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Art. I.—THE VARIETIES AND CAUSES OF NEURASTHENIA.

By J. S. Jewell, M. D.

GENTLEMEN:—Having discussed in previous lectures, to some extent, the *symptoms* and *pathology* of neurasthenia, I must now give you some closer insight into its *causes*.

This department of medicine—Etiology—it should never be forgotten, is far behind any other. The physician usually meets with what may be comprehensively called *effects*, and for these must seek *causes*. But causes are seldom simple, in relation to effects. They are on the contrary usually complex. They are not only complex, but often subtle, or even unknown, so far as positive knowledge is concerned. It often happens that among the causal elements in the complex web of disease, that one must take into the account, hereditary tendencies, personal peculiarities, habits of many kinds, physical and mental diatheses, the effects of season and climate, miasms, epidemic causes, the effects on the body of psychological states, in producing or simulating more or less serious affections, the interactions of the bodily organs, which pass under the name of sympathies, etc., etc. Many of these causal conditions of disease, not to mention legions of others, are hard to detect in their operation, and are more difficult to estimate quantitatively. And yet these things must be done before our knowledge of the *causes* of disease will be practically perfect. In case of a few diseases like itch, the causes of the phenomena are pretty well known. But this cannot be said of the vast majority of diseases. It is easy to say, this case is due to "biliousness," that one to a "cold," or to "malaria," or to "indigestion." But in almost every instance, it would be found upon strict investigation, that the alleged causes are not only ill defined, or vague, but that no actual efficient causal connection had ever been, or could be, established between the phenomena and their assigned causes. It is fair to state, that but little is precisely known as to the actual causes of particular diseases. And yet much is known as to causes of disease in general. It is known, for example, that foul air, impure water, personal uncleanliness, spoiled food, exposure to a rigorous climate, dwelling in miasmatic localities, over-excitement, exhausting occupations, cankering care, intemperances of many kinds, etc., cause disease. But many of these causes operate together, and often in the same case, and it is seldom possible to declare *how* they act, or what share each separate cause had in the production of the case. Hence, in speaking of the causes of neurasthenia, I wish to be understood as giving simply what seem to me to be the most important practical causes, or rather, *conditions*, of the disorders grouped under this head.

Looked at comprehensively there are two groups of cases at the causal standpoint: viz., *hereditary* and *acquired.* Then again, we may divide cases of neurasthenia into two other great groups, according as they depend, on the one hand, on a defective supply of nutritive material for repair of a normal waste, or on the other hand, on an abnormally rapid waste, which outruns the natural process of repair.

But for merely practical purposes cases of neurasthenia may be grouped according to their causes, or at any rate, in view of their apparent mode of production. I shall therefore discuss briefly in your hearing, the following groups of cases, all of them met with in actual experience: 1. *Hereditary or* *diathetic neurasthenia.* This is a class of cases often met with, and to which reference will be made hereafter at greater length. 2. *Dyspeptic neurasthenia.* 3. *Assimilative or trophic neurasthenia.* 4. *Genito-urinary neurasthenia.* 5. *Neurasthenia from over-work and from over-excitation, etc.* 6. *Diseases in which neurasthenia forms a prominent factor.* Besides these clinical groups, others should be made, such as partial and general neurasthenias, mental and bodily neurasthenias, and various subordinate groups named according to the parts of the body or groups of organs affected. These may be mentioned as I pass on, but for the present I am desirous, for clinical purposes, to direct your attention briefly to the groups named above.

I. Then first of all let me dwell to some extent on *hereditary neurasthenias.* Such are actually met with. Persons are daily coming into life, to pass their days until death, from beginning to end, below the plane of an average nerve-nutrition. They seldom present us with localized, destructive disease, but from first to last lack an average volume of nerve power and endurance, whether mental or physical, and joined with this condition of things, there is undue sensibility. In these cases the energy of nutrition is low. Recuperative power is far below what is ordinarily met with. Such persons are frail and puny from the cradle to the grave. They are at all times easily exhausted. They are with difficulty rested. They are usually thin in flesh, but they are not always so. They are often quite fleshy, and in a few cases may have a ruddy exterior. But they are neurasthenic all the same. If females, they are prone to hysteria, to headaches, irregularities in the action of the circulatory organs, especially to disordered cardiac action, to neuralgias, to be unduly excitable, and to be easily exhausted, or they may be easily kept awake and thus lose sleep from comparatively slight disturbances. Such persons are habitually over-taxed, and in most cases they are to a degree practically inefficient in the affairs of life. They are never well long at a time, but on the other hand may be seldom seriously ill. Such persons are especially prone to neuralgias, or neuralgic pains, and to the myriad slighter forms of neuroses of sensibility, whether general or special, whether somatic or mental, or more strictly, emotional. Practically it is a matter of high importance to determine this hereditary factor in nervous disease, especially in neurasthenia. It is of importance in *prognosis*, for to the extent that the general malady is ascertained to be hereditary, *to that extent is it practically incurable*, in a permanent way. If you can eliminate this factor in such cases, and quantitatively determine its value in the make-up of the case, you have made a great stride toward a prognosis which will stand the test of time. Morbid conditions which are acquired by heredity, are almost as difficult to eradicate finally, as the color of the eyes or expression of the countenance. They are ingrained into the type of organization itself. And gentlemen, more will depend on your prognoses, in the long run, than almost anything else connected with your work. If you gradually acquire the reputation of giving not only frank but carefully matured opinions, which stand the test of time, and which do not delude the patient and its friends, opinions dictated by a cautious scientific prevision, you will be not only wise but fortunate. Happy comparatively is the medical man, who does not have to face on every hand, as so many have to do, the miserable results of incautious and uncandid opinions.

It is important in treatment to find out to what extent the malady under consideration is hereditary. To the extent it is so, will the case be rebellious. Then again, it is especially valuable in laying down courses of hygienic management. If it is ascertained that a patient is strongly disposed by heredity to neurasthenia, then you may and you ought, to advise your patient to such a course of life as may enable the sufferer to avoid exhaustion. You can point out to them perhaps, how much or how little they may safely undertake to do or endure, or what kind of occupations they may most safely follow. And it may not be out of place for me to remark, that the older and wiser you become, the more stress you will lay on hygienic measures. You may not trust less to medicine, but certainly your medical treatment will become simpler, and more rational, and your dependence on a careful regulation of the course and conditions of life in every way, will be more and more pronounced. I would however equally warn you against the faltering expectancy which does nothing but sit by and look on, and on the other hand, against an irrational polypharmacy, which is dictated more by a restless spirit of anxiety to be, or appear to be, *doing* something, than by any deliberate intelligent purpose. For these reasons is it important to determine the presence of a hereditary element when it exists, as it so often does. You may ask me, how I would ascertain its presence in a given case. By inquiry, reflection on the facts, especially the *causal* facts, and by cautious processes of exclusion in your reasonings on a case. So much then in brief as to hereditary neurasthenia. I hope I have impressed you with its importance. It is my firm conviction it is becoming more and more frequent as time passes, and one generation after another comes on. I know some hold to a different opinion, that is as to a gradual increase in prevalence of nervous and mental diseases. But I have formed deliberately my opinion, and some time hereafter will expose its grounds. I now pass to

