of finding out whether they offer any suggestions as to what may be the most favorable kind of case for treatment. The group is too small to be taken very seriously from this point of view, but he ventured to state what he found: There were six cases of the tabetic type and ten of the cerebral type. Of those of the tabetic type, five or 84 per cent, did well. Of the ten of the cerebral type, five or 50 per cent, reached a high level of improvement. From the point of age of the patient, there were nine cases 45 years or over, and seven below 45. Of those above 45, 60 per cent, improved markedly, while 57 per cent, of those below 45 made similar improvement. From the standpoint of apparent advancement of the disease, it is of course obvious that advanced cases are out of the question. On the other hand, the early fulminating did not do as well as those of gradual, but not prolonged onset, although the most successful case in the group had marked symptoms for a year and a half before treatment. He was a tabetic, 49 years old. From the point of view of the laboratory findings, the most favorable cases were those in which the cells in the spinal fluid were gradually and progressively reduced to normal and showed little deviation in the process of reduction. Usually the Wassermann reactions in the blood and spinal fluids were also reduced, but this reduction did not appear to be parallel with clinical improvement. The clinical condition appeared, however, to follow the cell count in this respect, that a cell increase preceded an unfavorable clinical change. It is here, I think, that the efficacy of treatment is more nearly demonstrated. One repeatedly finds an increase of cells and a tendency to clinical relapse, followed by improvement after intensive intraspinal treatment.

His experience with treated and untreated cases leads him to believe that the intraspinal treatment with salvarsanized serum has, in a considerable number of cases, a positive influence in checking the progress of the disease, at least clinically. It does not stop it except in very rare cases. In cases where the disease had not yet made great progress and where there is some special reason for the family and patient to run better than an even chance of temporary improvement, especially as chance for improvement without treatment is not reduced, the method is encouraging. It would be unfortunate if apparent poor permanent success in arresting the disease should keep us from trying it and trying to improve it.

TREATMENT OF CASES OF CEREBROSPINAL SYPHILIS

By Henry A. Cotton, M.D.

At the Trenton State Hospital they had been treating cases of cerebrospinal syphilis for over two years and a half, and they had been able to classify three different types: general paralysis, tabes dorsalis and cerebrospinal syphilis, a mixed type, which was neither tabes nor paresis. The last type showed very marked sensory disturbances, Argyll-Robertson pupils, severe bladder disturbances, but, as a rule, no marked psychosis and they were consequently not committed to the state institutions. Altogether about 75 cases had been treated, and at the present time there were twenty-five patients under treatment. The treated cases fell into four groups: 1st, arrested cases (11 or 35 per cent.); 2d, much improved (7 or 22.5 per cent.); 3d, not improved (7 or 22.5 per cent.); 4th, cases which died (6 or 19.5 per cent.). Subsequent observations would change these figures somewhat, but they would not vary

to any great extent. Dr. Cotton's experience had been similar to Dr. Amsden's with regard to relapses and several of his most promising cases at the beginning of the treatment (some in spite of persistent treatment and others from the fact that they were removed and treatment discontinued) had shown a tendency to relapse. In spite of the fact that certain cases had relapsed, he thought the work had been extremely encouraging. An important point to be emphasized was that the patient must be treated in the incipient stage if good results were to be accomplished. The length of the duration was not always the index of the severity of the process, as some of the patients, in whom the duration was two years, had done remarkably well. In order for the treatment to be effectual it had to be administered early in the incipient stage. The question was, could this incipient stage be diagnosed by the general practitioner or the consulting neurologist or psychiatrist. He thought the answer was in the affirmative. There was no more reason why incipient paresis could not be diagnosed than incipient tuberculosis or any other disease where the treatment must be early to be effectual. Seventy-six per cent. of cases of paresis committed to the state hospitals were insane beyond any therapeutic help, which left 25 per cent. which could be much benefited by treatment, and often the progress of the disease could be materially arrested. The symptoms of incipient paresis should not be difficult to recognize and in the records of a large number of cases there were shown definite periods, from three to ten years, before they were committed to the hospital, when the patient had evidences of some neurological or psychic disturbance. Sensory disturbances were shown, such as dizzy spells, delirious episodes, mild depressions, neurasthenic episodes, irritability, change of disposition, general inefficiency; and on the neurological side, paresthesias, bladder disturbances, defects of vision, changes in the pupils, changes in writing and gait, high blood pressure without apparent cause. When such symptoms were present in a man of middle age or even younger, especially with a history of previous syphilitic infection, a thorough examination of the blood and spinal fluid should be made. These symptoms usually occurred during the incipient stage of paresis and might well correspond to the invasions of the spirochæte in the meninges. It was possible that even with a positive cell count, increased globulin, positive Wassermann reactions in the blood and spinal fluid and a positive gold chloride reaction, that such a case might not develop paresis, but chances were against this assumption, and such a patient should certainly be treated with salvarsanized serum intraspinally, or mercurialized serum. In two patients, in whom the most prominent symptom was high blood pressure, one was suffering from depression, ideas of poverty, but was attending to his work. When examined he had stiff dilated pupils, the eye grounds suggested specific trouble, and lumbar puncture revealed plus cell count, increased globulin and positive Wassermann in spinal fluid. The blood Wassermann was negative. This patient had been successfully treated, and biologically and clinically he presented at the present a normal picture. The other patient was a locomotive engineer who was apparently perfectly well and in the routine examination he was found to have a blood pressure of 220. He had a history of syphilis five years previously. Lumbar puncture revealed 80 cells per c.mm., 4 plus globulin and 4 plus Wassermann in the spinal fluid. The blood serum was negative. He had no headache and no neurological disturbance, except that the pupils were somewhat sluggish. While such cases could not be called paresis, Dr. Cotton was fully convinced that if untreated, such patients would, within a year or two, be classified as such. Thus they were considered incipient. The general practitioner should be educated to recognize the first symptoms of such a stage. In the state hospitals the disease had progressed too far to be benefited by treatment.

In regard to methods of treatment: The Swift-Ellis was familiar and

gave as good results as any. The criticism that the amount of salvarsan could not be estimated had been met by the Ogilvie method where a standardized serum was used. The cerebral puncture of Wardner had much to recommend it, but it was not likely to produce results where the Ogilvie or Swift-Ellis method had failed. Wardner's method might be more permanent and might not tend to relapse so much. The method of Byrne, mercurialized serum, might prove just as efficient as salvarsanized serum, and the increase in cost of salvarsan increased the necessity of a substitute. Two tabetic cases treated by this method did not react well; one died, one recovered and did well later. Recently he had gotten most encouraging results by this method. Its small cost was in its favor, especially for dispensary cases. The method of Hammond and Sharpe, ventricular puncture, had no advantage over the method of Wardner. A sixth method was their own modification, whereby they used the standardized serum of Ogilvie for cerebral puncture, and mercurialized serum for both cerebral and intraventricular puncture. It had not been used long enough to give a final report on. They had not been able to prevent relapses. Some patients had done well for six months or a year and had then relapsed in spite of treatment. In some the biological reactions were positive, in some negative. A persistently strong Wassermann reaction in the spinal fluid was a bad prognostic sign. Treatment should be continued till the Wassermann was negative. Most patients showed a decided improvement after four or five treatments; the cell count dropped; the globulin became negative, and the Wassermann much reduced; clinically also there was improvement. With an uninfluenced Wassermann, however, the prognosis was bad, even with clinical improvement. They had reduced the gold chloride test in many cases. The intraspinal treatment was not dangerous. Eight hundred intraspinal injections had been given and in only three were there irritative effects. These cleared up in a day or two, but they had severe pain. The fact that they had been able to produce remissions in 33 per cent. of cases with treatment, as against 4 per cent. without, warranted the feeling that the treatment was worth while. The treatment improved the physical condition and prevented the patients becoming useless and bed ridden. Interruption of the treatment was dangerous and regular treatment produced the best results.

Lantern slides were shown illustrating charts of patients.

Dr. H. C. Solomon, Boston, stated that when they started this work three years ago at the Psychopathic Hospital, Dr. Myerson had charge and he published his results. Later, Dr. Solomon treated a certain number of cases intraspinaly and the results were not particularly favorable and after a few months he became discouraged, as only one case out of the series recovered completely, serologically and clinically. They then adopted the ideas of the difference between the meningo-vascular syphilis and the syphilis centralis of Head and Fearnside; between the mesenchymal and the parenchymatous variety of Alzheimer. In the former type they expected improvement by treatment. They felt unable in many cases to differentiate between general paresis and Fournier's syphilitic pseudoparalysis or Binswanger's postsyphilitic dementia, and therefore felt that treatment was indicated. The method of treatment was salvarsan intravenously twice a week and dosage varying from 0.6 to 1.2 of a gram. Some cases also received mercury salicylate, intramuscularly, once or twice a week with potassium iodide, grains 15 to 100, three times a day. In a recent series of nine patients treated intravenously, two became much worse, seven were now able to go about their business, one woman had a baby who had never gone beyond the fifth month of pregnancy without miscarriage. Two of the cases, indistinguishable from general paresis, had been serologically negative for many months and had made clinical recoveries. It should be remembered, as Alzheimer had pointed out, there

were two processes in general paresis, a meningitic and a true parenchymatous degeneration with cell atrophy. This cell destruction could not be repaired, but many of the symptoms were due to meningitis and not to primary cell degeneration, and a good deal could be done to cure the meningitis. One early case, after having considerable treatment, died, and at autopsy showed no evidence of meningitis in brain or cord. Microscopically there was but very slight perivascular infiltration, but marked parenchymatous degeneration. Clinically the case was typically paretic. Oppenheim and Westphal stated that in cases that improved under treatment they had to change their diagnosis of paresis—if they improved they were not paretics. In regard to cases serologically negative, Nonne stated that cases that were serologically negative were not cases of general paresis.

Dr. I. Strauss, New York, said he thought this discussion was rather a fruitless one. They were not exactly sure of their ground. They had not the statistics, the biological tests, over a long period of time, to compare with present cases, no real scientific basis upon which to form judgment. Dr. Strauss knew that Dr. Cotton could make a better diagnosis of paresis than he could, but he did not think he would call the engineer, with high pressure, a paresis case. He had had such cases in the hospital with no sign of paresis. He had had a boy of 15 with blood pressure of 240 with 3 plus Wassermann in the spinal fluid, but that was a case of congenital syphilis, and no one would consider it a case of paresis. He would also take exception to the case of the patient who was depressed, but in whom the biological findings were positive, as being more than a case of cerebral lues. From his standpoint that was not paresis. In regard to the tabetic cases of Dr. Cotton, why form any judgment regarding the efficacy of the method because tabetic patients could walk? Fraenkel taught tabetic, bedridden patients at Montefiore Home to walk. It looked like a miracle, but he accomplished it. At one time they stretched their cords to make them walk. All kinds of treatment could bring results in tabes, even applying silver nitrate to the urethra was effectual. Another point was that other kinds of treatment than salvarsan had given results in paresis, as good, if not better than those shown to-night. At Wagner's clinic (*Neurol. Centrabl.*) Pilez treated paresis with tuberculin injections combined with mercury. He reported in 1911 that of 86 cases treated, 23 were able to return to work. In April, 1912, he reported that of the cases treated in 1911, 46 had died and of the 26 living, 10 were attending to work. If the presence of a positive Wassermann in the blood and spinal fluid in a patient who suffered from headache was to be regarded as incipient paresis, then we had to consider every case of lues in the secondary stage as belonging to this category. He was certain that most authorities would consider this as too extreme a standpoint, therefore the difficulty in diagnosis was another factor which rendered the discussion futile.

Dr. Bernard Sachs, New York, said he did not think they could confine themselves to general paresis. They could not exclude cerebrospinal lues; they must refer to lues of the central nervous system. Every form of general paresis was lues. They must speak of this treatment in its bearings upon the kind of lues of the central nervous system, especially these cases of assumed general paresis. In listening to the clinical histories this evening, as presented by Drs. Zabriskie and Cotton, some of them might have disagreed with the diagnosis of paresis, but all could agree that they were lues of the paretic or tabetic type. In his work with associates in hospital and in private work, he was among the first to advocate intraspinal treatment. Since that time he had become more indifferent, and had come to feel that the method had been unduly pushed. The question was whether more was accomplished by this intraspinal method than by the intravenous. The intraspinal method was more difficult and more likely to lead to serious complications, and had been

followed at times by disastrous consequences. He felt that he had seen as great and satisfactory improvement follow upon intravenous therapy as upon intraspinal. They had shown that very little salvarsan was found in salvarsanized serum, and that little was accomplished by that method. Almost any injection had been known to change the cell count and globulin. He had no fault to find with the Swift-Ellis or the Ogilvie method. They had been most carefully studied. They had also to determine whether more had been accomplished by these than by former methods of treatment. A patient had been referred a year and a half ago from the middle west. He had all the mental and physical symptoms of general paresis. He had had six intravenous salvarsan injections and the result was that he had improved sufficiently to be competent to undertake management of a large commercial concern. All that was noticeable was a slight exuberance, an undue optimism, but yet the man was not cured. He was merely in a remission and would sooner or later relapse. There was danger of attaching too much importance to remissions. The matter was an extremely difficult one. Perhaps there were more cases of remission now than formerly. The period, one or two years, was too short to speak of the cases as really cured. One suggestion to the larger hospitals he would make: the difficulty of getting salvarsan would increase, and the opportunity was at hand to compile very careful statistics as to the results of treatment in 1915-16, as compared with the salvarsan results of 1913-14. He did not believe that slight changes in the cell count were very important. "Cured" cases must not be only biologically cured, but clinically cured. The latter was of more importance. He believed with Dr. Ogilvie that many more cases were made socially possible with treatment, but he was not inclined to look upon these as cures, although the results were, in some cases, encouraging enough to warrant the treatment. Personally he should continue to give his cases most thorough intravenous treatment.

Dr. Walter Timme, New York, said that he had seen some of the cases reported by Dr. Ogilvie, which showed certainly remarkable improvement. Dr. Sachs had mentioned that he had obtained as much improvement with the intravenous method, and stated that it would do less harm than the intraspinal with salvarsanized serum. In the past six weeks Dr. Timme had seen three cases that had had absolutely no treatment for one year to eighteen months. At the beginning of this time the spinal fluid examination had showed from sixteen to eighteen cells, Wassermann positive and globulin in excess in each case. They had had no treatment of any kind during the entire year. Within the past six weeks their fluids had been again examined by competent laboratory workers, and the findings had been returned absolutely negative; that is, there were no cells, Wassermann negative, no globulin. So it could be seen that intraspinal treatment, intravenous treatment, and, in a few cases, no treatment at all, produced similar results. Nonne, in Hamburg, had made similar observations on his cases.

Dr. D. M. Kaplan said that general paresis was a type of cerebrospinal syphilis that could not be cured. The patient would be brought back. He appreciated what Dr. Soloman said as to the stubbornness of general paresis. One could only influence the meningitic phenomena, but could not repair dead cells. Dr. Cotton was more enthusiastic than the other speakers. He quoted a few cases with remarkable remissions, but he did not call them complete cures. He had spoken of a plus Wassermann without clinical manifestations. Whether that was general paresis Dr. Kaplan could not say, but when one said syphilis of the central nervous system, it could be included. General paresis was incurable and the others were more or less curable, as Dr. Sachs had said. In Ogilvie's cases four out of thirty-five were complete cures and remained in good health. That was a small percentage. The cases were very strongly treated, intraspinal, intravenously, and intramuscularly. He did

not believe that one could obtain more than temporary remission, from one month to three years.

Dr. Cotton, Trenton, said that he felt he could add very little to what had been said. Most of the criticisms which had been raised had been answered in his article on the treatment of paresis, now in process of being published in the *American Journal of Insanity*. Question had been raised as to the diagnosis of some of the cases presented in the demonstration. Because one or more of the biological reactions might be absent, it was no reason to question the diagnosis of paresis in certain cases. To one who had spent fifteen years in a state hospital in almost daily contact with paresis and with the opportunity of making autopsies and studying the brains in a large majority of cases observed during life, questioning the diagnosis by one who had given little, if any, time to the study of paresis seemed somewhat presumptuous. He would answer Dr. Sachs's criticism that one should study the remissions of untreated cases of paresis before one considered remissions due to treatment by stating that a number of studies had been made on this subject. In the state hospital, one found, in the 127 cases admitted over a period of seven years, that the number of remissions in paresis, where the cases were accurately diagnosed by means of lumbar puncture, were at the most only 4 per cent. The question of remissions had, he thought, been thoroughly treated in the article mentioned above. As his figures corresponded to those of Dr. Ogilvie (33 per cent. and 34 per cent. of remissions) as a result of treatment, he thought the question was answered as to the relation of remissions to treatment or no treatment. He still insisted that the question of paresis should be determined by the effects of treatment, that is, even though the patient had all the clinical signs of paresis and the positive biological findings were arrested by treatment, such a case should not be considered some other form of cerebral lues, merely from the fact that the process had been arrested. The argument would be the same as to say that a person suffering from incipient tuberculosis had never had tuberculosis, because the disease was arrested. The cases were similar; it was absolutely necessary to treat tuberculosis in the incipient stages in order to obtain results. It was fallacious to condemn the treatment of paresis because we could not cure the end stage. He had not found, with Dr. Sachs, that lumbar puncture was a dangerous procedure. In only three cases out of 800 injections had they had irritative effects. He considered intravenous injection of salvarsan attended with more danger than intraspinal. With some myocardial trouble intravenous injection might prove fatal. This had occurred in two patients in his experience. He never had given a full dose of salvarsan intravenously for the first time.

Translations

VEGETATIVE NEUROLOGY. THE ANATOMY, PHYSIOLOGY, PHARMADYNAMICS AND PATHOLOGY OF THE SYMPATHETIC AND AUTONOMIC SYSTEMS

By HEINRICH HIGIER

WARSAW

Authorized Translation by Walter Max Kraus, A.M., M.D.
[New York]

(Continued from page 80)

V. EMBRYOLOGY OF THE VEGETATIVE NERVOUS SYSTEM

The discussion of the development of the vegetative nervous system of vertebrates, and of man in particular, is not by any means closed.

According to the newest investigations of A. Cohn, Kuntz and particularly Froriep, the sympathetic cord develops in vertebrates from a pair of cell columns which lie dorsal and next to the aorta. In earlier stages, cells wander from the ventral half of the neural canal. They leave it in company with the ventral nerve roots as indifferently constructed primitive cells, with large nuclei. They join the main branch of ventral nerve roots. The means by which these cell fibers are carried to the periphery are the neuroblastic branches which grow from the medullary canal towards the periphery, and probably also those fibers which later become the preganglionic fibers of the autonomic system. It is these relatively coarse protoplasmic threads which combine with those of the primitive cells. The cell processes then curve medial as from the spinal nerve stem towards the dorso-lateral wall aorta. Near them a group piles up to make the vertebral ganglia. Other cells go further. They go centralwards, combined with protoplasmic threads which lie in the region which exists between the aorta and vena cardinalis. These make the pre-vertebral, and further out the peripheral ganglia.

According to Kuntz, the prevertebral plexus arises in a group of cells which lies ventral to the aorta in the posterior part of the body, while the cardiac and gastro-intestinal ganglia arise from groups of cells which come in from the midbrain and vagus ganglia. One may justly conclude that the excitatory neurones arise in cells which have wandered from the motor roots, while the sensory neurones are derived from the posterior roots. There exists, consequently, a broad analogy between the sympathetic system and the central nervous system. The sympathetic system is but the part of the central system which has functions corresponding to its part.

According to Froriep, the movement of cells to their later places is neither a free wandering [His' Keimcells] or a pure mitotic splitting [Kohn's theory of syncytiate or neurocytial construction of the sympathetic cord] but a combination of both processes, dependent upon the established paths of the outgrowing neuroblastic ramifications.

These latter come exclusively from the central organs where the corresponding neuroblasts occupy the dorso-lateral zone of the spinal and bulbar anterior horn region.

VI. HISTOLOGY OF THE SYMPATHETIC CORD AND CRANIAL GANGLIA AND OF THE SPINAL CORD CELLS AND NERVE FIBERS OF THE VEGETATIVE SYSTEM

Histologically, the sympathetic system is characterized by several peculiarities which may be of diagnostic value in differentiating it from other parts of the nervous system. The sympathetic differs both microscopically and macroscopically from other parts of the nervous system. The ganglia have a connective tissue sheath and its nerve fibers are sheathless, gray axis cylinders. Their color is due to the absence of the very refractile, whitish myelin.

The sympathetic ganglia are very hard to demonstrate in man both microscopically and macroscopically. This is due most probably to the fact that the ganglionic nodes lie very close to tissues which are readily fermented and destroyed after death, such as the nasal mucous membrane, the buccal cavity and the intestinal canal. Being very poorly protected, unlike central nervous system structures, they are easily destroyed.

Ordinary staining methods give the same picture in both spinal cord and sympathetic ganglia—round, processless, protoplasmic bodies with nuclear substance and a nucleolus surrounded by a capsule,—a fibrillary tissue. On more careful examination, even with this unreliable staining method, it has been shown (L. Müller) that

the cells of the spinal ganglia are larger, have a more conspicuous capsule and more nuclear material than those of the sympathetic ganglia. More delicate staining methods (impregnation with metals) (Ramon y Cajal, Bielschowsky) or vital methylene blue staining (Ehrlich) show that the fundamental difference exists between the cells of the spinal ganglia and the sympathetic cord. The former are decidedly larger, uniformly oval or round and have but one process. This process is a uniformly broad band which either encircles the cell or forms a corkscrew-like figure; the latter—the sympathetic cells—are mostly of a multipolar nature, have many dendrites and always have a nucleus and a nucleolus.

There are great differences in the structure of the cells, in their axis cylinders and the size of the dendrites, corresponding to variations in location and function.

Further details about the various structure of cranial ganglia, vertebral, prevertebral and organ ganglia cannot be given here. This much may be said, however: L. Müller has differentiated the main types of sympathetic ganglion cells; those of the sympathetic chain, the solar and semilunar ganglia, the ganglion of Wrisberg and the ganglion bulbi aortæ on one hand, those of the remaining ganglia on the other. Classifications may be made; those with extra and intracapsular processes, with thin or thick dendrites, with short and long, ramifying or forked dendrites (crown cell type) with thick or thin capsule (Klein, Cajal, Dogiel, Michailow).

Histological examination has also shown that groups of ganglion cells do not always form ganglia. Furthermore, they are scattered through nerve trunks without causing any swelling in them which could be identified with the naked eye as a ganglion. Examples are the submaxillary and Wrisberg's ganglia.

The axis cylinder is readily differentiated from the dendrites by its width and its fibrillary structure.

The old teaching of Gaskell and Langley that the nerves of the vegetative nervous system which are precellular or preganglionic are sheathed, while the postcellular or postganglionic fibers are un-sheathed, is still accepted generally. Yet there are exceptions to this rule as the postcellular fibers going to the intestines via the mesentery, the precellular fibers in the ciliary nerves and many others.

The origin of the vegetative tracts in the spinal cord are readily recognized. The nucleus lateralis or sympathicus may be recognized in the dorsal part of the lateral horn of the grey matter by the size and form of the cells. These are smaller than the multipolar cells of the anterior horn, are round, or pear-shaped, occasionally

spindle-shaped, club-shaped or spermatozoa-shaped and seem to have no processes on low magnification. (Paracentral cells. Jacobsohn.)

The vegetative paths in the medulla arise in similar cells of the *formatio reticularis*.

The anterior and posterior spinal root join to form the short spinal nerve (Fig. 1). The white rami communicantes are supposed to arise from the posterior roots.

The small sheathed fibers undoubtedly come from the anterior roots. The sympathetic fibers leaving the spinal cord are smaller than motor fibers. The former measure about 3μ (see text), the latter 16μ .

The visceral fibers are readily recognized in the mixed motor bulbar nerves (*N. Vagus*) and in the motor roots. The former have a thin sheath. The latter a thick one. Embryology shows that the former are myelinated at a later time than the former. The white rami go to that sympathetic ganglia in which the first neurone ends. Here it comes in contact with the second postcellular neurone. From thence it becomes a grey, sheathless fiber.

It is worth noting that the white ramus, which goes as a 1 cm. long fiber to the ganglion, usually lies in the same nerve bundle as the grey ramus. These latter return to the spinal nerve and proceed peripheryward. For this reason, it is not always easy to differentiate between the white and grey rami.

Precise observations concerning the spinal centers of the sympathetic centers, we owe to English authors, most prominent among which are Langley, Sherrington, Gaskell, Onuf and Collins. Recently Jacobsohn has gone over the old work by examining a complete set of serial sections from a human spinal cord stained by the Nissl method. According to Jacobsohn, there are two columns of vegetative cells.

(1) The lateral cell-column is composed of two parts: (a) An upper column corresponding to Langley's "Sympathetic System." This lies in the lateral horn of the dorso-lumbar cord ($C_8 - L_2$) and is designated the Nucleus sympatheticus lateralis superior s. cornu laterale. (b) A lower column lying in the sacral cord, from S_2 caudalward. It is placed between the anterior and posterior horns and is designated the Nucleus sympatheticus lateralis inferior s. sacralis.

The dorso-lumbar column is thickest at the upper dorsal segments and at the upper lumbar segments, that is near the cervical and lumbar enlargements where there are collections of ganglion cells for the extremities.

(II) The medial cell column lies in the medio-ventral marginal zone of the anterior horn of the lumbosacral cord, from L₁ distalward and is designated the Nucleus sympathicus medialis S. lumbosacralis. Low down in conjunction with the Nucleus radialis, it forms an area of groups of cells which takes up almost the entire anterior horn and the space between.

All the cells of these three columns have the following three characteristics: (1) They are always in groups and closely packed together. (2) They are long, round, club-shaped or vesicular, rather small, round cells. (3) They have a homogeneous appearance and are usually stained more darkly than the larger, less closely packed motor and sensory cells.

Microscopic investigations have established the fact that the above described type of cell found in the ganglia of the thoracic metameres are also demonstrable in the cranial structures. These represent a conglomeration of several metameric segments in which the position of the intervertebral spaces, sympathetic tracts, spinal and sympathetic ganglia are considerably modified. It has been shown that many of the cerebral ganglia are analogous to a modified spinal ganglion. Examples are the geniculate and Gasserian ganglia. Others are mixed ganglia resulting from the merging of the sympathetic and spinal ganglia. An example is the jugular vagus ganglion. A third group includes the pure vertebral or sympathetic ganglia, the ciliary, otic, sphenopalatinum, submaxillary and sublingual. The fibers for the smooth muscles of the eye, blood vessels and the tear, salivary and mucous glands pass through this last group of ganglia.

If we start with a cross-section of the medulla, that is, that plane of the cerebrospinal axis in which the most important cranial nerves are placed, we find, in addition to the large multipolar motor cells, small circumscribed groups of oval or pear-shaped unipolar cells (paracentral cells). These are the nuclei from which the pre-ganglionic rami communicantes spring. The nuclei are as follows (Fig. 3):

- (1) Nucleus pupillaris (Bernheimer)—median to the oculomotor nucleus.
- (2) Nucleus lacrimalis—median to the facial nucleus.
- (3) Nucleus salivatorius superior (Kohnstamm)—dorsal to the facial nucleus.
- (4) Nucleus salivatorius inferior (Kohnstamm)—near the glosso-pharyngeal nucleus.
- (5) Nucleus dorsalis vagi—between the motor and sensory vagus

nuclei, i. e., between the nucleus ambiguus and the nucleus solitarius vagi.

A closer analysis of the anatomical position of the various sympathetic nuclei shows that their relation to sensory and motor nerves is the same as in the spinal cord.

As a paradigm we shall take the most orally placed ganglion—the ciliary. It is of great clinical significance. For years well known authors have spoken of this ganglion as a spinal ganglion or a mixed ganglion (Schwalbe, Budge, Remak, His, Gehuchten, Kölliker, Bach). A cross-section of the brain stem shows the following: the oculomotor nerve is the anterior motor root, the trigeminal nerve is the posterior sensory nerve, the Gasserian ganglion corresponding to a spinal ganglion while the ciliary ganglion is the vegetative ganglion.

The white rami go from the visceral nuclei via their corresponding motor nerves. L. Müller and Dahl have tried to establish this on a firm basis.

Afferent and efferent may be differentiated in the cranial ganglia as well as in those of the sympathetic chain. The white rami communicantes pass via the anterior motor roots in the cranial as well as in the spinal region. Many rami albi spring from cranial nerves and have been anatomically described though the part they play was not even thought of (Fig. 4).

- (1) Radix motorica, or R. albus ganglii ciliaris—from the oculomotor.
- (2) Nervus petrosus superficialis major, or R. albus ganglii sphenopalatini—from the facial.
- (3) Nervus tympanicus and its process going to the otic ganglion—nervus petrosus superficialis minor, or R. albus ganglii otici—from the motor part of the glossopharyngeal nerve.
- (4) The chorda tympani, which sends fibers as the R. albus to the submaxillary ganglion—from the motor nervus intermedius.

The post-cellular tracts of the cranial ganglia are like those of the sympathetic chain, sheathless. They supply smooth muscle and glands exclusively. When they have a long path to follow to reach the organs which they innervate, they join sensory nerves. The reason that the sympathetic fibers, when they do not form separate nerves, join sensory nerves and not motor nerves, is no doubt that sensory nerves are more widely distributed and go to all tissues.

GLANDS OF INTERNAL SECRETION OR CHROMAFFIN GANGLION
BODIES OF THE SYMPATHETIC ANLAGE

Many authors include in the sympathetic system various glands which contain chromaffin cells, that is to say cells which have a great affinity to chromium, and on that account take up an intense brown coloration in Müller potassium bichromate solution. These cells all develop from the sympathetic anlage, and are therefore in very close relationship to the ganglion cells. They are found partly separate, partly in small groups in the sympathetic system, in the sympathetic ganglia, or in large nerve networks about blood vessels. Where they are found as individual bodies they are designated PARAGANGLIA.

They are for the most part spherical with a connective tissue capsule and are broken up by large nerves and blood vessels, between which the chromaffin cells lie in unequal masses.

Of the larger chromaffin bodies the following four may be named: (1) the carotid paraganglion incorrectly spoken of as a gland [carotid gland or epithelial organ]. (2) The coccygeal gland incorrectly spoken of as the sacral gland [coccygeal gland]. (3) Aortic paraganglion at the bifurcation of the aorta. (4) The best studied and largest chromaffin body, the suprarenal body, the medulla of the adrenals, from which the active blood pressure raising adrenalin is produced, a substance which stimulates the sympathetic system, and plays an enormously important rôle in the body.

According to Aschoff, chromaffin bodies are also to be found in the vicinity of or in the paroophoron and epididymis which are also organs of internal secretion.

The chromaffin, or more properly speaking phäochrom cells [Poll] all develop from the sympathetic anlage, and are at least closely related to the ganglion cells. The assumed transitions between the two have not received general confirmation, and, in spite of the hypothesis of Diarnera that the chromaffin cells are secretory epithelial cells, H. Kohn, one of the first describers of this picture, justly maintains the propriety of not putting these cells in any definite histological group but in a group of their own.

Like epithelial cells, muscle cells, and nerve cells, it also takes its place both embryologically and physiologically as a distinct type of cell which is most closely related to the sympathetic cord.

These cells, which may resemble alike epithelial cells, muscle cells, and nerve cells, also take their place, both embryologically and physiologically as a distinct type very closely related to the sympathetic cord.

(To be continued)

Periscope

Review of Neurology and Psychiatry

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1. The Pyridine-Silver Method. With a Note on the Afferent Spinal Non-Medullated Nerve Fibers. S. WALTER RANSOM.
2. The Significance of the Unconscious in Psychopathology. ERNEST JONES.

1. *The Pyridine-Silver Method.*—The pyridine-silver method is a modification of the Cajal method which has recently come into general use in America, and which is easy and reliable. It was devised as a differential stain for non-medullated fibers, but has been found to be of use in the study of a variety of problems. It is being used in a number of laboratories in the preparation of sections for class use of the spinal ganglia, sympathetic ganglia, and spinal cord.

An account of the method is given in the hope that some of the clinical neurologists, who have more ready access than the anatomist to fresh pathological material, will use the method in studying some of the problems for which fresh human material is absolutely necessary, and for the solution of which the method is especially adapted. A brief account of the method, and an enumeration of the purposes for which it has shown itself to be adapted, is given, followed by a brief statement of some of the results which have been obtained by its use, and an indication of some of the problems which await solution.

The chief advantages of the pyridine-silver method mentioned are: (1) It can be used in a study of the peripheral nerves where the other silver stains fail to give good results. (2) It is more reliable than the other silver methods and gives more uniform results. (3) Larger pieces of tissue can be successfully stained, and the impregnation is more uniform throughout the block than when the old Cajal method is utilized. (4) It is a differential stain for non-medullated fibers having a selective action for these axons, and staining them much darker than the other elements in the section. (5) It can be applied to decalcified tissue allowing the staining *in toto*, and cutting into serial sections of the entire head of a small animal or embryo.

It is obvious that a study of tabetic material would help in the solution of the problems which are here presented. Do the non-medullated fibers in the spinal nerves degenerate in tabes, and if so, early or late? What effect does tabes have on the non-medullated fibers in the spinal ganglia and in the dorsal roots? Do the non-medullated fibers in Lissauer's tract degenerate in tabes? What relation do the non-medullated fibers seen by Nageotte in tabes bear to these normal non-medullated fibers? What is the relation of disturbances of pain and temperature in tabes to the degeneration of these fibers? These are some of the problems which should be investigated, and for the solution of which the pyridine-silver method is especially adapted. If material from cases of tabes in different stages of the disease could be secured fresh, *i. e.*, within an hour after death, there should be no difficulty in answering these questions. Such an investigation should add something to our knowledge of the pathology of tabes, and at the same time clear up the physiology of the varieties of cutaneous sensation.

2. *The Significance of the Unconscious.*—A knowledge of the unconscious furnishes an indispensable key to the understanding and treatment of psychopathological manifestations. Very different connotations have been attached to the term. The commonest use of the term is the general sense in which it is employed in medicine, for instance, in reference to the unconsciousness following a brain injury or the administration of an anesthetic. This is a "non-mental" or psychophysical conception.

A second conception of the term is the philosophical one that the unconscious part of the mind is a sort of lumber room to which various mental processes get relegated when they are in a state of inactivity. These processes are of secondary importance and have no initiative.

A third conception of the unconscious is the psychoanalytical one, developed by Freud. He divides those mental processes that are not accompanied by awareness into two groups, the preconscious and what he calls the unconscious proper, the latter being the sense in which the term is used in this paper. Freud's conception of the unconscious differs sharply from the preceding ones in that it is always a purely inductive one, being built up upon the basis of actual experience without the introduction of any a priori speculative hypothesis; it may therefore be called the scientific conception, in contradistinction to the philosophical one. Instead of starting with any notions, whether precise or nebulous, of what the unconscious ought to be, he investigated the actual mental processes that were inaccessible to his patients' direct introspection, and which were only to be reached by means of some technical procedure such as the psychoanalytic one. As a result of these investigations, he acquired a gradually increasing knowledge of the nature of unconscious processes, of their content, meaning, origin, and significance, and was therefore placed in a position of being able to formulate some general statements on these matters.

The statement of most fundamental importance, and the one on which the writer lays the greatest stress, concerns both the origin and the content of the unconscious. It is to the effect that the existence of the unconscious is the result of "*repression.*" By this is meant that unconscious processes are of such a kind as to be incompatible with the conscious ones of the given personality, and are therefore prevented from entering consciousness by the operation of certain actively inhibiting, "repressing" forces. The incompatibility in question is of a moral order, the word moral being taken in its widest possible sense. The processes concerned flagrantly conflict with the moral, social, ethical, modest, or esthetic standards that obtain in the person's consciousness; their very existence would be intolerable to him, and he automatically refuses to acknowledge to himself their presence in his mind. In this action of repression only a very small part is played by the occurrence that may be described as a deliberate conscious pushing of certain thoughts out of the mind, though this is the one with which we are most familiar; much more extensive is the subconscious and automatic keeping apart of the two sets of incompatible mental processes.

Briefly summarized, in a single statement: according to psychoanalysis, the unconscious is a region of the mind, the content of which is characterized by the attributes of being repressed, conative, instinctive, infantile, unreasoning, and predominantly sexual. A typical example of an unconscious mental process, illustrating all of these, would be the wish of a little girl that her mother might die so that she could marry her father. The six attributes in question, together with others not here mentioned, make up a consistent and clearly-defined conception of the unconscious which is formulated on the basis of experience that may at any time be tested.

The significance of the unconscious is discussed under four headings:

(1) A knowledge of the content and mode of operation of the uncon-

scious furnishes a key for the understanding of numerous morbid manifestations that were previously incomprehensible. All psychopathological symptoms arise in the unconscious.

(2) A knowledge of the unconscious makes clear not only the meaning of these symptoms but also the causation of them. Normally, a great part of the energy pertaining to repressed trends of the unconscious is "sublimated" (or diverted) to permissible social aims. Many people are unable to achieve a renouncement of crude primitive pleasures and a replacement of them by more or less satisfactory refined ones. There is ever a tendency to regress. Both forces come to expression in a compromise way, disguised. The compromise-formations are called symptoms. The actual symptoms do not carry their meaning on the surface but have to be interpreted and translated into the language of the unconscious before this can be reached. To do this a knowledge is necessary of the different mechanisms by means of which the distortion is brought about that changes the underlying repressed trend into the manifest symptom. The nature of these mechanisms, such as displacement of the affect, inversion, projection, introjection, transposition, and so on, was not discussed. The distortion is brought about in perfectly definite ways, and through the operation of specific factors, which vary in their exact nature according to the past experiences and mental development of the individual concerned.

(3) The knowledge gained by investigation of the unconscious bridges over the gap between the normal and the abnormal by demonstrating that the same processes go on in both, though the control of the unconscious ones by consciousness is greater in the case of the former. Roughly speaking, insanity presents a picture of the normal unconscious.

(4) The remarkable aid that this knowledge has yielded for the treatment of psychopathological maladies. Up to the present this has, it is true, been far greater in the case of the psychoneuroses than in that of the psychoses, such as dementia præcox, but there it has already proved so valuable that one is justified in entertaining the hope that further researches may be profitable from this point of view in the case of the latter group also. The mode of action of the treatment, in a word, is that the overcoming, by means of psychoanalysis, of the resistances that are interposed against the making conscious of the repressed unconscious material, gives the patient a much greater control over this pathogenic material by establishing a free flow of feeling from the deeper to the more superficial layers of the mind, so that the energy investing the repressed tendencies can be diverted from the production of symptoms into useful, social channels.

(Vol. XII, No. 12)

Studies in Neurological Technique.—No. 2: Indication and Method for the Use of the Electrical Re-enforcement for the Elicitation of the Absent Reflexes. WALTER B. SWIFT.

The electrical method of reflex reinforcement is indicated where reflexes are absent; and where, at the same time, other methods have failed and that absence is doubled, irrelevant, inexplicable, or may turn a diagnosis. As for method, avoid pain, and place electrodes above and below the point of reflex stimulation, in such a way that reflex action may not interrupt the current.

C. E. ATWOOD.

Deutsche Zeitschrift für Nervenheilkunde

(53 Band, 1-2 Heft)

1. Clinical Contribution to the Pathological Anatomy of Acute Ascending Spinal Paralysis (Landry's Paralysis). LANGER.
2. Pathological Anatomy and Pathogenesis of Syringomyelia. MARGULIS.
3. Pathology of Paralysis Agitans. TRÖMNER.
4. Explanation of the Manifestations of Epilepsy. BOLTEN.
5. Some Reflex Investigation, Namely, Concerning the Presence of Certain Reflexes. WÜRTZEN.
6. Observations and Investigations in Atrophic Myotonia. CURSCHMANN.
7. The Valsalva-Morgagni Law. A Contribution to the Time Preceding Aphasia. EBSTEIN.

1. *Pathological Anatomy of Acute Ascending Paralysis.*—Some consideration is given to the three forms of myelitis as described by Schmaus, namely, parenchymatous degeneration, infiltration and softening. Other classifications are mentioned, particularly that of Lewandowsky. One case is reported and the individual came to autopsy; the histological findings are appended. The writer concludes that Landry's paralysis can through a degenerative process appear in a chronic intoxication. In the rapidly fatal case death may be due to bacterial toxins. The peripheral nerves are usually affected, but this is not absolutely necessary. The course of the disease may be so rapid that there is but slight evidence of acute morphological change.

2. *Pathological Anatomy and Pathogenesis of Syringomyelia.*—The material for this investigation was supplied by seven cases of syringomyelia, and in three of these the disease was combined with hydrocephalus. The article is elucidated by ten well selected illustrations and in these there is shown a widening of the central canal with a surrounding gliomatous proliferation. At times groups of glia cells are found so arranged as to present a glandular appearance and tumor-like areas of gliomatosis are likewise met with. Two cavities may be observed, one on either side of the cord and the appearance of a diverticulum may be presented.

The writer goes on to explain that through an excess of cerebrospinal fluid there is caused continuous pressure in the cavity and also irritation which leads to proliferation of the glial tissue. The epithelial layer becomes atrophied and may loosen and disappear. Through increased pressure by the fluid, the cord atrophies and the nerve fibers and cells degenerate. The clinical equivalent of the pathologico-anatomical changes are found in the triad of sensory, motor and trophic symptoms.

4. *Explanation of the Symptoms of Epilepsy.*—In writing upon this subject the author says that genuine epilepsy and numerous forms of cerebral are (in the immense majority of cases) cortical and cannot yet be distinguished; there is a similarity in the attacks and also in the secondary dementia.

Cerebral epilepsy may occur after diseases of the meninges, the brain cortex or the deeper lying parts, which in general through a sclerotic process causes circulatory disturbance of the brain cortex. Genuine epilepsy is a chronic auto-intoxication arising through nutrition and metabolic disturbances, the consequence of hypofunction of the thyroid gland and epithelial bodies and the failure to eliminate sufficiently the poisons. In consequence of the hypothyroidism the elimination of many ferments and intermediate products is diminished. In cerebral as well as cortical epilepsy there is through the diminished circulation an accumulation of toxins in the brain cortex. The attack must be considered a reaction of the organism to free itself of the toxine. The blood gives its toxins off through the kidneys, lungs and skin, and the brain cortex can then give off its toxins to the toxine free blood. In

genuine epilepsy a rectal injection of the freshly expressed juice from glands corresponding to those showing an insufficiency may cause a subsidence of the symptoms.

In the cerebral forms of epilepsy a trephine operation may lead to a betterment of the condition.

6. *Atrophic Myotony*.—In this paper report is made of a man 43 years of age who showed how much the dystrophic and tabetiform symptoms may prevail in atrophic myotonia. Two illustrations demonstrate the facies myopathica and paresis of the orbicularis oculi. It is also brought prominently forward that trauma may be the inciting cause.

A careful search for vagotomy or sympathicotomy did not reveal the presence of either bodily or pharmacological evidence of that condition.

YAWGER (Philadelphia).

Monatsschrift für Psychiatrie und Neurologie

(Vol. 35, No. 1)

1. The Anterior Central Gyrus in Lesions of the Pyramidal Tracts and in Amyotrophic Lateral Sclerosis. P. SCHROEDER.
2. Feeble-mindedness and Mental Affections with Dwarfism. W. WEYGANDT.
3. The Symptoms of Cerebellar Disease and their Significance. M. ROTHMANN.
4. Blood Examination as a Clinical Aid in Psychiatry, with Special Reference to Prognosis. J. H. SCHULTZ.
5. The Question of Loss of Memory in Paretics. M. RONDE.

1. *Anterior Central Gyrus*.—Several cases are described clinically and the autopsy findings are discussed. All cases of course showed destruction of the Betz cells and certain other large cells of the motor cortex as the most prominent feature. There was also a glia increase which did not correspond in location and probably not in time of development with the degeneration of the Betz cells. The six cases of pyramidal lesion tend to show further proof of the relationship between the pyramidal tracts and the anterior (not the posterior also) central gyrus. They do not show, however, that a direct and simple relationship of cell to fiber exists as in the case of the anterior horn cell and anterior root fiber. In fact there are certain observations which point to such a relationship not containing, *e. g.*, the preservation of certain central fibers in the pyramid even when practically all the Betz cells are destroyed. Numerous photomicrographs accompany the article.

2. *Dwarfism*.—Attention is chiefly drawn to the multiplicity of causes. The author mentions no less than fourteen different etiological groups. All sorts of combinations occur. An interesting observation is that of a dwarf who again began to grow after the age of thirty years and reached a normal height but was poorly developed. Two similar cases are quoted from the literature.

3. *Cerebellar Symptoms*.—A didactic exposition of the symptomatology of cerebellar lesions. The article constitutes a valuable résumé and digest of the work done by all authors in this line to the present date. The cerebellar affections are susceptible of localization as to whether the lesion is in the cortex or nuclei, worm or hemisphere, just as in the cerebrum. Affections of the worm produce typical cerebellar gait, often with queer position of the head, speech is slow and indistinct. Lesions of the cortex of the cerebellar hemispheres cause symptoms of one side of the body or of one extremity. Ataxia and atonia occur in the same side as the lesion. Adiadochokinesis and loss of resistance reaction are usually present. The most marked symptoms are the variation and unnatural directions of the movements of the limbs in carrying out an act. Affections of the nuclei produce giddiness and dis-

order of equilibrium, also cataleptic symptoms and true cerebellar spasmodic attacks. It must not be forgotten that mixtures of different symptoms are common as well as symptoms referable to other parts of the brain and diagnosis is still difficult. But the author hopes for such improvement in the future that cerebellar localization will be almost as exact as cerebral.

4. *Blood Tests.*—(A continued article—to be reviewed at its conclusion.)

5. *Loss of Memory in Paresis.*—Two cases are described with especial detail as to memory. The author remarks that although paretics would be expected to show defective memory for events occurring since the brain commenced to undergo organic change, it is less likely that they forget entirely the early events of their lives. He believes that these earlier memories are often not lost but only for a time impossible of recollection. His cases showed extreme memory defect, but there were fluctuations and they showed fleeting recollection of things which at all other times were apparently entirely forgotten.

(Vol. 35, No. 2)

1. Clinical and Anatomical Contribution to the Study of Apraxia and the "Motor Speech Path." K. BONHOEFFER.
2. Blood Examinations as Clinical Aids in Psychiatry, with Especial Reference to Prognosis. J. H. SCHULTZ.
3. The Forearm and Hand Tracts of the First and Second Order in a Man Born without the Left Forearm. C. ELDERS.
4. Motor Aphasia with Agrammatism and Sensory-agrammatic Disorder. E. SALOMON.

1. *Apraxia.*—Clinically the case studied showed marked left-sided apraxia and also some apraxia of the right side. There was motor aphasia and paragrammia. The brain showed several softenings, chief of which was an almost complete destruction of the corpus callosum. This lesion accounted for the left-sided apraxia. As to the apraxia of the right side, the author discusses the various possibilities but does not come to a definite conclusion. It may have been due to a small lesion which was found in the occipital lobe or to the softening which involved the first and second left frontal lobes. Or it may have been caused not by any one lesion but to the sum of all of them. The Broca area was entirely intact, showing that the motor aphasia must have been due to an interference with the connections of the Broca region with the periphery. There was a small lesion of the capsule but it is known that a capsular lesion is insufficient to produce motor aphasia. The author believes that the case shows clearly the existence of a second speech path, namely, through the corpus callosum to the Broca area of the right side. This connection was destroyed in this case and the lesion, coupled with that in the capsule, produced the complete motor aphasia.

2. *Blood Examinations.*—The author patiently made repeated examinations of the blood in 100 cases of mental disease. The hemoglobin was estimated, red cells and leucocytes counted and differential counts made. The following are some of his conclusions: In manic-depressive insanity, hysterical, epileptic, arteriosclerotic psychoses, paresis and feeble-mindedness the number of erythrocytes is normal. In all forms of dementia præcox the erythrocytes are increased. Eosinophilia is characteristic of dementia præcox stupor and differentiates it from other stupors. "Capillary erythrosthesis" produces the vaso-motor symptoms of dementia præcox and is prognostically unfavorable, as is also a lymphocytosis. The blood in attacks of genuine epilepsy shows a characteristic picture—a lymphocytic leucocytosis and an eosinopenia. The only other condition which gives a similar picture is a uremic convulsion. Bromide medication causes an eosinophilia.

3. *Neurones of Arm.*—In 1910 (Monatsschrift, Vol. 28) the author re-

ported studies of the first motor neurone in a man born without the left forearm. He now gives the results of his investigations of the other neurones. He found the first and second sensory neurones absent and the second motor neurone probably lacking.

4. *Motor Aphasia*.—(A continued article.)

J. M. MOORE (Beacon, N. Y.).

MISCELLANY

A CLINICALLY AND ANATOMICALLY EXAMINED CASE OF ISOLATED LOSS OF PUPIL-REFLEXES WITH ABSENCE OF PARALYSIS, TABES AND CEREBRO-SPINAL SYPHILIS. M. Nonne and Fr. Wohlwill. (*Neurol. Centralbl.*, 1914, No. 10.)

The authors report here upon a case of isolated loss of pupil reflexes, clinically and anatomically examined, in which the spinal fluid was examined for cell content, increase of globulin, Wassermann's reaction with negative result, and in which the brain and spinal cord were anatomically examined, without discovering a central nervous affection of syphilitic origin; moreover, signs of tabes and paralysis were wanting. Since the true loss of pupillary reflexes is rarely manifested from other causes, especially as the result of chronic alcoholism, and here lues had been present (infection thirteen years before), it could only be accepted that the isolated loss of pupil reflexes represents the clinical remnant of an earlier syphilitic, anatomical process which had spent itself. The authors accept this extinction of the process, since the fluid reactions are negative.

JELLIFFE.

CONTRIBUTION TO VAGOTONIA. W. Lublinski. (*Berl. klin. Wochenschr.*, 1915, No. 20.)

The vagus and the sympathetic act in opposition. If the organs provided with these nerves are to function normally both nerves must maintain an equilibrium. If one nerve overbalances vagotonia or sympathicotonia appears. The first is the more frequent. The author frequently had opportunity to observe: Laryngospasm, asthma, with complaints of cardiac and respiratory difficulties. The diseases of youth are mostly concerned, often through lymphatic symptoms, with glandular swellings, enlarged tonsils, and frequently also enlargement of the thyroid. The bluish, glistening flush on the face, outbreaks of perspiration, cold, bluish hands are striking. The palpebral fissure is narrow, the pupils are small and the eyes lusterless. Frequent swallowing movements are made on account of the excess of saliva. On the upper part of the body may be noticed a mottled redness, dermatographia. Stimuli in the region of the vagus may cause attacks of retarded, temporarily intermittent heart movements. Pressure on the eyeballs may cause that. The respiration is shallow, face pale, Aschner's phenomenon. Also on lying down a marked retardation of the pulse appears. Similarly it comes on in a squatting position or on bending the body forwards. Moreover, arrhythmia of the pulse may be observed, extrasystole. Whether it has to do with heightened irritability of the heart or injury of the heart muscles, the atropin test will decide. With those suffering from vagotonia even slight stimuli suffice to arouse alterations in the pulse, and so also will repeated rising in bed. A characteristic respiratory disturbance is cardiac obstruction in breathing, with laryngospasm and asthma. Automatically there is impulsion to deep breathing with a convulsive sensation in the upper air-passages. Pilocarpin can produce these phenomena artificially. The author looks upon vagotonia as a

result of disturbance of inner secretion. Vagotonia can be favorably influenced by atropin, since that reduces the irritability of the vagus endings. The atropin treatment must be a persistent one. Papaverin 0.03 also acts favorably. As a nerve tonic arsenic likewise recommends itself.

JELLIFFE.

CRANIAL NERVES OF ANOLIS CAROLINENSIS. W. A. Willard. (Bull. Mus. Comp. Zool. Harvard, Vol. LIX, No. 2, July, 1915.)

The general summary of this complete and masterly study of the cranial nerves of *Anolis* may be summarized as follows:

1. *Anolis* possesses the cranial nerves typical of the amniote vertebrate with one exception; there was not discoverable any representative of the spinal accessory nerve described in other reptiles, and the muscles innervated by this nerve in other forms seemed to be supplied in *Anolis* wholly from spinal nerves posterior to the second cervical.

2. The ganglia of the V, VII, IX and X cranial nerves are distinct from one another and all of their roots issue from the cranium through independent foramina. The ophthalmic ganglion also shows no fusion with the other portion of the Gasserian ganglion.

3. There is a wide distribution of sympathetic ganglion cells along the afferent rami of the cranial nerves. These form definite ganglia on the palatine VII (palatine ganglion), nasalis V (ethmoidal ganglion), maxillary V (infraorbital ganglion), and on the mandibular V (mandibular ganglion). The topographical facts would lead one to associate the development of these ganglia with specialization of the glands of the head. No medullated nerve fibers were found passing through the connective tissue surrounding these glands. The presence of smooth muscle fibers in the head region might also affect the development of the sympathetic. The sympathetic system of the head in the matter of the arrangement of rami and ganglia (as worked out incidentally to the study of the cranial nerves), when compared with other described forms of reptiles, points to the existence of a typical reptilian type of quite constant character.

4. The nerve components (excepting the sympathetic) reach their end organs, or peripheral terminations, through the following nerve trunks: *Somatic sensory*, by way of the 5th nerve over the ophthalmic (rami. frontalis and nasalis), maxillary mandibular rami. *Somatic motor*, by way of the III, IV, VI and XII nerves. *Viscero-sensory*, by way of the VII nerve over the palatine ramus and the chorda tympani; also by way of the IX nerve over the pharyngeal ramus and probably Jacobson's anastomosis; also by way of the X nerve over the superior laryngeal and recurrent rami. *Viscero-motor* (dark blue), by way of the V nerve by a number of independent rami and over the mandibular ramus; also by way of the VII nerve over the hyomandibular division and ramus hyoideus, also by way of the IX nerve over the pharyngeal ramus, and also by way of the X nerve over the superior laryngeal ramus. (a) This shows a greater reduction of the somatic sensory (as indicated by peripheral paths) in *Anolis* than is found in the described forms of other groups, such components not being found in nerves IX or X of *Anolis*, although their presence in the same nerves has been reported in each of the other classes of vertebrates. (b) Vestigial ganglia exist in a variable manner on the intracranial roots of X, which may be somatic sensory in their origin.

5. The morphological character of the fibers of different components is sufficiently differentiated to form types peculiar to each component. But the distinction in character appeared to be less than that described for the lower groups of vertebrates. However, there was considerable individual variation in the size of fibers. Nerve XII shows a marked difference in the size of

fibers going to the neck muscles and those going to the tongue muscles. In this case the smaller fibers have much the longer course. In at least three instances striated muscle fibers of visceral origin are innervated by nerve fibers of smaller caliber and lighter myelin sheaths than is characteristic of the other visceromotor components of V, VII, IX and X. These are the ciliary muscle, the protractor oculi, and the constrictor of the jugular vein, all of which are more closely associated with visceral functions than the other striated visceral muscles.

6. The skin is well supplied with special tactile organs, which are more abundant along the jaws than elsewhere. These organs are quite generally, if not always, covered by a thinned plate of the horny layer of the epidermis, which bears in its center a tapering "hair." The innervation of these hairs was not determined beyond the fact of the proximity of the strongly myelinated cutaneous fibers in the dermis beneath.

7. The distribution of taste buds is such as to preclude their innervation (save a very limited number in the laryngeal region) by anything except the chorda tympani and palatine VII. A large proportion of the fibers carried by these rami are for such sense organs, their innervation fields being covered for general sensory purposes by the somatic sensory of V.

8. *Anolis* presents a well-balanced form for the study of the reptilian nervous system. It is an active, responsive animal with well-differentiated muscles and sense organs, yet presenting no excessively specialized features. It is small enough readily to be sectioned and large enough for experimental operations, and it is suggested that degeneration and stimulation experiments on this form would advance our knowledge of the reptilian nervous organs even more than similar anatomical work on other forms. The anatomical work already done, however, should be supplemented by the proper technique to determine the final nerve terminations.

JELLIFFE.

Book Reviews

HEBREW AND BABYLONIAN TRADITIONS. The Haskell Lectures Delivered at Oberlin College in 1913, and Since Revised and Enlarged. By Morris Jastrow, Jr., Ph.D. New York, Charles Scribner's Sons.

Professor Jastrow has made an interesting study of some Hebrew and Babylonian traditions by considering the divergences rather than the resemblances as the traditions develop and are utilized by the two peoples. These divergences manifest the widely different trends in the two nations and account for the very different influence each has exerted in the history of the world.

The author traces first the origin of the contact of Hebrews with the Babylonians, when as migrating tribes they passed through the Babylonian lands, sojourning there long enough to adopt early traditions and make them a part of their own obscure past.

As they pass on, however, through history to a land and a nationality of their own, there manifests itself gradually a peculiar trend which expresses itself most distinctly only after centuries of development of national history. This is the ethical monotheism which leads the Hebrew nation and with them its traditions away from the materialism of the Babylonians.

This we are enabled to follow through a comparison of three leading traditions which hold their place in different form among the two peoples, the tradition of the creation, of the deluge and of the Sabbath with a consideration of views of life after death and of ethics. In the retaining of these myths and the utilization of them in Hebrew religious life their ardent exponents of that monotheism which recognized a just and righteous God and built up a system of ethics on this conception so distorted and colored—or shall we say decolorized—the ancient traditions that only a careful searching out of origins with a careful bearing in mind of the background to the ancient traditions make them recognizable.

Yet it is just here that Professor Jastrow fails to open up the very instinctive depth of human thought and feeling that are of special interest to us in the determination of the beginnings of ancient traditions and the form they take in national development as well as to explain fundamentally each of these individual tendencies which separated the two nations in their history and influence.

To reach the conclusion that the myths were nature myths and with the Babylonians reach in development to astral theories of their deities leaves much unexplained and does not probe into the depths of original meanings nor discover the wealth of early sublimation material produced by these two nations along diverging pathways. The book manifests also a clear rationalistic attitude toward Hebrew development and national history.

However, there are many suggestive elements for the student of beginnings and the volume is one that can be read with more than passing interest and profit in spite of its rather intellectualistic attitude towards psychical phenomena, seeing things as imposed from without rather than as evolving from within.

JELLIFFE.

CLINICAL STUDY OF THE SEROUS AND PURULENT DISEASES OF THE LABYRINTH.
by Dr. Erich Ruttin. Tr. by H. Newhart, M.D. Rebman Company,
New York.

The interest in the disorders of the labyrinth is shared equally by neurologists and ear specialists. The present volume adds another to the many brilliant studies which have come from our Vienna colleagues and which is now made accessible in English through Dr. Newhart's excellent translation. It is a painstaking, thorough and commendable volume—small, but full of valuable material which, while not very deeply analyzed, is so arranged as to be of service, particularly as an introduction to the subject. The reader who has carefully followed Bárány's work will find this elementary.

JELLIFFE.

A TEXTBOOK OF NERVOUS DISEASES. By Robert Bing. Translated by Charles L. Allen. Rebman Company, New York.

We have had occasion to comment on these lectures on nervous diseases on their appearance in 1913 in their original form. They here appear exceptionally well rendered by Dr. C. L. Allen, of Los Angeles, whose excellent work in the *JOURNAL* is familiar to its readers.

Although the lecture form has certain disadvantages for systematic presentation, Dr. Bing has given a book which is better than the usual one cast in this manner.

The general attitude reflected is that of the past few decades, in which sense these lectures are rehearsing old material rather than blazing a new trail.

PSYCHIATRISCHE VORTRÄGE. Von Prof. Dr. G. Anton, Halle. S. Karger, Berlin.

Five papers appear in this third series of the author's discourses. They deal with problems of the Organization of the Brain and the Spirit, Dangerous Types of Men, Return of Function in Brain and Cord Disease, Speech and Thinking, The Mental Type and Rights of Women.

They are very delightful essays and may be read to advantage.

DIE CHIRURGISCHEN INDICATIONEN IN DER NERVENHEILKUNDE. Dr. Sigmund Auerbach, Frankfurt. Julius Springer, Berlin. 6.40 marks.

Dr. Auerbach has added another very practical book to his credit, in which, in a most systematic and thorough manner, he has discussed all of the possible neurological conditions which might profitably be handled by surgical means, either palliative or curative.

It is an extremely useful volume for a common viewpoint for neurologist and surgeon.

DIE ABDERHALDENSCHER SERODIAGNOSTIK IN DER PSYCHIATRIE. Dr. Bresler, Carl Marhold, Halle. 2.40 marks.

This small volume contains a short summary of the findings and suggestions relative to the application of the Abderhalden ferment reactions in psychiatry. It contains the literature to 1914.

DIE GESCHICHTE GOTTFRIED. Eine kriminalpsychologische Studie. Von Dr. L. Scholz. S. Karger, Berlin.

This short brochure brings the reader back to the early thirties of the last century in its consideration of a notorious woman poisoner of that time and concerning whom her advocate wrote a two-volume life and history. From this time she has been made the subject of a number of communications, this being the last.

The study will link itself up well with other female poisoners, a specialty

to which the sex, the author states, shows special aptitudes, and offers a number of interesting suggestive features at a time when the art has largely gone out of fashion.

JELLIFFE.

PSYCHOTHERAPIE. Par Dr. André-Thomas. J. B. Baillière et Fils, Paris.

In twenty-eight volumes Gilbert and Canot have published a series on Therapeutics, of which this volume of André-Thomas is a worthy member.

In general he follows the exposition of Dejerine and deals with the general emotional rapport at the conscious level. Of the psychoanalytic material there is not a trace, and the book will commend itself to those working at the level of the conscious activities.

A COURSE IN NORMAL HISTOLOGY. By Prof. Rudolf Krause, Berlin. Trans. by P. J. R. Schmahl, New York. Rebman Company, New York.

Krause's beautiful work on histology is here given in appropriate and fitting English dress. The text is exceedingly clear and precise, while the illustrations are wonderfully clear and detailed.

The portions devoted to the nervous system are well done, but, as would be expected in a work on general histology, only partly supply the needs of the neuroanatomist.

As a work on general histology, however, it leaves little to be desired.

JELLIFFE.

DES TROUBLES PSYCHIQUES ET NEVROSIQUES POST-TRAUMATIQUES. Par R. Benou, Nantes. G. Steinheil, Paris.

The author, with a singularly clear vision as to the significance of what is meant as nervous or mental disorder, has given a pleasing monograph on post-traumatic disturbances.

These he has discussed under the dysthenias, dysthymies and the dysphrenies, under which headings he groups (a) asthenia, asthenomanie, asthenia prolongée, manie chronique, periodic dysthenias; (b) anxious hyperthymias, hypochondriasis, sinistrosis, hysterical crises, character disturbances; (c) amnesia, Korsakoff's syndrome, confusion, agnosia, dementia, systematized delirium. These are all discussed from the point of view of traumata.

JELLIFFE.

THE NARCOTIC DRUG DISEASES AND ALLIED AILMENTS. Pathology, Pathogenesis and Treatment. By Geo. E. Pettey, M.D. F. A. Davis Company, Philadelphia.

Dr. Pettey has given a very human book. The drug habitué he regards as a blameless victim of disease, entitled to rational and skillful medical aid. This disease he would envisage as one, a toxemia, in which respect only the surface of the subject is touched.

The vital and essential principle of treatment advocated is elimination. Little is said of the psychological foundation of the individuals. It is from this aspect that the book offers little, but from the practical everyday methods which are needed to handle the patients it is especially full and satisfactory.

SUGGESTION UND ERZIEHUNG. Von Dr. Leo Hirschlaff in Berlin. Julius Springer, Berlin.

This volume on Suggestion and Education appears as the second of a series on borderland studies in medicine and pedagogy. The author has already written a number of papers on the relationships of pedagogy to hypnotic and suggestive therapeutics. The present work first presents a fairly

complete summary of the literature, giving in great detail the various opinions of numerous authors. In the second part of the book he has attempted a critical exposition and interpretation of the phenomena usually included under the symbol suggestion.

In the final portion of his book he brings together the evidence to show that the educational significance of suggestion and hypnosis stands in an insoluble opposition to the scientific knowledge of these two factors. He attempts to show the internal antithesis between the mode of action of suggestion and that of education and thereby would finally lay low the myth of the possibility of suggestion as a means of educational value.

The author in a thoroughly conservative and yet forceful manner cuts through much of the pretentious medicine which is called suggestive medicine and goes to the quick when he sizes up the American Quackenbos as "one at the summit of exaggeration and lack of critique, who attempts to play the rôle of a Messiah in pedagogy; but who is a false prophet playing on human credulity through the quasi-mystical power of hypnotism."

The book is a thoroughly incisive argument showing that educational methods now in wide use have nothing to gain from the various methods of hypnotism, a conclusion which the recent researches on the action of hypnotism by Ferenczi have amply demonstrated. The weak part of the book is in the author's failure to comprehend the modus operandi of hypnotic phenomena, which is due to his ignorance of the psychiatric literature. It is also strange to note that Meumann's famous pedagogic series started a few years ago should have been inaugurated by Pfister's masterly volume on Psychoanalysis, which general subject the author states is the work of Beelzebub.

SYPHILIS UND NERVENSYSTEM. Prof. Max Nonne. Dritte Auflage. S. Karger, Berlin.

We welcome a third edition of Nonne's masterly work on syphilis of the nervous system which appears in a markedly enlarged and newly worked over form since the appearance of the second edition five years ago.

In it he has thoroughly gone over the evidence concerning the new discoveries of the *Spirochæta pallida* and the serobiological studies on the blood and cerebrospinal fluid. Many of these did not appear in the previous edition. In the monograph on Syphilis of the Nervous System in White and Jelliffe's Modern Treatment of Nervous and Mental Diseases and in this third edition of Nonne the present-day attitude toward these problems is made available.

PATHOLOGICAL LYING, ACCUSATION, AND SWINDLING. A Study in Forensic Psychology. By William Healy, A.B., M.D., and Mary Tenney Healy, B.L. Boston, Little, Brown and Company.

This book deals with a form of delinquency which the authors define as arising from a condition pathological in itself and distinct from mental abnormality, though often found also in borderline cases, where it is more difficult to separate this particular condition. A review of the literature on this subject shows that this distinction has hitherto not been made.

In accordance with Dr. Healy's method of long-continued individual work with delinquents a number of cases are presented in careful detail from his investigations, which illustrate this pathological trait as it manifests itself in apparently purposeless lying, and in false accusations, whether against self or other, and in swindling, the latter forms of behavior growing naturally out of the lying tendency.

While these cases as a rule do not show definite mental aberrations, especially according to the older classifications, still they are so bound with inner psychic conflict, particularly with sexual repressions and conflicts, often purely

psychical only, of early childhood as well as those due to later experience, that a close study of each case history but serves to convince one emphatically of the actuality of Freud's hypotheses. The authors recognize the values of these beginnings, but yet where the cause of the lying seems to be other than the fundamentally sexual, they do not give true weight, it would seem, to such underlying factors as the attitude of the subject to family relationships and his own place therein, imaginary as much as real. The authors recognize this attitude but do not seem to have measured it up by "the *Œdipus footrule*," particularly the "family romance" side of it. Viewed in the light of this it is most illuminating and also becomes clearer and more valuable as an explanatory factor.

However, the careful work here reported in detail is based on an appreciative understanding of individual psychic reactions as the causes to be searched out and is thoroughly constructive in its aim. It forms, therefore, a valuable study in its suggestive and in its practical bearing.

JELLIFFE.

A TEXTBOOK OF INSANITY AND OTHER MENTAL DISEASES. By Charles Arthur Mercier. Second edition. The Macmillan Company, New York. \$2.25.

In his preface Mercier writes "that insanity is a subject but little understood. When I began to study it there was no systematic knowledge of it at all." It is a pity that Heinroth wrote or Reil rhapsodied, and the long list of sincere students from the first pragmatic sayings of Protagoras concerning the mental life to the present have all been in vain. At last a prophet has arisen and his name is Mercier.

He tells us that "insanity is a disorder of conduct and not of mind, manifestly and blatantly true though it is, has made little or no progress toward acceptance in the twelve years since this book was published." One suspects Mercier to be blinded to the obvious, since from the earliest times disordered conduct has been the chief criterion of a disturbance of the psychical activities.

Conduct, we suspect, may be interpreted as the result of a series of mental processes. Possibly mental processes and mind are two symbols, which have nothing to do with one another in Mercier's mind.

Mercier thinks his classification "water tight." He accepts the principle of evolution, but it must stop with Mercier. All others have failed, but his is finally right. This and other types of gratuitous assumptions we find in the preface.

With such a rationalistic attitude toward science in general, what can one expect? A water tight series of boxes, arranged in a beautiful row, with all the sizes marked on the outside, as in a shoe shop. It is a convenient system for selling shoes! Will such intellectualism work for anything but the callow weed of a youth who wants to be told a thing is so because his father said so?

Calvinism in religion has had its day; the ipse dixits of ecclesiastical authorities as working schemes for growing social organizations failed to permit of advance and have passed. Mercier came too late. Instead of being a new prophet he is hopelessly Aristotelian and intellectualistic.

We believe that this work comes within that group engaged in a sterile discussion of the meaning of words rather than one furthering an understanding of the actions of things, and notwithstanding the right emphasis put upon conduct, which practically all psychiaters have agreed upon, it is difficult to understand what the author even means by conduct.

JELLIFFE.

HANDBUCH DER NERVENKRANKHEITEN IM KINDESALTER. Von Prof. L. Bruns, Prof. A. Cramer and Prof. Th. Ziehen. S. Karger, Berlin.

This notable triumvirate of talent has given us a remarkably comprehensive and extremely satisfactory work. Cramer has taken up Nervous Children, Hysteria, Epilepsy, Chorea, Stuttering and Tics.

Bruns has written on the diseases of the spinal cord and peripheral nerves in childhood, with additional notes on polymyositis and related muscular disorders; while Ziehen has taken up the disorders of the brain and meninges in an admirable manner.

The whole makes a very complete and satisfying volume of 1,000 pages, well illustrated and rich in facts and practical suggestions.

JELLIFFE.

ELEMENTS DE SEMIOLOGIE ET CLINIQUE MENTALES. Par Dr. Ph. Chaslin. Médecin de la Salpêtrière. Asselin et Houzeau, Paris.

The author has outlined for himself the production of a book which would avoid the illusory compactness of a quiz compend on the one hand and the encyclopedic diffuseness of the traité on the other. He therefore has written a manual, clear and precise in its descriptions, with marked accent on the semiology and illustrated with many extracts from case histories. He purposely has avoided all bibliographies and omits all interpretations, saying that which no modern psychiatrist can say acquainted with the work of Kraepelin, Bleuler and others, that they are purely metaphysical and must be remade.

All in all the author has rid himself of much useless lumber, here and there giving an intimation that he has done so with intention, and has written an entirely new type of work which has avoided descriptive generalizations and sought to describe what he has termed types.

JELLIFFE.

JAHRESBERICHT UEBER DIE LEISTUNGEN UND FORTSCHRITTE AUF DEM GEBIETE DER NEUROLOGIE UND PSYCHIATRIE. Redigiert von Prof. Dr. L. Jacobsohn. Vol. XVII, S. Karger, Berlin.

This the latest volume of this masterly yearbook on neurology and psychiatry reviews the literature of 1913. There are 1,600 pages in this number; the references are all inclusive and little of moment has been omitted. We repeat what we have so often said with reference to this work as being the most important single publication in its special field. It is preëminently the most valuable reference library that a worker in these fields can possess.

JELLIFFE.

DIE OPERATIVE ERFOLGE BEI DER BEHANDLUNG DES MORBUS BASEDOWII. Von Dr. Otto Klinke. S. Karger, Berlin.

This thesis received the Möbius prize. The author discusses the older literature and then goes over the recent work. It is a careful and valuable digest of the voluminous literature bearing on this important topic.

ORTHOPÄDISCHE BEHANDLUNG DER NERVENKRANKHEITEN. Von Prof. D. K. Biesalski. Gustav Fischer, Jena.

This "separate" from the Lehrbuch der Orthopedie of Lange's should be made available to all neurologists by reason of its scholarly and systematic presentation; its rich illustrative features and its many practical suggestions. By means of it the neurologist and orthopedist can work together to better advantage. It is a work that has long been needed.

DAS ZITTERN, SEINE ERSCHEINUNGSFORMEN, SEINE PATHOGENESE UND KLINISCHE BEDEUTUNG. Von Dr. Josef Pelnar, of Prag. Verlag von Julius Springer, Berlin.

This is No. 8 of the Alzheimer and Lewandowsky monographs. It is the most comprehensive, minute and detailed study of tremors that exists at the present time in medical literature and needs no further comment. The working out of tremors from the mechanistic and descriptive side is admirable. He shows no comprehension whatever, speaking from an interpretative side, of the psychogenic factors in tremors, such as in hysterias, dementia præcox, compulsion states, etc. His definition of hysterical tremors as "simulation," using it in a conscious sense, is nonsense.

One therefore is prepared to find a masterly study of the mechanical factors in tremor production, particularly at the sensori-motor levels of the nervous system; the vegetative level disturbances are touched upon, but not explained—indeed perhaps our knowledge of electrophysiology is as yet too imperfect to interpret these subtle synaptic junction surface electrical phenomena. The psychic level lies entirely outside of the author's cognition and like many mechanistic founded studies there is no evidence to show that the problems even exist.

The book is especially valuable from the purely descriptive side. The interpretative side is less well organized. The author accepts the hypothesis that the tremor paralysis agitans is a cerebellar spinal disturbance, chiefly localized in the mesencephalic pathways.

OXIDATIONS AND REDUCTIONS IN THE ANIMAL BODY. By H. D. Dakin. Longmans, Green and Co., New York.

Dedicated to the late Dr. Christian Herter, of New York, whom neurologists enroll as one of their own, this excellent volume by Dr. Dakin should be read by all whose chemical interests and information entitle them to have opinions relative to the complicated problems of metabolism.

The increasing knowledge concerning vegetative nervous activities promises to open a way to a comprehension of metabolic processes; a deep understanding of which is bound up in the biochemical constitution of the human body.

We welcome the attempt of the editors of this series of monographs on biochemistry, and feel that Dakin's volume is an excellent contribution to the value of the series. German science has shown its activity and its comprehension of the needs by its rich issuance of small volumes, at reasonable prices, which may be purchased, and, having served their purpose, are only of historical value. The present series of volumes is a worthy imitator.

Dr. Dakin's volume attempts an account of the principal chemical reactions, involving oxidation and reduction, viewed solely in the light of the chemical structure of the substances involved. It is therefore preëminently chemical.

When it is realized that only within comparatively recent times have the details of even some of the simplest oxidation and reduction processes been grasped, it is a satisfaction to know that they can be stated and a source of congratulation to have them so well outlined as in this small, inexpensive and thorough monograph.

JELLIFFE.

DENGUE UND ANDERE ENDEMISCHE KÜSTENFIEBER. Von Prof. Dr. Georg Stricker, in Münster. Alfred Hölder, Leipzig and Wien.

In this continuation of Nothnagel's celebrated series the question of coast fevers and dengue are taken up in monographic completeness. Dengue is of

interest to the neurologist because of its affinities to influenza, which latter large medley is greatly in need of careful revision from the neurological viewpoint.

NERVÖS, ZWANZIG GESPRÄCHE ZWISCHEN ARZT UND PATIENT. Von Dr. Ludwig Scholz aus Bremen. S. Karger, Berlin.

The author, following an early custom, arranges twenty short consultations with an intelligent patient and expounds a fairly systematic scheme of psychotherapy, following in the main the essential features of Dubois' dialectics. To cure psychogenic ills the patient must understand their nature. This he attempts to unfold in a readable and satisfactory manner. Suggestion also bulks fairly large in his psychotherapeutic talks.

PRINCIPIOS DE PSICOLOGIA BIOLOGICA. José Ingenieros, Buenos Aires. Daniel Jorro, Madrid, Editeur.

Dr. Ingenieros is known for his excellent work in psychiatry, criminal anthropology and related activities.

The present principle of biological psychology serves to enhance his reputation and to offer to its readers a number of ways of looking at psychology which, although often followed, are yet always attractive. It is thoroughly modern and utilizes the general concepts familiar to the student of the psychology of the last two decades. It fails to be ultramodern in that there is no suggestion of the study of the so-called unconscious phenomena. He is not a devotee of Bergson, but is more strictly formal and materialistic, patterning after Spencer and the Wundtian school.

DIE NERVENKRANKHEITEN, IHRE URSACHEN UND IHRE BEKÄMPFUNG. Dr. J. Finckh.

WIE BEHANDELN WIR GEISTESKRANKE. Dr. Hermann Haymann. Otto Gmelin, Munich.

These two popular lectures are attractively presented in form and material, but by reason of their appeal to the lay reader interests us only as to the methods followed by our German confrères in their attempts at popularizing difficult subjects.

UEBER DEN URSPRUNG DER GEISTIGEN FÄHIGKEITEN DES MENSCHEN. Von Berthold Kern. August Hirschwald, Berlin.

In this dissertation held before the Berlin Society for Anthropology and Ethnology, Dr. Kern traces the evolution of the mental processes of the individual, the state and the nation from its primitive sources. It is an attractive essay which states the general evolutionary hypothesis in an acceptable manner.

GRUNDRISSE DER PSYCHIATRISCHEN DIAGNOSTIK. Von Prof. Dr. Julius Raechle in Frankfurt. Fünfte Auflage. August Hirschwald.

We have had occasion to praise this small volume which appears now in its fifth edition. 120 of its 180 pages are devoted to the examination of the patient. The special part takes up the psychoses following in large part the Kraepelian nomenclature.

The Journal
OF
Nervous and Mental Disease

An American Monthly Journal of Neurology and Psychiatry, Founded in 1874

Original Articles

A REPORT OF TWO CASES OF PROGRESSIVE LENTICULAR DEGENERATION

By ARTHUR S. HAMILTON, M.D.

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AND

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The patient, described as Case I, was presented at the meeting of the Minnesota Neurological Society, November 23, 1911, and diagnosed diffuse cerebral injury, following partial strangulation. The appearance shortly afterwards, of Dr. Wilson's article on progressive lenticular degeneration, convinced us that we were dealing with a similar condition, and the history, since obtained from a variety of sources, has corroborated this opinion. When the case was presented, we knew nothing of a familial tendency, or of any pathological condition, antedating the injury. Even now, the relatives, especially the mother, are very loath to recognize the existence of a familial disease and we are left with the impression that, even as recorded, the history may not do justice to this feature, and on the contrary, may have exaggerated the traumatic element. At a subsequent meeting of the Neurological Society, November 21, 1912, the case was presented and diagnosed as one of progressive lenticular degeneration.

CASE I. F. W., male, age 28 years, single.

Family history: The paternal grandfather died of pneumonia at seventy-nine years, the paternal grandmother from the effects of a cold. The maternal grandparents were healthy and lived to old age. The grandfather died of cancer. Four paternal uncles and two paternal aunts are well. One paternal uncle died of "abscess of the brain" and one of unknown cause. Three third cousins died of pulmonary tuberculosis. The father and mother are living. The father has leukoderma and lumbago and the mother is decidedly nervous. Lues is denied. Neither has any condition like that of the sons. There are eight brothers and sisters. All are living and at least fairly well except as follows: One brother has valvular heart trouble, and another brother (case II) has a condition similar to that of the patient. This brother has a twin sister who is well except for some gastric disturbance. A third brother (case III) is possibly developing the disease. There were three miscarriages between the fourth and fifth children, one at one month and two at two months. These are said not to have been artificially produced. The sex, age, and order of birth of the children are as follows:

1. Girl, age 29, married, well.
2. Boy, " 28, single (case I).
3. Boy, " 26, married, well.
4. Girl, " 25, married, well.
5. Boy, " 23, single (case III).
6. Boy, " 20, single (case II).
7. Girl, " 20, single (twin with No. 6).
8. Girl, " 14, single, well.
9. Boy, " 10, single, well.

Personal history: The patient was a full-term child, breast fed, and weaned at eight months on account of the mother's succeeding pregnancy. He had considerable digestive trouble in early years, but, in a general way, was well up to nineteen or twenty years of age. He did better in school than the average until fifteen years old, when he was taken out on account of an attack of appendicitis. He is a masturbator. As a young man he was a good worker and had no trouble in holding a situation. He read a great deal, liked machinery and, until the onset of his illness, showed considerable mechanical skill. At nineteen he went to work in a candy factory, and at that time did much heavy lifting. While engaged in this work it was observed that he had so marked a tremor in the right hand that he could scarcely hold a glass of liquid without spilling it. When twenty years old he was operated on for appendicitis and two months later his family noticed that he talked as if his tongue were thick. At the same time his arms were spastic, and he dragged his right foot. A little after his operation for appendicitis he began to go into violent tempers when anything displeased him. Once he tried to attack one of his brothers on account of a minor disagreement. His appearance at that time is shown in Fig. 1. His condition grew slowly worse during the succeeding sixteen months. His

speech was thicker, and it became difficult to understand him. His right foot dragged more and both hands shook. When about twenty-two years old he left home and there is no clear record of what followed directly afterward. Apparently he went West about eight hundred miles to work with a railroad construction gang. While there he had trouble with some Italians who are said to have placed a rope about his neck and to have dragged him along the railroad track. After this he set out for home and wrote his mother

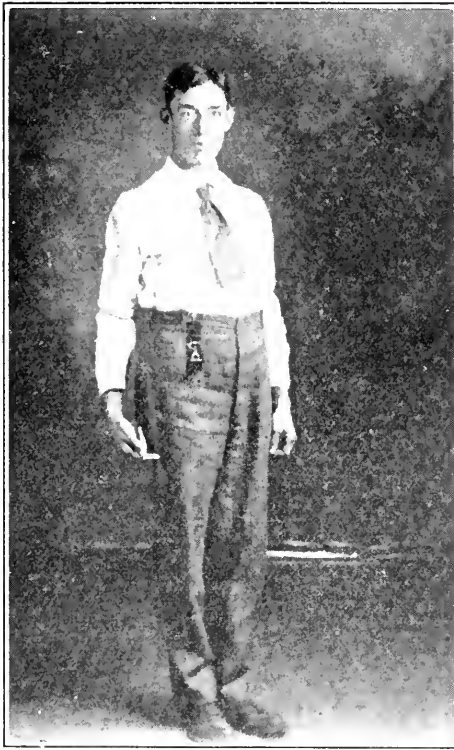


FIG. 1.

a fairly intelligent letter on a Thursday from a point about seventy miles west of his home. On the following Sunday he was found lying in an open freight car in one of the railroad yards of Minneapolis. At that time he could not walk, talk, or feed himself but he ate an enormous amount of food when assisted. Later he improved considerably and was able to tell that he had ridden the entire eight hundred miles in an open freight car in extremely hot weather. Since this experience he has been unable to dress himself most of the time. Shortly after his return home as above, he fell downstairs and was unconscious for one half hour.

In January, 1912, he had improved somewhat in the use of his

hands. He could talk a little but at times his tongue seemed to stick to the roof of his mouth, the saliva dribbled from his lips and he was unable to make a sound for a few minutes. At such times he would grasp his chin with one hand and after moving it up and down a few times he would swallow and could speak, though still with much difficulty. At times he wet his clothes but never the bed. He had an enormous appetite and his mother said that for several years he had "eaten enough for six men" and that he was ready to eat and drink again in an hour after a very full meal. He smoked incessantly but used no alcohol. His mother, also,



FIG. 2.

stated that on a number of occasions, lasting over a considerable period, he had intense cramp-like pains in the upper abdomen and that his whole body would be doubled up. For several years at intervals, both following these attacks and independently of them, he became markedly jaundiced. On these occasions, the skin discoloration generally passed away quickly but the eyes would remain discolored for days. For three years he had shut one eye on reading and said that things appeared double otherwise.

His physical examination, January 23, 1912, when he was twenty-five years old, resulted as follows: He was a well developed and nourished man and weighed one hundred and forty-nine pounds.

His hands and feet were cold and cyanotic. There was a yellowish tinge to the white of the eyes. His muscles were of good volume and strength. Much of the time his face had a sleepy, masklike expression, but frequently a broad grin, of long duration, would spread over his face. His tongue lay on the floor of his mouth and he was unable to protrude it much beyond the teeth. His mouth was full of saliva and this dribbled from his lips. His pupils were equal and reacted to light and accommodation. There was no paralysis of the external ocular muscles and no diplopia, but there



FIG. 3.

was a well-marked, irregular, coarse jerking of the external ocular muscles on lateral or upward vision. Sight and hearing were good. His speech was very slow and labored and only rarely could a word be understood.

Frequently his jaws became set, especially when attempting anew to speak, and it would then be necessary to relax the lower jaw with the aid of his hand, before a sound could be uttered (Fig. 2). He often choked in attempting to swallow. He walked with

a spastic, rolling gait and as he did so the arms were held in a semi-flexed attitude and the fingers in a peculiar position. (See Figs. 2 and 3.) Both arms were constantly spastic, the left more so than the right. There was also a very marked spasticity of the throat muscles, but the muscles of the entire body were more or less rigid (Fig. 3), especially on attempted movement. The left hand was stronger than the right, but the power in the right was fair. In lifting a glass of water with either hand he developed a very marked tremor but, by assisting the hand holding the glass, with the other



FIG. 4.

(Fig. 4), he could bring the water to his lips. At times, on effort, the tremor seemed to involve all parts of the body but was always much worse in the arms than in the legs. There were no atrophies and no sensory trouble could be made out, but he said he had some numbness of the right hand at times and there was an uncertain history of hypesthesia of the right hand and foot for six months after his experience at the railroad camp. The superficial facial reflexes were normal. The triceps, biceps, and Achilles jerks were all distinctly active and equal on the two sides. The upper, middle and lower abdominal reflexes were normal. There was no ankle or patellar clonus. The plantar reflex was unsatisfactory but probably

flexor. In the finger-to-nose and finger-to-finger test the tremor became extensive just as the action reached its culmination. He had poor control of the bladder and had to pass urine frequently during the day. The urine was acid, specific gravity 1.030, and contained no casts, but albumen and sugar were both present. (The latter findings could not be verified in many subsequent examinations.)

His intellectual power was not easily determined. At first sight he appeared to be a very demented person, but on closer study this was not borne out. His father thought he had a good memory and he certainly comprehended what was said to him. At times he would make a crude sort of joke. He often laughed in a foolish way and without any apparent cause.

In the fall of 1913, he was admitted to the Minneapolis City Hospital and at that time the following additional history was obtained. Subsequent to the examination above, he had improved considerably, but in the winter of 1912-13 he grew worse. Several times he fell and if anything upset his balance in the least he seemed unable to regain his equilibrium. After several of these falls he was unconscious for a time; in consequence of the fall, his mother thinks. She also stated that his condition was very changeable. Thus on some occasions he would call her attention to the fact that he could lift a cup of water with very little tremor and shortly afterwards his hand would shake so that he would spill half the water before getting it to his lips. Sometimes he would go to bed apparently feeling well and the next morning would be unable to talk or walk and on any attempt at the latter he would fall. In the same way on some days he could stand on one foot and on the next he would fall, directly, on attempting to do so.

On October 9, 1913, he raked the lawn. The next day he fell several times and seemed almost helpless and was finally picked up by the police, lying on the ground, some distance from home, and taken to the City Hospital.

When examined there the next day, he was found lying in bed. He was fairly well nourished and there was no discoloration of the skin. His eyes were open and had a fixed stare. His face had a grave and masklike expression (Figs. 5 and 6) but on recognizing the examiner it broke out in a broad grin which spread slowly over his face (Figs. 7 and 8). His mouth was always widely open and his lips were red, thick, and everted and saliva frequently dribbled from them. His eyes followed all the actions of the examiner and he seemed aware of all that happened.

At the time of this examination his left arm was in semi-extension with the hand straight on the wrist, the thumb and first finger extended, the second finger slightly extended and the other two fingers firmly flexed into the palm. The right arm was strongly flexed at the elbow and the fingers were drawn into the palm, but the two distal phalanges of the fingers were straight. The thumb was only slightly flexed. The position of the fingers and hands changed considerably from time to time, as is seen in the figures. All motions and signs were made with the left hand and arm and

especially with the left first finger which seemed more flexible than other parts. The right hand and arm could be brought down to the bed by the examiner with some effort and would remain down for a time but tended soon to return to their former position of flexion. It was evident that the left hand and arm were distinctly less spastic than the right. His legs were straight in bed and moderately stiff, but when handled in any way they quickly became very rigid. He occasionally sat up in bed and, to do so, he caught his toes under the round at the foot of the bed and drew himself quickly and rigidly into the upright position. When the statement was made



FIG. 5.

in his presence that his arms were stiffer than his legs, he immediately and vehemently denied it by signs. When given a pencil he always held it between the left thumb and forefinger, and he wrote very slowly and with difficult, cramped movements. There were no atrophies.

So far as could be determined his vision was good. The eyes were slightly prominent. There was no corneal pigmentation. All the external ocular movements were good in power and degree, but they were jerky and irregular in character. There was no apparent spasticity in the external ocular muscles and no diplopia. There was no definite von Graefe, but in looking up the lids sometimes moved faster than the balls and the sclera was shown. Con-

vergence was good until a nearer point was reached when the left eye always turned out. There was lateral nystagmoid movement on vision to either side but the movement soon stopped. The pupils were central, regular, and rather small. Both reacted normally to accommodation and sluggishly to light. The optic discs were normal.

The conjunctival and corneal reflexes were probably present but contraction was so slow as to leave the matter doubtful. Wink-



FIG. 6.

ing was notably infrequent. Sensation for touch, pain and temperature was normal in the face. Taste and smell were normal as far as could be determined. The jaws closed firmly and equally on the two sides, but slowly and only after several efforts. He shut his eyes equally but not firmly, and did not seem able to wrinkle his forehead, and moved his mouth only faintly in attempting to show his teeth. When asked to whistle he tried for some time to get his lips together and succeeded to some degree but not sufficiently to whistle and he could not blow out a match. He was later seen making repeated efforts to get his lips into position but he was not

successful in whistling. His smile was broad and pronounced and was more to the right than the left. Hearing was good in both ears and there were no subjective noises.

When he opened his mouth the tongue fell back. He could not say "ah," on request, and in his attempts no movement of the palate was seen, but, when he laughed, the palate moved equally on the two sides. In laughing he opened his mouth widely before emitting a noise and then gave forth a sound something like "ah, ha, ha, ha," with a rising inflection at the end. The mouth remained open for some time after the sounds ceased, about sixty seconds on an average



FIG. 7.

(Figs. 7 and 8). He often breathed deeply with an inspiration like that of a deep snore. He could not protrude the tip of the tongue more than an eighth of an inch beyond the teeth, but there was no atrophy. There was complete aphonia at the time of the examination except for the sounds mentioned above and for certain sounds which passed for "yes" and "no," but could not be so understood by an uninitiated person.