II. *Dyspeptic Neurasthenia.* This form of neurasthenia is consistent with all the other forms, with which it is often confused in complex cases. I now allude, however, to those cases of nervous exhaustion which depend, broadly speaking, on digestive disorder of whatever character, which includes impaired appetite, and always involves imperfect digestion, and back of this of course, to say the least, impoverished blood, and hence to a starved, worn nervous system, with its multiform morbid phenomena. In such cases there may be no hereditary tendency, no over-work, or undue excitement, or undue gross waste as in hemorrhages or fluxes, no lack of food, but simply disease or disorder of the digestive system, of such kind and to such degree as to persistently interfere with the digestion of food, and hence to interfere with the due preparation and elaboration of materials fit to nourish the nervous system. The supply of materials is not only inadequate, but impure. It not only fails to nourish the nervous system, but embodies unhealthy products, which may act the part of toxic agents on the nervous system. To this must be added also, the irritation of the nervous system, produced directly from the seats of disease in the digestive organs, which have such elaborate anatomical and hence physiological relations with the "ganglionic" nervous system, cord and medulla. By inquiry the "digestive" element in cases of neurasthenia may be made out, and it is of the utmost importance to ascertain its presence and causal position. I must regard this class of cases more closely, for they are exceedingly common in their slighter degrees, and they have a wide practical importance.

There are two principal ways, as already intimated, in which digestive neurasthenias become practically of importance: First, by diminishing the quantity and deteriorating the quality of the supply of materials to the blood. In such cases there may be, as already said, no over-action or over-excitation, or lack of rest, or any hereditary tendency to neurasthenia, or excessive or unnatural discharge to waste the materials of the blood for the nutrition of the higher tissues, though any or even all these conditions may be present with the dyspepsia in any given case. Under such circumstances, the tissues become worn and feeble in action, and once in this unhappy condition, a repair of damage is almost impossible without a cure of the dyspepsia. Of course there are many forms of dyspepsia, which I cannot spend time now even to enumerate. The digestive disorder may be at bottom, a simple gastric mucous catarrh, as it so often is. Or it may be a neurosis of the stomach, affecting especially the quantity or quality of the gastric juice. It may be caused by malignant disease of the stomach, or stand connected with a paresis of its muscular coat, causing dilatation, or it may depend on incontinence of the pylorus, which permits the food to pass immediately out of the stomach, before stomachic digestion has been completed, or it may include simple loss of appetite, or even a positive aversion to food, or again the eructation or vomiting of food, with or without nausea, etc. But whatever the underlying condition or conditions of the dyspepsia, the facts should be discovered, and their actual or probable relations to the neurasthenia determined, as a rational basis for treatment. It is out of my plan to discuss the various forms and conditions of dyspepsia. However, it is all the more necessary for me to commend this class of cases to your study. Keep your eyes open in the presence of cases of neurasthenia, and always deliberately consider, whether the facts do not warrant you not only in tracing more or less in the case, to defective nutrition, but back of this to a dyspepsia as the general cause. Secondly, dyspeptic disorders of the stomach may be related to neurasthenia, or certain of its phenomena, in an indirect or reflex way. The stomach, small intestine, liver, etc., have very important nervous relations, not only with the "ganglionic" system, but also with the spinal cord and medulla. These anatomical imply physiological relations. The stomach receives a share of the fibres of the vagus or pneumogastric, and through this nerve sustains wide-spread reflex relations with the vaso-motor nervous system proper, and hence with the vessels, and also with the heart, which receives an important division of the vagus. Whether any portion of the pneumogastric distributed to the stomach is sensory, and hence centripetal, or not, is not of so much importance as to recognize the fact that it has sensory nerves, and that these are the channels of impressions, which may and do reach the medulla so as to affect the motor nucleus of the vagus, and from this point the heart's action, in a reflex way. Nothing is more common of its kind, than to witness the occurrence of palpitations of the heart, irregularities in action of the same, etc., arising from gastric disorder, as in dyspepsia. This is all the more likely to occur on account of the great augmentation of reflex excitability of the nervous system in general, in neurasthenia. In point of fact, among the more uncomfortable features in *gastric* neurasthenia, are the sudden, capricious, and at times alarming changes in the rapidity, regularity and force of the heart's action. The symptoms are legion, which may be and are produced, in a morbidly sensitive patient, by fluctuations in blood supply, especially to important organs, such as the brain, medulla and spinal cord, and even the heart itself. Then again, the stomach, by reason of its complex nervous relations with the cord and medulla, may become the starting point for nervous excitations, which may disturb the circulation of blood in the head, especially the brain, causing often violent fluctuations in the brain circulation, leading to vertigo, confusion of mind, headaches, fullness in the head, throbbing of the same, disturbances of the special senses, disturbances of the sleep, especially by dreams, disorders in breathing, such as coughs, dyspnœa, etc., and disorders of the liver, intestines below, or even in the pelvic organs. These morbid reflex phenomena are peculiarly prone to occur in neurasthenia, and as might have been expected, more in its *gastric* form. In these and in other ways doubtless, may the various morbid conditions of the digestive system, in dyspeptic neurasthenia, lead to various symptoms or groups of symptoms, so as to justify, in view of clinical requirements, the name, *digestive neurasthenia.* But I must pass along in the next place to

III. *Assimilative Neurasthenia.* This is a form of neurasthenia which does not seem to me to have been very clearly recognized, which however I have come to regard as quite important. I may, perhaps, best make my meaning clear, by briefly reciting the history of a case. Some four years ago I was consulted by the friends of a young lady, who had long been in ill health, but in whose case no serious localized disease had been discovered.

She was about twenty-three years of age, medium in size, rather light complexion, and weighed perhaps about one hundred pounds at the time of my first seeing her.

By careful inquiry I was able to satisfy myself that she had no serious local disease whatever. She came from a nervous family on both sides, and possessed a highly nervous organization, was neurasthenic, hysterical, and for months, and even years, had been in feeble health. She had been fairly well from infancy up to near her twentieth year, was a bright student, and had made considerable advancement in her studies, especially in music, for which she had a great fondness. Her taste and talent in this latter direction were such as to seem to justify an extended course of studies abroad. In due time she began her musical studies at Leipsic, but after a few months of close application, her health gave way, the principal local symptoms being a partial amblyopia. The next year was spent in various parts of Germany, in the endeavor to restore her health, but without success. She then returned to her home in the West, almost unable to do anything, but without serious local symptoms, save spinal pains, which varied in situation and severity, and also with a continuation of the ocular symptoms. Her sleep was disturbed and unrefreshing, and her appetite capricious; but upon the whole, fair. To a moderate degree the menses were painful, though regular in their appearance. The action of the heart was excitable and irregular, and the vaso-motor reflex exceedingly sensitive. She was recommended to take rest, both mental and physical, to undergo a careful system of passive exercise, to use general faradization, to have highly nourishing and simple diet, to keep the bowels regular, and to use light sedatives and tonics, and when they appeared necessary, stimulants.

At the end of a year or eighteen months, she had gained some twenty-five pounds in weight, but with scarcely any perceptible increase in strength, or diminution in the excitability of the vascular system. The slightest exertion of the mind or body, or occurrence of emotional excitement, would cause irregular action of the vascular system, and throw her into a state of trepidation, highly uncomfortable. She ate well, appeared to digest well, and as has been already stated, gained considerably in weight, but she had not gained in strength. I was fully aware of her hysterical condition, and of the possibility of my being deceived as to her real condition. I knew very well that there is a difference, often very hard to detect, between real exhaustion, and that which is merely apparent, as is so often seen in cases of hysteria. I hence took every pains to satisfy myself in regard to this point; her lack of nerve power was real, but, under the circumstances, how could it be accounted for? She ate well, digested well, gained in flesh, then why not in strength? After a careful study of her case, I came to the conclusion, it was one of those cases, such as I have often met with, in which there is a defect in the process of assimilation itself, a sort of paresis had fallen upon the intimate process of nutrition, as it is accomplished between the tissues and blood. Food was taken and digested, and as a result the blood was rich in nutritive materials, which were appropriated by the lower tissues, but to a very imperfect degree by the higher tissues, such as the nervous, and this is what I can call by no better name than *assimilative neurasthenia.*

I had met with many cases similar to this before, and have met with many of them since. Whether they depend upon some hereditary vice of nutrition, or upon some condition of the nervous system itself (in respect to the influence which there is reason to think it exerts over the process of nutrition, under the name of *trophic action*), I am not able to say, but up to this point am well satisfied as to the nature of these cases. The process of nutrition falls short of the energy and perfection it presents in health. In such cases of neurasthenia it is found almost impossible to lift such patients out of the "Slough of Despond" into which they have fallen.

When, therefore, you meet with a case of neurasthenia the history of which does not exhibit any serious disturbances of the digestive organs, no genito-urinary disorder; cases in which, in spite of rest, of passive exercise, of good feeding, of good digestion, of gain in flesh, and in the absence of local disease and exhausting discharges, and yet no apparent headway is made at the end of months or even years towards recovery, you may be pretty sure you have a case of assimilative neurasthenia. Such cases will be among the most discouraging with which you can possibly meet. It will be your duty to discover them early, and in view of a just knowledge of this condition draw your prognosis and plan of treatment. No class of cases are more persistent, or more unsatisfactory to all concerned. But a just insight into their nature, and a candid statement to the patient and friends, as to the outlook for the future, affords the only satisfactory, if not successful, way of dealing with them. But without farther delay, I will now pass to what may be called genito-urinary, or sexual neurasthenia, viz., those cases which are chiefly caused by disorders of the sexual organs.

IV. *Genito-urinary Neurasthenia.* By this is meant, not simply nor principally, cases of exhaustion of the sexual apparatus, but rather those cases of *general* neurasthenia which are the outcome of sexual excesses, and of irritative disease of the genito-urinary apparatus. This is an exceedingly common form of neurasthenia. The generative and urinary organs are copiously supplied with nerves, not only from the "sympathetic" or "ganglionic" nervous system, but from the spinal cord, and through it from the higher parts of the central nervous system. The sexual system, during the whole middle period of the existence of the average individual, plays a conspicuous part in the organism. In its higher relations it stands in the midst of, and is connected with, many if not most of our instincts, propensities, and even our higher emotions. It thus has not only important physical relations, but mental ones as well. But it is impossible, perhaps unnecessary, to discuss in your hearing at present, the complex relations of the sexual system, its functions and relations in health and disease.

In the neurasthenia which results from over sexual indulgence or abuse, we have a marked instance of exhaustion produced, not so much by what is done as by what is endured, not so much from over action as from over excitation, but none the less *certainly* is the power of the nervous system exhausted and the sensibilities rendered morbid. Nothing is more common, perhaps, than nervous exhaustion from this source. To a moderate extent it is seen in early life, in both males and females, as the result of masturbation, and of dwelling upon lewd fancies and imaginations; in later life it results in both married and unmarried, as already said, from over sexual indulgence. It also results from disease of the bladder and its appendages, including the urethra, more especially in the male. In the female it arises chiefly from irritative disease of the uterus and ovaries, and sensitive parts within the pelvis. These parts in the female, and the bladder and urethra, especially in the male, are copiously supplied with sensory nerves, and involved in irritative disease, are the channels of continuously painful impressions from the pelvic zone, into the spinal cord, and upwards to the brain. In such cases the cerebro-spinal axis throughout suffers in the æsthesodic or sensory tract, which is excited and rendered irritable. Its nutrition is disturbed and lowered, its circulation rendered irregular, and, in short, a more or less general neurasthenia results. So frequently is this state of things observed as to justify, it seems to me, the formation of a distinct class of neurasthenias, when surveyed from the causal stand-point. In this form of the disorder, the lower part of the spinal cord, very naturally, suffers most, when it does not suffer exclusively.

Sexual neurasthenia is more common in females than in males, as might be imagined beforehand, but it is getting to be more common as time passes in both sexes. No other form of neurasthenia seems to be more on the increase, if I have observed correctly. But I am unable at present to do more than point out to you this form of the disorder. To discuss it in a satisfactory manner would require alone more than one lecture.

I had intended to have found time to have spoken of those more general forms of neurasthenia, mentioned under the *fifth* head, but must for the present pass them by. Such are the clinical forms of neurasthenia, to which it seems best to direct your attention. Without doubt other more or less distinct clinical forms could be made out, but these are all I shall treat of at present. In describing these different kinds of neurasthenia I would not have you for a moment suppose I regard them as essentially different, the one from the others. In each case the result is the same: the exhaustion of the substance and power of the nervous system, hand in hand with which we have the morbid increase in nervous sensibility. The differences are only in the modes of producing the result. In my own experience, which has now come to be very considerable with this class of disorders, I have found it profitable to keep the above different groups of causal conditions distinctly in view. I will now turn to a brief description of those forms of nervous disease in which neurasthenia is a prominent if not a chief factor.