When fed he insisted on the food being pushed well into the side of the mouth between the cheek and the teeth. Apparently he could not manage it at all if it were placed in the center of his

mouth. He could eat solid or semi-solid food, fairly well, though frequently it overflowed from his mouth in his attempts to swallow, but in taking liquids he often choked, always in a slow measured way, much like his other movements except not quite so slowly. The sterno-mastoid muscles were spastic but of good power. They did not relax on reclining.

Joint sense and cutaneous sensibility to touch, pain and temperature appeared to be everywhere normal.



FIG. 8.

Except when the spasticity was marked, the Achilles, patellar and forearm jerks were active and equal on the two sides. The triceps and biceps reflexes were active, the right more so than the left. The masseter and jaw jerks were slight. There was no ankle or patellar clonus. The facial reflexes were all sluggish. In the abdomen an occasional slight response was obtained with a sharp instrument, usually there was none. The cremasters were faint but equal on the two sides. No pharyngeal reflex was obtained, but he indicated that he felt the irritation. The plantar reflex was flexor with Babinski's and Oppenheim's methods. There was no definite loss of control of the bladder or rectum.

The muscles were of good size and power. Their tonicity

varied greatly. Usually they were in distinct hypertonus, but sometimes they seemed very limp when his attention was not drawn to them. His mother had observed the same condition. When in sound sleep all his muscles were relaxed.

At the time of the examination he was able to stand on his feet and to walk, but with a very stiff and spastic gait. When sitting with his legs hanging over the edge of the bed he was asked to lie down in the bed without assistance. At the time he was in an erect, spastic posture. After much delay his body dropped back on the pillow on the right side. The same movement elevated his feet and legs and brought them to the bed. He then rolled over on the bed so as to lie on his back and straightened his legs with a jerk. He liked to exhibit his muscular strength and after his attention was drawn to the matter frequently would go through difficult movements. Thus when lying on his back he was able to flex his thighs on his abdomen and finally to touch his feet to the top of the bed above his head. On several occasions he struck the orderly with his fist and once knocked him down. He doubled his fist and flexed his arm very slowly, but, after he had overcome a certain inertia, he struck quickly and with power.

As he was unable to talk he usually made known his wants by writing with a pencil on his bed sheet. This was a matter of considerable difficulty. When lying on his back a pencil was handed to him. He took it into his left hand with much effort and very stiffly, then suddenly threw himself *en bloc* on the right side with his entire body in a stiff and rigid attitude. His head was held straight out and was not supported by the pillow. The saliva flowed from his mouth. He wrote the word "rocker" requiring four minutes to complete it. "Roe" required fifty seconds, spent mostly on the "e." At "k" he stopped for one minute and four seconds and then quickly wrote "e." Before the final "r" his hand was again held in an absolutely stiff and motionless attitude for over one minute, after which he quickly finished the word. As he brought the pencil down to the sheet to write, the hand showed a coarse tremor. He held the pencil firmly on the sheet almost constantly but at times partially released it, and always with the development of the same coarse tremor on regrasping it.

On another occasion he was seen to attempt to catch a fly with his left hand. The thumb and forefinger were extended on the hand which was held suspended for sometime waving back and forth on the horizontal plane and then suddenly moved down to the fly.

He grasped an object with the right hand without tremor, but when using the left hand there was always a slow tremor, about three or four movements per second and with one to two inches amplitude. It was certainly much less pronounced at this time than at his first examination. It was absent when at rest. He touched the examiner's finger with his great toe without tremor and without incoordination, but slowly and only after securing relaxation. There was no twitching or contraction. The only voluntary muscles

which were not spastic were those of the eyeballs and, at times, the eyelids.

At the hospital he was often irritable and cranky. He would go into violent rages over trifling matters and tear up his clothing and his bedside records. At one time he knocked a woman nurse down, in addition to his experience with the orderly. Afterwards he would always laugh in explaining by signs that he did this, evidently considering it a great joke. He was oriented as to time, place, and persons, and, aside from his outbursts of passion, showed no evidence of mental suffering on account of his lot. There were never any delusions or hallucinations.

He slept soundly at night and often during a considerable part of the day. Occasionally he could not be awakened sufficiently during an entire day to get him to eat or drink.

Examinations of his liver usually showed the area of dullness normal. On one occasion it seemed diminished. No nodules or roughness could be felt. The cerebrospinal fluid contained four cells per cm. The globulin and Wassermann reactions were negative.

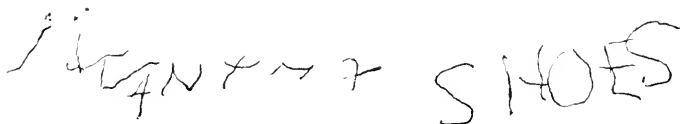


FIG. 9.

A sample of his handwriting in an attempt to write "I want my shoes" appears in Fig. 9.

Just previous to the writing of this paper, January, 1915, the patient has again come under observation. He is still moderately well nourished but he is much weaker, more quiet, and shows fewer signs of mental activity than on his previous examinations. Spinal tapping has been performed three times. In no case was there any globulin response or cell increase. Once the fluid had a slightly cloudy appearance and on this occasion it was said to contain some "foreign bodies, not cells." In none of these tests was the Wassermann positive.

CASE II. H. W., male, age 20 years, single.

Family History: See Case No. I.

Personal History: The patient was a puny child up to about six or seven years of age. When six years old he had a severe attack of scarlet fever, and, sometime in early life, he had measles and mumps but was not very ill. He had a mild attack of smallpox four or five years ago. His mother states that he has had several slight attacks of jaundice in recent years. He smokes a moderate amount of tobacco, but has used no alcohol. He is a masturbator. He was slow in school and finished the eighth grade when seventeen years old.

Four or five years ago he slipped and fell on the sidewalk, striking on the back of his head. He lay still for fifteen minutes

and was then helped up. He was dizzy and nauseated and this continued for four or five days with some vomiting. There was also slight pain through the temples and back of the head. Recovery was finally complete. Four years ago he was "bumped" by an automobile and one eye blackened but no serious symptoms followed. Two years later he fell from a wagon and struck on his head. He was dazed and "knocked out" for five minutes. He then got up, but staggered for some little time. There was no nausea, vomiting, or dizziness following this, but everything "seemed



FIG. 10.

dark for half an hour or so" and he could scarcely see objects. He made a complete recovery.

On May 30, 1912, he was struck over the right eye with a black jack and knocked down, after an altercation with another man. He was unconscious for over twenty-four hours and slept most of the time for three days. There was no headache, nausea or vomiting following this injury but he was "numb all over and felt as if asleep." The numb feeling lasted one week and has not since returned. For two weeks after the accident he saw double constantly, one object beside the other. The patient insists that he was normal before this injury, had good control of his muscles and could play

games like other boys, but his mother thinks he was somewhat clumsy even previously. It is certain, at least, that shortly afterward he had a distinct tremor in his hands and a stiffness in his legs so that he could not run well. This stiffness has troubled him a great deal since and the right leg has been worse than the left. There have been no convulsions. There is some speech disturbance but no evidence as to when it appeared.



FIG. 11.

In September, 1912, he decided to go west with some other boys. Under their direction he broke into a store to get some heavy shoes, was apprehended and sent to the State Reformatory, September 14, 1912, where he still is.

When examined, very briefly, on September 12, he was clumsy in the use of his hands and feet, hesitating in his speech and complained of headache. His pupils reacted to light and accommodation. There was a nystagmoid movement and general muscular hypertonus. The patellar reflexes were active and the plantar reflexes were flexor.

A second examination was made at the St. Cloud Reformatory, December 7, 1913.

Physical examination: The patient was five feet, eight inches

high. His ordinary weight had been one hundred and fifty pounds, and at the time of the examination was one hundred and fifty-four. His nutrition and general development were exceptionally good and there were no atrophies. His head was not very large. The forehead was low and narrow (Figs. 10 and 11). The ears were well shaped and the palate was well arched. The teeth were properly set and well preserved. The neck was muscular and unusually large. The tongue was clean and there was no pyorrhea. The pulse was sixty-six, full and regular. The radial and temporal arteries were not thickened. The area of superficial heart dullness was rather small. The heart sounds were clear and there were no murmurs. The systolic blood pressure was one hundred and ten. The patient said his hands and feet became blue very easily, and at the time of the examination the hands, feet and face were all somewhat cyanotic. There was no other vasomotor disturbance, but there was some roughness of the skin over the entire body and especially on the legs. There was no pigmentation of the cornea and no discoloration of the skin.

The respiratory system was normal except that several times during the examination he showed the same deep inspiratory action as his brother, only less frequently. His laugh was also much like his brother's, and, in the language of the guard, "he laughed with a haw, haw, haw, like a mule."

FIG. 12.

He walked with a stiff, somewhat halting gait and held to things in going up and down stairs. The muscles were all large and well developed. Motor power was good in the neck, arms, trunk and legs, but the right arm was distinctly more powerful than the left. The legs were equal in power. The arms did not tire with undue readiness. The hands were alternately pronated and supinated very slowly but equally. He wrote with some hesitancy, but not with such slowness as his brother showed, and there was an occasional slight, stiff jerk of the hand, as is seen in the second "i" in "Minneapolis" (Fig. 12).

There was an almost constant coarse jerking of the right hand and arm, increased on effort, and shown especially in such actions as buttoning his clothes. At these times the thumb tended to be in extension on the hand and the little finger in flexion. There was a

similar slight jerking in the left hand and arm. There was no contracture but all the muscles were hypertonic and the arms and legs were very spastic when passively moved, the arms more so than the legs, and the right arm more than the left. There was no athetosis and, aside from special effort, no fixed attitude in which the hands were held. The patient thought the jerking in the right hand had been rather marked the preceding winter and better again the past summer. The guard said there had been no permanent change but he and the patient agreed in that it varied from time to time, and the guard added that the patient's general physical and mental condition underwent similar variations. The guard stated also that the patient's walking had improved since coming to the reformatory.

He stood with eyes closed and walked backwards and forwards without difficulty. There was some trouble in walking a crack but no ataxia of the hands in the finger to nose test. The patellar and Achilles jerks were active but equal on the two sides. The triceps, biceps, and supinator jerks were active and more so on the right side than on the left. There was no ankle or patellar clonus. Both plantar reflexes were uncertain, sometimes extensor and sometimes flexor. The right abdominal reflex was normal, the left was faint. The pharyngeal, cremasteric and organic reflexes were all normal.

Cutaneous sensibility was everywhere normal to touch (cotton), pin prick, temperature changes and pressure. Joint sensibility and deep muscle sense were preserved. Sight, taste and smell were normal and equal on the two sides. He distinguished colors readily and there was no disturbance of the field of vision. The pupils were equal and reacted normally to light and accommodation. All the external ocular movements were normal. There was no diplopia or nystagmus. The fundus examination was also negative. There was no disturbance of the motor or sensory divisions of the fifth. In speech and in smiling the right side of the face was drawn up more than the left and moved more freely, but in all voluntary movements the two sides of the face moved equally. He heard a watch at two and one half feet, and air conduction was greater than bone in both ears. He complained of a ringing noise at times, heard in both ears.

The speech was distinctly thick but he knew this only from having been told so and had no idea when it appeared. He ate with some difficulty and at times choked on liquids. He could blow out a match but whistled very badly and was not able to close his lips firmly. He said test phrases correctly and fairly rapidly. The tongue was protruded weakly into the cheeks, especially the right, and only a short distance beyond the teeth. There was no atrophy or fibrillary tremor.

The genito-urinary system was normal. He urinated about eight times a day and once at night. He slept only fairly but said he seldom dreamed.

His face had usually a happy, child-like expression and he was very mild in all his speech and actions, but he showed some vin-

dictiveness in recalling the imaginary grievances to which he had been subjected. He was oriented as to time, place and surroundings, and attended fairly well to questions but was rather slow in comprehension and decidedly slow in responding. His entire attitude was childish and his memory was deficient. For example, his statement as to the details of his illness was considerably at variance with that of his mother, and he had difficulty in recalling incidents in which he was concerned as recently as a few months back. There was no special tendency to emotionalism but he spoke with affection of his home and family and said he wanted to return to them. Apparently there was no real comprehension of the fact that he had committed a serious offense for which he was being punished and he seemed to think that an application from his parents was the only thing necessary to secure his release.

He was examined again at the State Reformatory November 24, 1914. His attendant stated that he had failed decidedly since the preceding examination and this was evident at once when he was seen. He came into the examination room with a decidedly spastic gait. The left arm was abducted from the side. The forearm was strongly flexed on the arm and the hand was flexed at the wrist. The fingers were held in a fixed position, somewhat similar to those of his brother (case I). The right arm was held against his side and flexed at the elbow but to a less degree than the left. The right hand, also, was less spastic and less in contraction than its fellow. By passive movement, the contractions in both extremities were readily relieved but the parts soon returned to their former position when released. Both feet, but especially the left, were dragged on the floor. The face had a dull, heavy and somewhat sleepy look. The lower lip drooped decidedly, the face was somewhat flushed, and the hands and feet were very cyanotic. This cyanosis extended almost to the knees and half way to the elbows. He was carelessly dressed and his whole appearance was that of a much less intelligent man than at his former examination. His speech was considerably disturbed and none of his words were articulated clearly, although when an attempt was made to get him to respond to test phrases, he made no gross mistakes. He said he had trouble in drinking liquids, and frequently choked on them, but had no difficulty in taking solid food. He could not whistle or blow out a match and when he attempted to puff out his cheeks, his lips seemed weak and flabby. The tongue was pushed feebly into the cheeks and was not protruded beyond the teeth. There was no dribbling of saliva. The palate reflex was present. The external and internal ocular muscles were normal in their actions. There was no nystagmus or diplopia. Sight and hearing were good. The gross strength in the legs and arms was good. There was no atrophy and no sensory disturbance, either subjective or objective. All the muscles of the arms and the legs were in distinct hypertonus but this was more marked in the arms than in the legs and more marked in the right side of the body than in the left. The biceps, triceps, supinator, patellar and Achilles jerks were active. A posi-

tive ankle clonus was developed on both sides although persistent for only a short time. Both plantar reflexes were unsatisfactory, often flexor and never clearly extensor. In both hands, when in action, there was a distinct gross tremor, much like that of his brother, with an amplitude of two or three inches and four or five movements per second. In bringing a glass of water to his lips with either hand, the tremor was very pronounced, but not much increased at the termination of the movement. He recognized that his condition was similar to that of his brother and that he was seriously ill. He asked if it were possible that he should ever recover, and when told that it was not he said "It is hard luck." At first he was evidently depressed but shortly returned to his former state of cheerful apathy. Frequently a broad and persistent smile overspread his face. He was fully oriented, asked after members of his family, especially his mother, and seemed interested in others. He also told some news received in a recent letter. The guard stated that his memory was failing.

CASE III. At the visit of November 24, 1914, another brother was seen. He had recently been committed to the reformatory for some lawlessness. He was 24 years old, of medium size, but very well developed and very muscular. At the reformatory he had the reputation of being "a bad man." A careful examination failed to show any sign of the family ailment unless the fact that the sole of his right shoe was very much worn at the anterior and inner part, as if he were beginning to drag his right foot, can be accepted as such. This condition was limited to one shoe and there was no apparent cause for it other than the way in which he walked.

Though not in all respects typical of chronic lenticular disease as outlined by Wilson (1), we believe our cases belong in his group and we are encouraged in this belief by the fact that several of the cases reported since Wilson's first description do not coincide absolutely with the symptoms as given by him. The clinical picture as developed by Wilson is essentially as follows: The disease appears in young people and while often familial is not congenital or hereditary. It is progressive and lasts a varying period from a few months to several years according to whether we are dealing with the acute or chronic type. The chief clinical signs are: a generalized tremor, muscular rigidity and hypertonicity, spastic contractions and contractures, dysarthria, dysphagia, emotionalism and certain other mental symptoms, more or less severe. In pure type the disease is extrapyramidal, but, at times, and especially late in its course, signs of secondary involvement of the internal capsule may appear. Atrophic cirrhosis of the liver, though constantly found post mortem, is rarely, if ever, demonstrable during life.

A careful examination of our own cases shows them in agree-

ment with most of these fundamental features. Thus the condition is clearly familial but not, so far as determined, hereditary. Two children, the second and the sixth in the family, are undoubtedly affected, and possibly a third, and at least two others are sufficiently young to have by no means passed the danger point. There has been no special tendency then to involve the older children in the family, as Wilson found to be true in the familial cases investigated by him.

We have already stated that the history, as given, may place excessive emphasis on traumatism as the etiological factor. Additional history, obtained since this article was prepared, makes it doubtful if the choking complained of in our first case really ever occurred as described.

Cases I and II are evidently of the chronic type and, at the time of the report, have lasted eight and about two years, respectively. The average duration of eight chronic cases, as given by Wilson, was almost exactly four years. Three acute cases died at four, six, and seventeen months respectively. Dr. Homen's case (2) lasted seven years. Cassirer's (3) had lasted thirteen years. Sawyer's case (4) (accepted with some reservations by Wilson) had lasted seventeen years. Cadwalader's second case (5) had lasted twenty years and Strümpell's case (6) had lasted twenty-eight years at the time the reports were made. Therefore, the longer duration of our cases than the average determined by Wilson, can hardly be accepted as a vital diagnostic factor unless the other cases mentioned are to be excluded. It may also be added that, with most new diseases, subsequent experience has usually added to, subtracted from, or otherwise modified the features of the initial description.

In respect to the motor phenomena our cases are not in entire agreement with Wilson's description, although here again there has been considerable variation in the symptoms described in certain recent cases. Tremor is present in both of our patients but is hardly so persistent or widespread as it appears to have been in most of Wilson's cases. Moreover in case I this tremor has grown less in the later stages of the disease, in which respect it is in agreement with Sawyer's, Cassirer's and Strümpell's cases, though opposed to the principle laid down by Wilson that "as the disease progresses, the tremor, according to the experiences of all the observers, becomes worse in every way." At the present time the tremor has largely disappeared from the right hand of our case I. It has been suggested that such a disappearance may be explained

on the basis of a gradually increasing pyramidal lesion. In support of this suggestion our cases offer some evidence. In Wilson's second case the tremor is spoken of as varying greatly in intensity from time to time and in two other cases accepted by him for analysis, the tremor was not quite so pronounced as in others. In both of our patients the tremor is more marked distally than proximally, is inconstant in the intensity of its manifestations from time to time, is increased by attention and excitement, is often practically absent when the muscles are at rest and disappears entirely in sleep. Especially in case I it increases steadily in range from the inception of a movement until, at the end of the movement, it has reached its height. That a clear distinction can be drawn between the tremor in our patients and the typical intention tremor of disseminated sclerosis, we do not believe, unless its variation in degree on different occasions can be relied upon as a distinguishing sign.

As has been true in all cases observed by others, hypertonus has been a very pronounced feature. In the second case it has increased steadily as we have observed the progress of the disease and at all times has been prominent in both cases, but it has seemed to diminish somewhat in case I, in the later stages, and, at the present time, there are periods when, in the arms, it disappears and the arms become, for a few moments, even hypotonic. This is contrary to Wilson's experience but was true of Sawyer's case and in Cassirer's and other cases there were distinct changes in the degree of stiffness at different times. We have, also, on several occasions demonstrated in case I that, in deep sleep, hypertonicity disappears everywhere in the body, contrary again to Wilson's and Sawyer's observations. The hypertonicity in the waking period is seen readily in the mask-like expression of the face (Figs. 2, 3, 5, 6), and in the fixed attitude of the body and extremities. Thus when F. W. (case I) is lying down it is often noted that his head does not touch the pillow and all the muscles of the neck are exceedingly firm.

Though contractions are pronounced in case I and very distinct in case II, no definite contractures have developed up to the present. Thus by patient, passive movements, all the contractions of the muscles and the abnormal positions of the limbs in either case, can be overcome but, if the parts are left to themselves, they quickly return to their former position. In both cases there is a distinct tendency to flexion contraction of the upper extremities but in both, and especially in case I, there is a very pronounced tendency to hyperextension of the legs. In one of Gowers's (7) cases, the legs were extended at the knees and the arms at the elbows. Wilson

states that the only voluntary muscles not affected by this hyper-tonicity are the extrinsic ocular muscles.

Dysarthria and dysphagia have reached an advanced stage in case I, and are fairly well developed in case II, and evidently still increasing in the latter, but in neither is there a complete paralysis of the palate.

Probably in no respect do our cases diverge so greatly in important features from Wilson's description, as in the evidence of pyramidal disease. Wilson has shown, both clinically and pathologically, that the motor involvement is essentially extra-pyramidal. In both our cases the motor symptoms were clearly extra-pyramidal when first seen but in case I the abdominal reflexes were found to be very greatly diminished in the spring of 1913, and, on one occasion, during the following summer, both plantar responses were clearly extensor, though repeated attempts previously and afterwards, always gave a flexor response. At the time of writing this article (1915) an extensor response is frequently obtained in the left foot but never in the right. In the second case, approximately one year after the first examination, the left abdominal reflexes were faint and the plantar reflexes were uncertain, sometimes flexor and sometimes extensor. At the last examination (1914) there was a double ankle clonus of short duration and the plantar responses were described as often flexor and never clearly extensor. Even in these respects, however, the deviation from the accepted type is not necessarily vital. In one of Wilson's cases (No. 1) which came to autopsy, the disease had slightly involved one internal capsule, and in this case there was an extensor plantar response on the corresponding side and a loss of abdominal reflexes on both sides, and in another of his cases (IV) the abdominal reflexes were lacking (possibly due to the condition of the abdominal wall) and one plantar response was uncertain. Also Sawyer's case, at one time, had a double ankle clonus of short duration, and an extensor plantar response on one side was obtained, although both these changes were lacking at a later period. In Cassirer's case there was evidently some uncertainty at times as to the plantar response. In one of Oppenheim and Vogt's cases (8) (a lesion of the striated body, though probably not a true case of Wilson's disease) a double plantar extension was present at one examination. Vogt thinks there may be two varieties of this response, one a true Babinski and the other merely an evidence of spasm, but it seems to us that the nearness of the pyramidal tract to the lesion in the lenticular nucleus allows the assumption of a varying degree of interference

with the activity of the pyramidal tract, and, if so, this will readily explain the appearance at one time and the absence at another, of some evidence of pyramidal involvement.

Nystagmus has been present in both our cases at times, contrary, however, to all other reported cases, so far as we have observed, and double vision has been present at one time in both, if the record is to be relied upon, but only after a history of recent traumatism. In Wilson's first case, the eyes are described as "dancing" before coming to rest, and in two recorded cases we have found the statement that "no true nystagmus was found," implying that some sort of unusual movement was present.

In case II there was no demonstrable external or internal ocular muscle defect but in case I the external eye muscles had an unusual, jerky action on voluntary movement, although there was no apparent hypertonicity and all movements were performed quickly and easily.

Sawyer refers to attacks when his patient would for a time be very much dazed. A similar condition was present in case I, and there were several of these attacks in the course of the illness. Case II presented the same phenomenon, but apparently only when associated with some traumatic condition. There was also, in both of our cases, a marked variability in the symptoms, both mental and physical, a condition to which Wilson, Gowers, Ormerod, Homen and others have referred. This variability is well shown in the statement of the mother that F. W. (case I) would sometimes be in very fair condition, on one day, and the next morning would be unable to walk or talk.

Emaciation and muscular weakness are symptoms referred to by Wilson as common and significant. Neither has been present in any pronounced degree in our cases but this may be because both belong to the group of chronic cases and neither has, as yet, advanced sufficiently far. In case I there has been a distinct falling off in strength during the period of our observation and, at times, the patient has lost weight but there has never been a condition to which the terms emaciation or great physical weakness could apply, and even such falling off in weight as has been observed has been largely due, we believe, to the great difficulty in feeding the patient.

Cassirer, especially, has called attention to cyanosis of the hands and feet and the lessening of the vessel reflexes in his case and, in common with Müller and Glaser (11), believes that certain parts of the midbrain have an influence on the innervation of the vessels. Though the cyanosis and sluggishness of the vessel reflexes were well marked in our cases, we can not say that they were greater

than we have observed in chronic progressive chorea, for example, where the pathological condition may also well be in the median area of the brain. Like other investigators, we have been unable to find any definite evidences of liver trouble but the history of attacks of jaundice in both cases, preceding the onset of symptoms of nervous disorder, and of cramp-like attacks in the upper abdomen in case I, associated with jaundice, are suggestive. Cadwalader's first patient had a yellowish skin. Wilson's case I, four years before the known onset of her final illness, had an attack of jaundice, of five weeks' duration, and his case IV had an attack of jaundice, of three weeks' duration, five years before coming under observation.

The laboratory tests in our cases are largely negative. No urinary findings of any consequence were ever obtained in case II and in case I repeated tests of the urine were negative, except at the time of the first examination, when the urine gave a sugar reaction and showed albumen and casts. Why these findings have not been obtained later, we are unable to say. Wilson says that glycosuria has not been observed except in Anton's (9) case. In Zappert's (10) case, which appears to us a very doubtful instance of Wilson's type of chronic lenticular degeneration, the ingestion of 30 gm. of galactose gave a positive sugar reaction in the urine.

There has been no opportunity to do a spinal puncture except in case I. The only positive findings here were "foreign bodies" in a slightly cloudy fluid, present on one occasion (1914) and not found in some fluid withdrawn a few days earlier and again a few days later. A spinal fluid test made in 1913 showed a clear fluid with four lymphocytes per cm., and no globulin or Wassermann reaction.

Mental symptoms, in some degree, have been present in most of the recorded cases but there has been much variability in the degree of involvement and frequently such expressions as "the patient seems much more demented than he really is" are found in published reports. In case I our opportunities for determining the mental state were much better than in case II but in both there has been a progressive mental deterioration since they were first observed.

Even at the beginning of case I it was stated that the patient would go into a violent rage without adequate provocation. When first seen by us his dull, listless expression suggested a rather well-developed dementia but when spoken to his face would become animated, he attended well to what was said, comprehended readily, was well oriented and showed at least fair judgment in what he

said and did. Later, in the hospital, he always seemed pleased to see any one he knew and was very anxious to converse with him as far as his limited writing capabilities permitted. When visited by his mother, he would take advantage of the opportunity to ask to be removed from the hospital and would complain of various ill treatments, but as a rule he was good-tempered and cheerful, and, although he seemed in a way to realize his situation, he gave little evidence of being depressed by it. At times, with little or no cause, he would become very angry, and at such times his actions were vicious so far as circumstances permitted, but afterwards the affair always seemed to him more a matter of fun than anything else and he would take considerable pleasure in indicating by gestures what he had done. Thus, for example, he always took pride in indicating how he had kicked a woman nurse in the breast, so as to knock her over. Apparently he did not maintain ill feeling against any one at whom he had been angry.

During his first admission to the hospital he was able to walk about a little, and he would pick up papers and magazines and seem to comprehend their contents, and, so far as could be determined, recall what he had read. There was no aphasia including agnosia and apraxia. His writing was very difficult to read but he used words properly and could spell with accuracy such words as he used. At his first examination he followed the actions of the physician with apparent interest and seemed aware of all that happened. As time passed, this power of attention decreased until now it is possible to walk up to his bedside and go through a considerable examination with scarcely any change in his stolid, heavy expression.

During the earlier part of his observation he laughed freely and on slight provocation and his laughter was most peculiar, though the term "explosive" which appears in Wilson's and other articles, hardly characterizes it. Under sufficient provocation, a smile would spread slowly over his face. His mouth would open widely and at the same time he would emit a peculiar sound. When once set, the face would remain fixed in this position so long as to be extremely ludicrous. A good illustration of his appearance when laughing is seen in Figs. 7 and 8. At present his laughter is much less frequent, the evidence of mirth is much less marked and the sound accompanying it is not often heard. An evidence that his mental power is by no means gone, however, lies in the fact that he has recently, under tutelage, acquired a certain facility in the use of the sign language, carried on mostly with the right forefinger.

The mental condition in case II is somewhat different from that in case I. Here the evidence of true dementia is more clear. Although the patient is still able to speak in an understandable way, his language is childlike and, though twenty years old, he gives the impression of one whose mind is that of a much younger person. He is not alert and talkative but when his attention is drawn strongly to what is said, he seems to comprehend. When the matter is brought before him, his progressive disease seems to cause much more mental pain than is the case with the brother, but at other times he is happy and enjoys himself, especially when he can be out in the grounds of the reformatory. Incontinence of the urine and feces is now frequently present although not so when he was first seen. This condition seems to us much more the result of a lack of interest in the matter than of any special sphincter weakness.

Thus far we have contented ourselves with describing the relation of our cases with chronic lenticular degeneration. A possible pathological and even clinical relationship between chronic lenticular degeneration and paralysis agitans has been often described, and Strümpell (6), in a recent article, announces his belief that paralysis agitans, pseudo-sclerosis and Wilson's disease all belong to the same group. Paralysis agitans, without agitation, he regards as particularly like Wilson's disease. Nevertheless, it seems hardly necessary to defend our cases against a diagnosis of paralysis agitans, giving this disease its usual recognition as a distinct entity. That they may not belong with the Westphal-Strümpell type of pseudo-sclerosis is by no means so clear and the more the cases are multiplied under these two headings the more difficult does the distinction become. Several cases are now on record, generally accepted as pseudo-sclerosis, where the autopsy has revealed a very definite lesion of the lenticular nucleus though none in which the changes in this region have been so pronounced as in Wilson's cases, or where the changes were so clearly limited to the lenticular and subthalamic regions. The liver appears to be in much the same condition in the two diseases but in the cases of pseudo-sclerosis a large amount of pigment has been described in the internal organs and this has also been found clinically in the outer ring of the cornea. Assuming that there may be a clear differentiation between Wilson's disease and pseudo-sclerosis, it would appear that the early and marked mental disturbance insisted upon so strongly by Strümpell, in the latter, together with the hemi-paresis and para-paresis and the corneal pigmentation, all argue strongly against the admission of our cases.

In conclusion we may refer briefly to the differential diagnosis from pseudo-bulbar palsy. The history of traumatism in our cases may at first suggest such a diagnosis, but when one recalls the familial nature of the disease, its slowly progressive character, the failure of any definite signs of pseudo-bulbar palsy to appear directly after the accidents and the lack of such clear and constant signs of pyramidal tract involvement as would certainly be present if one were dealing with true pseudo-bulbar palsy, it seems that the diagnosis may be dismissed except in the sense mentioned by Wilson, that the geniculate fibers may, at some subsequent period, become involved.

Note: F. W. (case I) died March 13, 1915, and the autopsy showed an enlarged spleen, a typical cirrhosis of the liver and a bilateral lesion of the lenticular nuclei. A complete description of these findings will be given at a later time.

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A STUDY OF SOME CASES DIAGNOSED AS PARESIS IN PRE-WASSERMANN DAYS¹

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I. INTRODUCTION

It has been customary for many years, at the Danvers State Hospital, to present newly admitted cases before the assembled staff for diagnosis. Records of such staff meetings have been kept since May, 1868. For some years past every case admitted has been so presented.

Between May, 1868, and the early part of 1912 (prior to the routine use of the Wassermann test) paresis was considered in the diagnosis of about 810 cases so presented. The Wassermann test on the blood serum was made a part of the routine examination of patients admitted in May, 1912 (although used in selected cases in 1910), and no case is here considered in which a Wassermann test was obtained before diagnosis.

¹No. 76, Danvers State Hospital Papers. Read by invitation before the meeting of the New England Society of Psychiatry and Neurology, Northampton, Mass., March 30, 1915.

In the fall of 1914, 58 of these cases were still in the hospital. While we must realize that these are unusual cases, in that the majority of the real cases of paresis diagnosed in the period under consideration were dead, it nevertheless seems worth while to analyze these cases and determine (*a*) the correct diagnoses and (*b*) the confusing symptoms. Such a study should be of aid in avoiding such errors in the future. This study gives no idea of the accuracy in the diagnosis in paresis, which has been estimated by Southard (1) (on autopsied Danvers cases) at 85 per cent.

These 58 cases fall conveniently into three groups, which are considered separately. In 13 cases, paresis is considered "possible," since paresis could not be excluded, although the case was classed in some other group. In group 2 there are 17 cases in which the diagnosis is considered "probable," opinion among the staff being divided, but favoring paresis. The third group comprises 28 cases considered "certainly" paresis, all members of the staff concurring in the diagnosis.

The method of investigation was as follows: The chief facts as regards onset, signs and symptoms and course were tabulated. A brief examination was then made of each case with reference to the chief neurological and mental findings of paresis. The blood serum (in all but a few) was submitted to the Wassermann test, and in certain cases (where there was a positive blood test, or where the symptoms were sufficiently indicative) the spinal fluid was also submitted to the Wassermann test and to the other tests which are applied in this laboratory—*i. e.*, albumen content, globulin content, number of cells, and the gold sol reaction. As is, of course, well known, cases of paresis in which biological alterations in the spinal fluid are not present are almost unknown. The converse—that psychoses such as dementia præcox and manic depressive insanity practically never show such alterations—is also true. Hence, in these cases, such examinations are of great value in checking up the diagnoses.

II. ANALYSIS OF CASES²

Group 1: "Possible"; 13 Cases

Eleven of these cases are definitely not parietic. The final diagnoses were all determined as the result of clinical observation alone, and none have been in any way altered as a result of the present in-

² Such symptoms as depression, excitement, hallucinations, etc., are not included in this brief list, since they are not in themselves at all characteristic of paresis.

vestigation. In none of these was paresis definitely ruled out when presented at staff meeting.

They were admitted at varying times between 1897 and 1911, and the duration in the longest case is about 18 years. The final diagnoses are: dementia præcox, 4; manic-depressive, 1; alcoholic dementia, 3; imbecile (alcoholic), 1; chronic delusional insanity, 1; organic dementia, 1. There was knee-jerk alteration in 7 cases (exaggerated 5; lost 2); pupillary abnormalities in 5 (inequality and irregularity; sluggish light reaction in 2); 5 were demented; 3 were euphoric; 1 gave a syphilitic history.

The blood Wassermann was negative in 8 (including the case with specific history) and was not done in 3.

The two remaining cases in this group are of some interest, the first because the possibility of paresis has been confirmed, the second because, despite observation over a prolonged period, the correct diagnosis is still undetermined.

CASE 1. Hosp. No. 16564, Male. Admitted Jan., 1912. Age 41. Mother senile dement. Father alcoholic. Uncle tubercular. Brother epileptic. Gonorrhœa and venereal sore at 20. Attempted suicide at 16. Alcoholic since 20. Delirium tremens once. Married five years; one miscarriage and one living child. Three fainting spells in 1911. At time of entrance excited, restless, flight of ideas, visual hallucinations, insomnia, euphoria, mannerisms. Pupils unequal, sluggish reaction to light. Knee jerk increased. Diagnosis: manic depressive insanity, manic; paresis not excluded. At present: left pupil larger than right and stiff to light. Right is irregular, has a slight light reaction. Knee jerk normal. Tremor of hands. No speech or memory defect. Wassermann reaction: blood, twice doubtful, spinal fluid positive. Albumen and globulin increased; gold test positive; 63 cells per cubic millimeter. Determined diagnosis: paresis.

CASE 2. Hosp. No. 15689, Male. Admitted July, 1910. Age 30. Onset in 1906 with a "paralytic" stroke from which he made a good recovery. In 1908 epileptoid attacks began. These came about once in two months with a period of confusion following. These attacks gradually became more frequent, and he was committed to Danvers in 1910 after a very severe attack, which left him restless, deluded and apparently hallucinated. He gradually cleared up. There was slight right hemiplegia, knee jerk increased, and a Romberg sign. Following his convulsions he shows ankle clonus and Babinski sign. The convulsions start in the left forearm (he once had 27 convulsions in one day). Diagnosis: Brain tumor preferred; syphilitic dementia? paresis? Blood Wassermann negative in 1911. Anti-specific treatment pushed with no effect. At the Massachusetts General Hospital in 1912 he was regarded as a case of insular sclerosis and there were "no signs indicative of

brain tumor." At present, all tests on the fluid are negative. Knee jerk much increased, right more than left. Slight euphoria. Left side of face is full. Left hand and arm weak and incoördinate. Speech defect, marked memory defect, marked attention defect. This unclassified case seems to be perhaps a case of tumor involving the right postcentral gyrus, or a case of epilepsy.

Group II: Probable; 17 Cases

This group presents some interesting problems in the differential diagnosis of paresis, but it is very difficult to present satisfactorily. The problems are not sufficiently important to present an abstract of each case, so I shall simply state the conclusions.

Not one of these cases is clinically or serologically paresis. The determined diagnoses—most of them the result of clinical observation alone—are: dementia præcox, 10; alcoholic dementia, 3; paranoid condition, 1; imbecile, 1; toxic psychosis, 1; arteriosclerotic dementia, 1. The blood Wassermann was positive in one case, negative in 14 and not taken in 2. All tests on the spinal fluid were negative in 4 cases (including the case of dementia præcox with positive blood).

Analysis of symptoms likely to be confusing shows that knee jerk alterations occurred in 11 cases (absent, 1; exaggerated, 10) and pupillary alterations in 9 (unequal, 2; irregular, 1; sluggish, 2; consensual reaction lost, 1; unequal and irregular, 1; unequal and sluggish, 2). Five presented speech defect; 5 showed grandiose delusions; 5 were demented; 4 showed a Romberg sign. Three gave histories of syphilis, but the Wassermann is not positive in any of them, nor are there signs of paresis.

The high incidence of dementia præcox in the determined diagnoses is of interest. In the case books the diagnoses were as follows: Paresis? 3; paresis or alcoholic dementia, 2; paresis or dementia præcox, 6; paresis, organic dementia or dementia præcox, 1; paresis or manic-depressive, 2; paresis or organic dementia, 1. Dementia præcox was not, therefore, considered in the diagnosis of as many cases as eventually turned out to be such. It is furthermore clear that the differentiation of these two psychoses is not always easy on clinical grounds alone.

Group III: Certain; 28 Cases

It is necessary to divide this group into two subclasses: (A) 8 cases which are clinically and serologically confirmed. (B) 20 cases in which the diagnosis was not confirmed.

At the time of presentation before the staff for diagnosis, all members agreed, but in 10 cases the diagnosis had been changed before this study was undertaken.

(A) The clinical course and laboratory findings substantiate the diagnosis in all 8 cases. One case has died since this study was begun, with confirmatory autopsy. The others present typical clinical pictures. In 7 cases the blood Wassermann is positive, and all tests are positive in the fluid in all 8 cases. The duration has been three years in two cases; 4 years in 2; 5 years in 1; 6 years in 1; 11 years in 1.

(B) This group of 20 cases, none of whom are parietic, fall into 2 classes: (1) 14 cases in which some other diagnosis is certain and (2) 6 cases, which, for one reason or another, must be left unclassified.

(1) Of these 14 cases, 7 are cases of dementia præcox, and in 5 of these the diagnosis was long ago corrected. Among these, the blood Wassermann is negative in 6, positive in 1. In two cases all tests in the spinal fluid are negative. The duration in these cases is from 11 to 18 years.

In the remaining 7 cases of this subgroup, the blood Wassermann is negative, and all tests in the spinal fluid are negative in 2. The determined diagnoses are: organic dementia (arteriosclerotic), 1; alcoholic conditions, 3; hypochondria with involution features, 1; paranoid condition, 1; manic-depressive, 1.

The symptom analysis of the 14 cases shows pupillary abnormality in 12—1 presenting unequal pupils; 3 sluggish, 1 irregular and sluggish; 3 unequal and sluggish; 2 unequal and irregular; 1 unequal and irregular, without reaction to light or accommodation; 1 unequal, irregular and sluggish. Knee jerk alterations occurred in 12 cases—1 absent, 2 unequal and 9 exaggerated. Tremors of various types occurred in 6; 5 showed speech defect; 4 a Romberg sign.

(2) The 6 unclassified cases merit individual consideration, since each presents some unusual problem of diagnosis. In all cases the diagnosis of paresis was unanimous when patient was presented.

CASE 1. Male. Hosp. No. 14943. Age 41. Admitted January, 1908. First committed to Danvers at the age of 38, when the findings were much the same as at this second commitment—with knee jerk normal, confusion, speech defect, visual hallucinations, and slight pupillary light reactions. In 1910 there were delusions of grandeur, euphoria and speech defect. In 1913 and again in 1914 the blood Wassermann was negative, and all tests in the fluid

are negative. Memory is fairly good. Hallucinations denied. He stammers (teeth?). Tells a very involved story—running from one subject to another. Pupils unequal, good light reaction. Knee jerk normal. Slight general tremor. Grandiose delusions. Not a parietic—exact diagnosis uncertain.

CASE 2. Male. Hosp. No. 14077. Admitted January, 1908. Age 46. Onset at 40 with an apoplectic attack with subsequent great memory loss. History of syphilis. At time of entrance: Pupils small, equal, slow light reaction; knee jerk increased; feet drag in walking; emotional and mental instability. Blood Wassermann negative in 1910, and blood and fluid are both entirely negative now. Physical signs at present are those of residuals of shock, plus a great memory defect. The most probable diagnosis in this case is arteriosclerosis (the arteriosclerosis perhaps due to syphilis).

CASE 3. Male. Hosp. No. 15795. Admitted September, 1910. Age 42. Father died at 62 suffering from same condition, also called paresis. Insanity on maternal side. In 1906 patient became careless, forgetful, sat around and did not work. Three months later there was a convulsion followed in a month by another and from then until the time of commitment there was a convulsion about every four months. The head turned to the right, there were clonic spasms of the right arm and leg with cyanosis. Occasional vomiting at the end. Every three or four days a mild seizure, when he was confused but not unconscious. At time of entrance, knee jerk diminished, pupils large, irregular and unequal and *dilating* to strong light. Speech defect. Optic atrophy. Disorderly. Confused. Shattering of recent memory. Condition at present unchanged. Frequent convulsions. Tells same story now as when he first came. The blood and fluid were each twice negative to all tests. This is certainly not paresis. Possibly epileptic or tumor.

CASE 4. Female. No. 16111. Admitted in April, 1911. Age 51. Married. Five living children. One died at three days. Two miscarriages. Onset at 41 with gait difficulty and diminution of vision. At time of entrance, blind; apprehensive; knee jerk diminished; pupils stiff to light. At present she is bed-ridden; the eyes constantly roll to the right and are apparently corrected voluntarily; pupils are unequal, slightly irregular and do not react to light; has no insight; knee jerk absent; incontinent. Blood and fluid Wassermann negative; slight increase in globulin and albumen; 6 cells per cu. mm. There is a slight change in the third, fourth and fifth tubes in the gold test.

The most probable diagnosis in this case seems to be tabo-paresis, (in which the laboratory findings are often confusing).

CASE 5. Male. No. 16356. Admitted August, 1911. Age 34. Always wild. History of syphilis. Brother admitted to Danvers last summer and is a parietic. At time of entrance, patient showed lively reflexes, ptosis, no light reaction in right pupil, slight in left, elated, irritable. In 1912-13-14 the blood Wassermann was negative. In 1914 the fluid was negative on two occasions. Pupils are unequal, and right is stiff, while the left reacts slightly to light. Knee jerk normal. Mentally he is much like a neurasthenic.

This seems most probably a case of manic-depressive insanity. CASE 6. Male. Hosp. No. 16456. Admitted November, 1911. Age 40. At 35 trouble with walking; feet dragged. Physical signs those of spastic paraplegia. Mental symptoms a short time before admission. At time of entrance, spastic paraplegia; both pupils reacted fairly well to light; euphoria; grandiose ideas; diminished pain sense below the knee. At present, pupils unequal and irregular, good light reaction; knee jerk much increased; marked dementia; euphoria; speech defect; clonus; double Babinski. Wassermann negative on both serum and fluid twice. Marked albumen and globulin excess; cell count 26 per cu. mm.; gold reaction positive for syphilis. This case is probably one of paresis; against this however are the active pupils and the negative Wassermann.

III. DISCUSSION

If we consider only the cases in which paresis was "certain" (by unanimous agreement of the staff) we find only 8 cases in which the diagnosis has been unequivocally substantiated (with 2 more in which it is probable). Six (or 4) cases, for various reasons, remain unclassified; while of the remaining 14, 7 are cases of dementia præcox. It is striking that the determined diagnoses of dementia præcox (in all groups) far exceed the number of cases in which this diagnosis was considered at the time of presentation.

The fact that paresis and dementia præcox may often be hard to distinguish has received but little attention, at least in modern literature. Kraepelin, in the 1913 edition of his text-book, says (Vol. II, pp. 522-23): "Bei der Abgrenzung der Paralyse von der verschiedenartigen Zustandbildern der Dementia præcox werden aus der verschiedenen Art der sich entwickelnden psychischen Schwäche gewisse Schlüsse möglich sein. In der Paralyse steht die Gedächtnisschwäche, die Unklarheit sowie die Beeinflussbarkeit der Stimmung und des Willens im Vordergrund, bei der Dementia præcox dagegen die gemüthliche Stumpfheit bei Erhaltung des Gedächtnisses und der Klarheit, ferner die eigentümliche Verlust des Zusammenhanges zwischen Vorstellungen, Gefühlsregungen und Willen. Dem paralytischen Schwachsinn fehlen die Verschrobenheit, die Manieren sowie die periodischen Erregungen, dem Stupor der zähe, unbeeinflussbare Negativismus, wenn auch Nahrungsverweigerung, Stummheit, Reaktionslosigkeit längere Zeit hindurch bestehen können."

Again (Vol. III, p. 965): "Die Abgrenzung der Dementia præcox von der Paralyse hat durch das cytologische und namentlich das serologische Untersuchungsverfahren fast alle ihre früheren Schwierigkeiten verloren. Bei der gelegentlich vorkommen-

den Verbindung mit Lues finden wir wohl Komplementablenkung im Blute und vielleicht Zellvermehrung in der Spinalflüssigkeit, niemals aber die für die Paralyse so kennzeichnende Wassermannsche Reaktion in der letzteren. Berücksichtigt man weiter die körperlichen Zeichen der Paralyse, namentlich die reflectorische Pupillenstarre, die Sprach- und Schriftstörung, die mit Herderscheinungen einhergehenden Anfäll, so wird die Unterscheidung meist leicht sein, zumal auch schon das Lebensalter der Kranken gewisse Anhaltspunkte fuer die Beurteilung liefert"

Since we have found in the analysis of these cases that many of the physical signs are often confusing—as a case of dementia præcox may have unequal, or irregular pupils, or the light reaction may be "sluggish," with active knee jerk, etc.—it appears that serological investigation is very important in all cases in which paresis is suspected. It is, of course, true that in the majority of cases prolonged clinical observation will establish the correct diagnosis. We have, however, in the Wassermann and spinal fluid tests, a method which allows us to verify or disprove the certainty or suspicion of paresis in a very short time. This cannot be too strongly emphasized. (A forthcoming paper will deal in full with the results of such tests.)

It is worth while pointing out that no such group of cases (*i. e.*, cases in which paresis was positively diagnosed) could be found among the patients admitted since the Wassermann and spinal fluid tests became a part of the routine observation of patients, in which we would find the diagnosis of paresis made in cases which were not paretic, or belonging to the brain syphilis group. This point has been made by Morse (2), in connection with her summary of the results of spinal fluid tests. Had the Wassermann and spinal fluid tests been known at the time these patients were presented for diagnosis, paresis might have been confirmed or excluded in all the cases presented in this paper at that time.

SUMMARY

1. Data are presented dealing with 58 cases diagnosed with more or less certainty as paresis at Danvers between May, 1898, and May, 1912 (prior to the routine use of the Wassermann test).
2. Of 13 cases in which paresis was not excluded, 1 is a paretic and 1 remains unclassified. Of the other 11, 4 are cases of dementia præcox, and the diagnoses were long ago established.
3. Of 17 cases in which paresis was the probable diagnosis, not one is a paretic. Ten are cases of dementia præcox.

4. Of 28 cases in which paresis was certain, 8 are parietic, and 2 more are probably so. 14 cases can be definitely classed elsewhere and 7 are cases of dementia præcox. The other four cases are not parietic, but cannot be classed.

5. The serological investigation of cases in which paresis is suspected is an absolute requisite for establishing a correct diagnosis. Had the Wassermann and spinal fluid tests been known at the time these patients were presented for diagnosis, paresis might have been immediately excluded or confirmed. Clinical observation over a sufficient length of time will correct the diagnosis in the majority of cases, but this method has very obvious disadvantages.

6. This study presents a basis for the conclusion that dementia præcox is often extremely hard to differentiate from paresis. A case of dementia præcox may present unequal pupils, exaggerated knee jerks, etc., and it is here that laboratory tests are of great aid.

I must express my deep obligation to the senior members of the clinical staff for much valuable assistance and advice, without which this study could not have been completed.

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AN UNUSUAL PSYCHASTHENIC COMPLEX¹

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The following case of psychasthenia (Janet) or neurasthenic neuropathic insanity (Dercum) is so unusual, yet so clear cut and with such a definite etiology, that its presentation seems justified. It presents an added interest in the light of the modern ideas regarding the psychology of the psychoneuroses as advanced by Janet, Freud and others.

Case Report.—E. W., a patient at the Philadelphia General Hospital, age 39 years, white, single, laborer, a native of North Carolina.

The family history does not show any nervous or mental disease. The father died at 83 of pneumonia; the mother of "a fever" at 77. Five brothers and two sisters are living and well; four brothers died, two of consumption, one of brain abscess and one (an alcoholic) of a complication of diseases. One sister was killed in an accident.

The medical history of the patient, aside from his peculiar attacks, is as follows: He had no infectious diseases except measles, mumps and "scarlatina." He masturbated up to the age of fifteen years and suffered from sunstroke three times when fifteen. He denies venereal disease, but has been a moderate user of alcohol. It appears that he has been something of a wanderer, having lived in New Mexico and Arizona while engaged as a lumberman.

His present illness started at the age of eighteen years, and consists of attacks in which he becomes excited and screams, curses, stamps his feet and strikes out with his arms. This latter part of the attack has been aptly described as "shadow boxing" by Dr. Emerson, the interne, who has witnessed numerous spells. During the attack, the man is perfectly conscious and afterward can recall everything that transpired. He has never injured himself nor any one else, nor has he fallen, bitten his tongue or voided urine during the paroxysms. There is no headache nor somnolence following the attack and after it is over he will resume whatever he was engaged in prior to its onset. The attacks now occur from two or three to six or eight times daily, although while working in the woods, he has had them as infrequently as one a week.

The frequency of the spells is affected by the patient's general

¹ Case presented before the Philadelphia Psychiatric Society, March 12, 1915.

condition, as they occur oftener when he is fatigued. They may come on during the day or night, but only when he is awake, and he has had them when alone and also when so situated as to expose himself to the ridicule of those about him.

The interesting feature of the case developed when the patient was questioned regarding an aura. He had none of the varied sensory phenomena which frequently initiate epileptic attacks, but just before the paroxysm, he would always be thinking deeply of an incident which occurred in his younger days. When questioned further in regard to this incident he, with evident reluctance, said that when 18 years old, while out walking with a younger sister, they were attacked by a gang of young ruffians who beat him up badly and criminally assaulted his sister. It is only when his thoughts dwell on this happening, that the attacks occur.

Upon examination, the patient was found to be well nourished, with normal gait and station. His pupils were equal and reacted promptly to light and accommodation. The musculature of the face was normal and there was no evidence of cranial nerve disturbance. The tongue was tremulous and protruded in the median line. Heart, lungs and abdomen were negative. The abdominal, cremasteric and all tendon reflexes were normal. Babinski reflex and ankle clonus were absent. The extremities presented no palsies, tremors nor in-coordination. All sensations were normal. There were no hysterical stigmata. Mentally clear; no hallucinations, illusions nor delusions; memory and attention good. No persistent emotional state. The general intelligence was above the average. Blood, urine and Wassermann negative.

Diagnosis.—Various diagnoses have at different times been made of the attacks—such as petit mal, hysterical epilepsy and tic. In psychic epilepsy, while the attacks, as in this case, are usually similar in character, consciousness is clouded during the attack, there is more or less complete amnesia regarding the details of the outburst and the paroxysm is followed by headache and somnolence. Moreover, it is rare for pure psychic epilepsy to develop without at some time the occurrence of convulsive phenomena. (A case of psychic epilepsy without other epileptic phenomena was reported by the writer in the *JOURNAL OF NERVOUS AND MENTAL DISEASE*, Sept., 1913, Vol. 40, No. 6.) As in this case consciousness is never lost and memory of all that occurred during the attack is preserved, we may rule out epilepsy. In addition to these points, instead of the subsequent headache and somnolence, there is an actual feeling of relief after the spell is over. Hysteria may be excluded by the absence of the hysterical stigmata and the occurrence of the spells when the patient is alone.

The diagnosis of tic appears to be justified and I regard the attacks as the expression of a psychasthenia and the result of deficient inhibition from disorder of the will.

General Discussion. Our case represents one of a group of obsessions, all possessing the same general characteristics. They con-

stitute the neurasthenic insanity of the older French writers, the neurasthenic neuropathic insanity of Dercum and the psychasthenia of Janet.

In this group belong the phobias, or *special fears*, as of high places, of crowds, of dirt, etc., the obsessions resulting from *indecision*, in which class are found the timorous and the counters; obsessions resulting from *deficient inhibition*, of which the case recorded above is an illustration; and obsessions due to *deficient will*. All these special forms, as pointed out by Dercum, have their prototype in the various psychic symptoms of ordinary neurasthenia.

The essential features of all psychasthenic obsessions are impotence of the will with preservation of the intelligence, complete consciousness of the condition and unimpaired reasoning power. These characteristics of the obsessions enable us readily to distinguish them from the impulsive acts of the imbecile or epileptic. There is, as a rule, a neuropathic heredity and this feature has been so pronounced as to lead Charcot and Magnan to consider obsessions as a sign of degeneracy and having no relationship to neurasthenia except as a complication (Regis).

Dercum, objecting to Janet's term "psychasthenia" on the ground that "soul weakness" takes us rather too far afield, uses the designation "neurasthenic neuropathic," recognizing by the double appellation both the nervous exhaustion of the patient and the element of degeneracy or neuropathy in his heredity.

Other characteristic features of these obsessions are, the absence of hallucinations, the concomitant anxiety and the fact that the condition never terminates in dementia. The attacks, whatever their special character, are essentially intermittent and paroxysmal and of indefinite duration.

It has been my experience that pathological fears or phobias are more often seen by the doctor than the other forms of psychasthenic obsessions. Sometimes the obsession becomes the cause of much inconvenience, as in the case of one of my patients who had a fear of rapid movement and therefore in going from one city to another was obliged to travel on trolley cars or way-trains. Another patient developed a dread of going far from home, and as he was a traveling salesman, his obsession was obviously most unfortunate and ultimately led to his giving up his work.

Psychology.—Billod was the first to call attention to the disorder of the will as being the underlying and essential factor in the development of obsessions. Each one of us, as the result of our various mental activities, is constantly having impulses which are

passed upon by our judgment and normally are controlled by the will, which permits and reinforces certain of these impulses and restrains or inhibits others. When the will is deficient in its power of inhibition, acts are performed against the judgment and will of the individual and with full consciousness of the act.

According to the newer psychology, phobias are the result of pathological association, the obsession of indecision becomes a "conflict" and the obsession of deficient inhibition is believed to represent the attempt to suppress or submerge in the subconscious mind a painful recollection which, from time to time, escapes into the field of consciousness and finds its outward expression in some form of motor reaction, the whole being spoken of as a "complex."

Thus the psychological explanation of our case would seem to be the attempt at repression of the painful memory of the shocking affair which occurred when the patient was eighteen years old, his natural feelings regarding the incident and his outward manifestation or expression of them by cursing, shouting and striking. Taken all together this would form the complex, the thought of the outrage bringing to the surface the motor reaction or the "attack."

Freud would find a sexual foundation for all neuroses and while it is true that there is a sexual element in the incident which served as a starting point for the obsession of our patient, the writer has known of quite as marked symptoms arising from occurrences absolutely devoid of sexual content.

Treatment.—Our patient has not escaped the psychanalysts, but still retains his tic. It is perhaps possible that the etiology was not sufficiently obscure to provide a favorable field for what Lloyd has aptly termed "subterranean therapeutics." However, a tic of over twenty years' duration is not apt to disappear under any form of treatment. It is of interest to note in this connection, that our patient's attacks were much less frequent when he was in good physical condition and living in a wholesome environment and that they were always worse when he was fatigued.

While the prognosis must always be guarded in psychasthenia, excellent results are frequently obtained by rest methods combined with psychotherapy in the form of suggestion, explanation and encouragement, etc., adapted to meet the needs of the individual case.

DYSTONIA MUSCULORUM DEFORMANS WITH REPORT OF A CASE*

BY THEODORE DILLER, M.D., AND GEORGE J. WRIGHT, M.D.

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A review of the literature since October, 1911, when Oppenheim¹ described a form of myospasm to which he gave the name dystonia musculorum deformans, would seem to indicate, from the number of cases reported at least, that his work had resulted in renewed interest and critical study of that large group of illy defined and understood cases characterized by hyperkinesia. In a discussion of a paper read by Fraenkel before the New York Neurological Society in December, 1911, Collins² stated that he could not see any profit in bestowing a new name on a class of cases with which we had been familiar for many years, and that we all have a certain conception of what was meant by the tic neuroses, and he did not think there was any remarkable deviation in the cases described by Oppenheim from descriptions that embodied a portrayal of the tics. Other writers, among them Dana,³ have asserted these cases, in their opinion, should be put in the torticollis or tic group; and Fraenkel⁴ in his paper suggested the very happy name of "tortipelvis." And yet while it is true we have no conception of what this disorder actually is, and have only theories on which to base its pathology, one cannot help but feel from a study of the cases reported that this additional classification of the hyperkinesias has been exceedingly helpful. Most of the cases had previously to Oppenheim's paper been more or less satisfactorily diagnosed as hysteria, Huntington's chorea, chronic chorea, myospasm, tic, double athetosis; and not a few cases in spite of certain marked differences have been improperly labeled for years because of our acknowledged more or less generalized conception of tic movements. Spiller⁵ describes a case of a man who had been a patient at Blockley for years, and who was recorded as having "tic" or Huntington's chorea. He had never been satisfied with either diagnosis. After having had Oppenheim's paper called to his attention he studied the case again with the possibility of dystonia in mind and

* A paper read in abstract before a meeting of the Pittsburgh Academy of Medicine, February 1, 1916.

reached the conclusion that the movements which he had long considered atypical really belonged to those of that disease.

Any one who has had the opportunity to study a case of dystonia must at once be struck by certain peculiar features of the disease, and with Fraenkel and Jelliffe, must agree with Oppenheim that the disease is rare and one of the most remarkable encountered, considered as a clinical type at least, aside from its essential relationship to other already well-known groups. The nosological boundaries of this group of cases characterized by hyperkinesia being so unsatisfactory and indefinite, we have good reason to thank Ziehen and Oppenheim for giving us an additional and definite classification into which it has been possible for writers in this country and abroad to place with more or less satisfaction a considerable number of cases.

Since Oppenheim's report in October, 1911, of the four cases on which he based his paper, and Ziehen's reference⁶ to five cases at the meeting of the Psychiatrischer Verein in Berlin, December, 1910, with the publication of three of these five cases by Von W. Schwalbe (Berlin, 1908), notable papers have appeared by Fraenkel with a report of four cases in December, 1911, and by Bregman⁷ with a report of three cases in July, 1912. Flatau and Sterling⁸ described two cases in 1912. In more or less detail single cases have been reported by Biach,⁹ Spiller,⁵ Abrahamson,¹⁰ Belling,¹¹ Bregman,¹² Bernstein,¹³ Hegier,¹⁴ Climenko,¹⁵ and Bonhoeffer.¹⁶

In his original description Oppenheim stated the disease was a chronic progressive one affecting children between the age of eight and fourteen, and characterized by a deformity around the pelvis and clonic and tonic myospasms affecting chiefly the muscles of the thigh, pelvis and lower lumbar region. Other muscles might be involved, in fact the disease usually began in the upper extremities, but its chief and ultimate seat was the muscles associated with locomotion. Other muscles in his cases were never involved in the same degree. In the recumbent position most of the deformities and the myospasms disappeared. On standing and especially in walking the characteristic deformities and the so-called "dromedary gait" appeared, presenting a truly striking picture, and it was this that suggested the diagnosis of hysteria, as these cases were believed to be by many, even by Oppenheim and his pupils.

Definite signs of organic disease of the nervous system were not found in any of Oppenheim's cases; and yet in his opinion we are not dealing with a neurosis but a disease based on fine pathological changes in the cortex cells controlling muscle tone, resulting in

"dystonia"—a disturbance of the proper coördination of muscle tone. There arises therefrom a kind of "mobile spasm," expressing itself in a mixture of tonic and clonic movements. According to Oppenheim it is very important not to consider this simply a state of hypertonia; because with the tendency to tonic spasm of certain muscles there could be found also a definite hypotonia.

As described by Oppenheim this disease picture is definite and striking, and he insists on a close analogy of symptoms before granting the identity of other reported cases. The five cases presented by Ziehen and Schwalbe are discarded by Oppenheim because there were lacking the clonic spasms, the hypotonia, and the increase of spasm on standing and walking. Fraenkel's four reported cases conform more clearly with the description given by Oppenheim—all four were characterized by pelvic deformities and by tonic and clonic myospasms about the pelvic girdle. Other cases reported differ in rather important details, especially in the absence of hypotonia, the mode of onset and the degree and location of involvement. In addition, in certain cases, puzzling features have been noted. In Bregman's first case there were noted pain in the most severely affected extremity, hypertrophy in the cramp affected muscles, unexplainable non-degenerative atrophy in some of the small muscles of the hand, and a myotonic reaction in some muscles in the forearm. In another case of Bregman's the torsion spasm was chiefly one-sided and there was a slight involvement of the face muscles. In the case reported by Biach there was some atrophy of the muscles. Bernstein's case showed that speech was partly affected. The truth of the matter is we are dealing with a widespread constitutional disorder; and the lesion, assuming that the pathology is anatomic, is probably not definitely the same in each case, the nature and extent of the symptoms depending on the location and degree of involvement. It would seem after all the essential condition in dystonia musculorum is the peculiar torsion-like tonic and clonic condition of the muscles which alone ought to stamp the disease clinically; the picture presented then by the individual case would vary according to the function of the muscle groups involved. In the beginning, the symptoms may be very sharply localized and developed further only after considerable lapse of time. One case of Oppenheim's beginning in the right foot did not develop further for eighteen months; and Flatau-Sterling report a case where for two years the affection was limited to the lower extremity.

Since all the reported cases show the disease begins in child-

hood, we should be particularly careful and watchful for an eventual extension of symptoms and not let the more or less monosymptomatic character of the affection lead us into a hasty diagnosis of hysteria. We wish, therefore, to lay especial emphasis on the peculiar character of the muscle involvement, which shows a somewhat stable or constant condition of tonicity, varying in intensity and with a marked tendency to torsion, and further complicated by movements of a clonic type. Voluntary movements are possible but performed as if there was a conflict of muscle groups. The movements cease during sleep almost entirely (in some cases reported, entirely) as well as in the recumbent position with mental quietude. Mental excitement or even attraction of the attention and especially the erect position and walking bring out the movements in their most characteristic form. There are no muscular weaknesses, contractures (in the true sense), ataxia, sensory disturbances, abnormal electrical reactions, characteristic changes of the reflexes, or other symptoms pointing definitely to central disturbances. The intelligence is not disturbed; and suggestion and other therapy has been without effect. Leszynsky¹⁷ referred to a case, reported by Fraenkel, in which under his care psychotherapy apparently did some good, but there was a recurrence. No reported case of cure has come to light by this or other means.

The cause of this disease is so far unknown, although Oppenheim, as has been stated, believes the affection is on an organic basis. Biach also claims the disease is organic with location of the lesion in the back part of the brain, the medulla and the upper part of the cord. On the assumption of an organic lesion, Jelliffe¹⁸ suggested it might be found in some portion of the cerebello-thalamo-cortical arc. However, there is one autopsy recorded so far, by Ziehen,¹⁹ in which the findings were negative.

As a matter of interest it is well to note the different names that have been given for this affection by the different authors. Oppenheim suggested "dysbasia lordica progressiva" and "dystonia musculorum deformans" with preference for the latter. Ziehen used the term "tonic torsion neurosis," and Flatau-Sterling suggested "progressive torsion spasm of children." Von Bernstein, in an attempt to give credit to the first investigators, would suggest "Ziehen-Oppenheim disease." As we have noted, Fraenkel has added the happy term "tortipelvis."

The following case history is presented as an example of muscular dystonia as we understand it; and while the patient does not now and apparently never has shown the characteristic involvement

of the pelvic, lumbar and thigh muscles, we believe the involvement of the neck, shoulders and the upper extremities is of the same type.

CASE REPORT. George L., aged 32, single, Hebrew, was first seen October 28, 1913, consulting Dr. Diller because of uncontrollable spasmodic movements of the arms, shoulders and head. He states there is no history of nervous disease of any kind in his family anywhere that he knows of. He does not remember a single detail about the onset of his trouble except that he had it for some time previous to the age of fourteen, at which time he first consulted a physician. He cannot remember whether his condition is better or worse at the present time. He went to school up to the age of 15 or 16 and kept up with boys of his class. He learned to write and does so now with an indelible pencil and can with an effort use pen and ink. For years he has been earning his living by selling instruments, clinical thermometers, etc., to physicians in their offices. His habits are good. He attends to his business regularly and is able to make a modest living out of it.

Examination: The patient is affected with peculiar movements of both arms, the shoulders and the head. The movements are much more pronounced in the left arm than the right, where they appear to be of only moderate intensity. The head movements are less than those of the left arm and more than those of the right arm. In the left upper extremity the movements affect all the muscles and extend to the shoulder and neck. The muscles especially affected are the triceps, the trapezius, and the upper part of the pectoral. In the right upper extremity the muscles of the hand and fore-arm are only slightly involved, the muscles chiefly affected being the trapezius and several small muscles attached to the scapula. The sternocleido-mastoid muscle on both sides is not affected nor are any of the deep muscles of the neck.

The movements are very difficult to describe. They are neither those of a tremor, nor choreic, nor a tic, nor an athetoid movement, although somewhat suggestive of all of them. The movements of the left arm appear more like a convulsive movement which the patient is trying to control. The patient hooks his left arm behind his back, partly to fix the arm and partly to hide the movements. A closer observation reveals the fact that the muscles are tonic and affected with a clonic torsion-like movement. By a strong, apparently painful effort, the patient can pick up an object, such as a pencil, a key, etc., with the left hand and also with the right hand with much less difficulty. There is no involvement of the muscles of the lower extremities, the pelvis or the lumbar muscles. The gait is perfectly normal.

The back shows a moderate but distinct scoliosis to the right in the upper dorsal region. The muscles of the left side, particularly the trapezius, are found in a condition of hypertonia with clonic movements. Under excitement, when the movements are most severe, the scoliosis is most distinct; on lying down and when quiet the deformity is much less marked.

There is no speech disturbance, no apparent mental defects and no involvement of the facial muscles. There are no disorders of sensation of any kind, no muscular atrophy or weakness. The pupils are normal. The knee-jerks are exaggerated, the right triiceps exaggerated, the left not obtainable on account of the spasm. There is no Babinski and no clonus. The soles of the feet are almost painfully hyperesthetic.

All of these movements are worse on standing, occur constantly when walking and especially are marked under observation and mental excitement. Lying quietly alone on a couch the movements cease entirely and the muscles may be found in the normal, soft, relaxed condition. All movements cease in sleep. The muscles of the left arm appear to be larger and firmer than those of the right. The measurement of the contracted left biceps is 31.5 cm. while that of the right is 28.5 cm. The patient is normally left-handed.

The patient has made quite a study of his condition and believes that by using suggestion he might be cured. He observes that "If I did not think of them, there would not be any movements."

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PERIPHERAL NEURITIS WITH KORSAKOW'S SYMPTOM COMPLEX

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Alcoholic paralysis was first described in 1822, by James Jackson. In 1852, Magnus Huss in the study of fifty cases classified them according to the most prominent symptoms, into epileptic, convulsive, paralytic, anesthetic and hyperesthetic types which he considered due to lesions of the spinal cord and medulla. Duchenne de Boulogne, in 1855, reported similar cases which he supposed to be of spinal origin. In 1864, Dumesnil published the first case in which the lesion was found in the periphery, but his observations were not confirmed until ten years later by Eichhorst. Henry Hun, one of our own investigators, was one of the first to inform us of the pathological changes in this disease in his article which appeared in 1885, but it was not until 1887 that it was considered to be associated with definite mental symptoms. In that year Korsakow published, in Russian, a series of cases showing a disturbance of psychic activity with alcoholic paralysis and its relation to psychic disturbance with multiple neuritis of non-alcoholic origin.

In 1890, he published the result of his research work in German, naming the disorder, "Cerebropathria psychica toxemia," and making it a clinical entity. This caused an angry controversy. Tilling did not believe this described psychosis existed in infectious neuritis but later admitted it. Kraepelin calls it a metalcoholic psychosis, and makes it one of the subdivisions of alcoholic psychosis. He thinks that it is only a different expression of the same disease process. Bonhoeffer and Raiman consider it a disease entity and relate it closely to delirium tremens, calling it chronic alcoholic delirium. Ziehen calls it acute hallucinatory paranoia with amentia. Krucken-berg, who has observed many cases, claims Korsakow's psychosis is a combination of chronic alcoholism and senile symptoms. Dupre looks upon it as a chronic psychopolyneuritis with dementia. Kuapp, Redlich, and Näcke regard it closely associated with amentia, Jolly believes it a form of delirium tremens. However, the majority of investigators agree with Korsakow.

By "Korsakow's Psychosis" we mean a mental disturbance which is preceded by years of severe alcoholic misuse, especially of "Schmapskonsum," but the exact etiology is as unknown as it was twenty-five years ago. Probably, as Kraepelin thinks, it is not due to alcohol itself but to an auto-intoxication from poisonous metabolic products, formed in the system of chronic alcoholics, which accumulate in the blood, injuring the brain and peripheral nerves, and causing conditions which prevent their elimination. Bronchord, Charrin, Roger, Leyden and Rosenheim believe that ptomaines and leucomains are formed in great number and cause the toxemia. Why in so many drinkers only comparatively few have the disease is still unknown.

Although drinking is much more prevalent among men, the disease is relatively more frequent among women. This predisposition of the female sex must be referred to a greater susceptibility of the nervous tissue in general or to special peculiarities of the female organism. According to Kraepelin, women form only 10 per cent. of the entire number of alcoholics, but comprise 33 per cent. of the cases of Korsakow's psychosis. Of 63 cases which he observed, 18 were women and 16 of these were pure cases of Korsakow's psychosis. Of 49 males, 20 were characteristic. Soukenhoff and Boutenko found that in 192 cases, 112 were men, 80 women and 75 per cent. were alcoholic in origin. Multiple neuritis was absent in 9 per cent. of the men. In men the toxin seems more likely to manifest itself by acute cerebral symptoms than by those of the peripheral nerves. Toxic neuritis, especially alcoholic, is more frequent among those who have sedentary habits. It is caused by steady drinking of small amounts of the spirituous liquors, brandy, whiskey, absinthe, vermouth, rum and gin and is sometimes due to excessive indulgence in beer, when forty or fifty glasses are consumed daily. Medicinal uses of alcohol should not be forgotten.

The majority of cases occur between the ages of thirty-five and fifty. Only 21.5 per cent. of Kraepelin's patients were younger than forty years. Of 20 cases admitted to the Government Hospital for the Insane, since 1907, 17 were between the ages of 30 and 50. There were 11 white, and two colored females, and seven white males. The psychoses in all were due to alcoholic excess. In seven females, it was caused by alcohol, morphine and cocain. Five cases showed luetic infection.

Korsakow's syndrome may also occur in arteriosclerosis, concussion of the brain or other head trauma, diabetes and general paralysis, in such infectious diseases as basic syphilis, tuberculosis,

typhus and malaria, and in various psychoses as acute hallucinatory paranoia, senile and apoplectic dementia and states of amentia. Knapp and Mendel described various forms of acute or chronic poisoning as from lead, arsenic and hydrogen sulphide accompanied by this symptom complex. Cases due to brain tumor and strangulation have been reported by Servas and Pfeifer. Stierlin observed it associated with carbon monoxide poisoning and O'Malley found similar symptoms in a patient in the Government Hospital for the Insane. Recently Henderson published an article on Korsakow's psychosis occurring during gestation. One of auto-toxic origin has been cited by O'Malley and Franz.

Sometimes the onset of this psychosis is insidious and slowly progressive, in other cases, sudden. About one half of Kraepelin's cases developed gradually, and one fourth of them were preceded by delirium. Frequently the early symptoms are irritability, lack of ambition, restlessness, slight confusion, forgetfulness accompanied by severe headache, vertigo or fainting attacks. The patient may become stuporous and sit or stand staring into space in a dazed manner. Korsakow divided his cases into two classes—those preceded or accompanied by delirium and those characterized by confusion or stupor. Chronic gastritis, insomnia, general neuralgic pains or severe pains in joints and limbs, intensified by exercise, alcoholic tremors, twitchings, and progressive feebleness in movement, presence of Romberg sign and ataxia may precede the paralysis or the legs may give way suddenly. Soon there is a complete paralysis of the extensor muscles of the feet and legs which occasionally extends up the thigh. Later the extensors of the hands and forearms are attacked. The flexors of both extremities may be affected.

The paralyzed muscles are flaccid and soon show symmetrical atrophy. They do not respond to mechanical irritation as demonstrated by the absence of the deep reflexes. There is usually no reaction to the faradic current, but excitability may be produced by a very strong current. Galvanism produces the reaction of degeneration. Sometimes strong galvanic currents only will produce any contraction, showing that the muscles are affected directly by the toxins. The characteristic limp wrist-drop and foot-drop appear early. The deformity of the extremities varies in different stages. In the hands there is usually a hyperextension of the first phalangeal joint, a flexion of the second and third, extension of the metacarpal-phalangeal joint and hyperextension of the thumb. An adduction of the first metacarpal bone prevents apposition of the thumb to the fingers giving the characteristic claw-like appearance (*main en griffe*). The

hands are flexed at the wrist. Later, the muscles become contracted and atrophied and the fingers now straight and adducted are held firmly fixed. The feet are extended at the ankle, the heel elevated. The first joint of the toes may be hyperextended, the second flexed. The plantar and peroneal muscles become contracted and the sole of the foot can not be apposed to the floor. The knees are partially flexed. There may be ankylosis of the smaller joints. The pains in the muscles may be excruciating and there is extreme sensitiveness to pressure along the course of the diseased nerves. Zones of anesthesia and hyperesthesia can be demonstrated in the paralyzed parts. The patient frequently complains of perverted sensations as "pins and needles," numbness, formication, or the feeling of pressure girding the extremities. Following the paralysis, there may be abolition of tactile sense and partial loss of deep sensibility. Sensations of temperature or pain are never entirely lacking, but may be retarded.

The characteristic gait of the paretic which is due to loss of muscular sense is one of the earliest symptoms. The weak extremities cannot raise the toe, so he awkwardly lifts the foot as if to step over a high obstacle. Since this symptom is more marked in some cases, Dreschfeld designated these persons as ataxic, rather than paralytic, but they are not free from paralysis. Westphal and Charcot differentiated this "steppage gait" from that of the tabetic. The Romberg symptom is present in both conditions.

The vasomotor symptoms are variable. The extremities may be cold or hot or profuse sweating may occur. They are usually pale at first but after the paralysis occurs become purple and swollen, and the skin has a glossy appearance. The lines of the face may look ironed-out from paresis of the facialis, there may be a disturbance of speech and writing, difficulty of swallowing, paralysis of the eye muscles, especially of the sixth, nystagmus, unequal pupils, or limited movement of the eyes. If the eyes do not react to light, this may be an indication of lues. Aphasia, agraphia and apraxia, epileptiform attacks, cortical epilepsy, monoplegias and hemiplegias or other symptoms of central irritation may appear. There may be a serious change in the entire organism which expresses itself in gradual emaciation. Flabbiness, dilatation and enfeeblement of the heart muscle, signs of chronic pulmonary congestion with dyspnea, disease of the liver, qualitative changes in the urine, bladder disturbances, arteriosclerosis and persistent vomiting may develop. The phrenic and vagus nerves may become paralyzed and cause death.

The mental symptoms forming Korsakow's symptom-complex are characterized by disorientation, a defective power of observation (*Merkstörung*), a retrograde amnesia, and confabulation, which is the most important symptom in the syndrome. As Kraepelin says the patient forgets in a few minutes what he has just experienced or desired to remember, although he is clear and understands without difficulty what is said to him, but he is wholly unable to gather any new experiences, or appreciate the development of events. He forgets what he did a half hour before, and as it is impossible to make him retain the explanation, his confusion can not be overcome. He forgets the beginning and goal of his story, and relates new ideas which White designates "opportune confabulations." Bonhoeffer calls this "embarrassment confabulation." Impressions do not remain and are not associated. Strong impressions may remain but without any connection with present or following events.

The first result of this disturbance is disorientation, especially as to time, although immediate valuation and comparison of short intervals of time show no essential disturbance. The patient rejoices daily anew to make the acquaintance of the physician. He will say that he does not remember the names of those about him, but he feels as if he knows them. Events just preceding the outbreak of the disease are more easily forgotten. Years and decades may be erased from his life. He cannot tell how or when he became sick or whether it happened yesterday or last year. His memory may be good for intermediate periods of time without any arrangement of sequence. According to Gregor, even the memories which the patient still retains cannot be brought into any timely order as all intermediate links are lacking. This confusion of sequence varies in different individuals, as it bears a certain relationship to the mental vivacity. Kraepelin states that exact investigation by measuring tests shows a lessening of comprehension to one sixth of the normal. Gregor and Romer found that the time needed for a complicated reaction compared with that for a simple reaction was disproportionately lengthened. This impairment is scarcely detected by the usual tests. The memory pictures appear so slowly, recognition is more difficult.

The power of observation is much impaired about one third or one fourth of normal. Brodman and Gregor made many tests by having the patients memorize a series of senseless syllables. At the height of the disease, there was a total inability to remember any of them but after a large number of repetitions, eight or twelve were retained. Some were remembered 150 days after constant repeti-

tion, and there was a simultaneous improvement of memory and observation. Kraepelin did not find any improvement when mental problems in arithmetic were repeated. Morstadt found that they invented replies and showed a marked tendency to adhere to them.

His falsifications and pseudo-remiscences, or "hallucinations of memory" as Wehrung says, may be associated with his delusions or actual experiences. As the patient is hypersuggestible these fabrications may be started by "leading questions," which White terms "suggestion confabulation," or something in his environment may stimulate him to spin out a web of marvelous fantasy. This depends on the mental activity of the patient. He may be dull and apathetic, answering only in monosyllables and evasively, or living in a world of fancy, replies readily and does not appreciate his errors.

The content of this confabulation often shows delusions of a persecutory and a grandiose nature. He may have enemies disguised who plot against him, poison his food and take advantage of him at night. The grandiose ideas may simulate those of a parietic. He may enjoy wonderful travels, covering long distances in a short time, acquire an enormous fortune or attain a much coveted position.

The emotional status is variable and greatly influenced by suggestion. Emotional apathy is the usual result.

Kraepelin believes that for general clinical reasons, it is to be thoroughly recommended that this disease, developing on the basis of alcohol, be, as a matter of principle, separated from all disease pictures of other genesis, even though they offer the same symptoms. He feels that since we get a similar picture in paresis, it should warn us not to overvalue the clinical importance of the disturbances of observation and attention and memory falsifications. We must hold to the precept that disease processes of undoubtedly different origin cannot be alike in nature even though their clinical pictures at times cannot be clearly differentiated. A study of the history of development and course of the disease with a careful observation of the individual disturbances will show valuable differences in spite of all similarities between the clinical picture of infectious and alcoholic diseases. Thus the confusion and excitement in the beginning of those infectious cases which resemble Korsakow's psychosis do not simulate delirium tremens. The semi-stupor and confusion are more marked, while the hallucinations are less. The trembling and characteristic restlessness are absent. The entire mood has no alcoholic coloring. The prognosis seems to be essentially more favorable than in the alcoholic forms.

In differentiating between Korsakow's psychosis and general paralysis, Kraepelin says that emphasis must be placed on the previous history. In the one case we have lues, in the other alcoholism; in one a general failure of memory and inability to learn, in the other a predominating disturbance of observation and attention. In one case paralytic attacks with rapidly recovering symptoms of lameness, in the other fainting spells and epileptiform attacks with no after results. In one, slow development of the well-known prodromal symptoms; in Korsakow's psychosis pronounced neuritic disturbances, paralysis of the eye muscles, the characteristic trembling, speak far more for Korsakow's psychosis, while indications of aphasia, stumbling over syllables, symptoms of cerebral paralysis and above all the Argyll-Robertson pupil make dementia paralytica probable. In the psychic field, the apathetic or humorous mood of the alcoholic may be contrasted with the demented bliss of the paralytic, and the circumscribed disturbances of memory and observation of the former with the impaired judgment of the latter. With paralytics, the memory weakness does not seem to be limited by time, but may also include the events of their youth. At the same time, it is often very difficult to differentiate between a developing Korsakow's psychosis with marked weak-mindedness and brain disturbance, and paresis, if the spinal fluid can not be examined.

A similar trouble is met with in separating Korsakow's psychosis from certain arterio-sclerotic and syphilitic mental disturbances. In arterio-sclerotic diseases, cerebral symptoms predominate throughout in contrast to the neuritic symptoms in the foreground of Korsakow's psychosis, and general memory weakness, in contrast to the disturbance of observation and memory falsifications. The mood of an arterio-sclerotic is more whiny or apathetic, compared with the contentment of the alcoholic.

The syphilitic brain diseases are likewise characterized by appearance of center symptoms, frequently of a more transitory nature, while neuritic signs are generally absent. On the other hand, marked disturbances of observation, memory falsifications as well as paralysis of the eye muscles may be observed, so that mistaking them for Korsakow's psychosis is very easy. The diagnosis becomes less certain if we are confronted by alcohol and lues. The diagnosis can be confirmed by cytologic and serologic findings.

In presbyophrenia, we also observe a picture of severe disturbances of observation, loss of orientation and memory falsification, but we always deal with a patient of more advanced age, while Korsakow's psychosis develops between the ages of 30 and 50 in 55 per

cent. of the cases. There is an absence of previous alcoholic history and of the neuritic symptoms. Tilling first called attention to the fact that presbyophrenia begins with fainting spells or apoplectic attacks with intercurrent periods of agitation and apprehension. The patient is communicative, often talkative, takes an interest in his surroundings. He shows a peculiar childish emotional state and a certain busy restlessness especially at night. The loss of retention seems to be also much more extensive, so that the patient often has lost the simplest required knowledge and does not comprehend quite evident contradictions with daily experience. His history is essentially different from that in Korsakow's psychosis. Difficulties of differentiation will therefore occur at most only in such cases in which great misuse of alcohol and its results exist simultaneously.

The course of recovery is slow and quite uniform. The hallucinations are substituted by a roaring in the ears or seeing bright lights, and those finally grow less frequent and are lost. The patient may have some insight and his judgment may be good. "He becomes more skillful in covering the lapses of memory. He lacks inclination to serious occupation and lives without wish or action. Many things are left undone because he thinks he has already done them or he may repeat an act." The polyneuritis gradually disappears and the amnesia gradually improves. There remains a permanent weak-mindedness, with or without disturbance of observation and attention. Hallucinations may continue. Korsakow thinks a cure is possible. Wernicke says the prognosis is favorable. Baedeker and Tichtmeyer report recoveries. Baedeker reports a case of a university professor who had Korsakow's psychosis, but was later able to carry on scientific teaching as before. Tilling never observed a cure. Bonhoeffer, Knapp, Stanley and Kaufmann feel that there is always a mental weakness affecting the memory and the emotional state. Kraepelin is skeptical. Several writers feel that a larger number recover than shown by statistics.

The duration is from four months to two years.

In six of the 20 cases admitted to the Government Hospital for the Insane, the paralysis was lacking; three had a mild multiple neuritis and the others, had a typical peripheral paralysis; six were discharged recovered; four discharged improved, and four died; six patients are in the hospital at present. In all these the physical symptoms have improved, but each case shows mental deterioration, and five show a progressive dementia. The sixth, admitted in August, 1907, was an actress associated with Richard Mansfield

for several years. Both her grandfather and father held high positions in the U. S. Government. Her mother was a well-known society woman. Patient shows little mental impairment, most noticeably by inaccuracy of dates and the estimation of time. She has a tendency to retain erroneous impressions. She is still able to quote Shakespeare and other parts of plays she had memorized, to translate foreign languages, goes into the city and does her own shopping, and last year coached the hospital dramatics.

The pathological changes in this disease are very similar to those found in delirium tremens but are more extensive and of a chronic nature. Usually a simple degenerative parenchymatous neuritis occurs followed by atrophy. The toxins seem to have a selective action in paralyzing certain peripheral nerves of the hands and feet as in diphtheria, the poison has a preference for the nerves controlling deglutition and respiration. The peronei, tibialis, radial, ulnar and median are usually attacked. The sciatic, crural, musculocutaneous, circumflex, optic, pneumogastric and pleuric nerves may be affected. The degenerative changes are more marked in the myelin sheath of the finer branches. Some cases show a more extensive lesion in the periphery; others in the central nervous system which is believed by Cole to be due to a degeneration of the entire neurone, manifested in the periphery, although the disease is a general one, as senile gangrene may be the result of a general arteriosclerosis.

The changes in the cord are most marked in the anterior horn cells and the ganglia cells, especially in the lumbar region. It consists in the disintegration of Nissl's granules which become finely granular and lost their power of absorbing aniline dyes. The atrophy is similar to that in amyotrophic lateral sclerosis. The change is most marked about the nuclei which show decentralization and chromatolysis, and have a tendency to gravitate toward the periphery, much distorted in shape. There is often a deposit of pigment in the cell with a rarification of the fibrillar substance. The axones show an increase of connective tissue in the endoneurium and perineurium, with marked congestion of the blood vessels, capillary hemorrhages, small cell infiltration and later fibrous and hyaline degenerative changes in the vessel walls, which Gudden found was most extensive in the smaller vessels. Although there is a degeneration of the fibers in Goll's column there is no plasma cell infiltration as in paresis. Bonhoeffer believes the hemorrhages which occur in the first stage of the disease in this part of the cord are due to thrombosis caused by the circulating toxins, rather

than to the less pronounced changes in the vessel walls, but Alzheimer claims they are true encephalitic centers. Similar changes are found in Clarke's column.

Several investigators have demonstrated uniform changes in the cortical cells especially of the third and sixth layers. Some of the pyramidal cells, particularly the Betz cells, become swollen, and pigmented, granules disintegrated, nuclei distorted and decentralized and the dendrites and axones broken and atrophied. There is a proliferation of the glia cells and a thickening of the pia but to a lesser degree than in paresis. The degenerative changes show a greater preference for gray matter, especially around the aqueduct of Sylvius and the third ventricle. Here there is a great proliferation of blood vessels with hemorrhages which often cause a paralysis of the eye muscles, making the clinical picture similar to that of poli-encephalitis acuta hemorrhagica superior described by Wernicke. In the substantia nigra the thickening of the vessel walls is extensive. The degenerative changes are most widespread in the first and second frontal and anterior central convolutions, in the occipital lobe, along the calcarine fissure, and in the corona and in the internal capsule. The intercortical and tangential fibers show similar changes. Cells and fibers in the medulla and cerebellum show the same degenerative processes as the cerebrum.

Storch and Forester believe that the lesions of the cortical association fibers cause the peculiar mental state, and that the disorientation depends upon the lack of peripheral sensation.

The first thing to do is to eliminate the toxic agent. Gowers, Bernhardt and Oppenheim feel that in cases of weak heart, the alcohol should not be withdrawn at once. In the stage of invasion, Starr recommends the free use of large doses of salol; salicylic acid or sodium salicylate have important results. He suggests that potassium or bromide be combined with them, partly because these drugs counteract the unfavorable symptoms produced by the salicin compounds and partly because they are indicated in the hyperesthetic irritable condition of the patient. Sometimes morphine must be given for severe pain. Hot or cold applications may help—hot better in the chronic condition. Cases associated with syphilis or malaria are treated by their specifics. In the chronic stage, strychnine in doses from $\frac{1}{60}$ to $\frac{1}{30}$ —3, 4 or 6 times in 24 hours, Fowler's solution three to five drops t.i.d. Even if they increase the mental irritability, they should be continued. The remedies used in the chronic stage are to increase the repair in the nerves and to nourish the muscles. The tonic treatment of the drugs will aid

the nerves, but massage, warm baths and electricity do both. Massage increases the circulation. The baths produce a general sedative effect and are preferable to hypnotic drugs. De Kraft says that warmth has a sedative effect upon the nerve endings and upon the *vaso vasorum*, improving the circulation, relieving congestion in the splanchnic and cerebral vessels and has a general helpful effect upon the musculature of the vessels themselves, preventing sclerotic conditions.

After the acute symptoms, as pain and tenderness in the extremities, have subsided, the application of electricity will hasten the progress of nerve regeneration. The opinions of the electrotheraputists differ as to whether the faradic or galvanic current be used first. De Kraft, explaining the effects of electricity, says that stimulation of the cutaneous nerves by faradic currents produces contraction of voluntary and involuntary muscles and is irritant to nerve endings. When combined with the galvanic current there is less fatigue and exhaustion due to its effect on the circulation. As a therapeutic agent, the galvanic current has polar, interpolar and general effects. Acid ions accumulate at the positive and alkaline at the negative pole. The positive pole is sedative to sensory endings and is a vaso-constrictor. At the negative pole there are accumulations of fluid liquefaction and an alkaline caustic effect. The negative pole is irritant to nerve endings. It acts as a vasodilator. The interpolar effects are tonic. The use of high frequency currents fulfils certain definite indications but none exceed the wave current in value. The high tension alternating current is dependent practically upon the thermic effect which is produced by the resistance of the tissue to the passing electrodes, also to the general molecular oscillation. The sinusoidal current produces a gradual contraction and relaxation of muscular structures, tending to rebuild and restore the lax muscular conditions by squeezing out effete products with absorption of new materials. A mild current may be applied half an hour over the degenerated nerves and over the spine at the level of the nerve roots which supply the affected extremity. Starr suggests that the muscles be exercised for three or four minutes every other day till the patient recovers. High-heeled shoes will facilitate walking—the patient should be encouraged to take a few steps each day and the distance gradually increased until he has confidence in himself, then he should walk unassisted. If the contracture of the posterior tibial muscles can not be overcome, division of the *tendo Achillis* may be necessary.

The memory weakness may be improved by daily retention tests.

as suggested by Gregor. The events of the patient's life should be often consecutively reviewed until he can learn to estimate time.

After reviewing the literature concerning polyneuritis with Korsakow's symptom complex, we may conclude that it is a disease entity, since it is always caused by alcoholic excess and is characterized by the constant mental symptoms of deterioration, disturbance of observation, memory weakness and confabulation, usually accompanied by definite symptoms of a general polyneuritis, which may be preceded by stupor or delirium developing slowly or suddenly, followed by muscular weakness, loss of deep reflexes, a characteristic gait, presence of the Romberg sign and nystagmus, followed usually by a complete paralysis manifested by wrist and foot drop.

The syndrome may occur in various forms of poisoning, infectious diseases, pregnancy, head traumas, and be associated with other psychoses.

The principal conditions from which it needs to be differentiated are general paralysis, certain arterio-sclerotic and syphilitic diseases and presbyophrenia.

The course, unless aborted, is slow and uniform. The physical symptoms disappear, but a mental impairment results, although a few believe in complete recovery. The duration is from four months to two years.

The pathological changes occur in the peripheral nerves, cord and brain, and are characterized by degeneration and atrophy of the myelin sheath, a disintegration of the nerve cells shown by distortion and decentralization of the nuclei, pigmentation, disappearance of Nissl's granules, hemorrhages and small cell infiltration, fibrous and hyaline degeneration and proliferation of the glia cells.

Treatment is eliminative, sedative, nourishing and tonic for the physical condition, retention exercises for the memory defect.

The only case I have had an opportunity to follow throughout its course is here reviewed because it is not only of scientific, but of social interest, since it shows the danger of ignorantly using a proprietary medicine, and demonstrates one of the benefits of the Food and Drugs Act.

(To be continued)

Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

HELD WITH THE SECTION ON NEUROLOGY AND PSYCHIATRY OF THE NEW YORK
ACADEMY OF MEDICINE

NOVEMBER 9, 1915

The President, DR. WILLIAM LESZYNSKY, in the Chair

OBSERVATIONS REGARDING THE CONDITION OF SPASTIC PARALYSIS DUE TO INTRACRANIAL HEMORRHAGE

By William Sharpe, M.D.

Ten cases, showing the results in patients on whom decompression had been performed, were presented by Dr. Sharpe. He stated that 50 per cent. of the cases of spastic paralysis were due to intracranial hemorrhage; the remaining cases being due to meningo-encephalitic conditions, following acute infection and agenesis and lack of development of the cortex or pyramidal tracts. The history of the cases showing signs of intracranial pressure was carefully studied as regards difficult labor, convulsions after birth and ophthalmological signs, and confirmation was sought by lumbar puncture and measurements of the pressure of the cerebrospinal fluid. 719 cases had been examined up to November 1, 1915, and of these 194 were considered to be due to intracranial hemorrhage. 176 cases had been operated upon, of the selected type, showing definite signs of intracranial pressure. Twelve deaths had occurred. Eighty-six cases showed a visible hemorrhagic cyst at the site of operation; in seven the cyst was subcortical. But from this series Dr. Sharpe concluded that the majority was supracortical, rather than cortical or subcortical; the impairment was due to the pressure of the overlying cyst and not primarily to a destruction of nerve cells. The summary of cases shown was: I. Child with compression over left parietal area, with right spastic hemiplegia, due to instruments, was operated April, 1914. Removal of depressed bone done, leaving a large defect. Recovery was rapid after operation, so that the child was normal at present. II. Case of difficult labor and convulsions after birth; the child was unable to sit up or use arms, and had extreme spastic diplegia. Two months ago a right decompression was done, and later a left decompression. Child could now walk and was much improved, but the forehead still bulged markedly. There was a hemorrhagic cyst, due to the rupture of the longitudinal sinus. III. Child of 2 years, was operated on six weeks ago. There was a right spastic hemiplegia with a hemorrhagic cyst over the left temporal sphenoidal area. IV. Child 3 years of age, a spastic diplegiac from instrumental delivery, had a left subtemporal decompression done. A tense edematous cortex was found, under high pressure, but no rupture of cortex occurred. V. Child, 7½ years old, instrumental delivery, with typical left spastic hemiplegia, had a left subtemporal decompression done. He had since begun to pick up and take his place in school. VI. Child with right spastic hemi-

plegia. A left subtemporal decompression was done. There was a history of instrumental delivery and convulsions after birth. Operation exposed a cyst lying on the upper portion of the temporo-sphenoidal lobe. The cyst was in the cortex in this case and there was primary destruction of the cells, so that the arm had improved much less than the leg. VII. Child at eight months was unable to raise hand and unable to walk at 2½ years. Improved after operation. VIII. A left spastic hemiplegia with convulsions, operated October, 1913. IX. Right extreme spastic diplegia with convulsions, operated November, 1914. X. A girl of 12 years, had two operations. A typical edematous thickened arachnoid was found. The cortex did not rupture. The girl was doubled up before operation, with knees to chin. She could now walk, but with an awkward gait. XI. Boy, ten years, with severe spastic diplegia and impaired mentality, had two operations and was now much improved. XII. Case of difficult labor. Extreme spastic diplegiac, was operated one year ago. This case had such high intracranial tension that a protrusion of the bony edge of the decompression had resulted. In regard to cases generally, Dr. Sharpe said that operation on one side generally relieved the pressure sufficiently, though a second operation was often necessary, as in this last case. Autopsies were being performed on all cases to check the diagnostic findings. He thought the mental improvement was very much more important than the physical improvement. Prognosis was worse when the children had convulsions. In about 50 per cent. of the cases convulsions ceased after the decompression. The operation was a subtemporal decompression, a permanent removal of an area of bone beneath the temporal muscle. The dura was always opened and left opened.

Dr. Bernard Sachs said that twenty-five years ago Dr. Peterson and he had reported 140 cases of cerebrospastic states, particularly in the young. At that time they were not unmindful of the possibility of curing these cases by operation. Some of them were operated on by Dr. Gerster, particularly cases associated with epilepsy. They did not attempt to do decompression. They attempted to find the lesion and were willing to take the risk of a succeeding paralysis. The reason for discouragement was that only one of five or six showed any focal lesion. That was in accord with the pathology of these conditions. It was gratifying now to learn the frequency of cystic conditions in these cases. They thought the cases cortical, not subcortical. He was surprised to learn the actual number of cysts found in these cases and was further surprised to see the extremely gratifying results following decompression. These results justified surgical interference. Dr. Sharpe should be congratulated. The results proved that cysts must be extremely frequent. That was the only reason for the decompression operation. Otherwise he did not see how the success could be explained. The only other theory would be a meningo-encephalitis, that is, that there was a hemorrhage with adhesions. Decompression might relieve a brain that was partially constricted by meningitic adhesions.

Dr. Ramsay Hunt said that he would like to congratulate Dr. Sharpe on the excellent results he had obtained in this discouraging group of cases. There seemed to him, however, to be another explanation for this. Foerster had improved these cases by relieving stimuli which originated peripherally, by spinal decompression and rhizotomy. Would it not then be possible by lowering the normal intracranial pressure, and by breaking up adhesions, cysts, etc., to diminish cerebral stimuli and the tendency to increased muscle tone? In other words, to do by a cerebral operation what Foerster had accomplished by operations on the lower neurones and thus diminishing irritative stimuli by another route. Dr. Hunt said that he had not been able to confirm Dr. Sharpe's findings in regard to the optic disks. He was inclined to think that Dr. Sharpe had too much stress on the ophthalmoscopic changes.

Dr. Sachs said that in cases examined twenty-five years ago they did not find a single case of optic neuritis or of choked disk.

Dr. Norman Sharpe said that the sign of pressure which was noted in the eye was a blurring of the disk, but the vessels were tortuous. The duras were always thickened. It was impossible to get them together after they were once cut. The brain bulged at the opening.

Dr. Foster Kennedy said that an important point was that Dr. Sharpe stated that cases suitable for operation were those where pressure was known to exist by reason of the pathological findings in the optic nerve. Were the majority of these pathological conditions confirmed by Dr. Sharpe, by the findings in the cerebrospinal fluid? The resultants of increased pressure in the optic nerves, other than definite dilatation of the veins, blurring of the disk, disturbance of the retinal field, were extraordinary and difficult to teach to the ordinary student, and one would not be able to get a guide from such considerations alone as to whether the head should be opened or not. Would it not be more just to widen the basis of evidence with the idea that one should only operate on cases corroborated by an increase of pressure of the cerebrospinal fluid and possibly by the degree of spasticity? He felt it might be difficult to follow all of Dr. Sharpe's ophthalmological observations.

Dr. A. S. Taylor said that Dr. Kennedy's last remark that the field of operation should be broadened was well taken. Ophthalmological signs were difficult to find. There were cases where there was no other indication of intracranial pressure but increased spasticity. The brilliant results obtained might be explained by other reasons. Four or five years ago Dr. Clarke had 100 spastic cases at Randall's Island examined ophthalmologically, and no evidence of intracranial pressure was found in a single one.

Dr. William Leszynsky said that for a great many years he had examined all of such cases ophthalmoscopically. He had yet to see anything that could be demonstrated as optic neuritis or papilledema. Dr. Sharpe had demonstrated cyst formation during life. Cyst formation was a terminal condition and had been seen at autopsies in a number of cases.

Dr. William Sharpe said that in regard to the selection of the cases, that did not depend on any one sign. All points were considered—the history of difficult labor, convulsions after birth, spasticity, ophthalmoscopic findings, and especially the measurement of the pressure of the cerebrospinal fluid in lumbar puncture. He thought that frequently ophthalmologists did not consider there was intracranial pressure unless there was a high degree of choked disks. One did not find a high degree of choked disk or papilledema in these cases as the pressure was not a primary tumor pressure, but the mechanical pressure of a recent or old hemorrhage. He did not operate unless the cerebrospinal fluid showed a high pressure, and so confirming the ophthalmoscopic findings. The cases should be operated upon as soon as possible after birth and then normal children resulted. These cases were not cures but they were great improvements in children that were practically derelicts.

A NEW SYSTEM OF DEVELOPING MUSCLE CONTROL IN THE TREATMENT OF PARALYTIC CASES

By Bess M. Mensendieck, M.D.

The patient exhibited, a boy of 11 years, had been carefully trained for six months in individual muscle exercise and control. He had weighed 81 pounds and was diagnosed as a case of spastic paraplegia with pes equinovarus. He had walked with both heels 45 cm. from the ground with no

action of the peroneus longus, glutei, sacro-spinalis, or the broad muscles of the back. He had a large protruding abdomen with flabby recti, and was extremely lazy and sluggish in disposition. The bowels were chronically loose. He could not dress or undress. He could sit up, but when standing or walking he was inclined to drop to the ground and was quite unable to rise from the ground. Massage, osteopathy and electricity were used without result. At the present time the boy is able to walk without swaying and able to pound heels on the floor, showing the tibialis anticus function completely restored. The abdominal muscles were firm. The fat had disappeared about the thighs and knees. The bowels had become normal and movements regular. The boy could dress and undress standing up. He no longer dropped to the ground. He was allowed to go to school and took interest in other boys. He was no longer lazy and sluggish. Half the cure could be said to have been effected and in another six months the normal functions could be restored. The case was shown to illustrate the possibilities of volitional innervation to bring about the perfect static antagonism of the muscles. Dr. Mensendieck put the patient through exercises illustrating the isolated action of various muscles under volitional control of the patient. The boy's control of the muscles was remarkable and the results extremely gratifying.

Dr. Bernard Sachs said that the first impression he had of this boy was that the case was pseudohypertrophic paralysis. He very soon eliminated that diagnosis because the condition presented none of the absolutely characteristic symptoms. When the child first came he had typical spastic paraplegia with the knees and legs locked. He could not stand up and had extreme contracture of the posterior groups of muscles. The deep reflexes were exaggerated. The boy was bright, but very obese. The calves were flabby and stout, not like the pseudohypertrophic cases. A disseminated sclerosis was suspected. This type of case was important enough to bring to the attention of neurologists. The case was beyond surgical help and he was glad to put the boy in Dr. Mensendieck's hands as she had accomplished by dint of patient exercise and thorough knowledge of anatomy an innervation of the muscles to a greater extent than he had believed would be possible. He knew that some of his learned young friends claimed to do such things, but in this case more had been done than he had ever seen done before. He was anxious to submit cases of poliomyelitis to Dr. Mensendieck to see what she could do with them.

CASES OF SPINAL CORD TUMORS, TREATED BY UNILATERAL LAMINECTOMY

By A. S. Taylor, M.D., J. W. Stephenson, M.D., et al.

The first patient, a man of 33 years, with previous negative history, was operated on in July, 1915. Eight months previously he had begun to feel weak in the knees, with signs of numbness and dragging of feet. It was found he had spastic paraplegia with left drop-foot. The abdominal reflexes were absent.

Dr. Stephenson said the sensory changes in this patient showed temperature absolute to the level of the eighth dorsal. The cerebrospinal fluid was negative except for heavy globulin. Pain was never present. At operation an endothelioma was found at the level of the sixth, seventh and eighth dorsal vertebrae, and was removed in toto. One week after operation hyperesthetic areas became acute. One month after operation he could walk well and at present he had perfect bladder control. The only subjective symptoms were occasional pain in the back and unpleasant sensation in the left abdomen.

Dr. Taylor stated that it had been said that unilateral laminectomy was no good, that one could not get a tumor out. In this case the tumor was 3 cm. long by 2 cm. in width, was attached to the dura, but arose from the pia-arachnoid. The tumor was easily removed and hemorrhage controlled with warm saline solution. The man had now a normal spinal column and the muscles were well attached to the spinous processes.

The next case, one of meningo-myelitis, was shown by Drs. Taylor and Beling. The man had a negative family history. At 15 he had a fall and injured his back but showed no ill effects from this. He worked later as a motorman and was exposed to extremes of temperature. Three or four months before admission to the hospital he suffered from cramps in the left leg which caused him to get up at night. He was tired in the morning. On November 2, 1914, while standing on a table, he lost his balance and fell backwards, straining the lumbar region. Next morning he had violent pain, but went to work. The pain increased and his legs felt as if weights were attached. At the City Hospital it was found that he had sensory loss in the feet and retention of urine. Examination showed knee jerks present, no Babinski, no clonus, right foot-drop, plantar reflexes diminished, vesical weakness and frequency of urination, and complete loss of sensibility in the sacral second and third. The bowels were constipated. Blood and spinal fluid Wassermann were negative. Since operation the sensory disturbances were unchanged. The man walked better, the left foot being slightly spastic, the right foot hypertonic. Dr. Taylor did a unilateral laminectomy on the right side. The dura was normal except for increased tension. Inside of the dura there was a curious condition. The cord was quite congested and to the right of the midline there was a sheaf of dilated, varicose veins, one half inch broad and one inch and a half long, at the site of maximal interference with the cord function. No attempt was made to remove the veins, but, avoiding injury to the cord, three or four catgut ligatures were passed round them with a curved needle and a multiple ligation was done and the wound was closed. The man had intense pain for four days, only partly relieved by morphine. The fourth day this subsided. The backbone was normal with muscles firmly attached.

Dr. Bernard Sachs said he would not be inclined to describe the case as one of meningo-myelitis.

Dr. Joseph Byrne and Dr. Taylor presented the third case. Dr. Byrne said that on October 15, 1914, this young man, while playing football, attempted to make a catch while an opponent tackled him around the waist. The patient was thrown to the ground, after which some bone was found to be "out" about the left knee. A physician "shot the bone into place" on the field. The patient remained in bed for five weeks, when he discovered he had drop-foot. On April 28, 1915, at Fordham Hospital Dr. Byrne found that on the motor side he had paralysis and moderate atrophy of the tibialis and peroneal groups, dorsal flexion of the foot and toes being impossible. Myotatic irritability was present in both groups but was considerably diminished as compared with the right leg, more especially in the peroneal group. On the sensory side there was loss for light touch and prick over an area on the tibial side of the dorsum of the foot bounded on its outer side by the axial line through the third toe. The loss for light touch extended up the outer aspect of the leg to a point on the shaft of the fibula ten inches from the tip of the external malleolus. Slight over-reaction to prick was present over the roots of toes. All sensory tests were quantitative. Operation was decided on. Dr. Taylor found the nerve at the site of injury to consist of a mass of scar tissue. On section, Dr. John H. Larkin found the mass to consist mainly of connective tissue. Few healthy fibers were present and there was only slight evidence of attempts at regeneration. After operation

the sensory loss was greater than before, and on the foot corresponded remarkably with the sensory loss in the hand, following section of the radial branch in the forearm. The external popliteal was evidently the analogue of the musculo-spiral in the arm. Over an area on the outer portion of the leg prick was preserved, but touch and cold (ice) were absent. Similar dissociation areas had been found by Head and by the speaker on the hand after section of the radial branch in the forearm.

Dr. Taylor said that external dislocation of the knee was the probable diagnosis, as no fracture of the upper end of the tibia was now indicated by X-ray. The nerve damage was for one inch, just behind the head of the fibula. It was imbedded in scar tissue. One inch of the nerve was resected. The knee was kept sharply flexed for a month to allow complete nerve union.

Dr. Terriberry asked if, when the surgeon took out one inch of the nerve, was there not considerable traction upon the remaining portion?

Dr. Taylor said that the nerve could not have been brought together without a little tension, but in doing nerve suture one had to get as good anatomical union, without forming scar tissue, as was possible. It was necessary to get good apposition before suture.

INJURIES OF THE PERIPHERAL NERVES, PRODUCED BY MODERN WARFARE (WITH EXHIBITION OF LANTERN SLIDES)

By C. Burns Craig, M.D.

This paper was based upon ten months' observations at the American Ambulance Hospital at Neuilly sur Seine, and upon impressions gained by some visits to the Salpêtrière and other Paris hospitals. It should be stated that, in a large base hospital, the proportion of injuries to vital parts, as compared to those less serious, did not represent the proportionate varieties of wounds occurring in battle. The majority of men wounded in brain, abdomen, heart, or large arteries, died on the field. Thus 70 per cent. of wounds in base hospitals were in arms or legs. All these wounds had a neurological aspect. Various kinds of pain and paresthesia, the cutaneous anesthesia surrounding some large wounds, and effect of weather upon pain were worthy of attention. In this paper, by injuries to peripheral nerves, was meant only those wounds in which some marked paralytic effect was produced, distal to the wound, indicating that one or more of the principal nerve trunks had been damaged. Varying degrees of disability were observed, and the lesion might be motor, or sensory, or both. Mild cases of loss of function in hand or foot cleared up rapidly, provided the part was not kept motionless. One of the greatest lessons learned in the war in taking care of wounds on a large scale was to avoid immobility of a wounded extremity. Even when fracture existed this might be avoided. In the early days of the war there resulted a number of cases of "causalgia," so styled by Weir Mitchell, and stated by him to be frequent during the Civil War. This was due to immobilization of the arm and hand by the use of splints and slings. It could be avoided by an overhead suspension device, used extensively in Dr. Balke's service. It provided elevation of the part, and permitted sufficient movement to afford exercise. This, in conjunction with early massage, prevented causalgia and shortened convalescence. Considering the enormous number of wounds of the extremities, both of the bones and soft parts, the infrequency of completely severed nerves was quite remarkable. This was accounted for by the resiliency and elasticity of the nerve trunks, which permitted a certain degree of displacement without rupture. Ten per

cent. of peripheral nerve injuries were completely severed nerves. However, all symptoms of completely cut nerves might be simulated by severe contusion or compression of the nerve, and only direct examination at the site of injury could determine the nature of it. The proportion of peripheral nerve injuries to the total number of wounded was: musculo-spiral 12 per cent., sciatic 10 per cent. Dr. Craig gave instances of the following injuries: (1) Injury to the glosso-pharyngeal nerve with persistent paralysis of the uvula. (2) Contusion of the facial nerve with recovery. (3) Injury to the lumbar sacral plexus, with considerable improvement. (4) Isolated injury to the median from rifle wound in forearm, outcome unknown. (5) Peripheral paralysis of right facial nerve from rifle-ball wound, unimproved after four months. (6) Small sciatic completely severed and contusions of greater sciatic; six months after the patient was able to walk alone with normal gait. (7) Injury of median and musculo-spiral nerve by contusion; two months after, no improvement in resultant paralysis. (8) Injury to entire brachial plexus; nine months after, only incomplete restoration of function in arm and hand. (9) Complete division of both musculo-spiral and great sciatic, with no improvement in paralysis four months later. (10) Almost complete severance of sciatic with no return of function after seven months. (11) Injury to the internal saphenous, with anesthesia and paresthesia persisting after six and a half months. (12) Case of compression of the popliteal with complete recovery. (13) Injury to the posterior tibial nerve with compression and atrophy due to dense cicatrix, patient observed for two months with no alteration of sensation. (14) Olecranon almost blown away by shrapnel and elbow joint exposed. Diagnosis of lesion of ulnar nerve and damage to median nerve. Patient operated on by Dr. Blake and radial border of ulnar nerve found severed with formation of neuroma at the site. The contused median was almost completely recovered after five months. The partially severed ulnar showed faulty recovery. (15) Sciatic nerve completely traversed by fragment of shell; even with this slight damage, without severing of the nerve, six months elapsed before approximately complete recovery.

Dr. Ramsay Hunt said that they were all very much interested in the neurology of war and it was gratifying to hear from someone who had had actual experience of this kind at the front. The treatment of injuries of the peripheral nerves would be one of the great medical advances which this war would develop. When such masters as Marie, Dejerine and Oppenheim were concentrating their efforts on nerve injuries, no doubt great results would be achieved. It was interesting to note what a large number of irritative conditions from compression were amenable to treatment, by simple dissection of the sheath, and relieving the nerve trunk from pressure and adhesions (neurolysis). Another type full of interest was the partial lesion of a nerve, the dissociated syndrome. Dr. Craig had mentioned such cases where the projectile caused partial or isolated injury of certain fasciculi. Such lesions were very rare in civil life. Dejerine had devoted especial attention to the "syndrome dissocié." Neurological surgeons seemed to be in harmony as to the treatment of injuries of the peripheral nerves. Practically all recommended conservatism. One French surgeon, Delorme, had advocated radical procedures, excising large sections of the nerve trunk, but his views had aroused considerable discussion, and most agreed that the nerve should not be sacrificed, but only the scar tissue removed, and that any normal fibers and fasciculi should be preserved.

Dr. Goodhart said that the German surgeons made it a rule not to interfere with fresh wounds at all. After the infection was passed they did not hesitate to cut into the tissue months afterwards. In sheath surgery the nerves were sutured, using fat and fascia and arterial tissue. This protected the nerve. In resection of neuromata defects of nerve tissue were filled in

by segments of other nerves. Von Hofmeister recommended the method devised by him of double nerve grafting. Both ends of a divided nerve, which could not be directly resected, were implanted into a parallel nerve which acted only as the bridge. A healthy motor or sensory nerve could be utilized for this purpose.

Dr. William Leszynsky said he had been much impressed with the pictures representing the degree of trophic disturbance after injury of the sciatic nerve. It was almost identical with that after an ill-advised injection of the nerve with alcohol. The patient had been seen by several members of the society.

Dr. Craig said that the point of discussion this evening seemed to be as to whether these cases should be operated on, and if so, when. In France it was universal to wait until signs of infection had cleared up and then every case which presented evidence of serious nerve lesion was opened up. Many were cases of infiltration of connective tissue, which became exceedingly hard and blocked the nerve. Cases of compression of the fiber had a favorable prognosis but where the nerve was partially or wholly severed he was very pessimistic after ten months' observation, but it would take years for a nerve like the sciatic to grow again.

DECEMBER 7, 1915

The President, DR. WILLIAM LESZYNKY, in the Chair

BRAIN, SHOWING TUMOR OF THE PONS, INVADING ONE CRUS CEREBRI, WITH UNUSUAL SYMPTOMS

By Walter Timme, M.D.

The history of the patient was as follows: In July, 1913, a boy, 14 years old, was hit on the head by a playmate. He fell, rose unassisted, though dizzy for a moment. In August, five weeks later, he fell again and struck the back of his head, though without apparent after-effect. One week later the father noticed the boy's speech was affected and about that time the gait became unsteady. Coincident with these changes headache began, chiefly occipital, and there was nausea though no vomiting. The father noticed priapism for two or three hours every night. By September 15 his sight was affected and his sight became progressively worse. Since August his stature increased markedly and he showed marked drowsiness. On September 25 he was admitted to the hospital, where shortly he became so unruly and restive he had to be sent home. His status on admission was: Gait staggering, swaying, chiefly to the left, but occasionally to the right; occipital headache; nausea; no vomiting at first and no tremor; right facial tremor when smiling, *i. e.*, emotional. Examination of the eyes by Dr. Holden on September 25 showed the following: Diplopia, due to weak external rectus; nystagmus L. R.; vision 20/30, with white and red fields normal; discs pink, veins slightly dilated. October 26 there was beginning papilledema with hemorrhage in both fundi with normal color fields. There was then found incoördination with ataxia of hands and feet; R. L. Reflexes gave a greater right knee jerk, a double Babinski and Oppenheim, more on right; right abdominals sluggish; left absent; epigastric absent; cremasteric equal; right elbow jerk exaggerated; left doubtful; asynergia marked; hearing normal; Weber and Rinne tests gave normal conduction; adiadochokinesis of the right hand. The cerebrospinal fluid was normal. A general diagnosis of tumor was

made without special localization. The patient was kept track of by Dr. Timme and more marked symptoms were noted. He had two right unilateral convulsions and there was gradual impairment of the motor functions on the right side and of the trigeminus on the left. Joint sense was normal. Astereognosis was absolute on the right side. The boy was unable to give any information about an object in the hand. A moderate spasticity of the right leg appeared, but no clonus. Finally there was slight diminution of the cutaneous sensibility of the entire right side. These signs pointed to localization of the tumor in the crus and pons, probably, of the left side, as well as the thalamus extending posteriorly to the origin, but not involving the facial and auditory nerves, at any rate not beyond the motor fifth. The patient became progressively worse, with respiratory weakness, verging on the Cheyne-Stokes type. Before surgical interference could be attempted he died of respiratory paralysis. Before exhibiting the brain Dr. Timme pointed out the following interesting facts. First, the astereognosis was due to imperfect sense perception from the right periphery and was no true cortico-psychic astereognosis. Second, it was important to examine always for sensory and motor function separately of the fifth nerve. In this case the difference probably marked the boundary of the tumor laterally. Third, it was important to differentiate between crude differences of sensibility, but also between the finer difference. Lastly, and most important, the symptoms of priapism and skeletal growth pointed to irritation of the pineal gland or the hypophysis. In none of the eighteen cases of these tumors, before published, were such symptoms noted. Were they produced by pressure within the third ventricle, transmitted to the pineal gland, or to the hypophyseal stalk, or were they originated by direct pressure of the left crus cerebri which laterally encroached on the middle line against the hypophysis, and superiorly against the pineal? As the ventricles were hardly distended, it was fair to assume that the increased mass of the left crus cerebri was the irritative cause of these symptoms. Furthermore, the symptoms of increased intracranial pressure came on after the growth phenomena. Autopsy, by Dr. Casamajor, showed a very much enlarged brain, the ventricles were only slightly distended, with a pons very much distorted and enlarged, especially on the left side. This enlargement was caused by an extensive pontine tumor mass which reached forward through the left crus cerebri to the left thalamus, and posteriorly nearly to the beginning of the medulla, extending slightly into the brachium pontis of the left side; involving in this extended locus the left median fillet, the red nucleus with the emerging rubrospinal tract, the left brachium conjunctivum, the left motor fifth root and the thalamic nuclei with their radiations downwards; and compressing the pyramidal tract of the left side, as well as by transmitted pressure, that of the right side also in less degree. Both the hypophysis and the pineal gland were normal. The tumor proved to be a glioma. In taking up the interesting features of rapid increase in growth and sexual irritation, it was to be noted that in not one of the eighteen published cases of tumor of the crus cerebri were they present. In view of the normal condition of the hypophysis and of the pineal gland it was incumbent upon one to theorize. There were four possibilities. First: neighborhood pressure by the left crus upon the hypophyseal stalk; second, pressure by the left corpus quadrigeminum against the pineal gland; third, congestion of the basal blood vessels, thereby affecting the hypophysis secondarily; and fourth, interference with the tractus habenulæ interpeduncularis. A similar case had been reported where an interpeduncular growth pressed upon the hypophysis, but never where the actual crus was enlarged and produced such symptoms. Cases had also been reported where an enlarged hypophysis impinging upon one or the other crus produced spasticity and exaggerated reflexes. This may have been a con-

verse case. It was known that symptoms referred both to rapid growth and sexual irritation were present in pineal gland tumors, so that a similar course of reasoning with the pineal gland might be considered as the cause of the symptoms. The specimen was presented to illustrate the relationship of the crural tumor with the pineal gland and the hypophysis.

Dr. Abrahamson spoke of a case of encephalitis of the posterior peduncular area and the pons, at present in the Montefiore Home. A considerable similarity as to signs existed. There were crossed hemiplegia; crossed astereognosis, plus lesser disturbances of the threshold of pain and tactile sensation; crossed disturbances of the sense of postural movements, but less of the posture sense; homolateral oculomotor involvement; crossed ataxic tremor, namely, of the upper extremity and less marked homolateral tremor. Dr. Abrahamson could not agree with Dr. Timme's explanation of the occurrence of the astereognosis.

Dr. M. Allen Starr said that it seemed to him that in regard to the sexual disturbance that the work of Cushing had established the intimate relationship of the hypophysis to the sexual functions. These symptoms must be ascribed to some disturbances of the function of the pituitary body. Dr. Cushing had also called particular attention to the effect of pressure by tumors upon the circulation in the arteries of the medulla and base of brain. Was it not possible therefore that the pressure of this tumor, instead of irritating the hypophysis by pressure merely, may have had some effect by causing very marked congestion and a hyperactivity in the gland and that this produced priapism and marked growth of the bones, which was characteristic of disease of the hypophysis?

Dr. Timme said that Marburg had studied one case of pineal gland involvement showing these symptoms of sexual disturbance and rapid growth in a child of ten, so that the syndrome could be attributable to either one of the two glands. Personally he agreed with Dr. Starr that it was the hypophysis rather than the pineal. The pineal gland could adjust itself. The hypophysis could not. If the case was merely one of pressure every tumor would show the same symptoms, but they did not. The pressure in the ventricles in this case was very slight, indeed almost normal, so that the symptoms could not be secondary to the disturbance in the ventricles. The symptoms existed before any papilledema appeared.

A CASE OF BOMB WOUND OF THE RIGHT TEMPORO-SPHENOIDAL LOBE, WITH SOME REMARKS ON THE HEREDITARY CHARACTER OF LEFT BRAINEDNESS AND RIGHTHANDEDNESS

By Foster Kennedy, M.D.

The patient referred to was a soldier, wounded on August 5, 1915, near Arras, in first line trenches. He was admitted to the Hospital Militaire, Ris Orangis, September 25, 1915. The man stated that while making hand grenades he "suddenly became unconscious," but he remembered dimly being bandaged in the trenches and being carried to the second line. He was redressed by ambulance men and carried to a field hospital. He remained completely conscious and did not lose consciousness again. He received anti-tetanus serum immediately after being wounded. On August 7 he was operated on without anesthetic. He did not know whether anything was extracted or not. He had no convulsion or headache or any difficulty with speech. Four days after the injury the left arm and leg felt "as though they had been slept on," but this became better when he got up. This feeling of numbness

was present when admitted to the Ris Orangis hospital. He never had pain in the left arm or leg. On September 25 he said he felt very well. Over the right temporal and lower temporo-parietal region there was a wound. A scar existed, apparently the result of a semicircular subtemporal decompression. An infection had evidently occurred in the wound, the upper sutures having broken and the whole skin flap having fallen about 5 cm. The posterior margin of the skin flap was turned in. The upper portion was clean, with a granulating surface measuring 8 by 2½ cm. In the posterior margin of this wound, behind the ear, there was a sinus about 5 cm. long, which extended inward and forward parallel to the external auditory canal. There was a marked bone defect and the brain pulsated in the granulating area. Examination showed: pupils equal, with brisk reactions; sight emmetropic on left side. The right eye was myopic by four diopters. Optic discs: the left showed some tortuosity of the veins. The physiological pit was filled in and the left upper temporal quadrant was obscured by slight swelling. The right fundus was normal. Dr. Kennedy here pointed out that the formation of the myopic eyeball was such as to permit rapid drainage of edema accumulating at the nerve head, in consequence of this a well-marked papilledema occurring in a myopic eye-ball was not at all a common phenomenon. One would be justified in believing that had the patient had normal vision in both eyes, he would have had some papilledema in both fundi. There was no nystagmus, diplopia or strabismus. The lower jaw, on opening the mouth, swung to the right side, this being not due to a lesion of the motor root of the fifth nerve, but to a fracture of the right zygoma. The general hypesthesia of the left side was seen in the face as elsewhere, but there was no localized fifth nerve paralysis. Seventh nerve: the left frontalis muscle moved actively, the right not at all. On the other hand he could only close the left eye weakly. The left lower face was distinctly paralyzed for both voluntary and emotional movement, thus showing damage respectively to both the right facial cortical center and the right optic thalamus. The right frontalis muscle was inactive probably because the twigs of the right facial nerve supplying it were involved in the bomb wound and operation scar already described. The right membrana tympani had been ruptured and hearing proportionately diminished in the right ear. The tongue swung markedly to the right on protrusion. The swinging of the lower jaw to the right had overcome the tongue's hemiparetic tendency to go to the left. The patient was an intensely lefthanded man. He had no word deafness whatsoever and he named objects of which he had visual recognition promptly and accurately. He had no apraxia or alexia. His memory was good. He read and wrote in a manner only interfered with by hemianopsia which on the left side was complete to the fixation point. Patient's father and mother were both righthanded persons. He was an only child and knew of no other lefthanded persons in his connection. Motor system: there was distinct and general softening and atrophy of the muscles of the left arm and leg, there being a difference between the left and right upper arm of 2.5 cm., between the two thighs of 2.5 cm. and between the two legs of 2 cm. There was no tremor or athetosis. Slight ataxia of the sensory type existed in the left upper extremity. The weakness in the left arm was more marked than that in the left leg, though proportionately less marked than that in the left face. He could not stand on the left leg alone. There was considerable titubation, probably the result of a lesion of Türk's bundle, uniting the pons and the temporal region. There was distinct lowering of touch and superficial pain and deep muscle pain sensation over the whole of the left side of the body. No mistakes were made in sense of position nor in the discrimination of temperature. There was a slight slowness in the recognition of unseen objects held in the left hand, but in this regard also no mistakes were made. Re-

flexes: all deep reflexes on the left side were exaggerated in degree. Abdominal reflexes were present on the right and absent on the left side. Plantar reflexes: right flexor, left extensor. Dr. Kennedy pointed out that owing to the fact that the patient was left handed to an extraordinary degree, one would have been justified in looking for a correspondingly marked degree of disturbance in speech, manifested in him as a result of the massive injury sustained by the right temporo-sphenoidal lobe. He showed a photograph of the patient, together with two radiographs of his skull, which showed fragments of the grenade and the driven bone flung through the cortex and embedded in the right occipital lobe. It was pointed out that the usual teaching up to the present time had been that in lefthanded individuals, the centers subserving the function of speech were to be looked for in the right side of the brain; therefore a sudden injury of such severity as that described in this patient should have severely crippled the patient's communication with the outside world. In view of the seriousness of the lesion, it was only possible to suppose that the patient's immunity from this condition lay in the fact that, in spite of his lefthandedness, as far as his speech centers were concerned, he was leftbrained. Dr. Kennedy discussed some of the theories which had been put forth to account for the prevalent condition of righthandedness. He said that flint instruments of the paleolithic period showed that there had been as many lefthanded tools as those adapted for the right hand, consequently only in the evolution of mankind had righthandedness become more and more a general characteristic. Ophthalmologists had pointed out that in the vast majority of people the right eye dominated over the left, and some of them had ascribed the dominance of the right hand to this condition. In the case under discussion the right eye was myopic and the left normal. Conceivably under this condition the patient's lefthandedness might have thus arisen. On the other hand the hereditary trend was entirely righthanded, and presumably leftbrained, that is to say, he had acquired lefthandedness, though by heredity he was leftbrained. In this connection a case was quoted of a woman, 22 years of age, at the National Hospital for Paralyzed and Epileptic in London. This girl developed leftsided Jacksonian convulsions, the result of luetic thickening of the dural and pial membranes on the right brain. After each attack, over a period of twelve months, she became temporarily aphasic. She was entirely a righthanded person. Her paternal and maternal heredity showed lefthandedness. These considerations would make one consider the advisability of investigating, not only whether or not the patient was right or lefthanded, but also whether or not the family stock showed any anomalies in this regard.

Dr. Sachs said that there was one point that could be noted without going back to the history of ancestors. The majority of children were ambidextrous. Almost every child was born so and remained so until taught to use the right hand more than the left. There were relatively few exceptions to this rule. Parents had trouble in teaching the child to use its right hand in preference. Many children would be lefthanded if not taught to use the right. Centuries of civilization had insisted that the right side of the body was better than the left. Dr. Sachs thought it was largely a matter of artificial education. In studies of the child's brain in early life the speech function was not found exclusively in the left hemisphere. There were as many changes in one hemisphere as the other.

Dr. S. E. Jelliffe said in reference to right and lefthandedness, Stier had done a beautiful piece of work in the German army for a series of seven years. He had approached the problem from the hereditary standpoint. He had examined all the records of the recruits and had come to the general conclusion that lefthandedness represented an ancestral type of the race which was inferior to the righthanded type and therefore not the successful

type, and it had therefore been slowly eliminated. Lefthandedness, pragmatically considered, was an hereditary problem. The early biological determiners were as yet very uncertain, but there was some relation between the successful races, which, migrating northward, did come into a definite position to heliotropic influences. The position suggested regarding sun position and righthandedness was not as nonsensical as many superficial critics had assumed.

Dr. Ramsay Hunt said he could cite a case which had some bearing on the question of the speech disturbance raised by Dr. Kennedy, viz., a left-handed young man who had an abscess of the left temporal lobe, with right hemiplegia and right hemianopsia with definite disturbances of speech of the sensory type. He was a left-handed man, but in spite of that had developed a disturbance of speech from a lesion on the left side of the brain. The symptoms of aphasia did not last long and in a month or six weeks all speech trouble had disappeared, the hemiplegia and hemianopsia persisting. Although this man was by nature left-handed and performed most of the acts with the left hand which were usually done by the right, it was not so in all things, *e. g.*, he was a typewriter by occupation and performed this work like a right-handed man. It was probable that such a man was not left-brained or right-brained, so to speak, but was rather ambicephalic. This would be one explanation for the disappearance of the aphasia in such a case, the speech mechanism having a bilateral distribution.

Dr. Fisher said that he would like to relate a case which he saw that day of left hemiplegia in a righthanded woman. Her mother, brother and daughter were left-handed. In regard to Dr. Sachs's remark about ambidexterity, he doubted that that was entirely true. If one tried to teach a left-handed boy to write with his right hand, it was a most difficult matter. During his lifetime he retained greater facility with the left hand.

Dr. Kennedy said he would like to ask Dr. Hunt about the parents' right or lefthandedness in the case he had cited. This was the very point that it would seem worth while to investigate because the reasons given in the literature for aphasia with anomalous handedness were not very convincing. It might be worth while to see whether or not there was a sinistral tendency in the family in which the case occurred.

Dr. L. Pierce Clark asked Dr. Kennedy if the man in the first case cited was particularly clever and dextrous in the use of his hands before the injury. Lefthanded children never became very clever in the use of the right hand.

Dr. Kennedy said he had had no data upon that point.

CASE OF SYMMETRICAL WOUNDS OF TEMPORAL REGION

By Foster Kennedy, M.D.

A man came into the hospital from the trenches. When the bandages were taken off, two wounds, with marked bone defects, absolutely symmetrical, were shown of each temporal region. He could see perfectly well. The wounds were the result of a bomb explosion which had happened at his feet. The dura was seen pulsating vigorously in the wounds, on both sides. The X-ray showed two large defects, each the size of a dollar. The man had been struck by two symmetrical pieces of shell which had wounded him simultaneously. The case was not interesting neurologically, as beyond his wounds he had no physical signs.

ASSOCIATED JOINT AND NERVE LESIONS IN EXPERIMENTAL
STREPTOCOCCUS INFECTIONS; THEIR ANALOGY TO THOSE
OCCURRING IN CHRONIC DEFORMING POLYARTHRITIS
AND SPONDYLITIS DEFORMANS (BECHTEREW)

By William P. Nathan, M.D. (*by invitation*)

Dr. Nathan stated that the neurological symptoms associated with polyarthritides and spondylitis were those which were usually associated with compression of the spinal roots, or very slight compression of the spinal cord. In order to discover the cause of these symptoms the spine and epidural spaces in eighteen dogs injected with streptococci were examined. In six of these there was definite involvement of the spine, endosteal and subperiosteal marrow changes in the bodies of the vertebrae. These changes were associated with periosteal edema and epidural exudate. All these changes corresponded with those found in the joints elsewhere. Hence, it was concluded that in those cases in which there were neural symptoms associated with polyarthritides, the spine and epidural space were involved.

ON VARIOUS FORMS OF SPONDYLITIS, WITH LANTERN SLIDES
AND RADIOGRAPHIC DEMONSTRATION

By Bernard Sachs, M.D.

The patient presented was a man, 36 years of age, admitted to the Mt. Sinai Hospital November 1, 1915, complaining of pains in the spine. In the family the father, mother and one brother had tuberculosis. The patient had had gonorrhoeal infection; lies denied. Twelve months previously the right hip was painful, and three years previously there had been pains in the lower dorsal spine, especially at night. On May 15, before admission, he began to have shooting pains in the spine. A laminectomy was performed at another hospital. After this his condition was worse. He could not raise his arms to his head. He had no incontinence of urine or feces. Fifteen years ago Dr. Sachs had seen a similar case and had advised operation, because tumor was suspected, but nothing was found except thick strands along the inner surface of the column. This present patient on examination showed slight lateral nystagmus, rigid neck and limitation of movement upward. Achilles jerks were increased; wrist jerks increased; rigid spine was present with tenderness over cervical, lumbar and sacral regions with hyperesthesia and hyperalgesia. The spine could not be bent. Both upper extremities were paralyzed, with the exception of slight movements in the fingers. The Wassermann test was four plus. X-ray examination showed that there was marked spondylitis of the fourth, fifth and sixth thoracic vertebrae and eleventh and twelfth lumbar. The funuli and discs showed slight temporal pallor with contracted arteries and slight scotoma. At operation the twelfth thoracic vertebra was excised and an examination showed normal bone. The patient, when put upon specific treatment, showed marked improvement in four weeks. It was found that the lesion was absolutely specific, the possibility of tuberculous spondylitis having been considered and excluded.

The subjects of Dr. Nathan's and Dr. Sachs's presentations being similar, both were discussed together.

Dr. Gilney (*by invitation*) opened the discussion by saying that he was very much interested in the subjects presented by both Drs. Sachs and Nathan. Dr. Sachs was confronted with the same problem in regard to studying plates that he had been confronted with. Dr. Sachs was enthusiastic and thought

that the roentgenologist could make one see things as he saw them. The question was whether these were degenerative or hypertrophic processes. The lipping process might be tuberculous or it might be caused by other infective diseases. At the Forty-second Street Hospital they had had a group of cases with pain, stiffness and other unexplained symptoms, and they were going into the question of the teeth as a causative factor. All teeth were X-rayed, and those showing evidence of Rigg's disease or periodontal infection were suspected. The dentist was asked to examine and interpret the X-ray. A few years ago one held the opinion that every tooth showing an apical abscess must come out, but, at a meeting of the orthopedic section, a dentist showed the result of treating such a tooth through the root canal and there was apparently new bone formation. It had become the practice now to save more teeth than formerly and have them so treated. Sometimes adenoids and tonsils in older people were found to be the focus of infection. A laryngologist now examined the throats and a thorough search was made for the source of the disease. Dr. Sachs's differentiation was a good one. Dr. Gibney said he was interested to hear the statement that the "neurologist discovered the early signs" and that the "orthopedic surgeon the later signs" of disease. He had thought the condition was exactly the reverse. He always impressed upon the students the necessity of early diagnosis and told them that if they did not make a diagnosis before deformity occurred, they were culpable and ought to be prosecuted. They looked to the neurologist *later* to help them out.

Dr. George R. Elliott (by invitation) said that Dr. Nathan's interesting experiments were in the line of clearing up the subject of nerve findings in connection with multiple arthritis. For many years writers clung to a nerve origin for so-called arthritis deformans. This was largely based upon the rather bilateral nature of the arthritis. A great deal was said about a probable implication of the anterior horn cells, motor and trophic. This theory gradually fell into disuse and was dropped. It was known that the arthritis was not always bilateral. In fact it was frequently irregular in distribution. The past few years had brought forward a new theory which clinically had been generally accepted. This theory was the logical outcome of the now generally accepted view of the infective etiology of arthritis—that the organism causing the arthritis might involve the nerve tissue also. Poynton and Paine, Triboulet and others had dwelt upon this. Triboulet's well-worked-up autopsy illustrated this theory. His patient had multiple arthritis, together with extensive nerve lesions causing localized muscular atrophies and other signs of nerve implication. There was a clear history of puerperal infection. The autopsy showed extensive epidural exudation, explaining all the nerve findings. The puerperal infection was accepted as the common focus of origin. Dr. Nathan's experiments seemed to corroborate such a clinical belief and doubtless would do much to clear up the subject. Dr. Elliott would like to ask Dr. Nathan what kind of streptococcus he used, it being important that the organism be nonsuppurative, did he attenuate his organisms or mutate them in accordance with the transmutationists? In regard to Dr. Sachs's presentation, Dr. Sachs had seemed to dwell a good deal upon the so-called "lipping" in his demonstration of the interesting X-ray findings. That, Dr. Elliott thought, was too much dwelt upon in the text-books, while, in fact, it had little or nothing to do with the real nature of any particular disease. It meant simply the result of some irritation stimulating osteogenetic cells. This irritation especially in the spine was commonly trauma or static disturbance. Bone was thrown out at points of ligamentous and muscular attachments when subjected to strain. Bridge formation often meant nothing more than this. In X-ray studies made of laboring men over fifty years of age "lipping" and bridge formation were common where

no subjective symptoms were complained of. In one of the large London hospitals, where this point was especially studied 50 per cent. of the spines of hard working men showed at autopsy more or less "lipping" and bridge formation, where there had been no complaint during life.

Dr. Ramsay Hunt said that a little over a year ago he had considered this subject at some length on the basis of his own experience (four cases) and the records which were available in the literature (*Am. Jour. Med. Sci.*, 1914, p. 114). He had gathered in all 100 cases that seemed to him to meet the requirements for the diagnosis of syphilis of the spine. One striking thing about this series was the great preponderance of the cervical location. Half of the lesions were localized in the uppermost portion of the cervical region. He found that 25 per cent. showed neural complications. These were divided pretty equally between cases where only the plexus or the nerve roots were involved, and cases that presented symptoms of compression and paraplegia. One case recorded by Dr. Hunt was unusual. It came on like acute myositis (wry neck). Generally speaking in this group of cases the spinal symptoms outweighed in importance and frequency the symptoms of bone disease as shown by the X-ray. The majority of cases would come under the heading of a perispondylitis. In the later stages only would there be breaking down from necrosis and carious osteitis. Very difficult cases were those presenting the clinical picture of Pott's disease, but with a positive Wassermann reaction. Dr. Hunt cited the case of a young girl, 17 years old, who developed the typical picture of Pott's disease, but with a positive Wassermann. Her mother had also a positive Wassermann, and there was no history or symptom of tuberculosis. Dr. Hunt would warn neurologists to consider the question of syphilis carefully even when the case appeared to be cases of tubercular origin.

Dr. W. R. Townsend (by invitation) said he had studied bone syphilis and he did not think that "lipping" was characteristic of syphilis. He thought it would be found in many classes of cases. He did not mean that the condition of the vertebrae shown was not characteristic of Pott's disease, but a little "lipping" did not necessarily mean syphilis. It might occur with syphilis or it might occur in osteoarthritis or even in normal spines. There were all kinds of variations in the vertebrae. A little raising of one edge could not be taken as characteristic of any disease. Later, when breaking down of the bodies occurred, that was a different thing.

Dr. I. Strauss said in the matter of the X-rays that he did not understand Dr. Sachs to mean that "lipping" was an evidence of specific disease. They were all aware that slight changes in the bone occurred in many persons. The syphilitic case shown by Dr. Sachs had distinct changes in the body of the vertebra. Dr. Hunt's case had a wry neck; he also had marked hyperesthesia in the cervical region, which led him, in connection with the X-ray and Wassermann, to make a positive diagnosis. Lipping was not to be regarded as significant unless there were symptoms of nerve involvement. Dr. Nathan's paper was interesting. The diagnosis of rheumatism was being discarded. Rosenow's work on its bacterial origin had furthered this view. Dr. Nathan seemed to have found exudate in the periosteum in addition to the bone condition. He had seen sections which showed exudation clearly and changes in the neighborhood of the nerve roots, though no distinct damage to the nerve roots, but changes in juxtaposition to the nerve roots might cause degeneration in the stroma. In one case of Dr. Sachs's the contention of Dr. Nathan seemed to be proven, that was in the individual who had a staphylococcus infection. This was followed by a staphylococemia for several months, then by subperiosteal abscess. The patient had his leg amputated, and then began paralysis in the remaining limb. This level lesion increased so rapidly that operation was performed by Dr. Elsberg,

and in the laminae was found a pachymeningitis. There was dense fibrous exudate containing pus. The dura was not opened. The patient made a complete recovery. This was in accord with the symptoms produced in dogs by Dr. Nathan. In regard to malignant growth, there had been two cases in the hospital with very instructive X-ray findings. Sometimes intradural tumors might cause rarifying change in the bones which, if one was not careful, might be considered as syphilitic changes. In one case compression of the cord symptoms became very distinct. Laminectomy was performed and an intradural neoplasm was removed. With this there had been distinct signs in the bones.

Dr. C. A. Elsberg said he had five times operated on patients with intradural neoplasm in whom the X-ray showed spondylitis. Each one had been treated for spondylitis or arthritis of the vertebrae on account of changes in the bones such as had been shown by Dr. Sachs. The patient of Dr. Strauss had a tumor behind the first two cervical vertebrae, and projecting into the foramen magnum. On account of the X-ray picture the case was, for a time, considered spondylitis by neurologists and orthopedists.

Dr. S. E. Jelliffe said the discussion emphasized the need for a thorough search all over the body for sources of infection, not only teeth, but frontal sinuses, mastoid, cecum colon, prostate, kidneys, etc. Infections were possible from any of these hidden sources in spinal arthritic patients.

Dr. Nathan said he was aware there were four cases reported with autopsy findings in which epidural changes were found. They had used two or three strains of streptococci in their experiments. One was from Dr. Noble at Bellevue Hospital which produced the spinal lesion; one was a hemolytic streptococcus from a throat culture at Mt. Sinai, cultivated from agar slants. The strain was not attenuated as dogs were very resistant to streptococci. With regard to the X-ray of the spine, this had its dangers. No diagnosis should be made from the X-ray of the spine alone. Not only minor changes, but gross changes should be considered in connection with the clinical symptoms. The finer degrees of lipping might be due to partial crushing and softening of the vertebrae which occurred in all inflammatory conditions. In examining a large number of spines it would be found that there was more or less deformity irrespective of the cause of death. Diagnosis should only be made in connection with other clinical findings. All hospital cases had a Wassermann taken. They had had patients with a positive Wassermann who were relieved by specific treatment, but, on the other hand, some patients with a positive Wassermann were not relieved at all. That patients with syphilis might have something else as well was not always recognized. It should be remembered that in such patients all abnormal conditions were not due to syphilis.

Dr. Bernard Sachs said he had not done Dr. Jach's justice by his exposition of the X-ray plates. There was a large series. The attitude of the speakers to-night was what his had been in the beginning of his studies of the subject, that is, that the plates showed very little. Now, they had found that the X-ray studies were extremely important. To Dr. Elliott he said that he did not mean the lipping was entirely specific. It was part of general spondylitic changes. Dr. Ramsay Hunt had remarked upon the surprising preponderance of luetic caries cervicalis. Lumbar cases were very rare; cervical lues much more common. It was connected with spondylitis rather than osteitis. He had been surprised to note the relative frequency of spondylitis. He had seen about thirty cases in three years—cases sent to the medical and neurological service, not on account of bone changes. He thought medical and neurological men saw the early cases. He felt if he had done nothing else he had started interest in a somewhat neglected subject. Spondylitis should be an active subject of interest to neurologists.

Translations

VEGETATIVE NEUROLOGY. THE ANATOMY, PHYSIOLOGY, PHARMODYNAMICS AND PATHOLOGY OF THE SYMPATHETIC AND AUTONOMIC SYSTEMS

BY HEINRICH HIGIER

WARSAW

Authorized Translation by Walter Max Kraus, A.M., M.D.
[New York].

(Continued from page 279)

What are the physiological characteristics of the vegetative nervous system? The proof of even the most simple of these is more or less difficult to obtain since, with the exception of the cervical sympathetic, the structures are very inaccessible. The retro-pleural and retro-peritoneal ganglion nodes and nerve borders are so hard to get at that transection, stimulation or extirpation on the living animal can hardly be done. In reviewing the separated functions of the vegetative system, localized in the cerebral cortex (neopallium), the cerebrospinal axis (archæopallium), the ganglia and the periphery respectively, we find the following:

I. *Autonomy of the Peripheral Vegetative System.*—There is a distinct autonomy and independence of the periphery. For example, the progress of digestion is possible without the influence of the cerebrospinal axis as experienced in the simultaneous transection in dogs of the spinal cord and vagus nerve. Animals in whom a part of the spinal cord, or even the entire brain, has been removed, live without them, digesting, voiding and developing. The independence of the periphery is anatomically proven by the fact that smooth muscle does not degenerate after its nerves are cut. It is as yet undecided whether, since the end organ can functionate independently, there are ganglion cells in its walls as in the blood vessels, or whether the autonomy resides in the protoplasm of the organs themselves. It is noteworthy that many organs have no ganglion cells in their walls and that the embryonic heart muscle contracts

rhythmically for a time even though it has no ganglion cells. The physiological relations are therefore quite different than in the cerebrospinal system, in which permanent and severe changes occur in circumscribed disease of the brain and interruption of conduction bundles. In lesions of the sympathetic ganglia or their peripheral branches, there is at most a transitory disturbance of function in the corresponding organ. In many cases it is demonstrable that after the cerebrospinal axis has been cut off there is complete paralysis; *e. g.*, in intrinsic muscles of the eye and sphincter anus. This, however, gradually disappears.

The entire process of an increase of peripheral irritability of muscle is identical, according to Lewandowsky, and justly so, with the isolation phenomena as Munk describes it and which has long been recognized as characteristic of the vegetative nervous system. This is never dependent upon the absence of inhibition and never occurs immediately after isolation of the organ has taken place.

2. *Action, Sensation and Reflex.*—Under normal conditions there is no voluntary control of the activities of the vegetative nervous system, nor do visceral reflexes to mechanical or sensory stimuli occur via the brain or spinal cord in the usual fashion.

3. *Peculiarities of Smooth Muscle.*—The physiology of the irritability of smooth muscle shows (Nagel, Zierl) that the latter is uncommonly reactive to mechanical and thermal stimuli and less reactive to electrical stimuli; the latter must be continuous in character in order to have an influence upon the somewhat sluggishly reacting smooth muscle. Single induction shocks or discharges from a condenser are less active. Interrupted or constantly increasing continuous currents produce reactions. Smooth muscle is particularly susceptible on account of its sluggishness to summated stimuli. All skin stimuli seem to cause *tonic reflexes*, reflex activity of a tetanic or tetanoid character which, as is seen in the goose flesh due to the activity of the pilo erector, does not persist for a long time after the cutaneous stimulation has ceased. The rigor mortis of smooth muscles may last twenty-four hours after death, as is seen by the marked anemia and goose flesh of cadavers.

4. *The Pre- and Postganglionic Branches of the Sympathetic Ganglia.*—It is noteworthy, from a physiological point of view that, as Langley has established, there is but one ganglion between the cerebrospinal axis and the peripheral or internal end organs. Thus any given stimulus must pass through an intermediary station in order to reach the end organ. When the end organ is of a secretory

nature, or is motor with smooth muscle, the motor nerve, whether it be sympathetic or autonomic, can only exert its influence on the organ through a vegetative ganglion and through post-ganglionic fibers (Fig. 1).

The results of transection are the same whether the pre-ganglionic or post-ganglionic fiber is cut. The resulting irritability of the periphery occurs more rapidly and more intensely after transection of the post-cellular fiber than after cutting of the pre-cellular. It is noteworthy also that in cutting a branch of the vegetative, or in extirpating a ganglion, that regeneration only occurs between pre-cellular and pre-cellular, and between post-cellular and post-cellular fibers. Unless this type of regeneration occurs there is no complete disappearance of the manifestations of transection. Some physiologists deny that there is inherent tone in the vegetative ganglia.

5. *Synapses and Pseudo-Synapses in the Ganglia of the Sympathetic Cord.*—The unity of anatomical structure of the vegetative nervous system implies a unity of pharmacological action which would prove the division between vegetative and sensory motor nerves (Langley & Dickinson). The effects which are brought about by stimulation of the vegetative nerve fibers after they have left the gray matter of the central nervous system, may be stopped at once if a 1 per cent. solution of nicotine is painted upon the ganglion between the place of stimulation and the periphery. Sensori-motor nerve functions are uninfluenced by this procedure. Nicotine, which in large doses paralyzes the ends of all somatic nerves, in small doses acts upon the pre-ganglionic neuron and not upon the post-ganglionic.

If the sympathetic fibers pass through more than one station, *e. g.*, the pupilo-dilator fibers which cross the stellate, inferior and superior cervical ganglia, then painting these ganglia successively with nicotine and stimulating peripherally with a faradic current will show in which ganglia the synapse is placed; that is to say, where the sympathetic fiber does not pass through but is broken and comes in contact with a new physiological neuron.

In the above cited example, painting with nicotine only destroys the electrical conductivity of the pupillary fibers when nicotine is painted upon the superior cervical ganglion. The results of pharmacological methods are quite in accord with the degeneration anatomical method.

We are indebted for our knowledge of most of the anatomical bases of the reflex tracts, which we shall consider, to the animal ex-

periments of Langley and his coworkers. They worked out the central origin and the peripheral extension of the vertebral sympathetic ganglia by means of the nicotine method.

6. *The Myoneural Junctional Tissues.*—Pharmacological experiments with the paralyzing action of nicotine and the stimulating action of adrenalin (which stimulates all ends of the sympathetic system) have shown a further physiological characteristic (Wessley, Langley, Lewandowsky). Manifestations of the above named substances could be obtained months or even a year after extirpation of the ganglia, or after degeneration following transection of either pre-cellular or post-cellular fibers. Adrenalin does not act on every nervous part of the doubly innervated end organ; that is, upon the sympathetic and autonomic. It only acts upon the end organs which are innervated by the sympathetic; consequently, the toxic action does not occur upon the degenerated nerve ending but upon a chemically differentiated part of the end organ which is in some ways associated with the sympathetic nerve endings. This has been called by Dickinson, Langley and Elliott neuro-muscular end-plate.

This substance which is placed between nerve endings and the smooth muscle cells, has also been called myo-neural junction by Froelich.

7. *Distinctive Characteristics of Vegetative Reflexes.*—Organic motor reflexes travel via the vegetative nerve and are accomplished with the aid of involuntary muscle (scrotal reflex, colonic reflex, internal anal reflex, etc.). The reflex contraction of a smooth muscle is slow in comparison to the energetic reflex activity of a cross-striated voluntary muscle. In many reflexes, as for example the cilio-spinal, the reflex activity is only carried out by smooth muscle; in others, *e. g.*, the bladder reflex, the smooth muscle is aided by cross-striated voluntary muscle. In almost all these reflexes the activity may take place more or less completely without any intervention of the central nervous system.

8. *Simple and Visceral Reflex Arcs.*—Some reflex areas are very simple, as for example the esophagus reflex; others are exceedingly complicated, as the erection reflex. Let us take as an example the well-known ejaculation reflex. The stimulation aroused in the sensory end-organ, the glans penis, travels via the N. dorsalis penis and the N. pudendus communis to a spinal ganglion of the lower sacral roots and from here via fibers of the cauda equina to the lumbar ejaculation center where the centripetal part of the arc ends. From this point, the motor activity passes by the lumbar communicating branches and the hypogastric nerves to the pelvic tracts and

from here, via gray post-cellular fibers to the powerful smooth musculature of the end organs, the spermatic cord, seminal vesicles and prostate.

The path of the reflex arcs of the head ganglia are very much more complicated because the development of the head from its constituent metameres is not clear cut and the topographical relations of the sympathetic ganglia are extremely complicated. As a paradigm, the reflex which initiates the secretion of the parotid gland via the otic ganglion may be cited. The reflex may be divided as follows: (*a*) The impulse passes through the sensory fibers in the N. lingualis or the N. mandibularis via the trigeminus to the oblongata.¹ (*b*) Thence it travels through the sensory fibers of the chorda tympani whose trophic center lies in the geniculate ganglia and onward via the N. intermedius to the medulla.¹ Finally it travels via the taste fibers which pass via the N. glossopharyngeus to its nucleus in the brain (Fig. 3).

The centrifugal part of the arc is no less complicated than the centripetal. The fibers pass from the nucleus salivatorius inferior in the middle part of the glosso-pharyngeal nerve via the N. tympanicus, the N. petrosus superficialis minor to the otic ganglion and from here via the sheathless post-cellular fibers, which travel with the sensory auriculo-temporal nerve to the parotid ganglia.

The question is: Are such complicated tracts always necessary to the existence of reflex activity in vegetative organs; or do certain reflexes pass from the spinal cord and medulla only to the nerve tissues which are placed near or in the organs themselves.

Muller & Dahl have recently answered this important question in the following fashion: Reflexes which travel solely from the walls of organs via their plexi occur only in those instances in which the sensory stimuli which cause muscular contraction or glandular activity do not reach the brain and scarcely enter consciousness (stomach, intestines, heart, etc.). The reflex arc for these so-called axon reflexes does not lie in the spinal cord but in a vegetative ganglion just without or just within the organ itself. On the other hand the reflex arc is quite complicated in all organs communicating with the outer world, whose activities depend upon exogenous irritation of sensory nerves which carry conscious and localizable sensation. In these instances it is a question of a primary irritation of a sensory nerve which is carried to consciousness and the transference of the stimulus to the vegetative ganglion cells of the cerebrospinal gray

¹The path is then to the pons and thence to the nucleus salivatorius inferior.

axis. The centers for erection, ejaculation, secretion of sweat, secretion of sebum, secretion of saliva, secretion of tears and pupillary contractions are examples. From this point the irritation passes via the corresponding rami communicanti to the peripheral ganglion cell groups which belong to the organ involved. The post-ganglionic tracts are of varying length, from one millimeter to several centimeters and even longer according to the locality of the ganglion cell which has interrupted the path. Thus the synapse may lie very close to the end organ, or it may be very far from it.

(To be continued)

Periscope

Journal of Mental Science

(Vol. 60, No. 248)

1. Serum and Cerebrospinal Fluid Reactions and Signs of General Paralysis.

GEORGE M. ROBERTSON.

2. Vaccine Treatment in Asylums. W. FORD ROBERTSON.

3. Villa or Colony System. T. E. KNOWLES STANSFIELD.

4. Dysentery, Past and Present. H. S. GETTINGS.

5. Leucocytosis in Mental Disease. D. J. JACKSON.

6. Albumen in Cerebrospinal Fluid. H. D. MACPHAIL.

7. Enteric Fever at Omagh District Asylum. PATRICK O'DOHERTY.

8. Pupil and its Reflexes in Insanity. A. H. FIRTH.

1. *Serum and Cerebrospinal Fluid Reactions.*—Robertson in "The Morrison Lectures, 1913" discusses the history, methods of conducting and significance of the serum and cerebrospinal fluid reactions in general paralysis, differentiating especially other syphilitic conditions. The positive Wassermann reaction in the spinal fluid is called the "paramount sign" in general paralysis, occurring only in two other allied conditions, *i. e.*, tabes and cerebrospinal syphilis. Increase of globulin, the presence of albumen and of plasma cells very rarely fail as confirmatory signs in general paralysis.

2. *Vaccine Treatment in Asylums.*—After outlining the methods of preparation of vaccines and the therapeutic indications in conditions which may be present not only in the sane but also in the insane, W. Ford Robertson again calls attention to his formerly expressed view of the importance of the "diphtheroid infections" in the etiology of tabes and syphilis. He says, "owing to the almost universal prejudice that leads to the uncritical acceptance of syphilis as the exclusive cause of tabes and general paralysis, in spite of the incompleteness of the evidence, such infections and intoxications (*i. e.*, of the genito-urinary system) are still almost entirely neglected in their relation to chronic diseases of the nervous system. He feels also that "puerperal insanity" lends itself to such treatment, as does also a large proportion of manic-depressive psychoses. His views as to general paralysis and tabes and also as to manic-depressive insanity would arouse a severely critical discussion, to say the least, in an audience of American psychiatrists.

3. *Villa or Colony System.* Knowles advocates acute hospitals with a concentration of medical and nursing skill and facilities for care and treatment for the "10 per cent." who have a prospect of recovery. For the large chronic group of cases he advocates so far as possible the communal life of a country village, the villa or cottage type of asylum most nearly approaching this by affording the best facilities for the employment of patients and for giving them the maximum of personal freedom. A cheaper form of construction can be employed and the cost of maintenance reduced by patient labor. Additional accommodations can be provided more readily than in the barrack type of asylum.

4. *Dysentery.*—An extended adjourned discussion of a paper on "Dysen-

tery, Past and Present," by H. S. Gettings, appeared in the *Journal of Mental Sciences*, October, 1913.

5. *Leucocytosis in Mental Disease*.—After a number of blood counts were made in different types of cases called "acute mania, acute melancholia, acute manic-depressive insanity, general paralysis, dementia præcox and epilepsy," Jackson gives his conclusions as follows:

1. Cases of acute confusional insanity present a fairly well marked picture, namely, a polynucleosis and eosinophilia.

2. Cases of manic-depressive insanity and dementia præcox show variations in the leucocytic formula resembling (1) but not so well marked nor so constant.

3. That a continuous polynucleosis and eosinophilia point towards recovery and hypocosinophilia and absence of polynucleosis point towards chronicity.

4. Recovery may be hastened by stimulation of the leucocytes by terebene, etc.

5. The remission stages of general paralysis are characterized by lymphocytosis and seizures by polynucleosis.

6. Remissions in general paralysis may be prolonged by suitable doses of tuberculin.

7. Cases of delusional insanity and terminal dementia do not exhibit a leucocytosis.

8. Epileptics show a polynucleosis in their pre-paroxysmal condition and a diminution in the leucocytes in their inter-paroxysmal state.

Sufficient data in the illustrative cases are not given to establish the different diagnoses which do not apparently conform to any one generally accepted classification.

6. *Albumen in Cerebrospinal Fluid*.—In a very brief paper, MacPhail comments on the results of the examination of the fluid from seventy-seven patients by the Eshbach albumen meter. An excess of albumen indicates profound changes in the central nervous system. General paralysis always shows an increase, the greater the amount, the worse the immediate prognosis. The highest was .3 per cent., the lowest in any case .03 per cent. It was rare to obtain an amount in excess of .05 per cent. in purely functional cases. Excess of albumen and high cell count go together. If the amount of albumen is .1 per cent. or over, the case is almost certainly one of general paralysis, but if the amount is as low as .03 per cent., there is quite possibly no marked change in the nervous system.

7. *Enteric Fever*.—An account of an outbreak of enteric fever in the Omagh District Asylum which was traced to a sewage contaminated well, the water of which was used for drinking, culinary and bathing purposes.

8. *Pupil and its Reflexes in Insanity*.—A long continued paper discussing the pupil in health and in the various types of psychoses.

W. C. SANDY (Columbia, S. C.).

American Journal of Insanity

(Vol. LXXI, No. 2)

1. A Criticism of Psychoanalysis. C. W. BURR.
2. The Pathology of General Paresis. C. B. DUNLAP.
3. Medical Examination of the Mentally Defective. L. L. WILLIAMS.
4. Applied Eugenics. SANGER BROWN.
5. Translation of Symptoms and Mechanisms. C. L. CARLISLE.
6. Psychoses in the Colored Race. MARY O'MALLEY.
7. An Estimate of Adolf Meyer's Psychology. G. V. HAMILTON.

8. Dementia Præcox, Paraphrenia. Review of Kraepelin's Latest Conception. GEO. H. KIRBY.
9. Mental Disturbances in Acute Articular Rheumatism. R. H. HASKELL.
10. Cortex Lesions in Dementia Præcox. E. E. SOUTHARD.
11. Internal Secretion Glands. E. M. AUER.

1. *A Criticism of Psychoanalysis.*—A rather sharp criticism of the author's erroneous concepts of the Freudian doctrines, as misinterpreted by him from the writings of some American adherents. It is impossible in an abstract to do more than register the author's unfavorable opinion as to the scientific basis and the practical utility of the teachings of the Vienna psychologist, neither of which, judging from the evidence in the criticism, are at all within the grasp of the author.

2. *The Pathology of General Paresis.*—A review of our present knowledge of general paresis, the most essential point in whose pathological anatomy the author considers the perivascular exudate throughout the central nervous system. So far, however, we have not succeeded in strictly correlating the local anatomical change with clinical symptoms. That the spirochæta pallida is directly responsible for these changes there seems to be practically no doubt now, but the search for this organism in sections is tiresome and disheartening, as the methods of staining are very capricious. Again, it is not always easy to differentiate the changes of general paresis from those of cerebral syphilis and in fact they exist alongside of one another, though as a rule the changes of paresis are readily distinguishable from those of syphilitic meningitis. The clinical differentiation again is not always easy, but from a practical point of view this is not so important, since they are best considered as varieties of the same disease (though of different prognosis).

We know too little of the life history of the spirochæta pallida to answer such questions as, what is going on during periods of remission clinically of paresis, whether there is a special strain of this organism which has a particular affinity for the nervous system, etc. It, however, appears safe to assert that "general paresis is essentially a generalized infection with the spirochæta pallida, in which the central nervous system stands out more prominently than any other part." On anatomical grounds the author feels that by the time the diagnosis is made the damage will be already considerable and looks to prophylaxis in syphilis itself as the hope of the future.

3. *The Medical Examination of Mentally Defective Aliens: Its Scope and Limitations.*—A discussion of the problems which confront the public health and marine hospital medical officers in the examination of immigrants, especially at the port of New York. While far from satisfactory and imposing a heavy responsibility upon these medical men, the existing laws undoubtedly have effected the exclusion of a large number of mental defectives who would likely become criminals or dependents, though many of the higher grade defectives undoubtedly get by. On account chiefly of the immense material which must be handled in a limited time the examiners are greatly hampered in their efforts to render exact justice both to the immigrant and to the community and an increase in the number of examiners and interpreters and more space in which to work seem to the author great desiderata.

4. *Applied Eugenics.* A discussion of some of the problems of eugenics with criticism of the tendency to enact hasty and ill-considered legislation bearing on this subject.

5. *The Translation of Symptoms into their Mechanisms.*—An attempt to refer the symptoms observed in nine women, whose cases the author considers as belonging to the class of the constitutional depressions, to the presence in their subconscious spheres of certain unfulfillable wishes of sexual character. The interpretations of the symptoms are in strict accordance with Freudian ideas, hence the sexual element is of course uppermost. Unfortunately, the

prognosis is unfavorable, since the essential basis in each case is an irremediable situation. However, "the disturbing affect complex cannot be entirely sublimated by the patient, but it may be robbed of the greater part of its dynamic value by thorough and vigorous ventilation." This has been done in one case which was able to return home apparently normal.

6. *Psychoses in the Colored Race*.—The authoress's study extends over a period of four years and three months and is based upon a comparison of 455 white and 345 colored females admitted to the Government Hospital at Washington. On account of the mixture of races there are practically no really full blooded negroes in the United States to-day, according to Hoffman, who thinks that while the admixture of Caucasian blood renders the mind of the mulatto quicker, he does not really excel the black man in capacity. The authoress traces interestingly the psychological traits of the negro character and its bearing upon the symptoms in mental disorders, then studies the relative frequency of the different forms of mental disease in the white and in the negro. She draws the following conclusions:

1. The facts brought out warrant the conclusion that insanity has largely increased among negroes since their attainment of freedom.

2. The mental mechanism in different psychoses does not differ essentially in the two races.

3. Dementia præcox is the preponderant disease type among the colored but it is not greatly disproportionate to the same type among whites. The hebephrenic type predominates in both races; there is more catatonia among negroes, more paranoid dementia among whites.

4. The manic-depressive psychosis is less prevalent among negroes than among whites, the manic type being more frequent, the melancholic less frequent among the colored.

5. Involutional melancholia and depressions are rare in the colored, and since their moral standards are less strict and social conventions are less regarded, the absence of self-depreciatory ideas, etc., is noticeable.

6. The prevalence of syphilis among the colored has had a marked effect, and general paresis, cerebral syphilis and luetic affections are far more frequent than among whites.

7. While negroes consume large quantities of alcohol, they seem to have a certain immunity to it and its toxic effects are less lasting than in whites.

8. Paranoid conditions are found, but true paranoia is rare, especially in negro females.

9. Hysteria is rare in the colored.

7. *An Estimate of Adolf Meyer's Psychology*.—A review of the chief points of Meyer's psychological teaching which the author does not find sufficiently clear to be of great practical use in psychiatry, but which if formulated in somewhat more definite manner, which he indicates, he thinks would furnish a useful working hypothesis at least.

8. *Dementia Præcox, Paraphrenia and Paranoia: Review of Kraepelin's Latest Conception*.—Kraepelin has recently restated his views on dementia præcox which do not appear to be essentially modified and he has enlarged his disease picture by the introduction of a number of subvarieties. Under the head of "Endogenous Deteriorations" he forms two large groups, Dementia Præcox and Paraphrenia. Both of these develop independently of any external causes which we can discover and are chronic psychoses with more or less mental impairment. Under dementia præcox he describes the following varieties:

1. Dementia Simplex. A gradually increasing apathy with impoverishment of ideas and lack of interest. No hallucinations or delusions. Begins about puberty or even in childhood.

2. Hebephrenia. Progressive rapid deterioration with peculiar behavior,

hallucinations, ideas of grandeur, scattering of thought, emotional variability. Particularly characteristic are silly behavior, uncalled for laughter and infantile attitudes.

3. Simple depressive or stuporous forms, which are followed by gradual deterioration.

4. Depression with delusion formation.

5. Excited forms, of which there are the following subvarieties:

(a) Circular Type. Usually begins with a depressed phase, with delusions and subsequent excitement. The persistent senseless excitement is most characteristic for this form.

(b) Agitated Type. Continued restlessness and excitement, passing into deterioration, with or without remissions.

(c) Periodic Type. Infrequent, shows an episodic course of excitement followed by remissions. The intervals vary, but the outcome is deterioration.

6. Katatonic Forms. These cases show an alternation of katatonic excitement and stupor which is characteristic.

7. Paranoid Forms. Delusions and hallucinations are the most prominent symptoms, but in addition there are the characteristic symptoms of dementia præcox. This group contains the two types of

(a) Dementia Paranoïdes Gravis. Delusion formation, later peculiar behavior and emotional deterioration. Occurs especially in middle life and later.

(b) Dementia Paranoïdes Mitis. Paranoid type with long persistence of hallucinations and delusions, but in which the personality is less severely damaged than in the preceding form.

8. Forms with Marked Speech Confusion (Schizoplasia). This is shown particularly in the end stages with relatively less deterioration in other fields.

The lines between the different groups cannot always be sharply drawn and they shade into one another. The excited and katatonic forms are apt to have long remissions while in the simple, hebephrenic and paranoid forms remissions are much less common. The katatonic, hebephrenic and first paranoid type are most apt to sink into deep dementia. Kraepelin looks upon all these varied clinical pictures as manifestations of an underlying disease which he conceives to originate from some endogenic cause, probably some perverted glandular activity, or from some nervous tissue-damaging toxine elaborated within the body. As to the symptomatology, Kraepelin singles out the will and the emotions as the chief elements of mental life and reduces the primary symptoms of dementia præcox to disturbances in these fields. He does not think that dementia præcox is so much allied to the constitutional psychoses as to epilepsy, both diseases probably depending upon some progressive destructive disease process most often beginning in childhood or in adolescence.

A large number of cases of dementia præcox show marked peculiarities of mental make-up long before the onset of a definite psychosis. The following are singled out by Kraepelin as the most frequent types of personality found in dementia præcox cases.

1. Shut in, seclusive type, mostly males.

2. Sensitive, irritable, excitable, obstinate type, mostly women.

3. Lazy, unsteady, shiftless, mischievous type, mostly boys, who often become tramps or criminals.

4. Good-natured, pliable, conscientious, diligent type, mostly boys, who are marked by avoidance of youthful naughtiness. These peculiarities are thought by Kraepelin to be the earliest signs of dementia præcox, and he even suggests that these different types are represented later in the clinical picture of the psychosis itself, *e. g.*, seclusive, obstinate traits, as negativism, odd behavior, as mannerisms, irritability as impulsiveness, while easily influenced,

liable, over-conscientious personalities have traits later transformed into automatic obedience and suggestibility. Individuals who show some of the above traits but have later no psychoses may possibly be considered as having had formes frustes of dementia præcox.

As to the cause of dementia præcox, while this is unknown Kraepelin thinks that the weight of evidence is in favor of an auto-intoxication of some sort, and he is firmly convinced that in this disease we have to do with a widespread and severe disease of the cerebral cortex, founding his opinion on the work of Nissl and Alzheimer. If Alzheimer's findings are confirmed, disease of the small cell layers of the cortex must be considered responsible for the mental disturbances most characteristic of dementia præcox.

Paraphrenia includes cases formerly classified in part as dementia præcox, in part as paranoia. It is differentiated from dementia præcox by the fact that the main disturbance is in the intellectual sphere and the peculiar disturbances of will and the marked emotional deterioration so characteristic of dementia præcox is not present. On this account the disruption of the personality is not so marked. Kraepelin recognizes four subforms of paraphrenia:

1. Paraphrenia systematica. This includes a large part of the cases of Magnan's "Délire chronique à évolution systématique."

2. Paraphrenia expansiva. A smaller group characterized by florid delusions of grandeur and of persecution with a prevailing exaltation of mood and mild excitement. Visual hallucinations are common. These cases Kraepelin formerly considered as chronic mania. It occurs almost exclusively in women.

3. Paraphrenia confabulans. A small group in which falsifications of memory dominate the picture.

4. Paraphrenia phantastica. Abundant delusions of absurd, disconnected and changeable form.

For a small group of cases Kraepelin still reserves the name of paranoia, which he now looks upon as the reaction of an abnormally constituted personality to the struggle of life. It is the outgrowth of personal difficulties in adaptation to the environment, not of disease processes, as are dementia præcox and paraphrenia. These people show great overvaluation of self combined with suspiciousness. There is gradual development of an intellectually produced and unassailable delusion with integrity of the personality. There are no hallucinations, disturbances of the will or of emotion as in dementia præcox. The delusion of greatness crops up apparently after all kinds of internal conflict and represents the fulfilment of secret wishes and day dreams. Most of these cases can get along in society, many being known as reformers, statesmen, founders of new religions, philosophers, etc.

9. *Mental Disturbances Associated with Acute Articular Rheumatism.*—A comprehensive report of the mental symptoms in two cases of acute rheumatism with marked psychic disturbance of the nature of a hallucinatory delirium with marked episodes of fear and in one case with a curious idea that he had been dead and that the doctors had warmed him up again. The author then reviews the literature of the subject and discusses the possible pathogenesis of these cases and their treatment.

10. *The Topographical Distribution of Cortex Lesions and Anomalies in Dementia Præcox, with Some Account of their Functional Significance.*—Continued article. Will be abstracted when complete.

11. *The Psychical Manifestations of Disease of the Glands of Internal Secretion.*—A discussion of this subject as presented in the literature with some observations of the author. He draws the following conclusions:

1. "In the etiology of the affective psychoses we are evidently dealing with a biological disturbance."

2. "The glands of internal secretion physiologically act not as independent units, but on the contrary mutually influence functional activity."

3. "The occurrence of insanity at puberty and adolescence after severe physical and mental strain and at the time of the menopause, all periods when the metabolic changes are intense, and the occurrence in syndromes unquestionably the result of disease of the glands, internal secretion of idiocy, imbecility, depression, mania and dementia suggest strongly that the true etiology of the affective psychoses lies in the glands of internal secretion."

C. L. ALLEN (Los Angeles).

Archiv für Psychiatrie und Nervenkrankheiten

(53 Band, 1 Heft)

- I. Erythromelalgia. MAX SCHIRMACHER.
- II. A Clinical and Anatomical Contribution to the Diseases of the Central Nervous System. ELSA KAUFFMANN.
- III. Enuresis and Occult Spina Bifida. SCHARNKE.
- IV. The Pathography of the Julian-Claudian Dynasty. FRIEDERICH KANN-GIESSER.
- V. On the Graphologic Signs of Feeble-mindedness. GEORG LOMER.
- VI. Clinical and Pathologic-anatomical Contribution to the Study of Echinococcus of the Cord and Cauda Equina. PUBLIO CIUFFINI.
- VII. Treatment of the Aphasias. EML. FRÖSCHELS.
- VIII. Mental Excitement and Inhibition from the Standpoint of the Jodl Psychology. HARRY MARCUSE.
- IX. The Psychopathology of Religious Delusions. OTTO CRAEMER.
- X. Pupillary Disturbances in Dementia Praecox. FRIEDA REICHMANN.
- XI. Legal Medicine and Homosexuality. P. NÄCKE.

I. *Erythromelalgia*.—Schirmacher reviews on the basis of a carefully studied case our knowledge of erythromelalgia, first described by Weir Mitchell in 1872. Other cases reported in the literature are also cited. It is concluded that, in spite of the fact that in all cases of erythromelalgia vessel changes of the nature of sclerosis were found, a causal relation between this fact and the phenomena of the disease should not forthwith be assumed. It is, on the whole, probable that erythromelalgia is an independent disease, and that the alterations of the vessels are merely a chance accompaniment. In general, nothing has been determined as to the ultimate cause of the affection, but the symptoms are of such a character that it seems probable the etiology is to be sought in disease of the sympathetic system. The view advanced by Cassirer and Senator, that erythromelalgia is due to paralysis of the vaso-constrictors or spasm of the vaso-dilators, is somewhat supported by the beneficial effect of adrenalin in the case reported by the author. In one case carefully studied, postmortem, certain pathological cells were found in the sympathetic ganglia as well as in the substance of the adrenals,—a matter perhaps of importance but demanding further confirmation.

II. *Perniciouſ Anemia*. Kauffmann discusses the disturbances in the nervous system occurring in pernicious anemia, and reviews briefly the literature on this subject. She describes in detail a case, the essential features of which are as follows: A man of 48, with clearly defined pernicious anemia, low hemoglobin, greatly reduced red cells, and symptoms on the part of the nervous system consisting in weakness of the legs, increase of the knee reflexes, with clonus and Babinski phenomena, together with a marked psychological disturbance, the autopsy showing typical lesions in the organs, with pronounced degenerations throughout the spinal cord. The relation of the

alterations in the nerve tissue and in the blood vessels is discussed, with the conclusion that presumably both are due to a common cause. A description of the pathological findings is given, and the distribution of the lesions. Of particular importance is the fact that the mental disturbances found a possible explanation in certain anatomical changes in the brain.

III. *Enuresis and Spina Bifida*.—Scharnke discusses the commonly recognized distinction between enuresis and incontinence as depending in the first instance upon a functional disorder, and in the second, upon organic disease. Little light has been thrown upon the condition known as enuresis, due to a variety of purely theoretical hypotheses which have from time to time been advanced in explanation. The object of the paper is to consider the recently advanced theory expressed by the term *myelodysplasia*, on the basis of a collection of cases. From this investigation the assumption seems justified that the enuresis of adults is due to a cause appearing in childhood but not developing until after the time of puberty, namely, the so-called myelodysplasia. The whole subject of enuresis is detailed from a physiological standpoint, and the various theories of occurrence described. The X-ray in these cases shows alterations in the sacrum and the symptomatology indicates further a hypoplasia or dysplasia in the lower part of the spinal cord, and possibly also in the cauda equina. The anatomical proof of these latter changes is, however, as yet lacking. In general, therefore, it appears to the author that enuresis as it occurs in adults is due to an occult spina bifida in the majority of cases rather than to the ordinarily recognized functional disturbances.

IV. *Julian-Claudian Dynasty*.—Kanngiesser presents a learned dissertation on the life history and diseases of the Julian-Claudian dynasty, which should prove of interest to neurologists and psychiatrists, and in general to students of medical history.

V. *Graphology and Feeble-mindedness*.—Lomer believes that the subject of handwriting as a diagnostic means may be placed on a more scientific basis than has hitherto been done. As a criterion of mental development or defect, handwriting must be considered of first importance. A study, therefore, of its characteristics in the feeble-minded may lead to conclusions of importance. The paper constitutes a profound study of this subject and may well be brought to the attention of those interested in the determination of objective indications of mental defect, especially in patients of high grade and medium types.

VI. *Echinococcus of Cord and Cauda Equina*.—Ciuffini draws attention to the relative infrequency of echinococcus of the cord, and points out the difficulty of making a correct diagnosis, not only on account of this fact, but also because the symptoms are not particularly characteristic. On the basis of a case operated upon with good result, in which the echinococci were found in the cauda equina and the conus terminalis, the entire subject is discussed, together with its differential diagnosis, with the inclusion of a summary of 54 cases described in the literature. The paper is of value in calling attention to an unusual condition which should at least be considered in otherwise inexplicable disturbances involving the cord at its various levels.

VII. *Treatment of Aphasias*.—Fröschel's attempts to outline a systematic treatment of aphasia based on a careful classification of the forms in which it may occur. For this purpose he divides the aphasias into the following general groups: (1) Pure; word deafness or subcortical sensory aphasia. (2) Receptive; deficiency in understanding speech, difficulty in spontaneous speech, and in repetition. (3) Expressive cortical sensory aphasia; understanding of speech, defect in spontaneous speech, and agraphia. (4) Transcortical sensory aphasia; failure in the understanding of speech, with retained capacity to repeat; spontaneous speech defective. (5) Cortical motor aphasia. (6) Subcortical motor aphasia.

VIII. *Jodl's Psychology and Mental Signs*.—Marcuse is of the opinion that the psychology elaborated by Jodl, although hitherto little recognized in psychiatry, is of positive value. He describes in some detail the basis of Jodl's psychological conceptions under three different types of mental activity; the first stage constituting those psychical reactions which occur as the immediate result of stimuli; a second stage in which are reproduced in consciousness the effects of stimuli previously exerted; and the third stage, which includes abstract thought and in general the highest psychological processes. Jodl conceives the whole psychical capacity of man as a specific force of the central nervous system, which in its higher stages is determined by the morphological constitution of the organism. The conceptions of development and energy must be considered as the essential doctrines of his psychology. With these general conclusions as a basis, Marcuse discusses the fundamental psychiatric disturbances and expresses the belief that Jodl's theories have a very definite practical application in determining diagnosis and prognosis.

IX. *Religious Delusions*.—Craemer traces from its simple beginnings the well recognized mental disturbances associated with the religious consciousness. The paper offers a systematic discussion of the method by which, in predisposed persons, religious conceptions may evolve into a systematized delusional system.

X. *Pupillary Changes in Dementia Præcox*.—Reichmann calls attention to the observation made by Westphal, in 1907, concerning striking pupillary phenomena occurring in a patient suffering from dementia præcox. To this condition he gave the name of catatonic *pupillenstarrê*, by which he designated the transient loss of light and convergent reaction of the pupils, which usually go hand in hand with changes in the outline of the pupils. Following this work, many observations were made on pupillary changes in dementia præcox, with the general result that a temporary loss or slowing of the reaction was observed in many of the cases. On the basis of this work, the opinion was expressed that dementia præcox must be regarded as an organic disease. Meyer's work followed, showing that changes in pupillary reaction up to complete inactivity might be induced by localized abdominal pressure. Stimulated by these observations, Reichmann has further investigated the subject, with the object of determining how far these observations were accidental and not dependent upon the existence of a definite mental disease. She concludes that the statements advanced by Westphal cannot be unequivocally accepted, and that a definite explanation is by no means as yet determined. It appears, however, probable as a working hypothesis that there is a connection between certain vasomotor disturbances and disturbances of the iris innervation, which may well form the basis of further work on the subject.

XI. *Homosexuality and Legal Medicine*.—In considering the relation of legal medicine to homosexuality, Nacke concludes that homosexuality is usually congenital and does not in itself indicate either degeneration or disease; although naturally such a perversion may occur in persons of deficient mental development, it by no means follows that actual degeneration is a prerequisite for its occurrence. Such degeneration is rather the exception than the rule.

E. W. TAYLOR.

Book Reviews

DIAGNOSTIK DER NERVENKRANKHEITEN. Von Prof. Dr. Alexander Margulíes in Prag. Erster Band. Allgemeiner pathologischer Teil. S. Karger, Berlin.

This little volume partakes of the nature of a small semiology. It is concise, authentic for the most part, a little old-fashioned, but withal an excellent small quiz compend sort of an affair.

LEHRBUCH DER PSYCHIATRISCHEN DIAGNOSTIK. Von Privatdozent Dr. Adalbert Gregor. S. Karger.

This new claimant for favor impresses one very favorably. The author adopts the Heidelberg-Illenau schemes, patterned largely after Kraepelin, and gives a model systematic series of methods of case examination.

L'APHASIE. Par Dr. H. Bernheim. Octave Doris et Fils, Paris.

This little brochure contains Bernheim's attitude of mind towards the aphasia question expressed in simple and concise language. There exists no cortical center, he says, which conserves the memory of the movements necessary for articulation or for writing. If lesions in Broca's or Egner's regions can cause aphasia or agraphia, it is simply because the fibers going from the frontal area, where internal speech is formed, have their communications with the bulbar and spinal nuclei broken. This is the author's general notion on the question.

DIE AKUTE UND CHRONISCHE INFEKTÍÖSE OSTEOMYELITIS DES KINDESALTERS. Von Dr. Paul Klemm. S. Karger, Berlin.

Osteomyelitis is a frequent cause for neurological complications and pitfalls. The author's work will prove of value in recognizing a comparatively rare source of neurological difficulties.

LEHRBUCH DER ALLGEMEINEN UND SPEZIELLEN PSYCHIATRIE. Von Dr. Erwin Stransky. I. Allgemeinen Teil. F. C. W. Vogel, Leipzig.

In general we are not in sympathy with that part of psychiatry which is called general psychiatry. We do not see much use in discussing large generalizations which have no real value and which are being left behind in the growth of science.