VI. Forms of Disease in which Neurasthenia is a prominent element. There are many cases of neurasthenia presenting a combination of all the forms already described. Such may be called complex. But it is rather to forms of nervous disease more or less distinct, in which neurasthenia is a factor, to which I would, at present, call your attention. First among such nervous affections is *hysteria.* A careful analysis of the multiform phenomena of hysteria reveals *consistently*, two features—undue excitability, or mobility, and loss of nerve power. No case of typical hysteria can be found, in which these two elements are not present. But to particularize: the morbid increase of the sensibility of the nervous system is especially observable in respect to simple reflex and emotional excitability. Reflex responses of the nervous system, whether from a peripheral or a cerebral source, occur in hysteria more easily than in health. As respects the emotions in hysteria, they are altogether more easily excitable than in health, and the cerebral reflexes or impulsive actions to which emotional excitations tend to give rise, occur more easily than in the normal state. Let us now turn to the other side of the picture, that of nerve power, especially to the inhibitory power of the nervous system. It is invariably the case in hysteria, that the patient has but little capacity for control, not only of the ordinary reflexes which are normally under the dominion of the will, but especially of those which may be called *cerebral*, to which emotional excitations give rise. Hence, the agitation and excitable states into which such patients fall. Given these two factors, in varying proportions, that is, abnormal sensibility and loss of power, and we may produce most of the phenomena of hysteria. There is no special lesion in hysteria. There is chiefly a lesion of nerve nutrition, so far as the nervous system is concerned. Besides this, there is to be noted *a loss of equilibrium in force and action*, between certain parts of the nervous system, which may be hereditary, or may be acquired and established as a habit. In this latter state may lie the essence of the hysteric state. The balance of action in the nervous system may be so delicate and so easily disrupted as to make the patient liable to hysteric attacks. In order to alleviate hysteria it is necessary that the patient should avoid excitement, and thus give the nervous system repose—should avoid fatigue or exhaustion of nerve power, and finally, take all needful measures to strengthen the nervous system, and to acquire the habit of self-control. All these things are required in the treatment of neurasthenia. Hysteria in its essence is but little more than a peculiar form of this latter affection. When this is once recognized, the nature and treatment of the disorder become more simple and intelligible.

In the next place, chorea may be mentioned as a form of disease in which a localized neurasthenia is very prominent. In my opinion it is very probable, that there is in chorea *exhaustion of control centres* in the brain, face to face with increased reflex excitability of the higher parts of the nervous system, in its relations to muscular movements. These occur with abnormal facility, partly in consequence of the direct loss of power for control from exhaustion of certain centres. In this view, chorea is to be regarded chiefly as a form of neurasthenia; its peculiarity consisting in its location and limitations. It is especially a cerebral disorder, and involves, seldom, and never necessarily, destructive localized disease.

In the next place I would direct your attention to melancholia, which, so far as its symptoms go, embraces morbidly distressing, and at times exciting emotion, and side by side with this, loss of will power and of thought power. Such cases may, of course, include, as they often do, localized disease in the nervous system, more especially the brain, but, in the majority of instances, such is not the fact. There is brain exhaustion, and it may be morbid excitation from some source. There may be hereditary weakness of nervous organization, deficient nutritive supply, insufficient sleep, and too much work and worry. In all these ways, singly or combined, that state of brain exhaustion may occur, coupled with an unhealthy cerebral circulation, which together are the essential conditions of most melancholias. In such cases the cure is usually effected, sooner or later, by much sleep, the best nourishment possible, and the removal as far as possible of causes of nervous exhaustion.

Then again I would call your attention to neuralgias in general, as forms of nervous disease in which neurasthenia is always present, and in most cases to a remarkable degree. A due consideration of the phenomena of neuralgia, of its causes, of the circumstances which aggravate it, and of the various means found useful in its cure, demonstrate this fact. It would be impossible for me to go at any considerable length into this subject, for it is one which deserves extended treatment. No other form of nerve disease will be met with so frequently in your future experience as neuralgia, and, unless you are fully aware of its relations to neurasthenia, you are not likely to attain to correct notions as to its pathology and rational treatment.

Before I cease speaking upon this subject, I wish to call your attention finally to that form of nervous disease which passes under the name of *spinal irritation.* After a rather careful study of this affection, I have arrived at the conclusion that it is to be divided into two classes of cases, very widely different from each other in fact and, to a certain extent, in appearance. One class presents, under this name, localized disease of the *spinal system* (as it may be called), such as spondylitis and other inflammatory disorders of the bones and fibrous structures of the spinal column, and localized pachymeningitis of various grades or degrees, and, at times, disease of the sensory tract of the spinal cord itself. This is one class of cases; but there is another class, far more common, according to my own observation, and in which there is no good reason for suspecting the presence of any of the graver disorders already mentioned, but simply a spinal neurasthenia, with great exaltation of sensibility to painful impressions in certain parts of the spinal cord, varying in different cases. It is my opinion that the great majority of cases of so-called "spinal irritation," are simply cases of spinal neurasthenia. I am not able, for want of time, to do more than allude to this subject; but it is a fruitful one, about which even now more thoughtful members of the profession do not have harmonious views. At a later period in our course of instruction, I may go at greater length into this interesting theme; but it is impossible for me at present to give more space to this phase of our subject.

But a further examination would probably show you as plainly as it has shown me, that neurasthenia, or nervous exhaustion, has a wider area than almost any one has suspected. In various neuroses of the muscular system, especially pareses, trophic affections, and the like, various neuroses of the sensory tract of the nervous system, as when we come to deal with hyperæsthesias in the domain of general sensibility, in many of the neuroses of the special senses, more especially of sight and hearing, also in many forms of insanity, both of the excited and quiet kinds, in spermatorrhœa, in feeble and irregular cardiac action, in imperfect vascular tonus, in various respiratory disturbances, in weakened peristalsis of the alimentary canal, and other affections which could easily be mentioned, neurasthenia often plays a conspicuous part. If these observations are well founded, it is of the highest importance that you understand clearly as possible the nature of this disorder and its appropriate management.

In the present course of instruction, however, all I can do is to give you a brief account of its phenomena and underlying conditions, its relations, and treatment, and leave you to apply the doctrines I have placed before you, in your own observations when you meet with the disease. In my next lecture, I will give some account of the hygienic and medicinal treatment of neurasthenia.

Art. II.—MICROSCOPIC STUDIES ON THE CENTRAL NERVOUS SYSTEM OF REPTILES AND BATRACHIANS.

By John J. Mason, M. D.

ARTICLE I.—THE SPINAL CORD OF THE FROG—RANA PIPIENS, RANA HALECINA.