General discussions of etiology are of no more value in psychiatry than they would be in general medicine. They have misled the student and continue to foster the idea of a single psychosis, called insanity, just as if but one affection of the chest existed to which one attached a diagnostic label.

The tendency to generalize about the psychoses has resulted in great harm and has been a form of mental shackle handed down from time immemorial. No one can object to a discussion of mental phenomena and of their interpretation as symptoms, but to be fed up with pages and pages of general directions of how to treat psychoses becomes wearisome.

Stransky falls into this same pitfall. Imagine anyone writing on the general pathology of lung disease at the present time. There is no such thing as lung disease to have a general pathology. Pneumonias have a pathology. Carcinoma of the lung has a pathology, but what common general pathology lies at the base of these? There is no general pathology of the

psychoses. There is a special pathology for paresis; a fairly definite series of changes in a few other psychoses; there is no known pathological basis for others. A general pathology is worthless. It is worse. It is directly misleading.

Seen from the older point of view, this volume of Stransky's is excellent, but from the attitude of mind that would deal with the psychoses as with any other region in medicine, it is deplorable.

DIE PSYCHOLOGISCHEN METHODEN DER INTELLIGENZPRÜFUNG UND DEREN ANWENDUNG AN SCHULKINDERN. Von William Stern. Johann Ambrosius Barth, Leipzig. Marks, 3.

This excellent brochure of approximately 100 pages contains an enlarged and amplified discussion of the general subject as originally presented by him at the Berlin psychological congress.

This revision and amplification has taken the author beyond the ordinary limits of a "Sammelbericht" in that he has included criticisms of methods, his own trends, and particularly his understanding of advances to be made in the testing of the intelligence of children. By all those working in these fields Stern's paper should be attentively studied.

IGNATIUS LOYOLA. Vom Erotiker zum Heiligen. Eine pathographische Geschichtsstudie. Von Dr. med. Georg Lomer. Johann Ambrosius Barth, Mk. 2.80.

Lomer has here made an extremely fascinating psychological exposition of the life and character of Ignatius Loyola, the founder of the Jesuit order. At the same time he has well shown the great sublimation power of religious activities and the religious spirit. In some ways one can draw striking parallels between the hysterical youthful stages of Loyola and Mary Baker Eddy, both seeking sensory gratifications through their hysterical symptoms, and the later mystical developments with the foundings of new orders. The development in Loyola's case is well sketched, although we cannot feel that Lomer's point of view is clear, nor his grasp of the mechanisms of religious activities adequate. He has written an interesting book, but missed a great opportunity.

K'UNG FU TZE, A DRAMATIC POEM. By Paul Carus. The Open Court Publishing Co., London, Chicago. 50 cents.

It requires skill and more than a superficial knowledge of Chinese ethical thought, as well as of Chinese history with its sharp contrasts between the high ideal of its great sage and the avarice and bloody tyranny of many of its rulers, to make such a brief drama as this of real vital interest. But this philosophy, such phases of history, Mr. Carus has touched with just the skill that presents Confucius in very human form, the great teacher and exemplar of Chinese ethics, sustained by the devotion and emulation of his immediate followers, his pupils, but otherwise disheartened and apparently defeated because of the corruption and worldliness of those in political authority. Perhaps the form of the drama might have been more thoroughly pervaded with the peculiarly Chinese mode of life, but the true spirit of Confucius's sincere and finally successful endeavor after a practical code of right living and betterment of his nation is shown throughout. It is a pleasing picture out of the remote past.

The foreword gives a key to the understanding of the movement of the drama as it represents the periods of the sage's life with their varying success or apparent failure. It gives also in a brief statement of the main points of Chinese philosophy some valuable and suggestive hints as to the evolution of this thought through early, concrete conceptions of fundamental princi-

ples and processes, conceptions which still cling to the higher philosophical abstractions.

NATURE AND NURTURE IN MENTAL DEVELOPMENT. By F. W. Mott, M.D., F.R.S., F.R.C.P. Published by Paul B. Hoeber, New York.

This book contains in a small space a great deal of important fact presented in exceedingly interesting form and of practical value for the control of inheritance and environmental factors pertaining to mental life.

It reviews the structure and functioning of the nervous organism in man; by comparison of the normal brain with that in which the higher centers are wanting or have degenerated it shows how dependent mental activity is upon these structures. While doing this, however, the author never confuses the relative importance of mind and its instrument, to serve as which he clearly maintains is the sole function and distinction of the brain. His aim is to show the influence of nature, that is inheritance, and of nurture, prenatal and post-natal factors, particularly of nutrition, which affect the body in its relation to the brain and nervous system, upon mental conditions and character.

He has emphasized with especial clearness several important considerations. He speaks understandingly of the two great instincts which determine activity, the reproductive or racial and the nutritive or self-preservative. The sexual glands are the special organ of the former, as the brain is of the latter instinct. The influence upon both of these of heredity and environment, or nature and nurture, are discussed in view of his practical purpose. Both of these organs are especially protected by nature against injurious effects, but are influenced by prolonged action of certain causes.

This is discussed in the simple, clear treatment of heredity. Inherited tendencies and dispositions occur rather than directly acquired characteristics. There are causes indirectly affecting the germ cells and so modifying the inheritance, accentuating these tendencies or limiting resistance in the offspring and actual invasion of the embryo by the toxic agent as in syphilis.

Of interest is the section on the social inheritance of the individual, in which there is a distinction between external acquisitions of cultured society and the development of the potentiality of the brain which would be preserved to the individual even were all external environment suddenly withdrawn.

These and other significant topics suggestively treated are applied definitely to social questions especially the life of the child and make the book a valuable practical guide to parents and teachers and other social workers.

JELLIFFE.

THE EIGHT CHAPTERS OF MAIMONIDES ON ETHICS (SHEMONAH PERAKIM). A Psychological and Ethical Treatise. Edited, Annotated and Translated with an Introduction. By Joseph I. Gorfinkle, Ph.D. Columbia University Press, New York.

A bit of rare treasure of wholly delightful reading are these eight chapters of Maimonides, the eminently practical philosopher and physician of the twelfth century, one of the number of Hebrews living under Moslem rule. Dr. Gorfinkle having discovered in the course of his study this treasure marred by corruptions occurring as the original work has passed through frequent manuscripts, editions and translations, decided it was worth his while to reconstruct the original and very literal Hebrew translation from the Arabic, in which Maimonides wrote, made by Samuel ibn Tibbon under the advice and with the high esteem of the author himself. This volume contains as a result the Hebrew manuscript and a translation of it into English, together with an introduction giving a brief history of Maimonides's life and ethical writings with an outline of the contents of the Eight Chapters.

These were written as an introduction to Maimonides's larger works on

ethics, which subject for him belongs under the division of practical philosophy. They are written for the laity and are therefore made very simple in statement, avoiding as far as possible philosophical and metaphysical discussion. His aim, however, as in his larger work, is to harmonize the teachings of the philosophers with those of the Talmud, whose authority he venerates.

The short treatise is a direct and practical discussion of the soul and its faculties; to which of these faculties belongs man's choice of virtue or vice; the health of the soul, which depends upon cultivation of the virtues by turning toward them and practising them; and the supreme purpose of the soul toward which all must tend, namely, the obtaining of such knowledge of God and attaining to such nearness to Him as is possible.

Under the rational faculty of the soul belong intellectual virtues and vices. The moral ones belong to the appetitive faculty, which here includes the sensitive. The nutritive and imaginative faculties have no part in voluntary activity as we know from the fact that they work while we sleep.

Virtue is the mean between two extremes which as excesses constitute the vices. In order to acquire virtue or to cure his soul, has a man deviated from the mean of virtue it is necessary for him to turn far toward the opposite extreme from the one in which his vice lies that a proper median adjustment shall be reached. In order to do this it will be necessary to consult the sages just as one physically ill applies to his physician for enlightenment and direction in regard to bodily health. In accordance with this principle Maimonides places the saint, that is, one who has no inclination to evil, above the one who only by severe striving has overcome evil desires. The prophet still higher in honor than the saint is he who has drawn near to God, to whom the barriers between him and God have become few. Moses attained the greatest height, but one partition, that of the material flesh, remaining.

The last chapter is concerned with a discussion of man's free will. Maimonides's conviction of the freedom of choice is firm, but he must reconcile with his assertion the teachings of Scripture and of the Rabbis that God has made it impossible at times for man to choose the right. God has, says Maimonides, as a punishment for former sins taken away man's power of choice, his freedom of will. The subtle sophistry here, which meets us in other places as well, contains, however, deeper truth which belongs also to a humanistic doctrine of free will, where man by ill-doing would himself curtail or destroy his ability to choose. Such deeper truth outreaches and redeems the rationalism of his age and environment which the author seeks to defend.

The subtlety of his thought manifests itself at the close of this last chapter in an exalted metaphysic in which he sets forth the impossibility of attaining to a knowledge of God or the understanding of His essence, for this is God. His knowledge, His essence, all His attributes are God and not comprehensible by human knowledge.

Maimonides's vision was clear. In the practical simplicity of his ethics he shows himself an advance spirit of his age. His adherence to tradition, both of philosophy and the narrower traditions of his native faith, does not obscure the truth of his thought nor destroy the value of his ethics. The Eight Chapters are well worth careful reading. JELLIFFE.

GOETHE. WITH SPECIAL CONSIDERATION OF HIS PHILOSOPHY. By Paul Carus. The Open Court Publishing Company, Chicago and London.

There is rather too much statistical fact compressed in the first part of this book. The details of Goethe's life with his relations to his contemporaries might have been preserved in more vital manner. Beside this the profusion of illustration, while in itself highly interesting and valuable, detracts one's attention from the main interest of the book. But aside from these things the author has succeeded in his aim to make this new work on Goethe a unique presentation of him.

This is not a biography nor a criticism. The reader is made acquainted with Goethe the man, not so much as he lived his outer life but rather in the developing and creating soul which manifested itself throughout his works. Mr. Carus lets Goethe speak for himself by introducing extracts from his biography and quoting largely from his poetry.

His life was more free from external care than that of many writers, but his greatness of soul led him to a knowledge of truth through larger experiences of the inner life, so that all his work is largely biographical, a record of truth won through personal experience.

His objectivity was a cause of his success and an index of his healthy state of mind and attitude toward the world, although his earlier works reveal a somewhat morbid period.

His philosophy is the expression of a poet, hence it was not a formulated, definitely ordered system. He was impatient of the narrow literalness of his contemporaries and yet had no sympathy either with that criticism which tore asunder long revered traditions, whether in religion or in literature. He revered the Christianity in which he had been reared even while unable to accept its narrower tenets. His religious inclinations were tinged with mysticism, tended toward ancient polytheism and showed also a curious leaning toward the Roman Catholic ritual and organization.

Influencing his science as his philosophy, his poetry prevents a truly scientific representation of nature. Still here he did important work and ahead of his generation accepted the doctrine of evolution and contributed signally to its acceptance.

The selections which Mr. Carus has given are those which manifest the variety of Goethe's style and the range of his interest and thought. There are delicate verses like the little night song written upon the wall of a hunter's hut, poems also that describe, though somewhat heavily, what nature meant to him and those which give noble expression to religious aspiration and conviction. There are, moreover, many illustrations of his ready humor and epigrammatic wisdom.

The selections made from *Faust* and the discussion accompanying these bring out well the relation of the masterpiece to Goethe's own life and philosophy. It was the work of his entire life and in *Faust* are embodied the poet's own fearlessness and independence of mind, willing to accept both the pleasure and pain if only he may live in the fullest sense a man and achieve for the world something beyond that already possessed. When *Faust* has erred, "has destroyed his old ideals, he feels in himself the power to build them up again," and in this lies his soul's final salvation. It is here that is found the message of Goethe's life, expressed through *Faust*, true satisfaction and happiness in the higher realm of endeavor and lasting achievement of service to mankind.

It is this which Mr. Carus finds and gives us in the consideration of Goethe's life in the light of his philosophy, the poet and the man who realizes this greater truth in aspiration and accomplishment through his own creative power.

DER ALPTRAUM. Zu seiner Beziehung zu gewissen Formen des mittelalterlichen Aberglaubens. Von Prof. Ernest Jones. Deutsch von Dr. E. H. Sachs. Deuticke, Leipzig v. Wien.

This is the fourteenth volume of the *Schriften zur angewandten Seelenkunde*, edited by Prof. Freud. Dr. Jones's study on the nightmare is known to our readers. We call attention to the fact that it has been translated into German as one of this most interesting series, three of which, *Wishfulfillment and Symbolism in Fairy Tales*, *Dreams and Myths*, *The Myth of the Birth of the Hero*, have been translated into English and have appeared in the *Nervous and Mental Disease Monograph Series*.

Notes and News

ALIENISTS AND NEUROLOGISTS

The Chicago Medical Society announces the fifth annual meeting of Alienists and Neurologists of the United States, to be held under the auspices of the Chicago Medical Society, June 19 to 23, 1916, at La Salle Hotel.

We wish to invite you to attend these meetings and participate by paper or take part in the discussion of the various subjects and other matters that may come before the conference. We hope to enlist your valuable assistance in a campaign of education of physicians and the public as to the causative forces of mental deficiency and will appreciate your assistance. As physicians and the public have taken great interest in these meetings the Chicago Medical Society, even though at great expense, has decided to continue these annually without expense to others.

Resolutions were passed at the meeting in 1915 requesting the governors of the various states to appoint committees to investigate the causative forces of feeble-mindedness.

Reports of these committees will be made at the meeting in 1916. The reports of the general committee will be forwarded to the governors of each state. Resolutions will be formulated by the conference that will be instructive to legislatures, to the end that reasonable laws may be passed that will in a measure at least be preventive of mental deficiency.

The governors and boards of administration or control are taking great interest in these meetings and giving us valuable assistance to carry forward this movement. We hope also to interest the editors of the various medical journals in this movement and through them enlist the help of physicians. If a campaign of education were made against the causative forces of mental defectiveness as there is against tuberculosis, a wonderful amount of good would result. This subject should interest us, first, from a humanitarian standpoint; second, from an economic standpoint. The judges of our courts are acquainting themselves with mental diseases; they give us the information that a large per cent. of crime is committed by mental defectives and a large percentage of the prisoners in our penal institutions are also defectives and should not have been confined to prisons of this kind, but sent to farm colonies or other reformatory institutions with proper environment. In our state asylums there are many cases of insanity which if they had been diagnosed early could have been cured. This is especially the case as regards dementia praecox and lues. The state would not have been burdened with the immense expense of their long confinement and their families would have been relieved of the humiliation of their commitment.

There has been no branch of medicine so neglected as the study of mental diseases and psychology.

There should be a great reform in this respect within the near future.

W. T. MEFFORD,

Secretary of Conference,

2159 Madison Street.

WM. O. KROHN, *Chairman,*
29 East Madison Street.

The Journal OF Nervous and Mental Disease

An American Monthly Journal of Neurology and Psychiatry, Founded in 1874

Original Articles

TABES DORSALIS. A PATHOLOGICAL AND CLINICAL STUDY OF 250 CASES¹

BY BALDWIN LUCKE, M.D.

*(From the McManes Laboratory of Pathology, University of Pennsylvania,
and the Nervous Wards of the Philadelphia General Hospital)*

The purpose of this paper is to analyze the symptoms and pathological findings of 250 cases of tabes dorsalis, and to compare the results with similar statistics. All of the patients have been inmates of the Philadelphia General Hospital at some time during the past ten years. Only those cases which have been thoroughly studied by members of the neurological staff have been utilized, hence only 250 cases have been selected from a much larger material.

"Selected" is not used in the sense that special cases have been picked out, but merely that incomplete or insufficient records have not been made use of. Even with such precautions against errors of all sorts, it must be borne in mind that in the class we deal with the patients possess but limited intelligence and can often not be made to realize the importance of exercising their memory, or telling the truth.

Not unmindful of the above, I yet believe that a study of a large number of tabetics may prove of some slight value, especially since it has been stated by Nonne and confirmed by others that the type of tabes is changing to one of less severity.

¹ Read by invitation before the Philadelphia Neurological Society, November, 1915.

This paper then is to serve as a record of the type of locomotor ataxia as it exists at present amongst the poorer class in America.

The Philadelphia General Hospital is a charitable institution. Most persons of this series are laborers, or have no regular occupation. Most have lived a rather stormy life, and have committed all sorts of excesses in their pre-tabetic existence; this I mention because of the belief that tabes differs somewhat in different walks of life. All the statistics are based, unless otherwise stated, on 250 cases. 207 or 82.8 per cent. are white males. 29 or 11.6 per cent. are white females. 13 or 5.2 per cent. are black males. 1 or 0.4 per cent. is a negress. The ratio between males and females is therefore 8.5:1.0.

I have been able to find but three other American statistics on tabes, namely, Thomas' (1886), Bonar's (1901), Collins' (1903).

Thomas (111 cases) gives the proportion as 7:1, Bonar (286 cases) as 6.5:1, and Collins (140 cases) as 7.5:1. European writers give widely variable proportions, ranging from 1:1 (Leonhard) to 27:1 (Fulton).

These variations are probably due to lack of homogeneity of material; some statistics coming from private, some from dispensary and others from hospital practice.

Mendel and Tobias have recently calculated the mean ratio of forty European reports, and find the average proportion to be 7.5:1.

Bonar determined the relative frequency of tabes amongst patients suffering with nervous diseases (Starr's clinic, Columbia University). He found that of 11,271 male cases 2.147 per cent. were tabetics, while of 11,563 females only 0.35 per cent. suffered with tabes. The patients were ambulatory cases.

In our institution among 4,322 inmates of the men's nervous wards, there were 355 cases of tabes, or 8.21 per cent., and among 2,956 female nervous patients 91 tabetics or 4.42 per cent. (This calculation was made for the years 1906, 1907, 1910-1913 incl.)

In other words, 1 of every 12.46 male and 1 of every 22.60 female patients in the nervous wards were tabetics. (This ratio is found not to be constant.)

Mendel and Tobias, who have given special attention to tabes in women, attribute the preponderance of male tabetics to the greater frequency with which syphilis occurs in the male sex. In support of this statement I give the following data from the records of the venereal wards of this institution. During six years (V. S.) there were 1,621 cases of lues in the men's and 559 in the women's wards; that is about three times (290) as many men as women suffered with syphilis.

As to the etiology of tabes there is at present, I believe, no doubt in any one's mind that Moebius's dictum "Omnis tabes e lue" is correct. However it will be well nigh impossible to get 100 per cent. of the patients to admit luetic infection. Denial of syphilis may be attributed to direct misstatements for reasons of shame, etc., or to lack of memory, or to the fact that in a great many cases the primary or secondary lesions are so slight as not to be noticed by people who by nature are not observant.

Of our cases only 141 or 56.4 per cent. admitted lues. In 46 cases it was noted whether secondary eruptions followed the chancre. 28 patients or 60.8 per cent. disclaimed secondary lesions. Collins states that in 85 tabetic patients who admitted syphilis fully 80 had but a slight infection. He states: "In many of the cases in which a history of syphilis was made out the patient maintained that the initial lesion was very slight—a pimple or a slight abrasion, and the rash, which was scarcely noticeable, lasted only a few days or a week or so." Similar observations are reported elsewhere; I feel that this is significant, especially since Rosenow's recent work on selective action of various strains of streptococci and microorganisms. In view of the fact that but slight primary, slight and rapidly fading secondary, and seldom if ever tertiary lesions of lues occur in tabes I am inclined to believe that more than one strain of the *Treponema pallidum* exists, and that tabes is caused by a strain of this microparasite which has a special selective affinity for the central nerve axis. In support of this theory I wish to call attention to the comparative rarity of locomotor ataxia amongst certain races.

In 1892 Burr failed to find a single case of tabes in a full-blooded negro. Lloyd in 1893, in a footnote appended to a report of a case of tabes in a negress occurring in this institution, states: "It has been claimed that locomotor ataxia is rare, even unknown in the negro race. Its occurrence has certainly been rare in Blockley, for the above case is the only one seen there during recent years."

In our series we have 13 negroes and 1 negress; whether these are full-blooded Africans or whether admixture of Caucasian blood existed in some or all I am unable to state. In Collins's series of 140 cases there were 4 negroes, and 1 negress; in Thomas's series of 111 cases 5 negroes. Therefore tabetic colored patients made up about 5 per cent. of each series. The explanation for this rarity of locomotor ataxia in a notoriously syphilis-soaked race might well be along the lines of the various strains of treponema theory advanced above. Syphilis manifests itself in many forms; it like

uremia and hysteria will mock most any disease. May it not be that the African negro possesses a relative natural immunity against that strain of the treponema which presumably causes tabes, and may not this barrier of immunity be gradually broken by increasing admixture of white blood?

What holds true of the African applies to the Chinese as well. While there is no case of tabes in a Chinese in this series, there has been at least one case of this sort in the Philadelphia Hospital (reported in P. G. H. reports by W. B. Irish from the service of Dr. Lloyd). Collins also reports a case in his series. Jeffery and Maxwell in their book, "Diseases of China," state: "Syphilis is one of the most common diseases of China, and as we have already stated, transverse myelitis of almost certain syphilitic origin is relatively common. We therefore find it difficult to account for the absence, we believe the total absence, of true locomotor ataxia. Among some twelve thousands in-patients and more than four times that number of out-patients seen by us in Formosa, we have not yet come across a single case which in any way could be mistaken for tabes dorsalis, and the same is the experience of our colleague in Shanghai; nor do we know of any well-authenticated case reported from China.

"As we have already said the absence of the disease is quite a mystery to us." Another point in the substantiation of my theory I find in *Frambesia tropica* (yaws), a tropical disease resembling clinically syphilis, and caused by the *Treponema pertenue*, an organism so closely allied to *Treponema pallidum* that it cannot be differentiated from the same. Its course is characterized by the mildness of symptoms and by the absence of affection of the nervous system.

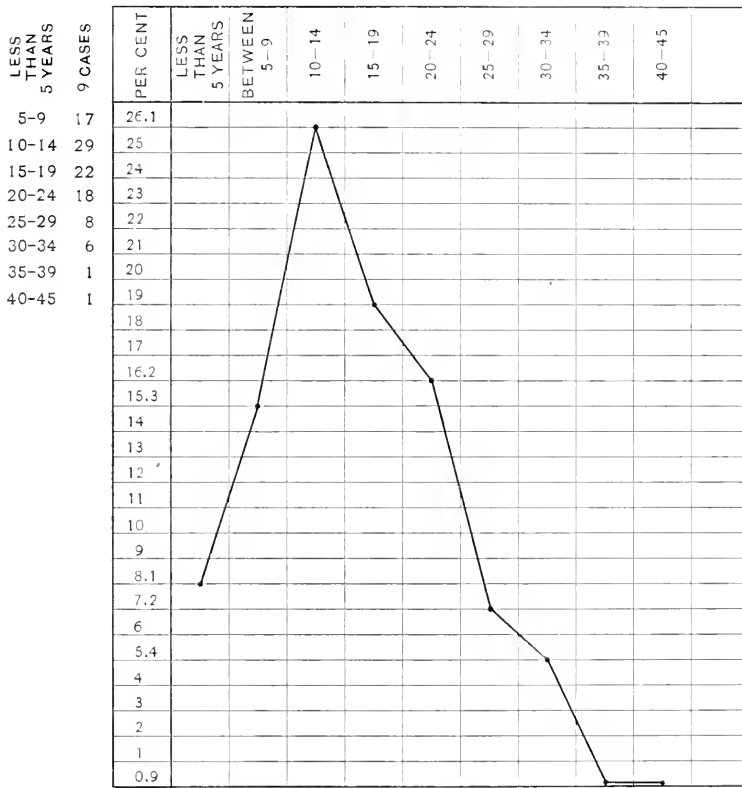
It is especially difficult to obtain luetic history in women. Mendel and Tobias from the literature and their own observations estimated that only 50.3 per cent. of females admit luetic anamnesis. Tabes occurs now and then in virgins. In the cases of Mendel and Tobias these authors were always able to trace the disease to either congenital or extragenital syphilis so that they add to the above quoted saying of Moebius "Virgo non fit tabetica nisi per parentes aut per luem insontium."

Since the Philadelphia General Hospital is the only institution in the City which admits as inmates any considerable number of patients suffering with lues or tabes, I have compared the number of luetic and tabetic patients in the institution for six years (V. S.). This was done in the hope of throwing some light on the ratio in which these diseases exist. During the period stated 1,621 cases of

lues occurred in the men's venereal and 355 cases of tabes in the men's nervous wards; giving a ratio of 4.76:1 or 20.96 per cent.

In the female venereal wards there were 559 cases of lues and 91 female tabes occurring at the same time; giving a ratio of 6.25:1 or 16 per cent. I do not wish to state that 20 per cent. of male and 16 per cent. of female syphilitic patients suffer from that form of lues which eventually causes tabes; but these figures show

TABLE I



Incubation period of tabes.

that syphilis in any form occurs more frequently in men than in women, further than this they may or may not possess some value in showing a possible proportion between these diseases.

I purposely have omitted data concerning other so-called etiological factors, as trauma, alcoholism, sexual excesses, exposure to cold, etc. One or all of these, if searched for, may be found in practically any one of our patients. While any of these conditions

may act as adjuvant to lues, may even perhaps hasten the occurrences of tabes, they are certainly not the cause of the disease.

The importance which they are given in some writings is a relic of the days when nothing at all was known concerning the etiology of locomotor ataxia.

Incubation period of tabes: This is calculated from the statements of 111 persons who admitted chancre and stated how many years thereafter tabetic symptoms made their appearance. Here again the calculation depends upon the truthfulness and the memory of the patient, and since the subjective symptoms of the beginning of tabes are often slight, our figures must be taken as the minimum average. It was found that 15.34 years was the average period which elapsed between primary sore and beginning tabetic symptoms. Table I shows graphically the result of this investigation.

The incubation period ranges from three years to forty-five (1 case), with the maximum percentage between 10-14 years.

In Frey's recent paper on 850 cases of tabes he also found this period as containing the highest percentage.

The extremes reported in the literature are:

- Frey, 1 case with incubation period of 6 weeks.
- Frey, 1 case with incubation period of 2 months.
- Blumel, 1 case with incubation period of 1 year.
- Bonar, 10 per cent. of his cases with incubation period of less than 1 year.
- Schaffer, 1 case with incubation period of 1½ years.
- Kron, 1 case with incubation period of 2 years.
- Thomas, 2 cases with incubation period of 30 to 40 years.
- Bonar, 1 case after 40 years.
- Raymond, 1 case after 45 years.
- Chiray-Cornelius, 1 case after 50 years.
- Schuller, 1 case after 50 years.

I have data on but three women here; the average incubation period was 5.33 years. Mendel and Tobias report 47 cases of women where the incubation period could be exactly determined. It ranged from three to thirty years, with an average of 14.25 years.

The average incubation period for negroes in our series was 24.83 years, in 6 cases, being therefore longer than the average.

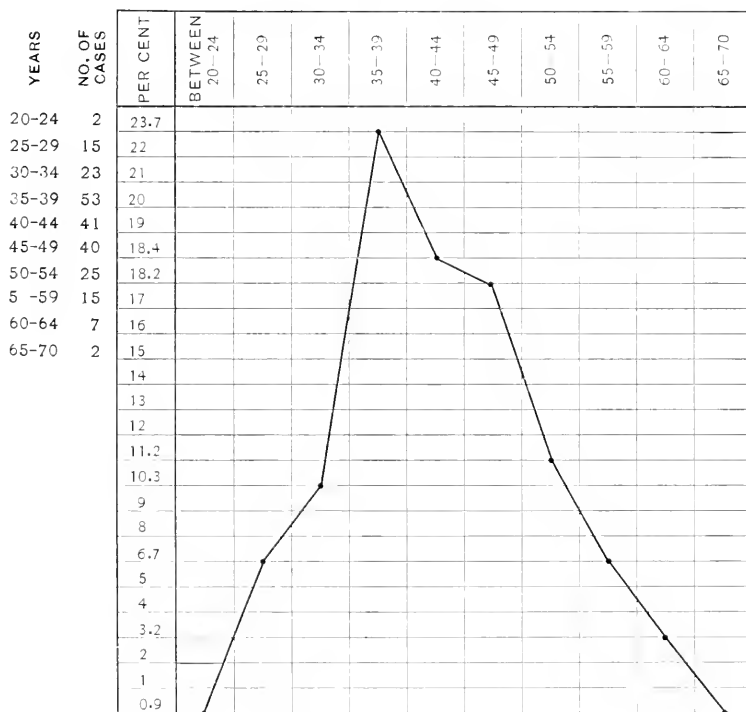
I do not possess sufficiently exact data to state the bearing which anti-syphilitic treatment has on the incubation period of tabes.

Very few patients took, as far as could be ascertained, treatment. When treatment was taken it was seldom kept up longer than three months. However even so the incubation period in these cases averaged 13 years, or about 2 years less than the average. According to figures of Eulenburg, Drubler, Schuster, Mendel and Tobias, etc., thorough anti-syphilitic treatment reduced the incuba-

tion period to one half the average of their nontreated cases, that is to say from 5 to 8 years against 12 to 16 years. Even in insufficiently treated cases the incubation period was shortened. All this refers of course to Hg treatment.

The explanation of this phenomenon may be that Hg, as has often been stated, seldom really cures syphilis, and the treponema may be stimulated to greater activity by the drug. So much for the etiology of tabes.

TABLE II



Age incident of tabes.

The average age at which subjective symptoms made their appearance is difficult to determine, since patients will only seek treatment when their symptoms are troublesome; there is no age however in which tabes may not occur; in our cases it varied from 23 to 65 years. With the average of 42.34 years, the highest percentage of cases occurred between 35 and 39 years, as shown in Table II.

The table graphically represents the age incident. The average age for women (27 cases) is 40.96 years. The average age for

negroes 48.28 years. In America Bonar finds the average age for tabes (sex not stated) to be between 30 and 40 years (40.16 per cent. of his cases).

Thomas finds 38 per cent. of his cases to be between 30 and 40 years and 40 per cent. between 40 and 50 years.

Collins gives 38.5 years as the favorite age period.

In Europe Frey finds the favorite age period for man to be between 30 and 40 years.

Kron, Mendel and Tobias, etc., give similar figures. In short tabes in men usually begins in a little earlier period of life. This, I believe, may readily be explained by the fact that men enter sexual life at an earlier age than women, and consequently are exposed to luetic infection sooner than the opposite sex.

In our series we have no cases of so-called juvenile tabes. A considerable number may however be found in literature.

Tabes developing after the sixtieth year does not appear to be uncommon; Mendel and Tobias report 3; Long and Cramer 4; Thomas 1 such case. The various points of the age incident are summed up in the following table. The first column gives the averages of the entire series; the second of women; the third of negroes. The figures in parenthesis are the number of cases used for the calculation.

TABLE III

	General	Women	Negroes
Average age at which chancre appeared	25.31 yrs. (121)	22.25 yrs. (4)	26.5 yrs. (6)
Average age at which symptoms appeared	42.34 yrs. (250)	40.96 yrs. (27)	48.28 yrs. (14)
Average incubation period	15.34 yrs. (111)	5.33 yrs. (4)	24.83 yrs. (6)
Average age at which patient came to the hospital	47.63 yrs. (250)	45.48 yrs. (29)	51.07 yrs. (14)

The averages for women and for negroes are estimated on too small a material to be of much value.

Symptomatology; symptoms in their chronological order: The first column of the table contains the initial symptoms in order of their frequency; the second and third columns the percentage with which these symptoms occurred as a second or third symptom; the fourth column the percentage of the symptoms when they occurred at a later period in the course of the disease; the fifth column the sum-total of their occurrence. For example, a symptom listed in

the third column is one which was preceded by two other symptoms. Here again we are dependent upon the patient's memory. Sometimes certain symptoms will appear at the same time, and sometimes a long period will elapse between symptoms, while in other cases they follow each other in more rapid succession. Unfortunately I have not been able to satisfactorily ascertain the period between the symptoms; unless one deals with people with more than ordinary intelligence this is well nigh impossible, unless accuracy is greatly sacrificed. The figures in parenthesis preceding the percentages in the different columns denote the number of times in which this or that symptom occurred during the respective periods.

Occurred as	Initial Symptoms	2d Symptoms	3d Symptoms	Later Symptoms	Total
Lancinating pains in lower extremity.....	(78) 31.2	(59) 23.6	(31) 12.4	(11) 4.4	179 71.6
Paresthesia or numbness of lower extremities.....	(44) 17.6	(29) 11.6	(21) 8.4	(13) 5.2	107 42.8
Weakness of lower extremities..	(41) 16.4	(35) 14.0	(19) 7.6	Not tabulated	Not tabulated (V.I.)
Staggering or unsteady gait....	(31) 11.4	(72) 28.8	(76) 30.4	(29) 11.6	218 87.2
Sphincter disturbances.....	(21) 8.4	(21) 8.4	(33) 13.2	(94) 37.6	169 67.6
Visual disturbances.....	(16) 6.4	(13) 5.2	(29) 11.6	(51) 20.4	109 43.6
Lancinating pains in upper extremities.....	(14) 5.6	(6) 2.4	(4) 1.6	(3) 1.2	(27) 10.8
Rheumatoid pains in body or back.....	(14) 5.6	(18) 7.2	(4) 1.6	(4) 1.6	(20) 8.0
Visceral crises.....	(12) 4.8	(7) 2.8	(6) 2.4	(5) 2.0	(30) 12.0
Paresthesia or numbness in upper extremities.....	(11) 4.4	(9) 3.6	(5) 2.0	(9) 3.6	(34) 13.6
Girdle sense.....	(5) 2.0	(16) 6.4	(28) 11.2	(28) 11.2	(77) 31.2
Vertigo.....	(3) 1.2	(5) 2.0	(1) 0.4	(1) 0.4	(10) 4.0
Lancinating pains in head and face.....	(3) 1.2	(0) 0	(0) 0	(0) 0	(3) 1.2
Joint pains.....	(3) 1.2	(2) 0.8	(1) 0.4	(1) 0.4	(7) 2.8
Rectal tenesmus.....	(2) 0.8	(0) 0	(2) 0.8	(3) 1.2	(7) 2.8
Visceral tenesmus.....	(1) 0.4	(0) 0	(0) 0	(4) 1.6	(5) 2.0
Loss of sexual power.....	(1) 0.4	(6) 2.4	(6) 2.4	(15) 7.0	(28) 11.5
Difficulty in articulation.....	(0) 0	(1) 0.4	(1) 0.4	(4) 1.6	(6) 2.4

The above table is based on the entire series of 250 cases. The number of females (29) and of negroes (131) is too small to be of value for chronological tabulation; I have therefore merely totalled some of the more important symptoms.

	Females	Negroes
Lancinating pains	25 times or 85 per cent.	12 times or 86 per cent.
Staggering gait	18 times or 62 per cent.	12 times or 86 per cent.
Sphincter disturbances	18 times or 62 per cent.	5 times or 36 per cent.
Paresthesia or numbness of lower extremities	13 times or 45 per cent.	5 times or 36 per cent.

	Females	Negroes
Weakness of lower extremity calculated for first three symptoms only	11 times or 38 per cent.	8 times or 57 per cent.
Girdle sense	8 times or 28 per cent.	5 times or 36 per cent.
Gastric crises	5 times or 17 per cent.	1 time or 7 per cent.
Visual disturbances	6 times or 20 per cent.	7 times or 50 per cent.

The above tables are self-explanatory and require but little comment. Lancinating pains, somewhere in the body, lead the percentages of the initial symptoms and occupy first place in the total. This holds true in women and negroes as well. Most writers find this symptom in approximately the same percentage of cases. Collins finds them as the initial symptom in 24.6 per cent.; Spillmann and Perrier in 41.9 per cent.; Mendel and Tobias (in women) in 27.84 per cent. The total percentage is given as 88.25 per cent. by Limbach; 82.35 per cent. by Frey; 90 per cent. by Collins; 79.5 per cent. by Bernhardt, etc. The lancinating pains in face or head were observed in cases of "optical" and "cervical" tabes. Collins reports them as occurring in 1.58 per cent. of his cases as initial symptoms. "Rheumatoid" pains in back are especially often mistaken for rheumatism, and indeed several patients had been treated for this before admittance. They are reported by Mendel and Tobias as occurring in 12.47 per cent. of his cases (women) as initial symptoms.

Weakness of lower extremities: This symptom has only been tabulated if it occurs as one of the first symptoms, since sooner or later most all tabetic cases will complain of weakness.

By disturbances of vesical function is meant: frequent desire to urinate, retention, constant dribbling, etc. Rectal disturbances include: obstinate constipation, diarrhea, loss of sphincter sense, etc. Many of the symptoms coëxisted or occurred at the different periods in the same case, for this reason no attempt has been made to separate them except to ascertain the relative frequency of the disturbed function of the two sphincters. In the 169 cases which showed sphincter disturbances, the rectal sphincter was affected in 70 and the vesical sphincter was affected in 143.

Thomas records vesical disturbances in 63 per cent.; Bernhardt in 74 per cent. of their cases.

Girdle sense: In this category belong 5 cases in which a sense of constriction occurred about the arm, both legs, both thighs, the chest and neck.

Loss of sexual power: Our figures are probably too low. They will serve however as an index as to the frequency with which

patients note this symptom and call the physician's attention to it. In the great majority of cases reported, this symptom was not elicited by direct question but stated voluntarily by the patient. Anosmia was observed in 2 cases or 0.8 per cent. Deafness was noted in 2 cases or 0.8 per cent. Frey found it in 4 cases of his series.

Insanity, other than paresis, in locomotor ataxia, occurred in 6 cases or 2.4 per cent. It was not possible from the record to diagnose the type of mental aberration, except that paresis could be excluded. Burr gives an account of 4 such cases; Henderson reports 5 cases and reviews the literature on the subject. He states that acute hallucinatory disturbances are the most typical form of this mental disorder, but quoting Krapelin "many patients are sad and take a hopeless view of things and are filled with depressing thoughts and fears." The feature which especially distinguishes these cases from paresis are, according to Henderson, absence of any defect of memory, of speech or writing and of facial tremor. One of our cases, while not a paretic, did have however complete loss of memory. Frey and others regard these mental disturbances as being purely of the nature of an accidental complication and having nothing whatsoever to do with locomotor ataxia.

TABETIC SYMPTOMS AND SIGNS IN ORDER OF THEIR FREQUENCY

	Per Cent.
1. Romberg sign	96.4
2. Absent knee jerks	90.0
3. Lancinating pains	88.4
4. Staggering gait	87.2
5. Argyll-Robertson pupil	80.0
6. Ataxia in upper extremities	68.2
7. Sphincter disturbances	67.6
8. Sensory disturbances	58.2
9. Visual disturbances	43.6
10. Paresthesia and numbness of feet and lower extremities	42.8
11. Girdle sense	31.2
12. Ptosis of eye-lids	23.2
13. Paresthesia or numbness in hands or upper extremities	13.6
14. Strabismus	12.0
15. Visceral crises	12.0
16. Loss of sexual desire	11.5
17. Charcot joints	9.2
18. Vertigo	4.0
19. Mal perforans	3.2
20. Pain in joints	2.8
21. Rectal tenesmus	2.8
22. Mental degeneration (other than paresis)	2.4
23. Hemiplegia	2.4
24. Vesical tenesmus	2.0
25. Difficulty in articulation	2.0
26. Deafness	1.2
27. Anosmia	0.8

OBJECTIVE SYMPTOMS

Visual disturbances occurred in	109 cases or 43.6 per cent. of these
Failing eye-sight occurred in	63 cases or 25.2 per cent.
Diplopia occurred in	46 cases or 18.4 per cent.
Optic atrophy occurred in	37 cases or 16.0 per cent.
Nystagmus occurred in	23 cases or 9.2 per cent.

It is seen therefore that certain eye symptoms occurred simultaneously; especially frequently did this happen in nystagmoid movements and optic atrophy. This latter condition was observed by Frey in 28.16 per cent.; by Fuchs in 15 per cent.; by Gowers in 13 per cent.; by Marie in 20 per cent.; Collins found it in 14 per cent. Bonar in a collective study of the 1,088 cases reported by Grosz, Berger, Limbach, Thomas and himself, found it in 20.4 per cent.

Charcot and others of the earlier writers believed that after the occurrence of optic atrophy, further progress of tabes ceases. Benedikt stated that all symptoms, even in advanced cases of tabes, retrograde as soon as optic atrophy appears. Foerster found that optic atrophy modifies the tabetic symptoms. Von Malasić states that in his cases symptoms remained stationary. Bonar reports a case which developed no further symptoms. Marie and Léri do not believe, however, that optic atrophy prevents the development of ataxia.

There are at the present time two patients in the Philadelphia General Hospital in whom complete blindness was an early symptom, and which I cite apropos of the above: J. C., male, colored, age 43 years. Tabetic symptoms began at the age of 27 years, with pain in the back, and about the rectum. Afterwards his eyesight became diminished; he had paresthesia and numbness of both feet and weakness of the legs. His gait was decidedly ataxic. Two and a half years after onset, vision was completely gone. At the present time, that is 16 years after the onset of tabes, he walks without a stagger, and with only that hesitancy usually observed in the blind.

N. S., white, female, age 33 years. Symptoms began at the age of 28 with lancinating pains in left lower extremity and numbness of legs; vision gradually failed until 2 years after onset, she became totally blind. Her ataxic gait, not very pronounced before her blindness, is now decidedly worse.

It is of interest to note that in one of the blind cases (J. C.) Romberg's sign is not so great with eyes open, while he promptly will sway and even fall to the ground if he closes his eyes. The other case has a marked Romberg's, which is more decided with eyes closed. Optic atrophy occurred in 4 of the 29 female patients, 13.7 per cent., and in 4 of the 14 or 28.6 per cent. negroes.

Mendel and Tobias found optic atrophy somewhat less in females than in males. The difference is however not sufficiently great to draw conclusions. All writers agree that the optic nerve usually is affected early in the disease and rarely becomes affected in the ataxic stage. Diplopia is almost always transitory and usually an early symptom. Collins found it in 22 per cent.; Limbach in 26.5 per cent.

Nystagmus or nystagmoid movement is rare. In our cases they occurred most often in blind tabetics. Bonar finds the symptom in 2.44 per cent. In women it occurred in one of our cases, in negroes in 3 cases.

PUPILS, PTOSIS, AND PARESIS OF EYE-MUSCLES

Typical Argyll-Robertson pupil occurred in	200 cases or 80 per cent.
Sluggish reactions or no reactions occurred in	32 cases or 12.8 per cent.
Normal reactions occurred in	18 cases or 7.2 per cent.
Unequal pupils occurred in	86 cases or 33.6 per cent.
Irregular pupils occurred in	34 cases or 13.6 per cent.
Unequal and irregular pupils occurred in	20 cases or 8 per cent.
Ptosis of both eye-lids occurred in	17 cases or 6.8 per cent.
Ptosis of left eye-lid occurred in	16 cases or 6.4 per cent.
Ptosis of right eye-lid occurred in	4 cases or 1.6 per cent.
Ptosis therefore occurred in	37 cases or 14.8 per cent.
Paresis of eye-muscles occurred in	30 cases or 12.0 per cent.

Frey finds Argyll-Robertson pupils in 70.54 per cent.; normal reaction in 4.7 per cent. and no reaction or sluggish reaction in 24.72 per cent.; unequal pupils in 52.35 per cent.; Bonar finds Argyll-Robertson pupils in 78.69 per cent.; Limbach in 70 per cent.; Collins in 77 per cent. Mendel and Tobias find unequal pupils in 62.5 per cent.; Collins in 23 per cent.

Eye-muscles: Paresis of one or the other muscle of the eye occurs with great frequency. Very slight grades were not taken into consideration. Collins found paresis in 10 per cent. of his cases; Bonar in 12 per cent.; Mendel and Tobias in 13.8 per cent. In our cases the oculomotor was affected 14 times, the abducens and trochlear both 8 times. This predominance of third nerve involvement is generally noted.

Ptosis of eye-lids: Is often transitory. Why the left lid should be more often affected is difficult to explain.

Reflexes: Only the patellar reflex is considered in this paper. It was found to be:

Absent on both sides in	217 cases or 86.8 per cent.
Absent on one side in	8 cases or 3.2 per cent.
Diminished in	11 cases or 4.4 per cent.
Normal in	6 cases or 2.4 per cent.
Increased in	8 cases or 3.2 per cent.

In one of the 8 cases where the knee jerk was absent on one side, tabes was complicated by hemiplegia; in another by Charcot joint of the knee.

In all of the cases where knee jerks were normal, there was an absence of the Argyll-Robertson pupillary phenomenon. In three of the six cases the pupils reacted sluggishly and were unequal or irregular. In the other three the pupillary reaction was normal and the cases were at an early stage. All, however, presented such typical tabetic symptoms as lancinating pains, paresthesia, etc. In two cases where the reflex was increased, hemiplegia was a complication; two others are listed as optical tabes; one as cervical tabes; in two pupillary reaction was normal. One was the youngest case (23) of this series.

Limbach reports absence of the knee jerks in 92 per cent. and alterations in the reflex in 4.25 per cent. Collins finds the reflex absent in 84.3 per cent.; normal in 4.3 per cent.; sluggish in 5.7 per cent. Frey notes absence in only 56.47 per cent. of his cases, with diminution in 5.17 per cent. Thomas reports absence in 81 per cent.; Bonar in 95.2 per cent.; Von Sárbo in 91 per cent.; Bernhardt in 95.6 per cent. In women, Mendel and Tobias find absence on both sides in 62.85 per cent.; on one side in 6.25 per cent.; normal in 15 per cent.; increased in 7.05 per cent.

Romberg's sign: Romberg's phenomenon was present in 241 cases or 96.5 per cent. Nine cases or 4.5 per cent. showed no swaying standing with the feet together and eyes closed. Romberg's sign was found pre-ent by Von Sárbo in 93 per cent.; Limbach in 88.75 per cent.; Bonar in 79 per cent.; Thomas in 76 per cent., while Frey noted it in but 54 per cent. In women Mendel and Tobias found it in 81.7 per cent.; Friedrichsen in 90 per cent. and Fehre in 71 per cent.

Sensation: Fehre believes that disturbances of sensation are the most frequent symptom of tabes. In a number of our cases this symptom is unfortunately not recorded with sufficient lucidity to make use of in a paper of this sort. I have for this reason refrained from classifying the various objective sensory disturbances, realizing that such tabulation would be incomplete. In stating that in only 58.2 per cent. of our cases there were objective disturbances of one sort or the other I am not unmindful that this is probably too low a figure. The percentage might be regarded as a minimum and not as an average finding.

Arthropathies: Occurred in 23 cases or 9.2 per cent.; in 7 cases there were bilateral arthropathies. The joints affected were: Right

knee joint in 9 cases; left knee joint in 5 cases; both knee joints in 4 cases; right knee joint and metatarso-phalangeal joints in 1 case; both ankle joints in 2 cases; left ankle joint in 1 case. In one case Charcot joint (knee) occurred as the first symptom of tabes. I have seen another case in the surgical wards of this hospital (not included in this series) where a Charcot joint of the knee constituted the initial tabetic symptom. Ballet-Barbe, Trommer, Kredel and others report similar cases. Thomas found arthropathies in 5 per cent.; Mendel and Tobias in women, 7.7 per cent.; Limbach in 1.75 per cent.

In 29 women Charcot joint occurred twice; in 13 Negroes once. It would appear from the study of the literature that arthropathies occur more often in women. In our series, which contains a high percentage of arthropathies, they occur relatively as frequently in the male as in the female sex.

Spontaneous fracture in tabes: Occurred in but one case, a woman, who suffered about 10 years after the onset symptoms, a fracture of the femur. This fracture was the result of a slight fall. The fracture caused but little, if any, pain. At the present time, 6 years after fracture, union has not taken place. Another case, not included in this series, is at present in the surgical wards of the institution.

Mal-perforant: Was found in 8 cases or 3.2 per cent. The perforant ulcer always occurred on the foot. It affected the left foot in 4, the right in 3 cases and both feet in 1 case. None of our women or blacks showed the condition. Mendel and Tobias found it in one of their female cases only.

Footdrop: Occurred in 9 cases or 3.6 per cent. In 8 cases the condition was bilateral; in 1 case only the left foot was affected. This symptom appears to have received scant attention in the literature.

Hemiplegia and tabes: Occurred in 6 cases or 2.4 per cent. This to me appears as a remarkably low percentage if one considers that in a great many tabetics, the cardio-vascular system, either as a result of tabes or because of the preceding lues, has undergone marked changes.

Duration of tabes: 56 cases died while in the hospital; of these 48 were men and 8 were women. The average age at time of death was 54.96 years or 8.01 years after the symptoms began; in women 54.12 years or 8.00 years after onset of tabes. Judging from this, sex appears to exert no influence on duration of the disease.

In 49 cases a definite cause of death is stated, in the other 7

cases no cause further than "tabes" is determined. Twenty-one cases or 43 per cent. died of an intercurrent acute disease. Thirty-two cases or 57 per cent. died of a chronic disease.

Causes of death: The principal cause of death as determined by autopsy or clinically was:

Chronic diffuse nephritis	in 15 cases
Lobar pneumonia	in 7 cases
Pulmonary tuberculosis	in 5 cases
Sepsis due to gangrene	in 4 cases
Myocardial degeneration	in 4 cases
Apoplexy	in 3 cases
Broncho-pneumonia	in 2 cases
Edema of the lungs	in 2 cases
Acute parenchymatous nephritis	in 1 case
Pyonephrosis	in 1 case
Gastro-enteritis	in 1 case
Tuberculous enteritis	in 1 case
Acute cardiac dilatation	in 1 case
Intestinal paralysis	in 1 case
Carcinoma of esophagus	in 1 case

In detail the duration of tabes was less than one year in 8 cases.

1 to 4 years	in 12 cases
5 to 9 years	in 13 cases
10 to 12 years	in 9 cases
15 to 19 years	in 9 cases
20 to 24 years	in 3 cases
25 to 29 years	in 0 cases
30 to 34 years	in 2 cases

It seems of interest that a high percentage of cases died of intercurrent infections. This probably for the reason that their vitality was below par as can be expected.

THE GROSS MORBID FINDINGS IN 23 TABETICS COMING TO AUTOPSY
(Only the important findings are here recorded)

Cardiovascular System

Myocarditis, chronic interstitial	8 times
Brown atrophy of the heart	2 times
Fatty infiltration of the heart	3 times
Aneurysm of the aorta	2 times
Chronic valvulitis	7 times
Arteriosclerosis, marked	0 times
Marked secondary dilatation of the heart	6 times

Pulmonary System

Tuberculosis (active)	5 times
Lobar pneumonia	4 times
Broncho-pneumonia	1 time
Congestion and edema of the lungs	7 times
Emphysema	7 times
Hypostatic pneumonia	2 times
Gangrene of lung	1 time

Digestive System

Fatty degeneration of the liver	2 times
Atrophic cirrhosis of the liver	2 times
Catarrhal and ulcerative enterocolitis	1 time
Tubercular enteritis	1 time
Acute peritonitis	1 time
Carcinoma of esophagus	1 time

Central Nervous System

Cerebral apoplexy	1 time
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Genito-urinary System

Chronic urethritis	2 times
Chronic interstitial nephritis	17 times
Cloudy swelling of kidneys	1 time
Acute parenchymatous nephritis	1 time
Chronic suppurative cystitis	8 times
Pyonephrosis or pyelitis	5 times
Gangrene of scrotum	1 time

A study of these findings will show that there are no distinctive gross morbid changes in the organs of tabetics. The chronic lesions found are to be expected in all elderly syphilitics, belonging to the class of patients with which we deal. The kidneys seem to suffer especially. In a study of the urine of 213 cases of tabes, either albumen or casts or both occurred in 109 cases or in over 50 per cent.

In conclusion I wish to express my grateful appreciation to the members of the neurological staff, and their assistants for permitting me to use freely the record and material of their department. Particularly are my thanks due to Drs. Burr and Ingham for many valuable suggestions.

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(For further literature see Frey, and Mendel and Tobias, where a very complete bibliography is given.)

HYDROMYELIA AND HYDROENCEPHALIA¹

BY ALFRED GORDON, M.D.

The pathogenesis of spinal cord cavities is far from being definitely established. Considerable uncertainty exists on this subject. The reason lies partly in the fact that under the term of syringomyelia have been described cavities of various origin and of various structure. The majority of writers admit that a gliosis which develops in the central part of the spinal cord and subsequently becomes disintegrated is the chief factor in formation of cavities, although no less an authority than Weigert says that the conception of syringomyelia as softened central gliosis has no foundation.

Cavities in the cord have been observed in association with various malformations of the cerebrospinal axis such as acrania, encephalocele, congenital hydrocephalus, diplomyelia and spina bifida. Here the condition of the cord was attributed to a congenital anomaly on the same basis as the associated malformation, and the mechanism consists of a secondary softening of glia tissue. This was the view held by Virchow, Leyden, Pick, Kahler and Strümpell.

The rôle of an inflammatory state or other changes of the ependyma has been emphasized by some observers as a cause of cavity formation: shrinking and dilatation of the central canal with increased transudation follows, exactly like ependymitis and hydrocephalus develops in the brain.

In chronic inflammation of cord tissue softening may occur and cavities form. Huismans² speaks of cases with chronic progressive infectious myelitis in which softening developed because of embolism or thrombosis of the central vessels of the cervical cord (Myelitis longitudinalis).

Compression at any level of the cord may produce a dilatation of the central canal above or below the compression and give rise to syringomyelic symptoms. In Lhéritte's and Boveri's case³ there was an exostosis of the basillary process of the occipital

¹ This paper was read and the specimens were exhibited before the Philadelphia Neurological Society, December 18, 1914.

² Zeitschrift f. klin. Med., 1903, Bd. 48, p. 329.

³ Revue Neurologique, 1912, No. 6, p. 385.

bone which compressed the lower part of the medulla and a dilatation of the central canal was found. It extended from the medulla down to the 10th thoracic segment. Alquier and Lh ermitte found cord cavities in cases of spondylitis.

In cases of meningitis cavities have been found within the cord. Saxer⁴ observed them in cured cerebrospinal meningitis in which the patients happened to die from other causes. Philippe and Oberth ur⁵ speak of a pachymeningitic form of cord cavities. Charcot and Joffroy observed them in hypertrophic form of pachymeningitis. Lazarew⁶ speaks of tuberculous and syphilitic meningomyelitis with cavity formation in the cord.

Increased pressure of the cerebrospinal fluid may lead to dilatation of the central canal. This has been proven experimentally by Rosenbach, Eichhorst and L epine. The latter⁷ injected blood in the cord of dogs and guinea-pigs. Change of air pressure followed and in a few minutes he found the central canal and the lymph-spaces dilated and filled with blood. By the mechanism of increased pressure can be explained hydro-myelia in various congenital or pathological conditions of the brain. The brain cavities may become dilated as well as the aqueduct of Sylvius and thus influence enlargement of the central canal of the cord. Thus Hom en found 5 cases of internal hydrocephalus in 12 cases of syringomyelia and Hinsdale 15 times in 150 cases of syringomyelia.

The vascular doctrine of cavities in the cord has its place among others. Almost all the authors who have written on the subject admit more or less pronounced lesions of the blood vessels in every case. New formation of vessels, their sclerosis, their obliteration, hyaline degeneration, rupture of their walls and particularly of their external wall. Raymond for example thought that the cavities in syringomyelia develop at the expense of conjunctival membrane of vascular origin: the adventitia becomes hyperplastic and the blood-vessels become obliterated; the nervous tissue suffers secondarily.

An analysis of all the above-mentioned factors demonstrates the fact that multiple causes may produce cavities in the cord and if syringomyelia means cavity formation there are syringomyelias and not a syringomyelia.

Considering the seat of the cavity or cavities two chief varie-

⁴ Ziegler's Beitrage, 1902, p. 279.

⁵ Revue Neurol, 1900, No. 4.

⁶ Dent. Ztschr. f. Nerv., 1908.

⁷  tudes sur h matomy elies, 1900.

ties, I believe, may be emphasized. The first embraces cases in which the central canal does not participate in the pathological process: the lesion may press against it, disfigure it but has no direct relation to it. The cavity originates in the posterior cornua. This is the common finding in syringomyelia. In the second variety the central canal is the point of departure; it becomes dilated and by doing so it penetrates the cord tissue in various places and deforms it: an ependymitis may be the origin of the condition. In both groups the vascular system probably plays an important rôle in the process of destruction of tissue and in the formation of cavities. This form of cavity formation was recognized long ago by Ollivier and Lancereaux under the name of hydromyelia and considered by them to be congenital in origin.

Hydrocephalus seems to stand pathogenetically close to hydromyelia and syringomyelia. Numerous instances have been reported of combination of both affections. They explain the psychic and cerebral disorders that are encountered in such cases. Schlesinger observed in 56 cases of syringomyelia 4 times hydrocephalus. The above mentioned Homén's and Hinsdale's cases also Kupferberger's cases⁸ which simulated tumors of the brain, Langhans'⁹ and Kiewlicz'¹⁰ cases all tend to show the comparative frequency of such an association. This fact together with the occurrence of syringo- or hydromyelia in spina bifida, anencephalia, porencephaly, cerebral gliomata, microgyria observed especially by Schüller,¹¹ also by Oppenheim, Schultze, Hoffmann, Heubner, Dejerine and others—all tend to show that there must be an etiological relation and of a teratological nature, viz., developmental anomaly of both portions of the cerebrospinal axis.

A very interesting observation in such cases, especially when the hydromyelitic form of cavities is present, is that there are very few or no clinical symptoms during life. An anatomoclinical case of this nature came recently under my observation. Until the age of ten the patient was in good health. Two years following a severe trauma a few symptoms developed. At no time did she present any mental disturbances and repeated examinations failed to reveal any sensory disturbances characteristic of syringomyelia. Also in spite of the bulb being involved no symptoms referable to that portion of the brain-stem were present. Pathologically I found besides the enormous dilatation of the

⁸ Deut. Ztschr. f. Nerv., 1893, Bd. 4.

⁹ Virchow's Archiv, Bd. 64, s. 175.

¹⁰ Ibid., Bd. 20, s. 21.

¹¹ Jahrb. f. Psych., Bd. 26, s. 365.

central canal of the cord and of the ventricles of the brain with extraordinary deformity of nervous tissue also marked vascular changes viz., thrombosis of the anterior spinal artery and of numerous small vessels within the cord and medulla. The latter were seen mostly near the anterior portion of the cord, viz., near the thrombotic anterior spinal artery. Moreover a certain degree of meningitis was also present in the vicinity of the peripheral thrombotic arteries. The simultaneous occurrence of a marked dilatation of the cerebral cavities also of the central canal of the cord and the beginning of somatic disturbances at an early age together with almost total absence of the corpus callosum—all these facts speak in favor of a congenital malformation of the cerebro-spinal axis. The vascular disturbances mentioned above probably participated to a certain extent in the pathological process of the cord but undoubtedly the malformation of the central canal together with the presence of a considerable amount of gliomatous tissue could not have been produced exclusively by a vascular lesion of that character, neither by the accompanying slight meningeal inflammation. Besides, the coexisting enormous dilatation of the brain cavities and absence of the corpus callosum were not accompanied by conspicuous lesions of the cerebral vascular system.

The case is as follows.

Girl, 22 years of age, Austrian by birth, was in good health up to the age of ten. At that time she had a fall with loss of consciousness after which she was ill for quite a while. Parents could not state how long and in what particular way she was ill. At the age of 12 it was noticed that the fingers of her left hand became spastic and contracted, also that her head was drawn forward. The latter condition continued and became more and more pronounced during the following three years. At the same time the parents noticed that her gait was not steady and she could not walk along a straight line. Headache and dizziness were the other complaints at that time. She was brought to this country 3 years ago. She then complained of severe headache and was losing power in her left arm and leg; there was also severe pain in the affected limbs. When she came under my observation she presented the following symptoms. She appeared considerably older than she or her parents claimed. Her face was wide and its skin was thick. The form of the head was particularly striking. It resembled a square box, the lateral sides of which were bulging, the temporal regions were therefore protruding. The forehead was perfectly flat. There was a marked kyphosis and scoliosis to the right. The patient complained of considerable headache, also of vertigo when she attempted to raise her head from the pillow. She was very somnolent and presented a very

marked general asthenic condition: the least exertion such as raising her arm off the bed exhausted her. The entire left side was paretic, but there was no spasticity. Increased knee-jerk, ankle-clonus and the extension toe phenomenon were present on the same side. Superficial and deep sensations were normal over the entire body; the least touch or pin prick was promptly perceived by the patient. The eyes presented a peculiarity, viz., marked nystagmus when the eyes were turned to the left, but not to the right side. Otherwise there was nothing pathological in the fundi, ocular muscles, in the pupillary reflexes and visual fields. No palsy of any of the cranial nerves was present. No symptoms referable to the medulla were noticed. She could swallow easily, spoke distinctly and there was no difficulty of breathing. The sphincters were intact and the mentality fair. She responded correctly to all questions, although slowly, and the memory was good.

Gradually a weakness of the right arm and leg developed and at the same time the paresis of the left side increased, so that at the end of 5 weeks the left side was totally paralyzed. No spasticity was noticed on either side. The headache kept on increasing, the somnolence became very much pronounced so that she had to be aroused for food. She gradually lost control of both sphincters. The nystagmus remained unaltered. Gradually the asthenia increased and finally the patient expired. The Wassermann test made several times on the blood was invariably negative.

Autopsy showed the following findings. Scalp thick; calvarium shell-like and transparent; dura very thin and tense; meningeal vessels very thin and straight. Blood-vessels of cortex were much congested. Cerebral lobes were bulging. A thin and tense membrane covered the optic chiasm and when the latter was severed there was an outpouring of an unusually large quantity of clear straw-colored fluid. Beneath this membrane was noticed an opening at the base of the brain of one half inch in diameter which led directly into the right lateral ventricle, which was greatly dilated and filled with clear straw-color fluid. The pituitary gland was found somewhat enlarged.

The spinal cord presented the most interesting condition. From the upper cervical region down to the lumbar region the spinal cord was flattened and upon pressure showed distinct fluctuation. On the anterior surface of the cord extending from the lower portion of the medulla down to the upper thoracic segment lies a thrombotic blood-vessel giving the impression of a longitudinal, hard, round mass closely attached to the cord.

After hardening both brain and cord in 10 per cent. formalin sections were made. A transverse antero-posterior section of the brain showed an extraordinary dilatation of both lateral ventricles. The corpus callosum was almost entirely destroyed and thus both lateral ventricles being in communication presented one large cavity very much dilated, so that the peripheral walls surrounding the cavity consisted of a small amount of brain tissue. The entire section of the brain resembled a deep cup-like shell

whose walls were thin and the center of which was occupied by displaced basal ganglia. The caudate nuclei were pushed externally, the internal capsules were pushed outwards and inwards, so that the characteristic formation of limbs and knee was totally absent. The optic thalami were pushed backward, so that their shape was no more oval; they presented square masses. Of the

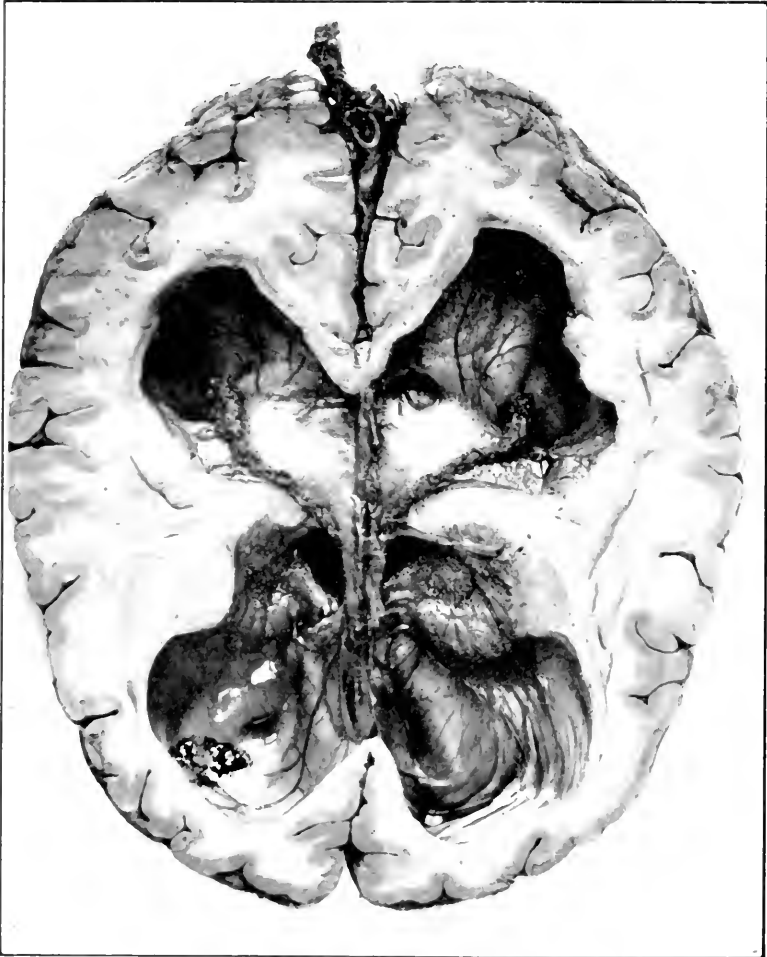


FIG. 1. Hydrocephalia.

corona radiata only small portions were seen entering the remaining cortical areas. The various lobes as seen from this section were thin. The lateral ventricles on their inner middle surface communicated with the base of the brain through a very large opening which would admit the thumb of an adult. The cerebel-

lum on its anterior border when severed from the cerebrum presented a deep cavity extending laterally from one end to the other. At the base of the brain the two temporal lobes were close to-



FIG. 2. Hydromyelia. Thrombosis of anterior spinal artery in its cervico-thoracic portion.

gether and the chiasma together with the neighboring portions were markedly displaced.

Cross sections of the spinal cord revealed a hollow tube ex-

tending from the uppermost segment of the cord down to the lower thoracic portion. The form of this tube was various according to the level: it was oval in the cervical portion and in the shape of letter S in the thoracic region. The disfigurement of the nervous tissue surrounding the hollow tube was enormous so that in the lower medulla there was great difficulty in distinguishing the anatomical arrangement of various portions of nervous tissue.

Microscopical study of the cord and medulla revealed the following condition.



FIG. 3. Cervical Segment

Lower Cervical Segment (Fig. 3).—The entire section showed an extreme disfigurement of the nervous tissue. It presented a cavity branching out in several places and surrounded by the following elements counting from within: a uniform mass evidently of gliomatous structure thicker in some places than in others and following the branched parts of the cavity; it was particularly seen in what appeared to be the anterior portion of the cord. The gliomatous tissue was surrounded by the substance of the cord itself in which it was difficult to discern anterior or posterior tracts and gray matter. Here and there cells were seen but the entire cord tissue was pushed outward by the dilated central canal. In two places the above mentioned thickened lining of the cavity reached the periphery, and its thickened portion which apparently corresponded to the anterior fissure was in com-

munication with the exterior of the cord; in that space were seen thrombotic vessels forming a chain between the pia and the lining of the cavity. In the same place a degenerative condition of the adjacent white fibers was seen more on one side than on the other. Small degenerated areas were also seen in other parts of the section. The pia surrounding the segment was thickened only in some places. The dura mater was markedly thickened anteriorly. A number of thrombotic blood-vessels were seen within and especially in the anterior portion of the segment.

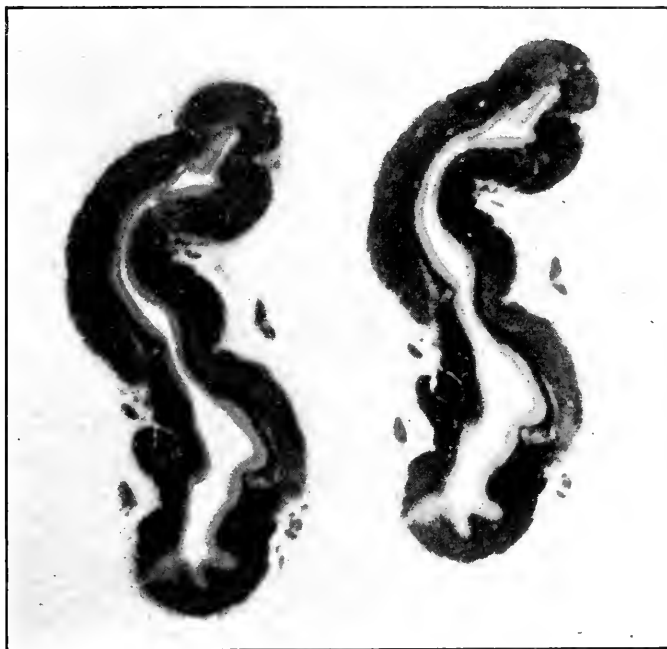


FIG. 4. Thoracic Segment.

Thoracic Segment (Fig. 4).—Here a very narrow central cavity was observed which apparently stretched out laterally and branched out at its extreme lateral ends thus separating and deforming the cornua as well as the white matter. The entire narrow cavity was surrounded by thick gliomatous tissue in the midst of which were seen many thrombotic blood-vessels. The lining of the central cavity was thicker on the posterior than on the anterior half. The gliomatous tissue followed the branchings of the cavity, formed diverticula and surrounded them. The white matter surrounded the central gliomatous tissue and its diverticula and in some place showed degenerative changes. Some thrombotic vessels were seen at the periphery of the cord in its anterior portion.

Lumbar Segment (Fig. 5).—The central gliomatous tissue presented the shape of ∇ . Anteriorly it contained in the center an opening of ∇ and laterally it extended into the cornua pushing them externally and deforming them. The entire mass was embraced in a circular way by the gray matter of the section, more on one side than on the other. The longitudinal part of the gliomatous tissue extended posteriorly almost to the periphery and contained a longitudinal cavity. Anteriorly the glia tissue was continuous with the anterior fissure of the cord. Some degenerative areas were seen in the white matter near the gliomatous tissue and close to the periphery which was surrounded by thickened pia. No thrombotic blood-vessels were seen at this level.

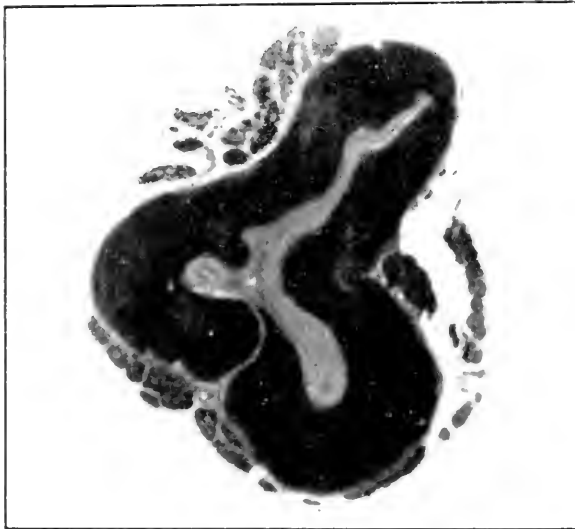


FIG. 5. Lumbar Segment.

Section at the Lowest Part of the Medulla.—Many cavities were seen. Two very large ones were situated in the central portion more anteriorly than posteriorly. Small narrow ones and of various shape were seen throughout the section. Enormous masses of gliomatous tissue surrounded these cavities. The two large cavities branched out in various directions. The disfigurement and destruction of the entire segment was very striking. White nerve fibers were seen scattered throughout the section. Narrow tracts of fibers ran at an angle to be decussated but were interrupted by masses of gliomatous tissue or were largely absent. Columns of Goll were greatly degenerated: only a few isolated fibers were seen. Dilated and thrombotic blood-vessels were seen within and anteriorly to the section. The surrounding pia and dura were decidedly thickened, especially in the anterior portion of the section.

Section at the Level of the Oliges (Fig. 6).—The fourth ventricle was covered with a thick layer of gliomatous tissue. On one side within the wall of the ventricle was seen a cavity surrounded by glia tissue. One of the pyramids presented evidence of partial degeneration, while the other was intact. Many dilated and thrombotic blood-vessels were seen in the space between and in front of the pyramids, and in the same area the pia surrounding the pyramids was thickened and in some places the outer layer of the pia was continuous with the thickened outer layer of

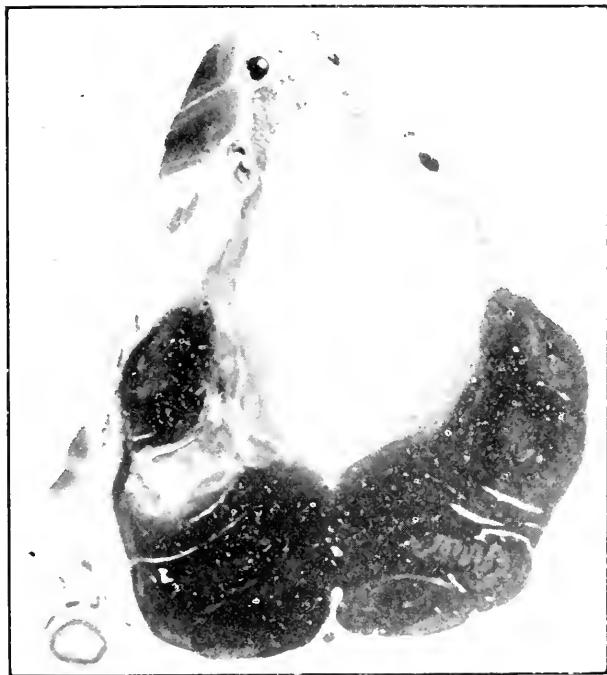


FIG. 6. Medulla.

the much dilated and thrombotic vessels. The same condition of blood-vessels, of pyramidal fibers, of the walls of the fourth ventricle and of the meninges was found at higher levels.

The aqueduct of Sylvius was dilated and its walls were covered with gliomatous tissue irregularly distributed, thicker in some places than in others; the thickest mass was found in its posterior portion.

ABNORMAL RELATION BETWEEN LIVER AND BRAIN WEIGHTS IN FORTY-TWO CASES OF EPILEPSY

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This paper or rather note is along the same line of research that Dr. Myerson of the Taunton State Hospital reported in the *JOURNAL OF NERVOUS AND MENTAL DISEASE*, July, 1914, and it was due to the fact that Myerson reviewed a small group of epileptic cases at the Monson State Hospital that my interest in the abnormal relation between the liver and brain weights was aroused. Myerson divided his cases into four groups:

1. The emaciated and non-emaciated senile dementias.
2. The dementia præcox group on which Southard based his paper, "Focal Lesions in Dementia Præcox."
3. Emaciated general paretics.
4. Small group of epileptics, non-emaciated, dying and autopsied at the Monson State Hospital.

It is regarding this latter group of cases that I wish to contribute my findings.

As these data were collected and an arbitrary standard accepted for normal liver and brain weights before Dr. Myerson's paper came to my notice, I find that I have given a little more freedom to the limits to which the weights of these organs must confine themselves and still be called normal. I also accepted the liver-brain weight ratio as 7-6 instead of 16-13, but these changes in no way affect the ultimate results. These data were collected from forty-two cases of clinically certain epilepsy which came to autopsy at the Monson State Hospital during the past two and one half years. Those cases were considered which died in a well-nourished condition, where the terminal disease was of short duration, and the patient of such an age that development was complete, yet discarding those cases of advanced years where senile changes might be suspected on account of the advanced years.

Most of the cases in this series at the time of death were between seventeen and forty-five years of age. Pulmonary edema, bronchopneumonia, lobar pneumonia, status epilepticus and asphyxia were the causes of death in over 90 per cent. of the cases, so that the

gross lesions found at autopsy could not well be attributed to the terminal disease. It is in such a series as this that one might expect to find the normal 7-6 liver-brain ratio hold good; but it was the rather large number of cases, twenty-six (62 per cent.), in this series where the brain outweighed the liver that I offer as an excuse for the publication of this note. I have put my comparative data in tabulated form and summarized them briefly to show that not only was there an abnormal relation existing between the liver and brain weights, but in only a very limited number of cases did the weights of these organs fall within the limits of what I arbitrarily accepted as normal liver and brain weights. I have made no distinction between the normal weight of male and female organs, but have widened the normal limits to include both, viz., normal liver 1,500-1,800 grams; normal brain 1,250-1,400 grams.

SUMMARY

Brain heavier than liver.....	26 cases (62 per cent.)
Liver heavier than brain.....	16 cases (38 per cent.)

ABNORMAL RELATION BETWEEN LIVER AND BRAIN WEIGHTS, 26 CASES

Brains

Brains weighing between 1,250 and 1,400 grams (normal)	8 cases
Brains weighing over 1,400 grams	8 cases
Brains weighing less than 1,250 grams	10 cases

Livers

Livers weighing between 1,500 and 1,800 grams (normal)	2 cases
Livers weighing over 1,800 grams	0 cases
Livers weighing less than 1,500 grams	24 cases

SIXTEEN CASES OF LIVER AND BRAIN WEIGHTS NORMAL

Brains

Brains weighing between 1,250 and 1,400 grams (normal)	6 cases
Brains weighing over 1,400 grams	4 cases
Brains weighing less than 1,250 grams	6 cases

Livers

Livers weighing between 1,500 and 1,800 grams (normal)	6 cases
Livers weighing over 1,800 grams	2 cases
Livers weighing less than 1,500 grams	8 cases

SUMMARY OF WEIGHTS IN 42 CASES

	Normal	Overweight	Underweight
Livers	8 cases	2 cases	32 cases
Brains	14 cases	12 cases	16 cases

Of the sixteen cases where the relative liver and brain weight was normal, in only two were the weights of the liver and brain both within the normal limits in the same case, *i. e.*, forty of the forty-two cases studied revealed either an abnormal relation between the liver and brain weights, or that one of the organs was of abnor-

mal weight. In some cases both conditions were true. The most common gross abnormalities named in order of their frequency were as follows: Atrophy of liver, atrophy of brain, overweight of brain (probably due to edema or hydrocephalus), hypertrophy of liver. The liver is most commonly diminished in size by some structural alteration such as cirrhosis, acute parenchymatous degeneration, and the hypertrophies are apt to be due to tumors, abscesses, fatty and amyloid degeneration, acute congestion and in some cases cirrhosis.

The question now arises to what extent, if any, can the convulsions be attributed to those pathological changes found in the liver; or more broadly and more practically, to what extent can the abnormal functioning of a normal brain be due to structural changes in organs remote from the nervous system? And are we justified in feeling that the abnormal functioning of a normal brain may be secondary and the structural alteration in other organs the primary process? Is it true that in our efforts along special lines of research, especially in the study of the nervous system, that we are holding the brain at such close range that we are losing sight of the system as a whole, of which the brain is only one of the many component parts? With such striking examples before us as uremic and infantile convulsions and those following the administration of exogenous poisons such as strychnine, with autopsy material presenting striking pathological changes in the liver, kidneys, spleen, ductless glands, etc., associated with brains that defy macroscopic examination as to their abnormalities, it would not be surprising to find that much of interest developed from a careful study of the visceral organs, both in the psychoses and epilepsies.

A CASE OF ATYPICAL MULTIPLE SCLEROSIS WITH BULBAR PARALYSIS¹

BY SIGMUND KRUMHOLZ, M.D.

This girl is eighteen years old, born in Chicago, doing general housework at home.

Mother and two older sisters and herself are afflicted with otosclerosis. Two other children died, one at nineteen years of cardiac rheumatism, the other at thirteen months in a convulsive attack; otherwise family history negative.

Birth and early childhood of the patient normal. At three years had measles and diphtheria; at age of six years was operated on for suppurative cervical adenitis on the left side of the neck. At twelve years had tonsillectomy performed, and again in March, 1913, had undergone another tonsil and adenoid operation. Since the age of thirteen years has had a spastic torticollis. Her hereditary otosclerosis gradually developed, beginning at the age of six years. Intelligence normal. Menses regular. Habits good.

About July, 1912, suffered a slight contusion of the left side of neck, and dates the onset of present complaint to this accident. The patient complained of a dull continuous pain on the left side of the back of the neck, radiating upwards and homolaterally, and for the last three months (about one year after date of onset) the pain was also present at the right side of the neck.

In May, 1913, the patient experienced a neuralgic pain on left side of the forehead, accompanied by hoarseness and dry cough, which was soon followed by impairment of speech and voice. The latter two functions became gradually more affected, and about one month later the patient experienced difficulty in swallowing, so that liquids would at times partly regurgitate through the nose, and sometimes swallowing of food would excite a coughing spell. Fever was at no time observed.

On September 9, 1913, Dr. Krumholz first saw the patient, at the request of Dr. Joseph C. Beck, and obtained the history just

¹ Read before the Chicago Neurological Society, Dec. 17, 1914.

described, and on examination found a bright, well-nourished and normally developed young girl. The history was gotten with some difficulty, on account of the combined deafness and dysarthria of the patient. Her speech was thick, indistinct and nasal in character, and her voice dysphonic. Left half of the tongue felt spongy, and was thinner than the right, presenting slight corrugations and marked fibrillary twitchings, and on protrusion it deviated to the left side. The velum palati hung down lower on the left than on the right side, and on phonation was not elevated. The uvula was drawn over towards the right side. Laryngoscopic examination by Dr. Joseph C. Beck discovered a paralysis of the left vocal cord. The patient found difficulty in the articulation of words which contained the linguals r, l, n, etc., and pronounced them indistinctly, but the enunciation of the labials, p, b, w, etc., was not in any degree defective. On drinking water, there was some regurgitation through the nose. The sensation of the left side of the pharynx was not as acute as on the right. The eyeballs moved in all directions normally and without any nystagmus. The pupils were round, equal in size, and reacted readily and efficiently to light and convergence; no anophthalmos; no exophthalmos; the corneal and conjunctival reflexes were present. The eye grounds were normal. The upper and lower facial muscles contracted sufficiently and equally on both sides. The masseters well innervated. No disturbance to touch, pain and temperature sense on either side of the face and forehead.

The neck is short and thick like her mother's. The head is slightly drawn to the right. The face and chin directed slightly to the left and upward, but only when not self-conscious. The posterior muscles of the neck on the left side feel on palpation like one hard mass. Upon bending the head to the right, the left sterno-mastoid muscle becomes extremely tense. Rotation and side-to-side bending of the head is limited. The upper third of the left trapezius is slightly thinner and possibly weaker than the right. No fibrillary twitchings. There was some tenderness on pressure over the posterior part of the neck, especially on the left side, but no objective sensory disturbance to be detected over the neck and head, nor on any other part of the body.

At the root of the left side of the neck above the clavicle a slightly enlarged gland could be palpated, but no other glands. The lower end of the left sterno-mastoid muscle was markedly thickened; the thyroid was not enlarged.

The reflexes of both patellar and Achilles tendons were exaggerated on both sides, more on the right side. No ankle clonus. Positive Babinski was only at times obtainable on the right, not on the left, side. Biceps, triceps, and periosteal reflexes were increased bilaterally, but a little livelier on the right side. The abdominal reflex was present.

September 13, 1913, the physical findings and subjective symptoms remained unchanged. No distinct change in the taste sense. Temperature, 98.4°; pulse, 88. The contractions of the neck muscles to the galvanic current were lightning-like in character on both sides. Heart, lungs, and abdominal viscera negative. No palpitation or dyspnea. There is a scar over the left antero-lateral side of the neck, due to the old operation for cervical adenitis.

September 15, 1913: Tuberculin test with Koch's O. T., gave a slight local reaction, but no constitutional effect was observed.

September 25, 1913: The sero-biological findings were: Wassermann in both blood serum and spinal fluid negative. The cell content and the globulin not in excess. Lange's colloidal gold test negative. No bacteria in spinal fluid.

Blood count: Lymphocytes, 40; large mononuclears, 13.3; large polynuclears, 33.3; eosinophiles, 13.3. Urinalysis negative.

November 14, 1914: Blood finding same, except tubercular fixation faintly positive.

September 27, 1913: The condition of patient considerably improved. Absence of dysphagia and regurgitation. The speech was much more distinct than previously, and the fibrillary twitchings of the tongue markedly diminished, and its consistency on the left side harder than on previous examination. The reflexes are about the same. No Babinski, but positive Gordon on right side. On examination of the eyes, a horizontal nystagmus could be seen distinctly on directing the patient to look to the side. This symptom could not be obtained on previous examinations.

Dr. Krumholz did not see the patient again for over one year, until November 14, 1914. Dr. J. C. Beck told him that he had operated on the patient November, 1913, which operation will be described by Dr. Pollock; and his notes, which Dr. Beck kindly furnished, give record that the patient feels better and that the pain in the back of the neck diminished considerably, but that the described paralysis of the tongue, soft palate and larynx did not change materially, that a haziness in the outline of the discs was

to be noticed. In Dr. Krumholz's repeated examinations of the patient, November, 1914, he found the unilateral glosso-laryngo-palatine paralysis about the same as in September, 1913, except that the tongue was more corrugated, and the optic discs were hazy in outline, and that the remote torticollis remained stationary.

In considering the differential diagnosis, cerebrospinal syphilis has to be excluded, on account of the absence of the general clinical luetic symptoms, and negative sero-biological report, which, to a great extent, also spoke against a pachymeningitis in the area of the exits of the affected nerves, or in the cervical region of the cord.

Aneurysm at the base or acute bulbar paralysis, due to hemorrhage, etc., had to be ruled out, since the patient had no cardiac disease, nor any etiologic factor producing arteritis.

Again, the absence of acute symptoms excluded polyencephalitis.

Chronic progressive bulbar paralysis had to be eliminated from the diagnosis on account of the remission of the symptoms, the youth of the patient, the limitation of the lesion to one side, and the absence of involvement of the facial.

Again, paralysis of the trunks of the pneumogastric and hypoglossal nerves caused by tumor pressure (for instance, enlarged tuberculous glands) from without at their exits, or along their course at the upper part of the neck, before their divergence from each other, had to be excluded, because the general picture of the disease did not conform with such diagnosis. In lesions at the jugular foramen (exit for ninth, tenth, and eleventh nerves) or in affections of their branches in their side-by-side course at the upper part of the neck, the laryngo-palatal paralysis is always accompanied by paralysis of the neck muscles (trapezius and sterno-cleido-mastoid). This patient has a remote acquired reflex spastic torticollis since her thirteenth year, probably due to muscular irritation, produced by cervical lymph nodes, but a recent paralysis of the spinal portion of the spinal accessory nerve could not be detected. In paralysis of this branch of the eleventh the scapula assumes a swinging position. The head is drawn towards the unaffected side, on account of the unopposed action of the healthy sterno-cleido-mastoid muscle, which is exclusively supplied by the eleventh nerve. In this case, as above stated, there is a limited side-to-side motion, and tension on the

left sterno-mastoid and contraction of the trapezius, due to a spasm, but no flaring-out of the scapula, nor distinct bending of the head towards the healthy side. On electrical test, these muscles do not respond to the reaction of degeneration.

Again, polyneuritis of the branches of the tenth, eleventh and twelfth nerves had to be ruled out, because the general affections (influenza, diphtheria, etc.) which lead to lesions of these nerves usually produce bilateral paralysis: while tuberculous peripheral neuritis is very rare, and probably always secondary to tuberculous meningitis. This patient, with the exception of pain in the back of the neck, presented no symptoms of meningeal irritation.

Besides, the fibrillary twitching of the atrophic tongue, although occurring in neuritis, is usually a sign of nuclear affection.

Again, the exaggerated reflexes and transitory Babinski imply affection of the upper motor neuron. No extracranial lesion, with the exception of a vertebral compression of the cord, could have produced the endogenic neuron affection in our patient. The Roentgen pictures showed no lesion of the vertebræ and skull.

Again, the nystagmus cannot be explained upon a disease affecting the tenth, eleventh and twelfth nerves after their escape from the skull. This symptom, if not normal, represents a disturbed function of the vestibular nerve, or in the connection of its nucleus with the cerebellum. If we stretch our imagination and overlook the character of the nystagmus, then the otosclerosis could be held responsible for its presence. But in otosclerosis the involvement of the labyrinth is rare, and the character of the labyrinthine nystagmus is such that the slow component of the nystagmus is directed toward the side of the irritating lesion. In this patient the slow phase of the nystagmus is directed toward the median line, which, according to J. Gordon Wilson, is characteristic of an intracranial nystagmus.

The above enumerated diseases practically exhaust all that may be considered in differential diagnosis, and leave as a substratum of the disease in question some affection in the depth of the stem destroying the left nucleus ambiguus, the left nucleus hypoglossus, the left and possibly the right pyramidal tracts, and the vestibular nuclei. These anatomical structures are separated from each other by the interposition of important fiber systems (sensory fibers of the fifth nerve, fibers of pain and temperature

sense to the body), the destruction of which would present characteristic objective sensory disturbance. These facts force the assumption that two or more lesions are responsible for the clinical syndrome of this disease. The behavior of the symptoms is characteristic of one of those diseases, the lesions of which are disseminated, namely, disseminated cerebrospinal syphilis, which was already excluded, and multiple sclerosis.

After the laryngo-glosso-palatine paralysis had distressed the girl for several weeks, it receded to a marked extent. At this examination, when the improvement was noticeable, Dr. Krumholz observed for the first time a distinct nystagmus. In October, 1913, the outline of the optic discs appeared hazy and haziness is still present. This remission, intermission and appearance of new symptoms is most characteristic of multiple sclerosis. Atrophy and long intermissions are rare, but do occur. Oppenheim mentions in his text-book his observations of "hemiatrophia lingualis" in multiple sclerosis. Fuerstner published a case of multiple sclerosis with fibrillary tremor of the atrophic tongue, and on necropsy found a sclerotic process distributed in the medulla and hemispheres. Goodhart reports a case of multiple sclerosis in a twenty-four-year-old girl, who had sensory paresis in the hands and flaccid motor paralysis of the lower extremities, which gradually disappeared within six months, and after an intermission of seven years developed the classical symptom-complex of the disease. Kennedy reports two cases of multiple sclerosis with nuclear facial paralysis. My patient, No. 2 on the program, who, to my regret, failed to come here to-night, is almost a counterpart of Goodhart's case.

The finding of tuberculous glands at the operation is interesting, in which connection may be noted Stan Fleshen's recent preliminary report of eighteen cases of multiple sclerosis with distant tuberculous lesions, wherein he expressed the opinion that tuberculous lesions in distant organs are probably the specific etiological factors of the disease.

PERIPHERAL NEURITIS WITH KORSAKOW'S SYMPTOM COMPLEX

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(Continued from page 354)

Case is as follows:

C. L., a white married female; admitted to the Government Hospital for the Insane, July 22, 1914.

The medical certificate which accompanied the patient stated: One brother died of tuberculosis following pneumonia. Patient addicted to some form of morphine from 1898 to 1910. Addicted to alcohol from January to May 15, 1914. Last five years, hysterical attacks which were relieved by having a good cry. First symptoms were manifested in September, 1913, by mental aberration. Present symptoms: Patient is disoriented in all fields, memory for recent events is practically nil. Fails to recognize those with whom she is familiar. Has retrospective falsifications—thinks she was down on the Avenue last night. Has wrist and foot drop, many nerves being tender. Probable cause: Grief, trouble, alcohol. No suicidal or homicidal tendencies.