IT is not intended in these articles to give, in detail, an anatomical description of the nervous system of this class of animals. So far as the anourous group of batrachians is concerned, one could hardly effect such a purpose better than by translating the works of either Reissner * or Stieda,† which together with those of Wyman‡ and Ecker § are in the hands of most comparative anatomists. Only in writing of species, the nervous system of which may not previously have been

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**Der Bau des Centralen Nervensystems der Ungeschwänzten Batrachier.* Dorpat, 1864.

†*Studien ueber das Central Nervensystem der Wirbelthiere.* Leipzig, 1870.

‡*Anatomy of the Nervous System of Rana pipiens.* Washington, 1853.

§*Icones Physiologicæ,* 1851–59. Liepzig. "Die Anatomie des Frosches des physiologischen Thieres, ist fur den Physiologen, kaum minder wichtig, als die Anatomie des Menschen."

studied, will a full description be attempted, the main object being to present from time to time facts observed by the author, and regarded by him as supplementary. The form of the spinal cord and especially that of its enlargements; the nuclei of the nerve cells, and variations in their shape, size, etc., in the same individual; the number of ganglionic bodies in the spinal cord, and their relations to the roots of the spinal nerves, and the differences, if any, which may be determined by sex: these, among others, seem to me to be subjects of much interest, many of which can be examined remarkably well in cold-blooded animals.

Before describing the method of making preparations which I employ, a few features of the process of Stieda will be noticed. This observer places the entire brains of small animals, first in a solution of 80–90 per cent. alcohol, which has been tinted yellow by iodine. As soon as the piece feels firm to the touch (one to four days according to the size of the specimen) it is placed in a dark yellow solution of bichromate of potash, care being taken to use a large excess of the solution. After a time varying from three weeks to three months, the hardened part is placed in strong ammoniacal carmine, and is removed after from one to five days, placed in alcohol, and after all excess of carmine has been removed, is ready for section.

By this process Stieda has been able to prepare sections in a long unbroken series, of the brains of mice, frogs, etc., saving thereby the risks of several transfers.

My own method is the old one, except in regard to the solutions for hardening. A two per cent. solution of bichromate of potash has given me excellent preparations, also the solution of Clarke, which consists of a solution (1–800) of chromic acid, to each ounce of which a grain of bichromate of potash is added. So far I prefer to stain after cutting. At least two transfers may be avoided by using a siphon tube, to remove alcohol or water, and with the flattened spoons of Seguin, there is but little danger of injuring the sections. After the piece has remained from three to five weeks in the two per cent. bichromate solution, which it is well to renew every two weeks at least, it is placed in Ivanoff's modification of Müller's fluid, which consists of one or more parts of sulphate of soda, until ready for section, when it is transferred to alcohol for a few minutes.

The membranes of the cord ought not to be removed until just before making the sections, or until the part is thoroughly hardened, otherwise deformity will surely result, showing itself in an oval instead of circular central canal. When an unbroken series is not desired, it is better to make sections with the membranes on. After cutting, the sections are stained in Beale's glycerine and water solution of ammoniacal carmine, for which I often substitute the borax carmine of J. W. S. Arnold, after adding to it some ammonia, which rather improves the color. Transparency is effected by oil of cloves, after absolute alcohol has expelled the water, and the mounting is done in Canada balsam dissolved in chloroform. A short piece of copper wire hammered flat at one end and bent at right angles is a good substitute for the steel spoon, as it can be quickly made of any size, and its outline changed by scissors when desired.

The sections of the alligator's spinal cord, which were shown with photo-micrographs at the last annual meeting of the American Neurological Association, measured about 9–10 mm. through the brachial and crural enlargements, and were made from specimens hardened by the same process as that recommended by Seguin* for the human cord.

To prepare isolated nerve-cells, there is perhaps no better method than that employed by Karabanowitsch, viz.: maceration for forty-eight hours in a weak solution of bichromate of potash (2–100) mixed, equal parts, with a (1–100) solution of caustic soda and ammoniacal carmine.

It is possible, however, to make beautiful preparations of the nerve-cells of the frog, by simple agitation, with some teasing, in a drop from a solution of glycerine, water and carmine. Agitation in osmic acid is another common means of isolation, but the preceding methods are generally to be preferred.

The large cellular structures which form such a prominent group in the inferior horns of grey matter are composed of large, sharply defined nuclei, surrounded by protoplasmic

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***Stricker's Handbook*, p. 646.

masses which, under the action of certain re-agents, look as if they were composed of fibrillæ, which unite in bundles to form what are called the cell processes. The nuclei seem to be but slightly affected by these re-agents, but by prolonged action, seem to be compressed by the surrounding mass. In the cells of medium size the nuclei are rarely if ever changed from the spherical form or circular appearance. These nuclei which contain a distinct nucleolus, are not too numerous to be counted in the frog. For example, in an unbroken series of twenty-four sections, from the middle of the brachial enlargement of Rana halecina, I counted in both inferior horns 540 large and medium-sized nuclei, and in an unbroken series of twenty-four sections from the middle of the crural enlargement I counted in both horns 390 nuclei. Reissner * estimated the length of the brachial enlargement as standing to that of the crural enlargement in the ratio of 6–10, and this proportion is true of the American species, as would be supposed. It seems fair to conclude therefore, that while the crural enlargement in frogs has a smaller transverse diameter than that of the brachial enlargement, still, by its greater length it contains as many if not more ganglion cells than the latter. It is then, perhaps, the larger of the two swellings and corresponds, as it ought, with the larger size of the posterior extremities.

The preponderance of the lumbar enlargement in birds, and the equality of the two which I have observed in the alligator† and in several species of lizards can undoubtedly be explained, by regarding the amount of grey matter, or possibly the number of nerve-cells, as the surer indication of importance of function in different regions of the cord.

The large crural nerve cells, as well as their nuclei, are larger than those of the brachial region.

This fact I have established by numerous measurements, which may be condensed into the following average diameters for Rana halecina: Brachial nuclei, long diameter, 7; crural

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* Loc. cit.—Length of intumescentia anterior, 6 mm.; that of intumescentia posterior 10 mm.

† See "Transactions of American Neurological Association," in preceding number of the JOURNAL.

nuclei, long diameter, 8; brachial nuclei, short diameter, 6.5; crural nuclei, short diameter, 7.5. The numbers denote divisions of the micrometer eye-piece, each division with the objective used representing .002 mm.

After a thorough comparison of sections from the brachial region of twenty large specimens of Rana pipiens, of which seven were males, I have been unable to detect any difference either in the arrangement, size or structure of the elements, that could reasonably be referred to as explaining the remarkable and purely reflex energy displayed by the male frog during the embrace of copulation.* The group of cells with nuclei of medium size, described by me in the *New York Medical Journal*, of December last, is present in the "pars media" of cords from both sexes in three species which I have examined with especial reference to this point.

The distribution of the inferior root fibres in the inferior horns of grey matter, among and to the ganglion cells.

Wyman,† whose memoir appeared at the time Ecker was preparing his *Icones Physiologicæ* for publication, states, page 20: "After the most careful examination, I have not detected any direct connection between these caudate appendages and nerve tubes;" while the latter anatomist prints an illustration after Küpfer ‡ which represents, in a cross section made through the middle of the brachial enlargement, four large nerve cells, with processes running downwards and outwards, as far as the periphery, and two other large cells, from the same group, with processes continuous with the superior (posterior) roots!

Such an exaggerated illustration could never have been made by photography.

Reissner,§ ten years later, in a work than which there are few more perfect memoirs, writes: "In regard to the inferior roots, I must premise, that the spinal cord of anourous batrachians, which have been at my disposal, is very little suited

* Goltz.—*Beiträge zur Lehre von den Functionen der Nervencentren des Frosches.* Berlin, 1869.

† Loc. cit.

‡ *Diss. de Medullæ Spinalis Textura in Ranis.* Dorpat, 1854.

§ Loc. cit. pp. 19, 20.

for observing the entrance and course of the fibres in the grey substance. * * * * As before stated, a nerve cell may lie near the point of entrance of a bundle, and send one of its processes into the same. (Fig. M.) * * * * The remainder of the nerve root fibres which run upwards or outwards in the grey matter, unite either wholly or in part with large nerve cells."

Stieda,* after contending for the true cell structure of the protoplasmic mass which contains the nucleus, and the structureless state of the axis cylinder, against the views of those who believe in their fibrillary composition, enquires: "How is it now with the connection between nerve-cells and nerve-fibres? * * * * From my observations on fresh as well as on hardened ganglia of the spinal nerves in fishes, amphibia, warm-blooded animals and man, the union is of this nature: the axis cylinder of the nerve-fibre is the direct continuation of the cell substance;" and two pages further on, "It seems to me impossible to see such a connection in sections of the brain and spinal cord; it can only be done with the help of isolating methods, as we are taught by the latest observations of Koschewnikoff."† It will be observed that although Stieda has not seen such a connection in a section, he nevertheless considers it as a fact, while Reissner, in 1864, claimed to have seen it; and it was figured by Ecker and Küpfer. Dean ‡ has also a plate showing, in the rabbit, a nerve process joining a nerve-fibre of an anterior root, and passing out as far as the periphery. The frequency with which I have obtained sections from the brachial enlargement of the frog, which show in the clearest manner what becomes of by far the greater part of the inferior root-fibres of this region, leads me to give here my manner of procedure.

In the first place, I must assert, contrary to the opinion of Reissner given above, that I know of no other animal so well suited, and for so many reasons, as is the frog, for the study of this point. It is true that the root-fibres in each section are

* Loc. cit. p. 150, et seq.

† *Archiv für Microsk. Anat.* Bd. V. 1869.

‡ J. Dean.—*Microscopic Anatomy of the Lumbar Enlargement of the Spinal Cord.* 1861.

comparatively few; but this seems to me an advantage rather than an impediment, and if more nerve-fibres are desired, it is quite easy to obtain them by making more sections. The supply of frogs is ample; and their spinal cords almost come out of the spinal canal of themselves, so easy is their removal, when the operation is done upon the abdominal side. As the chief cause of failure lies in the division by the razor of the nerve-tube somewhere between the cell and the periphery of the cord, it follows that, *cœteris paribus*, the smaller the diameter of the cord, the greater the chance of success. In the brachial enlargement, many fibres from the inferior roots enter the cord at right angles, and remain in the same vertical plane while describing a curve laterally, the convexity of which lies towards the inferior median fissure. This is why longitudinal sections are useless for showing this connection; while a series of transverse sections, made in the section cutter, including the roots of the second pair of nerves, will often show, in well stained specimens, the greater portion, if not all, the root fibres passing through the white substance, and, after entering the grey substance, branching outwards among the cells. Most of the fibres lose themselves among the larger external group of cells, while a few are seen to unite with the upper group. In several instances I have traced a connection between cell process and nerve-fibre, with so much certainty, confirming the observation by using a binocular instrument, that I am forced to believe not only in the possibility, but the facility of demonstrating in this way an important fact.

It is always advisable to submit the transparent section to microscopic examination before it is covered, as the weight of the cover is often sufficient to sever fibres. Good objectives, of considerable power, can be used in studying uncovered preparations; and I have succeeded in obtaining satisfactory photographs of some of these.

CONCLUSIONS.

1. The central canal of the spinal cord of frogs is more nearly cylindrical in shape than has been generally supposed. The oval contour is not seen in cross sections below the second pair of nerves, when the membranes are not removed before hardening.

2. The nuclei of the large nerve-cells are more generally oval in form than are those of the smaller cells. I have confirmed this in a few fresh preparations only. It is possible that the re-agents employed have a different effect upon the two classes of nuclei, but it seems more reasonable to conclude that they have a different form anatomically.

3. The nerve-cells of the crural enlargement are as abundant as those of the brachial enlargement, if not more so. Their nuclei are larger, as are also the surrounding masses of protoplasm or cell bodies.

4. No difference in structure can be made out in the upper portion of the cord, corresponding with the sexual function in the male. The long-continued and violent tonic spasm of the anterior extremities, must be explained by local hyperæmia influencing the same structures as those which exist in the female.

5. The relation which is generally believed to exist between the so-called motor-cells and the inferior (anterior) roots, can be demonstrated in the frog more readily than in any other animal.

ART. III.—THE DOSAGE OF ELECTRICITY.*

BY GEORGE M. BEARD, M. D.

THE dose of ordinary remedies given internally is accurately determined by one factor, weight or measure.

The dose of an electrical application on the human body is a complex resultant of a number of different factors. The elements which constitute a dose in the application of electricity are as follows :

First—the strength of the current. Secondly—the length of the application. Thirdly—the locality of the application. Fourthly—the method of the application, including size and quality of the electrodes, and also whether the applications are made beneath the skin, on the skin, or on the mucous membranes.

A glance at these factors makes clear at once this general fact : that we have complex, and not simple elements to deal with in determining the dose of an electrical application. First of all, the strength of the current is a very difficult thing to estimate, when it is applied to the human body. When using the galvanic current, it is customary to specify the number of cells that are used ; but cells vary not only in regard to size, but in the quality of the fluid they contain, and in the condition of the metals, whether clean or otherwise, and also in the surface of the conducting wires. To say, therefore, that we have treated a person with so many cells, is to give very little information with regard to the dose of electricity we have given ; it is in fact, to give no information at all.