Status on admission: Patient was admitted to the ward on a stretcher, laughed and talked to the nurses in a rambling manner while being bathed. She showed falsifications of memory, confusion of sequence of time, and confabulation. Was completely disoriented and had a mistaken identity of those about her. Wrist drop and foot drop present, pain on pressure over the deep nerve trunks. She complained of a peculiar feeling in the extremities, could not tell whether it was pain or numbness. No nystagmus. Aside from a peculiar odor of the body, showed no signs of personal neglect.

Family history: No history of mental disorder in the family. A brother used alcohol to excess.

Personal history: Born in Slatedale, Pa., November 11, 1866. Birth and infancy normal. No illnesses in childhood. Began school at seven and left at 17, in the eighth grade. She enjoyed school life, especially the dramatics. She outdid her companions in all their sports, especially in swimming and diving and was nicknamed "dare-devil." During her girlhood had violent crying spells and had to be left alone at these times. Although she was very sensitive she got along well with her friends and her family. After

leaving school, she worked in a slate factory, for a short time, then went to New York and worked in Macy's department store nearly a year. At eighteen, eloped with her present husband, four years her senior; a shipping clerk at that time. He was a man of good habits and their married life was happy. Eleven months after marriage, a son was born. Labor was instrumental, followed by "milk" fever. Four months later, the baby died, and although she was disappointed, she did not seem unnaturally sad. About this time began having strange "spells," like fainting attacks, although the usual remedies never prevented her losing consciousness. She knew when these spells were coming on but could not prevent them. At these times would say strange things, as, "Your mother was here this morning and treated me terribly." Then she would stare peculiarly and fall. She showed no pallor, cyanosis or dyspnea or frothing at the mouth. Would be unconscious ten or fifteen minutes. These would recur every other day; gradually they became less frequent and in three months disappeared entirely. (Reference to her mother-in-law at these times seemed to be due to the fact that she did not belong in her husband's social sphere, and she had refused to meet his mother because she felt that she would not be accepted by her husband's family.) In June, 1887, another son was born, delivery instrumental. Patient sustained a laceration of the second degree. She did not seem strong after the births of her children, and in 1887 and 1895, had attacks of inflammatory rheumatism, from which she recovered slowly. In 1897, was nauseated for months. The physicians were unable to discover the cause, and it was finally decided that it was symptomatic and would be relieved after the laceration was repaired; this was done the following year. A year later, the old symptoms returned, stomach had to be pumped out every other day and finally the sight of the stomach tube would cause a fainting attack. In 1900, a friend recommended some medicine which she took about ten years, with more or less relief. After the Food and Drugs Act was passed, it was found that this medicine contained a large amount of morphine and alcohol. This annoyed her very much, and she had a hard time overcoming the habit. She had previously been very happy in her home, did her own sewing, took full charge of her child and devoted all her time to her family. She always enjoyed company and everyone liked her. She had a sweet, affectionate manner, was practical and economical. She taught in Sunday School and was interested in an Esperanto Club. However, her disposition changed perceptibly, she began fretting over little things and was irritable. In 1907, her father and brother died; and in 1911, her mother, who had been her constant care for two years, died suddenly in her arms which caused a nervous shock. Because of religious differences, members of her own family became estranged and disagreed over property. In the meantime, she cared for three members of her husband's family during their last illness, and her health became impaired. She then tried to get interested in Spiritualism and found she could move tables and write yards

of poetry at the hands of the spirits. She soon found that this was doing her harm, so desisted.

Present illness: In 1909, complained of feeling badly, had headache, general weakness, drowsiness, irritability, restlessness, anorexia and some gastric disturbance. Was treated for a month in a local hospital—cause not ascertained. In November, had what her husband called an hysterical attack. She became more restless, was constantly rubbing her hands over her face, fussing with her hair, had the habit of gritting her teeth, seemed to hate the sight of her husband; if he spoke to her, would become irritable and profane; accused him of attempting to choke her. She talked foolishly and would hide in the bath room, and told her husband she would kill herself if he did not leave her alone. On one occasion he caught her as she was about to jump from a second-story window. These attacks came on about three times a year at first, and the paroxysm would last half an hour or more. They gradually increased in duration and frequency. Sometimes they would be preceded by vomiting and general weakness, and the patient would frequently faint. She went to Cape Cod for four months without any benefit. In September, 1913, was taken with severe pains in the abdomen—appendicitis was diagnosed. The next day it seemed more like impaction; two days later had a recurrence of her usual attacks. Since that time has complained of poor eyesight; examination was negative. Early in October, 1913, seemed stuporous and desired to stay in bed. When urged to get up became excited, yelled profanely, pulled her hair, made suicidal and homicidal threats. She was taken to a local hospital for a week. Early in November, 1913, she complained of feeling badly again; was given some brandy and milk. She immediately became excited, and ran out into an alley shrieking. After a few days was able to conduct her home as usual. In December, 1913, became restless at night, would get up and finally go back to bed and go to sleep. It was discovered she was using whiskey. She seemed sleepy and stuporous most of the time. Quart bottles were found wrapped in towels, in stockings and hidden in her shoes. For about a month she had purchased four quarts and a half of whiskey, at a dollar a quart. She denied this indulgence and did not seem to mind the deprivation of it. April 19, 1914, complained of lameness in ankles and legs, especially when climbing stairs, and thinking it was rheumatism, the usual remedies were applied. This gradually grew worse and on May 20, 1914, she was unable to walk. May 28, wrist drop developed, suffered from girdle sensation, pressure of tight clothes, tight shoes and had excruciating pains in the extremities. On one occasion, it was necessary to give her morphine. She was taken to a local hospital for a week; later, had a nurse at home. Her paralysis became more complete; her mental symptoms more pronounced. Thought the neighbors had hurt her feelings, that all her friends had gone to war and she was fighting Indians; that the white and colored were having battles with terrible slaughter, on the pavements; that her dead relatives were around her, especially

her mother; that cats, dogs and babies were in her bed. She repeatedly told them, that something was under her, and that she was afraid she was smothering her baby. She prayed a great deal for herself and family. She had no aversion for her husband but frequently called him. Thought she had been shopping and doing various things about the house. She was admitted here July 22, 1914.

Mental examination two days after admission: She answered the questions willingly and seemed to comprehend their meaning. Apparently realized her uncertainty and would invariably make her answer a question. Whenever her memory failed her she had a tendency to confabulate. Her paralyzed condition seemed to give her no anxiety. She frequently said she should be up and doing the work. She spoke in a low, soft voice with more or less effort. Dyspnea became more marked.

Stream of talk: Was coherent and free, full of fabrications, showed a retrograde amnesia.

Emotional status and attitude of mind: She showed emotional instability and often wept, at times would laugh heartily. She said she was depressed—worried because her mother was in poor health, but after all she was only a step-mother. Her father was well and she had visited him early that morning.

Hallucinations and delusions: She admitted hearing strange noises by saying that very often when she was considering what to do she could mentally hear her mother's advice urging her to be careful of fire. The voice was distant and clear. She heard many voices at a distance swearing but did not feel that they were directed toward her; they sounded natural. She was not able to tell from whence they came—thought some came from God. She saw an angel that looked like a male cousin of whom she was very fond. He looked natural but was dressed differently. Kept telling her to beware of dynamite, that she was too careless. She was trying to cut down a dead tree to get a swarm of bees. She saw a picnic of twenty-five babies mostly under five years of age, and she saw stairs with beautiful children going up and down happily. Sometimes the most beautiful flowers and plants were around her, and colored lights. These imaginary people were always kind to her. She felt that these hallucinations had been going on for fifteen years.

Dreams: Her dreams were usually pleasant about her home in the country; horses said she goes fishing a good deal in her dreams and often dreams of her sister. Her last dream: "I thought my sister had left the bottom of the house open and her baby and my baby were taken from their cradles. It was only done in a joke, and we got them in six hours. They didn't get any disease. Both were as clean as could be."

Insight and judgment: She had no insight in her condition. Said she came to Washington from Pennsylvania to finish college and was married to ———— (giving her brother's name). Said she was not brought here but was visiting. Her first trouble was dislocation of the knee two weeks ago, when she had an accident with

her father's horse; that if she could get out and exercise, she would be all right. Said she was scared because she had been away from everyone she knew. She did not believe there was anything wrong with her mind.

Orientation: She is completely disoriented for time, place and person; thought it was June, 1908, in the autumn; that she was in Albany, N. Y., in an educational center. She thought she had come from her home in Lehigh Co., Pa., to meet an English girl whose name she could not remember. She thought everyone knew her here because her brother had been here a number of years. She was able to differentiate the nurses from the patients. She thought she had seen the physician before, and gave her a fictitious name (and has adhered to it since).

Memory for remote events: Patient could tell fairly accurately what had happened in her life preceding her marriage. She had completely forgotten everything within the past twenty years. She showed uncertainty in giving details and dates.

Memory for recent events: Patient could not remember what she had said or what she had done only a few minutes previously. She could not give any account of her illness or the experiences which led to her commitment. Soon after her husband's visit she would ask if he were coming to see her. She could not remember whether she had eaten or of what the meal consisted.

Special memory: Tests were fairly well done. She could not remember historical dates.

General memory: Was inaccurate, especially for time.

Intelligence tests: These were fairly well done, although she left out words, showing the usual memory defects. Calculations were inaccurate. She was able to repeat the days of the week and the months forward and backward slowly. Retention tests were poorly done, and when her memory failed her, she had a tendency to add new ideas.

PHYSICAL STATUS

General type and appearance: Patient is a large, well nourished, well developed white woman. Face asymmetrical. Nose deviates to left. Muscles of face have an ironed-out appearance. Expression sad and subdued.

Respiratory system: Nothing abnormal detected. Dyspnea present.

Circulatory system: Veins on right breast prominent, otherwise negative.

Alimentary system: Tongue thickly coated, breath offensive. Bowels constipated. Scar $1\frac{1}{2}$ inches long above the pubis present, site of old operation. Maculo-papular eruption present in left hypochondriac region.

Genito-urinary system: Nothing abnormal detected.

Glandular system: No glands palpable.

Nervous system—subjective complaints: Patient complains of hands and feet feeling peculiar; she does not know whether it is the



FIG. 1. Characteristic wrist-drop, peripheral neuritis, at time of admission.



FIG. 2. Characteristic ankle-drop at time of admission.

numbness or coldness. At times, when her foot gets tangled in the bedding, she feels as though something was pulling her and then she gets delusions that dogs are tugging at her feet. Complains of neuralgic pains in extremities.



FIG. 3. Six months after admission. Paralysis of wrists much improved. Patient is able to feed herself. Contracture of little finger remains.

Cutaneous sensibilities: There are areas of anesthesia, paresthesia and hyperesthesia over paralyzed hands, forearms, feet and legs. As the patient's replies were so uncertain, no definite areas could be marked out. The anesthesia seemed more marked towards

the extremity and the hyperesthesia along the course of the radial and musculo-cutaneous nerves in the upper extremity and anterior tibial and peroneal in the lower extremity. When pressure was made over the deep nerve trunks, pain was referred to the hand



FIG. 4. Six months after admission. Paralysis is less in all the limbs. Patient is able to walk with assistance.

and foot. A repetition of the test did not seem to intensify the pain. She was not able to differentiate cotton, cloth, wood, glass, rubber or sponge by the sense of touch. The whole left side seemed more hypersensitive than the right, although her response was vari-

able. There was an impairment of muscular sense. Patient was not able to tell which toe or finger was manipulated. Her sensations of pain seemed more acute as her replies were more uncertain. There was no aphasia or apraxia present.

Motor functions: Facial muscles were coördinated and under control, although they appeared weakened, especially around the mouth, shown by the tremor. Wrist and ankle drop were present. Romberg was not tested as patient could not stand. No atrophies or hypertrophies. Profuse perspiration present and a sour odor.

Reflexes: Superficial reflexes were normal. Triceps and patellar reflexes absent. There was no ankle clonus and no Babinski. Pupils reacted to light and accommodated normally. There was no nystagmus.

Cranial nerves: Patient was not able to differentiate any of the gustatory or olfactory test solutions. Speech and audition not impaired.

Laboratory findings: The urine examination and Wassermann reaction with the blood serum were negative on admission.

Treatment: Patient was kept in bed and given extra nourishing diet; strychnine, gr. $\frac{1}{30}$ every four hours, and a tablet of Bland's with arsenic, every four hours.

The first month, patient's condition remained unchanged. She did not realize that she was paralyzed, how long she had been here, continued to have a mistaken identity of those about her and to confabulate. Some days she was very restless and depressed, frequently weeping. She felt that her feet and legs were tied together and that her corsets were on too tight. She would weep when her husband visited her, would tell him that she never saw a doctor or nurse or received any medicine. Her husband found that she had forgotten practically everything that had happened within the past twenty years.

The last of October, she was still complaining of pain in her limbs, and the muscles showed some contracture. She was allowed to sit up in a chair every day for several hours but she did not appreciate that her feet touched the floor. Mental condition showed slight improvement. She was very restless. Physical examination at this time showed little change. The paralyzed muscles were more atrophied and the paralyzed extremities had a purple color. The circulation was sluggish and there was some swelling. Her replies when cutaneous sensibilities were tested showed much uncertainty. The hypersensitiveness seemed less.

In November, she confabulated less, some days not at all.

Physical examination made December 21, showed that the tactile and muscle sense had improved: Patient was able to tell the shape of different articles placed in her hand, whether they were soft or hard, but could not differentiate cotton from cloth. Stereognostic sense was normal. Her replies to the cutaneous sensibility tests were more accurate, especially for pain and heat. The interossei muscles showed more atrophy and the concavity of the hand was greater. Patient was given daily mild faradic treatments for half an hour

over the paralyzed muscles and along the spinal column at the side of the spinal roots of the diseased nerves.

In January, she showed marked mental improvement. She was able to feed herself and attempted to walk, being supported by two nurses. She had a tendency to push her feet before her and it was difficult to make her attempt to take steps.

Physical examination made January 23 showed less hypersensitiveness and practically no anesthesia. Patient still complained of numbness in the extremities. The reflexes were still absent.

Since that time, she has shown more improvement—is able to do many things for herself, and walks unassisted. She keeps her body slightly stooped to balance herself and her gait is spastic and slow. The sensation in the extremities is nearly normal and there is a slight response when the deep tendons are tapped.

Patient will leave the hospital April 12, 1915, for a visit.

Here we have a psychosis developing in a white female in the fourth decade, who gives a history of having hysteriform seizures for several years in early womanhood, which no doubt predisposed to the development of a psychosis caused by the use of proprietary medicine containing a high percentage of alcohol and morphine, in tablespoon doses three times daily, for about twelve years. The early symptoms were manifested by headache, drowsiness, anorexia, and gastric irritability, changed disposition and irritability; later, had definite periods of excitement and showed suicidal and homicidal tendencies, followed by muscular weakness and severe pain in extremities which developed into complete paralysis, with wrist and foot drop, loss of reflexes, perverted sensations, pain on pressure over deep nerve trunks, accompanied by disorientation, a defective power of observation, retrograde amnesia and tendency to confabulate.

The alcoholic history with presence of polyneuritis, the age of the patient and the negative reaction of the Wassermann will aid us in differentiating it from syphilitic disease or arteriosclerosis, and we can safely make the diagnosis of Korsakow's Psychosis.

A recent Literary Digest quotes that statistics of the United States Internal Revenue Department show that per capita consumption of alcoholic beverages is steadily increasing despite the steady growth of prohibition legislation, and figures in the National Bulletin show that in 1899, with 6,000,000 people living under "dry" laws, the combined consumption of malt and spirituous beverages was 16.91 gals. per capita. In 1907, with 35,000,000 living under "dry" laws, the combined consumption of these beverages was 23.58 gals. per capita. In 1914, with 48,000,000 living

under "dry" laws, the combined consumption of these beverages was 25.00 gals. per capita.

If this estimation is true, it would be interesting to watch out for an increase in the number of cases of "Korsakow's Psychosis."

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Society Proceedings

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY

NOVEMBER 18, 1915

The President, DR. WALTER E. PAUL, in the Chair

A NEW TREATMENT FOR PARALYSIS AGITANS

By Walter B. Swift, M.D.

Reference was first made to a paper offered a year and a half previously reporting the cessation of tremor in a case of paralysis agitans for ten days. No cause for this could be ascertained. Since then a treatment has been sought to accomplish the same thing. This consists in slow arm movements in various directions repeated for fifteen to twenty minutes three times a day. The patient shown acknowledged that tremor had entirely stopped for one or two periods of an hour long and for two evenings of several hours; also there is some general relief, such as less muscular spasm, more ease and quietude of mind, less pain and tiredness from muscular contraction.

THE TEACHING OF NEUROPATHOLOGY. (a) THE STUDENT TYPE

By Walter B. Swift, M.D.

Dr. Swift showed that the usual type of student was not necessarily over-observant, but from his work in note-taking and cramming constituted an entity which might be described as a hearing, slightly collaborating, writing individual. In order to meet the demand for the course as required in Tufts Medical School Dr. Swift instituted efforts to change this type. Methods employed are reserved for a later report. The new type of student, which was held as the ideal, could be described as a seeing, largely collaborating, talking individual. Reference is made to college students as an illustration of the former type; and to intellectual work later in life as naturally evolving the latter type. Higher standard of scholarship resulted from this effort to change the usual hearing, slightly collaborating, writing individual into the seeing, largely collaborating, talking individual.

TWO CASES OF CEREBRAL HEMORRHAGE SIMULATING BRAIN TUMOR

By J. B. Ayer, M.D.

Oppenheim says in his text-book: "I have only once found choked disc in chronic recurrent hemorrhage." This statement alone seemed to be sufficient excuse for offering two cases, in which there was not only choked disc, but other evidence of increased intracranial pressure, so closely simulating brain tumor that operation was performed in each case.

CASE I.—Man, 50 years of age. One year ago had had a "shock," following which he remained generally weak, though not paralyzed, complaining of dizziness and headache, aggravated during the three weeks just previous. Examination suggested moderate increase of intracranial pressure, with suspicion of tumor in the cerebello-pontine angle on account of deafness, marked cerebellar ataxia, speech disturbance, and a questionable Babinski right. The eye-grounds showed moderate papilledema with patches of exudate, and on account of high blood pressure and albuminuria, the diagnosis of nephritis was also held. Subtemporal decompression relieved all symptoms somewhat and the patient was discharged with a diagnosis of "probable brain tumor."

Two months later he was found dead on the bathroom floor. Autopsy showed a large hemorrhage as the immediate cause of death. The brain was found to contain many other hemorrhages of size varying from the head of a pin to that of a large lima bean. At least five ages of hemorrhage were suggested by the difference in color between them. No tumor was evident. Chronic interstitial nephritis and hypertrophy of heart were also present.

Here, then, was a case of chronic interstitial nephritis with papilledema, in which the cerebral symptoms were such as to suggest the progressive irritation of a tumor, but which were, in fact, due to successive hemorrhages associated with general cardiorenal disorder.

CASE II.—A man of 35 was said to have had a "shock" a few days previous to examination. He was dull and confused mentally, exhibiting a partial right hemiplegia. Headache, dull and continuous. Choking of both discs, most on the right (3 diopters). Urine negative.

A diagnosis of brain tumor was thought likely and parietal decompression performed. Considerable increase of intracranial pressure was found, but no evidence of tumor.

One year later this patient died and autopsy showed the cause of death to be a large hemorrhage of the brain. No tumor was found, but an old hemorrhage of considerable size occupying a portion of the caudate nucleus, internal capsule and corona radiata appeared as the evident cause of symptoms the year previous, which had led to operation for supposed brain tumor.

Dr. Walter B. Swift said that Starr reports a very interesting case of some slowly advancing lesion. The patient knew three languages: English, German and French, and lost one first, then another, retaining English, his first learned—or mother tongue. It would be of interest to know if Dr. Ayer has found in his successive lesions any new evidence for more minutely located cortical areas, as is shown in this case reported by Starr.

Dr. Taylor said he saw no reason why there should not be mild optic neuritis and even choking of the discs due to intracranial pressure in recent hemorrhage of the brain, and, as a matter of fact, slight disc changes are common in apoplexy. The striking thing is that the changes are so extensive and last so long. He mentioned another case, in which there seemed to be a pretty definite brain tumor syndrome, including a marked swelling of the optic discs, though not, to be sure, typical "choked disc," in which case operation had failed to show tumor. Subsequent autopsy showed cerebral hemorrhage as the cause.

Dr. Knapp said that slight disturbances in the optic nerves, blurring of the outlines of the disc, tortuosity of the vessels, congestion and slight swelling—were not uncommon in apoplexy, but so great swelling as three diopters was extremely rare. He had advised the operation in this case, but could recall only the fact that before the history of bleeding was known, blood had been taken for a Wassermann without any disturbance, but, after it was known that the man was a "bleeder," they became apprehensive even at giving a hypodermic

PHYSIOLOGICAL CONSIDERATIONS IN THE DIFFERENTIAL
DIAGNOSIS OF NEURASTHENIC, HYSTERICAL, AND
PSYCHOTIC SYMPTOMS

By Donald Gregg, M.D.

Dejerine and Gauckler, in their book upon the psychoneuroses, deal with symptoms involving the autonomic system almost entirely. Janet in his book, "The Major Symptoms of Hysteria," deals with symptoms involving for the most part the central nervous system.

Many psychotic cases show a seeming lack of correspondence between the emotional condition and symptoms involving the autonomic system.

The suggestion is here made that neurasthenic, hysteric and psychotic symptoms are possibly to be distinguished from one another on physiological grounds based upon a differentiation between symptoms involving mainly the voluntary nervous system as in hysteria; symptoms involving mainly the autonomic system, as in neurasthenia, and symptoms showing possibly a break between the emotional activity of an individual and his autonomic nervous system as in a psychosis.

Dr. Walter B. Swift said this attempted correlation between neurasthenia and the autonomic nervous system, and between hysteria and the central nervous system is very interesting. It immediately brings up an array of points of attack. The Freudians should have a word. But if both of these lesions can be shown to have cerebral signs, Dr. Gregg's correlation breaks down. Neurasthenia mentally presents a picture of over-active, uninhibited overflow of mental functions from poorly inter-controlled brain centers. Hysteria shows a type of mental function where isolated brain areas seem to work while others are relegated to unconsciousness. This is shown in the suggestive way a hysteric may be led. All this is of course on the conscious side. If, then, as we know, neurasthenia is an overflow of numerous poorly interrelated brain centers, and hysteria a type of suggestively isolatable brain centers, neither of these entities can be counted out of the central nervous system.

HEREDITARY ANCHYLOSIS OF THE PROXIMAL PHALANGEAL
JOINTS (SYMPHALANGISM)¹

By Harvey Cushing, M.D.

There are many recognized forms of congenital malformation of the hands and feet. Walker in 1901 described the type of deformity that is made the subject of this paper, and showed that the lesion had been transmitted through five generations, though the number of his recorded cases was too small to justify a definite conclusion on the Mendelian basis. Farabee in 1905, and Drinkwater in 1908, showed that another type of deformity of the hands, known as brachydactylism, was a dominant unit character, transmitted in accordance with Mendel's law.

The lesion in the condition under discussion consists of a congenital anchylosis, or failure of formation of the joints, between the proximal and middle row of phalanges, resulting in a condition that is known in the community as "stiff fingers," in contradistinction to the normal, which are called "crooked fingers." This condition has been transmitted through seven generations, the progenitor of the family having migrated from Scotland to Virginia in 1700. There are connections of the family still in Scotland who carry the trait.

¹ This paper will appear in full in the January number of "Genetics."

In the Virginia branch, which has been made the object of this statistical study, the record has been secured of 312 descendants, among whom there are 84 affected persons, a few more than the 25 per cent. of the total number which would have been expected. Excluding the incomplete families of the first three generations, in which were recorded few other than the affected persons carrying the trait, there are 72 completed families, comprising 302 individuals, 78 of them being affected, namely, 25.8 per cent. Of these 72 completed families, 44 of them were from the mating of unaffected parents, with 152 unaffected children. Of the 28 families in which there was an affected parent, there were 150 children, 78 of them, or 52 per cent., carrying the trait. It has been observed that the trait may be transmitted in outspoken form by a parent in whom it is inconspicuous, though never by unaffected parents. The trait, moreover, is transmissible by either sex, and both hands and feet of the affected individuals may be involved.

The trait, in short, behaves as a simple Mendelian dominant, with an equal chance among the offspring of affected individuals that it will be, or will not be, inherited.

Dr. Paul asked what happens to the flexor sublimis digitorum.

Dr. Gregg asked if Dupuytren's contraction also followed Mendelian lines, as suggested in a group of cases known by him.

Dr. Taylor spoke of a family group which he had studied recently, in whom a vago-glosso-pharyngeal paralysis developed in members of the family in the fifth decade.

Dr. Knapp thought that the hypothesis of a defective development of the phalangine from failure of the center of ossification was not a satisfactory explanation of the condition. In such an event, if the phalanx showed increased growth to make up the deficit, there should be no partial joint or enlargement of the bone at the place where the phalango-phalangine joint ought to be. It seemed, therefore, that the trouble was due to a failure of development of the joint rather than the bone. Although the brachydactylism was a striking feature in some of these cases, there were no changes such as are seen in the very marked brachydactylism of achondroplasia,—the mushrooming of the bones, the deformity and the presence of peculiar excrescences on the bones. As a contrast to the strict conformity to the doctrines of Mendel, as shown in these cases, he mentioned a family in which polydactylism was pronounced,—an additional digit on both hands and both feet. He had known several members of the family and had been informed that the condition had existed for at least seven generations, but it manifested itself only in the first-born child, especially if not exclusively in the males. He inquired as to the functional capacity in the hands of these "stiff-fingered" people.

DECEMBER 23, 1915

The President, DR. WALTER E. PAUL, in the Chair

THE TEACHING OF NEUROPATHOLOGY. II. CHANGING THE STUDENT TYPE

By Walter B. Swift, M.D.

Mention of two previous types was made, which were shown in a previous paper. The method employed of changing the type consists in calling attention to unequal functions in contradistinction to temporal lobe functions as an avenue of obtaining knowledge. Excessive note-taking was dispensed with; and in place first-hand observation of tissue was substituted. There was no

objection made to notes taken after observation. This new standard was maintained throughout the course; and resulted in replacing temporal lobe functions with cuneal functions.

A CASE OF "ESSENTIAL TREMOR" WITH A NEW TREATMENT

By Walter B. Swift, M.D.

A case that previously showed marked tremor in the face, right arm and leg and slight tremor on the other side. The child when first seen could not talk without marked constant tremor; the writing was unsteady; and patient had to hold pen with both hands. She could not feed herself or drink water. Could not sit still. After about two years' treatment all these symptoms diminished three fourths. The tremor is markedly improved; she can now sit still; she can write with one hand, and feed herself, and drink at table.

In brief, a marked case of "Essential Tremor" is treated for two years with slow movements of face, arm and body and is three fourths relieved.

PATHOLOGICAL FINDINGS IN THE SEMILUNAR GANGLION IN THE PSYCHOSES¹

By A. Myerson, M.D.

The semilunar ganglion shows two types of change. First, an acute type corresponding in every respect to the ordinary axonal reaction. This was prominently present in five cases: one of acute exhaustion, three of enteritis, and one of generalized tuberculosis. Second, chronic changes indicating a metabolic disturbance rather than any inflammatory process and for which the term coined by Levaditi, "neurathrepsia," seems proper. The concept of neurathrepsia stands in contrast with that of neuronphagia in that in the latter the phagocytes and satellites are phagocytic for the injured nerve cells. In neurathrepsia, as preëminently exemplified by the semilunar ganglion, pigmentation of two kinds is prominent: first, the ordinary lipochrome pigmentation, and, second, an oxyphilic pigmentation. These pigmentary processes may go on to complete disintegration of the cell. Nuclear changes also are very common. The capsule shows mild reactive processes manifested by swelling of the nuclei of the capsulary cells and increase in their number as well as the encroachment upon nerve cells. Interstitial connective tissue shows a moderate increase.

Contrasting the interstitial changes with the changes found in the central nervous system, the Gasserian ganglion and the adrenal gland, structures related by form or by function, a very marked peculiarity of the semilunar ganglion is the absence of inflammatory products, such as leucocytes, plasma cells, lymphocytes, etc. In small numbers there is present an eosinophilic connective tissue cell which bears some relationship to the changes found.

It is concluded first that the semilunar ganglion shows precocious senility and secondly it is affected by general processes going on throughout the body. Findings by other workers indicate that in the symptomatology of general disorders, injury to the peripherally located nervous cells is to be considered and the appropriate therapy is strongly recommended.

Dr. Southard said he thought the pathological study of the sympathetic nervous system most important. He questioned if the changes spoken of cannot be an index of the integrity of the musculature of the intestine or of whatever part is concerned. He thought that Alzheimer's "central neuritis" really was a "general neuritis."

¹ To appear in toto in the American Journal of Insanity.

EPIDURAL INTRASPINAL TUMOR OF TWO YEARS' DURATION;
OPERATION. RECOVERY.

By W. E. Paul, M.D.

The patient, a rugged woman of 43 years, first noticed in November, 1913, that her feet were clumsy in walking. Soon some numbness developed in her feet and she stumbled and fell at times. Hot water was not felt by the left foot and the numbness increased upward in the left leg so that she did not feel the prick of a pin. The right leg was weak but prick and heat were recognized. No pain or tenderness; sphincters unimpaired. Some eight weeks elapsed during which these symptoms developed. She entered the Massachusetts General Hospital January, 1914, examination showing: Pupils equal, reacting well to light and distance, knee jerks lively, especially the right, position sense in toes normal, ankle jerks normal. Babinski suggested on right but no clonus; abdominal reflexes not obtained. Touch felt everywhere without apparent loss. Temperature and pain senses diminished throughout the left leg and left half of the trunk to a level just above umbilicus; on the right there was also impairment of pain and temperature appreciation. Gait unsteady. Both blood and spinal fluid showed negative Wassermann. X-ray revealed nothing abnormal in the vertebræ. Diagnosis of syringomyelia was made.

In December, 1914, she reentered the hospital with accentuation of her previous symptoms and the diagnosis of syringomyelia was again made.

August 3, 1915, she again entered the hospital and was hardly able to get about. Romberg marked. Ankle clonus had developed on the right and there was double patellar clonus, with Babinski on right only. Touch sense was preserved but pain and temperature senses were practically lost up to the sixth dorsal level. Though touch was appreciated everywhere, the change of sensation at the sixth dorsal level was determined by the pin point as being different and less natural below this level than above it; it was not determined by sharp delimitation of pain and temperature sensibility at this level.

The spinal fluid findings on the three different occasions were as follows:

	Jan., 1914.	Dec., 1914.	Aug., 1915
Pressure	150 mm.	—	210 mm.
Cells per cmm.	8	1	5
Noguchi globuli.	3 plus	Strong positive	Strong positive
Nonne phase	Faintly positive	Faintly positive	Moderately positive
Gold chloride	Pathological, but negative for syphilis	Syphilis	Syphilis or non-tubercular tumor
Wassermann	Negative	Negative	Negative

The objective symptoms pointed to intra-medullary disease of the cord, and in the first eight weeks of the disease it was regarded as a myelitis; later the evidence seemed to justify the view that syringomyelia existed. At the last visit in August, 1915, the suspicion of a tumor, other than gliosis, was strengthened by the partial degree of spinal impairment, combined with a marked level of sensory change at the sixth dorsal segment. Exploratory laminectomy was advised and performed by Dr. W. J. Mixter on August 17. A tumor presented at the fifth vertebral level, extra-durally, and was completely removed; it measured 4 x 2 cm. A cup-like depression existed in the fifth vertebra conforming to the tumor.

Diagnosis of tumor (J. H. Wright), fibrosarcoma.

Surgical recovery was uncomplicated and functional return was very rapid; at the end of eight weeks the use of the legs was practically complete and sensory restoration had taken place. Reflexes were still active but the Babinski and clonus had disappeared.

It would be of interest to examine the progress of symptoms from cord pressure to determine whether any typical order existed. Are all the nerve tracts affected alike or do they fail one after another and what is the order of functional block? In this case the order approximately was: (1) posterior columns; (2) lateral tracts; (3) antero-lateral tracts; (4) sphincter controlling tracts. Least vulnerable were the tracts conveying touch sense. The order of severity is practically the same as that for invasion. In keeping with the right-sided location of the neoplasm is the partial Brown-Séquad distribution of symptoms suggested by the greater spasticity on the right and the greater sensory impairment on the left. The time development of symptoms as well perhaps as the absence of subjective pain indicates that the effects of pressure were chiefly on the columnar tracts and not on the roots or commissural crossings of the temperature and pain tracts.

Patient appeared and seemed normal in every way.

Dr. Mixter showed the tumor and made remarks on the surgical aspects of the case.

Dr. Knapp said he had found the cases of spinal cord tumor, initiated by very intense pain, to be in the minority, especially the cases in which he had advised operation. A certain amount of dull aching, not very exactly localized, was most common. He had, within a week or two, seen a case which he reported before the American Neurological Association in 1913,¹ which had had a very curious history, the explanation of which was very difficult. About a year after an extra-dural growth had been removed the symptoms returned. Fearing a possible recurrence, a second operation was performed; only a little accumulation of fluid was found and the patient made a good recovery, walking as well as Dr. Paul's patient. About a year after the case had been reported the symptoms again returned. Mindful of the previous experience and thinking that there was another accumulation of fluid, repeated lumbar punctures were made, at first with slight relief, but later with no benefit. Consequently, a third operation was performed. There was no compression from the scar, no adhesions within the dural cavity, but again there seemed some excess of cerebrospinal fluid. She again made a perfectly good recovery. Two or three months ago the symptoms began to return, and she is now in the hospital for more lumbar punctures and possibly a fourth operation, with as much trouble as ever, a fairly marked spastic paraplegia with slight sensory symptoms.

Dr. J. J. Putnam said he had seen the patient from time to time and that he had postponed operation not believing that there was a cord tumor, but that he had finally recommended it, seeing that the case was otherwise hopeless.

With reference to Dr. Knapp's case, he said that he had had a case where pain was associated with accumulation of spinal fluid subsequent to operation, which when let out brought about a permanent cure.

PSYCHIATRIC CONTRIBUTIONS TO THE STUDY OF DELINQUENCY

By Herman Adler, M.D.

The subject of delinquency is one which has attracted the attention of experts in many fields from earliest times. Of late years there has been a

¹ JOURNAL OF NERVOUS AND MENTAL DISEASE, JANUARY, 1914.

tendency to regard delinquency as a manifestation of abnormality if not of disease. While the attitude of the community is changing in regard to delinquency and taking on more the attitude of regarding delinquency as comparable to disease and therefore to be treated with sympathy and constructive remedies, the law remains searching for responsibility. We are apt to blame the law and exalt science in this connection. The truth of the matter is that medicine, and psychiatry in particular, have not yet delimited the problem or discovered sufficient facts to warrant definitions of such precision that the law can note them. When it comes to definitions, we find nothing very satisfactory. The law has been passed in Massachusetts recognizing the defective delinquent as "an individual who has committed an offense not punishable by death or imprisonment for life, but who ordinarily might be committed to a state prison and so forth," as mentally defective. The English Mental Deficiency Act of 1913, which was to become operative in 1914, but was prevented by the war, classifies idiots, imbeciles, feeble-minded persons and moral imbeciles. The classification of psychopathic personality as contained in Kraepelin's *Psychiatrie*, eighth edition, volume IV, describes a number of groups of individuals belonging to the "not insane, not defective" group. In analyzing an individual there are two points to be considered: First, the intelligence of the individual, that is, his ability, consciously and logically, to direct his conduct; secondly, the emotions. The intelligence is the most recently developed faculty. The emotions have been developed out of instincts, and are much older in the history of the development of the individual. In health there is a reciprocal relation between the two which is more or less in equilibrium. It is manifestly impossible to analyze human nature in the present state of our knowledge. It also seems probable that it will be many generations before this will be done with such a degree of accuracy that scientific prediction may result. We are therefore in the same position in which Ehrlich found himself when he first proposed his side chain theory of immunity. It will take the psychologists and neurologists a long time to prepare accurate explanations of recognized phenomena, just as Ehrlich said it would take the chemists a hundred years to explain the phenomena of immunity. Introspective psychology with painstaking psychoanalysis of the individual cases is too time-consuming to be employed on the large scale. We need methods which will enable us to deal with the increasing number of subjects that come under our professional care. With this in mind, and using the terms that follow as symbols, without any idea that they represent actual underlying conditions, just as Ehrlich used symbols for his side chain theory, the following classification is proposed. All individuals with mental or social difficulties can be grouped into three headings: The first group is one in which the intelligence is found to be below the lowest normal level. This is called the group of defects or inadequacy. Into this class fall the feeble-minded, the oligophrenias of Kraepelin, the end stages of dementia praecox, and all other deteriorating psychoses, of senile, organic dementia, etc. The next group, the group of the emotional unstable, or emotional instability, includes individuals who have average intelligence or better, but who show in their conduct the predominating influence of the emotions. The third group, the paranoid group, includes individuals of average intelligence or better in whom the emotional influences are of secondary nature, but whose main difficulties are a result of mistakes in logical thought processes. The egocentric, contentious, prejudiced, cynical or vindictive individual belongs to this group. These three groups can be separated only theoretically. There are many cases which fall on the border between two or three of these groups. A distinction is to be made, in the main, on the behavior of the individual as observed in the course of years rather than on a definite quantitative difference to be observed in a single examination.

The introspective psychologist will attempt to determine in each individual by psychoanalysis or other means what the mechanism of the disturbance is. He may succeed in doing this and still be unable to treat the future course of the case. The behavioristic psychologist will not lay too much weight on the results of a single examination, but will lay more emphasis on the history of the case. This behavioristic method offers the hope of a short cut. The examination of a hundred cases of unemployment made at the Psychopathic Hospital gave the following results: The hundred cases consisted of men between the ages of 25 and 55. Of one hundred cases, forty-three were paranoid, thirty-five defective, and twenty-two emotionally unstable. The paranoid and defective groups together form 78 per cent. of all these cases. The paranoid individuals average 20.6 months for each job, the defectives average 24.7 months per job, while the emotionally unstable average 50 months for each job. The difference in the accounts of the careers of these people and those of the average healthy person consists in an apparent inability of the delinquent to learn by experience. Ehrlich, in devising his side chain theory, borrowed a generalization from Weigert, to the effect that when the body is injured in such a way that death does not result, the result is an over-production of defenses. Thus, a fractured bone, when it knits, will produce a union which is stronger than the original bone. The injection of a sublethal dose of toxin will result in immunity, that is an over-production of antibodies. One might apply this law to the formation of habits, good or bad, to the acquisition of mental control in delinquents. If the individual is exposed to conditions which are not enough to permanently disable him, he should react by an over-production of defenses. The threshold for this reaction must lay at a different level in each individual. This must be determined in each case. By careful training, based on the analysis of the individual it should be possible to influence the future conduct of these individuals. Nothing can be gained by endeavoring to increase the intelligence of a mental defective. Nothing can be expected from an attempt to change the personality of a paranoid individual. A great deal can be accomplished, however, in controlling the emotional instability of the third group. What is desired, therefore, is a system of mental and emotional exercises for the purpose of habit formation. This might be designated as orthopsychics. Educational training rather than punishment are the methods that hold out a chance of success. These individuals are unable to learn well by experience, but though they often recognize the full significance of their circumstances, their experiences have no corrective influence. To punish such an individual, therefore, is to increase his intoxication rather than to strengthen his defenses. It is like administering alcohol to the patient suffering from delirium tremens. We may draw a final analogy from immunity in applying therapy: in the first place, protection against the immediate effects of the acute attack. This means freeing them from their immediate difficulties, supplying them with food and lodging, helping them to recover from alcohol and so forth, and in the second place, immunization, building up at a rate which should be determined in each individual case, the defenses by training, not by overwhelming the organism, but by gradually strengthening it.

Professor Dearborn said this very interesting paper lays emphasis both in the review of Kraepelin and in the author's own constructive part on the defects of the feelings as contrasted with those of what we ordinarily speak of as intelligence or intellect. The interesting suggestions of a therapeutic nature would seem to be most hopeful in those cases in which these defects in the feelings may be traced to disturbances or failures of natural expression in early life. The dissociation between the intelligence and the feelings which appears in these cases—the schism between the two—is rather hard to describe psychologically. Recently he had been reading the attempt of Zielen

in this respect. In the ordinary cases of feeble-mindedness, the defects are most evident in the fields of ideation and reasoning; if, for example, you test the ability to form general concepts or notions of a somewhat abstract nature, you will of course find grades of feeble-mindedness in which these concepts are not possible. But there are cases which must still be judged feeble-minded and particularly of this moral-delinquent type, where you do find the ability to form such abstract notions, *e. g.*, those of "justice," "truth," and "goodness." Ziehen would then say that in the delinquent cases there is, however, an absence of the "feeling tone" which normally accompanies such concepts; that ordinarily, when we say "justice," with that abstract concept there is an accompanying "feeling tone," but that in the case of these delinquents this quality is lacking. Professor Dearborn was not sure whether psychologically this is more than a descriptive term. There still remains the question as to *why* there is this failure in these relations.

Dr. Myerson said it seemed to him that the defective delinquent can be well considered from the angle that Dr. Adler has considered him, as one whose failure may lie in any one of the three fields he has described. More fundamentally, he may be considered as an individual who is unable to adapt himself to the society in which he lives, that is to say, he can neither resist the temptation of the present moment nor learn by experience. This maladaptation, or inadaptability, may arise from several causes. It may arise, as Dr. Adler has pointed out, from true defect. It may also arise from disharmony. For example, the sex instinct may be over-developed; the intelligence may be average, the will power on other matters may be average, but because of the overwhelming or disproportionate development of the sexual instinct his conduct will lead him into perpetual conflict with society. Especially is this true of young girls of the type often classed as defective delinquents. Disharmony between an overwhelming desire and a moderate power of resistance may give rise to persistent delinquent conduct in an individual who otherwise is not defective. Many of our greatest men have been persistent offenders against the sexual laws of society, but their greatness has pardoned what would otherwise classify them as delinquents, whereas the same offenses in an individual of moderate powers would not be tolerated, and the individual would be considered as a defective delinquent. In other words, in addition to true defect, as a cause of delinquency, we must add disharmony, hyperdevelopment of certain instincts and as a result failure to conform to the usages of society.

Dr. Lyman Wells said it has come out in the discussion that we have quite a large number of delinquent cases nondefective according to ordinary intelligence tests. At the same time they show defects of adaptation to the environment. Their failures are independent of defects of intelligence, and one wonders whether we are not dealing with a beginning psychosis, even dementia praecox, where the intelligence is fairly well preserved. To test these cases experimentally you are not concerned with how much the individual knows, but rather his ability to use that knowledge, and that leads you experimentally into the choice reaction procedures, where you have a definite situation where the subject knows the proper reaction, but you want to determine how quickly and correctly he makes that series of reactions. They had been working on that at McLean during the past year, and while the material is not yet very large, there have appeared two of the tests they had been using which separate the normal group from the psychotic group pretty sharply. That gives some ground for hope that they shall be able to add to the Binet, Simon and other scales in time a scale which will give some measure of the adaptation of the individual. The separation of the normal from the pathological group is so far independent of the diagnostic entities, dementia praecox, manic depressive insanity or psychopathic inferiority.

Professor Frankfurter (Harvard Law School) said there was one sentence that Dr. Adler dropped he should like to comment on. He thought one cannot help reading criminalistic literature these days without feeling that the rather wasteful contest between the lawyer and the doctor is gradually coming to an end, and that each recognizes the interrelation of his own department to the other. Dr. Adler pointed out the fundamental reason why the law is still not accepting what some of the medical profession insist upon. The reason is that this profession has not yet given that sufficiently authoritative data that the law can apply, as it must, in generality of cases. But the times are much more propitious for the developing of the kind of results which this discussion here indicates. The old classical theory of criminology that Gilbert and Sullivan expressed, that the punishment must fit the crime, while still practised, is certainly a vanishing theory. The whole tendency of courts in this country indicates a growing activity on the part of the law to receive what science has to give. Also, in this country, there is evidence of a growing study, much more striking on the Continent, of the individualization of punishment, as indicated in systems of parole, the utilization of psychopathic laboratories and the like. Law shows a readiness to take over material from the medical profession as soon as that can furnish the data. He thought that it will never come fully till there is a growing recognition, as there is, of the need of coördinating the social sciences. We shall never make a marked progress towards utilizing what data there is till we do, what for instance the University of Berlin has done, in gathering doctors and lawyers and judges and that vague profession, the social workers, into a cooperating scientific group. Professor Frankfurter was talking a few nights ago with one of the most thoughtful judges of New York. He and his court had just been struggling through a case involving the defense of insanity. He said that he felt sure that the time has arrived when something more satisfactory must be ready for application by the court, some more satisfactory technique in ascertaining the fact of insanity than the present methods. Professor Frankfurter told him of some of the things that the Psychopathic Hospital was doing here, and trying to do in Chicago, and what they were trying to do on the Continent, and he said in effect that the bar and bench would surely be most eager to apply new data as soon as the medical profession had worked out authoritative data and technique for application.

It seemed to him one essential in the situation is the recognition on the part of the medical profession, as it has done very generously in talks some of them at the Law School have had with Dr. Southard and Dr. Adler, that the determination of these facts, the application of these medico-sociological facts, cannot be done without the coöperation of the legal profession, for instance, the determination of insanity, or at least legal consequences of the determination of insanity must be made by the legal profession. Just as soon as that is recognized by the medical profession and by the legal profession, and time and good temper are no longer wasted over a dispute to serve where both must serve, just so soon will we have a more creative atmosphere for the progressive development of the participating social sciences, and also for the progressive salvage of the part of the community which everybody recognizes can be saved to a larger extent, or at least can be treated with less ignorance than is at present the case.

Dr. Knapp said he felt that Dr. Adler's classification of this delinquent class had much to justify it, but exact definition was difficult. A certain definition was of course essential in making any classification, but there was always the danger in dealing with the subject from the legal point of view lest the terms of the definition be exalted into a fetish and the classification, which must necessarily at present be elastic, be made too rigid and precise. Another difficulty also arose. In the majority of cases, it is comparatively

an easy task to determine intellectual defect. Our tests of intelligence, even though not ideal, help us in the problem. Even our marking system in our colleges, so often laughed at, is of some worth, as is shown by the fact that a greater percentage of the men who lead their class make good in later life than do the average. Our tests for emotional stability, however, are far less trustworthy, and it becomes a difficult matter to demonstrate such cases to the court and the jury. As to those of defective will, it is open to question whether that is not a metaphysical speculation. If we take out intellectual defect and emotional instability, how much will is left? The difficulty with the legal side of the question is not entirely due to the fact that the medical profession has not definitely determined the facts, but that the law is unwilling to admit new points of view, even when clearly established. Thus, mental defect is clearly established, but the bench is not ready to take a step forward, as Chief Justice Shaw did many years ago, and recognize limited responsibility due to such defect, but it stands pat on the old decisions.

Dr. Adler said, in closing, he felt that perhaps his classification was taken in a little different way from what he intended it to be. He had no intention to explain these phenomena. He stated that the explanation was quite beyond us at present. He thought the points that have been raised are just the sort we want to know about. Once we can answer the questions Dr. Myerson, Dr. Southard and Dr. Wells have asked, he thought we will be able to explain some of the phenomena we are now doubtful about. Because we cannot agree in these various ways, and cannot explain it, it might be possible to analyze the difficulty from a behavioristic point of view. He did not insist on paranoid or emotional instability. He picked out what seemed to him to be the chief characteristic in the behavior of each group. There is a group which apparently lacks something—whether judgment or will or a number of other possibilities it is not always clear—but it seems as though some of these people do not react in a way a person with full knowledge and will power would react. Then there are other cases in which the discrepancy between the conduct and exciting moment is due more to positive characteristics than to negative characteristics or to emotional reactions. As Kraepelin has pointed out, there is a defective will in almost all of these cases. He did not want to enter into an explanation of these different phenomena, but merely wanted to make a short cut towards the classification and arrive at some agreement as to what characteristic classes should be in order that we should be able to deal with these cases as they come to us. Just what the physician is able to do, what to treat, what is curable, the diseases, the mechanisms, we do not know. As we were able to treat syphilis with mercury long before we knew the disease, so we might get the remedy for these cases long before the mechanism was explained.

JANUARY 20, 1916

The President, DR. EDWARD B. LANE, in the Chair

THE CORRELATION OF BRAIN ANATOMY, MENTAL TESTS, AND
SCHOOL OR HOSPITAL RECORDS IN A SERIES OF
FEEBLEMINDED SUBJECTS (WAVERLEY
ANATOMICAL RESEARCH SERIES)

By E. E. Southard, M.D.

Dr. Southard presented an account of the first instalment of work on the brains of the feeble-minded done under the auspices of the Waverley School for Feeble-minded. He called attention to the extraordinarily small

amount of work which has been done upon the anatomy of brains of feeble-mindedness, speaking of the work of Bourneville, Hammarberg, and the early work of Wilmarth in this country. He spoke of the present as an auspicious period for work in this field on account of the great achievements in cortex topography of recent years. He described the systematic photography of the brains from above, below, from the two sides and from the two mesial aspects, and of the further photography of frontal sections. Thereupon microscopic work could be done with the full advantage of correlations with the gross appearances, such as anomalies, atrophies and other focal lesions.

Another reason for working eagerly at this topic at this time was the fact that mental tests are now available, so that we can compare: (A) the psychometric level of the patient, (B) the functional level of the patient as exhibited clinically and educationally, (C) the level of brain development.

The speaker insisted upon the importance of studying efficiency in the material of feeble-mindedness. He considered that feeble-mindedness forms the best material now available for research in efficiency and called attention to the fact that all the modern books upon efficiency had neglected the field. Just as the Montessori method was a logical descendant of the work of Séguin, so new ideas in the education of the normal derive from the more modern work in the education of the feeble-minded.

If correlations between the psychometric and practical capacity levels of the patients on the one hand and the trained brains on the other can be made, then possibly something new concerning the nature of work in this connection and comparison between appearances in the parietal lobes and those in the frontal lobes would obviously be of importance.

Robert M. Yerkes, Ph.D., said Dr. Southard had suggested so many things to talk about that he was almost afraid to begin. Moreover, there are so many things that ought to be said about psychological examining, especially the Binet method (many of them not agreeable to say), that he was still more timid about beginning.

He was not quite sure how far the psychological findings which Dr. Southard had mentioned are based upon Dr. Fernald's observations and how far upon the results of the Binet scale. He should himself rather depend upon the former than the latter, for the Binet scale has shortcomings which are especially unfortunate in such an investigation as Dr. Southard's.

The scale was devised by a man who was meeting a practical demand for a rough method of classifying children with respect to their intellectual capacity. From the point of view of many of us (and he thought Binet himself if he were here would agree with them), the method has been used neither intelligently nor fairly, for it has been applied, beyond the intentions of its originators, to the study of adolescents and adults.

It is a heterogeneous multiple scale consisting of a variety of tests chosen to suit the different years of age, especially through childhood. Its results are at best very rough and only in a general way indicative of the mental level of the individual. There is nothing differential about them—nothing that can be safely used in correlation with the anatomical findings that Dr. Southard has presented. The fact that the scale is complex, or, rather, consists of a number of scales, counts against it, especially for such purposes as Dr. Southard's. For no two years of age are precisely the same mental functions measured. For this reason, unless all the tests of the Binet series are presented, individuals do not get the same opportunity for credit.

Mental development varies extremely in rapidity at different ages. The growth of intelligence between two and three years is much greater than that between eleven and twelve. When we attempt to arrange brains or intellects in order, on the basis of Binet measurements, we meet difficulties which are

due, not to the things measured, but to the nature of our measuring scale. While the present Binet method is practically satisfactory for the years between five and ten, it is less satisfactory below the age of five, and eminently unsatisfactory above the age of twelve.

He had attempted to touch on two or three of the points raised by Dr. Southard. He inquired also concerning the relative values of the point scale and the Binet scale for the purposes under consideration. He should unhesitatingly answer his question thus: Neither the point-scale method, as at present used, nor the Binet method is reasonably adequate. The situation demands more accurate measurements than either of these scales can possibly supply. The investigators should obtain measurements of perception, memory, imagination, suggestibility, judgment, reasoning and various other mental functions in order to have at hand a reasonably accurate, although rough, description of the mental constitution which a given brain represents.

Very recently he watched the psychological examination of a delinquent adolescent who is also mentally defective without being below average intelligence. The examination, lasting one and one half hours and consisting in the main of the point-scale and the Binet-scale measurements, showed nothing strikingly peculiar about the individual. The chances are that the difficulties lie in the affective rather than in the intellectual sphere. This aspect of mental life neither of the scales in question adequately measures. The individual in question would almost certainly rank according to the Binet scale as a moron; by the point scale as a person of approximately average intelligence. The Binet findings might tempt one to account for the delinquency by appealing to inferior intelligence. This case indicates both a serious weakness of the Binet method and one of the most insistent demands made of the psychological examiner. It is not sufficient that the intellectual level of an individual be stated. It is necessary that the various aspects of mind be measured and that a general description be presented as a result of such measurements.

What we most need is the intelligent use of psychological methods which are already at hand and which can be made to yield practically serviceable results when applied to the various mental functions. We shall soon begin to move backward instead of forward if we insist on using rough measurements of intelligence for other purposes than those of preliminary classification. Certain social shortcomings or failures are due to feeble-mindedness and many others are due, either wholly or in a large part, to mental peculiarities other than intellectual.

There is yet another aspect of this subject which he felt impelled to mention. Even among medical men there is an impression that mental or psychological examinations may be made to good advantage with relatively little training. Many physicians have spoken about learning how to give "mental tests," as they call them. It is usually their thought that a week or two of instruction and practice should enable them to do this work satisfactorily.

This attitude seems extremely unfortunate. It is true that an intelligent person can learn the technique of the Binet and the point-scale methods in a very short time, but it is also true that without an excellent knowledge of the science of mind, and without a thorough grasp of the principles of mental measurement, the results obtained by such amateur examiners are likely to be of little value. The point is this: Psychological examining demands not only skill in observing, but to as great an extent, skill in interpreting the results.

There is every reason why psychological examinations should be regarded by the medical profession as are other forms of examination. The work must be placed upon a professional basis if it is to be made safely

serviceable and maintained in good repute. At present there is serious risk that mental "testing" may become a matter of ridicule because of the careless and unintelligent work of incompetent examiners.

Dr. Walter E. Fernald said there is very great need of such a study as Dr. Southard is making. When we consider the vast advance in the past decade in our knowledge of feeble-mindedness from the pedagogical, psychological, economic and eugenic angles, it is rather remarkable that our knowledge of the pathology of the mentally defective has been added to but little during that period. As Dr. Southard has said, the best work was done two or three decades ago by Bourneville, Hammarberg and Wilmarth.

It is rather to be regretted that the cases in this first series necessarily come within the "museum" group of extreme cases of mental defect, referred to by Dr. Southard. The literature on the subject abounds in these "sport" cases of the unusual and spectacular variety rather than those of the ordinary cases of imbecility and moronity. As a matter of fact, there is no literature pertaining to the pathology of the so-called moron group except that rather sketchy part of Tredgold's revised treatise, which is based on a very small number of cases in which the degree of defect and the actual existence of defect is more or less a matter of conjecture.

Until we have consolidated our lines, as our military friends would say, by bringing up the pathological salient, we shall not be able to develop the most effective methods of dealing with feeble-mindedness, especially with regard to possible prevention. We have practically no knowledge as to the exact pathological conditions in cases of hereditary defect. No studies have as yet been made combining the results of eugenic research, the type and degree of the defect, and the exact brain conditions which are responsible for the defective mentality. If, in a large series of cases, we can correlate the family history and the personal history, the history of accidents and diseases, the pedagogical history and the psychological measurements with the pathological findings, there seems to be a possibility that avenues of prevention may be opened up of which we know nothing at this time.

NEW YORK NEUROLOGICAL SOCIETY

JANUARY 4, 1916

The President, DR. W. M. LESZYNSKY, in the Chair

RECURRENT FACIAL PALSY AND ITS RELATION TO THE SO-CALLED FACIOPLEGIC MIGRAINE

By J. Ramsay Hunt, M.D.

Dr. Hunt prefaced his paper by saying that migraine was occasionally associated with motor cranial nerve palsies which were usually limited to the ocular nerve. The first contribution to the subject was by Möbius in 1884, who described a periodical recurrent oculo-motor palsy. A few years later Charcot described similar cases as ophthalmoplegic migraine. There were now about 100 cases in the literature of this subject and it was a well-established clinical type. It was rather extraordinary that such a complication of migraine should be limited to the ocular nerves. The other *motor* cranial nerves, with the exception of the facial, seemed to escape. The evidence in favor of a facioplegic type of migraine was, however, very uncertain. Therefore Dr. Hunt wished to present to the Society his own convictions in

regard to the relationship of the so-called *facioplegic migraine* to recurrent facial palsy. In his paper Dr. Hunt stated that recurrent or relapsing facial palsy was a term which had been used to describe a group of cases characterized by a peculiar tendency to multiple attacks or recurrences. The palsy might always recur on the same side—the relapsing type, or, frequently, there was involvement of alternate sides. The individual attacks might be separated by months or years and did not differ in etiology and symptomatology from usual clinical types of peripheral facial palsies. The interesting point was the frequency of occurrence in a single individual and the underlying pathological tendencies which might favor a predisposition. This tendency was not always confined to one individual, but familial and even hereditary types were sometimes encountered. Oppenheim had recorded a family in which three members, all sufferers from diabetes, had recurrent attacks of facial palsy. The frequency of the relapsing form of Bell's palsy was greater than was generally supposed. Remak, in 200 cases, noted recurrence in 3 per cent. Bernhardt placed the percentage as high as 7.2 per cent. The etiological factors were the same as those which caused facial palsy with one attack: viz., rheumatic or refrigeration palsy after exposure to cold; infections and intoxications, such as diabetes, syphilis, otitis media, and perhaps also the congenital narrowing of the stylo-mastoid foramen, which would predispose the nerve to pressure from slight inflammatory reactions. In Bernhardt's series, otitis media, syphilis or diabetes was present in a third of the cases. Two other types of relapsing facial palsies should here be mentioned. These had found their way into medical literature and were widely quoted as examples of periodical facial palsy in the sense in which this term was used by Mobius to describe the oculo-motor palsies associated with migraine. One type was based on a fragmentary clinical report by Hachek, where relapses of facial paralysis were observed in a child with basal tumor. This case he regarded as analogous to the so-called periodical oculo-motor palsies of the Mobius type. No clinical data had been given in the report, and yet an attempt had been made to establish an important clinical group on this slight and uncertain evidence. Most neurologists of experience had probably observed such intermittent and transient attacks of facial palsy from pressure in cases of tumor beneath the tentorium, and yet would not think of giving them this interpretation. Another type was founded upon the oft-quoted contribution of Rossolimo, entitled "Relapsing Facial Palsy in Migraine." In this case a woman, aged 28, had been subject since the age of puberty to recurrent attacks of migraine, an inheritance from the mother. She had at various times four attacks of facial palsy, in all of which the accompanying pain was localized in and around the mastoid region. In the first attack the pain was situated in the region of the left mastoid and superior maxilla, and lasted a week. It was accompanied by tinnitus aurium and a metallic taste on the tongue, and was followed by a typical facial palsy on the left side, from which she recovered in five months. The attending physician at the time ascribed the condition to an exposure to cold. Three years later, there was a similar attack, after sleeping by an open window on a train. The right facial palsy which ensued cleared up in about five months. Two years later, there was palsy on the right, preceded by localized headaches, and three years after the left side was again involved with pain and the usual symptoms of facial palsy. This case was reported by Rossolimo as one of migraine with relapsing facial palsy, in which he assumed an etiological relationship between the migraine, which was undoubtedly present, and the recurrences of facial palsy. On this evidence Rossolimo postulated a *facioplegic* type of migraine, similar in nature to the ophthalmoplegic variety of Mobius, which had an established place in literature. This case, however, stood alone and presented insufficient grounds on which to base such analogy,

the symptomatology not differing in the least from the usual clinical picture of relapsing facial palsy.

In regard to pain in facial palsy, it was well known since the studies of Webber and Testaz, and especially in Dr. Hunt's own contributions to the sensory functions of the facial nerve, that severe pain was a frequent precursor and accompaniment of facial paralysis. When present it was localized in the ear and mastoid region, often radiating to the occiput and trigeminal distribution. The pain under such circumstances might reach an extreme degree of intensity and persistence, and was quite sufficient in itself to explain the severe localized headache in the Rossolimo case, and might well give rise to suspicion of a migrainous seizure. That migraine coëxisted in this case there could be no question, but as both migraine and facial palsy were comparatively frequent maladies, it required no great stretch of the imagination to explain their joint occurrence in the same individual, and yet etiologically unrelated and distinct. While the idea advanced by Rossolimo was suggestive, there was no reason at the present time for accepting a facioplegic type of migraine—an opinion which was shared by other workers in this field. The cases reported by Dr. Ramsay Hunt were as follows: Case I: Woman, 23, with relapsing alternating facial palsy, associated with pain; three attacks. Case II: Woman, 21, with relapsing alternating facial palsy with pain. (The girl's father had similar attacks.) Case III: Man, 45, with recurrent facial palsy, accompanied by pain; three attacks. The conclusions drawn from these cases were that recurrent or relapsing facial palsy, associated with pain in the ear and occipital region, was therefore merely a peripheral paralysis of the seventh nerve, in which was manifested a peculiar tendency to multiple attacks or recurrences. The symptomatology corresponded in all its essentials to the more usual type. The theory of Despainne on the narrow exit at the stylo-mastoid foramen which might predispose the nerve to compression was ingenious, but called for more definite pathological confirmation. The possibility of coëxisting diabetes should always be considered. Most cases were of infective or refrigeration origin. In the infectious or rheumatic groups there was simply a constitutional tendency to peculiar local reactions to cold or infections, very similar to those observed in tonsillitis, lumbago, sciatica, with well-known tendency to recurrence. A pathological theory of the rheumatic origin, advocated by many, was that of a perineuritis of the facial nerve, similar to brachial and sciatic perineuritis of rheumatic origin. Such a lesion would be favored by the exposed situation of the nerve, and swelling of its structures within the Fallopian aqueduct being immediately registered as pressure palsy. This would be enhanced by a congenitally narrow canal. This might explain some of the familial and hereditary types. Peripheral facial palsy as a sequela of the migraine attack, the facioplegic migraine of some writers, was not a clinical entity. If the facial nerve had any relation to migraine which was so well established in the case of the ocular nerves, this relationship had yet to be established. The cases already published gave insufficient grounds for any such assumption. Titles like "periodical relapsing facial palsy" and "facioplegic migraine" were misnomers which had crept into some of the best monographs dealing with the subject. Such terms were misleading and denoted nothing more than transient intermittent facial palsy as a focal symptom of basal tumor in the one case, and the not uncommon relapsing facial palsy associated with pain in the other. It was, of course, self evident that migraine and facial palsy, both of which were common affections, might be met with in the same individual, but were etiologically distinct. Dr. Hunt added that his three cases must be classified as recurrent facial palsies, associated with localized neuritic pains. There was very definite and severe pain, preceding and during the attacks. Otherwise they were typical facial palsies. This was the point that

he wished to make in regard to paralytic complications of migraine. At the present time one could only recognize as an established clinical group of motor cranial nerve palsies that of the ocular nerves, viz., the third nerve, rarely the abducens, and very rarely, the trochlearis. The optic nerve, and especially its termination in the retina as well as the sensory trigeminus, had rarely shown involvement. The other cranial nerves were not involved in migraine. He thought the teaching expressed in most standard monographs on this subject regarding a facioplegic migraine was wrong. In the Rosso-limo case the connection between the palsy and the migraine was very doubtful, and Hatchek's case was merely a transient intermittent paralysis, associated with basal tumor.

Dr. W. M. Leszynsky said that it seemed to him that those who had seen large numbers of cases of facial palsy could come to no other conclusion than that formulated by Dr. Hunt. For a number of years Dr. Leszynsky had studied facial palsy without, however, going into such detailed study of sensory disturbances, excepting for pain, as had Dr. Hunt. He found that quite a large proportion of patients had pain. It was assumed that refrigeration had acted on the terminal filaments of the fifth nerve, as well as the facial, and had thus produced pain. In regard to migraine, it was rarely that patients suffered from this, coincident with facial palsy. He had seen all of in other types, that is, oculo-motor, hemianopic and hemiparetic, but not the so-called facioplegic.

Dr. S. E. Jelliffe said that he had been very much delighted to hear Dr. Hunt call attention to the facioplegic syndrome in migraine. He believed it to occur more commonly than the few scattered records would lead one to suppose, and that it should be allied, not only to the ophthalmoplegic, but to the hemiplegic, brachio-plegic and to other isolated palsy syndromes in the leg and other parts of the body which were a part of the migraine syndrome. It was but one of a series of related and correlated disturbances. He felt sure that it was more useful to regard the kaleidoscopic variations seen in the migraine syndrome as dynamic trends, rather than so-called definite static types. Pigeonhole neurology should be going out of fashion.

PROGRESSIVE LENTICULAR DEGENERATION (WITH EXHIBITION OF LANTERN SLIDES)

By F. J. Farnell, M.D., and A. H. Harrington, M.D.

This paper was read by Dr. Farnell. The case was one of a young girl, in whom the symptoms appeared at the age of puberty. The case ran a four years' course, the patient finally dying in a state institution for the insane. Lantern slides were shown illustrating microscopical sections of the liver and brain.

Dr. F. Tilney, in discussing Dr. Farnell's paper, said he wished to express his appreciation of the excellent presentation of this case, which seemed to him typical of the disease described by Wilson. It had especial interest in connection with the case of Wilson's disease which he presented to the Neurological Society last winter. Since that time Dr. MacKenzie and he had been progressing with the pathological work. The brain was ready for cutting in serial sections and detailed pathological study had been made of the other organs. He thought it very essential in the preparation of the brains obtained from such cases that the material be so treated as to make possible the study of serial sections. One of the most important question concerning Wilson's disease at the present time was the anatomical relation and pathological condition of the lenticular nuclei. These could not be studied as thoroughly as

need be in any other way than by serial sections of the entire brain. Concerning the general subject of progressive lenticular degeneration, there were certain clinical aspects which should be considered. First, in the matter of tremor, as summarized from the reported cases of the disease. If it was expected that anything typical or characteristic was to be observed in Wilson's disease, so far as the tremor was concerned, the discrepancies in the published descriptions would soon dispel that idea. One observer, for instance, described the tremor as coarse, another spoke of it as rapidly changing movements like chorea. This no doubt led Gowers to term the condition "tetanoid chorea." It had also been described as tremulousness. The place in which the tremor began imparted no characteristic feature to it. In the majority of cases it first appeared in the right hand and was noticed when the patient wrote. Nearly as often it made its first appearance simultaneously in the legs and arms. Less frequently it occurred in both arms alone and in a few cases in the tongue. The tremor was usually described as rhythmical, but the references in this particular were thoroughly unsatisfactory. Its rate was variously described as rapid or slow and its amplitude given as one to four inches. On the other hand, in some cases, it was noted as an extremely fine tremor. As a rule, voluntary action, as well as emotional excitement, increased the tremor, while it disappeared when the patient was resting. This statement, however, was not made in all the reports, so that there seemed to be no striking uniformity in the statements concerning the tremor. This was also true of the description of contractures. There were few, if any, references to the character of resistance against passive movements, the myotonic status of muscles, the myotatic and electrical irritability. Even the distribution of the contractures was none too fully described. In the matter of contractual attitudes one feature did not stand out in all the cases, namely, the abduction of the angles of the mouth and the separation of the lips due to contracture of the facial muscles, which gave the patient a silly, almost idiotic expression. This occurred in 100 per cent. of the cases. A rather characteristic contractual attitude was seen in the hands and fingers, namely, adduction of the thumb with extension at all its phalangeal joints, flexion of the fingers at the metacarpo-phalangeal joints, with extension at the phalangeal joints. This latter arrangement might affect one or two of the fingers, usually the index and middle, while the ring and little fingers were held completely flexed in the palm of the hand. This general attitude was seen in 60 per cent. of the cases. In the remainder, however, the fingers were flexed into the palm and the hand was in extreme pronation. In about 50 per cent. of the cases the feet and toes assumed a similar characteristic attitude. The feet were in a position of equino-varus, while the toes were flexed at all joints. In the remaining cases the contractual attitude of the feet and toes was varied and irregular, so that with regard to contractual attitudes progressive lenticular degeneration did not seem to produce any distinct type comparable, for instance, with that of paralysis agitans. In fact, the attitudes of Wilson's disease might easily be mistaken for a number of other conditions. The changes in affective tone and in emotive expression, said to be so characteristic of progressive lenticular degeneration, as well as indicative of a lesion in the basal ganglia, did not seem to deserve the importance attached to them. To believe that the basal ganglia of themselves were responsible for control of the affective tone, was turning back to the ancient history of neurology. Dr. Tilney said that his work on pseudo-bulbar palsy in which he published an analysis of the findings in 91 autopsies of this disease, showed that in one half the cases with no lesion in the lenticular nucleus, caudate nucleus or the optic thalamus, there were typical laughing and crying attacks, while in one half the cases with lesions in these parts, no such attacks were observed or reported. This seemed to be an argument absolving the lenticular nucleus,

caudate nucleus and optic thalamus of at least some of the responsibility ascribed to them in controlling affective tone. Within the past two years Rausch and Schilder had cited a number of cases of pseudo-sclerosis and stated as a result of their findings that there existed a hereditary degenerative disease simultaneously involving the liver and brain; that the cases described by Wilson were only a well-defined subgroup of pseudo-sclerosis and that in all of these cases it was presumably a complete involvement of the brain though the subcortical motor apparatus was affected most severely. Dr. Tilney said in conclusion that he had not intended his remarks as adverse criticism of the brilliant work already done in this disease. He had tried to point out that while one might recognize it as an entity, there was not as yet full anatomical, physiological or clinical recognition of its individuality. It was rather his object to make a plea for a more careful and extensive study of such of these cases as came to one's notice, especially an anatomical investigation, since through this disease there was offered an opportunity of shedding light upon a part of the nervous system which had so long baffled them, and yet was so intimately concerned in the evolution of the brain, namely, the corpus striatum.

Dr. George M. MacKenzie (who discussed this paper by invitation) said that he had been particularly interested in the pathological findings in cases of Wilson's disease. Dr. Farnell's case conformed in most details to the typical cases. The most striking and most constant pathological finding in this disease was the cirrhosis of the liver; in fact, it had been present in every case reported and might be regarded as a *sine qua non* for a complete diagnosis of progressive lenticular degeneration. Every case had advanced cirrhosis of the liver and in these livers there was a striking uniformity of appearance. The livers were smaller than normal, nodular and firm. In Dr. Farnell's case the cirrhosis was earlier than usual. Naturally the question at once occurred of the relation of this form of cirrhosis to the ordinary hepatic cirrhosis in children. This was not an extremely rare condition in children, though much less common than in adults. Schlichthorst had collected over 100 cases, and Howard in this country collected 63 cases. A striking difference between cirrhosis in children and that in progressive lenticular degeneration was that the latter was entirely without symptoms. In only one of the reported cases of the latter had there been a slight transient jaundice some years before and this might very well have been the ordinary catarrhal jaundice. There had never been ascites or gastric hemorrhages or evidences of dilatation of collateral circulation. In the ordinary cirrhosis of children symptoms were always present. In all the Wilson's disease cases there was marked evidence of attempts at regeneration, shown by the active separating of the bile ducts in the connective tissue bands and also by the mitotic division of the liver cells, resembling in the formation of irregular masses of cells in which the architecture of the lobule was lost. The lesion in the lenticular nucleus varied greatly. It was rather surprising that in the case of Dr. Farnell, of four years' duration, that it was not more marked. The lesion in the carefully studied cases had varied from slight discoloration and sponginess to complete softening and excavation of the nucleus. In general the chronic cases had more marked changes than the acute, but this had not been constant. To explain the cases without lenticular changes Wilson was forced to fall back on the hypothesis that the nucleus might be dynamically disturbed to a degree sufficient to produce marked symptoms without any nuclear changes discoverable by available methods. The gaping spaces about the blood vessels described as a lesion by Wilson might be seen in otherwise normal brains and were probably an artefact due to shrinkage during fixation. In any disease in which the pathogenesis was so obscure as it was in these cases, it was worth while to have thorough examinations

made not only of the liver and basal ganglia but also of the peripheral nerves, muscles and spinal cord. They were still very much in the dark as to the point of origin of this interesting disease.

Dr. Bernard Sachs said he had seen a number of cases which had come under this heading. One striking thing was that the anatomical findings were not at all of such a character as to account for the symptoms during life. He was much impressed with the opinion that there was much more peculiar to this condition than the mere lenticular degeneration. If there were no more than that they had not enough to account for the symptoms. The lenticular degeneration would seem to be a part of a very much more widespread anatomical change in the entire brain. During the reading of the paper he had remembered that nearly thirty years ago he and Dr. Seguin had a patient of sixty years of age, with such a condition—tremors and gradually developing contractures, and marked psychic change. Dr. Seguin had observed that only a universal gliosis involving every part of the brain, both cortex and ganglia, could account for the condition. Dr. Sachs did not believe that they would be able to accept the diagnosis of lenticular degeneration for this clinical group of symptoms. Until the study of a number of brains was so accurate that they could exclude changes in the other parts of the brain, the cortex and neighboring ganglia, they could not accept this definition. He was not convinced by Wilson's paper that the entire brain had been satisfactorily examined. There were perhaps great changes in the cellular elements, in the ganglion cells of the cortex and the spinal cord, that could not be definitely stated to be actually normal. This was shown by the pictures to-night. He had to express his appreciation of the excellent way in which the subject had been presented. He did not feel, however, that they had even fairly started upon the study of this very difficult subject. He did not believe that progressive lenticular degeneration would remain as a clinical entity.

Dr. Ramsay Hunt said the question of the symptomatology in this disease was very interesting, especially in its relation to paralysis agitans of the juvenile form. When he first read Wilson's paper he gathered the impression that it would be difficult to separate his disease clinically from juvenile paralysis agitans, except for the quicker course and the more toxic symptoms. Sawyer reported a clinical case of eight to ten years' duration, which in its symptomatology simulated Wilson's disease, though the course was milder. Wilson examined this case and acknowledged its symptomatology and relationship to the type he had described. They had such cases of juvenile paralysis agitans at the Montefiore Home. One patient, very many years in the Home, died, and the brain was examined. There were no lesions in the lenticular nucleus and the liver was normal. In this case the juvenile paralysis began at six years. Dr. Tilney's question as to tremors was a good one, but the tremor in paralysis agitans varied in character and degree, apparently depending upon the degree of rigidity. Dr. Hunt said he regarded Wilson's disease as an encephalitic or gross lesion in the lenticular region, whereas in paralysis agitans there was probably a more specialized lesion in the nature of a system disease.

Dr. F. J. Farnell closed the discussion by adding that in his case for several months before death there was marked toxemia, and in going over the slides it was difficult to tell which cells were degenerated from the toxic process and which from the disease itself. The spinal cord cells were recognized as not being entirely normal but were not considered to be involved in the special disease process.

SOME THERAPEUTIC SUGGESTIONS DERIVED FROM THE
NEWER PSYCHOLOGIC STUDIES UPON THE NATURE
OF ESSENTIAL EPILEPSY

By L. Pierce Clark, M.D.

The author first called attention to the fact that the modern trend of research into the nature and treatment of the neuroses and psychoses was distinctly based upon a fuller recognition of the importance of psychogenic factors than neurologists had held or seemed at present willing to admit. Even in the so-called organic disorders, such as paresis and arteriosclerotic conditions, the interpretation of the psychotic reactions in such was to be sought on the ground of considering these mental disorders as functional or psychogenic, rather than structural ones in the ordinary acceptance of the term.

Next followed a short exposition of his theory of the nature and pathogenesis of essential epilepsy. The individual has an inherent defect in instincts which constitutes more or less distinctly the so-called epileptic constitution. Various types of stress, ultimately psychic in character, cause the predisposed individual to react away from his difficulty by a loss of consciousness, as shown in the periodic attacks, and the main motive of the whole mechanism of his attack is to gain a riddance of the particular adaptive demand and gain, through regression to the unconscious, a state of peace and harmony, comparable to that of infancy or before reality has become part of the environmental demand.

Attention was called to the importance of the recognition of the essential makeup of potential epileptic children and the degree and character of earliest training necessitated in the handling of them. He reemphasized the importance of the release of the frankly established epileptic from a too severe or stressful environment and pointed out the empirical manner in which this had been a part of the best phase of treatment in the past. As a positive factor in the further treatment of such individuals he pointed out the necessity for employing varied interests of work and play to keep them in closer contact with that environment which had been rendered simple. He gave a number of experiences of gaining the cooperation of the patients in the general scheme of psychologic treatment and the outcome of the same, the best method being found in the working out of the mechanism of the patient's adaptation to a phase of everyday reality to which he could fully respond, slowly making an effort to vary the same and increase the power of interest and adaptation as the patient learned the successive grades of life lessons entailed by such a principle. In conclusion, Dr. Clark called attention to the great importance of a more extended study of the mental factors, both the defects in makeup and the nature of the precipitating causes for the convulsive episodes, and the demand for a much better grade of psychiatrically trained assistants on the part of nurses, physicians and teachers, and that in its best sense the treatment was a broadly educational one in which a psychiatric insight into the difficulties to be handled was absolutely necessary.

Dr. S. E. Jelliffe, at the risk of appearing pedagogic, ventured to recall to the Society his retiring address given one year previously. Herein, while reviewing the work of the Society, he had expressed the view that it was possible to classify neurological activities under three general groups, which mutually integrated and, interacting, made up the sum total of nervous structures and functions. It was essential first to relinquish the worn-out conception that the human organism was a reservoir of energy. It was, more strictly speaking, a transformer of energy. Its transforming mechanisms might appropriately be divided into three levels, not separated one from

another, but evolving the one into the other. At the lowest, by which he meant the phylogenetically oldest level, the specific energy carrier was the *hormone*. Through these, regulated by the vegetative nervous structures, the general metabolic upkeep of the machine was made possible. With the gradual evolution of animal structures, sensori-motor mechanisms became increasingly important, and by means of the *reflexes*, outside energy was transformed for bodily adjustment; finally, for social needs, the psyche utilized the symbol as the specific energy transformer. To him the whole quarrel between the somatic and the psychogenetic attitudes was the mutual inability of each to understand the aspect of the other. For the somatist and the mechanist, the human body was nothing but hormones and reflexes; for the vitalist there were only symbols. Man, however, was a biological entity, living in a social milieu, and it was necessary to regard him as a transformer of energy at all three levels. Dr. Jelliffe felt that his point of view did away with many so-called difficulties. Just as the vegetative and the sensori-motor systems had their evolutions, so also had the symbolic systems. To comprehend mental phenomena, then, it was necessary to get at the evolution and modifications of symbols. This entailed a comprehensive study of the gradual formation of language, institutions, ceremonials, customs, etc., etc. Whereas this was completely comprehended by any attentive student of Darwinian concept, previous attitudes of mind had taken into consideration chiefly conscious phenomena; they had neglected the unconscious, which were vastly more important. Expressed in a fractional form, one might compare the conscious as a numerator of one, while the denominator is made up of the accumulations of 100,000,000 years. Practically, all discussions of symbolic values had been expressed in terms of the numerator, the conscious moment, whereas in reality, behind every symbol there lay the entire past of man's evolution, back to the laws which govern the movements of the solar system. The symbol simply expressed the apex of this evolutionary system. "For man, then," he said, "it is more important to view the phenomena of life from the standpoint of symbolic significance." So far as the epileptic problem was concerned, this seemed the only possible thing that would lead to a complete view of the entire situation. It was perfectly evident to the simplest intelligence that a hormone disturbance could so change the neurological machine as to make it a bad energy transformer, and this might result in the phenomena known as an epileptic fit. Similarly, a tumor or other gross lesion could produce the same results through interference with the reflex arcs. But it should be equally evident if one should rise above the level of physico-chemical explanations that the epileptic phenomena resulted from failures of the symbolic functions of the human being. Dr. Clark had emphasized this attitude and had contributed largely to its proof.

Dr. John T. MacCurdy (by invitation) discussed Dr. Clark's paper. He said that he considered it a privilege to state the opinion that this careful work of Dr. Clark's represented the consummation of investigations which promised much for epileptics. That statement should be qualified, perhaps, by saying the promise was for those who were fortunate enough to come under Dr. Clark's care. Whether it would mean anything for epileptics as a whole would depend upon the attitude of the profession. The psychogenetic standpoint had not been adopted by many physicians for two reasons: first, there was a belief in the minds of the profession that some day, somehow, a psychophysical parallelism would be established. Whether this was to be reasonably expected one could not say, but, at least, none of the present methods of investigation showed that it was a hopeful view. There was probably no pathologist who had dealt with the anatomy of the brain who could say that there was a rigorous psychophysical parallelism. This was perhaps essentially a religious rather than a scientific faith. Advance of sci-

ence had been blocked by adherence to set opinions and the materialistic attitude of contemporary science represented a faith in the ultimate similar to earlier religious creeds rather than a scientific theory. Another tendency acting against the psychogenetic standpoint was that people flew from one extreme to the other. They said if treatment were not based on a physical conception, then it was Christian Science or New Thought. He held that the profession might well regard the success of quackery with scientific awe. It was a daily occurrence that patients left regular practitioners and were cured by charlatans. Results were results and should be studied. They should find out why the quacks cured, rather than eliminate psychic treatment as a delving in the occult. Mental events should be considered as belonging strictly within the domain of science. The human organism was not merely liver, heart, kidney and brain, operating as it were *in vitro*. It was a more complex structure with integrated functions. The attitude of the average medical man was that the patient was a conglomeration of organs such as might occur in an earthworm. There was no realization that a large part of man's adaptation was not on a physical plane, but was largely mental.

Translations

VEGETATIVE NEUROLOGY. THE ANATOMY, PHYSIOLOGY, PHARMODYNAMICS AND PATHOLOGY OF THE SYMPATHETIC AND AUTONOMIC SYSTEM

BY HEINRICH HIGIER

WARSAW

Authorized Translation by Walter Max Kraus, A.M., M.D. [New York].

(Continued from page 377)

9. Some vegetative reflexes are produced by a single stimulus; *e. g.*, the secretion of saliva. Others, however, such as the ejaculation of spermatozoa, require summated stimuli. In summated stimulation, the impulse begins at the end of the summation and travels from the vegetative centers to the neighboring spinal, or bulbar centers, or cross-striated musculature. For example, the act of vomiting, an anti-peristaltic contraction of the smooth musculature of the stomach, is followed by contractions of the voluntary pharyngeal muscle. Another example is the contraction of the cross-striated voluntary muscle of the constrictor urethrae, the bulbo- and ischiocavernosus, the muscles of the legs and back, subsequent to the contraction of the smooth muscle of the seminal vesicles, vas deferens and prostate.

These parallel manifestations which follow summated stimuli do not alter in the least the principal mechanism of the vegetative reflexes.

10. There are many exceptions to the general rule that the pre-ganglionic tracts are sheathed, the post-ganglionic, sheathless. Thus far examined, some of the pre-cellular esophageal and cardiac branches are gray and, on the other hand, some of the post-cellular ciliary and mesenteric nerves are white. The sheathed fibers of the *ramus communicans albus* are to be considered as those fibers which are pre-ganglionic and through which the spinal cord exerts its influence upon the vegetative ganglia and thus upon the nerves which spread to the corresponding end organ. The white branches are thus motor, centrifugal. The gray fibers, the *rami communicantes grisei* which travel peripheralward, are also motor in character.

They regulate the activity of the vegetative structures of the skin and of the visceral organs of the cranial, thoracic and abdominal cavities through the intermediary station of the ganglia in the sympathetic cord.

11. There are normally sheathless fibers springing from the gray branches or from the ganglia of the sympathetic cord whose path is spinalward or to the sensory spinal ganglia. We may only guess their function at the present time. These anastomoses may either carry recurrent nerves to the blood vessels of the vertebral canal, or sensory centripetal sympathetic fibers.

The communication which exists between both systems, that is between the sensory tracts and the sympathetic ganglia, may be observed in all the cranial ganglia. An example of this is the ciliary ganglion whose small branch (*radix longus*) passes to a branch of the first branch of the trigeminal nerve (*n. nasociliaris*).

The microscopic course of these fibers in the ganglia is not clear up to now since many authors have been of the opinion that there were no sensory centripetal elements among the fibers coming from the ganglion cells and that the sensory fibers going to the ganglia did not end therein but passed through or were merely mechanically associated. Experimental investigation with extirpation of sympathetic ganglia (*ganglion stellatum*, *ganglion cervicale*, *ganglion ciliare*) and subsequent careful examination of the cerebrospinal axis, or experiments which disturb the sensory supply of an organ with subsequent examination of the corresponding sympathetic ganglia, have not as yet yielded harmonious results.

Whether the sympathetic is really exclusively motor in character, centrifugal, whether the sensory impulses from vegetative organs pass through the customary posterior routes, and the sensory nerves to the cerebrospinal axis will be discussed later.

12. The "anlage" of the sympathetic nervous system stands, as is well known, in close relationship with the vascular system in all parts of the body. The maintaining of the close proximity of the sympathetic cord to the neighboring blood vessels is still obscure, in spite of the fact that post-cellular, sheathless nerve bundles or plexi, regularly pass to these.

An example of this may be found in all the intracranial ganglia, *e. g.*, the ciliary ganglion sends a fine branch (*radix sympathica*) to the ophthalmic plexus which winds around one of the cranial blood vessels, the ophthalmic artery. Whether stimuli are carried by these fibers from the plexus to the ganglion, or whether stimuli pass from the ganglion to the distribution of the vessels is still, physiologically speaking, unknown.

13. The function of the ganglia in the vegetative system is not entirely known. Outside of what has been mentioned above concerning the ganglia of the sympathetic cord, it may be said that they regulate the activity of the peripheral vessels, the sweat glands, the skin muscles, and also send fibers to all the internal organs and the large vessels of the thoracic, abdominal and pelvic cavities. All the blood vessels of the cranial cavity are supplied with nerves which have their origin in mesencephalic and bulbar parts of the vegetative nervous system.

Outside of these, the following structures exist: (a) Ciliary ganglion lying in the posterior part of the orbit which supplies the sphincter iridis and the ciliary muscle; (b) the sphenopalatine ganglia lying on the pterygo-palatine fossa which supplies the lachrymal gland and the mucous glands of the naso-pharynx; (c) the otic ganglia lying under the foramen ovale which supplies the parotid gland; (d) the submaxillary and sublingual ganglia which supply the corresponding glands; (e) the autonomic ganglia (the bulbar part of the vagus domain) which lie in organs and which supply the glands and muscles of the trachea, the bronchi, the heart muscle and the gastrointestinal tract from the mouth to the descending colon (Fig. 1); (f) the ganglion mesentericum inferium, hypogastricum and hemorrhoidale which lie in the upper and lower parts of the pelvis, supplying the muscles and glands of the descending colon, the sigmoid, the anus, the genital apparatus and the blood vessels thereunto belonging.

14. It is not possible to identify the individual functions of the cells of a ganglion, when that ganglion has cells whose paths go to different organs and control different functions.

Even the significance of the vegetative paths is not entirely clear. L. Müller observes quite justly that we do not know whether these tracts merely serve the purpose of transferring impulses coming from the spinal cord or whether they are also reflex paths bearing sensory impulses from internal organs which give rise to motor impulses. This much is certain, that after exclusion of the abdominal and cord ganglia of the sympathetic system, such organs as the heart, blood vessels, stomach and intestines continue their activity sufficiently to maintain life.

Inhibitory and accelerator activities are to be ascribed to the vagus and sympathetic nerves, while the initiation of activity seems to lie in the ganglion cells of the organs themselves.

15. In addition to the above-mentioned sensory stimuli, conscious or unconscious, and exogenous pharmacological stimuli as pilocarpin, atropin and nicotin, there are endogenous stimuli which

affect the activity of the vegetative nervous system. These are internal secretions as thyreoido globulin, adrenalin and the peristaltic hormone.¹

16. The intense reaction which all vegetative end-organs show subsequent to stimuli of cerebral origin, as for example, pain or rapid changes in the emotional sphere, is certainly a physiological characteristic. The reaction manifests itself clinically in terror, fear, pain, anxiety, anticipation, shame, annoyance and joy. The activities of the heart, pupil, vasomotors, sweat glands, gastrointestinal tract, bladder, tear glands and sebaceous glands, etc., are considerably altered.

H. Nusbaum states, and quite justly, that we can have no psychic experience of any kind, joy, sorrow or any other without there being reactions of a definite nature in our body. Strange as it may seem, it is true nevertheless that we should be without shame did we not blush, and without rage if our muscles did not contract, our heart beat more rapidly and thump in our breasts, and if we had not all those other changes in our vegetative organs which accompany the emotional activity of rage. "That the mind acts upon the body and the body acts upon the mind in that important sphere of psychic activity, the emotional, is quite clear."

It is significant that this psychoreflex manifests itself in many ways. The different emotional states have qualitatively different manifestations in various parts of the body.

That which applies to sensory stimuli and emotions also applies to every mental act of the individual. Every psychic activity, every voluntary impulse, every fixation of attention, every stimulating idea brings with it a reaction, for all psychic activities are accompanied by emotional variations and feelings. We are not only governed by pure sensory stimulation, but also by higher intellectual, ethical and esthetic feelings.

The proof of this which lies in the older studies upon psychophysical parallelism promises to be further confirmed in the future thanks to the more recent studies concerning the pupil (continuous pupillary activity) and the vasomotors (variations in the blood volume in the brain and at the periphery). The continual minute oscillations of the vegetative nervous system bear witness that the sum of stimuli going to the central nervous system is always varying; that the tone of the vegetative tracts is always varying (L. Muller), that the mirror of our consciousness, *i. e.*, our vegetative balance is never quite stationary (Bunke).

¹Cholin may be added to these.

Periscope

Psychiatric Bulletin of the New York State Hospitals

(Series 2, Volume 9, No. 1, January, 1916)

1. Studies on Alcoholic Hallucinoses. C. VOX A. SCHNEIDER.
2. The Relation of Pelvic Diseases to Mental Disorders. ANNE E. PERKINS.
3. Dry Permanent Standards in the Wassermann Reaction and a Technique Based on their Use. S. MORSE.
4. Clinical Studies in Epilepsy. PIERCE CLARK. (A continued article.)

1. *Alcoholic Hallucinoses.*—In this discussion of the alcoholic hallucinoses Schneider expresses views somewhat at variance with classical conceptions. He draws a distinct line between delirium tremens and the Korsakoff psychoses on the one hand, and the acute hallucinoses on the other. The alcoholic hallucinoses do not arise from the abuse of alcohol alone. Neither in the physical signs nor in the mental conditions are there evidences of toxemia. On the other hand, mental factors play an important part. Indeed, these clinical pictures are brought out by mental factors alone—cases in which alcohol can be entirely excluded as the cause. The views of a number of writers are cited to substantiate this. The acute alcoholic hallucinoses seem very closely related to manic depressive disorders, and patients suffering from this condition are of manic personality. An alcoholic hallucinosis, in a case which eventually develops in dementia præcox, is an incident in the course of this latter disease, rather than that there is any close relationship between the two conditions. To consider these views in more detail: The general question of alcohol as a cause or factor in insanity is first dealt with. Schneider quotes a number of investigators, W. Bevan Lewis, Mott, and others, to the effect that alcohol has been overrated as a cause of insanity. The abuse of alcohol is very prevalent among healthy-minded people, outside of institutions, and an alcoholic heredity is not limited to the insane. The writer does not believe that the homosexual tendencies attributed by some writers to alcoholics are to be found in the case of the hallucinoses. These individuals generally lead normal sexual lives. Hirschfield, in an analysis of a thousand homosexuals, found that 16 per cent. only were married, 50 per cent. were impotent and 53 per cent. never attempted coitus. In the hallucinoses 77 per cent. were married, and nearly all were vigorous and normal in their sexual life. The question of the relationship of the alcoholic psychoses to other psychoses is considered. The writer does not think they have much in common with dementia præcox. The personality is quite different. In the hallucinoses the personality is of the open and frank type, and the individuals are robust, jovial and social. This is in contrast to the well-known seclusiveness of dementia præcox.

A number of facts are referred to to show the relationship of manic depressive disorders to the hallucinoses. Kirby's findings in Race Psychopathology show that the Irish are most subject to both alcoholism and manic depressive insanity. H. M. Pollock shows that the usual age of onset in alcoholic psychoses is forty-two years. Dementia præcox begins much earlier.

The alcoholic has the same unstable, social makeup as the manic, and the writer thinks that the alcoholic hallucinosis should be allied to the manic depressive type, or at least to the functional recoverable psychoses. Schneider next raises the question whether alcohol is the all important factor in the alcoholic hallucinosis. Many sprees are entirely without mental symptoms. When the hallucinosis does occur mental factors are prominent precipitating causes. One finds just such precipitating causes as occur in manic depressive cases. Moreover, acute hallucinosis, clinically identical with the alcoholic type, have frequently been observed where no alcohol is present. Such cases have been observed by a number of writers.

In his material the writer has made the following observations: (1) "That the patient has suffered many previous and succeeding debauches without mental trouble; (2) that there is always a precipitating shock exclusive of alcohol; (3) that subsequent debauches do not cause mental breakdowns unless another mental shock is experienced. In fact, readmissions of the hallucinations are not the rule; (4) that the condition follows, in frequent cases, withdrawal of alcohol, attendant depression and worry, while the content of the hallucinosis is determined by the cause of the worry; (5) that the makeup is in the majority jolly, open, sociable, rather excitable and distinctly frank." A number of case reports are given to illustrate these views.

The article brings to our attention the fact that the alcohol hallucinosis depend upon factors other than alcohol alone. Mental causes are important, and possibly are necessary factors in the evolution of the psychosis. Schneider goes rather farther than this in his concluding paragraph: "Alcoholic hallucinosis is a misleading term for the psychosis, because definite precipitating factors other than alcohol are present and necessary in its production, and are often reproduced in the psychosis, which shows their importance; because alcohol is not the only factor or the most important factor or even a necessary factor in its production, as shown by numerous hallucinosis identical in course and outcome, where alcohol and other toxic factors can be excluded; because debauches, both before and after attacks, when the mental precipitating factor is absent, cause no difficulty; because other psychoses in the same individuals, in which alcohol plays the same part, are not called alcoholic."

2. *Pelvic Diseases and Mental Disorders.*—The study of the relation of pelvic diseases to mental disorders is by no means a new one, but so many extravagant statements about the cure of mental disorders by surgical operations have been made from time to time in the past that it is refreshing to have the views of one who has first-hand knowledge gained by long experience. The views here expressed show broad understanding and good judgment. The article may be studied to advantage both by the surgeon who has the preconceived idea that much insanity may be cured by some sort of a gynecological operation, as well as by the psychiatrist, who thinks that in attempting to relieve mental symptoms by surgical interference, little or nothing is to be expected.

Dr. Perkins, whose observations have extended over a period of eight years, made pelvic examination upon four hundred and seventy-eight of the patients admitted; 65 per cent. were diseased. Many different disorders were found, among the most frequent being lacerated perineum, retroversion, lacerated cervix, endometritis, parametritis, salpingitis and fibroma uteri. Relatively more disease states were found in the manic depressive group (manic depressive 78 per cent., dementia præcox 58 per cent.). This is explained by the fact that the manic depressive temperament is peculiarly sensitive to various influences, mental and physical. The pelvic disease appears to be but one factor etiologically; yet in some cases the mental state appears to be a direct result of this diseased condition, and the mental symptoms are relieved

by operation. There is probably a psychopathic tendency in such cases, but they might escape an attack if they remain in good physical health. Cases are described in which a surgical operation relieved a diseased pelvic condition and resulted in prompt mental recovery. One case recovered promptly after an operation for retroversion. Some years later after an automobile accident the adhesions were broken up. The patient again became depressed and her mental symptoms were again relieved by a ventral fixation. The patient again became depressed in the menopause, however, and no pelvic disease was demonstrated. Another case developed a depressive exhaustive psychosis after a severe infection with gonorrhoea which was followed by peritonitis. She eventually recovered after careful gynecological treatment. A third case was relieved of an attack of depression by a ventral fixation. This same patient developed a depression two years later. A hysterectomy was performed before her admission, but this time she did not recover until several months' residence in an institution. Of the 478 cases examined, anomalies of development of the generative organs were found in eleven instances. No anomalies were found in the epileptic group.

The manic depressive cases were most benefited by operations, the dementia præcox least. A number of interesting cases of the former type were observed. One elderly woman had apparently been kept maniacal for months by a severe prostatic, hemorrhoids and a double inguinal hernia. She recovered promptly after the operation and has been healthy and well ever since. One patient with involuntional melancholia made a surprising recovery after the removal of the cervical poly, the bleeding of which had convinced her that she had cancer.

Remarkable improvement was noticed in one case of epilepsy of twenty years' standing. This patient had a lacerated cervix and perineum on admission. She was ill-nourished and seemed demented. She improved wonderfully after the operation. Her convulsions came down from thirty-nine in two and one half months to two in five months. She went home and has been capable in her housework ever since, having but one or two convulsions a year. Another epileptic was greatly benefited and able to leave the hospital after hysterectomy for a fibroid. Sixteen cases of dementia præcox were operated upon without mental benefit.

In a number of cases attacks were precipitated by operation. The post-operative psychoses bore no constant relationship to the severity of the operation. The writer discusses the question of operations in nervous and mental patients, and the knowledge which she has gained could be utilized to advantage by the surgeon who has occasion to operate on this type of case. Patients without nervous capital should not be operated upon if it can be avoided; serious neurasthenic states or psychoses may follow. The after care is important, and the practice of hurrying patients out of the general hospital in a few days after a laparotomy, to take up their home responsibilities, may lead to serious results. In mental conditions arising from artificial menopause a number of vasomotor disturbances and emotional disorders are met with, especially if the operation is during the child-bearing period. These symptoms generally disappear after a few months. The fact that the patient has knowledge of the character of the operation may aggravate the symptoms. The writer adds an interesting note on some observations she has made of insane imbeciles. These findings are quite in keeping with numerous other reports on this subject: "Among 24 cases of insane imbeciles studied, 15 were known to be infected with syphilis, gonorrhoea or both; 19 had been sexually irregular, 9 had had illegitimate children (one three, one five). Two, who were married, had each five children."

3. *Permanent Wassermann Standards and Technique.*—This article deals with the technique used in the laboratory routine, routine tests, etc., at the

Psychiatric Institute, Ward's Island. The plan is to standardize all reagents and methods of procedure so that all reports to the various state hospitals will be uniform. The details of standardization and technique are given in detail. They are not suitable for abstract.

4. *Epilepsy*.—Continued article.

SANGER BROWN II.

MISCELLANY

SYNTHETIC GENETIC STUDY OF FEAR. G. Stanley Hall. (*Am. Jour. Psychology*, 1916.)

Hall defines fear as an "anticipation of pain," not a prevision but a generalized forefeeling that something more painful is threatening. This can only be based on some former experience in individual or racial existence. Fear reaches back into the past even while its function is to prepare for the immediate "next thing" which will be an efficient reaction when the dreaded stimulus comes. In this way it contracts the past and the future into an intense, full moment of the present. By this setting toward an intense response it has become an important educative force and a chief spur to psychic evolution. At the same time it limits the field of interest and attention, in its preparation to meet the situation, and inhibits certain psychic processes and organic activities while intensifying others. It is therefore both dynamogenic and inhibitory. For a time the most incoherent and convulsive movements may be the most advantageous, but these disorganize coordination and ordinary modes of adaptation, and repeated fear leads to the establishment of the unusual reactions. But it also sets in motion the stronger reactions which arouse vitality, stimulate to ventures and risks in order even to create and enforce these higher reactions. Man learns to control fear and make it the servant of the higher culture.

The manifestations of fear may be studied in endless variety and degree, so extensive has grown its hold upon mankind. This multiplicity, however, is subject to synthetic arrangement and may be traced to one generic root. This Hall finds fundamental. It belongs to the most elementary reactions tending to the preservation and recuperation of life. Its origin probably lies in the first amebic reflex withdrawal from pain stimulation and has increased in complexity up to our present day defensive and offensive setting toward objects of fear. It is then an early psychic element on the basis of affectivity, a flushing up which follows hard upon the evolution of pleasure-pain. From this a diathesis of fear has been gradually built up and it is this that is inherited, rather than the effects of specific objects feared. A consideration of shock and the reactions aroused by it illumines the nature of fear, and reveals the all-pervasive traces of ancestral experience. Shock is peculiar in that it comes unanticipated, it takes us without warning. The higher psychical functions are not prepared for it. It calls into action rather those earlier responses which have been long side-tracked and dispensed with. It activates the lowest level of the nervous system, producing elementary somatic disturbances, respiratory, circulatory, secretory, muscularity. It may release action upon any level, but its effects are usually reversionary with a downward tendency on the phyletic scale. Where these stimuli have been adequately met in the past heightened experience has formed the power to deal with them, but often inadequately received they tended to develop and fix a low level response which is less under the control of the cortex. This form of reaction can be found all the way from the reverse reaction of the mutilated plant up to the "moral relapse to savagery" of criminals.

Shock comes, then, without anticipatory fear, but develops a new fear of itself. We dread the pain and strain that it gives, but even more, perhaps, the revelation to ourselves and others of our reactions on these primitive

levels. The fear then becomes an obsession to which we react by a tension and a repression, out of which in turn grow the substitutions.

Hall refers here to Adler's study of compensation. (A. Adler, *Studie über Minderwertigkeit von Organen*, 1907, p. 92. also *Über den Nervösen Charakter*, 1912, p. 195.) This is a process, mostly psychic, by which a congenitally inferior or subefficient organ is compensated by subsequent overdevelopment or by the vicariating of some other organ for it. The nervous system reinforces through this law of compensation both atrophy and hypertrophy in the effort to adjust to effective adaptation. If the brain fails in this effort the neuroses and psychoneuroses result. There is a sense of insufficiency and incompleteness. Out of this feeling of inferiority, inadequacy and great inner intension, a general anxiety arises.

"Sex anxieties," Hall says, "are symbols of this deeper sense of abatement of the will to live, . . . to illustrate in our personality the whole estate of man." Sex plays a large part because its pleasures are most intense and vitality at its height during sex activity; also because upon it depends the immortality of the race. It is, moreover, through sex that inner disharmonies are transmitted, while on the other hand it performs the greatest service in restoration through love and cross fertilization. Sex defect, however, both impairs the efficiency of inheritance and is in itself most readily inheritable, so that here we have the most favorable soil for anxiety and for specific fears. This fearsomeness is easily transferred to other realms and hides itself under substitutions and symbolisms. Other forms of fear have their own independent causations, although they may use in part the same mechanisms found in sex fears.

Hope and fear, then, are based on the desire to attain the fulness of development, and fear and shock warn us that we are falling short of this attainment. From the genetic standpoint, according to Hall, hope and fear are the creators of consciousness itself, from its lowest to its highest forms.

The author goes on now to discuss a number of specific phobias, which he traces in the multiplicity of intensive experiences which have marked the long history of the race. His ingenious tracing of the various forms of fear, typical of countless others to which he can only refer, carries conviction. These past experiences, which were vital at certain periods to the race, must have left some trace.

But there is a different attitude toward the whole question. It is as if Hall had reached the genetic beginning only of the mechanism at work and traced this widely in its manifestations and its influence upon men. Even here he seems to have departed somewhat from the conception of an inherited diathesis rather than of specific object fears. His study of the past lies among the obvious causes and reactions of fear which accompanied man's evolutionary history.

There was some active cause stirring beneath these, some energizing force. Hall is not entirely unmindful of this. He alludes to it in "the will to live" to reach "the whole estate of man," but he has strangely disregarded it as the motive power which would have unified this discussion, focussing all fear in one energizing source. Instead of this he leaves his reader with a sense of scattered disunity in his thought.

He has carved out and set apart sexual fear, disposing of Freud's conception as too narrow to include all fear. It is just here that he misses the "libido" energy concept that would have embraced all fear in the one vitalizing source. He uses the term sex in the old limited way instead of giving it the broader all-comprehensive concept of the dynamic life force, immortality principle. His failure to stand in this attitude toward his discussion leads to the overemphasis of the nutritive element in the struggle of man with his environment which produced the fears. This again is due to the

occupation with the obvious rather than the fundamental and dynamic in the consideration of these fears.

It is difficult to see why certain objects which he discusses, or indeed the many which he only mentions, should have become so impressively objects of fear that we still react to them as our ancestors did in other circumstances, when such reaction was a part of the adaptation necessarily in process of acquisition, unless there was some cause inherent in our predecessors as in us which made these objects of supreme importance.

One can utilize the facts which are brought forward in this discussion and perhaps find in them the manifestations of the libido concept, which will help one to a more pragmatic understanding of fear. Hall has made passing allusion to the ambivalence of fear and desire, but without this unifying libido concept it could not find the place in his discussion that it demands. External objects of fear which must be dealt with, at once and effectively, may be soon disposed of, but that anxiety and dread that linger within one arise from the frustration of desire due to the increasing restrictions of society. Thus certain objects bound up with desire become constant objects of dread and fear and call forth strong emotional reactions.

Some of the elements of the fears considered become significant from this point of view. Hall mentions particularly the various attributes of the serpent which impress different individuals. Why should this one enemy of mankind have produced such a profound and lasting impression upon his fears unless it stimulates fundamental desires symbolically bound with these very characteristics? If we consider thus the serpent's phallic significance, it is far easier to explain the universality of snake worship and reverence, as well as the types of fear which they inspire to-day. The fear of cats, too, which is taken up in great detail, can be referred to a related source of desire symbolically expressed, and the peculiar manifestations of this phobia take on an explicable significance. They seem to rest upon the "polymorphous perverse" libido channels of infantile reactions.

Our attention has been directed to the respiratory reactions as the response to the earliest libido demand of the newborn child. This most vital demand not only persists as necessary to existence, but it is intimately bound with our pleasure-pain reactions, not the least in the sexual life. It is not strange, therefore, that intense and complicated anxieties arise in this connection. Pavor nocturnus doubtless represents low level reactions, which Hall attributes to the insufficient resistance on the part of a neurotically disposed child to the impulses which arise in the deepest layers of sleep. Then, he says, we have slipped down into the earliest ages of human life and any disturbance arising from without, or from within the neurotic constitution, releases these early defensive mechanisms, with which our arboreal ancestors, perhaps, met the ever-present disturbers of sleep. Again, he but touches upon the real causal explanations. He says that pavor lacks the analysis that Freud has given to sex. It is, on the contrary, the broader inclusiveness of Freud's sex theories that have covered pavor nocturnus and reveal in it the fundamental libido striving, however much it may utilize the early response levels. The respiratory striving is manifest, together with other reflex activities, but these are all bound inextricably with phantasy formation which seeks the various energy outlets.

Ereuthophobia finds its motivating cause in this energy concept. Hall reminds us how much more important was once the function of the skin than it is to-day. But this is not alone the cause of the marked reactions and the related phobia considered under this head. The skin was then as now an organ through which the libido could find outlet at all levels, in reflex activities, in vital contacts and in the gradual sublimation of these. Need for protection and defense, or even the more obvious shame, which gradually

arose, explain only to a slight extent the extensive meaning the unconscious attaches to the skin as a libido territory, especially with erotic significance.

Claustrophobia and agoraphobia, too, have their chief determinants in the unconscious motivation and energizing of the early acquired reactions, and these latter can serve to illustrate but not explain the peculiar manifestation of these as of all phobias and their intensive and-persistent influence upon the individual. A reflex memory of troglodytic days may abide but the infantile desire after the mother's womb, a return forbidden by reality, is far more efficient to activate an ambivalent anxiety into an intense fear of wells, such as Hall mentions, or of any of the objects which the neurotic finds.

Fear and desire, so closely bound, arise from the one source. This was already an activating, energizing power with our remote ancestors, so that their fears too arose from it. External causes and the reactions may have intensified the fears and serve to some extent to condition still our feeling and behavior, but the fundamental explanation lies in the immortal libido.

JELLIFFE.

THE DISCOVERY OF TIME. James T. Shotwell. (The Journal of Philosophy, Psychology and Scientific Methods, Vol. XII, Nos. 8, 10 and 12, April 15, May 13 and June 12, 1915.)

This is a highly interesting discussion of time, its gradual appreciation and appropriation by man. Time is presented in such a vital manner as will surely recall the fact of its reality. This the author says there has been a tendency to overlook. It is so much easier to measure man's conquest of things of space, that the other half of life is neglected. Time is no less real but it belongs to that everlasting flux ceaselessly appearing, ceaselessly dissolving within the heart of things, and all that is seized of it, in the very apprehension, becomes at once static, no longer vitally real. However, for long ages, time was apprehended only in the deeper sense. Men had not learned to measure it for exact control of nature and regulated activities. They lived in the present, but dimly emerging from the emotional stage, where the intellectually guided imagination was as yet barely taking hold of the future, an attitude which directs interest still to the romance of vague, indefinite time rather than to the well-defined times and seasons marked by dates. Necessity, however, compelled man to find some way of thus marking time if he was to advance and control the course of things. Foresight depended upon a practical grasp of it, and a system of measurement must be found. Shotwell guides us through a rapid survey of this effort on the part of the various advanced nations of antiquity. The periods of the moon were tried and long held sway. The Egyptians early discovered the more accurate dependence upon the sun, while Assyria began late in her history to develop a real knowledge of astronomy. The thrusting of the days of the week into the month regardless of the time division illustrates the preponderance of primitive superstition and belief in the consideration of time. The sense of the deeper vital reality, however mistakenly manifested in superstition, was too potent to be easily replaced. Hence the slow, long delayed growth of the practical system. Shotwell remains upon the surface of these things but seems to be groping for the more profound interpretations which are fraught with the most real meaning of time as of all things. Of the surface achievement he has promised more chapters in the future.

JELLIFFE.

Book Reviews

BODILY CHANGES IN PAIN, HUNGER, FEAR AND RAGE. An Account of Recent Researches into the Function of Emotional Excitement. By Walter B. Cannon. D. Appleton and Company, New York and London.

The interrelations of the vegetative and psychic levels of the nervous system, and the interdependence of their activity demand increasing attention. Their importance is assured and they have entered the field of careful experimental research. This contribution from the Harvard laboratory speaks strongly, from the physiological side, of this fundamental interplay of mind and body, and suggests the value of this in the economy of life.

The book is the result of four years of very definite experiments upon the effect of some of what the author calls the "major" emotions upon bodily conditions. Certain external signs of physical response to emotional stimuli are easily recognized, but it is the reaction of deep-lying organs which calls for investigation, and which is, moreover, of vital importance. This has been the subject of the study.

Cannon first briefly reviews the results obtained by previous observers in regard to the relation of the emotions to the digestive processes, and thus brings into view the antagonistic action of the three different divisions of the vegetative system. These he then very graphically presents, both anatomically as well as in their threefold functioning. The cranial autonomic serves to conserve the resources of the body, the sacral division to release tension, and the sympathetic, whose action is more extensive and diffuse, rather than restricted, also acts as an antagonist, whenever it comes into contact with either of the other divisions.

On this physiological basis Cannon's observations were made. In conditions of emotional excitement there are obvious, external evidences of the activity of the sympathetic nerves. But some internal change seems to take place which determines a prolongation of the first direct effects.

This phenomenon led to a detailed study of the secretion of adrenin from the adrenal glands. These glands are supplied by the sympathetic system, it has been proved, and when this system is activated by the emotions, there occurs a marked secretion of this substance. This fact is attested by varied experiments described in detail, and so also is the effect of the secreted adrenin upon various tissues of the body.

These can be merely indicated here. Through the action of adrenin sugar is increased in the blood; by its influence the blood supply is increased in those organs likely to be called into activity in response to the emotions; muscle fatigue is abolished; and the coagulability of the blood is hastened. These are all unconscious processes, and this causes the very promptness of their response which establishes their utility.

For these involuntarily produced effects of the activity of the sympathetic division amply prepare the body for the reactions toward defense or toward the violent exertion which the emotions demand.

Special attention is given to hunger, which Cannon finds to be the result of reflex contractions of the alimentary canal, or in other words, "a signal that the stomach is contracted for action." It is therefore classed with the

other primitive emotions as a determinant of the reflex activity of the body.

The interrelation of the three divisions of the autonomic system manifests itself in the dominance of the sympathetic division, in its antagonistic action in regard to the other two. This is demanded by the response to quick action called forth by the emotions. But it illustrates also the harmful effect of uncontrolled emotional reactions which hold the functions of the cranial and sacral divisions of the autonomic in abeyance.

Sometimes, however, the sacral innervation seems to prevail even under great emotion. Cannon admits the difficulty of explaining this. This is suggestive of the extent of this problem still before investigators, for the work is only begun. The finesse and extent of the emotional interactivity with physical reactions, calls for all the resources of psychical as well as physiological investigation.

Cannon closes with a timely plea for a rational outlet in healthful, manly sports for these unquenchable primitive emotions and their reflex activities. Modern militarism, he says, in its highly perfected artificiality no longer provides them.

In general survey, one might say that this work marks a great advance in the experimental method to render provable a number of facts which have been known empirically for thousands of years. The literature of psychiatry abounds in observations with which the author is unacquainted, hence a certain not unbecoming naïvete.

One only has to go one step further to prove the entire range of the psychoanalytic observations of the past decade and that is to recognize the force of the emotions which are operating under unconscious repression. Cannon is working with evident conscious emotional reactions, the psychoanalyst with repressed ones. Hence, Cannon's work will be a useful harmonizer and tend to show from the physiological side the truths underlying the whole psychoanalytic situation.

JELLIFFE.

EROS. THE DEVELOPMENT OF THE SEX RELATIONS THROUGH THE AGES. By Emil Lucka. Translated by Ellie Schleusner. G. F. Putnam's Sons, New York and London.

There is a twofold power in this book that compels attention from beginning to end. It lies first in the form which portrays with a new vividness the growth of the love life in the race embodying it in men who move over the stage of history, particularly of that of the middle ages, that period just emerging from obscurity, and who are here depicted clearly, distinctively in their service in representing and forwarding the advancing stages of the erotic nature of man. In the second place there is a power in the author's thought and the consistency and conviction with which he maintains his thesis which no less sustains our interest, and which the evident sympathy and comprehension of the translator have preserved to us in this edition.

Lucka briefly reviews the sexual life of early man, in few words setting forth strikingly its salient features, and showing that it was in no wise connected with love. Even among the Greeks love was a sentiment unknown in marriage, confined to a few legends which rather foreshadowed a future ideal than represented actual conditions. To early man sexual satisfaction was easy and natural. It brought with it no problems, no complications. It was an incident of easy fulfilment, then easily forgotten, while man passed on to the acquisition of necessities in the struggle with nature.

There arises, however, gradually some sense of individual desire for power, for organization, for restricted sexuality, for recognition of a man's own offspring. These, even later more highly developed monogamy, are based on economic reasons, sexual love has not yet entered.

But with the rise of Christianity a great new factor has appeared which is to dominate Europe and distinguish its thought and feeling from that of the older civilizations. This is the element of personality. Lucka introduces here a chapter on the Birth of Europe in order to develop a background upon which he can trace the influence of this new factor upon erotic feeling and the new manifestation of erotic desire that wrought itself out. True to his definition of history he introduces it to present not a record of facts but the creative development of new values in desire and their achievement through representative men. In the erotic life this new sense of personality was a yearning after metaphysical love. The asceticism of the Church had condemned sexuality establishing a sharp duality between the sensual and the spiritual, which belonged to another world. And yet men had awakened to the joy and inspiration of a personal love. It formed the theme of song and story, created the devotion of chivalry, it was poured out even upon nature and transformed the perfect form of ancient sculpture into vital, breathing structures of Gothic art. How then shall men reconcile the power of this new love and the need of deliverance from the evil which is condemned.

It remained for certain great souls to grasp the metaphysical love, deify its object and project it into the heavens, there to unite it with man's salvation. Thus it glorifies the Virgin Mary, placing her even on an equality with God. It raises the individual loved one to Mary's side and brings her to the salvation of her lover. "Dante possessed this vision," Goethe found it, but for him it was necessary to "seek, strive and err." This metaphysical love reached its tragedy in Michaelangelo, for whom this love became greater than his work and made all his creative activity seem as nothing.

The sexual, however, is never denied. It exists undiminished but apart from the metaphysical ideal. It is not strange, therefore, that men crave still a new development which shall in turn have its exponents in those who apprehend and make real a further stage in erotic evolution. The demand of modern life is for a synthesis of these two elements of eroticism. The object of love must be no longer removed to a transcendental sphere but must satisfy the personality with the higher spiritual love in the ideal woman found here upon earth.

As the individual epitomizes the history of the race, so each man must himself pass through these separate erotic stages. Wagner was the great representative of this principle, and he has given immortal expression to these periods of development in the stages of his musical production. In Parsifal Lucka sees a possible foreshadowing of a plane of erotic development yet to be reached, when sexual love shall have been finally outgrown and replaced by mysticism.

Such is the thesis of the book. But as one follows its stirring presentation, one is dashed now and again upon some rock of resistance and can but feel that it is the author's own complex, that his power symbol and satisfaction lying in the metaphysical and transcendental are sweeping him on to unfounded conclusions divorced from solid reality, the actual evolutionary achievement of the race. Lucka anticipates the criticism that he has departed from the accepted theory of the sexual as the base of all love. It would seem to us that his whole book is an intense revelation of the sexual in its broadest sense, the truly and completely erotic underlying all these manifestations of love, even the most exalted striving and attainment of greatest metaphysical souls. To a certain amount of mysticism he attributes a sexual basis. To us the difference in these manifestations would seem to lie not in the source but in the degree and kind of sublimation conceived and attained.

Then, though he has skillfully touched upon the nature of the sexual life of early man, researches into primitive customs certainly do not reveal such simplicity of the erotic life. True, primitive man is not yet the victim

of modern complicated repressions, but the sexual seems to press upon him from every side, demanding countless taboos, burdensome restraints, endless ceremonials, even while allowing him a liberty and license which prevent the psychical complications that cultural restraint brings in its train.

Nor again does the position of woman in eroticism seem so simple as the author sees it. He admits here the pathological attitude that hysterically finds a mystic outlet for genuine sexuality, but on the whole he conceives of woman as serene and unperturbed throughout man's long struggle in erotic development. Again he seems strangely unmindful of the enormous part that sexuality has played since the dawn of human life, a part in which the course of woman's erotic life also has passed through stages of such varying significance that she too has been the victim of violent repressions which have created for her psychic problems and developmental attitudes no less urgent than those of man.

Lucka's denial of "Schopenhauer's instinct of philoprogenitiveness" would lie behind this attitude. To assert that there is an instinct of love apart from and beyond the reproductive desire most broadly considered would draw false lines of distinction through the erotic life and its racial history. This too would lead to that chapter which seems to accept the love death as a form of high attainment in the spiritualized erotic sphere instead of giving its true auto-erotic value.

The book is full of stimulating thoughts and it reaches out to a high sublimation of love. Yet by its very force of thought combined with its power of diction one feels hurled from the true foundation of things and projected upon the author's own complex reactions.

JELLIFFE.

APPLETON'S MEDICAL DICTIONARY. Edited by Smith Ely Jelliffe, A.M., M.D., Ph.D., assisted by Caroline Wormeley Latimer, M.D., A.M. D. Appleton and Company, New York and London.

The scope of the purpose of this new dictionary is denoted by the choice of the editors who have prepared it for use. Dr. Jelliffe and Dr. Latimer, together with those who have collaborated with them, represent the various fields of science which belong to medical work and contribute to its knowledge and activity.

Especial stress has been laid upon the newer terms which have arisen to express the advance of knowledge and the broadening of concept in the fields of neurology and psychiatry. This has been done in that spirit of open-mindedness and comprehensive grasp of pragmatic principles, which must prove the efficiency of the language tools that are used and open the way to a newer, broader and more effective service. Terms are conceived and defined in that broader attitude that anticipates and furthers development through serviceableness, and which is the attitude of the newer psychology and philosophy of nervous and mental as well as of all disease.

To this pragmatic end there has been an elimination of matter grown superfluous, a simplification of external form and expression. This has produced a volume of convenient size and extent for practical working purposes.

There is room, however, for greater clearness of detail in form, and for the further extension of the principle of workable utility in arrangement. This latter would revolutionize the old crystallized forms of classification as we see them in the table of nerves, for example, and make the classification illustrative rather of the actual functional, experiential source of development. To such alteration, however, the fundamental attitude of the dictionary opens the way.

A valuable appendix has been added which will serve as a practical guide in various directions where technical accuracy is of special importance.

L. BRINK.

NATURE AND NURTURE IN MENTAL DEVELOPMENT. By F. W. Mott, M.D., F.R.S., F.R.C.P. Paul B. Hoeber, New York.

This small volume is fairly crowded with facts and suggestions, all of fundamental importance and sound value. In the first place it comes from one familiar with a subject vast in its origin and in its possibilities for the improvement of the race and of the individual. Then, though the subject matter here is presented in a somewhat rhetorical style as befits rather the lectures in which it first appeared, yet so truly scientific are the given facts and presented in so direct and forcible a manner that they appeal not only to the social worker, the teacher, and the intelligent parent, but are of distinct value to the physician as well.

For the outlines of the structure and functioning of the nervous system are very carefully though briefly given, with special attention to the history of development of both in their relation to their environment, prenatal, natal and postnatal, and in the effect of the environment as well as heredity in determining the mental character and ability.

In the latter part of the book attention is given to the various ways in which this question of environmental conditions or nurture may be theoretically considered and practically worked out through medical inspection in schools, separate schools for the physically or mentally disabled, care and instruction of the mother and all the ways which are being entered by the social worker.

It is not, however, this general outline that rouses our interest chiefly. Dr. Mott's facile handling of the subject of heredity emphasizes with convincing clearness the importance of inherited mental tendency for strength or weakness rather than of specific factors or agents pathologic or otherwise, and with this the hopefulness that lies in the social watchfulness which can counteract the inherited neuropathic tendency, removing the causes which would attack it and moreover strengthening the weak points by proper measures.

The inherent potentiality of the brain is capable of marvelous development through the proper associative paths, even when it lies dormant for want of stimulus from without, which is most strikingly illustrated in the cases of Helen Keller, Laura Bridgman and Marie Huertin, who showed this potentiality in a marked degree when avenues of approach had been found for them other than those of hearing and sight, from which they were cut off.

Herein lies the social heritage which has formed a brain of superior tendencies, abilities, potentialities, which is apart from the acquisition of language and all other external tools and products of the ages of racial advance. The author has not gone at all extensively into the purely psychical factors behind mental behavior, but there is no confusion between the physical basis of mind and the mental activity itself. Here again he moves with a clear handling of facts and suggestive theories for further research, as, for example, in the action of the chemical hormones upon the nervous system, and therefore their relation with the mind.

It is possible only to point out a few of these topics that follow rapidly upon one another in the author's comprehensive and well grounded presentation of the subject. The whole attitude of the book is well worth closer attention, while its substance and form are stimulating to a high degree.

JELLIFFE.



PROFESSOR ALBERT VAN GEIN CHIEN

Notes and News

Obituary

The passing of a great man calls upon us to consider what advance has been made through his life, how far his activities and researches have brought us to a higher plane of achievement.

The death of many notable leaders in neurology and psychiatry in the last few years turns attention to the increase in knowledge and effectual service in these fields, which have resulted from the work of these leaders and revolutionized the theories and methods of the laboratory as of the clinic.

The Editors of the JOURNAL have recorded by special obituary notice the loss among its own countrymen in the recent past of such men as Weir Mitchell, D'Orsay Hecht, Isaac Ott, and others. It wishes to present as well some account of the lives of those who are laying down their work in foreign countries, in order to mark the impress of these lives upon neurological and psychiatric progress in the individual service they have rendered to it.

ALBERT VAN GEHUCHTEN

The death of Prof. van Gehuchten, of Louvain, marks the passing of a masterly figure in the neurological world. The tragedy that befell his work as a result of the destructive conflict waging in Europe has served to throw his personality and work into even stronger relief.

His death occurred in Cambridge, December 9, 1914, where he had taken refuge a few months previously when the entrance of the Germans into Louvain had interrupted his work as professor of anatomy, pathology and treatment of diseases of the nervous system in the University of Louvain. Valuable records of his work extending over the past ten years were lost in the destruction of his city and country homes. Warmly welcomed in England van Gehuchten had rallied from the effect of the catastrophe and was devoting himself with a return of his former ardor to his work, for which the English had put at his disposal the laboratory of the Research Hospital together with a contribution from the Rockefeller fund. His brilliant methods of work combined with his purely disinterested spirit of scientific research, illumined now by a hopeful courage that could surmount his misfortune and enable him to begin work afresh, won for him a still greater measure of

that esteem and affection which had been his from students and colleagues.

He was however suddenly attacked by an illness which necessitated an operation. This was successfully performed and recovery seemed assured when a severe distress in the region of the heart was followed quickly by his death.

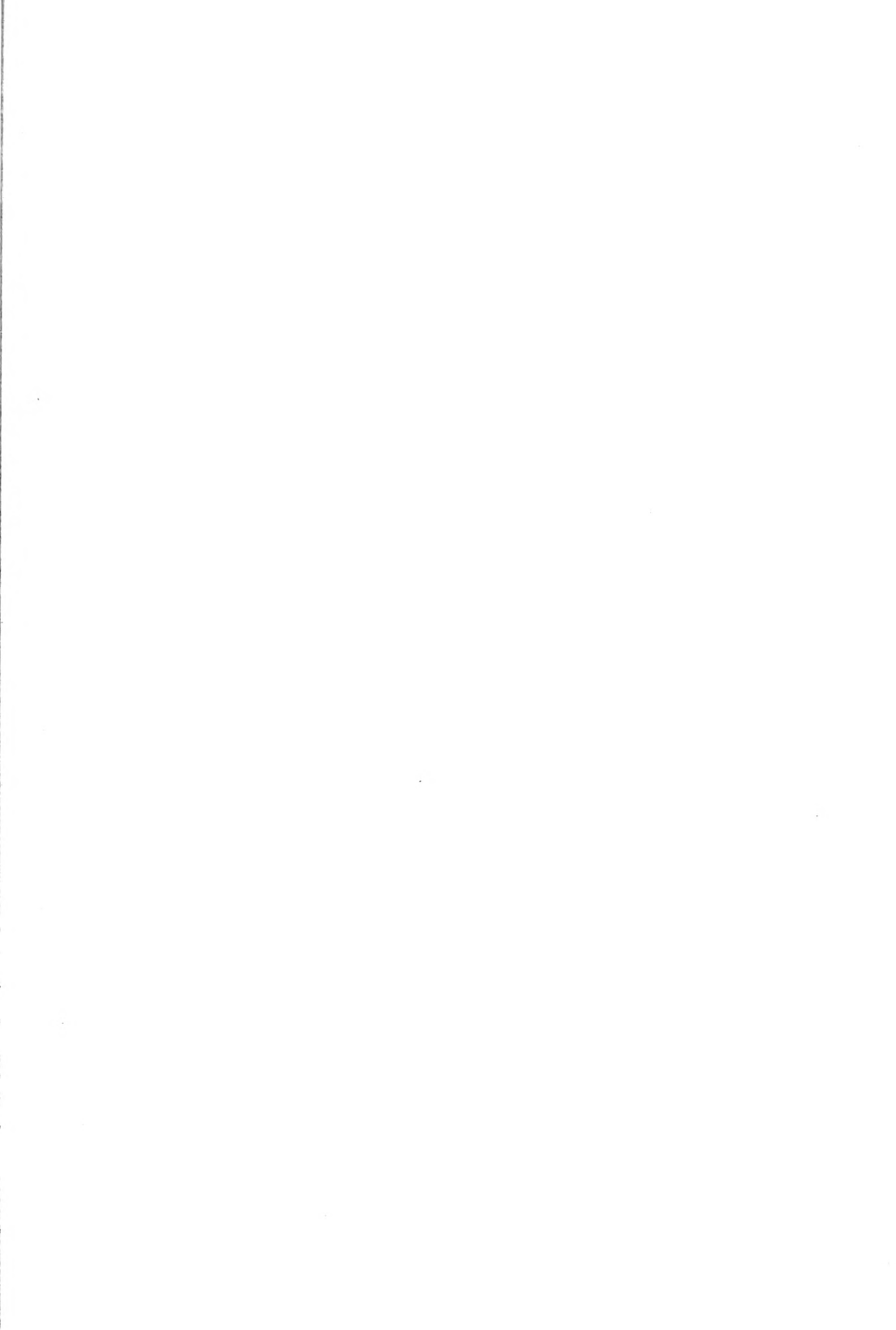
His first publication, in 1886, on the structure of the muscle cells, marked the beginning of his skillful investigation and brilliant exposition in the field of biological science, which he later developed particularly in the study of the central nervous system.

He largely contributed to the establishment of the present day indispensable conception of the neuron as an independent and fundamental unit, with its protoplasmic prolongations for cellulipetal transmission and its axis cylinder prolongation for cellulifugal transmission, and the conduction of impulses from one neuron to another by the propinquity of the terminals of the axis cylinder of one neuron to the protoplasmic prolongations of the other. This formed the basis for all his later researches.

He refined the methods of Golgi in the examination of the finer nerve structures by his methods of methylene-blue staining. His study of the true origin of motor nerves rested upon his investigation of the phenomena of chromatolysis. Later he studied with an exactitude of result the intracerebral or medullary course of the motor nerves and certain central nerve tracts, and the origin and termination of the peripheral nerves, also the tracts of certain bundles of neurons in the cerebrospinal axis, in which he identified each one of the peripheral nerves.

His investigations led him to radical advance in neurological surgery. The tearing out of a nerve, he demonstrated, resulted in degeneration of the central as well as the peripheral portion of the nerve, since the degeneration was due to the atrophy of the cells from which it originated rather than the mere separation of the nerve. Dissection of the nerve prevented such violent injury to the nerve. In obstinate neuralgia of the trigeminal nerve he advocated the bringing about of atrophy of the originating cells and so destruction of the nerve and elimination of pain by excision of the nerve branches.

He worked on the organic lesions in dementia præcox, searched out the pathogenic processes of rabies, solved the problem of the inhibitive fibers of the heart by tracing the connection of these fibers to the pneumogastric nerve itself instead of to the spinal nerve and contributed much to the knowledge of acute anterior poliomyelitis in the adult.





SIR WILLIAM R. GOWERS.

These and many other results of his labors familiar now to neurology all indicate the distinguished service he has rendered. He was distinguished as a clinician no less than as a laboratory scientist and his methods of instruction were unique in brilliancy and variety, the cinematographic illustrations with which at times he accompanied his lectures attracting special attention. His methods were characterized throughout by remarkable skill and an accuracy which he also demanded from others. He displayed moreover a boldness of innovation in therapeutics but even more in surgery. All of these elements contributed to the lasting results of his work, the elucidation of some of the most important problems in neurology and psychiatry.

WILLIAM RICHARD GOWERS

On May 4, 1915, death removed one of the most notable figures in the English medical field. Sir William Gowers was distinguished by a certain dynamic forcefulness which manifested itself in his thought and in his vigorous methods of activity, combined with breadth of observation, clear perception and constructive imagination.

He early applied these effective forces to the chaotic condition that marked the knowledge of nervous diseases, particularly on the pathological side, when he entered the field. He possessed the faculty for generalizing and systematizing the chaotic facts, and directed this clear constructive activity to the abundance of material which he himself obtained in his investigations in pathological anatomy and clinical symptomatology.

He was bold in thought. The sometimes over-positive dogmatic assertion of his views was motivated by his zeal for neurological advance together with a certainty of his own conclusions. His very positiveness always aroused interest and stimulated his hearers to thought and discussion, if only in opposition. He was thus always an inspiring teacher. He grew, however, more tolerant and was ever willing to listen to the views of others. Moreover, in spite of the confidence based upon the accuracy of his observations, he was cautious and reluctant to express himself in regard to prognosis.

His originality as an investigator and his power as a teacher evidenced themselves most in his work upon the diseases of the spinal cord. Here he demonstrated the intimate relation between the anatomy and the symptomatology. His publication in 1880 of *Diagnosis of Diseases of the Spinal Cord*, followed later by a similar

volume on diseases of the brain, filled a pressing need and demonstrated that keen observation, which distinguished him throughout his career as the greatest diagnostician of his time. His book contained a description of the hitherto unrecognized tract of fibers in the gray matter, the area of descending degeneration, which he called the anterolateral tract, but which Bechterew later described and named Gowers' tract. He was most widely known, however, through his *Manual of Diseases of the Nervous System*, a standard authority not in England alone but in many other countries. He built so appreciatively upon the work of Hughlings Jackson and other leaders in neurology that the principles and rules he laid down are those which guide the neurologist to-day. The ability to execute his own illustrations for his publications added to their great value.

He contributed also in earlier days to the study of the percentage of hemoglobin and number of corpuscles and greatly improved the hemoglobinometer, which is now however no longer in use. His work extended itself moreover to ophthalmology, epilepsy and syphilis.

The prodigious amount of material at his disposal was obtained from his masterly power of observation and his ability to record in shorthand. Phonography was a particular hobby with him and he encouraged the practice in other students. To this end he founded the Society of Medical Stenography and published in shorthand an organ of this society.

Gowers gratefully emphasized the value of his early training with a country physician and the foundation of botany then laid. This was always a source of interest with him and had proved a practical aid in medical training, accuracy and the like. He was also skillful in etching and exhibited at the Royal Academy.

He was the recipient of many honors. Dublin recognized his achievements with an M.D., Edinburgh bestowed the degree of LL.D., a number of foreign societies included him among their membership, the American Neurological Association being one of them. He was knighted on the occasion of the Queen's Jubilee in recognition of his family, professional and social greatness, for in all he represented the highest English type. He had been appointed also to positions of increasing responsibility and importance and been made a fellow of the Royal Society for his work on nervous diseases. His last few years were lived in the quiet retirement of invalidism.



MR. THOMAS MITCHELL CLOUSTON

SIR THOMAS SMITH CLOUSTON

In the death of Sir Thomas Clouston on April 19, 1915, Scotland has lost her great-hearted, painstaking leader in psychiatry. This descendant of the Norsemen, born in the Orkneys, bore himself proudly and freely in his relations with men, prizing more than the knighthood with which he was honored a few years before his death, the freedom of Kirkwall, the capital town of Orkney, which he received in 1908, and the Norse galley in silver presented to him at the dinner given him by his assistants past and present, when he retired from the office of physician superintendent of the Royal Edinburgh Asylum after thirty-five years of service.

His fresh vigorous nature received an impetus to thorough honest work at the grammar school of Aberdeen, which has turned out so many famous men, and he profited by the teachings of the brilliant circle of men who in the middle of the last century heralded the dawn of a new conception of mental disease. His student days already marked him as a man of distinguished attainment and signal honors. His first gold medal was won through his graduation thesis on the nervous system of the lobster. The presidency of the Royal College of Physicians of Edinburgh, of the Edinburgh Medico-Chirurgical Society and of the Medico-Psychological Association were among the later honors bestowed upon him.

His contributions to psychiatric foundations were of the descriptive type but his descriptions of adolescent insanity have formed a basis for later development in the conceptions of dementia præcox. They included also a study of general paresis in children.

These contributions were the result of that method of careful and original observation which he sought successfully to make a part of the work of the asylum, for it was due to his efforts that the psychiatric laboratory became a part of the Scottish asylum. His work was also distinctly propagandist and to this end he strove to give psychiatry an equal standing with other branches of medicine. His own appointment to lecture at the University of Edinburgh was the first of its kind and he had the satisfaction of seeing there the establishment of a separate chair of psychiatry, while it was also largely the result of his efforts that an academic diploma in this branch was granted.

His work was always closely bound with teaching and he sent forth a large band of trained men. His "Clinical Lectures on Mental Disease" became extensively known and have widely promulgated his methods of treatment and his conceptions of mental disease.

His long administration of the Royal Asylum displayed his ability to grasp essentials and was demonstrated particularly in the building of Craig House, a department for private patients. His insistence on the medical idea of hospital administration firmly established the supremacy of modern scientific methods of treatment.

He was always deeply interested in questions of public moral welfare and lectured to large eager audiences laying down sound practical advice in matters of eugenics, marriage and divorce, which this country is assimilating to-day. He bore a prominent part in the establishment of a council of public morals for Scotland.

His staunch adherence to former associates and their teachings, which had once influenced him, was illustrated by the tenacity with which he held to opinions of Laycock and Skae, which however he was willing to modify to a considerable extent. A certain aloofness prevented the making of many close friends among his acquaintances. His time was moreover well filled with his public as well as his professional duties.

Success with his patients was assured by his good judgment, ready intuition, a broad sympathy which understood and took into account all circumstances, and his advice extended to the entire welfare of the patient. These qualities with his wide experience made him an ideal consultant.

He was in all things a man who brought things to pass. "He was a spring from the north land bringing fresh waters while carving new channels.

JELLIFFE.

The Los Angeles Society for Neurology and Psychiatry has been organized with Dr. H. G. Brainerd as president and Dr. E. H. Williams as secretary.

The State Hospitals' Medical Association of the State Hospitals of Illinois wish to announce their next meeting at the Anna State Hospital, Anna, Illinois, May 25-26, 1916. All physicians are cordially invited.

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Original Articles

A CLINICAL AND PATHOLOGICAL STUDY OF A CONDI- TION OCCURRING IN THE AGED USUALLY ATTRIBUTED TO CEREBRAL AR- TERIOSCLEROSIS¹

BY CHARLES METCALFE BYRNES, M.D.

INSTRUCTOR IN CLINICAL NEUROLOGY, JOHNS HOPKINS UNIVERSITY

Through the kindness of Dr. William G. Spiller an opportunity has been given me to study, clinically and pathologically, a type of nervous disorder frequently observed in the aged, which is often correctly diagnosed as cerebral arteriosclerosis.

Vascular disturbances within the central nervous system present a varied clinical picture, depending upon the degree of sclerosis, its extent and distribution, and the development of such accidents as hemorrhage, thrombosis, or embolism. The symptoms, therefore, may be transient or permanent, localized or general, or there may be a combination of general and localizing features. These several types, particularly the diffuse variety described by Collins (1), are familiar disorders, and only the important symptoms will be abstracted from the records of the four patients who have furnished the material for this contribution.

Three of the patients were from the wards of the Philadelphia General Hospital and the notes upon a fourth case were given to me from the personal records of Dr. Spiller, who in each instance confirmed the diagnosis of cerebral arteriosclerosis.

¹From the Department of Neurology and the Laboratory of Neuro-pathology in the University of Pennsylvania.

J. M., a male, past the age of seventy, was observed sitting in a chair apparently inattentive to his surroundings. The drooping shoulders and head, expressionless countenance, marked emotionalism, and the partly open mouth from which saliva was dribbling, contributed to the general picture of senility and impaired mentality. When attempting to arise from the chair all movements were slow and deliberate, and in walking the short quick step with the feet wide apart were quite characteristic. There were no evidences of ataxia, paralysis, sensory disturbances, or degenerative involvement of the pyramidal tracts. The peripheral arteries and retinal vessels were sclerotic and tortuous, and arcus senilis was marked.

F. S., a male, past middle life, experienced some difficulty in speech and unsteadiness in walking. All movements were slowly performed, but not so much so as in the previous case, and mental impairment was less pronounced. When walking, the feet were placed wide apart; the stride was short and quick; and when performing this movement with the eyes closed, there was some unsteadiness which was intensified when standing with the feet together. There was evidence of slight ataxia in the upper extremities in performing the finger-nose test, and in the lower extremities when performing the heel-tibial test. This condition was more pronounced upon the right side. No gross sensory disturbances were detected. The pupils were unequal, the right slightly larger than the left, and both reacted slowly to light and during accommodation. All deep reflexes were present and slightly exaggerated, but equally so upon the two sides. There was no ankle or patellar clonus and plantar stimulation produced a normal response. The peripheral vessels were markedly sclerotic.

E. M., a patient of Dr. Heubner, of Allentown, Pa., was referred on October 30, 1912, to Dr. Spiller, who has given me the following notes: The patient is a male, 66 years of age, and a carpenter by occupation. He complained of almost constant pain in the forehead, and stated that last June almost a quart of blood was removed in order to give him relief. For the past two years there has been some difficulty in walking. While walking, but only then, he has fallen about five times and has had occasional attacks of unconsciousness. These attacks sometimes last an hour, but have never been associated with convulsions. Upon arising, and also at other times, he has suffered from dizzy spells, and memory has failed, so that he does not comprehend quickly.

Examination shows that the patient's comprehension of questions is very slow. The pupils are equal and the irides respond freely to light and in convergence. The remaining cranial nerves appear to be normal. Arcus senilis is marked. The biceps reflex is feeble on each side, and there is a fine tremor of each hand, especially during motion. He arises from a chair and begins walking with extreme difficulty and takes very short steps. There is no paralysis or ataxia in any of the extremities. The patellar reflexes are about normal, and the Achilles reflexes probably are present, but were not obtained because of the difficulty in making the patient relax his muscles. There is no real spasticity of the extremities.

The kidneys are said to be in good condition. The radial arteries are not particularly rigid, and the heart sounds are clear. The blood pressure has not been determined.

J. W., a male, 76 years old, was admitted to the Philadelphia General Hospital October 3, 1907, where he died January 30, 1908. I did not have an opportunity to observe this patient during life, but the anatomical material was placed at my disposal. The clinical history and examination are abstracted from the hospital records.

The family history is unimportant. When a child he had measles but was otherwise healthy until the age of 61. He denied lues; there was no evidence of secondaries; and the marital history was insignificant. Alcohol and tobacco were used moderately.

Fifteen years ago, after suffering from headache and vertigo, he suddenly fell and lost consciousness. Upon regaining consciousness, the right side was paralyzed and speech was "peculiar." The duration of these symptoms is not known, but it is probable that in a short time recovery was complete, for he enjoyed good health for about ten years, when he again complained of headache and vertigo, which occurred at intervals for a period of five years and terminated in a second "stroke" described as follows:

After some slight exertion he tried to sit down, but suddenly fell to the floor and lost consciousness. This attack lasted only about three minutes, when he was able to get up and walk with assistance, but the right leg was weak and the right arm was paralyzed with the exception of slight movement in the fingers. The face was not affected and he could talk better immediately after the stroke than when admitted to the hospital. There was no difficulty in swallowing nor was he aware of any sensory disturbance upon the right side. During the following two months, he recovered some use of the right arm, but vision, which was good before the attack, has gradually failed so that he is now almost entirely blind. Sphincter control, which was lost at the time of the "stroke," has not been regained.

The patient talks monotonously and indistinctly and there is definite mental impairment. The muscles are poorly developed and the peripheral vessels are markedly sclerosed. There is evidence of slight paresis of the right side of the face and the tongue is deviated to this side, but is under good control. All movements can be performed with the arms, with some limitation upon the right side. He places this arm over the head with a peculiar jerky movement, but is finally successful. Ataxia is present in both arms. The right biceps jerk is not obtained but the muscle reflex is present. The triceps jerk is exaggerated. Both of these reflexes are hyperactive in the left arm. There are no contractures.

Both legs are moved normally in all directions, with some limitation upon the right side. Ataxia in both legs is extreme, and more pronounced in the right. Edema and scars of old ulcers are observed upon both legs. The deep reflexes at the knee and ankle are equally exaggerated upon the two sides, but there is no clonus, and plantar stimulation gives a normal response. The following additional note was made by Dr. Spiller: "Ataxia in both lower

extremities is extreme and the limbs are slightly flaccid. There is slight ataxia in the upper limbs." Examination of the blood showed marked anemia, and the urine contained albumen.

Twenty-eight hours after death an autopsy was performed by Dr. Sykes, who made the following notes: "Coronary arteries prominent and tortuous. The mitral and aortic leaflets are thick, rigid, markedly sclerosed, and covered with numerous calcified nodules. The aorta has numerous calcified, sclerotic areas throughout its entire length. The kidney shows evidence of chronic interstitial nephritis." Apparently, no note was made upon the gross appearance of the central nervous system when it was removed, and when examined by me it had been in formalin solution for several months. The cerebrospinal vessels were not sclerotic and there were no calcified areas or aneurysmal dilatations. The convolutions of the brain were of good size and shape and the pia was not adherent. Since no gross changes were observed upon sectioning the hemispheres, brain stem, and spinal cord, it was suspected that a microscopic study of the tissue would furnish valuable information.

Very minute lesions are sometimes responsible for quite a definite group of clinical symptoms, and in such cases the histological study, to be of any value, must be thorough. Accordingly, microscopic sections from the following cerebral areas were carefully examined: The right and left optic nerves, the optic chiasma, the inferior portion of the medulla through the twelfth nucleus, the right and left paracentral lobes, the anterior central convolution of each hemisphere, the left internal capsule, the left superior temporal convolution in the region of the operculum, the right and left cuneus about the calcarine fissure, and the superior vermis of the cerebellum.

Transverse sections from the first cervical, cervical enlargement, low cervical, mid-thoracic, twelfth thoracic, and lumbar segments of the spinal cord were also studied.

Cross-sections were made from the following cerebral arteries: The right and left anterior cerebral, the left middle cerebral within the Sylvian fissure, the intracranial portion of both internal carotids, the right and left posterior cerebral, and the basilar.

The nervous tissue was stained with hemalum and acid-fuchsin, Weigert's myelin stain, Bielschowsky's neurofibrillar method, and thionin. Hemalum and acid-fuchsin, and Mallory's elastic tissue stain were used for the arteries.

In all, fifty-four microscopic preparations were carefully examined by Dr. Spiller and myself and in none of them did we find any single lesion which we felt was sufficient to account for the symptoms in this case; nor were there sufficient evidences of thickening in the blood vessels to support a diagnosis of cerebral arteriosclerosis.

My desire for completeness would lead me to include a descriptive paragraph for each of the fifty-four sections, but consideration for those who may have occasion to refer to this study makes me feel that a general summary of the pathological changes is preferable.

In several parts of the brain and spinal cord there is considerable round-cell infiltration, which is particularly marked about the optic

chiasma (Fig. 1). This infiltration extends for a short distance along the sheath of each optic nerve, but does not show a perivascular arrangement. The fibers of the optic nerve are not degenerated, and the axis cylinders are healthy looking. The pial and intraneural vessels show slight thickening of the media but are nowhere occluded. Similar evidences of a moderate inflammatory reaction are found upon the surface of the right anterior central convolution, the left superior temporal convolution, the cortex of the superior vermis, and to a lesser degree upon the surface of the

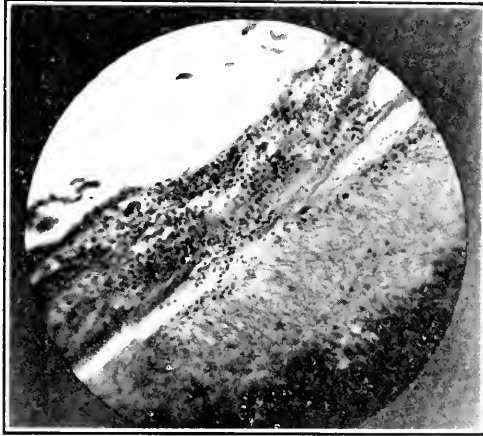


FIG. 1. Photomicrograph of a section of the optic chiasma, showing round-cell infiltration. Hemalum acid fuchsin stain.

pons and pyramids. Moderate infiltration is also observed in portions of the spinal meninges, particularly in the cervical and high dorsal regions, where it is most pronounced upon the posterior surface of the cord.

In the nervous tissue proper, there is no evidence of hemorrhage, softening, or degeneration in the internal capsule, and the pyramidal fibers of the pons appear to be normal. There are, however, variable degrees of cellular disintegration. The Betz cells show increased pigmentation and moderate chromatolysis. Similar changes are observed in the nucleus of the twelfth cranial nerve, in the Purkinje cells of the superior vermis, and in the anterior horn cells of the spinal cord. In many sections there is distinct shrinkage of the cerebellar cortex, and many of the Purkinje cells are completely disintegrated. Although the right and left halves of the brain-stem and spinal cord were not differentiated when the tissue was imbedded, it is quite obvious in the sections that cellular disintegration is more pronounced in one half than in the other, and further investigation has shown that the cellular alteration is greater in the right side of the cord. In the cervical region of the cord, where the cellular changes are more pronounced, it is found

that in one of the sections twenty-seven anterior horn cells can be counted in one half, while the opposite half contains only seven. This loss of cellular substance is probably not due to technical methods, since no cellular spaces were observed and one of the horns is slightly shrunken. In the middle thoracic cord, these cellular changes are confined mostly to the nucleus dorsalis, while the anterior horn cells are more nearly normal than elsewhere. The lumbar cord shows only slight cellular disintegration which, as in the cervical region, is more marked in the right half.

Weigert preparations from the upper cervical segment and the cervical swelling show moderate degeneration in each half of the posterior column. This degenerated area begins at the periphery in the region of the paramedian septum and extends ventro-medialward for about three fourths the depth of the posterior column, and is situated almost entirely in the fasciculus cuneatus in the region

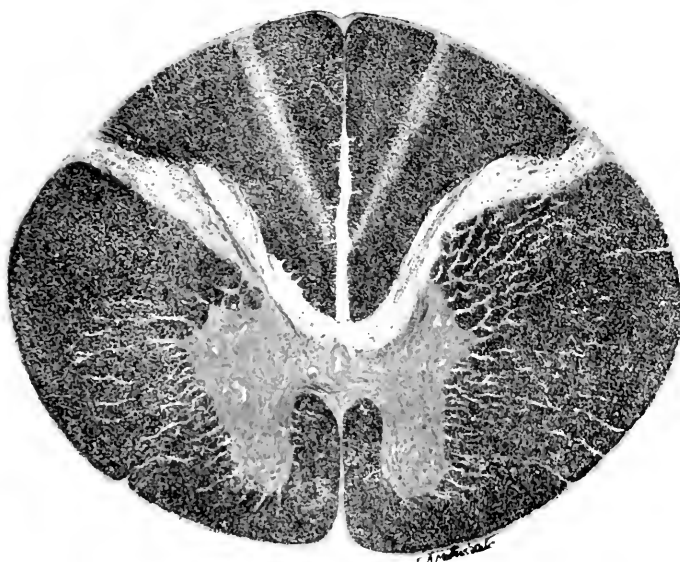


FIG. 2. Cross-section of the first cervical segment of the spinal cord, showing degeneration in each half of the posterior column. Weigert stain.

occupied by fibers arising from the lower cervical nerves. Under the microscope, this area shows definite absence of medullated fibers and has the appearance of a degenerated area which can be followed for a short distance into the lower part of the cervical swelling (Fig. 2). There is no degeneration elsewhere in the spinal cord, and the pyramidal fibers are normal throughout.

Microscopic examination of the cortical and intraspinal arteries shows no occlusion or marked thickening of the vessel wall, and considering the advanced age of the patient, the arteries at the base of the brain are surprisingly normal in appearance. The media is, in general, slightly thickened, and takes the stain poorly, and occa-

sionally there is moderate proliferation of the intima in the larger vessels, but in none of them is the lumen occluded or greatly reduced in size. There is no perivascular infiltration. The elastic tissue is, in general, diminished in amount, and slightly fragmented. Occasionally all three coats of an artery are reduced in thickness and slightly evaginated, but not to the extent of aneurysmal formation.

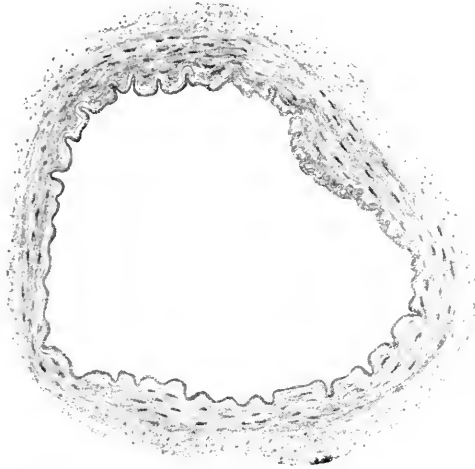


FIG. 3. Cross-section of the left middle cerebral artery, showing moderate sclerosis, which is more marked than in the other cerebral vessels. Hemalum acid fuchsin stain.

A cross-section of the left middle cerebral artery (Fig. 3) represents fairly accurately the more pronounced pathological changes which are present in the cerebral vessels.

Although the histological examination of the cerebral vessels does not confirm the clinical diagnosis of cerebral arteriosclerosis, there are other important pathological changes which may explain some of the symptoms. There were marked changes in the peripheral vessels, chronic interstitial nephritis, anemia, moderate local meningeal infiltration, and disintegration of the Purkinje cells, the cells of the nucleus dorsalis and the anterior horn cells of the spinal cord. In the absence, however, of a localizing cerebral lesion or cerebral arteriosclerosis, it is difficult to explain the two attacks of right hemiplegia with persisting hemiparesis, almost total blindness and mental impairment.

Conditions indicating localized organic lesions of the central nervous system without confirmatory pathological evidence have been recorded. Not infrequently, the pathological study in such cases has been incomplete, or when a more thorough search has

been made the presence of minute aneurysmal dilatations, microscopic areas of softening, or hemorrhage, have been demonstrated, and in the absence of these, the symptoms have been attributed to toxemia, pseudo-tumor, or arterial spasm. Chronic interstitial nephritis with defective elimination, anemia, and enfeebled circulation, offer suitable conditions for the production and accumulation of toxins, and it is not unlikely that some of the symptoms in the case which I have studied might be due to chronic renal or gastrointestinal intoxication. Although the clinical examination was made before the introduction of the Wassermann reaction, the presence of moderate round-cell infiltration in the meninges, particularly about the chiasma, together with evidences of old leg ulcers suggests the probability of a syphilitic toxemia.

That certain toxins exhibit a degree of selectivity for particular nervous structures, is an opinion supported not only by clinical observation, but also by experimental pharmacology and toxicology. The effect of strychnine upon the motor neurones, of cocaine upon the sensory system, and the localized paralyses of the infectious diseases and metallic poisons are familiar illustrations. Uremic or syphilitic toxemia, then, even in the absence of arteriosclerosis, might explain the cellular changes in the cerebral cortex, the lower motor neurone, and in the cerebellum with resulting mental impairment, flaccidity, sphincter paresis, and ataxia. It is also conceivable that such symptoms may be transitory or permanent, depending upon variations in the intensity of the toxemia and in the degree of cellular derangement. In spite of this apparently selective property of toxic substances it is difficult to imagine the cortical cells of the two hemispheres so unequally affected that hemiplegic symptoms are produced by a poison distributed through the general circulation. It is true, evidences of cellular disintegration may be present, and to all appearances of equal intensity in the two hemispheres; but, unfortunately, except in the presence of complete disintegration, cytology has not reached that degree of exactness which has enabled one to say when any particular cell has ceased to function or exceeds its limit of recuperative ability.

There is, however, some clinical evidence which suggests the occurrence of toxic paralyses of the central nervous system and toxic hemiplegias. Bornstein (2) records the case of an epileptic boy fourteen years of age, who for six years suffered from intermittent attacks of lameness, characterized by flaccid paralysis in certain muscles, ataxic gait, ankle clonus, reaction of degeneration, and absence of sensory changes. Recovery after each attack was complete.

The author is of the opinion that the condition was due to toxemia but does not suggest its probable source. Hochhaus (3) has reported interesting observations upon seven patients in whom there were evidences of localized disease of the brain for which no anatomical explanation could be determined. Six of his cases presented the clinical symptoms of cerebral hemorrhage or thrombosis, and although no gross lesions were found at autopsy, the pathological examination was not sufficiently thorough to permit of trustworthy conclusions. Arteriosclerosis was pronounced in three of the specimens, and in none of his cases was syphilis excluded. Hochhaus attributed the symptoms to pseudo-tumor, arteriosclerosis, localized cerebral congestion, and toxemia. He makes no suggestion as to the character of the toxine, but from a study of his cases I find that all but one patient had some nephritis; and one in particular showed a definite relationship between the severity of symptoms and the degree of albuminuria. The author refers to a case of toxic hemiplegia reported by Oppenheim in which the symptoms developed in a carcinomatous patient without anatomical changes in the brain substance; and a similar case by Finkelburg occurring in a patient with carcinoma of the pancreas. A suggestive case of toxic periodic paralysis occurring in a boy seventeen years old is reported by Gardner (4). The attacks were characterized by complete loss of power in the head, arms, and legs, and had been preceded for several years by attacks of migraine, which ceased when the paralytic phenomena developed. There was no loss of consciousness or sensory disorder, but the deep reflexes were lost, and the muscles did not respond to electrical stimulation. A pathological study was not made, and, because of the marked indicanuria, the author is of the opinion that the condition was due to defective metabolism with liberation of toxic substances.

An interesting pathological study of seven cases of paralysis without gross anatomical changes in the brain has been made by Rhein (5). All of these cases had marked renal disturbance; in six, there were positive evidences of lues; and in the seventh, syphilis was suspected. Cerebral arteriosclerosis was pronounced in all but one of the specimens, and microscopic areas of softening were occasionally observed. Although these changes were probably sufficient to account for the symptoms, Rhein thinks the condition was due to uremic or syphilitic toxemia, and remarks that: "The diagnosis in old people is more difficult on account of the resemblance to symptoms following hemorrhage or softening." His belief in the toxic nature of the affection is encouraged by the experiments of

Castaigne, who injected the spinal fluid of uremic patients into the brains of guinea-pigs and produced marked convulsions, terminating fatally.

Cases of hemiplegia without discoverable anatomical lesion were observed by Andral and were thought to be due to cerebral congestion, and Sands (6), in 1856, made a study of two cases of fatal hemiplegia at Bellevue Hospital, in which the cerebral findings were entirely negative. Both occurred in young adults and in neither was there evidence of nephritis or arteriosclerosis. In one of the cases, a microscopic study was made of the cerebral hemispheres, corpora striata, optic thalami, crura, pons, and anterior columns of the spinal cord, and all were found to be "perfectly normal." There was, however, marked disease of the mitral leaflets. The probability of syphilis is not mentioned and the author offers no explanation.

A short time later, Draper (7) reported from the same hospital, the study of two more fatal cases of hemiplegia in which no gross lesion was found at autopsy. One occurred in a young adult who gave a positive history of lues and showed periosteal nodes upon the tibia; and the second case had had syphilis "in all its forms." It was suggested by one of the attending physicians at Bellevue that the paralysis might have been due to the "syphilitic poison acting either by virtue of its toxic properties, or indirectly by its effect upon the nutrition of the brain."

Weisenburg (8) from a study of two cases of hemiplegia, with marked nephritis, in which no gross changes were found in the brain, concludes that the paralyzes were of uremic origin; and Warrington (9) contributes additional evidence in support of the toxic origin of cerebral or spinal lesions from an anatomical study of a case of carcinoma uteri, which had shown evidences of bulbar involvement, without demonstrable changes in the nervous system.

Although the selective action of a circulating toxine is a more or less speculative explanation for the development of localizing cerebral symptoms, convincing studies have been made by Rossi (10) and Fickler (11) upon toxic cerebellar disease in which the symptoms were not unlike those usually attributed to cerebral arteriosclerosis. The former studied the brain of a patient, 66 years old, who gave a history of severe diarrhea of six weeks' duration. As this condition improved, he noticed that he walked "like a drunken man," and had difficulty in speaking. These nervous symptoms were gradually progressive, and characterized by difficulty in walking, ataxia, disturbance in speech, exaggerated reflexes, sphincter weakness, and positive Babinski. There was no nystagmus or

strabismus, and the pupils reacted normally. No gross changes were found in the brain except slight atrophy of the superior vermis. Microscopically, the Purkinje cells and cortical layers of the vermis were definitely atrophic and there was some loss of fibers in the central portion of the dorsal columns of the spinal cord. The cerebral arteries were not thickened and the meninges appeared to be normal. The condition was regarded as a primary atrophy of the cerebellum beginning in the Purkinje cells, and probably dependent upon gastro-intestinal toxemia. Fickler concluded, from a review of the literature and his study of eight cases of cerebellar disease, that a condition exists in the aged which might be called senile cerebellar involution; and it is usually, but not invariably, associated with sclerotic changes in the cerebral vessels. Among other causes, he mentions acute and chronic cerebellar ataxia from the absorption of gastro-intestinal toxins, alcohol, syphilis, and other infectious diseases. In those cases of toxic origin, there is no arteriosclerosis and the most marked changes are confined to the cerebellar cortex, with only slight secondary degeneration. Similar observations have been made by Thomas (12), Dejerine and Thomas (13), and in a later study by Garbini and Rossi (14) of a patient fifty-five years old, who suffered from right hemiplegia, dysarthria, and dysphagia. The only changes found at autopsy were sclerosis and atrophy of the cerebellum, from which it was concluded that the cerebellum acts as an accessory coördinating speech center, and that the dysarthria and dysphagia were due to incoördinate movements of the primary speech mechanism. It is not unlikely that the speech defect in the case which I have studied may be of this origin.

Symptoms resembling those of cerebral arteriosclerosis have been observed in a case of chronic purulent meningitis studied by Schlesinger (15), although he does not compare the two conditions. The moderate meningeal infiltration observed in my sections was not sufficient, however, to account for the hemiplegic symptoms nor did it suggest a chronic purulent affection, and its pathological importance is due largely to the evidence it furnishes in favor of the syphilitic nature of the disease. It is interesting in this connection, that some time before the publication of Schlesinger's paper, Sir William Osler (16) reported a case without autopsy, in which ten attacks of transient mutism occurred, with numbness of the right side. The patient had previously consulted a well-known specialist, who made a diagnosis of "chronic meningitis," which was not concurred in by Dr. Osler, who attributed the condition to arteriosclerosis and vascular spasm.

Inability to explain satisfactorily the symptoms in my case entirely upon a theory of chronic intoxication or meningeal infiltration, and the presence of marked peripheral arteriosclerosis suggest the probability that such symptoms might be due to the changes in the peripheral vessels. Naturally, as the cranial cavity is approached, the pathological importance of a peripheral vascular lesion becomes more evident, and a recent thesis by Ferry (17) calls attention to the development of cerebral symptoms from occlusion of the extracranial vessels. Although his cases showed evidences of cerebral edema or areas of softening sufficient to account for the gradually progressive hemiplegia, there was no sclerosis of the cerebral vessels. A study of the extracranial and cavernous portions of the internal carotid arteries, however, showed marked thrombosis with almost complete occlusion, which was usually confined to one side, but occasionally involved both. Similar observations, he states, have been made by Lancereaux and Bristowe, and the condition is thought to be due to syphilitic arteritis and atheroma. The fact that surgical ligation of both carotid arteries has been practiced without the development of local cerebral symptoms discredits somewhat the pathological significance of Ferry's observations, but he attempts to meet this objection by quoting from Le Fort, who maintains, that in surgical ligation a thrombus is formed at the point of ligation which advances to the first bifurcation of the artery. If collateral circulation is established before the thrombus reaches the bifurcation of the common carotid artery, cerebral symptoms do not develop. If, however, the clot reaches the bifurcation and passes into the internal carotid branch, hemiplegic symptoms are likely to occur.

Unfortunately, I did not have an opportunity to examine the carotid arteries in my case, but with the marked peripheral sclerosis, it may be reasonably assumed that there was impairment of the general circulation and cerebral malnutrition. Under such conditions, even transitory disturbances in the general circulation might be sufficient to produce localizing symptoms from an already impoverished brain. An interesting study of the effects produced by interruption of cerebral circulation has been made by Sand (18), who examined the brain of a patient subjected to prolonged chloroform anesthesia during an operation for osteomyelitis. At the close of the operation syncope developed, the pulse could not be felt, and the patient was thought to be dead. After an hour he was partially resuscitated, so that he would answer questions vaguely, respond to a pin prick, and protrude the tongue when asked to do so. The pupils responded normally, and there was no paralysis, but he was

incontinent. Death occurred nine hours later, and the autopsy showed slight edema of the brain and cord, but no other gross lesion. Microscopically, the nerve cells were in various stages of disintegration and this change was especially pronounced in the cerebellum, where there was almost complete disappearance of the Purkinje cells. These cellular changes were thought to be due to the interruption of the circulation rather than to the direct action of chloroform, since the liver did not show changes characteristic of chloroform intoxication. This observation is interesting, when it is recalled that similar changes were found in the cerebellar cells of my specimens, and that both toxemia and circulatory disorders may have been contributing factors.

It is not improbable that sclerosis of vessels more distant than the carotid arteries might produce symptoms resembling those of a cerebral lesion. The observations of Boullay (19), in 1831, upon the cause of "string-halt" in the horse, and a later study by Charcot (20) upon a similar condition in man demonstrated the relation between these symptoms and changes in the arterial wall. Thrombosis and arteriosclerosis are usually present, but the symptoms of intermittent claudication may occur without thickening of the arterial wall, and the condition is generally confined to one or both lower extremities. The resemblance of this affection to an associated group of symptoms sometimes observed in Raynaud's disease, and the occasional absence of changes in the peripheral vessels have encouraged the belief that, in some cases, intermittent claudication is due to arterial spasm alone; hence, it has become known by some writers as *dysbasia intermittens angiospastica*. The disease is not always confined to the lower extremities; but occasionally one or both arms have been affected. Erb (21) and Determann (22) have recorded cases in which the leg, arm, and tongue, upon the same side, were involved. During the attack, the pulse in the lingual artery was obliterated.

Intermittent lameness, as originally described, showed no evidence of involvement of the spinal cord. Cases have been observed, however, in which symptoms indicating spinal involvement were present. Pathological examination revealed sclerosis of both the peripheral and intraspinal vessels, and a diagnosis of spinal intermittent claudication was made. It is only a step from these observations to imagine spasmodic closure of the cerebral vessels, and the term cerebral intermittent claudication has been adopted to account for a number of transitory cerebral symptoms of apparently vascular origin. Such a conception finds some support from a clinical and

pathological study of migraine, with its associated transitory paralytic phenomena.

The inability to demonstrate a nervous mechanism for the cerebral vessels and the general belief that they are therefore incapable of transitory constriction and dilatation have been the main support of those who oppose the theory of cerebral intermittent claudication. There is, however, clinical and experimental evidence, in favor of the independent irritability of the vessel wall, and the presence of vasoconstrictor fibers to the cerebral vessels has received some support from experimental physiology. Edgeworth (23) from a clinical study of four cases of transient hemiplegia attributes the condition to intermittent contraction of the cerebral arteries and is inclined to accept Wigger's experimental studies upon vasoconstrictor nerves to the cerebral vessels. In a later paper, Phillips (24) contends that it is not necessary to assume the presence of vasoconstrictor nerves to the cerebral vessels, since it is known that certain drugs when circulating through a vessel isolated from all nerve connections will produce temporary constriction; and it is therefore reasonable to assume that circulating toxins in the body may produce the same effect.

If the cerebral vessels possess independent contractility it is necessary to assume the presence of some irritating substance in the general circulation which stimulates the muscle coat directly. Arteriosclerosis, increased demands upon the circulation, and hyperexcitability, are regarded as essential conditions in the development of intermittent arterial spasm; while gouty and rheumatic states, metabolic disorders, and gastro-intestinal toxemia are, according to Russell (25), predisposing factors. But a condition of general toxemia alone does not explain satisfactorily the spasm of a localized vascular area, which, of course, must be assumed if localizing cerebral symptoms are to be explained upon a theory of vascular spasm. Physiological experiments, however, seem to indicate that contraction of even a small portion of an artery does occur; but that some local condition, either within the arterial wall itself or from without, is essential. Holthouse (2), in discussing Russell's paper, quotes from Sherrington as follows: "Local tonic spasm of short lengths of small arteries are seen in experiments. If the student touches the artery or if heat or cold is applied, a spasm occurs which may lead to almost complete closure." Sherrington further suggests that in diseased arteries unequal elasticity at a point of commencing change might be sufficient mechanical stimulus to produce contraction in the neighboring arterial wall. Parker (27) takes exception to the

theory of arterial spasm and would explain the symptoms of cerebral intermittent claudication upon the selective action of toxic substances for certain groups of nerve cells, and a similar opinion has been expressed by Heard (28). Herz (29), however, attributes the condition to extraventricular systole.

Two interesting clinical papers have been published by Langwill (30) and Edgeworth (31) in which transitory hemiplegia is attributed to the spasmodic closure of the cerebral vessels; which, in their opinion, may be caused by the toxemia of nephritis and occur independently of arteriosclerosis. In one of Allau's (32) four cases of transient paralysis, the probable toxic nature of the affection is strikingly illustrated. The patient, a young man, who gave a previous history of rheumatism, had suffered for three years from transient paralysis of the left side, of ten or twenty minutes' duration. During the interval between attacks the urine was quite normal, but following a seizure it almost invariably contained a heavy albuminous precipitate. Allau, however, is of the opinion that the symptoms were due to arterial spasm induced by circulating toxins absorbed from the gastrointestinal tract, and refers to the experiments of Dixon and Dale which showed that toxic substances derived from putrid meat, when injected into the circulation, produced arterial constriction. In two cases of Raynaud's disease, studied by Semon (33) and Fox (34), syphilitic toxemia was thought to be the cause of the arterial spasm.

Whatever view may be entertained concerning the occurrence of angiospastic phenomena and localizing cerebral symptoms in the absence of confirmatory pathological changes in the brain, it appears that any explanation must be more or less speculative; and while this study may not have contributed any positive information to the present conception of such conditions, it has, at least, been instructive through its negativeness.

That so striking a clinical picture of general and local cerebral arteriosclerosis can occur in the absence of sclerotic changes in the cerebral vessels is of interest. Although the histological examination furnishes no satisfactory explanation of the symptoms, it is not improbable that they may have been due to uremic or syphilitic toxemia, extracranial arteriosclerosis, or spasmodic constriction of the peripheral or cerebral vessels.

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TUMOR INVOLVING THE CRUS CEREBRI (WITH UNUSUAL ENDOCRINE SYMPTOMS)

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Tumors of the crus cerebri usually give a symptomatology dependent upon the possible positions that the tumor may assume in relation to the three important anatomical divisions of the crus—namely the basis, the tegmentum, and the corpora quadrigemina. The tumor, if small, may involve only one of these, giving sharply defined limited symptoms. But usually, besides the direct symptoms produced by the tumor growth, there are those arising from the pressure exerted by the neoplasm upon more remote cell groups and tracts within one or both of the other crural divisions. Such a growth involving the *basis pedunculi* gives a so-called Weber syndrome, oculomotor palsy of one side with crossed paralysis; involving the *tegmentum*, an oculomotor palsy with crossed choreiform or athetoid movements, Benedikt's syndrome; and involving the *corpora quadrigemina*, presents the syndrome of Nothnagel (1) with ocular muscular palsy, cerebellar ataxia and disturbances in hearing.

There are of course various combinations of these to which are superadded the distant symptoms in the case of larger tumors. Cases heretofore reported conform more or less completely with this theoretical scheme. Unexplained symptoms which have thus far been described in the literature are inordinate laughter, which occurred in 2 cases reported respectively by Hunt (2) and Spiller (3), and reduction of body temperature on the paralyzed side, in the cases of Garnier (4), Mendel (5) and Ramey (6). To these I now desire to add a case in which, apart from the fairly classical symptoms of oculomotor involvement with crossed paralysis, ataxia and incoordination of cerebellar type, there were added abnormally *rapid skeletal growth* and *sexual precocity*. Rhein (7) published a series of 18 cases of tumor of the crura which he had thus far found in the literature, and in none of them were such conditions present. While the tumor here presented was not solely confined to the crus

cerebri but extended down to the pons, yet there will be little difficulty in separating the symptoms due to that part below the crus from the gross picture.

In July, 1913, a boy, fourteen years of age, with a negative preceding history, was hit on the head by a playmate. He fell, and though he arose unassisted, was dizzy for a minute or two afterwards. In August, about 5 weeks later, while running, he fell and struck the back of his head without any apparent after-effects. One week later, or about August 25, the father noticed that the boy's speech was affected, his articulation not being clear and perfect as formerly. At the same time his friends began to notice a gradual change in his gait, which had become unsteady. Coincident with these changes, headache began, located chiefly in the occipital region. With the advent of headache, nausea, though no actual vomiting, also began. With these changes, and indeed as early as any of them, the father began to notice priapism in the boy lasting from two to three hours each night. About the 15th of September his sight began to bother him and this got progressively worse. Since the beginning of August his stature increased two to three inches, that is, within five weeks; the rapid growth involved his extremities also, so that shoes which were bought in the early summer no longer fitted him. He became withal more and more drowsy and at times it was difficult to awaken him for examination. He was admitted to the Neurological Institute on September 25, on the service of Dr. Pearce Bailey. While here he was very unruly and resistant, constantly crying to go home, so that it was necessary to discharge him for a time.

His status on entrance was as follows: A staggering, swaying gait towards the left side chiefly, but also occasionally to the right; occipital headache; nausea; no vomiting at first and no tremor. There was a right facial weakness seen chiefly in smiling, *i. e.*, emotional in character. His eyes were examined by Dr. Holden on September 25 with the following result: Diplopia was present, possibly due to the weak left external rectus. Nystagmus, coarse in character, greater when looking to the left, with the slow component to the right, was constant. Vision 20/30 each; hyperopia; with white and red fields normal. Discs were pink, veins slightly dilated.

On October 26 a beginning papilledema with hemorrhage was first noticed in both fundi with normal color fields.

There was incoordination with ataxia of hands and feet; right greater than left. The reflexes gave a greater right knee jerk, a double Babinski and Oppenheim, greater on the right, doubtful on the left at times; abdominals, right sluggish, left absent; epigastrics likewise; cremasterics equal. Elbow jerk, right exaggerated, left doubtful; synergia was well marked in the usual movements of equilibration. Hearing unaffected. Weber and Rinne tests showed normal conduction. There was irregular pointing by and adiadochokinesis of the right hand. The cerebrospinal fluid was negative. The penis and scrotum were unduly developed. An X-ray

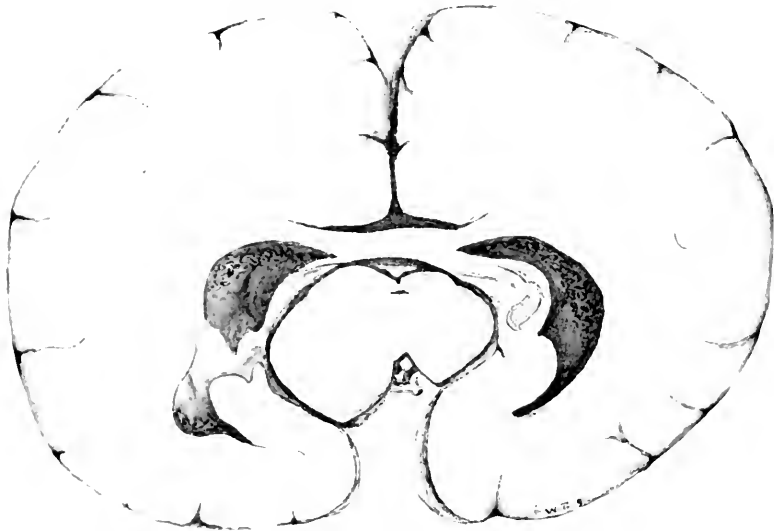
of the skull showed no abnormal sella turcica, nor other pathological condition.

From these findings a general diagnosis of tumor was made without special localization. I personally kept track of the patient while he was at home and noticed gradually an exaggeration of the signs and symptoms. The drowsiness and headaches became more marked. He had two unilateral convulsions involving the right side. Following them there was added an Oppenheim on the left side and a gradual impairment of the motor functions of the trigeminus on the left side. Joint sense was unimpaired. Astereognosis was absolute on the right side, the boy being able to give no information whatever of the object in that hand. A moderate spasticity of the right leg began to appear but no clonus. Finally there was elicited by means of my esthesiometer (8), a slight diminution of cutaneous sensibility of the entire right side. These signs, together with the foregoing status, enabled us to localize the tumor as one involving the crus and pons of the left side, and extending posteriorly to the origin of, but not including, the facial and auditory nerves—at any rate beyond the origin of the motor fifth. The possibility of an enlarged left crus impinging upon the hypophysis or its stalk, was also considered probable.

As the patient became progressively worse with daily attacks of respiratory weakness, verging on the Cheyne-Stokes type, it was imperative that surgical interference be undertaken, albeit there was no increase in the papilledema and scarcely any diminution in vision. He was again brought to the Institute on October 27, but before anything could be done, he died of respiratory paralysis.

In analyzing the symptoms I would like to call attention to several interesting and important points brought out in the examination. First, the astereognosis was probably due to the imperfect sense perceptions from the right periphery and the reciprocal imperfect motor adjustment on the same side, therefore it was no true cortico-psyche astereognosis; secondly, I would like to point out the importance of examining always for the sensory and motor functions separately, of the fifth nerve. In this case this difference possibly marked the limit of the tumor, laterally; the motor root cells lying centrally to the sensory. Thirdly, there is seen the importance of differentiating not only crude changes of sensibility on symmetrical areas of the body, which in this case elicited nothing; but also and especially the finer changes. This gave us one of the requisite signs for localization. Lastly, and most important, I would like to call attention to the symptoms in this case pointing to irritation of either the pineal gland or the hypophysis, those of priapism and of skeletal growth. In none of the 18 cases of tumor of the crus heretofore published, were such symptoms mentioned. As neither of these glands was abnormal, as shown at the necropsy, were they produced

by the pressure within the third ventricle transmitted to the pineal gland or to the hypophyseal stalk, or were they originated by direct pressure of the left crus cerebri (which centrally encroached on the middle line) upon the hypophysis, and superiorly against the pineal? As the ventricles were hardly distended, it is fair to assume that the increased mass of the left crus cerebri was the irritative cause of these symptoms. Furthermore the signs of increased intracranial pressure came on after the growth phenomena had appeared and therefore these could not have depended on this general pressure increase. Another, though very remote possibility, is that the fibers of the commissura habenularum (some of which penetrate and



A transverse section of the brain showing the enlarged left crus cerebri impinging against the stalk of the hypophysis ventrally, and against the pineal gland dorsally. The very slight distension of the ventricles is also to be remarked.

become part of the pineal gland), in their further course from the glandula habenula to the glandula interpeduncularis as the tractus habenulae interpeduncularis, are interfered with in their course through the crus by the tumor, thus affecting the function of the pineal. In such an event, however, all tumors of the crus should show similar symptoms which they do not. These fibers moreover are presumed to be merely vestigial in character.

The remarks are of course based upon the assumption that interference with either the hypophysis or the pineal gland, or perhaps both, influences the evolution and control of skeletal growth and sexual precocity.

The autopsy by Dr. Casamajor showed a brain very much enlarged, the ventricles only slightly distended, with a pons very much distorted and enlarged, especially on the left side. This enlargement was caused by an extensive pontine tumor mass which reached forward through the left crus cerebri to the left thalamus, and posteriorly nearly to the beginning of the medulla, extending slightly into the brachium pontis of the left side; involving in this extended locus, the left median fillet, the red nucleus with the emerging rubro-spinal tract, the left brachium conjunctivum, the left motor fifth root, and compressing the pyramidal tract of the left side as well as by transmitted pressure that of the right side also in lesser degree. The hypophysis was normal in size. The pineal gland was roughly triangular in shape with a large transverse diameter of 12 mm. and its anteroposterior 10 mm. This represents a gland rather large in size although within normal variation. The tumor proved to be a glioma.

The sketch shows a transverse section of the brain giving the relations of the tumor to the pineal gland (which is also reproduced in the picture), and to the hypophyscal stalk.

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TIC OF THE ABDOMINAL MUSCLES OF 13 YEARS'
DURATION, STUDY OF A CASE WITH
NECROPSY¹

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If one may judge from the literature, abdominal tic is not frequently seen. The case forming the basis of this paper was distinctly of the abdominal type, and was under observation in the Philadelphia General Hospital, for a period of seventeen years, having been observed by various members of the neurological staff. Notes were made by Drs. Burr, Potts, Weisenburg, McConnell, Spiller and others. Dr. Weisenburg had cinematographs made which unfortunately, are not available. At death from myocardial degeneration, March 22, 1914, a necropsy was secured. For the notes in this case and the necropsy material, I am indebted to Dr. W. G. Spiller.

A muscular movement constituting a tic represents a psychomotor adjustment initiated as a reaction to an external cause or an idea; in addition, such a movement must have become habitual by frequent repetition. It is usually held that in its onset a movement later to become a tic is conscious and voluntary. This is probably true when the cause is external or physical, but when resulting from an idea, it may be conscious but involuntary, in the sense that it represents an involuntary motor reaction made possible by a lack of inhibition of the will. After a muscular movement becomes habitual, it is no longer conscious and involuntary, but becomes unconscious and involuntary, although coordinated, since muscles physiologically grouped are called into action.

In its inception, a tic is a purposive act, since it represents a movement the purpose of which is to secure relief. Later the cause may disappear, and then the movement becomes purposeless.