Then, again, the size of the electrodes, and the degree in which they are moistened, and the amount of pressure which is applied to them,—all these factors must be known if we would know just how much electricity, according to this law, passes through the patient.

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* Read before the American Neurological Association, June, 1879.

Then also the resistance of the skin varies with the condition of the sweat glands and the amount of water with which the electrodes are saturated; and also with the quality of the water, whether warm or cold, fresh or salt. Even if all battery cells were constant at all times and under all circumstances, this element of error from the different states of the skin and the character of the electrodes, would make it impossible to even approach anything like mathematical precision in the time of the application of the electrodes, or in a description of our method of treatment by this agent. The amount of electricity that passes through any part of the body when an application is made to it, depends on these three factors, the electro-motive force of the batteries, the internal resistance within the battery and the external resistance outside of the battery, in the conducting wires, in the electrodes, and in the patient's body. The amount of electricity that passes through the circuit is equivalent to the electro-motive force divided by the external resistance and the internal resistance, thus: $\frac{E}{R + r}$ It will be observed that all the elements of this fraction, both numerator and denominator, are inconstant: to say, therefore, that we have treated a patient with so many cells, is not to state just how much electricity has passed through the patient.

In using the galvanic current, it is possible to modify this difficulty, in a measure, by the use of the galvanometer; and Dr. J. Dickson Mann, of Manchester, England, has devised a galvanometer for this purpose, which shows in the thousandth of the Weber, (the British Association unit,) the dose of electricity that we give to a patient. This instrument is graduated by divisions which become much closer after the first ten or fifteen, and are spread out more widely in the portion of the scale which is most frequently used. As all these galvanometers are made in the same way, they give the means of accurate comparison of observations, *provided we also know the exact position of the electrodes.*

If, when the galvanometer is interposed in the circuit a certain definite deflection of the needle is observed, when the electrodes are in a certain position, and a certain amount of pressure is used upon them, we infer that we are getting a definite dose of electricity. If, however, we change the relative position of the electrodes and increase or diminish the amount of pressure upon the sponges, we can keep the same deflection in the galvanometer, and yet, the two applications are essentially different, because the electrodes are differently placed, and the effects are different, both physiological and therapeutical. This can be demonstrated theoretically by Ohm's law, and is easily confirmed by experiment.

This instrument, however, is for the galvanic current; for the faradic current we have no means of estimating the strength of the current used in medical applications.

To all this should be added that patients vary very much in their susceptibility to electricity at different times according to the stage and grade of the disease.

The second factor, the length of the application, cannot be determined with minute precision. The majority of physicians do not, I think, make electrical applications by the watch or clock. There is a very wide margin, all the way from a minute to an hour, according to the locality of the application, the strength of the current used, the temperament of the patient, and the mode of the application, whether general or local.

As a rule, the European neurologists make shorter applications than the American. Whether this difference of custom is due to any difference of theory, or is merely a conventionalism, I cannot say. In America, general and central applications are more used than in England, or even in Germany, and as general and central applications take more time than local applications, it is not impossible that we, in this country, have thus fallen into the habit of making all treatment, local or general, somewhat prolonged.

There is no question that long applications, especially if the current be strong, exhaust the muscle or nerve to which the application is made. It is probable that after a paralyzed muscle, for example, has been faradized for a minute or two, it has received all the benefit it can get from electricity, for that application, and that very extensive prolongation of the treatment might induce exhaustion, and neutralize all the effects of electricity; but in this respect, different muscles differ, and also differ with the quality and stage of the disease. Large and strong muscles bear longer electrization than small and weak muscles; and with all muscles a current *just sufficient to produce contraction* is best. In general applications considerable time is taken, even though each muscle or group of muscles is treated but a moment or two. For local applications, where the electrodes are kept in one position, or nearly so or where interrupted currents are used, from five to ten, or at most fifteen minutes gives all the irritation that seems to be advisable, in the average case, that is, where strong currents are used.

The wife of a physician now under my care, feels unpleasant sensations from a faradic current of even two minutes, to the head or neck. A lady who consulted me some two years ago, also the wife of a physician, was apparently made worse from even a moment's application to any part of the body. Cases like these impress the importance of always beginning the treatment with short applications, as well as with mild currents, trusting to time and the results of treatment for greater tolerance of the remedy. I have now under care, a lady who, at the outset of treatment, would ask to be excused after one or two moments of the application, saying she felt sick, faint and weary; now she can bear a general application of ten minutes with satisfaction, and with every appearance of benefit resulting. I lately had under my care a gentleman who from the very first was so insensitive to electricity, that very long and very strong applications all over the body with either current seemed to have no effect at any time, good or bad. I tried powerful galvanic currents through the head and neck, causing flashes of light, sour taste and vertigo, but without producing any of the soreness and weariness, or headache, that so often result from severe treatment or any exacerbation of special symptoms. This tolerance appeared to be one of the symptoms of the disease for which I treated him, which was an affection of the liver and kidneys, and was probably pathological; this insensitiveness to electricity being, as I believe, a morbid symptom. On the other hand, I have lately seen a case of various difficulties, where an application of one minute at a time, of the galvanic current to the eye, faithfully continued from week to week, ultimately cured the functional disease of the ocular muscle. If the current, which was always very mild, was applied more than a minute, unpleasant results followed.

These few cases which I have recited briefly, show the impossibility of laying down absolute and unvarying rules for the strength of the current or for the length of the application.

Other considerations being constant, the stronger the current, the shorter should be the application. When very mild currents are used, the application may be protracted in some cases for many hours; the battery being placed in position at the bedside of the patient, and the current being allowed to run. In the treatment of tumors and rheumatism this method may have advantage. A galvanic current of mild strength is not so well borne for a long time as a faradic current of corresponding strength; and it may cause ulcers. Very mild currents, however, either galvanic or faradic, may, with precautions, be used a long time.

One of the explanations of the benefit which comes from electricity is found not only in the direct effect at the time, but subsequently and in the intervals; hence, the disadvantage and comparative uselessness in medical cases of the various body-batteries, in the shape of galvanic belts and discs.

The third factor in determining the dose, the locality of the application, is one of great significance; an application which on the face would be not only painful, but excessively so, and would be calculated to aggravate any pain which it was designed to relieve, might, on the back or thigh, cause so little sensation as to be scarcely felt.

The general direction to begin treatment of a new patient with mild applications is a wise one. I continually see patients who have been over-galvanized and over-faradized.

To one beginning to use electricity, it is a natural and almost inevitable temptation to use too strong currents or too long applications; but this general caution should not keep us from employing strong currents in certain localities of the body, and in certain temperaments. There are cases of neuralgia and other irritative conditions that will not yield to mild applications. It is necessary that the current should be not only of considerable strength, but perhaps moderately painful for a short time, in order to gain the best results.