While a tic is involuntary, it is to a certain extent under the control of the will, since it may be prevented from occurring for a short time if the patient directs what will power he may have against its

¹From the Laboratory of Neuro-Pathology of the University of Pennsylvania and the Philadelphia General Hospital. Read, by invitation, before the Philadelphia Neurological Society January 28th, 1916.

repetition, but it is in this direction that the individual is least capable mentally, and, therefore, inhibition of the tic even for a short time is extremely difficult. A tic may be temporarily inhibited by the attention of the ticeur being fixed upon the performance of an agreeable task, which requires highly specialized skill. Meige and Feindel (1), in their excellent monograph, describe a man who was afflicted by many and various tics, yet when engaged in a game of billiards or fencing, he did not tic. It is equally true that whenever engaged in an unpleasant or difficult task which results in a feeling of inadequacy, the tic is exaggerated. Whenever a ticeur feels that he is under observation or his attention is directed to his infirmity the movement becomes more violent.

Patrick (2) called attention to the fact that the voluntary inhibition of a tic produces a feeling of malaise, followed by a feeling of relief and satisfaction after the movement overcomes the inhibition and is accomplished. Inhibition of a tic by the exercise of the will can be brought about and maintained for a short time, but it occasions such mental discomfort that inhibition cannot be maintained.

Charcot (3) taught that a tic was a physical expression of a psychic disease, which view was later held by Brissaud, Meige and Feindel and others. He also held that the irresistible impulse to tic and the succeeding content were evidences of the functional nature of the disease.

An understanding of the mental state of the ticeur is of importance, since it offers an explanation of why an ordinary movement of everyday life may become habitual and therefore a tic.

Itard (4), in 1825, called attention to the "infantilism of tiquers," and later, Charcot, Brissaud and many others recognized that there was, in patients so afflicted, a defective mental endowment. They are of a class deficient in will power, rather than in intellect, and it is this inequality of development which is most striking. Infantile reactions to environment in tiquers, guided by the emotions rather than by judgment, easily angered and of strong likes and dislikes, rapidly changing without cause are quite characteristic.

CLINICAL HISTORY.

Case G. G., admitted to the Philadelphia General Hospital September 16, 1897, where he remained until his death on March 22, 1914, was under observation for a period of seventeen years. During this time he was observed by several members of the neurological staff, and frequent notes were made by Drs. Burr, Potts, McConnell and Spiller. His symptoms having remained comparatively

the same, the notes made by Dr. Spiller a relatively short time before death will be used.

Family History.—Father and mother died at an advanced age, from unknown causes. Three brothers and two sisters are living and well.

There is no history of serious illness, operations or accidents occurring prior to his present illness. The beginning of his present trouble dates back twelve years, to an injury which was as follows: While assisting in unloading a press, some part of the apparatus gave way and the patient fell backward to the ground. A crowbar fell and struck him across the right side of the abdomen and lower part of the chest. Following the injury, he was unconscious (time not stated), and was confined to bed. During this time there was difficult and painful urination, and at times, blood was passed. Immediately after the injury he suffered from shortness of breath, and muscular twitchings of the back occurred, at times lasting for several hours, occurring from one to five times each week. These attacks were sometimes brought on by hard work or worry. His trouble became progressively worse, and he developed what he describes as "fits." The entire body would twitch, but he never lost consciousness. These attacks sometimes lasted for several hours, and occurred four or five times a week. For relief he went to the Episcopal Hospital, where he was confined to bed for several months and was discharged as incurable.

After leaving the hospital he developed attacks in which he would lose power in his arms and legs, causing him to fall, but he never became unconscious. It is stated that excitement always brought on one of these attacks, which persisted for some years.

In 1901, four years after entrance to the Philadelphia General Hospital, it is noted that he had abdominal spasms which were brought to his attention by shortness of breath. They were attributed by him to pain in his abdomen, which, as he expressed it, was so severe as to "double him up," and he would feel as if his "insides were leaving him." He complained of considerable pain and tenderness over the lower end of the spine. This complaint was persistent, beginning in the dorsal region and increasing as the lumbar region was reached. It is noted that there was a slight curvature backward in the dorsal region. Skiagraphs were negative.

At one period of his residence, a cast had been applied to the trunk, in order to determine if support would in any way influence the pain described above, but it did not.

In appearance, he is an old man. The mouth is always kept open, and the tongue shows a fine tremor.

Gait and Station.—The patient states that he cannot walk without the aid of his crutch on his right side. In walking the body is bent to the right about 15°, and there is a contraction forward of the trunk and head, due to the abdominal spasm. The feet are always wide apart, and the step measures about twelve inches in height. When the crutch is taken away the abdominal spasms become much worse, and he would fall if not supported.

With the aid of his crutch he does not sway with the eyes closed

and the feet together, but as soon as the crutch is removed he will fall in a heap.

Chest.—Barrel shaped, bulging distinctly in lower part. The two sides are symmetrical and the expansion is poor, breathing being largely of the costal type. Dyspnea is marked when he lies on his back, but relieved when position is changed to the side. The lungs are normal.

Heart.—Area of dullness normal. Sounds are distinct, and of fair muscular quality. No murmurs or accentuation of aortic or pulmonic sounds.

Abdomen.—Soft and flabby, but fairly fat. There is a small, soft, superficial tumor mass at the costal margin in the left side. The abdominal movements will be described later.

The musculature of the upper extremities presents no atrophies or spasticities. The muscles are soft and flabby. He can perform all active movements well, and resistance to passive movements is equal on the two sides, but less than normal. The same condition is found in the lower extremities.

The deep reflexes have shown great variability. Earlier in his history they were quite uniformly noted as exaggerated, but during the last eight years they have been noted as diminished or absent at various examinations by the same examiner.

The following notes were made about six months apart: The biceps and triceps are prompt and slightly exaggerated on the left side; normal on the right. Patellar and Achilles reflexes are absent on both sides. There are no pathological reflexes.

Six Months Later.—The patellar reflexes are present, but greatly diminished on both sides. The same is true of the ankle jerks. "On stroking the sole of the right foot, the great toe is at first slightly flexed, then decidedly distended. This is a constant phenomenon, and at times it seems to constitute almost a true Babinski. The great toe on the left is never dorsal flexed. There is no ankle or patellar clonus."

Superficial Reflexes.—Abdominal and epigastric cannot be tested. Cremasteric on the left is exaggerated, while the right is sluggish. It is noted that upon stroking the inside of the right thigh, the left cremasteric is much more active than the right.

Sensation to touch, heat and cold, and pin prick is normal. No sphincter disturbances.

Eyes.—Vision is good. Irides react to light and convergence. On testing the eye reflex there is a constant contraction and relaxation of the lids.

Hearing is impaired, probably due to age.

Tic of the Abdominal Muscles.—The abdominal muscles are in a state of constant contraction and relaxation during passive inspiration and expiration, but during deep inspiration the contraction ceases to reappear with expiration. The entire movement is wave-like, spontaneous, and followed by two shorter or two longer contractions. When the patient believes himself to be unobserved, the tic is not marked, but under the slight stimulus of observation it becomes, at times, so marked as to force the air out of the chest with

such violence that the sound is plainly heard, and there is marked dyspnea due to the power and frequency of the muscular movements. In lifting the limbs from the bed, thereby fixing the abdominal muscles, there is much less contraction, but the dyspnea is proportionally greater.

The oblique muscles seem to take part in the tic movement feebly except under excitement, and then contract strongly. Contraction of all the abdominal muscles with the umbilicus as the fixed point, gives to the abdomen a pyriform appearance.

On watching the lower part of the chest during contraction, there is a distinct impulse on the right side, as if the liver were being pushed forcibly against the abdominal wall. Upon spreading the palms of the hands over the lower part of the chest, leaving about four inches between the thumbs, there is, during each contraction, a decrease of at least one inch between them.

During each tic movement the symphysis pubes and the costal margin are brought much nearer together, the head sharply extended, due to the contraction of the abdominal muscles and not to contraction of the muscles of the neck, although at times the latissimus dorsi takes part in producing the movement of the head. The trapezius is never seen to contract. The respirations usually averaged twenty-five per minute, and were rarely below twenty.

Death occurred March 22, 1914, at the age of 69, from myocardial degeneration. Sections were studied: of the medulla; fourth, fifth, sixth, seventh and eighth cervical; first, second, third, fourth and twelfth thoracic; first, second and third lumbar segments; also sections of the recti abdominis at two different levels.

In previous cases studied, involvement of the nervous system has not been found, nor was there any change in sections studied in this case, except those incident to age. Even the sections of muscle did not show hypertrophy, as one might expect.

Oppenheim describes a case in which the tensor fasciæ latæ, the extensors of the thigh and the recti abdominis had been affected for six years, resulting in a marked hypertrophy.

It is interesting to note the fact that the psychoneurosis had its beginning as the result of the injury, as he had been able to work, and had not manifested symptoms of a peculiar mental state prior to that time. That there was a definite injury was shown by the period of unconsciousness and painful urination accompanied by hematuria. That the physical trauma, in this case, was productive of a psychoneurosis lasting for twenty-nine years is evidenced by the immediate development of muscular twitchings, convulsions of a psychogenic nature and later by abdominal tic.

The "fits," as he called them, were of two distinct types; one is described as a "jerking" of all of the muscles of the body, without loss of consciousness or falling, and the other, as a "weakness of all the muscles of the body, causing him to fall, without losing con-

sciousness or having twitching of the muscles." These psychic manifestations persisted for about sixteen years and gradually disappeared, to be followed by the abdominal tic which was present until his death thirteen years later.

Oppenheim considers that tic may result from an external cause or an idea. In this case, while the trauma had occurred long before the development of the tic, yet, to the patient, the trauma persisted, because he always complained of pain in the lower dorsal region, and it would seem probable that the tic movement was initiated as a relief from this pain. However, the original trauma was a potent factor in bringing about a peculiar psychic state which made the tic possible.

The exact mental mechanism by means of which an idea results in a tic is not well understood, although it is probable that the majority of the tics owe their origin to an idea rather than a peripheral irritation. Obsessive thinking and tics are so frequently present in the same individual, that one is forced to recognize the possibility of the same cause as productive of both.

An obsession represents a substitution process in which the affect has been separated from its original distressing idea, and becomes associated with an idea not repellant, which by reason of being frequently forced into consciousness, entails a motor reaction. Frequent repetition of this motor reaction leads to its becoming habitual and, therefore, a tic.

Clark (5) states that when an obsession is productive of a motor reaction, it cannot be removed until the idea itself has been removed.

Abdominal tic, occurring as the result of an idea, is well described by Janet (6): A woman who had been twice pregnant, thought she was pregnant a third time, as violent movement of the abdominal wall occurred. She was taken to a hospital for the purpose of delivery, but was not pregnant. After being transferred to the Salpêtrière the abdominal distention disappeared, but the tic persisted, consisting of violent upward movements of the abdominal wall, the recti being firmly contracted. The upward movement of the umbilicus was interrupted from time to time by the contraction of the oblique muscle, which pulled the abdomen from side to side. This tic was repeated about ten times per minute. The patient later became pregnant, but the tic never disappeared.

The second case was even more remarkable. A woman suffered from the fixed idea that there was an animal in her abdomen. There was a sharp severe contraction of the recti muscles above the umbilicus, then an invagination of the contracted portion by the

oblique muscles. The pictures descriptive of this movement are very striking.

There was a slight deformity of the lower dorsal and lumbar spine in my case. The skiagraphs were negative. This deformity, in the absence of organic disease, may have resulted from the psychic shock of the injury. Carriere (7.) describes the case of a young boy who developed a deformity of his spine after an altercation with a playmate; there was also a well marked abdominal tic. Both disappeared after hypnotism.

It may be observed that the tic of G. G. had many features which would suggest a spasm of the abdominal muscles, rather than a true tic, but spasms of muscles always require a pathological irritation in some part of the reflex arc. Moreover, muscular spasms are confined to a single muscle or one group of muscles, rather than to muscle groups coördinated for the purpose of a definite function. Study of the necropsy material did not reveal such a cause, although the patient always complained of pain in his lower dorsal region, nor would we expect a pathological irritation, provided one was present, to persist for a period of thirteen years without becoming more marked or losing its irritating property.

That an irritation of the reflex arc of the lower thoracic region may give rise to a spasm of the abdominal muscles, producing similar movements to the ones described in this patient, is shown by the case described by Chipault (8). There were paroxysms of pain in the subcostal region, accompanied by violent contraction of all the muscles of the right abdominal wall, the movements occurring at intervals of a few minutes to several hours. At operation, the eighth, ninth, and tenth dorsal roots were found to be compressed by an infiltration and thickening of the pia arachnoid.

That the character of the abdominal muscular contraction in my case is typical of a tic is shown by:

(a) Rhythmical character, each contraction being followed by two longer or two shorter ones of like character.

(b) Coördination of muscles of the abdominal wall in producing a contraction, characterized by the pyriform appearance of the abdomen with the umbilicus as the center.

(c) Increase in violence of the tic by consciousness of observation, leading to well marked dyspneic attacks due to the power of the muscular contractions, preventing proper movement of the diaphragm in abdominal breathing.

(d) Resemblance of the tic movements to purposive movements.

(e) Automatic character, as shown by the inability to inhibit the tic, and the uniform and persistent character of the tic.

(f) The mental state. That there was an abnormal mental state is shown by the persistent psychogenic convulsions for a period of sixteen years, also by the mental process which necessitated a crutch in walking, although there was no physical infirmity rendering it necessary. As a further evidence is the fact that many symptoms of a psychic nature disappeared when the necessity for earning a living had been removed.

An interesting clinical observation was the variability of the reflexes, especially of the lower extremities, which were noted to be diminished, and at other times, absent, by the same observer. At times there was dorsal flexion of the great toe on the right followed by extension. A study of the cord did not give an explanation for this variability.

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ON THE INTERPRETATION OF SYMPTOMS IN THE INFECTIVE EXHAUSTIVE PSYCHOSES

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The infective exhaustive psychoses, or as they have more properly been termed, the toxic exhaustive psychoses, have been isolated as a clinical group only comparatively recently. The descriptions are lacking in a number of details. We have been given no very clear interpretation of many of the symptoms, and there is often much haziness as to just what cases should be included in this group. The typical cases are quite readily recognized, but when there are unusual features there may be much difficulty in understanding the symptomatology and in making the diagnosis.

Because of these difficulties, we feel that the clinical descriptions should be improved in certain respects. When this is accomplished we may be able to interpret certain symptoms more readily, and to learn the origin of others. In this communication, therefore, we shall suggest the use of a somewhat schematic arrangement by which the symptoms may be described under different headings, according to the basis on which they arise. It is hoped that by emphasizing the importance of certain symptom complexes, an explanation of some of the more obscure symptoms may be possible. We also emphasize here the close relationship of these toxic exhaustive psychoses to certain other toxic reactions. Finally, we shall indicate a few directions in which further study is desirable.

Yet it cannot be said that we lack clinical descriptions of toxic exhaustive states. Kraepelin¹ has described them very fully. Bonhoeffer² has also given us excellent clinical pictures; but both these descriptions are unsatisfactory in certain respects. One difficulty is that these writers use a great many terms in a way which were formerly intended for dementia præcox. The terms negativism, mutism, stereopathy, catatonia, etc., used freely by these writers, have a quite different significance in acute toxic exhaustive states than they have in dementia præcox. Any one who is not already familiar with the different clinical pictures would be misled by this

¹ Kraepelin, *Das infektiöse Irresein* (8th edition).

² Bonhoeffer, *Die Symptomatischenpsychosen*, etc., 1910.

terminology alone. Again, while in other psychoses, the manic depressive for example, the symptoms are grouped under certain fundamental headings—some symptoms occurring because of a mood change, some, such as flight, distractibility, etc., dependent upon disorders of association, etc.—while this grouping of symptoms is made in our description of the manic depressive psychoses, the toxic exhaustive states are described under no such definite headings and in no ordered way. Added to this, a great many psychogenic symptoms are present, such as one sees in dementia præcox. Kraepelin has offered very little explanation of these symptoms and Bonhoeffer pays comparatively little attention to them. Bleuler, on the other hand, says that when any such symptoms occur the cases are to be regarded as schizophrenic. We feel that for clinical reasons and for further study the need of closer differentiation is quite evident.

Dr. Hoch³ has given a résumé which is most helpful in understanding *the delirious states* of these disorders. He divides all deliria into two main groups, the psychogenic and the organic. By an organic delirium is not necessarily meant a condition dependent upon gross brain lesions, in the way in which we generally employ the term organic, but rather, it is meant that some definite toxic or exhaustive factor is the causative agent. The symptoms of these organic deliria—such as the disorientation, the peculiar nature of the hallucinations, the changes in clearness of consciousness, etc.—are all quite characteristic. This is in contrast to the psychogenic delirious states, in which the apparent delirium (hysterical delirium) has to do with some topic of dynamic value in the subconscious. This latter state is not a true delirium, but until Dr. Hoch pointed out the distinction, the two conditions were not satisfactorily differentiated.

With these preliminary remarks, we may now proceed with the main outline of the description. In order that a definite type may be kept in mind by the reader, we may consider as typical cases either a post-typhoid toxic exhaustive psychosis or a post-puerperal psychosis. With these cases as types we propose to give an outline of the symptomatology under headings which, it is hoped, will be useful for the interpretation of symptoms and for further study.

Now in accordance with Dr. Hoch's observations, we see much that is *organic* in these toxic exhaustive psychoses, using the term organic in the way in which he has used it. The frank delirium, the slight elevation of temperature, the deranged state of the ali-

³ The Problem of Toxic-Infectious Psychoses, August Hoch, New York State Hospital Bulletin, 1912, v, 384.

mentary canal, the slurring speech in some cases, and a number of other symptoms, all point in this direction. We propose, therefore, to separate out all those symptoms which seem definitely dependent upon organic (*i. e.*, toxic or exhaustive) factors, and describe them separately. This entire group of symptoms, or this symptom complex, we shall designate as *the organic part of the reaction*. Under this heading fall all the physical signs of toxemia or exhaustion, few as they are in many instances.

But after we have described the symptoms which we have spoken of as organic, there remain many other symptoms to be described. There is a definite *mood change* in most cases, either before, during, or after the delirium. The anxiety and the depression may be extreme. Elation is common, and well-marked manic symptoms, such as flight of ideas, distractibility, rhyming, etc., may be met with in delirious utterances. In the subsequent confused period much real depression may be observed. All these symptoms we propose to regard separately and group under another heading. This symptom complex with manic-like characteristics we shall term *the affective part of the reaction*.

Finally, we must speak of another group of symptoms which are met with in varying degrees of importance in nearly all toxic-exhaustive states. These are the trend reactions, the delusional formations, etc. These symptoms may be very transitory, and dependent upon lack of clearness, but again they may be of very definite dynamic importance. All the symptoms which appear to be of *psychogenic* origin we shall group under another heading, which is termed *the psychogenic part of the reaction*. Since our knowledge of the origin of psychogenic symptoms in general is less complete than that of organic, for example, so in this instance we will be able to do little more than mention the symptoms under this group. Their interpretation may vary with different observers but their presence should be recognized by all.

To summarize, we would describe the symptoms seen in the toxic-exhaustive psychoses under these three headings: the organic part of the reaction, the affective part, and the psychogenic part. These are all seen in any given case and often at the same time.

Before outlining the symptoms which we consider of the most significance under these headings, we may recall to the reader certain stages in the course of these psychoses which should be kept in mind. At the onset, there is the prodromal stage, during which there is much irritability, anxiety, etc. These symptoms are mainly of affective character and may last for a few days only. Next often

comes a frank delirium, in which the organic part of the reaction is most in evidence. Then may come a prolonged stage of the psychoses, which for want of a better term, we may refer to as the confused period. This latter stage may endure for weeks or even months. Many psychogenic features are often in evidence, and out of it it appears that chronicity occasionally develops. With these different phases of the entire reaction in mind, we may now proceed with the description of the individual symptoms. It is hoped that a somewhat detailed enumeration of symptoms will be excused by the fact that we wish to bring together all symptoms belonging to definite symptom complexes.

The Organic Part of the Reaction.—Of all the symptoms seen in toxic exhaustive states, that which seems most closely associated with the physical disorder—the elevation of temperature, the toxemia from the infection, etc.—is the delirium. As both Kraepelin and Bonhoeffer have mentioned, this delirium may be initial, febrile, or post-febrile. While the symptoms are much the same in all, our experience has been mainly with post-febrile cases. These cases develop, after a few prodromal symptoms, in a few days, or even weeks, after the acute physical symptoms and the fever have subsided.

In delirium, necessarily, the clouding of consciousness must be the most important feature. The orientation is entirely lost in all respects. Such patients mistake the physicians or nurses for relatives. They call to their friends, etc., who they think are just outside or above them. They often think that they are at home—in a hotel, on the train, etc. They have no appreciation of time, or of the chronology of passing events. Symptoms dependent upon a loss of personal orientation are quite prominent at times. Patients speak of their own bodies in an impersonal way as "it." They also feel that the body is changed in a most distorted way—the legs are shortened, the eyes are twisted. These symptoms are rather different from the sense of bodily change in cases of depression, but the differentiation is at times difficult.

Memory is of course interfered with where consciousness is clouded. There is generally complete amnesia for the deeper levels of the delirium—but certain occurrences may be remembered: "islands" of memory are retained. Well-marked fabrications are often seen and are quite as definite as in the polyneuritic psychoses.

The perceptive faculties, whose integrity is necessary for the understanding of complex situations, passing events, etc., are impaired. Some such patients cannot read a simple paragraph under-

standingly. They read word by word and do not comprehend. They comprehend some one detail only of a picture; they cannot comprehend the general presentation. In speaking to them in long sentences, phrases only are understood. These symptoms may in part be dependent upon failure of attention but probably in part only, as there seems to be a disorder of those directing forces which are necessary to make a series of ideas comprehensible.

The hallucinations of delirious states are quite characteristic. Those of sight are often very distinctive. They are more marked at night. Often the patients see a series of events, a parade, a wedding, or a short scene in a play. They often see moving pictures on the wall. Very often the objects they see are much distorted. They see imps, small people, people cut in half, people with their limbs off, their heads off, etc. This type of visual hallucinations is quite characteristic of these deliria. It may be accompanied by a depressive or fearful affect and then it is in every way comparable to the toxic delirium of delirium tremens. Hallucinations may be induced or suggested by pressure over the eyeball or by the use of pictures, or even blank paper.

The hallucinations of hearing are very vivid. They generally consist of disconnected words or phrases, in contrast to the hallucinations in dementia praecox, for example, where the hallucinations are a part of connected trends of thought. The toxic exhaustive patient often hears voices which relate to his former working life. In such cases, the term "occupation delirium," which has been used, is quite descriptive of the mental state. In some cases the voices seem to come from inanimate objects, such as a vase of flowers; or the sound of heels on the floor is interpreted as a voice. Such patients often hear someone, perhaps relatives, being tortured or burned just outside the door. With the agreeable affective states, beautiful music may be heard and this is not infrequently accompanied by visions of angels floating in the air. A marked religious coloring to the visual hallucinations is not infrequent.

Hallucinations of the senses of taste and smell are probably more frequent in these disorders than in any other, and so are of some diagnostic significance. Such patients often speak of their food as filth, spoiled meat, or human flesh. They describe an odor or taste which to them justifies this conclusion.

Very characteristic of these deliria are the hallucinations of touch. This is probably an indication of a certain degree of toxic neuritis, as there may be either a mild paresthesia, or a well-defined polyneuritis. Very frequently the patients speak of bugs crawling

on the face. They feel insects on the hands and arms. They may request frequent baths, and an inquiry will reveal that this is to get rid of these sensations.

All cases of delirium should be examined frequently for changes in clearness of consciousness. At one time in the day they may be entirely disoriented; again, perhaps after a short rest, they may be nearly clear for a short time, and realize where they are. The symptoms are worse at night, and the hallucinations of the night may be spoken of as a dream on the following day. By commanding the attention these patients may be raised temporarily from the delirium, to relapse quickly when left alone. Cases of mental exhaustion dependent upon broken cardiac compensation show that changes in the state of consciousness are clearly dependent upon the heart condition.

States of stupor come as a natural sequence after the more profound deliria. In these conditions attention cannot be even momentarily gained.

Another group of symptoms which one should never fail to investigate are the paraphasic symptoms. These are readily overlooked, unless specially investigated. The use of a wrong word is very common. Some slight difficulty in naming objects may occur temporarily and there is a similar difficulty in the use of objects.

There are a number of *physical accompaniments* of delirious states which should be mentioned. In the febrile deliria there is hyperpyrexia, but we are at present referring to those deliria which start some days or weeks after the acute febrile condition has subsided. These post-febrile delirious states are accompanied by a slight elevation of temperature, but in this case the temperature does not appear to be of etiological significance. The patients generally have the appearance of being physically ill. The lips are dry, tongue is coated, the eyes are heavy, and there is considerable muscular exhaustion. The pulse is often wiry and rapid, and the extremities may be cold. The pupils are often dilated. Considerable difficulty in articulation may be observed along with the paraphasia. The speech may be definitely slurring with considerable tremor of the facial muscles.

More marked evidences of toxic involvement of the nervous system may be manifest. Added to the paresthesia a well-marked polyneuritis may exist. Cases of this kind have been observed, following such exhaustive and toxic states as the puerperium and typhoid fever. Complete recovery is observed in these cases. The

characteristic multiple neuritis, with the delirium, fabrications and retention defect, are symptoms very similar to those seen in the alcoholic Korsakow's psychoses, and one seems justified in concluding that both states arise on a similar toxic basis.

In summary, it appears that the rapid heart, the dilated pupils, the deranged gastro-intestinal tract, the slurring and ataxic speech and the occasional cases of multiple neuritis—it appears that these symptoms, accompanied by a delirium, are sufficient to indicate the physical basis on which these states arise. The term organic delirium seems entirely appropriate.

The Affective Part of the Reaction.—When we have described the organic side of these psychoses, many mental symptoms are left unmentioned. We shall now indicate the extent to which affective or mood changes are responsible for a certain group of symptoms. By these affective reactions we are, of course, not referring to manic-depressive attacks which are brought out by physical illnesses, but rather to mood changes and allied symptoms which are an integral part of the toxic exhaustive psychoses.

Depressive symptoms may be observed at the onset, that is during the prodromal stage, before the delirium. This may merely be the apprehension and irritability seen in any serious physical illness, or it may be marked by extreme anxiety and restlessness with suicidal impulses.

During the delirious phase the depression may continue. An anxious apprehensive state is not uncommon and this is generally associated with hallucinations of a fearful character; the thought content is in keeping with this affect. Any suicidal attempts are liable to be of an impulsive nature, arising from a clouded sensorium, rather than the deliberate and planned attempts of the manic-depressive depression.

Of more interest during the delirious state are the manic-like features. These symptoms are very like those seen in manic-depressive cases. A definite elation may be present, and the utterances are manic-like. There may be rhyming and distractibility with play on words. At the same time, the productions are generally interspersed with delirious utterances which are not a part of definite manic pictures. There may be much motor activity, but this is quite likely to be purposeless. It arises in a clouded sensorium, where the environment is not fully appreciated. With the elated mood, however, and the volubility with distractibility and rhyming, these cases may be indistinguishable from manic-depressive reactions, if one relies on the clinical picture alone. In such instances a

definite affective reaction is undeniable and the difficulties of diagnosis are increased by the fact that some manic-depressive cases at the onset show transitory exhaustive symptoms.

In toxic exhaustive states, not only elation, but a certain euphoria and grandiose tendency may temporarily be in evidence. Bonhoeffer has reported some instances, and we have observed two such cases, although they are probably infrequent.

Not uncommonly, the more profound the delirium the more the mood tends to be one of elation, except of course when degrees of stupor are reached. In the milder cases, in which there may for brief periods be some vague insight, the mood is one of anxiety or apprehension. There is probably no constant relationship, however, between the mood change and the depth of the delirium.

During the prolonged confused period following the delirium the mood is variable. More frequently there is an anxious depressed state during which many psychogenic features are in evidence. The depression is genuine, as contrasted with the more shallow mood reactions of dementia præcox. Marked variability of mood may be in evidence, suggesting the ability of affect seen in organic brain disease. Occasionally a considerable degree of elation may be present during this period but this, in our experience, is unusual.

From what has been stated, it will be observed that definite affective reactions are present throughout the various phases of toxic exhaustive states. At times the affective reactions are slight; again they may be so marked as to dominate the clinical picture and thereby lead to a faulty diagnosis.

We are inclined to regard these affective changes in the same way as they are regarded in organic brain disease. In cases of early paresis we at times see manic pictures, and in such cases the diagnosis may be established only by the presence of definite physical signs and positive laboratory findings. In cerebral arteriosclerosis both manic and depressed states occur. In all these cases it appears that the underlying characteristics of the personality are accentuated during such periods of impaired mentality. In the toxic exhaustive states the higher control is likewise removed and the natural tendencies of the personality are expressed in an exaggerated form. An additional toxic element may be present to account for the mood change; we know, for example, that tubercular patients are often slightly elated. Of the nature of these latter factors, however, and of the way in which they act, we have no very definite knowledge.

The Psychogenic Part of the Reaction.—By the psychogenic part of the reaction we refer to the delusional trends, the peculiarities of

the behavior, symbolism, etc., which are observed in these disorders. Such symptoms may occur during the delirium, but are generally more marked during the subsequent confused period.

Peculiarities of behavior and the delusional interpretations seem dependent upon two main factors during this confused state. Some symptoms seem dependent upon the perplexity, the confusion, the inability to think clearly and to entirely comprehend the environment. Thus these symptoms seem of quite superficial origin and are comparatively benign in character. Other symptoms, of more definite psychogenic origin, are the expression of underlying trends of the personality which are allowed to come to the surface during a period of impaired mental control. These symptoms are of more serious character. In some cases it appears that most of the symptoms can be accounted for by the perplexity and lack of clearness. In others the trends are very deeply rooted and seem to be a more grave psychotic manifestation.

Although the symptoms rising out of the confusion are not of the same significance as the deeper trends, we feel that they are best referred to here. The oddities of conduct and behavior are also to be spoken of at this time.

First, as regards the conduct. These patients while apparently clear and free from delirium show many oddities of behavior. It is in the description of these traits that Kraepelin and Bonhoeffer have used many terms as they are used in dementia praecox. The patient does not answer and so the term mutism is used. He stands about inattentive to surroundings, and the term stereopathy, resistiveness, etc., are employed. We feel that these symptoms arise from quite different sources than in dementia praecox, and so the use of such terms here may be misleading. If one investigates, it is found that the conduct is peculiar because of perplexity, or because of failure to understand the environment. Dementia praecox patients showing similar symptoms are not as a rule perplexed. They are quite clear and deliberate. In the toxic exhaustive states there is much apprehension and uncertainty. This lack of complete clearness, then, is probably responsible for many of the oddities of behavior. Patients after recovery will explain that they do not remember this period of their illness very clearly, and they give quite reasonable explanations for many of the symptoms.

Lack of complete appreciation of the environment may be indicated in other ways. At night such patients are confused, and generally distressing dreams have the value of reality. It is as yet difficult for them to distinguish between the reality of their environment

and the unreal circumstances of the delirium. This mixture of clearness and unclearness explains some of the delusional ideas. The hallucinations continue at night as a residual of the delirium. Such states may continue for weeks or, in an exhausted individual, for months.

A patient of this sort, under observation some time ago, was very assaultive, apparently without cause. She always wished to visit the cellar; the physician was improperly treating her child, etc. A study of her case revealed that she was quite clouded at night, although clear during the day. In her dreams she seemed to see the nurse crushing her child under her knee. She saw the children about to be run over by a wagon, etc., in fact, a number of symptoms indicated that some residuals of the delirium were present at night. These impressions had all the vividness of reality, and the patient in the morning was unable to form correct judgments. When assured of her mistakes, she had insight for the time and the suspicions cleared temporarily, only to reappear towards evening, or after a restless night. Thus a number of the symptoms seem to be quite readily explained, and were of benign origin. Other symptoms observed in this case, however, were of more serious significance.

In the above explanation of symptoms, it might be inferred that the deeper psychogenic factors are of minor importance in these delirious and confused states; yet when we learn of certain other manifestations, we find that many important psychogenic symptoms come to the surface at this time.

These more serious symptoms often come out after the delirium has entirely disappeared. Such symptoms are very similar to the trend reactions, delusional formations, etc., seen in dementia præcox, or occasionally in the atypical manic states. They have as a rule a favorable prognosis. It is when these symptoms are marked that Bleuler regards the cases as essentially schizophrenic. While we hesitate to accept this generalization, since thereby many psychoses of various types are regarded as primarily schizophrenic, still the conception serves a useful purpose by emphasizing the psychogenic elements in a number of conditions.

Even during the acute stage of the delirium, which we have regarded as essentially organic, many psychogenic features may be in evidence. It is not our object to discuss the origin of these symptoms here, as this whole subject requires separate consideration. Some observers lay much stress on the dynamic significance of these psychogenic symptoms. We prefer, for the present, at least, to

regard them as secondary manifestations, released by reason of an impaired higher control, just as in the case when such symptoms occur in gross organic brain disease.

We have indicated the method which seems most practical to us for the study of the toxic exhaustive psychoses. What is essentially organic is recorded, the delirium and the physical signs particularly coming under this designation. The affective symptoms are observed and their significance considered. Finally, the psychogenic part of the reaction must be given due consideration. Only in this way can we determine the importance of these various symptomatic expressions.

It remains to be shown how these general views, as expressed above, may be utilized for the better understanding of certain clinical conditions. We feel that as regards the *organic part of the reaction* in particular a somewhat broader conception than is generally entertained may be indicated. Since this organic part of the reaction is regarded as a very definite reaction on the part of the nervous system to toxic or exhaustive factors, we may expect these distinctive symptoms to appear wherever such factors are found. This symptom complex, as we have here described it, is found in a number of states which are not always considered in connection with the toxic exhaustive psychoses. We shall now indicate some of these conditions, and point out the general relationship between them.

We wish particularly to point out the close relationship of the *drug psychoses* to this general toxic exhaustive group. Dr. Hoch emphasized this some years ago, and he also indicated that the alcoholic psychoses should be similarly considered. The subgrouping for both drug and alcoholic psychoses is quite satisfactory, provided we do not lose sight of the broader interpretation.

The drug deliria bear a striking resemblance to the delirious states which we have been describing above. The hallucinations, the disorientation, the fabrications, etc., are all much the same in the two conditions. Similar physical signs such as speech disorders, paraphasia, tremor of the facial muscles, etc., are commonly met with. Indeed, a differentiation cannot be made from the clinical picture alone. This indicates the definite nature of these organic reactions in drug cases.

Likewise, the *alcoholic deliria* have quite identical features. An acute alcoholic delirium (delirium tremens) is remarkably like a toxic exhaustive delirium, the fear in the alcoholic cases being a

distinctive feature. The alcoholic Korsakow's psychoses, during the acute phases, are in every way comparable to the polyneuritic psychoses following typhoid fever or the puerperium.

We should always keep in mind, therefore, that in the drug and alcoholic deliria we are dealing with reactions in every way comparable to toxic exhaustive states. The nervous system reacts in a similar way to many different toxic agencies.

We see this organic reaction (still using the term in this particular sense), in yet another group of cases. We see toxic exhaustive deliria arising *as secondary symptoms* in a number of the psychoses of gross organic brain disease. Thus in paresis, cerebral lues, cerebral arteriosclerosis, fracture of the skull (traumatic delirium), etc., we encounter transitory delirious states.

These delirious states, when so observed, are in every way similar to the other deliria. A bromide delirium is very like the transitory delirium at times observed in paresis, and a delirium arising in the course of cerebral arteriosclerosis may resemble any other toxic exhaustive state. Thus in the psychoses of organic brain disease, we encounter these same organic deliria, occurring here as a secondary symptom.

While emphasizing the organic character of these deliria, we wish to refer to a clinical observation which appears to be of considerable significance. We do not encounter this type of delirium in the functional psychoses—in dementia præcox for example. At least this has been our experience. States of stupor and states of acute confusion occur, but not the true delirium. When an organic delirium occurs a toxic agent of some sort should be considered.

In manic-depressive cases we do occasionally see these delirious conditions, but they probably arise as complications, brought out by physical exhaustion, refusal of food, and loss of sleep. They are secondary symptoms, and are transitory.

We would therefore emphasize the distinctive character of this organic reaction wherever it is found. It is observed primarily in the toxic exhaustive psychoses, being here a leading symptom but supplemented by affective reactions and psychogenic features. It is brought out by such well-known toxic agents as drugs and alcohol. Finally, it appears as a secondary and generally as a transitory symptom in the psychoses associated with organic brain disease. We feel that it is desirable to emphasize the general identity of this symptom complex, which arises under so many different circumstances.

Returning to the more formal aspect of infective exhaustive disorders, one may point out a few directions in which further study is desirable.

We have no very clear idea of the *personality* of the individuals who suffer from these psychoses. Possibly a physical predisposition may be found—a tendency to physical fatigue or to neurasthenic states. It seems probable that there are no very constant features of the personality (such as we find in manic-depressive cases, or dementia præcox, for example), but the study of a well-observed group of cases would doubtless be of interest.

The *duration* of some of these cases is much longer than is generally realized. We recently observed a case of nearly three years' duration. On retrospect, there appears to be no reason for changing the diagnosis. Such cases are probably more frequent than a study of the literature would indicate. They may be overlooked, or regarded as dementia præcox.

The *outcome* is a matter of importance. It was formerly thought that all such cases recovered, provided they survived the acute period. Bonhoeffer¹ states that permanent defect is rare, but he mentions a post-typhoid case with defect symptoms of long standing, observed by Mönkemöller. Kraepelin definitely speaks of a chronic type, but he does not describe them very clearly; indeed the whole question of the outcome in certain instances is not very clearly understood. If true chronicity exists, it is of interest to know whether it is primarily due to physical factors, or whether mental elements play a part.

The question of chronicity is of more than mere academic interest. If such cases exist, and are wrongly diagnosed as dementia præcox, erroneous deductions might readily be drawn regarding the pathology of the latter disorder. In toxic exhaustive psychoses definite and distinctive nerve cell changes may be found. These changes have not been consistently demonstrated in dementia præcox.

In concluding, the main features which have been brought out in the above pages may be briefly summarized. The toxic exhaustive psychoses are made up of a number of elements; these elements may be designated as the organic, the affective and the psychogenic. These factors may be present in varying degree in any given case, and some of the symptoms may be more prominent than others during different phases of the psychosis. In order to understand and interpret the symptoms, it is desirable to keep in mind these three

¹ Die Symptomatischen psychosen, p. 55.

aspects of the symptomatology. This will help us to determine what etiological or diagnostic significance to give to each. Some cases may be of short duration and show mainly organic features; others of equally benign character may show marked affective reactions. Those which show a prolonged psychogenic reaction are probably more serious, although a number of these symptoms may be benign, and dependent upon lack of clearness. A prolonged course does not necessarily warrant an unfavorable prognosis.

We have attached considerable importance to the organic symptom complex, as it is felt that this part of the reaction forms a bond between all toxic exhaustive states. It connects these disorders with other reactions which are generally grouped separately—notably the drug psychoses and the alcoholic psychoses. Moreover, one can recognize this same organic type of reaction, as a secondary symptom, in the psychoses associated with gross organic brain disease. This enables us to understand why an acute episode in cerebral arteriosclerosis may resemble a drug delirium, or why the delirium of early senile dementia may resemble a post-febrile psychosis. This organic group of symptoms is a reaction on the part of the nervous system to toxic or exhaustive agencies; while these agencies may vary greatly, they probably interfere with function in much the same way, and so the same reactions are brought out.

We have indicated some of the directions in which further study is desirable. A full understanding of the personality of these individuals may be of considerable aid in interpreting a number of the symptoms. Further studies in this direction may suggest a reason why certain cases are quite benign, and others are quite prolonged. Fuller information may eventually be given about cell changes and other pathological findings; the brain cell changes arising from acute toxic agencies are well known, but those existing in chronic toxic states are not readily recognized. In order to carry out these studies successfully, it is desirable that the cases be clearly differentiated clinically, lest cases be included which do not belong to this group.

PATHOLOGICAL FINDINGS IN TWO CASES OF PARALYSIS AGITANS

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Though the symptoms occurring in paralysis agitans have long been attributed by many clinicians to cerebral changes, pathological demonstrations of the same have been advanced only within the last few years. Gowers, Westphal and Grashay observed cases of paralysis agitans in which the tremor disappeared after an attack of hemiplegia. On the other hand Krabbe (1) described a tremor of the type of paralysis agitans as occurring acutely after a paralytic attack and persisting after the return of motor function. Souques (2) considered the lesions as being cerebral and sometimes cortical. BriSSaud regarded the peduncular region, especially the locus niger, as the seat of the lesion. Maillard (3) attributed the condition to arteriosclerosis. Alquier (4) found small areas of disintegration in the brain though the motor region of the cerebral cortex was well preserved in the majority of his cases. Haskovec and Basta (5) described marked development of neuroglia along the axis cylinders of the white substance of the central nervous system and of the peripheral nerves. In the brain they found marked changes in the neuroglia cells, nuclear defects, picnomorphia, rarefaction of cytoplasm and vacuolization, more advanced than the age of the case warranted. There were slight sclerotic changes in the vessels and hyaline degeneration in the capillaries. Spielmeyer (6) considered that the neuroglia played an important part in the pathology of paralysis agitans and described a certain form of neuroglia cells similar to amoeboid cells found in the white substance of the central nervous system in six cases. F. H. Levy (7) maintained that Spielmeyer's amoeboid neuroglia cells were by no means a constant finding and suggested that these might be the result of post-mortem changes. Borgherini (8) noted in the cerebellum widening of the perivascular lymph spaces and thickening of the vessel walls and in the medulla oblongata thickening of the vessel walls, overgrowth of glia and pigmentation of the glia cells.

On purely theoretical grounds Kleist (9) and Zingerle (10) in 1908 suggested the region of the lenticular nucleus as the site of the principal lesion of paralysis agitans. Winkler (11) described a loss of fibers in the lateral nucleus of the thalamus, in the inner limb of the lenticular nucleus, in the subthalamic region, in the tegmentum and in the pons. Manschet (12) reported a loss of both fibers and cells in the thalamus, most marked in the lateral nucleus and atrophy in the putamen and subthalamic region. Jellgersma (13) found marked reduction in both size and number of the radial fibers in the lenticular nucleus, most marked in the globus pallidus. The strio-luysian fibers were atrophied. The ansa lenticularis, ansa peduncularis and the H bundle of Forel were scarcely recognizable. There were similar changes in the lateral nucleus of the thalamus with atrophy of the superior cerebellar peduncles and of the region between them. In a thorough study of the region of the basal ganglia F. H. Levy (14) observed the same reduction of both radial and medullary laminal fibers in the lenticular nucleus and of the ansa lenticularis, and even more important were the cellular changes he noted in the lenticular nucleus, the nucleus of the substantia innominata (Meynert's nucleus of the ansa lenticularis), the nucleus lateralis thalami and the dorsal nucleus of the vagus. In the lenticular nucleus there was advanced degeneration of the ganglion cells and replacement by an overgrowth of neuroglia. The glia fibers were irregular and thick; the cells large and rich in plasma. The large ganglion cells of the globus pallidus were relatively slightly involved, though they were shrunken and showed some nuclear degeneration. Senile fibrillary changes were also noted. The nucleus of the substantia innominata showed widespread senile cell degeneration of a honeycombed or granular nature. Both this nucleus and the dorsal nucleus of the vagus showed intracellular inclusions, staining light red with eosin and taking all the basic stains. The nucleus lateralis thalami and the nucleus paraventricularis showed nuclear changes and sometimes two or more nuclei in one ganglion cell. Senile and sclerotic vascular changes were frequently found. The perivascular spaces were enlarged and often filled with cells. Around many of the vessels were bodies staining with eosin and with basic stains which Levy regarded as products of degeneration precipitated from the tissue fluids probably during fixation. In many cases there were lymphocytic infiltrations, frequently in the inner half of the globus pallidus and the paraventricular zone of the thalamus. M. Löwy (15) found symmetrical areas of softening in the lenticular and caudate nuclei in the case of paralysis agitans without tremor.

F. H. Levy called attention to the clinical resemblance of many cases of paralysis agitans with early onset (between the thirtieth and fortieth years of life) to the progressive lenticular degeneration described by Wilson (16). The changes in the lenticular region are also similar though much greater in Wilson's disease. Wilson in a description of the findings in his third case stated: "The posterior two thirds of the putamen in its complete transverse extent and to a less degree the corresponding parts of the middle zone of the lenticular nucleus were the seat of an obvious softening. The substance of the nucleus was discolored, friable, pitted, as it were, worm-eaten. There were a number of small holes in it, evidently related to blood vessels: many were clear cut and empty and around these the degeneration of the nucleus seemed at its maximum. The minute vessels which remained stood out from the surface of the section, were patent, tore very easily and when extracted left but a gaping hole. The whole substance of the nucleus in the affected area was greatly shrunk, slightly hollowed out and clearly in an early stage of definite cavitation. The diameter of the minute punched out holes averaged one to one and one half millimeters, the length of the degenerated area was two and a quarter centimeters, and its greatest breadth three quarters of a centimeter."

In describing the pathological findings of a similar case Cadwalader (17) observed, "when examined under the low power microscope a number of small irregularly scattered areas of softening were readily detected in the lenticular nucleus of each side. These areas of softening varied considerably in size, the largest being about the size of a pin, whereas numerous points of beginning softening appeared to be much smaller. On the whole these areas of softening were more numerous in the putamen than in the globus pallidus. In the middle of one of the larger areas of softening as a rule the small artery stood out prominently, although the perivascular space was dilated. The surrounding tissue appeared to be contracted and there was a considerable space between it and the blood vessel which contained a few compound granular cells and a quantity of debris. The tissue in the region of the softened area contained a marked increase of neuroglia cells and when stained with hemalum-fuchsin appeared to be firmer and denser than normal. The large nerve cells of the putamen seemed to be less numerous than in the normal condition. The internal capsule, the optic thalamus and the external capsule revealed nothing abnormal.

Spiller (18), in a report on a case of contracture of the limbs of the right side, observed "that numerous areas of rarefaction were

found throughout the basal ganglia of the left side and were most numerous in the putamen of the lower part of the lenticular nucleus. These areas were of much the same size, small, and had a marked moth-eaten appearance. They were not in connection with blood vessels. Often they appeared as cavities but more careful focusing would show that they consisted of loose neuroglia tissue. They were not conspicuous in the basal ganglia of the right side, and for this reason among others they could not be regarded as artefacts. There was no atrophy of the lenticular nucleus or of any of the tracts connected with it."

CASE I.—H. W., female, single, age 67, housework, admitted to the University of Pennsylvania Hospital June 26, 1909, died February 2, 1910. Her history stated that in 1904 she began to be nervous and her hand became tremulous. This tremor gradually became worse. Her examination at that time stated that her voice was feeble and tremulous, her face expressionless and there was a pill-rolling movement of the fingers of both hands. She had a beginning arcus senilis but the eye examination was otherwise negative. She protruded her tongue in the median line and there was marked tremor. The muscles of her arm were flabby and the motor power was less than average. The biceps and triceps jerks were exaggerated. There was a typical pill-rolling movement of the fingers of both hands, which was temporarily checked on voluntary movement. The motor power of the limbs was decreased. The patellar and Achilles reflexes were increased. There was no ankle clonus and plantar irritation caused plantar flexion of the big toes of both feet. In walking the body was held forward, the arms were flexed at the elbows and the steps were short and shuffling. She died of an intercurrent pulmonary condition.

CASE II.—" M. G., female, married, 8 children, age 58, admitted to the University of Pennsylvania Hospital December 2, 1907, died January 5, 1908. She was an excessive drinker of beer. In 1903 she observed a feeling of weakness in the left arm which later developed a tremor. Early in 1906 the right arm became similarly affected. About this time her lips and tongue began to tremble and she had difficulty in talking and swallowing. She later noticed that the lower limbs were becoming weak and felt numb. Her face had a fixed mask-like expression. The eyes on examination revealed nothing abnormal. There was a coarse tremor of the upper and lower lids of both eyes, and a nystagmoid movement of both eyes on lateral deviation. There was a coarse tremor of the lips and of the tongue which she protruded only partially with great difficulty. The musculature of both arms was flabby and the motor power weak. The biceps and triceps jerks were exaggerated on both sides; the left possibly more so than the right. There was a pronounced pill-rolling movement of the fingers of both hands which ceased momentarily on voluntary movement. The lower limbs were rigid and the muscle power weak. The patellar jerks and Achilles jerks were

exaggerated. In walking, with assistance, the body was bent forward and the head held in flexion. She walked on her toes, with short shuffling steps. There was no ankle clonus and plantar irritation caused plantar flexion. Her mentality was impaired.

In a study of the brain of these two cases of paralysis agitans horizontal serial sections were made through the region of the basal ganglia and stained with Weigert's axis cylinder stain, with Nissl's thionin method and with hemalum and acid fuchsin. Owing to the age of the material the thionin sections stained poorly especially in the lenticular nucleus. Consequently several of the cell changes noted were determined in hemalum and acid fuchsin, and even in the Weigert sections. Bearing in mind the inadequacy of the Weigert fiber preparations for the determination of cellular changes and of any method which fails to stain fat for the diagnosis of fiber degeneration, much that is probably pathological must pass unmentioned and only the degenerations that are sufficiently advanced to be unquestionable will be reported.

Of the findings common to both cases it may be stated that there was no gross atrophy of any of the basal ganglia. Under low power the most obvious change was the presence of many small irregular circumscribed areas of rarefaction containing a few neuroglia cells and debris. Several of these rounded patches coalesced to form multiple areas irregular in gross outline; the edge being usually notched by the borders of the component small areas. The largest multiple areas were about a millimeter in diameter. Most of them were about one fourth of a millimeter. The vast majority of these areas were not associated with blood vessels, though in a few instances they trespassed on the perivascular spaces. Where these areas occurred in a fiber tract some of the fibers were cut, others spanned the patch uninterrupted. They were not confined to any single region. Though most plentiful in the lenticular nucleus they were found in the thalamus, in the caudate nucleus, the internal and external capsules, the claustrum, the corpus subthalamicum, in short everywhere except the cortex and the red nucleus. They were identical in type with the areas described by Spiller in his case of hemi-contracture as giving the section a moth-eaten appearance.

A finding of a very different nature was the presence of round holes with sharply cut margins, sometimes circumscribed by an overgrowth of glia fibers. These holes are clean cut as though "punched out" and contained no neuroglia or debris. Whether they originally contained vessels and were merely excessively large perivascular spaces it would be difficult to determine. They remind one strongly of the holes described by Wilson and by Cadwalader in progressive lenticular degeneration. In the case of M. G. these were met only

occasionally; in that of H. W. they were still more rare and when they did occur were small and were not lined by any circumscribing growth of glia fibers. They were found chiefly though not exclusively in the lenticular nucleus.

In both cases the perivascular spaces were slightly enlarged, in a few instances, containing basic staining deposits round, oval and crescentic in shape. In one instance at least the perivascular space appeared to have served as a mould for such a deposit which filled the entire lumen, forming a doughnut-shaped mass completely surrounding the vessel. These deposits were more frequently found in the tissue immediately about the perivascular spaces, they were too large for corpora amylacea and showed no concentric lamellation. It seems probable that they are identical with those described by F. H. Levy as products of degeneration precipitated from the tissue fluids during the process of fixation.

In accordance with the findings of Jelgersma, F. H. Levy and others, we noted a distinct reduction in the number of fibers in the external medullary lamina dividing the putamen from the globus pallidus and in the radial fibers streaming from the putamen through the globus pallidus. The latter showed marked granulation with Weigert stain suggestive of a degenerative process.

Cellular changes in the corpus striatum were ill defined. The cells of the caudate nucleus and putamen and the small cells of the globus pallidus failed to stain well with any of the stains used. In the case of H. W. the cells of the centrum medium on both sides and of the corpus subthalamicum on the left were excessively shrunken, leaving distinct pericellular spaces. In many instances the cytoplasm was vacuolated and the nucleus absolutely obliterated. In the case of M. G. these structures showed no such signs of degeneration. The occurrence of these moth-eaten patches destroying as they did in many instances portions of the fiber tracts might readily account for much of the symptomatology occurring in paralysis agitans and like conditions.

In brief the pathological changes noted in the region of the basal ganglia in the two cases studied were:

1. Areas of rarefaction containing neuroglia cells and debris giving the tissue a moth-eaten appearance.
2. Clean punched out holes possibly excessively enlarged perivascular spaces from which the vessels may have dropped out.
3. Round and oval basic staining deposits chiefly in the perivascular space and adjacent tissues.
4. Diminution in the number of the external medullary laminal

and of the radial fibers of the lenticular nucleus with some evidence of degeneration of the latter.

5. Failure of the cells of the corpus striatum to stain well which latter may possibly have been due to the age of the material.

6. In one case advanced degeneration of the cells of the centrum medium on both sides and of the corpus subthalamicum.

We wish to express our thanks to Dr. William G. Spiller for placing the above material at our disposal and for many kind suggestions in the preparation of this paper.

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Society Proceedings

THE PHILADELPHIA NEUROLOGICAL SOCIETY

DECEMBER 17, 1915

The President, DR. S. D. W. LUDLUM, in the Chair

A CASE OF PELLAGRA, WITH AUTOPSY, IN A CHILD

By Charles W. Burr, M.D., and W. B. Cadwalader, M.D.

M. A., Italian, female, 11 years old, came to the Dispensary of the Orthopedic Hospital and Infirmary for Nervous Diseases February 8, 1915.

The mother stated that she herself was healthy and that the patient's father died of heart disease. Four other children were healthy. The patient began to walk at eleven months and to talk a little later. She was healthy until five years of age, when she had some illness in which the feet were swollen, and she passed a great deal of urine.

Present trouble began when the child was ten years old with weakness and stiffness in the legs and mental slowness.

Examination.—General appearance is that of a rather high-grade imbecile. The gait is both spastic and ataxic. The right leg is more affected than the left. She tends at times suddenly to fall to the right side. The right knee jerk is plus, plus; the left plus. There is no ankle clonus and no Babinski. The plantar reflex is normal and active. No mechanical limitation of movement is observed in the hips, knees or ankles. The spine is held rigid, the head is bent a little forward but there is no tenderness on jarring or tapping the spine. On standing there is slight lateral spinal curvature, which disappears on lying down. She has incontinence of urine. There is an erythematous rash on the face, around the eyes and on the hands and wrists. There is no anesthesia anywhere. Wassermann reaction is negative. The heart and lungs are normal.

Though her appearance is imbecilic, her intelligence is good. She spells well, writes quickly and *legibly*, draws plane geometrical figures well; solids she can not draw accurately. She is somewhat awkward with her fingers.

Eye Report by Dr. Langdon: Vision—O. D. 5/25; O. S. 5/25. Pupils 3 mm. Prompt and equal reactions. Ptosis of left eye. Palpebral fissure about 7 mm. Visual axes parallel. Constant slow lateral nystagmus. Conjugate lateral rotation short as in upward rotation. Media clear. Discs oval, somewhat pale. Margins clear, no fundus changes.

She was admitted to the hospital March 24, 1915.

She improved somewhat under cacodylate of soda and iron. The erythema on hands and face entirely disappeared and she was discharged.

She was readmitted July 26, 1915, scarcely able to walk on account of spasticity. There was a bright red eruption over the forehead and around the eyes. On July 30 her temperature rose to 105 $\frac{3}{4}$, and she began to vomit. In a few hours she became unconscious, had convulsive twitching of the left arm and leg, breathing became difficult and stertorous, the neck and legs became stiff. The spinal fluid was microscopically normal. During the third day the right arm seemed paralyzed but she soon regained use of it. There

was Babinski jerk on both sides, the knee jerks were spastic, Kernig's sign was present, and there were ankle and patella clonus. She died August 4, 1915.

Autopsy.—August 4, 1915. Skin healthy. Herpes labialis. Lungs: general hypostatic edema. Heart: rigid contraction left ventricle, and dilatation right ventricle. Liver negative. Spleen negative. Pancreas hard, nodular and slightly hemorrhagic. Kidneys congested. Adrenals negative. Intestines negative. Throat negative. Internal genitalia negative. Brain showed general venous congestion and edema. Dura was tightly adherent to the skull over the entire cranial wall. The spinal cord was grossly negative.

Pathological Report of Dr. Williams B. Cadwalader.—The brain and cord were preserved in formalin solution and examined February, 1916.

Sections were made from blocks of different levels of the spinal cord, medulla oblongata and the motor cortex. The Marchi stain was used but was of no use, the specimens having been in formalin two or three months previously. Weigert hemalum and Nissl stains were used. The sections of the cerebral cortex showed nothing abnormal, but sections of the spinal cord showed considerable disease.

The most marked changes were found in the thoracic region; and consisted of degenerative changes of ganglion cells of the anterior horns and diffuse degeneration of the white matter. The anterior horn cells were swollen, the nuclei sometimes seemed to be displaced to the periphery and there was some chromatolysis. There was no round cell infiltration of the pia. The anterior and posterior roots appeared to be normal. With the Weigert stain diffuse degeneration of the nerve fibers was seen throughout the lateral and antero-lateral regions. The posterior columns were affected, but less severely than in other parts. The anterior portion of the posterior columns close to the gray commissure seemed to have escaped. There were numerous holes irregularly scattered about the periphery from the antero-lateral region as far as the exit of the posterior roots where the axis-cylinders seemed to have entirely disappeared. The white matter on either side of the median fissure close to the anterior spinal artery was also degenerated. The distribution of the degeneration did not conform strictly to the distribution of any one tract of fibers. It appeared to be a diffuse endogenous process and not a true systemic degeneration. The blood vessels were not sclerotic.

Many of the cells of the nuclei situated in the floor of the fourth ventricle appeared somewhat swollen and some appeared to be undergoing chromatolysis, including the chief nucleus of the hypoglossal nerve, the small-celled nucleus of the hypoglossal nerve, the chief auditory nucleus and Deiters' nucleus. The tenth, twelfth and eighth nerve fibers outside the medulla oblongata were partially degenerated as shown by the Weigert stain. The pyramids in the medulla oblongata were not affected, but the fibers situated in the lateral part of the medulla oblongata of both sides stained poorly with the Weigert stain, particularly in the region occupied by the tractus spino-cerebellaris ventralis and the tractus spino-vestibularis.

The interesting points in the case were the manner of death, evidently due to a sudden increase in intoxication, and the marked spinal symptoms.

COMPLETE EXTERIOR OPHTHALMOPLEGIA FOLLOWING AN ATTACK OF SEVERE COUGHING

By G. E. de Schweinitz, M.D., and W. G. Spiller, M.D.

Exterior ophthalmoplegia developing suddenly after severe coughing must be unusual, and for this reason the following case history is placed on record.

A girl, aged 4, consulted Dr. de Schweinitz on March 9, 1915. The mother and father of this child are healthy, and the child, so the mother maintains, has always been in good health, except for one or two of the usual illnesses of childhood. The mother particularly insisted that her daughter's mentality had always been excellent and that she had been normal in all respects. Eight days before she came for examination, owing to a severe cold, she coughed violently all of one night and day, and to some degree for about one half of the following day, so severely that the child was unable to hold the head up. According to the mother, there was no fever, no hebetude, and no other symptoms indicative of a severe infection. To Dr. Spiller the mother stated that the ocular conditions presently to be noted were not noticed until two or three days after the coughing spell. But she also stated to Dr. de Schweinitz that immediately on the cessation of the coughing the eye complications were observed.

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Ocular Examination.—Vision O. D. XL; O. S. LXX. Naturally, this record of acuteness of vision may not be entirely accurate, owing to the youth of the subject. The response of the pupils to the ordinary stimuli was present, but rather slow in developing. Ophthalmoscopically no lesions were discovered. The discs and retinal circulation were normal; there was no macular lesion (the child is of the Jewish race). Efforts to map the field of vision were not very successful. Certainly there were no marked changes. In one examination it seemed as if the right fields were a little more contracted than the left fields, but hemianopsia could not be developed.

The lateral movements of the eyes were entirely abolished, there was not the slightest upward movement nor the faintest torsion movement. Each eye retained a very faint downward movement, not more than 1 mm. The function of the ciliary muscle was intact.

The patient was given five grains of iodid of sodium three times a day. At the expiration of six days of this treatment, together with rest and the use of laxatives as required, a faint action of the left internus was detected. One week later, the previous treatment being unchanged, the child developed a marked bilateral convergent strabismus, of about 15 degrees, and at intervals there occurred sharp attacks of bilateral convergent strabismus, so that the corneas were well buried behind the inner commissures. There was not the faintest return of power to rotate the eyes either upward or outward. The downward rotation had increased to 5 mm.

At the expiration of twenty-three days the mother returned with the child and stated that two weeks prior to this visit, therefore about the first of April, the patient had acquired a sore throat which was believed to be diphtheritic and which was treated with antitoxin. The mother, however, declared that before this sore throat developed, therefore about the last of March, and probably approximately three weeks after the ophthalmoplegia had appeared, there had been a great improvement in all the ocular movements. These were carefully studied a few days later, when the child showed a convergent strabismus of the right eye of 10 degrees, right abduction being markedly limited, although not quite obliterated. The inward movement, or adduction of this eye, was almost restored, being within 5 degrees of normal. There was a slight convergent strabismus of the left eye, about 5 degrees, with limitation of the outward movement. The inward movement of this eye was practically normal, the cornea reaching to within 1 mm. of the inner canthus. The upward and downward movements of the eyes appeared to be fully restored (Fig. 1).

Two weeks later there was practically complete restoration of the eye movements, upward, downward, to the right and to the left, and in oblique directions. Since this date the child has not been seen, although efforts have

been made to secure an examination.¹ It is known, however, that the child at the present time is in good condition. We regret to state that no expert examination of the cardio-vascular system was made. There was, however, no apparent lesion of any of the bloodvessels. Efforts to obtain a Wassermann test were ineffectual.

In summary the ocular conditions primarily were: Complete exterior ophthalmoplegia, without loss of the levator action (absence of ptosis), no involvement of the interior ocular muscles supplied by the third nerve (iris and ciliary muscle); normal ophthalmoscopic appearances; doubtful contraction of the right visual field, but certainly no hemianopsia. The first evidence of recovery was observed in the left internus, followed by recovery of the right internus; the abducens action continuing to be defective. The next



recovery of motion occurred practically at the same time in the upward and downward movements, with slight return of the torsion movement. Ultimately, between two and three months after the onset of the ophthalmoplegia, there was practically entire restoration of ocular movements, with only a slight limitation, about 10 degrees, in the downward rotation.

In general terms it may be said that hemorrhage in the corpora quad-

¹Since this report was made the child has been examined; the ocular rotations are normal in all respects.

rigemina, the result of coughing, should be regarded as a possible etiologic factor in the palsy, and in this regard the possible or probable effect of congenital syphilis should be considered, although none of the stigmata of this condition was present.

Hemorrhage may occur in the spasms of whooping cough, but in these circumstances an infectious disease is present, and it is impossible to exclude the possibility of a localized encephalitis if symptoms indicate a brain lesion. Neither of the authors saw the child whose history is reported in this paper at the onset of the ocular palsies, but the mother's statements that the child at this time did not have fever, diarrhea, nausea nor vomiting, and did not appear to be sick in any way excepting the cold, and was not drowsy, may be accepted as reliable. Had the ocular palsy developed so rapidly from an infection through the throat, fever at least would have been probable, for young children react quickly to severe infection with fever. Whooping cough may be excluded.

The case is of importance as showing that severe coughing alone probably may produce hemorrhage in the region of the oculomotor nuclei, though one might suspect that congenital syphilis had made the vessels more liable to rupture.

The implication of the sixth nerves may be explained by the lesion affecting the posterior longitudinal bundles. If the connection in this bundle between the nucleus of the internal rectus of one side and the nucleus of the external rectus of the other side be broken, the synchronous movement of the eyeballs toward the side of the external rectus palsy probably would be abolished (paralysis of associated lateral movement), and if both posterior longitudinal bundles were affected both external recti muscles would be paralyzed. Such a paralysis as occurred in this case in its method of implication of the ocular muscles suggests a lesion in the region of the corpora quadrigemina. The escape of the inner muscles of the eyes suggests a lesion of the oculomotor nuclei, if the view of certain investigators be accepted that the nuclei of these muscles are to be found in the Edinger-Westphal nucleus of each side. This nucleus is distinct in the grouping of cells forming the oculomotor nuclei.

The method of return of function also suggests nuclear lesion. The first recovery of function was observed in the left internus, and this was soon followed by recovery of the right internus. The schemes that have been devised as representative of the position of the various groups of cells in the oculomotor nuclei for the innervation of the different ocular muscles may be viewed with suspicion, but it seems probable that the internal recti muscles, situated near the median line of the face, are represented by nuclei also near the median line of the cerebral peduncles, and therefore recovery of function in one of these muscles should be followed soon by recovery of function in the other, in proportion as release of their nuclei from the effect of hemorrhage pressure occurred.

Dr. Alfred Gordon said that when he read the announcement of Dr. de Schweinitz and Dr. Spiller's case of ophthalmoplegia following cough he immediately made arrangements to bring to the meeting a little child whom he had under observation. The mother wrote him that the child had a cold and could not come. The history was almost similar to that of Drs. de Schweinitz and Spiller. The mother stated, when she brought the child in 1913, that three months previously the child coughed incessantly and in the most violent way for three days. The mother said she had never seen an attack so severe. At the end of three days she noticed that the child could not raise her eyelids and the eyes became "crossed," to use her own expression. Ptosis was present in both eyes and there was paralysis of both external recti and a paresis of the right internal rectus. Nystagmus on lateral movements was observed. A complete eye examination was made by an oph-

thaimologist and no other changes of any kind were found. Neurologically the child was examined and absolutely nothing abnormal was found. The child was healthy and perfectly normal prior to this trouble. The Wassermann test was refused by the mother and Dr. Gordon began treating the child with sodium iodid. At the end of three months the child began to show improvement. A few weeks later some improvement was noticed at first in the internal rectus and later in the external recti. Ptosis remained persistent in both eyes. The mother ceased to come to the clinic and Dr. Gordon saw the child only occasionally. He saw the child about a month before this meeting and the palsies had entirely disappeared, the external recti had regained their function but he still noticed a slight ptosis. The recovery took a considerably longer time than in the case of Dr. de Schweinitz and Dr. Spiller.

Dr. J. Hendrie Lloyd said that one possible explanation occurred to him in reference to this very interesting case. It required certainly bilateral lesions which would catch the third, fourth and sixth nerves. It was difficult to see where bilateral lesions would do this unless it was in the course of these nerves through the cavernous sinus. The third, fourth and sixth nerves run through the cavernous sinus. The lining membrane of the sinus lies on the inner side of each nerve. The whole body of the blood flowing through the sinus is in a position, if any great pressure is brought to bear upon it, to squeeze or hit these nerve trunks. We know the great power that can be exerted through a column of fluid in a closed vessel, like in a tube. This is a well-known principle of hydraulics of which engineers avail themselves. In this case the child had been subject to very violent coughing attacks. Every one of these coughing attacks meant the congestion of blood in the cavernous sinus, and every time she coughed violently she squeezed or hit the nerves between the column of blood on the inside and the bony wall on the outside. This explains clinically the accident better than any explanation offered. Dr. Lloyd said he did not see how hemorrhage beneath the corpora quadrigemina, *i. e.*, in the nuclei beneath the aqueduct of Sylvius, could explain paralysis of the sixth nerve. There was one objection to the idea of a succession of the nerves in the cavernous sinus, namely, that the internal muscles of the eyes were not involved. Dr. Lloyd supposed that testing the power of accommodation in a child four years old was rather difficult to do. There was another difficulty, the fact that there was no ptosis. It would seem that all the fibers of the nerves should be involved, therefore ptosis should occur. We know, however, that in injuries to nerves all the fibers may not be involved. We may have injuries to peripheral nerves in which some of the fibers are involved, but not all. If it is contended that this paralysis in the present case was caused by hemorrhage in the nuclei, we have got to suppose that minute hemorrhages were present in nuclei as far apart as those of the third and fourth nerves in the midbrain and of the sixth nerves in the pons. That is a difficult thing to conceive. Against this theory also is the rapid recovery. Now we have something like this case in cases of bilateral paralysis of the sixth nerves following blows on the head. Dr. Shumway read an interesting paper before the Neurological Society some time ago, in which he spoke of bilateral injuries of the sixth nerves from such blows. We may have these injuries to the sixth nerves without any evidence of injury to the skull, such as fracture. They are caused simply by succussion to the nerve trunk, probably where it passes under the posterior clinoid process. This is analogous to what has probably happened in Dr. de Schweinitz and Dr. Spiller's case.

Dr. Alfred Gordon said in reference to the case that he reported it was quite difficult to assume that the lesion was in the cavernous sinus because if it is true that paralysis of both external recti occurred through the congestion of the cavernous sinus or a hitting of the sixth nerve, as Dr. Lloyd

expressed it, why were only some branches of the third nerve affected through the procedure and not all? He is inclined to diagnose multiple hemorrhages as they give a better idea of the condition than a hitting of only some branches of the nerve through congestion of the blood vessels. In regard to what Dr. Leopold said, namely, that it was difficult to admit that cough could produce such hemorrhage; we can not ignore the fact that apoplexy, hemiplegia, loss of consciousness may occur during intense physical efforts, such as constipation, lifting heavy weights, paroxysms of cough. A continuous cough of three days and nights can therefore easily explain the hemorrhage in his case.

Dr. de Schweinitz agreed with Dr. Leopold that the possibility of infection had not been ruled out by the studies in the case of the patient whose clinical history had been recorded, although such investigations as had been made failed to establish an infection as an etiological factor. He was inclined to agree with Dr. Gordon that violent coughing should be considered as a possible cause of hemorrhage in the sense in which it had been suggested as a possible cause of this ophthalmoplegia, and referred to various forms of ocular hemorrhage, subconjunctival as well as retinal, which were undoubtedly due to the strain of excessive coughing. Interested as he was in Dr. Lloyd's ingenious and original theory, Dr. de Schweinitz doubted its applicability. Were it so, other nerves in the same region should have suffered, and no symptom of their involvement was present. He explained how by means of the shadow test the amount of accommodation could be measured.

Dr. William G. Spiller said that Dr. Lloyd's explanation was most ingenious, but it is improbable that a lesion of each cavernous sinus would pick out the nerve fibers affected symmetrically in this case and allow others to escape. The ophthalmic division of the fifth nerve was not affected on either side. It was not necessary to assume that hemorrhage occurred in the sixth nerve nuclei, as destruction of each posterior longitudinal bundle probably would greatly interfere with the function of the sixth nerves.

Dr. E. A. Leonard (by invitation) read a paper on *The Results of Treatment in Cases of Delirium Tremens*.

Dr. Alfred Gordon said that in a German journal a man recently reported about eighty cases of delirium tremens treated systematically by lumbar punctures. In some cases two or three were done, in other cases only one. The reporter called the attention of the profession to this simple method of treating chronic alcoholics without having recourse to any other remedy. The amount of spinal fluid withdrawn was between 20 and 30 c.c.

JANUARY 28, 1916

The President, DR. S. D. W. LUDLUM, in the Chair

A CASE OF BULBAR PALSY

By Augustus A. Eshner, M.D.

A man, 43 years old, employed for some nine years in the United States Arsenal at Frankford, for perhaps half of this time in the manufacture of cartridges and for the remaining half in the soldering of lead boxes, presented himself at the Orthopedic Hospital in the service of Dr. John K. Mitchell with widespread muscular weakness and wasting, difficulty in swallowing and scarcely distinguishable mumbling speech. There was some doubt as to the order of invasion, but the symptoms had set in about two years previously, and they had been gradually progressive. In the course of their evolution the lower jaw was the seat of periodic recurrences of pain and

eventually the gums became sore and the teeth loosened, finally being removed.

On examination the musculature generally was found deficient, with fascicular twitching, especially in the muscles of the neck and chest. The thenar and hypothenar eminences were flattened and the interosseous muscles of the hands were wasted, in greater degree on the left side. The knee-jerk was increased, also in greater degree on the left, and the Babinski reflex was present. Station was steady and the dynamometer registered 120 on the right and 40 on the left. The eyes presented no fundus change and no muscular derangement.

The Wassermann reaction was negative. The red blood corpuscles numbered 4,450,000 in the cubic millimeter. The hemoglobin percentage was 70. No basophilic degeneration was noted in the red blood cells. Lead could not be isolated from the urine. The affected muscles exhibited only slight quantitative changes.

Although the patient in this case was exposed for a long period to the influence of lead in the absence of conclusive affirmative evidence there must be some doubt as to whether this metal acted as the etiologic factor in the development of the lesions of the nervous system underlying the characteristic clinical picture. The case is a close counterpart of that of a painter exhibited by Dr. Mitchell before this Society in 1909 and in whose spinal cord, later examined by Dr. Cadwalader,¹ were found disease of the ganglion cells in the anterior horns and degeneration of nerve-fibers in the lateral columns.

A CASE OF HYSTERIA

By Augustus A. Eshner, M.D.

A man, 50 years old, while engaged in unloading a boat, was struck on the right arm by a large bucket of coal falling from a great height. The member was quite severely injured, and the bone was broken in two places. Under treatment union took place and the wound healed. Ten months later the man presented himself at the Orthopedic Hospital in the service of Dr. John K. Mitchell, with a violent tremor of considerable range in the right hand, together with less marked tremor in the remaining members. In addition, he complained of pain referred to the spine and running up to the head, and of crackling sounds in the ears. There was also pain in the thighs. Sleep was poor and disturbed by jerking in various parts of the body. The man stated that in the course of his illness he had lost twenty-one perfect teeth, without any apparent lesion of the gums.

On examination the right hand was found in violent agitation when free and unsupported, the jactitation ceasing when the member was supported within the coat. This jerking had set in when the splint employed in the treatment of the fracture of the arm had been removed after a period of seven weeks. Some movement was perceptible also in the left hand. At this time the man was unable to walk without aid, the legs giving way at times. Sensibility was preserved in the affected member. The knee-jerks were exaggerated and station was fairly good.

Under treatment with static electricity and various nervine drugs, together with verbal suggestion, marked improvement has taken place, but the peculiar violent movement persists when the arm is free and unsupported and it ceases when the arm is thrust within the coat or is supported in some other way and stroked with the other hand.

The man is now able to go about with facility and comfort, but he has not resumed his occupation.

¹ JOURNAL OF NERVOUS AND MENTAL DISEASE, March, 1912.

This case is interesting, among other reasons, on account of the peculiar movement in the right upper extremity, which resembles in its behavior somewhat that presented by a patient long under the observation of the late Dr. S. Weir Mitchell, and in whom after death no organic change was found by Dr. Spiller in the central nervous system.

Dr. Alfred Gordon asked as to the condition of the reflexes, sensations and other data in the second case.

Dr. Eshner stated that he could not supply the information asked for by Dr. Gordon in the second case. The first case was clearly one of amyotrophic lateral sclerosis, with bulbar involvement.

A CASE PRESENTING ATROPHY OF THE RIGHT LOWER EXTREMITY, WITH INCREASED REFLEXES AND POSITIVE BABINSKI SIGN.

By Williams B. Cadwalader, M.D.

V. J. S., male, aged 17 years, was admitted to the University Hospital on January 13, 1916, complaining of weakness and wasting of the right lower extremity. The patient's father was said to have had syphilis; his mother, two older brothers and two younger sisters are living and well. The patient states that he had been well until 1913, when he had an attack of what he had been told was rheumatism. This condition was characterized by pain on movement in the joints of both lower extremities and also in the right hand. There was no redness nor swelling. After a few weeks he made a complete recovery. In September, 1914, he again had some pain in the region of his hip joints, which was increased by movement. It disappeared, however, after a few days.

He states that since September, 1914, his right lower limb has been gradually growing weak and the muscles have been wasting. In all other respects he is entirely well.

On examination, his eyes, cranial nerves, upper extremities and internal organs were found to be normal. The muscles of the right lower limb are moderately and uniformly atrophied and there is weakness in proportion to the wasting. The tendon reflexes are exaggerated but on the right side they are distinctly greater than on the left. There is a distinct Babinski sign on the right but not on the left side. Ankle clonus is absent. Sensation is normal. There is no incoordination, ataxia nor tremor.

Examination of the joints by Dr. Edward Martin revealed nothing abnormal and in his opinion the atrophy is not related to joint disease. This was later confirmed by Dr. Pancoast, who made x-ray studies. Dr. Leopold made an electrical examination and reported that the muscles reacted normally to the faradic current.

The Wassermann reaction was negative. Blood count and urine examination were also negative.

The combination of atrophy of gradual onset with increased reflexes and Babinski sign is a difficult one to explain. If it were not for the presence of the Babinski sign and the joint condition could have been demonstrated, then arthritis with muscular atrophy would seem to explain the case, but the presence of the Babinski sign in itself must indicate some disturbance of the upper motor neuron. It would seem possible that this patient had had an infection which had caused pain in his joints simulating rheumatism and that the spinal cord had been involved as in acute anterior poliomyelitis, some of the anterior horn cells being destroyed, causing atrophy, and the morbid process extending laterally to involve the pyramidal tracts, producing the Babinski sign and increased tendon reflexes. The fact that this boy's father

had had syphilis might be important but no evidences of syphilis have been discovered in this patient.

Dr. Dercum said that this was of course not a case of primary neurotic atrophy. The history pointed unmistakably to an infection. However, in some of its aspects it suggests a primary neurotic atrophy. Dr. Dercum had himself placed on record two cases of the latter affection in which the knee jerks were preserved. It is also well known that in autopsies in cases of primary neurotic atrophy, the changes are by no means limited to the peripheral nerves, but also involve the spinal cord. On the whole he was inclined to accept Dr. Cadwalader's explanation. The absence of spasticity is further in keeping with this explanation; there is also no evidence of spastic gait.

Dr. J. Hendrie Lloyd said he thought the subject of the relation of muscular atrophy to syphilis was an interesting and rather novel one. He did not know to what extent this case brought it up, because, as he understood, there was no evidence of specific infection. We do know, however, that there are cases of marked muscular atrophy in patients who have suffered from a primary sore. Only that afternoon Dr. Lloyd had been going over one of the cases at the Philadelphia Hospital of extreme muscular atrophy in all four limbs in a young man. The symptoms came on two years after the primary sore. The patient had a positive Wassermann reaction. As in all cases of nervous syphilis, the type was what we see in poliomyelitis, except that the symptoms came on without the evidence of an acute infection. There was not an abrupt onset with fever and pain, such as we see in poliomyelitis. The progress was slow, first in one set of muscles and then in another. Dr. Lloyd said he had another case in a man at Blockley which had impressed that fact upon him. This man was a very robust, perfectly developed fellow, over six feet tall, who had atrophy of all the muscles of one thigh from his hip to his knee. There was nothing to account for it, except that the patient had had a syphilitic infection a few years before the onset of the trouble. He had no pain, no alteration of his cranial nerves or reflexes, no evidence of syphilis in the action of his eye muscles, but he had had syphilis; and as a result some years later he began to have very marked muscular atrophy of the muscles of his thigh. It was of the type seen in poliomyelitis. This subject is referred to by comparatively few authors. McDonagh, however, in his recent work on the Biology of Syphilis, includes muscular atrophy as one of the symptoms. Nor should there be any surprise that muscular atrophy is one of the symptoms of syphilis. If the spirochete gets into the parenchyma of the posterior tracts it causes locomotor ataxia; if in the brain cortex, it causes paresis. In these cases of muscular atrophy, the spirochete probably gets into the parenchyma of the anterior horns. In these cases also the type of amyotrophic lateral sclerosis is sometimes seen. Or, again, there may be a primary lateral sclerosis, without muscular atrophy. Some years ago Dr. Lloyd, with Dr. Ludlum, had put on record a series of cases of primary, or essential, lateral sclerosis, all occurring in syphilitic subjects. In these cases doubtless the organism of syphilis finds lodgment in the lateral tracts, just as it does in tabes in the posterior tracts.

Dr. Cadwalader said that he had considered this case from exactly the same point of view Dr. Lloyd had spoken of, but there seemed too little evidence of syphilitic infection to warrant drawing such conclusions. Dr. Cadwalader said that he believed many cases of amyotrophic lateral sclerosis were syphilitic in origin. Also some cases of muscular dystrophy and some cases of spinal muscular atrophy must be syphilitic.

Dr. S. F. Gilpin showed a case of paralysis agitans in a negro.

Dr. Dercum said this was the second case of this kind he had seen. Several years ago Dr. Burr showed a case of this affection in a negro before

the Society. Dr. Gilpin's case is one of typical paralysis agitans and occurring in the negro, it is very rare.

Dr. N. S. Yawger presented a case of a lesion probably confined to one posterior horn of the spinal cord throughout the thoracic region.

Dr. J. S. Rodman and Dr. W. B. Cadwalader presented a case of cerebral abscess apparently cured by operation.

Dr. A. A. Eshner asked whether the abscess was merely intracranial or subdural or really cerebral. Its superficial character, as well as its mode of origin and the results of operation would seem to suggest the former rather than the latter.

Dr. George E. Price said the high leukocytosis was interesting. In uncomplicated intracranial abscess it was apt to be below 14,000; while in meningitis it ran from 14,000 upwards. In this case the meninges were involved.

Dr. Rodman, in closing, said if he had failed to make it clear that this was a real cortical abscess he had missed the whole point in presenting the case. There was a superficial abscess as well. The superficial abscess was between the skull and the scalp. The abscess beneath the dura was in the brain substance itself, about 2 cm. below the surface of the cortex.

Dr. Charles K. Mills and Dr. George Wilson presented a case of Sprengel's deformity: congenital elevation of the scapula.

Dr. Wilson said the patient walked with difficulty because she probably had tabes, she had sharp pains and lost reflexes, also incontinence of urine. The lack of motion of the upper limb was due to lack of motion of all the shoulder muscles, atrophy of the trapezius and deltoid. The scapula fails to descend. It is an embryological condition.

Dr. William G. Spiller read a paper on tabetic ocular crises.¹

Dr. Dercum said that Dr. Spiller's paper called to mind the intense ophthalmic migraine so-called which we every now and then meet with in paresis, especially in the early stages. Every now and then, among the early symptoms presented by paresis we meet with intense pain referred to the eyeball or to the orbit or immediately adjacent regions. These attacks are usually of short duration. They are put down in the older textbooks as attacks of ophthalmic migraine. It is not impossible that they are really attacks analogous to the tabetic crises which Dr. Spiller has described.

Dr. George E. Price inquired as to the length of the individual attacks. He thought the duration of the attacks would have a bearing on the differential diagnosis between ophthalmic migraine and tabetic ocular crises.

Dr. Alfred Gordon said tabetic ocular crises as well as crises of other cranial nerves are rare. In the last edition of Gowers no mention is made of them. In connection with this a brief history of a case of tabes under Dr. Gordon's care will be of interest. The patient had attacks of the following nature: all of a sudden she would be taken with a deafness of the left ear with dizziness. There was no pain. The attack came on suddenly and disappeared suddenly. She had for a number of months attacks of this character. Evidently it was very likely a tabetic crisis consisting of a disturbance of function of the eighth nerve. Sudden attacks of this character lasting a fraction of a minute and consisting of deafness with vertigo and without pain are exceedingly rare. He examined a patient for objective sensory disturbance of the ear in which there was no trace of involvement of the fifth nerve, but this striking symptom of sudden deafness of the left ear and vertigo, although without pain, reminds one of tabetic crises.

¹ Published in the Journal of the American Medical Association, March 18, 1916.

Dr. Charles K. Mills said the case was interesting and had been well presented by Dr. Spiller. There was only one point about this patient to which he would refer. So far as his description of what he sees is concerned, Dr. Mills was inclined to attribute that to his emotional and imaginative tendencies. He is a well known case at Blockley. Almost every member of the staff has at times heard him discoursing on the Lord, the stars, salvation and damnation, etc., much after the manner of his description of his visions in the attacks described.

Dr. Spiller said the man he presented has attacks at various times during the day and they disappear as suddenly as they come. He did not believe the visual phenomena could be attributed to vivid imagination, because they were always associated with agonizing pain and intense lachrymation.

Dr. Charles K. Mills said he did not mean to infer that the case was not such as Dr. Spiller described. He had seen the man in one of his visual attacks a short time since. He merely wished to indicate that the patient's imagination would tend to expand a real visual appearance. If he saw a lizard or a lobster in his optic crises his imagination was sufficient to call up a train of other visions.

Professor Ulric Dahlgren of Princeton University read a paper on the primitive balancing apparatus in vertebrates.

FEBRUARY 25, 1916

The President, DR. FRANCIS X. DERGUM, in the Chair

Drs. S. D. Ingham and William E. Robertson presented a case in which spinal tumor had been removed ten months previously.

Dr. John H. W. Rhein asked if there had been at any time any abdominal pain, and what the present reflexes were.

Dr. Ingham said the reflexes of both legs were absent constantly from the time of the first examination.

Dr. P. de Long showed a case of tabes with paralysis agitans.

Dr. Theodore Weisenburg said he had asked Dr. de Long to show this case because he thought it was very unusual. He had known this man for sixteen or seventeen years. He always thought him a typical case of tabes dorsalis. Six or seven years ago Dr. Weisenburg noticed that the man had a tremor of the right upper limb, then in the head and now in both lower limbs. It is a very unusual complication.

Dr. Rhein said that he had presented before the Section on Nervous and Mental Diseases of the American Medical Association, in June, 1904, a case of locomotor ataxia in which there was a tremor resembling paralysis agitans. The pill-rolling position of the fingers was well illustrated, the tremor being fine and rhythmical and bilateral. Voluntary effort quieted the movements temporarily, after which they became more intense. The pathological study of the case showed the usual findings of well-advanced tabes. Arterial change could not even be compared with that found in cases of paralysis agitans in which it has been claimed that the lesions resemble those of old age. No degeneration of the muscle spindles was found. This case was one of tabes associated with paralysis agitans.

CEREBRO-CEREBELLAR ATAXIA

By Alfred Gordon, M.D.

Girl of 17, made her first attempt to walk at 18 months. Began to speak only at 2 years of age. From that time her speech remained deficient. She

would stumble and fall while walking until the age of 12, and then began to improve. More marked improvement commenced three years ago. At that time she showed marked ataxia of both hands, had to be fed; gait swaying, feet scraped the floor. Was mentally defective, could not progress in studies. The speech was deliberate with accentuation of syllables; enuresis.

Present status.—Intelligence below normal. With Binet-Simon test the mentality is that of a child of 10. Gait peculiar: walks stooping, sways slightly at each step; slight scraping of the floor; stands well on one foot, but not on the other; in turning around a tendency to fall; no spasticity; knee jerk ++. Ankle clonus slight on both sides. Babinski distinct on left, but not always obtainable on right; slight ataxia of arms. Sensations normal; speech overprecise, slow; eyes normal, no nystagmus. Wassermann test negative. Family history negative; born at term.

Comment.—The *cerebral* symptoms are: evidences of pyramidal tract involvement, speech and mental status. The *cerebellar* symptoms are: ataxia of arms and legs, station and absence of rigidity. Progressive improvement of motor symptoms is noticeable. In 1903 Batten described "congenital cerebellar ataxia" and the symptoms are: onset in early life, unsteadiness of head, trunk, limbs, unsteadiness in sitting, standing, walking, slowness in swallowing, alteration in speech, tendency towards recovery, but speech, mild degree of ataxia and uncertainty in gait remain. In 1913 L. P. Clark described "cerebro-cerebellar diplegia," the symptoms of which are: cerebellar ataxia and mental defect; unusual flaccidity of the limbs, especially in the upper; ataxia in all limbs, straddling gait, dysmetria, no changes in reflexes; tendency towards improvement especially in cerebellar symptoms, but speech and mental deficiency remain unaltered. In this case also cerebral and cerebellar symptoms are present; evolution of symptoms, progressive improvement and the remaining condition are all the same as in Batten's and Clark's cases; only in their cases the reflexes are normal; in Dr. Gordon's they are ++; Babinski and ankle clonus present. Therefore cerebral symptoms are preserved. Batten's, Clark's and Dr. Gordon's case are identical in essential features. *Nature:* probably congenital defect in cerebrum and cerebellum.

Dr. Cadwalader stated that the case that Dr. Gordon referred to and which he had reported before this Society about one year ago under the title of Cerebellar Diplegia, seemed to him quite different from the case Dr. Gordon had just exhibited. Dr. Gordon's patient did not seem to Dr. Cadwalader like the type of case that Clark, Batten and others have reported, because spasticity was present with increased tendon reflexes and in the typical cases of cerebellar diplegia hypotonicity was perhaps the most striking feature. The patient Dr. Cadwalader had reported was extremely hypotonic, did not have a Babinski sign and was extremely ataxic and tremulous.

Dr. Gordon said that ankle clonus was present on both sides and the knee jerks exaggerated. In Batten's and Clark's cases the reflexes were normal. In regard to the Wassermann test the patient has been tested twice and both times the results were negative.

AN UNUSUAL SPINAL CORD CASE

By T. H. Weisenburg, M.D.

Patient is a man about forty-five years of age. His history is that about eight months ago he began to be weak in the left leg and in a month or so in the right leg, and since then he has noticed a gradual increase of weakness in the lower limbs, until when he was admitted to the hospital six months later he was unable to walk at all. An examination then showed foot drop on both sides and inability to move the toes and feet below the knees. There

was a disturbance of sensation for pain and temperature but not for touch over both lower limbs to about the middle of the thigh. In the course of about a month the weakness in both lower limbs extended until he could not move his feet at all and the disturbance of sensation has extended until he is unable to have any form of sensation over both lower limbs and abdomen to a point on the right side corresponding with the umbilicus and the left about two inches below. Almost from the beginning his bladder and rectum have been involved, until at the present time there is total loss of bladder control. Examination showed an unusual condition in his reflexes. The patellar jerks were increased, the Achilles jerks were lost and plantar irritation caused no movement of the toes, but irritation by the Oppenheim method gave a distinct extensor response on both sides. It is interesting in testing this method that if the irritation was over the anterior tibial group the corresponding group responded alone, while if the irritation was over the peroneal group only this group responded. In the course of a week or two the responses of the toes changed very much, inasmuch as plantar irritation if sufficiently long continued causes an extensor response of the toes. It must be remembered that this patient had complete loss of sensation for all forms and yet plantar irritation caused a distinct response of the toes which according to Babinski is impossible.

The interesting point about this case outside of the phenomena mentioned is that the responses by irritation either over the plantar surface or over the leg at once eliminates the location of the lesion from the lumbo-sacral area and places it higher up, that is, about the ninth or tenth thoracic, which is the limit of the loss of sensation, for if the lesion were in the cells of the anterior horn supplying the tibial and peroneal group of muscles, no irritation would cause a response. This is a very important point in spinal diagnosis and has not been sufficiently emphasized.

Dr. Charles K. Mills said he had seen this patient in his service at Blockley. The diagnosis seemed to him to be pretty clearly a lumbo-sacral myelitis or a thoracico-lumbo-sacral myelitis. It was unusual, Dr. Mills thought, to see the Beevor sign demonstrated in that way. One interesting point was the ability to obtain dorsal tension in the absence of sensation. He thought the case required thought and discussion. There must be some transfer of afferent stimuli in order that this reflex should be brought out and therefore it was likely there was some retention of the integrity of the cord in the region concerned with the Babinski reflex. He did not think that the diagnosis of peripheral multiple neuritis would fit the case.

Dr. Weisenburg thought that the presence of extensor response on plantar irritation was evidence of the fact that sensation was not entirely lost.

Dr. Gordon inquired whether Dr. Weisenburg has asked the man when he pressed deeply on the muscles of the leg whether he felt the pressure, that is, had Dr. Weisenburg tested for deep sensation.

Dr. Weisenburg replied the man had an absence of all sensibility. He was surprised that Dr. Gordon was not able to obtain his reflex as he thought this was precisely the kind of case in which Dr. Gordon had claimed that his reflex was of value.

A CASE OF NON-TRAUMATIC ISOLATED CERVICAL SYMPATHETIC PARALYSIS

By H. Maxwell Langdon, M.D.

Mrs. E. G., aged 48, complaining of drooping of right eyelid for thirteen years. No history of trauma, does not know when it began. Patient well in every other way except for a moderate enlargement of the thyroid. Stout,

well-nourished woman. Wassermann negative. Right lid droops, pupil is small. Eyes are negative except in so far as the lid, pupil, and ocular position are concerned, there being slight enophthalmos. O. D. palpebral fissure measured 4.5 mm., O. S. fissure 7 mm.; O. D. pupil measured 1.5 mm., O. S. pupil 2.5 mm.; O. D. exophthalmos measured 15.5 mm., O. S. exoph. 16.5 mm. After three drops of a 5 per cent. solution of cocaine and waiting thirty minutes, O. D. fissure measured 5 mm., O. S. fissure 9 mm.; O. D. pupil measured 1.5 mm., O. S. pupil 4 mm.; O. D. exophthalmos measured 15.5 mm., O. S. exoph. measured 17 mm., making it quite sure there was paresis of the right cervical sympathetic; the right side of the face was also less well developed than the left.

Dr. F. H. Clark (by invitation) reported a case of tic of the abdominal muscles of eighteen years' duration, with necropsy (*See page 510.*)

Dr. Weisenburg said he remembered this patient very well, as he had been in Blockley for a long time. He had taken moving pictures of him six or seven years ago and again several years before he died. The tic in the first picture was very marked, in the latter not quite so marked and it was his impression that it became less as the patient grew older. The pictures of this patient were shown before the International Medical Congress in London in 1913. It is interesting that most of the neurologists expressed themselves that they had not seen a similar case.

Dr. Langdon said one thing struck him: that the majority of tics come from an idea; the commonest form is that of oculomotor spasm and that comes from a mild low-grade conjunctivitis, which will be present a short time. He has seen it any number of times in children and it is kept up by the continual closing of the orbicularis, and if it is treated more or less actively with lotions containing zinc the tic will often quiet down if taken in its earliest form. He thought many of them go on for years because not treated, not from an idea, but as an actual condition.

The form of tic which ophthalmologists most frequently see is blepharospasm, which usually does not start from an idea, in his experience, but with some form of mild conjunctival inflammation, which in turn is kept up by the spasm of the orbicularis, and so a vicious circle is set up. The best treatment is a lotion containing astringents, especially zinc, though the habit once formed is at times quite difficult to overcome.

TUMOR OF THE DURA

By John H. W. Rhein, M.D., and Thomas Adams, M.D.

The man, aged 48, colored, was admitted to the Howard Hospital January 5, 1916, at 1.30 a.m. Upon admission the left arm and leg were the seat of convulsive movements. The patient was conscious and talked intelligently and said the convulsive disturbances came on at midnight and that this was the first attack. The left arm and leg seemed weak and he was unable to lift the left leg from the level of the table. The pulse was hard and bounding. The patient was put in bed, the convulsions persisting. He bit his tongue, the left side of the face became drawn, and he became unconscious at the end of an hour. The blood pressure was over 300 mm. Venesection was done and four ounces of blood withdrawn. The convulsions ceased and he became quiet.

Upon examination by Dr. Rhein the following day he presented the following condition: Conjugate deviation of the eyes to the right, pupils inactive and equal, breathing stertorous, both cheeks blowing out equally. The right arm was rigid; the left flaccid. There was no rigidity of either leg. Ba-

binski was present on the right side. The knee jerks were capricious, occasionally present on both sides slightly, but absent on most tests. There was no clonus on either side. Heart sounds were clear and there were moist râles on the bases on both sides. Further tests could not be made, as the man was unconscious.

The patient's sister gave the following statement: Her brother had lived in her house for several years, working regularly as a stevedore. His only complaint was that at times his left arm and leg would go to sleep and sometimes at night he would ask her children to rub his hand to take away the sensation. On the night of the attack he came home from work as usual and ate a large supper of sausage. He went to bed early and she heard him singing a hymn while undressing. About midnight she was awakened by his groans. She said he was always a great eater of meat, but was not an alcoholic. He died at 6 p.m. of January 5.

Pathological diagnosis: Edema of the lungs with congestion and small patches of bronchial pneumonia. The kidneys showed focal interstitial nephritis and parenchymatous change. There was a well-marked arterial sclerosis. The brain was the seat of a tumor involving the dura on the right side, in the paracentral region. It was very cellular, the cells being elongated, and contained many thin-walled blood vessels and several round calcareous bodies. Dr. E. O. Case made a diagnosis of psammo-sarcoma.

The tumor is a spherical mass about 4 cm. in diameter. It is attached to the dura and compresses the brain in the right paracentral region, forming a depression in the cortex $3\frac{1}{2}$ cm. long, and in depth almost 2 cm. and about $2\frac{1}{2}$ cm. in transverse diameter. When in position the tumor is only slightly elevated above the surface of the brain. The brain tissue is not invaded. The brain macroscopically appeared otherwise to be normal.

Of tumors of the dura mater, sarcoma and endothelioma are the most common, fibroma, lipoma, and chordoma being of rarer occurrence. Gliosarcoma of the brain, and carcinoma of the scalp may give secondary growths in the dura. The psammo-sarcoma is not uncommon.

This case illustrated the case with which this class of tumors may be removed. In this case if the patient could have been under observation long enough to have made a diagnosis, no doubt the tumor could have been successfully removed. The causation of the symptoms causing death is a matter of doubt in this case. The man was undoubtedly uremic and a diagnosis of uremic convulsions was made. The question arises, did not the tumor localize the convulsions to one side?

TIC DOULOUREUX

By G. M. Dorrance, M.D.

Dr. Dorrance gave a brief historical sketch of the history of the disease and gave more or less in detail all of the early methods of treatment employed for its relief.

He gave in detail the accepted methods of treatment at the present day and favored the surgical and injection methods.

While selecting five methods of operating, he favored that of Cushing for gasserectomy and that of Frazier and Spiller for cutting the posterior root.

He gave in detail Levy and Bauloin's method, made popular in this country by Patrick, and showed several lantern slides illustrating the method of approach to the various branches.

Harte's method was given as the one of choice and here several slides and many anatomical pictures were shown illustrating the method and showing the needle in position.

He has tried all the methods and felt Hartel's is the most reliable. Dr. Dorrance has made over 300 injections of the ganglion on cadavers during the past year, using methylene blue, and made many interesting observations on the position of the needle and the diffusion of the alcohol.

He explained the number of failures reported and showed illustrations to emphasize the reasons.

He pointed out a fact hitherto unmentioned of the presence of an anomalous vein at the foramen ovale.

In conclusion he advises the operator to thoroughly familiarize himself with the method and practice faithfully on cadavers before attempting an injection on a patient.

Dr. C. M. Byrnes said that Dr. Dorrance, like most writers upon this subject, attributes the first ganglion injection to Hartel, but from Dr. Byrnes' study of the literature, it appears that Taptas was the first to perform such an operation, and was followed later by Harris of London. It appeared to him that the selection of the descending root of the zygoma as the posterior landmark for determining the point of puncture is unsatisfactory, since this bony elevation is often absent and is therefore extremely difficult to determine upon the living subject.

Dr. Dorrance's statement that no experimental work had been done upon the effect of alcohol when injected into the Gasserian ganglion is inaccurate, since Dr. Byrnes presented his studies upon this subject before this Society more than a year ago, and later published those studies in the Johns Hopkins Hospital Bulletin, January, 1915. Similar studies have also been made by May of England. At the same time, Dr. Byrnes demonstrated his method and the instrument used by him for locating the foramen ovale, and thus reaching the Gasserian ganglion.

Dr. Dorrance's lantern demonstration and anatomical illustration of Hartel's method are well chosen and helpful, but Dr. Byrnes did not see that any new technical procedures have been introduced. It is well to remember that there is a small percentage of skulls in which the foramen ovale is so situated that the ganglion is inaccessible by any route, and his objection to Hartel's technique is due largely to the fact that at least one of the landmarks which determines the direction of the needle is itself variable. By the use of the instrument which he had adopted, this variability is overcome, and the needle is so directed that there is little danger of entering the jugular foramen.

Since the needle is sometimes occluded by a small clot of blood, it is well to make the injection with a syringe, which has a guard upon the plunger, so that in case excessive pressure is required to disengage the clot, the entire contents of the barrel will not be injected at once.

NEW YORK NEUROLOGICAL SOCIETY

FEBRUARY 1, 1916

The President, DR. WILLIAM LESZYŃSKY, in the Chair

REPORT OF A CASE OF CEREBRAL ABSCESS WITH AUTOPSY

By M. Neustaedter, M.D.

The patient, a male, 23 years old, had a negative family history and a negative personal history for alcoholism, venereal disease or trauma. He had had measles and otitis media as a child. Onset of the present illness occurred July, 1915, with pain in the right side of the neck, for which a

physician ordered a tooth extracted. The condition, however, became worse, with typical headache, dulness and difficulty in answering questions. He was admitted to Bellevue Hospital. He was found to have double choked discs, partial auditory aphasia, left oculoptosis, unequal pupils, pain on percussion over both mastoids. Superficial and deep reflexes were exaggerated and there was partial right hemiplegia. Both ear drums were incised and pus obtained which was stained for tubercle bacilli, but was negative. Lumbar puncture was done and blood examinations made. The blood count showed: W. B. C. 20,800; polys 77 per cent.; lym. 23 per cent. A brain abscess was suspected and operation was performed, incising the left mastoid. Fifteen c.c. of pus were removed and the wound was drained. The blood Wassermann was positive but the spinal fluid was negative. The general condition improved with operation, as well as papilledema and ptosis. Aphasia continued and hemiplegia became more pronounced. On August 11, while having his wound dressed, he died suddenly from respiratory failure. At autopsy, the brain showed marked enlargement on the left side, complete flattening of the left base and very marked dilatation of the veins. The abscess on the left side was very extensive and pushed through the claustrum into the internal capsule, occluding half the left ventricle. There was also an abscess on the right side in the temporo-sphenoidal lobe, burrowing back into the occipital lobe. The report of the pathologist was a double tuberculous mastoiditis.

Dr. Leszynsky asked if this was looked upon as a secondary otitic abscess.

Dr. Neustaedter said the otitis media occurred eight years before, but there was no history of a recent affection, but this evidently was the cause.

A CASE OF BULBAR DISEASE WITH UNUSUAL SYMPTOMS

S.P. Goodhart, M.D., and A. Skversky, M.D. (by invitation)

The patient, Russian, male, 22, was admitted to the Montefiore Hospital a month ago, complaining of heaviness, numbness on the left side, and paralysis of the left side of the face. The family and personal history was negative. The present trouble dated back three years with history of two attacks. The first attack occurred with pain and paresthesia of both extremities on the left side. After the first attack which kept him in bed for two weeks, he could not walk straight. He swayed or fell to the right. He acquired the use of the limbs again but felt numbness and heaviness in them. One year ago suddenly he felt the face drawn to the right and had double vision; his tongue was thrust to the side and he could not swallow. After six weeks there was slight improvement. The patient was well developed and nourished. Vision was good. There was no sexual nor sphincter disturbance. There was still complete paralysis of the left face and occasional rapid fibrillation of the left upper abdominal muscles. There was left adiadochokinesis, left upper asynergia, left astereognosis, marked. The left upper and lower abdominal reflexes were absent. Knee jerks present, but right exaggerated. The X-ray picture showed that the whole osseous system had undergone condensation, some canals being obliterated. In conclusion, there was therefore involvement of the motor cranial nerves of the left side; definite sensory disturbance, epicritic, protopathic and of deep sensibility. It was questionable whether the increased right knee jerk should be considered pathological, without further evidence of pyramidal tract involvement. The case was one of obscure origin when the onset in two attacks was considered. These might be apoplectiform, but the course did not suggest polioencephalitis. Each attack resulted in a disease picture which might be explained in part. The question was were these two attacks to be considered due to the same lesion.

The uniform subjective sensory disturbance of the initial attack pointed to right-sided brain involvement, possibly thalamic, but the second attack suggested bulbar pontine involvement. How was the isolated astereognosis on the same side to be explained? Was this a true cortical astereognosis, if the patient had lost perception of the form, size, consistency and weight of the object? The absence of abdominal reflexes pointed to pyramidal tract involvement, but there was nothing else to bear this out. The other isolated symptoms, such as falling to the right and the present nystagmus, were not accounted for. If the case were one of vascular origin, a more profound general disturbance might have been expected. At no time had there been any symptoms of intracranial pressure, yet a central gliosis was a possibility. One might account for the clinical picture with the diagnosis of multiple sclerosis, but those who presented the case were not inclined to regard it so. The osseous changes were those described in general luctic disorders, but the history and serological findings had not borne this out. The possible influence of the pituitary should not be overlooked in view of the increased size of the sella turcica, with the general picture of osteosclerosis and increased sugar tolerance.

Dr. S. P. Goodhart said that the interest of the case seemed the difficulty of explaining the symptoms by a single lesion. A good deal depended upon whether the astereognosis was a true cortical astereognosis. He would not so regard it on account of the inability of the patient to interpret objects held in the hand. In cortical astereognosis the form would be recognized. A cortical lesion then might be ruled out. It was more likely to be thalamic in character. The lesion was erratic, affecting the sixth, seventh, avoiding the eighth, involving the ninth slightly and the eleventh absolutely. With the sensory symptoms this was difficult to explain with one lesion, unless a gliosis were considered in which the sensory tract had crossed the level of the sixth and seventh, but the lesion was unusual. He thought the case was some form of gliosis.

Dr. M. Neustaedter said he had presented a similar case at the Section Meeting, the case of a young man, 19 years of age, in whom the lesion escaped the sixth and seventh, but he had the other symptoms. In addition he had spastic hemiplegia and very marked astereognosis, also on the left side. The cytological examination was negative. It was a question why there was involvement of the cranial nerves and astereognosis and spasticity on the same side. Dr. Neustaedter did not see why there should not be gliosis producing an irregular infiltration. In glioma the lesion would be much more circumscribed and produce therefore much more definite symptoms. He would regard the case as one of syringobulbia.

STUDIES IN THE ESTABLISHMENT OF PERMANENT DRAINAGE IN CASES OF HYDROCEPHALUS

By Adrian V. S. Lambert, M.D.

Dr. Lambert stated that procedures had been evolved for the relief of this condition, but not one had been permanently retained. Recently treatment had been based, however, on correct physiology. It was recognized that the fluid was absorbed mainly into the large venous sinuses through the arachnoid villi, and perhaps, slightly, through the lymphatic system. The absorption took place much more rapidly from the cranial arachnoid space than from the spinal. The so-called "circulation" of the cerebrospinal fluid, which was secreted in the ventricles, was into the arachnoid space, thence into the blood. Observers had shown that the rate of flow could be increased by compression

of the jugulars, and ligation of the internal carotid arteries perhaps diminished the rate of secretion and favorably influenced cases. Hydrocephalus resulted from increases of ratio of secretion, as compared with absorption. One of three conditions might occur: (1) an increase in rate of secretion, with normal absorption; (2) a normal rate of secretion with diminished rate of absorption; (3) an increased rate of both secretion and absorption, with greater secretory increase. In all three cases an accumulation of fluid resulted, with increased intracranial pressure. Relief might occur by increasing absorption or diminishing secretion. Cases that might be favorably influenced by treatment were those whose lesion was not removable by operation, or with increased intraventricular tension, due to inaccessible neoplasm. Two kinds of cases were classified: (1) *obstructive*, in which the passage of fluid was interfered with; (2) *communicating*, where, despite free flow from the ventricles, there occurred accumulation of fluid under increased tension. Ligation of the carotids had been found too risky a procedure to use to diminish rate of secretion. Methods to increase the rate of absorption were therefore considered. Very many substances had been employed in attempts to drain the ventricles, but most of them gave rise to irritative reactions in the tissues. In the search for an ideal non-irritative substance for a permanent connection between the ventricles and the arachnoid space, collodion had been suggested and was found non-irritative. It was, however, impossible to make tubes of it and collodion had been used as a substitute. The tubes of this substance could be sterilized, were not brittle, were light, non-collapsible, and withstood reasonable manipulation. With the employment of these tubes permanent drainage had been effected between the ventricles and the arachnoid space by introducing a tube through the corpus callosum and leaving it in situ. Further opportunities of drainage were now sought to increase absorption. The peritoneal cavity was considered as it was well known that it could absorb an enormous quantity of fluid. The procedure of uniting the ventricles with the peritoneal cavity had been hitherto considered severe, the mortality being high. There was too rapid an escape of fluid, and free drainage had not been maintained. By the employment of collodion tubes which telescoped one another a permanent free drainage had been obtained, the lower end of the tube being kept open inside the larger tube. This procedure had been found effective. It was not difficult and the peritoneal manipulation had been found so slight as not to give rise to any shock. The opening of the skull was of such short duration as to be borne by most patients. Two incisions were necessary—one $1\frac{1}{2}$ inches over the twelfth rib, deepened down to the peritoneum, without opening the latter; one in the neck from the external occipital protuberance downward for 2 inches. A long canula was passed from the lower wound to the upper and the larger tube passed through it. The flange of the tube was implanted into the peritoneal cavity. An opening was then made in the occipital bone, the arachnoid space was opened, and the smaller tube was passed down inside of the larger one. The wounds were then closed. Collodion had been found absolutely non-irritative for this and other procedures, such as implantation in sheets to prevent formation of adhesions, or for adherent dura, or removal of neoplasms. No ill effects had been observed.

Dr. B. Sachs said he had never attempted to establish a connection between the brain and the abdomen, and therefore felt very incompetent to discuss the question. In the first operation referred to he was reminded of a callosal operation where the attempt was made to establish a connection between the ventricles and the arachnoid space. If one could be sure of establishing a permanent drainage the case might be successful, but the trouble usually was that the drainage was not permanent. He would like to ask the doctor in how many cases this method had been tried.

Dr. Lambert answered that the corpus callosum connection had been tried in a good many cases, children as well as adults, and, so far as they could tell, permanent drainage had been established.

Dr. Sachs said the procedures were very interesting and the results in a large number of cases should be watched for. He would like to ask if the other procedure was an easy one and how long could the connection be kept open.

Dr. Lambert said he did not know exactly how long, but at least several months.

Dr. Brush said he had seen two such cases, where permanent drainage had been established through the corpus callosum. A child had been kept alive for nine months, but beyond that there was no noticeable improvement. The death finally occurred from marasmus. The question was, was it really worth while keeping a child alive in a case where the brain was badly malformed from birth and the child would be defective? Simply to perpetuate malformed beings could be hardly worth the trouble.

Dr. Leszynsky said he was not familiar with the method of drainage from the subarachnoid space or into the peritoneum. He had had some experience with the corpus callosum method. The doctor had said his procedure was a simple affair. He would like to ask if it was difficult to pass the tube into the ventricle. Was it strong enough to go through the callosum, or had it to be passed afterwards? Sometimes when the callosum had been punctured the opening remained patent for many months.

Dr. Lambert said the tubes were passed on the stiff canula. They fitted on the end of it. The canula was withdrawn and the tubes were left in situ.

SOME APPLICATIONS OF THE NEURO-BIOLOGICAL METHOD OF INVESTIGATION TO THE STUDY OF CONSCIOUSNESS

By Stewart Paton, M.D. (by invitation)

Dr. Paton gave this paper to the Society rather as a point of view than as a statement. A philosopher had said that only one thing was more misleading than statistics and that was a fact. This principle was apt to hold where isolated facts were concerned. The problem of consciousness should be approached from the broad biological standpoint and it would then be found that some of the difficulties of this investigation would vanish. Reactions of organisms should be studied as units. Even the reflex could not be understood by itself, but only in connection with all the other biological reactions. Reactivity depended upon factors both inside and outside of the nervous system. Any problem of reactivity looked at only from the human standpoint was unnecessarily complicated. Excellent material for the study of the simplest reactions of the embryo was found in the shark, lizard, guinea-pig, rat and chick. In the case of the shark embryo it was possible to study the primitive functions in relation to the structural changes without disturbing the natural environment. When approaching the great problem of correlation of structure and function from the comparative point of view, the great gulf which seemed to exist between man and the lower animals did not seem to be broad or deep enough to discourage the investigator in his efforts. As a matter of fact the functions of the lower animals and those of man did not seem to show any greater contrast than existed between the lower and higher functions of the human brain. Until quite recently the number of investigators in this important field was a limited one. Wintrebert, a French scientist, had attempted to bring the simple reactions of the organism into some sort of correlation with the structural conditions. The first movements that took place in the embryo were those of the heart and it was not difficult to

think of the causes which gave rise to the cardiac pulsations as being quite similar to the changes taking place in chemical reactions. The first movements of the body were not influenced by incident stimuli; in other words, the organism was not responsive to external excitation. At the moment incident stimuli became effective the reflex arc, marked by bundles of neuro-fibrils, but without any signs of medullation, was completely differentiated. A chick embryo at 120 hours of incubation, placed in Ringer's solution, responded readily to stimulation by means of a platinum electrode connected with a single dry cell. At this period when the first reactions to incident stimuli began, a number of important organs had been differentiated and had received their nerve supply. Large bundles of neuro-fibrils might be detected running from the vagus to the thyroid; and other bundles were noted in connection with the adrenals. The sympathetic nervous system had reached an advanced stage in the development. In connection with the conduction of currents by these primitive nerve tracts prior to the appearance of medullary sheaths it was interesting to note that there was a possibility of the nervous impulse following the law in the invertebrates of running in both directions. There were reasons for asking whether the specificity of the posterior and anterior roots might not begin with medullation. The question was an interesting one as to whether medullation determined the direction of the nerve current. The correlation of structure and function in the case of these primitive responses had a very important bearing on the problem of consciousness. The higher forces of consciousness were undoubtedly closely related to the functional activity of the higher brain centers, namely, those contained in the cerebral cortex. From what was already known about the physiology of the brain it was quite clear that we could not understand the functions of the higher centers without considering these in their relation to the mechanism of the great basal ganglia. The functions of the cortex were long misunderstood and only recently had it been appreciated that this structure controlled, but did not initiate legislation. In the primitive reactions of the embryo there existed an excellent opportunity for observing the development, not only of the basal ganglia, but also changes taking place in the cortex could be noted, when it first began to be a dominant factor in determining the character of the mechanism. Professor H. H. Lane had shown that the first reactions to olfactory stimuli took place at a time when the terminations of the nerves in the olfactory bulb were connected directly with the basal ganglia, medulla and cord without any relations to the cortex. It was an extremely interesting problem to try to analyze the different elements entering into the reaction when the higher centers had assumed control. Other centers were capable of being studied in a similar manner. One important fact in connection with these primitive reactions deserved special consideration, and that was at the moment when the embryo first reacted to incident stimuli in the shape of electrical stimulation or needle pricks, although the thyroid and adrenals were included in the closed circuit, the sex glands had neither received their nerve supply nor were they sufficiently differentiated to be taken into account. This might indicate that the thyroid and adrenals became factors of dominant importance in neuro-biologic reactions at a period which preceded that of the sex glands. (Dr. Paton then showed lantern slides, illustrating the development of neurofibrils in the embryo, showing the early development of the sympathetic, thyroid, spinal ganglia as well as the thyroid and adrenals.)

Dr. Bernard Sachs said that Dr. Paton had given them more material to digest than to discuss. He had great hesitation in making statements on the subject. He felt that this presentation was very much in line with the work of Eddinger in comparative embryology. Dr. Sachs believed that the correlation of structure and function could be best attempted on this line. The

problem which engaged Edinger was the first beginning of consciousness as exhibited in the lower animals. In an exhibition of some mechanical toys he had shown that what were usually considered conscious movements, such as avoidance of an obstacle, were really to be explained by laws of physical forces. The whole subject was extremely complex, and Dr. Sachs could not say how the psychologist was coming out in the solution of many of the problems offered by this study. In most textbooks on psychology there was a long first chapter devoted to the anatomy of the brain, and this was carefully avoided in the rest of the book. The fact pointed out by Dr. Paton of the very early innervation of the thyroid and adrenals was of great interest. Presumably these organs had most to do with the early physical development of the chief organs of the body, and they needed their nerve supply very much earlier than the other parts. In regard to the point of localization, Dr. Sachs was glad to hear that Dr. Paton was returning to the standpoint of his old master, Golz, who was always an antagonist of the view of strict cerebral localization, and who always claimed that it was an absurdity to say that the brain was divided into small sections with special function. He claimed that function was the result of coöperation of many different parts of the brain. The paper to-night gave neurologists a great deal of inspiration. Dr. Sachs hoped that Dr. Paton would elaborate this early beginning. They would be very glad if this suggestion led to a further study of the question of consciousness.

Dr. E. Fisher said that Dr. Paton had stated the materialistic side of mental action. It could be said that he had given a body blow to psychoanalysis. In regard to neurofibrils and medullated fibers, Dr. Paton was speaking of a very primitive form of reaction. In specialized reaction there must be some form of insulation. In regard to distinct areas of localization, Dr. Fisher thought one must have these. He could agree with the generalization of control, but in pathology certain areas were found destroyed by disease, resulting in impaired function. There were higher centers, but one did not know exactly what that meant in mental action. At the same time one could not do without definite areas of the brain that responded to the spoken or written idea. Dr. Fisher thought the meeting owed a great deal to Dr. Paton for awakening interest in new ideas of mental action.

Dr. Walter Timme said there were two questions on the sympathetic development of the early embryo which were interesting. The reason for the early development of a comparatively large mass of sympathetic fibers might be answered as follows: The sympathetic nervous system did not alone control function, but it did also control the actual cell growth. It regulated both the number and character of the cells. In the early period of life cells increased to the most rapid extent, so that it would follow that the fibers which controlled normal development would have to be increased in proportion. In experiments on animals results had been shown, that if one cut the sympathetic fibers and excluded them from performing their function, the organism would change macroscopically. The actual increase or decrease of cells would depend on the nature of the experiment. With diminished vagus control over the glandular region of the stomach and intestine there was actual increase in the number of cells. With diminished sympathetic fibers there was actual diminution of the cells. As to the antidromic passage of the current in non-medullated fibrils, that occurred in the higher animals. All of the post-ganglionic fibrils were non-medullated, in distinction to those which passed from the spinal cord to the ganglion, which were medullated. In post-ganglionic axon reflexes the current passed both ways. Actual stimulation at the upper portion of the gut caused the current to pass through the non-medullated fibers in an antidromic direction, and so cause the following section of gut to adapt itself to the oncoming bolus. The meeting owed Dr.

Paton sincere thanks for his clarity of presentation of a new viewpoint in the study of consciousness.

Dr. Joseph Byrne said that it had been well known for a long time that the basal ganglia had functions similar to those referred to by Dr. Paton. It was a commonplace in the physiological laboratory to find that after removal of the cerebral cortex a frog could avoid obstacles. Such a frog, however, was utterly incapable of conceptualizing, and would starve to death though food lay in front of it. Sherrington had recently shown that the cerebral cortex was not necessary for the elicitation of auditory reactions. Again, clinico-pathological study had shown that in lesions isolating the thalamus from the cortex certain affective elements of sensation were preserved, viz., those evoked chiefly by protopathic stimulation. Dr. Byrne did not feel that Dr. Paton, in so far as he had gone, really touched upon the phenomena of consciousness. The electrical and olfactory reactions mentioned did not rise to the dignity of consciousness as the term is understood.

Dr. S. P. Goodhart said that Dr. Paton adroitly avoided going deeply into the subject of higher forms of consciousness, though stimulating important considerations from the doctor's most instructive demonstrations. The theme of correlation of nerve reaction and function had been given a clear aspect and the speaker's experiments and deductions, simple in themselves, were the more valuable as bearing out Dr. Paton's contention that consciousness, as conceived in man, would finally be most clearly understood by first observing the simplest processes of nerve structure in its relation to the development of function in the lower forms. If consciousness in the humble species, the frog, for example, was, as Dr. Paton's experiments may be regarded, but reflex, then in man too could not one regard conscious activities, even judgment, volition, emotional reaction, as but highly complex reactions, automatic or reflex; such reflex responses as the result of past experience within the individual, acquired and inherited formulae, physically formulated to expression. Then, too, as Dr. Paton had set out to show, the basal ganglia, perhaps, had not lost their original dignity. Thus, the simple process of consciousness conceived as such in the frog, apparently a simple reflex, might be the fundamental physical principle upon which one based the most complex mechanism of consciousness in the higher animals.

Dr. L. Casamajor said that he had understood Dr. Paton to make the point that the problem was best approached by beginning with simple things and working upward; thus anatomical structures were brought into relation with function, and consciousness studied from the point of view of the different elements which go to form it rather than as a single entity. The point Dr. Paton had made that no reflex defensive reactions were possible in the embryo till both parts of the reflex arc had established their connection with the periphery, was an important one, as establishing the fact that proper nervous connections were necessary for the animal's defensive reactions. Dr. Byrne's remarks concerning the inability of the de-cerebrated frog to seek out food, although he could still avoid obstacles, seemed rather far from the point. It did not prove the dependence of consciousness upon the cortex. The cerebrum in the frog was merely an olfactory receiving station and when it was removed the animal lost his olfactory memories upon which he was obliged to rely for his choice of food. There were certainly elements of consciousness in other nervous tissue besides the cerebral cortex. The spinal cord held something of consciousness in its reflex active capacity. Likewise there were elements of consciousness in the sensory nuclei of the medulla and surely in the thalamus. The simple reflex act itself implied something of memory in its capacity for repetition. This was the memory of sensory impulse, and it was upon sensory memories that all consciousness was based.

Dr. Stewart Paton, in closing the discussion, said that he did not mean his remarks to apply to localization proven by clinical experience, but to some of the absurd theories that were advanced from time to time. As regards consciousness, he had endeavored to make it plain that he had suggested a point of view, rather than given information. He wanted to get as many people as possible to approach the subject from the simple to the complex. If he had approached it from the higher standpoint there would be very little chance of dealing with the subject in one evening. There was no doubt that the basal ganglia had a tremendous influence on the higher centers. Reflexes moved higher and finally reached the cortex.

Dr. Leszynsky said he knew he was voicing the sentiment of the meeting when he said that they were very much indebted to Dr. Paton for this valuable paper.

Translations

VEGETATIVE NEUROLOGY, THE ANATOMY, PHYSIOLOGY, PHARMODYNAMICS AND PATHOLOGY OF THE SYMPATHETIC AND AUTONOMIC SYSTEM

BY HEINRICH HIGIER

WARSAW

Authorized Translation by Walter Max Kraus, A.M., M.D. [New York].

(Continued from page 470)

17. There exists a further physiological fact of the greatest importance in regard to the vegetative nervous system, that is, a definite antagonism between its various parts. This antagonism has been recognized for some time. The newer researches upon its significance promise to be of great clinical value.

Anatomical investigations by the histological method and pharmacological investigations by the nicotine method have separated the vegetative and sensori-motor systems. Further studies have shown that the vegetative nervous system itself may be divided both anatomically and physiologically into two elements, the sympathetic and the autonomic.

Let us see how the physiologists, who of late years have devoted much attention to this subject, have established this division and how they define it anatomically, physiologically and pharmacologically. The definition is quite empirical and therefore somewhat incomplete.

"Autonomic fibers are all efferent fibers of the vegetative system which are not sympathetic" is the statement of Froelich, who draws his conclusions from his own researches and from results of the pharmacologists, Meyer and Gottlieb. "Those organs which are innervated by the sympathetic include all involuntary organs whose innervation is derived from the thoracico-lumbar spinal cord [DI to LIV]. All other nerve tracts which supply smooth muscle, glands and heart muscle are autonomic." This is another of Froe-

lich's definitions. He goes on: "The autonomic system proceeds from various parts of the cerebro-spinal axis. The uppermost part springs from the midbrain, goes to the ciliary ganglion and to the smooth muscle of the eye. This is designated the midbrain autonomic. The second part receives fibers which travel by the facial nerve and pass into the chorda tympani to the mucous membrane of the mouth and to the salivary glands. The chorda tympani is a part of the bulbar autonomic system. The glossopharyngeal and vagus nerves also belong to this part of the autonomic. The latter nerve supplies the thoracic viscera and the viscera in the upper part of the abdominal cavity. The pelvic nerve arises from the sacral part of the spinal cord, particularly from its first two segments. This nerve constitutes the sacral autonomic system. It supplies the viscera of the pelvis and the genital organs.

Between the parts of the spinal cord which have been described there are areas having nothing to do with the vegetative nervous system. One may surmise from this that the cranial autonomic had its origin far cephalad and then wandered caudad. It innervates the entire gastro-intestinal tract as far as the descending colon as well as all organs which had their origin in the digestive tube, as for example the lungs. The sacral part of the autonomic arose from the caudal end of the cerebrospinal axis and developed upward from the anal region until it met the cranial part in the colon region. Between lies the sympathetic, which with few exceptions reaches and supplies all involuntary organs of the body and with varying degree."

Eppinger and Hess, the Vienna clinicians of the school of v. Noorden, basing their observations upon the older work of the English physiologists state: "The vegetative nervous system may be defined both anatomically and functionally. Those fibers which arise in the thoracic and newer lumbar segments of the spinal cord and the sympathetic cord comprise an anatomical unit. After the fibers have left the sympathetic cord anatomical differentiation is difficult, for the sympathetic fibers are mixed with others on their way to the end organs. The second anatomical entity is characterized by the fact that its fibers arise from the midbrain and medulla as well as from the sacral cord and that they have no relation to the sympathetic cord.

On gross anatomical grounds the origin is divided into three parts, cranial, lumbar and sacral. The cranial part passes into the oculomotor nerve, is interrupted in the ciliary ganglion and supplies certain parts of the eye. The bulbar part passes into the

facial and glossopharyngeal nerves and supplies fibers to the salivary glands and the vasodilator muscles of the head. The most important nerve of the bulbar part is the vagus, the main nerve of the viscera. It supplies fibers to the heart, bronchial tubes, esophagus, stomach, intestine and pancreas. The sacral part, spoken of anatomically as the pelvic nerve, supplies fibers to the descending colon, the sigmoid, anus, bladder and genital organs.

For the sake of brevity it is customary to speak of all fibers which pass through the sympathetic cord as the sympathetic while all other fibers comprise the autonomic or "extended vagus." It is noteworthy in this connection that it is comparatively easy to separate the two systems at the cerebrospinal axis, while it is exceedingly difficult, almost impossible, to separate them at the periphery.¹

18. There are two general classes of fibers in both the autonomic and the sympathetic systems, (*a*) positive, stimulating, vaso-viscero-glandulomotor fibers, (*b*) negative, inhibitory, vaso-viscero-glanduloinhibitory fibers. The normal state of irritability of the ganglion cells is regulated through delicate activities of inhibition and stimulation so that the apparently superfluous inhibitory influences are in reality an invaluable psychic property of the central nervous system.

19. Another noteworthy characteristic of vegetative end organs is that they are supplied not only by all the paths going through the sympathetic cord (sympathetic fibers) but also by the fibers of the second system (autonomic). Thus practically no involuntarily acting organ exists which is not doubly innervated.

The sweat glands, pilomotor muscles and vascular muscles of the viscera form an exception in that they are only supplied by the sympathetic.²

However, pharmacological proof, which many consider most important, indicates that these structures, particularly the sweat glands, are innervated by the autonomic. It is in our opinion quite improbable on a priori grounds that there should be any exception to the rule that all organs are doubly innervated. We are rather inclined to believe that diffusely located ganglion cells exist in the cerebrospinal axis, which belong neither to the mesencephalic, bulbar nor sacral groups of autonomic structures and which supply the sweat glands, pilomotor muscles and vascular muscles with autonomic fibers. The apparently strange division of the autonomic would be found untrue by this rational theory.

¹See Eppinger and Hess. *Vagotonia. Nervous and Mental Disease Monograph Series No. 21.*

²For an interesting and enlightening discussion of this matter see Gaskell, *The Involuntary Nervous System, 1916.*

20. Simple investigations with electrical stimulation showed that in many organs stimulation of one system served to inhibit the activities of the other. Thus both systems, the sympathetic and the autonomic, showed physiological antagonism. Impulses going to organs from the sympathetic as a rule acted contrariwise to stimuli from the autonomic. As an example: The bulbar autonomies have a vasodilator effect upon the blood vessels of the head, while the cervical sympathetic acts in a vasoconstrictor fashion. Some doubly innervated organs do not have muscles which act exactly oppositely to one another, *i. e.*, like the sphincter and dilator pupillæ, but there is but one group of muscles. Yet stimulation of one part of the vegetative will cause shortening, of the other part lengthening of the muscle.

The double innervation is a very important characteristic, one which is not found in the psychomotor system. The cervico-thoracico-sympathetic fibers are opposed functionally and pharmacologically to the cranial autonomic fibers, and the thoracico-lumbar fibers have the same relation to the sacral autonomic, the pelvic nerve.

(*a*) The pupil, tear glands, salivary glands, and cerebral blood vessels are supplied by both the cranial autonomic and the cervical sympathetic.

(*b*) The heart, stomach and intestines are supplied by the autonomic vagus nerve and the thoracic sympathetic.

(*c*) The recto-vesico-genital apparatus is supplied by the sacral autonomic system and the lumbar sympathetic. In a word the autonomic and sympathetic are like an object and its mirrored image, are like the positive and negative of a photograph (Froelich).

Just as there are physiologically opposed stimuli, so there are chemically opposed stimuli both of exogenous and endogenous origin (atropin and pilocarpin, adrenalin and cholin). If two oppositely acting substances are used at once the more powerful gains the upper hand just as in experimental stimulation of the autonomic and sympathetic nerves to the heart, the influence of the more powerful vagus predominates, causing brachycardia, and in the eye the autonomic fibers in the oculomotor nerve predominate causing miosis.

The normal progress of activity in visceral organs is therefore an orderly result of oppositely acting stimulation. The purpose of this antagonism is to prevent the activity of the various organs from going to one extreme or the other.

21. Since the nerves of both systems are mixed with other nerves on their way to organs, the relations of the nerves to each organ

must be worked out anatomically, physiologically and pharmacologically. The following points which were not gone into in detail in the discussion of the anatomy of the sympathetic are of importance in regard to the autonomic.

(a) In the midbrain the autonomic is composed of those fibers in the oculomotor nerve which supply the sphincter pupillæ (miosis), the ciliary muscle [accommodation spasm] and in part the levator palpebræ (widening the lid slits).

(b) For the medulla the tracts going by way of the chorda tympani to the salivary glands and by way of the N. lacrimalis to the lacrimal glands are worth noting. The vagus, which supplies the lungs, heart and gastro-intestinal tract is also of great importance. This nerve contracts the smooth muscle of the bronchi. It furnishes inhibitory fibers to the heart, which act in every way antagonistically to the sympathetic accelerators. The four functions of the heart, chronotropic, inotropic, bathmotropic and dromotropic, are all affected. The vagus also contracts the musculature of the upper part of the gastro-intestinal tract, the esophagus, the cardiac sphincter and the sphincter antri pylori. It also increases the peristalsis and secretions of the stomach. In the small intestine the vagus causes emptying movements, more rarely tonic contraction. Its effect upon the smooth muscle of the gall bladder and the excretory duct of the pancreas is to produce intermittent contractions. Stimulation of the vagus branches to the pancreas causes an increase of its secretion.

(c) For the spinal cord there are in addition to sympathetic fibers diffusely located autonomic centers for control of the blood vessels of the skin and mucous membranes, the pilomotor muscles and the sweat glands.

(d) The centers of the autonomic pelvic nerve lie in the lowest part of the spinal cord. This nerve might be called a lumbosacral vagus. It supplies the descending colon, the sigmoid, the bladder and genitalia. Stimulation causes erection, spasm of the sphincter of the rectum, contraction of the detrusor of the bladder and simultaneous relaxation of the sphincter.

It is most probable that through their influence upon glands of internal secretion (pancreas, thyroid) the autonomic has a considerable influence upon metabolism.

(To be continued)

Periscope

Brain

(Vol. 36, Nos. III and IV)

1. Lymphogenous Infection of the Central Nervous System. DAVID ORR and R. G. ROWS.
2. Unusual Type of Hereditary Disease, Aplasia axialis, Extra-Corticalis Congenita. F. E. BATTEN and D. WILKINSON.
3. Study of the Posterior Longitudinal Bundle in Forced Movements. L. J. MUSKENS.
4. An Experimental Research into the Anatomy and Physiology of the Corpus Striatum. S. A. K. WILSON.
5. Aphasia due to Atrophy of the Cerebral Convolution. G. MINGAZZINI.
6. A Study of the Satellite Cells in Fifty Selected Cases of Mental Disease. S. T. ORTON.

1. *Lymphogenous Infection of the Central Nervous System.*—The authors endeavored to pierce some of the obscurity which surrounds the genesis of almost all inflammatory lesions in the central nervous system, and of those which are degenerative except where a focal lesion exists. The questions of the causation of the lesion, the point of origin of the morbid change and its propagation are constantly recurring in regard to cases of meningitis, myelitis, tabes dorsalis, dementia paralytica, and the non-systemic scleroses, and the theories advanced have often been based on assumptions devoid of proof which have tended rather to divert the investigator from, than to lead him on to, the right path. For years it has been apparent that continued examination of chronic lesions, affecting the columns of the spinal cord, while increasing our knowledge in detail yet failed to widen it in regard to etiology, and though toxic influence naturally received due recognition, its source and mechanism of action remained unexplained. It seemed obvious, therefore, that investigation ought to be directed towards elucidating the mechanism of production of those lesions and the first step naturally involved a study of all possible paths of infection and intoxication. It is with one of these, infection via the lymphatic system of peripheral nerves, that this paper mainly deals and in it the authors give a synopsis of their observations in clinical cases and experiment. In all probability the controversy surrounding the genesis of the lesion in tabes dorsalis and the recognition of general paresis as an inflammatory disease were most important factors in directing attention to the lymphatic system of the cerebrospinal axis, and an important step forwards was taken with the demonstration of a continuity of the lymph-stream in peripheral nerves with that of the spinal cord. The injection of organisms and colored substances into nerves showed that the lymph-stream was an ascending one towards the cord and that the main current lay at the periphery of the nerve bundles immediately under the fibrous sheath. It must be borne in mind, however, that this statement regarding the main current of lymph in nerves was based on experiments in which organisms have been injected into the nerve substance. Where infection occurs from without it will be shown that diffusion of organisms and toxins can take place along the outer surface of nerves and give rise to an ascending epi- and perineuritis.

Infection along peripheral nerves had been deduced for many years in regard to tetanus and rabies, and the recognition of a wider application of this principle suggested a new line of research along which an explanation of certain other pathological phenomena might be sought. The researches of Marie and Morax, Homén, Guillaín, Spitzer and others are briefly cited. In 1903 the authors had the opportunity of examining the nerve tissues in a case of left brachial neuritis of twelve days' duration. The exciting agent in this instance was the *Staphylococcus pyogenes aureus*. The brachial plexus was found bathed in pus which had burrowed among the cervical muscles as well and surrounded the root ganglia of the cervical cord. The microscopical examination of the tissues proved of great interest. The loose areolar tissue round the spinal root ganglia of the left side was greatly inflamed, the veins were thrombosed and contained many cocci. Those not thrombosed were greatly congested; the arterioles, on the other hand, showed no morbid change. In the ganglion capsule there were hemorrhages and cocci, more evident in the outer layers, and amongst the nerve cells dilated venules and capillaries containing microorganisms. Similar changes affected the perineurium of the brachial plexus, but to a less degree. No cocci were found in the dura of the cervical cord or loose areolar tissue covering it. One small group only was observed in the pia arachnoid covering the posterior column. There were no inflammatory phenomena in either membrane. The 6 C. and 8 C. root ganglia of the right side were examined. There were no thrombi in the capsular areolar tissue, but scattered hemorrhages in which there were a few cocci. No cocci were found in the ganglion substance. The extramedullary portion of the anterior and posterior cervical roots was examined for degeneration by Marchi's method and none was found. In the spinal cord, however, the same method demonstrated an acute degeneration whose distribution was confined to the cervical region. The seventh, sixth and fifth segments showed much the greatest degree of degeneration. There was marked degeneration of the intramedullary portion of the left posterior root, which, commencing at the point where the fibers lose their neurilemma sheath, affected the middle area of the root entry zone. On the right side the degeneration affected the same area, but was less marked. There were degenerated fibers on each side of the posteromedian septum. In the lateral columns of the cord on either side of the septa derived from the pia arachnoid there was a considerable degree of myelin degeneration; and here and there in the posterior and lateral regions there were degenerated myelin droplets at the cord margin. A considerable degree of degeneration was observed in connection with the intramedullary portion of the anterior roots in their whole course from the cord periphery to the gray matter. There was degeneration of the collaterals running from the left root entry zone to the anterior cornual cells, and also of the anterior commissure. All the vessels of the cord and meninges were greatly congested. Seven cases are then reported in detail. When the examination of clinical material had shown that lesions in the central nervous system had a definite anatomical relationship with the nerve supply of peripheral infective areas, and that these lesions depended upon toxic diffusion along the perineural lymphatics, it seemed that to submit this view to experiment would be the most certain method of obtaining definite data. Instead of injecting organisms or toxins into the nerves on which it was proposed to operate, a colloidin capsule containing a broth culture of a micro-organism was placed in contact with the nerve. In one series of experiments this was placed under the gluteal muscles alongside the sciatic nerve; in another series under the skin of the cheek. The animals experimented upon were rabbits and dogs, and the organisms used were *Staphylococcus pyogenes aureus*, *Bacillus pyocyaneus*, Gaertner's bacillus, *B. coli*, *B. botulinus*, and a culture of a diphtheroid bacillus obtained from a case of dementia paralytica. At first all these bacilli were used in the experimentation, but later a strain of

S. aureus was adopted whose virulence had been raised. It was also found expedient to renew the capsule at intervals. Some of these capsules remained intact, others did not, and a variable amount of leakage occurred. From the clinical cases and the results of experiments the following conclusions were arrived at: (1) In spinal and cranial nerves there is an ascending lymph-stream to the central nervous system whose main current lies in the spaces of the perineural sheath. Toxins reach the spinal cord and brain by this route; and although they spread to some degree in the lymph spaces of the pia arachnoid, and so may affect structures at a distance from the point of entrance, they pass for the most part in the main stream along the nerve roots into the substance of the central nervous system.

(2) Outside the central axis the nerves are possibly protected by the vital action of their neurilemma sheath; most probably, however, it is the peripheral situation of the lymph current which is the deciding factor. The evidence given in the experimental infection leaves no room for doubt that the lymph stream in nerves is an ascending one, and that toxins and organisms can be carried to the cord by that path. The reaction of the tissues to the toxin also shows that the lymph not only ascends in the spaces of the nerve-sheaths, but diffuses in the fibrous septa between the nerve fasciculi and into the adventitia of the vessels. From the experiments, too, it is clear that when the toxin gains the spinal cord it is carried round the periphery in the meshes of the pia arachnoid and along its prolongations into more central parts. It is exceedingly interesting to observe how the character of the inflammation undergoes progressive changes from the focus of greatest intensity onwards, and there is one important fact to which attention is drawn, and that is how plasma-cell formation becomes the most prominent indication of irritation when the irritant has been to a great extent neutralized by the reaction of the tissues close to the capsule. The results of the above experiments show that infection of the lymph system of peripheral nerves is followed by an ascending perineuritis which spreads to the posterior root ganglia and along the spinal roots to the cord. The loose areolar tissue covering the perineurium, the ganglion capsule, and the dura mater shows the greatest degree of inflammation.

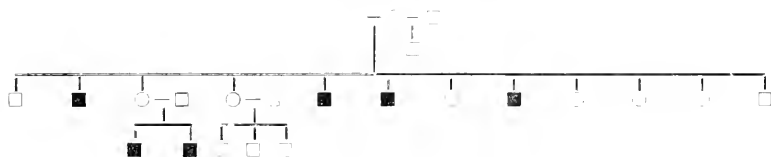
The clinical cases which the authors bring forward confirm the results of their experiments, and not only is the same path of infection clearly demonstrated, but also a perfect similarity in the type of reaction. This reaction varies with the degree of intensity of the irritant. Orr and Rows have also lately undertaken a series of experiments in which the abdominal cavity was chosen as the site for infection. This was done for three reasons: (1) The peritoneal cavity is most suitable for an experiment in which one wishes to avoid an infection of the lymph system of spinal nerves; (2) to reproduce as closely as possible a gastro-intestinal intoxication, and observe the effects upon the spinal cord; (3) to ascertain in how far such toxi-infection affected the sympathetic ganglion chain. Celloidin capsules containing a broth culture of the *Staphylococcus pyogenes aureus* were therefore placed in various regions of the abdomen where they became attached to the mesentery, kidney, bladder, or lower border of the stomach. The number of capsules introduced varied from two to six, and the animals were permitted to live for from three to six weeks. Ten rabbits were used and one dog. In summarizing the changes above described, the authors find: (1) the most highly developed structures, the nerve cells, suffer least of all; (2) there is primary degeneration of the myelin sheath round the cord margin and along the postero-median septum; (3) the myelin degeneration is greatest in the upper part of the cord; (4) there is edema of the cord; (5) there is active proliferation of the perivascular neuroglia; (6) the vessels are dilated, congested, are hyaline, and contain thrombi of the same nature. If these be now contrasted with the

cord lesions in lymphogenous infection the difference is at once obvious. Lymphogenous infection is characterized by (1) the reaction of the cells of the fixed connective tissue; (2) the proliferation of the cells of the adventitial sheath of the veins and capillaries; (3) the appearance of numerous scavenger cells when the myelin is disintegrated; (4) nerve cell degeneration and neuronophagy. From the above one must conclude that the lesions in hematogenous intoxication are of a degenerative nature and differ very widely from those found in lymphogenous infection, where the fixed tissues are actually proliferating and all the morbid phenomena are of an inflammatory type. The difference between the two might, therefore, be expressed by saying that in lymphogenous infection the inflammatory phenomena reach their maximum; in hematogenous intoxication they are reduced to a minimum. From the above clinical and experimental study it is clear that the two mechanisms of infection of the cerebrospinal system—the hematogenous and lymphogenous—are characterized by sufficiently distinct morbid phenomena, and if the results of the experiments are applied to the human subject, very considerable assistance is obtained in arriving at an understanding of the genesis of certain lesions. The authors claim to have brought forward ample evidence to show that acute and chronic myelitic conditions are readily produced by infection of the ascending lymph system in nerves. The opinion previously given by them is that general paresis is a chronic inflammatory disease of lymphogenous origin. This opinion is based on the close similarity between the vascular lesions in this condition and those found in the experiments of these authors where the lymph system of the nerves or cord is infected. The striking predominance of adventitial proliferation and infiltration can be explained only by toxic-infection of the cerebrospinal lymph. There is no evidence of a general blood intoxication, for in general paresis, as in these experiments, the endothelium of the vessels may be quite unaffected, while the adventitial spaces are packed with the products of proliferation. Further, to *tubercle dorsalis* Orr and Rows assign the same lymphogenous genesis. The vascular phenomena, similar to those in general paresis, the constant primary affection of the root entry zones, and the rigidly systemic character of the lesion preclude any other conclusion. As the authors have shown that certain cases of acute meningomyelitis fall into the lymphogenous category, they believe that there is now a preponderance of evidence to show that acute poliomyelitis must also be included in this group. The whole picture of this disease is one of a disseminated meningomyelitis, and as the brain may be affected in adults especially, the more comprehensive term of disseminated meningomyelo-encephalitis has been suggested by Wickman. There are many facts to show that infantile paralysis cannot be a blood infection, and indisputable evidence in favor of the lymphogenous genesis. This latter view is upheld on clinical and experimental grounds by both Wickman and Remer, and with them Orr and Rows agree. The localization and morphology of the lesions and the continuity of extension are characteristic of lymphogenous infections, a continuity which varies naturally, and attains its maximum in the acute ascending paralysis of Landry. A consideration of the phenomena in the subacute non-systemic lesions of the cord, such as occur with or without anemia, Addison's disease, cancer cachexia, etc., shows that they must be included in the hematogenous category. There is an entire absence of the proliferative change in the adventitia of the veins and capillaries which characterizes the lymphogenous infections. The root entry zones in the posterior columns are, except perhaps in the latest stages of the affection, quite sound, while there is a marked sclerosis around the posteromedian septum. The nerve cells in the gray matter maintain their integrity. The morbid picture is degenerative, not inflammatory, in type and in the zones affected it corresponds with what is found in experimental hematogenous intoxication.

2. *Aplasia Axialis, Extra Corticalis Congenitalis*.—The authors illustrate this disorder, which is a familial and hereditary one, having its onset in the first three months of life, even if it is not actually congenital. It presents symptoms which in many respects are similar to those seen in cases of disseminated sclerosis, cerebellar disease, and in its later stages to Friedreich's disease. It is very slowly, if at all, progressive, affects chiefly males, and is transmitted by healthy females. In the family here described males only are affected. It corresponds to none of the commonly recognized types of familial affection, but the symptomatology so closely resembles that presented by the family recorded by Pelizaens and Merzbacher, that the disease is believed to be of the same nature, although no pathological examination has been made in any member of the family here described. The cases published by Nolan also resemble these cases clinically, but no pathological examination has been made. The family first came under notice when two boys, aged four and two, were admitted into the Hospital for Sick Children, Great Ormond Street, in November, 1913.

FAMILY TREE

Wilson-Gulvin Family, 1913



In addition the authors present a further family tree. They then present as a summary: A familial and hereditary disease, having symptoms resembling disseminated sclerosis, is described. Six males at least were affected in two generations. The subjects of this disease are almost always males, and the condition is transmitted by unaffected females. Those affected are either congenitally diseased or exhibit symptoms in the first months of life, the progress of the disease being very slow. They are mentally defective and ataxic, show nystagnus, speech defect, and defective development, with weakness and spasticity of the lower limbs. It is considered probable that these cases belong to the type of familial disease described by Pelizaens and Merzbacher under the title "aplasia axialis extracorticalis congenita."

3. *Posterior Longitudinal Bundle*.—Dr. Muskens presents a lengthy study on rolling and circus movements and their relationships to this bundle. In previous investigations respecting the circus and rolling movements occurring in different species of vertebrates, he had observed the important part played by the posterior longitudinal bundle, when injured, in producing these phenomena; he resolved, therefore, to make special experiments in this subject, and by means of the Probst "concealed needle" he made lesions in all directions, chiefly in cats, in the area between the nucleus of the abducens nerve and the posterior commissure. In each case the forced movements were noted, whether in the horizontal plane (circus movements) or in the plane vertical to the longitudinal axis of the animal (rolling movements). Forced movements were considered to be present, first, so long as the head and eyes remained deviated or so long as there was an inclination to go to one side, circus movements in a slight degree; and secondly, as long as there was an inclination to lie down or to fall to one side, which Muskens looks upon as a slight manifestation of rolling movement. The character of the movements

and the direction of the locomotion which is the consequence of them are determined in accordance with the normal anatomical position of the animal, the normal posture being always reduced to that of the primary vertebrate exhibiting the simplest forced movements, for instance, the fish. In reviewing the physiological analysis of the vestibular system and the posterior longitudinal bundle formation, certain facts, both physiological and anatomical, stand out clearly, while other points can only be considered as suggestions or probabilities. (1) The study of the physiological phenomena observed after lesions of different parts of this system demonstrates that there is a far-reaching differentiation of function in the primary end-stations of the vestibular nerve. Further, it also shows that the different strands of fibers which connect the vestibular nuclei with the various nuclei in the midbrain and with the region of the posterior commissure in a cerebropetal direction may be more accurately analyzed. (2) The principal vestibular nuclei are the following: (a) The descending branch of the vestibular nucleus; (b) Deiters' nucleus composed of a ventral caudal division, named the nucleus triangularis, and a dorsal magnocellular division or Deiters' nucleus proper; (c) Bechterew's nucleus with the nucleus tecti. (3) Physiological analysis affords a practical method of establishing the existence of important differences in the ascending and descending connections of the above-mentioned nuclei, and of establishing equally important differences in the functions of the nuclei. (4) The starting point of this analysis is the fact that an ascending degeneration of the crossed vestibulo-mesencephalic bundle, which forms the bulk of the mesial part of the posterior longitudinal bundle till near the nucleus of the posterior commissure, is always found associated with circus movements to the side of the intact posterior longitudinal bundle. This rule holds good so long as the lesions leave the other parts of the vestibular systems intact. It is immaterial whether the degeneration of this vestibulo-mesencephalic tract is the result of a cross section of the median part of the posterior longitudinal bundle, or of a lesion of the heterolateral Deiters' nucleus. Experimental evidence tends to show that in the Deiters' complex the nucleus triangularis is the principal origin of this tract (fasciculus vestibulo-mesencephalicus cruciatus). (5) The degeneration of an ascending tract lying immediately lateral to the crossed vestibulo-mesencephalic tract in the posterior longitudinal bundle formation appears to be equally associated with a circus movement (or rather conjugate deviation) to the side of the normal posterior longitudinal bundle. This tract is further shown to be a homolateral tract originating exclusively in the nucleus of Bechterew, at least in the oral parts of the vestibular region, and terminating in the region of the posterior commissural nucleus. This bundle may be styled the homolateral vestibulo-mesencephalic fasciculus. This tract is only partially identical with that described anatomically by Probst. Van Gehuchten in 1904 suggested that the whole of the lateral part of the longitudinal bundle (fasciculus Deiters' ascendens, Lewandowsky, Winkler) consisted of fibers, ascending from Bechterew's nucleus. This origin, for this limited portion at least of the posterior longitudinal bundle, may now be held as proved, as may also the association of its upward degeneration with circus movements or conjugate deviation to the normal side. Both the circus movements observed after lesion of the homolateral or crossed vestibulo-mesencephalic tract are associated with conjugate deviation of the head and eyes to the side of the movement, or with loss of lateral deviation of the eyeballs to the opposite side. (6) According to the notions advanced by Duval, Bleuler, Edinger, Bischoff, Spitzer, Kolbstamm, Bernheimer, Fraser, Wallenberg, Wiersma, and others, the posterior longitudinal bundle represents a combination of ascending and descending tracts, which control the coordinated movements of the eyes, head and trunk and control or direct the maintenance

of the equilibrium of motion. Now, from experimental data furnished by the present investigation, it is seen that after a direct lesion in the region of the posterior commissure of the cat on one side, where the resulting circus movements were directed to the side of the lesion, a descending tract degenerates which lies at the innermost part of the posterior longitudinal bundle of the same side. This tract probably originates in the posterior commissural nucleus. As it stops short in the medulla it is suggested that it may be termed the fasciculus commissuro-medullaris. (7) Although it is probable that this mesencephalo-medullary tract exists in all the higher organized vertebrates, such as selachians, teleosteans, amphibians, reptiles, birds and mammals, it is only in the mammal that a destructive lesion of the nucleus and of its efferent tracts from the striate body is associated with circus movements towards the side of the lesion. In the lower animals a lesion oral to the posterior commissure is not followed by any circus movements. The anatomical explanation of this fact seems to be that only in mammals are the hypothalamic and commissural nuclei sufficiently connected with the prosencephalon that section of the connections should be followed by asymmetrical locomotion, as evidenced in circus movements and conjugate deviation towards the side of the lesion. Further, it is only in mammals that stimulation of certain definite areas of the cortex is followed by conjugate deviation of the head and eyes towards the opposite side. Birds seem to form in this respect a group between the reptiles and mammals. In the prosencephalon of the bird is an area, faradization of which is associated with conjugate deviation towards the opposite side (Boyce and Warrington). The section of the connections of this area is not, however, associated with any alteration in the mode of locomotion. As regards those cases (cats) where, after lesion of the thalamus and cerebral hemisphere, circus movements towards the side of the (destructive) lesion were observed over a longer period, it was found that there was a tract of degenerated fibers in the lamina medullaris externa. These fibers, which probably emanate from the striate body, pass to the hypothalamic region, where they lose their medullary sheaths. The termination of these fibers, probably in the nucleus of the posterior commissure, can, therefore, not be demonstrated. The circus movement in such cases is always accompanied by conjugate deviation towards the side of a destructive lesion, or in less pronounced cases by loss of lateral deviation to the other side. (8) Like the circus movements the rolling movements may serve as a guide in working out the anatomo-physiological analysis of the vestibular complex and the posterior longitudinal bundle formation. (9) After a direct lesion of the complicated nerve fibers, which help to form the vestibular root, a rolling movement towards the injured side is constantly observed, mostly associated with a skew deviation and conjugate rotation of the eyeballs around their antero-posterior axis. In only one case (rabbit, direct lesion in the caudal part of the vestibular root) were rolling movements toward the non-injured side observed. (10) In three cases of lesion of the descending branch of the nucleus vestibularis rolling movements towards the normal side were seen lasting over several days. Although this experiment was repeated several times, Muskens did not localize a distinct ascending or descending connection from this part of Deiters' complex. (11) Lesion of Deiters' nucleus proper is found in two cases associated with rolling movements, moderate in character, towards the side of the lesion. From this nucleus the degeneration spreads upwards along a tract which lies in the outermost part of the lateral horn of the posterior longitudinal bundle. A direct lesion of this ascending tract or connection is also associated with a tendency to roll towards the side of the lesion. This was demonstrated in five cases. The fibers of this tract appear to end mostly in the tegmentum, although some may be traced to the caudal part of the posterior commissure, where the fibers appear to lose their

medullary sheath; it is therefore suggested that it should be styled the tractus vestibulo-tegmentalis lateralis. Its origin is apparently in the medium-sized cells of Deiters' nucleus proper, its termination probably in the interstitial nucleus. (12) A comparison of the cases where the lesion is situated in the region of the posterior commissure leads us to postulate in that region a center, probably the nucleus interstitialis, injury of which (or of its afferent tracts from other parts) in the cat is constantly followed by rolling movements to the normal side. The existence of a descending interstitio-spinal tract in the innermost section of the posterior longitudinal bundle in these cases in which rolling movements, or, in less pronounced cases, a tendency to fall to the normal side are observed seems to justify this supposition to a certain extent. (13) The physiological combined with the degenerative method does not afford such ample information as regards the tracts from Deiters' complex to the posterior longitudinal bundle formation of the spinal cord. This is partly due to the irregular form of the collection of reticular cells which give rise to the ponto- or reticulo-spinal tracts. It seems certain that heterolateral descending fibers of the posterior longitudinal bundle do not come from Bechterew's nucleus, although descending homolateral fibers are given off from both Deiters' and Bechterew's nuclei. After experimental lesion of Deiters' nucleus it was not in all cases possible to decide from what cells the heterolateral fibers originate. If the descending connections of the vestibular structures which control the circus and rolling movements and those of the superimposed mesencephalic structures be compared, the conclusion seems warranted that the descending connections are far more important in the case of the rolling movements. Relatively few descending fibers which originate in the structures associated with circus movements pass beyond the sixth nucleus.

4. *Corpus Striatum*.—In this masterly study Wilson says that the exact nature and function of the large mass of basal gray matter known as the corpus striatum have hitherto constituted one of the unsolved problems of neurology. Not that the corpus striatum has failed to attract the attention of anatomist, physiologist and clinician; on the contrary, since the days of Willis, it has received its full share of investigation along all the familiar lines. The disturbing element in the matter of research into its functions has been the conflicting nature of the results obtained. Anyone who will take the trouble to read the curiously philosophic text-books of half a century ago would imagine, it is true, that the corpus striatum was an organ as high in the cerebral hierarchy as the cortex itself, endowed with motor functions as elaborate and as detailed. But a change took place when neurologists realized that many of the functions assigned to it were the property of the adjacent corticospinal paths, and almost at once it seemed to fall from its high estate and depreciate in physiological significance. Under these circumstances the question of its function became an enigma, and, as a consequence, there was eventually assigned to it a varied assortment of motor, sensory, vasomotor, psychical and reflex functions, no one of which Wilson says has ever rested on unequivocal evidence. Within the last two or three years, however, the clinico-pathological method has furnished evidence which goes far towards clearing away this obscurity. In the last year or two a syndrome of the corpus striatum has been enunciated which, however much it may come to be modified, shows every sign of being corroborated by each accession of fresh evidence, and in any case can fairly be regarded as furnishing the closest approximation to the exact mode of working of that important structure. In Wilson's review of the experimental literature on the corpus striatum he has referred to a possible association of these masses of gray matter with the functions of the viscera, and some evidence has accumulated which goes to show that there may be connections between the corpus

striatum and the functions of respiration, circulation, and the maintenance of body temperature, as well as possibly the function of the bladder and alimentary tract. As Wilson's own experimental researches have been concerned with the motor part of the subject, he leaves this question aside temporarily. His research was carried out upon some twenty-five monkeys (*Macacus rhesus*, *Macacus sinicus*). Both stimulation and electrolytic methods were utilized. The instrument employed was the stereotaxic instrument of Clarke and Horsley. A study of the small and strictly localized lesions produced shows that the fiber system of the corpus striatum may be divided into four main groups: (1) Fibers arising and ending within the corpus striatum (internuncial). (2) Fibers arising in the corpus striatum and ending elsewhere (striefugal). (3) Fibers arising elsewhere and ending in the corpus striatum (striopetal). (4) Fibers passing through the corpus striatum, but arising and ending elsewhere (fibers of passage).

Group 1. In the first group several subdivisions may be distinguished: (a) *Internuncial fibers from the putamen to the globus pallidus*.—These are invariably of fine caliber with a delicate myelinated sheath. They are massed into bundles or pencils, arising by the approximation of individual fibers, not always very close to their cells of origin, and running mesially; the anterior pencils converge as they pass in a posterior direction, while the posterior converge as they travel anteriorly; the most ventral run in a dorsal direction, the dorsal in a ventral direction, and in this fashion they all converge towards the lateral zone of the globus pallidus; here some of them diffuse out, while others pass on to the mesial zone, where they in turn diffuse out. (b) *From lateral to mesial zone of the globus pallidus*.—Similarly fine myelinated fibers arise in the lateral zone of the globus pallidus and cross mesially in radial bundles to the mesial zone. (c) *From caudate to putamen*.—Many fine internuncial fibers pass across the dorsal third of the internal capsule from the nucleus caudatus to the putamen, while others reach the lateral zone of the globus pallidus. It is perhaps worthy of note that distinctly fewer fibers pass from the putamen to the caudate than in the reverse direction; and this is true also of the connections between the globus pallidus and the caudate.

2. In the second group there are also important subdivisions. (a) *Strio-thalamic fibers*.—These constitute the minor portion of striefugal fibers to the optic thalamus and regio subthalamica. They are derived from the mesial groups of radial bundles of the globus pallidus, and cross the internal capsule obliquely in its basal third to reach the lateral and ventral sections of the thalamus. They can be traced passing mesially across the thalamus and diffuse out in the neighborhood of the internal nucleus; a fair number, however, do not extend beyond the nucleus lateralis. (b) *Strio-subthalamic fibers*.—The ansa lenticularis is a somewhat complex fiber system, in which, however, certain subdivisions are readily distinguishable. (1) The chief set of fibers in the ansa stands out unmistakably as composed of fibers slightly larger in caliber than the others, which are of the same size as the internuncial fibers already described. This tract arises in the lateral and mesial zones of the globus pallidus, runs more or less at right angles to the radially disposed pencils and is distinguished in the descriptions of experiments given above as the transverse group. It passes directly across the capsule in a slight curve with the convexity dorsal, and constitutes a closely set bundle reaching and occupying Forel's field. It corresponds to the lenticular bundle of Forel (H_2). The fibers pass mesially across Forel's field and form a sort of nucleus (*noyau du champ de Forel-Cajal*) at a point where the general direction of the fibers changes slightly from a latero-mesial to a more antero-posterior direction. Many then pass ventrally and caudally and can be definitely traced to end in the ventro-lateral and ventral capsule of the nucleus ruber. It seems possible, from one or two of the experiments, that a few

fibers continue across the mesial plane by the decussation of Forel to reach the contralateral red nucleus. This is the main group in the ansa lenticularis, and the definiteness of the anatomical connection between the globus pallidus and the nucleus ruber is of considerable importance. It is easy to distinguish these fibers from those of the capsule, indeed from any other tract in the neighborhood. (β) The second division of the ansa lenticularis is composed of slightly finer myelinated fibers arising from the radial bundles of the globus pallidus. They are ventral to the striofugal group to the nucleus ruber, and they edge across the basal third of the capsule much more obliquely. They can be traced across the capsular fasciculi as the latter extend into the crus. The great majority pass into the corpus subthalamicum (striolysian fibers) and diffuse out in its interior. Some, nevertheless, cross it completely and make their way to the neighborhood of the lateral capsule of the red nucleus, approaching it from in front. It is difficult to determine whether they effect any union with the nucleus. A smaller number of fine fibers pass obliquely across the crus in a mesial direction, ventral to the corpus subthalamicum, to reach the locus niger. (*c*) *Striofugal fibers to the internal capsule or cerebral peduncle.*—No unequivocal proof of the passage of fibers, fine or medium, from either the putamen or the globus pallidus to the internal capsule or crus has been obtained. The general direction of the two divisions of the ansa lenticularis is always oblique to that of the corticospinal fibers. Sir Victor Horsley has examined the specimens independently and agrees that they furnish no evidence of such a passage.

3. In the third group there are again a number of separate tracts. (*a*) *Thalamostriate fibers.*—As none of Wilson's own lesions were placed in the thalamus, it was not possible for him to confirm or deny, on experimental grounds, the existence of thalamostriate fibers. It is known, however, that such do occur, the association between the thalamus and the caudate being close (Edinger, Dejerine, Sachs). Reference is made to these for the sake of completeness. (*b*) *Subthalamostriate fibers.*—From a lesion in Forel's field Sachs has found degeneration passing laterally across the capsule in its basal third, and entering the globus pallidus, where it diffused out. No degenerated fibers entered the putamen. This degeneration resulted from the involvement of fibers passing in a reverse direction in the main part of the ansa lenticularis. Similarly, Dejerine was able to follow degeneration from a lesion in the regio subthalamica: (1) mesially, according to the lines already fully described, and (2) laterally, by the ansa lenticularis and Forel's lenticular bundle to the globus pallidus. It would appear, therefore, that while the ansa lenticularis and the striosubthalamic tracts are to a very large extent striofugal, they also contain striopetal fibers. Such fibers are, no doubt, to be expected, for it is a general rule that cerebral areas of gray matter are united doubly, though not always equally, to each other, by afferent and efferent fiber systems. (*c*) *Cortico-striate fibers.*—The experiments herein detailed show sufficiently that the corpus striatum is independent of the cerebral cortex. A few small fasciculi may cross the dorsal, ventral, oral or caudal aspects of the putamen from the cortical side, but they are fibers of passage. With practically complete capsular degeneration no fibers have been seen to leave the corticospinal path and enter the lenticular nucleus by its laminae or otherwise.

4. There remains the final question of any fibers of passage running for part of their course through the corpus striatum. (*a*) *Thalamocortical.*—The experimental evidence in this matter has already been considered. It negatives the possibility of such fibers passing in part by the laminae of the lenticular nucleus, and is thus definitely opposed to the views of Probst, Obersteiner and others. Tschermak believes that fillet fibers made a loop-shaped excursion through the nucleus lentiformis on their way to the cortex, but

assent to this view cannot be accorded. In one instance only, Wilson says, has he found fibers whose relative caliber proclaimed their extra-striate origin degenerating in a lateral direction from a lesion in the lateral zone of the globus pallidus. They were not laminal fibers. In all some two or three small fasciculi were seen to contain somewhat coarse Marchi granules, and they were traced lateralwards out of the putamen. In view of the fact that identical lesions in other animals failed to reveal any such fibers, those just mentioned must be considered aberrant bundles, presumably of thalamo-cortical fibers. In number they were quite insignificant, while the fact that they passed out of the putamen a little more centrally than the fasciculi previously alluded to, which "cut the corners" of that structure, is perhaps a sufficient reason for making a reference to them at all. (*b*) *Corticothalamic*.—It has been held, similarly, that some of this group pass by the laminae medullares of the lenticular nucleus, but there is no evidence of such a route in apes. (*c*) *Corticoluysian*.—Dejerine says that "le corps de Luys . . . reçoit de la corticalité cérébrale quelques très rare fibres qui passent par les lames médullaires du globus pallidus." However this may be in man, Wilson does not find them so in the apes on which experiments have been made.

The problem of the *function* of the corpus striatum in man, difficult as it is, is brought nearer solution by a consideration of the anatomical (human and comparative) and clinico-pathological sides of the question, each of which will be found to furnish a material contribution to the subject. (I) It is essential in discussing the physiology of the corpus striatum to think anatomically. Admitting the not infrequent error of supposing that anatomical juxtaposition argues physiological relationship, it is, nevertheless, a more serious mistake to assign functions to an organ which it is anatomically incapable of carrying out. The cardinal anatomical connections of the corpus striatum are as follows: (i) It is independent of the cerebral cortex. (ii) The putamen and caudate are closely linked to each other, and both to the globus pallidus. (iii) The main striofugal and striopetal fiber groups are related to the globus pallidus only, and not to the putamen and caudate directly. (iv) The striofugal groups preponderate, and link the globus pallidus with the optic thalamus and the regio subthalamica, including the nucleus ruber, corpus subthalamicum, and substantia nigra. (v) The corpus striatum is not connected directly with the spinal cord. (vi) The corpora striata are, directly at least, independent of each other. From a consideration of these anatomical data, obtained by experiments on apes, and known to be, in great part, if not entirely, identical in man, it is clear that the corpus striatum is an autonomous center; in other words, whatever its function, that function is exercised independently of the cerebral cortex. Further, these anatomical data indicate that that function is motor in type, *i. e.*, that it is exercised in an efferent or caudal direction. It does not, however, follow that because the main connections are efferent the motor function of the organ is identical with, or even similar to, the motor function of the corticospinal system. Certain other anatomical features may here be referred to. By far the greatest number of the cells of the corpus striatum in man are small and of a more or less spindle or spherical and only slightly polygonal type, with scanty cytoplasm. It is mainly in the globus pallidus that larger cells are to be found; the former have short axons, the latter longer axons, and they belong to the striofugal group of neurons. There are not, however, in the corpus striatum large polygonal cells unmistakably of the type of the Betz cells of the motor cortex or the ventral cornual cells of the spinal cord. Again, the caliber of the internuncial fibers is very fine, and that of the larger of the ansa fibers is less than that of the fibers of the adjacent corticospinal system. Without laying unjustifiable emphasis on these structural differences,

they may, the author thinks, be taken at least to suggest that the function of the corpus striatum and its projection system is not, in man, identical with the function of the motor cortex and its projection system. On anatomical grounds the localization of "automatic movements" in the corpus striatum, or its description as a "subcortical motor center" whose motor function is in any way analogous to that of the motor centers of the cerebral cortex, cannot be entertained. The independence of the motor cortex and the corpus striatum, and the peculiar projection system of the latter, make these views untenable. (2) Evidence derived from the sources of comparative anatomy and physiology has an important bearing on the function of the corpus striatum. In the whole vertebrate series the corpus striatum is a prominent organ. Phylogenetically, it is a very old structure, consisting of the basal part of the telencephalon or forebrain. In fishes it consists of a paleostriatum only, corresponding to the globus pallidus of the higher vertebrates; in reptiles and birds there are additions to it in the shape of (1) the archistriatum, corresponding to the nucleus amygdalæ of the apes and man, and (2) the neo-striatum, which represents the putamen and caudate nucleus. The paleostriatum or globus pallidus is the oldest part of the corpus striatum not merely phylogenetically, but also ontogenetically. Its cells develop in the fetus in mammals earlier than those of the other divisions, while the globus pallidus and the ansa lenticularis myelinate earlier than the fibers of the rest of the striatum. The fiber connections of the paleostriatum are important. In all vertebrates a well-marked and definite bundle passes from the corpus striatum to the optic thalamus and beyond. As Edinger says, a fiber system found so universally and so obvious must have a special significance; it is, indeed, primeval (*uralt*). This basal bundle or basal forebrain bundle (*basal Vorderhirnbündel*), a tractus striothalamicus and tractus striosubthalamicus in one, is essentially striofugal or centrifugal, i. e., efferent or motor, and it links the paleostriatum to the optic thalamus and to the motor centers of the mid- and hindbrain and spinal cord. According to Johnston this linking of the paleostriatum to motor centers situated caudally is effected by means of the fasciculus longitudinalis medialis (posterior longitudinal fasciculus), the oral end of which is continuous with the caudal extremity of the tractus striothalamicus. Thus the original motor pathway from the paleostriatum is broken once in the optic thalamus and the fibers arising here probably make connection with widely separated motor nuclei in the brain and spinal cord. Essentially the same motor conduction path, according to the same author, is found in all vertebrates, although its functional relations may be somewhat modified in mammals on account of the cerebral cortex. Whatever may be the case in the lowest vertebrates, the posterior longitudinal fasciculus in mammalia and in man cannot have the same function as its homologue may have had as a "primitive somatic motor fasciculus." The researches of Fraser (cats and monkeys) show that only a few fibers unite the fasciculus to the optic thalamus, and these are all afferent to the thalamus or centripetal. The facts are important by analogy, for they supply another instance of cerebral function moving away from its original localization with the development of the vertebrate species. Like the ansa lenticularis, the posterior longitudinal fasciculus has, in part at least, depreciated. The researches of Ariens Kappers, de Vries and de Lange, in the lower vertebrates, have shown that the paleostriatum is linked to the optic thalamus and mid-brain, medulla oblongata and cord by double connections, both efferent and afferent. Its relation to the trigeminal system in particular, both motor and sensory, seems to be very close. This is well seen in the reptilia. It is well recognized that the rule of double connections between nervous ganglia obtains almost universally in the nervous system of vertebrates, so that while the main connections of the paleostriatum are striofugal, it cannot be sup-

posed that it is insulated from sensory stimuli in any way; on the contrary, it must be conceived of the paleostriatum as a correlation center for various sensory impulses (olfactory, gustatory, etc.), from which passes caudally an efferent tractus striothalamicus, with connections, for the execution of motor impulses. The part of the striatum associated with olfactory impressions is more particularly the archistriatum, the homologue of the nucleus amygdalæ in man. The archistriatum is connected with a tertiary olfactory path, and Ariëns Kappers thinks that even in mammals a part of the corpus striatum may subserve an olfactory function. The nucleus amygdalæ can readily be distinguished from the neostriatum (putamen and caudate) with which it is continuous only in appearance; its cell maturation is later than that of the paleostriatum and earlier than that of the neostriatum, and, as de Vries says, there is doubt whether it may not really be pallial in origin, while Elliot Smith has shown that at the palliostriate junction there is confusion owing to the rapid growth of (among others) the olfactory cortex in the neighborhood of the corpus striatum. The archistriatum may be left as not being of further interest. Looked at from the point of view of comparative physiology, it may be regarded as the original corpus striatum, as that part of the original cerebral hemisphere whereby impressions of smell, and no doubt other sense impressions, may bring their influence to bear on the nervous mechanisms regulating movement. The paleostriatum, then, has a projection system which consists of the basal bundle, or tractus striothalamicus and strio-subthalamicus, and which is continued, according to Johnston, as the fasciculus longitudinalis medialis, or at least as a part of the latter; this is designated by him the primitive somatic motor fasciculus. It is therefore to be considered the homologue of the corticospinal paths of man, and is, for instance, in the fishes, the sole descending tract that can be compared to the corticospinal motor system of higher vertebrates. With the progressive development of the brain the motor paths become more complex. When a pallium develops above the original paleostriatum motor center, as in reptiles, birds, etc., the descending paths are doubled. The earliest appearance of corticospinal fibers separating the two parts of the neostriatum and blending with the striofugal projection system is in the higher reptilia, according to de Lange. The state of affairs in the bird's brain is particularly remarkable. In Ariëns Kappers's view, it is possible that the neostriatum of birds acts vicariously for the neopallium or cortex. In the tractus striomesencephalicus are mingled fibers both of striate and of pallial origin, and the suggestion is made that it is because of the necessity for economy of space in the brains of birds that such a state obtains. It should not be forgotten, however, that McKendrick, Ferrier, Mills and others have shown definitely that the pallium of birds is electrically inexcitable; Ferrier obtained no movements at all; McKendrick noted simply movements of the iris and eyeball. The mammalian brain, in its turn, is very different from that of the birds and reptiles. The reptilia have an olfactory pallium; birds a visual and olfactory pallium; the lower mammalia a visual, an olfactory, an auditory, and a tactile pallium. With further development of the pallium afferent systems are pushed beyond the level of the thalamus and corpus striatum to reach it; and while in response a definite cortico-spinal motor system is developed the primitive motor projection system of the corpus striatum disappears, or, rather, is reduced to the ansa lenticularis, which does not extend beyond the nucleus ruber. Its function is replaced by that of the corticospinal or pyramidal tracts. In some ways there is a parallelism between the development of the corpus striatum as a whole and that of the pallium. The former, consisting originally of a paleostriatum possessing motor and correlating functions, develops by the addition of a neostriatum (putamen and caudate) which is found for the first time in the lower reptilia and increases in relative size through the lizards,

birds and mammals; so in proportion to the corpus striatum as a whole the pallium develops increasingly through the vertebrate series. But the analogy does not carry us far; while the function of the palliospinal system usurps that of the striospinal system, we do not know that the neostriatum abrogates the function of the paleostriatum. In fact the exact relation of these two to each other in functional activity is far from clear, that is, in the case of animals whose pallium is still comparatively insignificant. Indeed, the relation of the neostriatum to the paleostriatum is one of the difficult subsidiary questions in a difficult subject. Ariens Kappers, apparently, is the only investigator who has devoted attention to the matter. He believes that just as in the higher mammalia and man the pallium has taken the place of the corpus striatum as a whole, so the neostriatum (putamen and caudate) takes the place of the paleostriatum (globus pallidus) in birds. In his view, further, the connections of the neostriatum with the thalamus is an indication that the former has functions in relation to the fillet and trigeminal systems. Whatever may be the case in birds, this view does not commend itself in the case of animals with a better developed pallium. Wilson's experiments with apes show conclusively that the neostriatum has no projection system of its own beyond the paleo-striatum; with the possible exception of a few caudate-thalamic fibers, the neostriatum is not connected to the thalamus or subthalamus at all; it is the globus pallidus which through the whole vertebrate series possesses the important projection system. This may perhaps suggest that the corpus striatum should be considered as a physiological unit, or, rather that the functions of the neostriatum and paleostriatum are blended. It will be understood that at one stage in the development of the vertebrates the thalamus and corpus striatum functioned as a brain in miniature, the latter being a correlating center concerned with the translation of sensory into motor impulses; but, even at the best, its motor functions must have been simple compared with the complexities of the pallium of the mammalia. In the course of development the corpus striatum and its projection system have depreciated; they have had to abandon their position of hierarchy in the field of motor activity. Thus the facts of comparative anatomy and physiology support the evidence derived from experiment. In view of the changing importance of the corpus striatum it becomes a delicate matter to allocate its function in the various animal groups; its function in man is not necessarily identical with its function in apes. Although the curious and unique features of the bird's brain demonstrate conclusively that evolution is not necessarily progressive, from the strictly motor point of view, the corpus striatum seems to have been progressively shorn of its possessions; its proportionate size in man is less than in any of the lower animals, and it may be that the superman of the future will have no corpus striatum at all.

(3) Wilson states that whatever function the corpus striatum once possessed, there is no experimental evidence in apes to show that it exercises any motor function comparable to that of the motor cortex. There is no evidence to suggest that it is a center for so-called automatic movements. It is electrically inexcitable, and comparatively large unilateral lesions do not give rise to any unmistakable motor phenomena. In short, the only proofs that it does possess a function of a motor order, in the widest sense, as it is to be expected it would exercise in view of its phylogenetic history and the facts of anatomy, are to be obtained by a consideration of clinico-pathological data. Sherrington's conception of the "final common path" is here to be emphasized. "At the commencement of every reflex arc is a receptive neuron, which is reserved exclusively for impulses generated at one single receptive source. The motor neuron at the other end, however, receives impulses from many receptive sources. "It is the sole path which all impulses, no matter whence they come, must travel if they are to act on the muscle fibers to which it

leads. Therefore, while the receptive neuron forms a *private path* exclusively serving impulses of one source only, the final or efferent neuron is, so to say, a *public path* common to impulses arising from any of many sources of reception." And, again, "reflexes originated at different distant points, and passing through paths widely separate in the brain, converge to the same motor mechanism (final common path) and act harmoniously upon it. Reflex arcs from widely different parts conjoin and pour their influence harmoniously into the same muscle. The motor neurons of a muscle of the knee are the *terminus ad quem* of reflex arcs arising in receptors not only of its own foot, but from the crossed forefoot and pinna, and tail, also undoubtedly from the otic labyrinth, olfactory organs, and eyes. Thus, if any motor nerve to a muscle be taken as a standpoint it consists of a number of motor neurons which are more or less bound into a motor unit mechanism; among the reflex actions of the organism a number can all be brought together as a group, because they all in their course converge together upon this motor mechanism, this final common path, activate it, and are in harmonious mutual relation with regard to it." This illuminating conception of a "final common path" is not further applied by Sherrington in a detailed manner, but by implication it may be applied to the problem considered. Various influences act harmoniously on the final common path of the lower motor neurons: (1) The cortico-spinal motor system extends from the Betz cell "ganglion" to the arborizations round the anterior cornual cells, and its function is to innervate, or to conduct innervating impulses, originating we know not how in the cortex, to the final common path. If this system is impaired or destroyed by a lesion the result is paralysis. (2) The cerebellar system also exerts an influence on the final common path. Its ganglion is the cerebellum from which it extends by a series of internuncial neurons to the lower motor neuron. The cerebellum exerts a coordinating and cooperating influence on the stream of innervation passing from the rolandic motor ganglion via the final common path to the muscles. The routes by which cerebellar influence is exercised are complicated, some perhaps may pass by the tractus cerebello-tegmentalis to the opposite nucleus ruber and so back to the spinal cord on the same side; some travel by the superior cerebellar peduncle, contralateral optic thalamus and contralateral cortex and so back to the final common path by the corticospinal system itself. In this case the latter becomes an *internuncial* common path as opposed to the *final* common path, and Sherrington makes it clear that such internuncial common paths are by no means infrequent. For the sake of simplicity, however, Wilson indicates cerebellar influence in his diagram by an independent path. A lesion of the cerebellar path results in incoordination or ataxia, or better, dysmetria, while there is no paralysis. (3) Another important reflex path carrying impulses to act on the final common path is the vestibular. It extends from Deiters' nucleus (to which there is a private path from the labyrinth) via the vestibulospinal tract to the anterior horn cells. An additional allied mechanism is perhaps constituted by the posterior longitudinal fasciculus, which is linked to Deiters' nucleus and also passes to the anterior horn cells. Interference with the function of the vestibular element in the activity of the final common path results in what is called by the French school "titubation." It is of course commonly held that some at least of the cerebellar influx to the cord is transmitted by Deiters' nucleus and the vestibulospinal path, and this may very well be so. But it is desirable to attempt to separate cerebellar from vestibular elements in coordinate innervation, and for diagrammatic purposes, at any rate, one may properly be distinguished from the other. (4) Finally there is the striorubrospinal path, conveying impulses from the corpus striatum, via the ansa lenticularis, nucleus ruber, and rubrospinal tract, to the anterior cornual cells. In what way impulses originate

in the corpus striatum is immaterial—they may depend on stimuli from the optic thalamus by thalamostriate fibers; in any case, the evidence for the efficient action of corpus striatum impulses on the final common path, by the route just mentioned, is not to be lightly set aside. This influence, it has been said, is one which steadies pyramidal innervation along the final common path. In the absence of this influence tremor is likely to occur, and, as a rule, with increase of pyramidal action so will the tremor increase. It is an action tremor. The reader is referred to the author's monograph for a full discussion of the evidence associating tremor as well as hypertonicity of the skeletal muscles with defect of function of this internuncial system. One final question remains. Admitting that the corpus striatum has no longer any motor activity comparable to that of the motor cortex or of the spinal cord, and that its motor function is one of steadying (the author purposely avoids using the difficult word "inhibiting") innervation as it streams along the final common path, is there any evidence to suggest that the organ under discussion has developed in other ways, and that it may be associated with innervation of non-striated muscle fiber? Does it bear any relation to organic, visceral activity? Has it to do with a central representation of the sympathetic and autonomic systems? Langelaan has put forward the hypothesis that the corpus striatum, with the body of Lays and the substantia nigra, is the highest motor center for non-striated muscle. A great deal of attention has at different times been devoted to a consideration of the view that in the corpus striatum is a heat-regulating center; also a respiratory center, a vasomotor center, a blood pressure and pulse-controlling center, and so on. There are obvious difficulties in the way of accurately determining such functions by experiment, and the evidence hitherto adduced is far from convincing, besides being in some ways contradictory. The variety of animals operated on is also a very important complicating factor. In Wilson's own experiments no evidence was obtained of any disturbance of respiration from stimulation or destruction of the putamen or globus pallidus in apes. And, further, the question must always remain, assuming any of these functions for the sake of argument, how are they carried out?

5. *Aphasia*.—Mingazzini describes a case with marked aphasia due to severe atrophy of the respective convolutions.

6. *Study of Satellite Cells*.—The author finds through the analysis of the relative numerical occurrence of satellite cells in ten cases, each of five psychoses, that satellitosis cannot be considered in any sense indicative of the type of psychosis, although it has in this series appeared with more consistent intensity in the maniacal depressive cases and has been of very much less prominence in dementia precox. The reaction clefs the deeper cell layers both in regard to frequency of occurrence and degree of reaction. The cortices of the dome, precentral, postcentral and frontal seem to show the reaction with greater intensity than do the temporal and occipital regions. Age at the time of death seems to play some part in the occurrence of severe reactions, but cannot be considered the only factor. The duration of the psychosis bears no demonstrable relation to satellitosis.

JELLIFFE.

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