The interesting cases of sciatica relieved and cured by electricity, lately published by Dr. Gibney, very well illustrate this principle; and they are in harmony with my own experience. Sometimes a severe application made by pure metal against the skin without the intervention of a sponge or cloth, is more satisfactory in its results than a milder form of application. I am persuaded that, while there are some physicians who fail by using too strong applications at the outset of various diseases, there are others who fail from being content with mild applications, and not pushing them to sufficient strength to produce the desired result.

Many physicians have been led away by those terrible, but now perfectly familiar terms, anelectrotonus, catelectrotonus, which are all correct as applied to physiology, but of far less practical bearing upon therapeutics than has been claimed for them; and for this reason, practically, that electricity relieves and cures more by *reflex* than by direct action.

When, for example, an electrode is placed on the thigh, in the neighborhood of the sciatic nerve, the effect, whether the current be mild or strong, upon the nerve, may not be a direct effect at all, but reflex only, and the nerve itself, which is diseased, and which we wish to reach, may be quite out of the range of an anelectrotonus or catelectrotonus. Similarly with applications either to the spine and back or to the head and neck. The direct action of electricity, either of galvanic or faradic currents, is submerged in the indirect or reflex action. Herein we find scientific justification for those who have claimed that electro-therapeutics is a thing of experience merely, not to be controlled by any supposed or real discoveries in physiology. Herein, also, is the explanation of the fact that experience compels us to admit that the sedative and tonic effects of electricity, as well as its stimulating effects, can be obtained by either the positive or negative pole, the difference between them, in medical cases, being in practice one of *degree* only.

It is this reflex effect of electricity, when applied to the body, that makes it impossible to use the facts of anelectrotonus and catelectrotonus as a basis for electro-therapeutic procedures. It is in this reflex action of electricity that we find, in part, the explanation of the advantages of general and central applications over localized applications, even in diseases or symptoms supposed to be local, as, for example, dyspepsia, impotence and cerebral congestion. The part diseased is affected reflexly by the electricity during the entire application, even when both poles are quite remote. It is impossible to apply electricity to the feet, as it is impossible to apply cold or heat to the feet without affecting distant parts of the body.

Comparative experience makes this point very clear, that when we fail in localized electrization, we may succeed by the general methods. The exclusive use of local applications in electro-therapeutics is unscientific, even in many diseases or symptoms that appear to be exclusively local.

Practically, in the treatment of diseases, the difference between the galvanic current and the faradic current, between the positive pole and the negative pole, between the ascending current and the descending current, is one of degree, rather than of kind; and even in electro-surgery, as in the treatment of aneurism, ulcers, and nævi, the difference between the action of the positive pole and the negative pole is one of degree—a difference of high importance, to be sure; but as I have learned by many experiments on animals, and by experience with patients, it is possible to cure ulcers and to produce coagulation or an aneurism and nævi by either pole, although the positive is preferable if only one pole is used.

One of the best illustrations of the relation of the locality of application to the strength of the current, or the dose of electricity, is found when we make an application to the uterus and rectum. The cervix and upper part of the vagina are not sensitive to electricity. When the negative electrode of the faradic current is in the vagina, against the cervix, and the positive, that is the weaker pole, is against the spine, or on the abdomen, the external pole is felt, perhaps, painfully, while the inside pole against the cervix produces no sensation whatever. This fact is a surprise to the patient, who at first supposes that the application inside must be very painful. If now, leaving the negative pole in position against the cervix, we connect the positive pole with a rectal electrode, not insulated, the current is painfully felt at both portions, and must be reduced at once. If, again, we use in the rectum an electrode insulated near to the tip, only an exceedingly feeble current can be tolerated, whether galvanic or faradic (and I often use both in this position), for the reason that all the electricity must pass through this insulated tip, and the recto-vaginal septum—a thin and very moist surface, a fraction of an inch in thickness—interposes but slight resistance. This illustration alone shows the impossibility of attempting to prescribe doses of electricity by the number of galvanic cells used, by the resistances of the rheostat, or by the divisions of the scale that are sometimes found on our faradic batteries.

Mathematical errors are the worst of all errors; and on this subject mathematical errors without number have been taught, especially by the German writers.

For all these reasons it is that in the practice of electro-therapeutics I long ago recommended the use of these three terms: *medium*, *mild* and *strong* currents, as the best approximation possible in describing the dose of electricity.

The dose of electricity is also modified by the position of the poles.

The negative pole is stronger than the positive; and with the same strength of current, an application to the locality of the disease by the negative pole is a stronger application than an application of the positive pole to the same locality.

This important factor has been quite disregarded in the accepted modes of studying the doses of electricity; and instead we have an immense literature of anelectrotonus, as applied to electro-therapeutics, wherein most painful and misleading confusion has resulted. Experimenters in electro-therapeutics have been deceived in this way. They apply the positive pole to the seat of the disease, as near as they can reach it, and get perhaps immediate relief; they then apply the negative pole, and irritation, instead of relief, comes; then they infer that the positive pole or anode has produced anelectrotonus, and the negative pole catelectrotonus, and hence the differential action. But one source of error here is, that they have not really made a fair comparison, since two different strengths of electricity have been used, that at the negative pole being the stronger. Another element of error is that which comes from reflex action, inasmuch as it is impossible to touch either pole of either form of electricity to the body without exciting reflex effects.

One of the most instructive facts in the history of electro-therapeutics is the attention and space that are assigned to the direction of the current and the relative power of the poles. In the later history of the subject, interest and attention to these questions have been rapidly diminishing along all the line of this specialty; and there is a tendency among all those whose actual experience in the treatment of disease is widest and most varied, to this practical basis for operations in electro-therapeutics, namely, that pain can be relieved, muscular contractions produced, and in general the relieving and curative effects of electricity obtained by either current and by either pole, in any direction, ascending, descending or diagonal to the nerve, the practical difference, in the average of a large number of cases, being of *degree* more than of kind, and to be determined by the results in each case by itself.

No one who uses electricity in a large number of cases of various diseases, and who observes and reasons from h s observations for himself, unawed by imposing theories or facts of physiology, and unbiased by the voluminous literature of Germany and France on this subject, can fail to reach in time substantially this same conclusion.

This whole question of current direction may be summed up in this proposition, namely: *that direct action of the positive pole is more calming, and direct action of the negative pole more irritating; and, therefore, when calming, sedative effects are desired, the positive pole is usually desirable, and when irritating effects are desired, the negative pole is preferable; and this without reference to the direction of the current, whether ascending or descending, or across the nerve* or many nerves.

In cases of local pain, where local electrization is used, and where the nerve which is the seat of the pain, is tolerably accessible, or can be brought within the range of the pole action, I would use preferably the positive pole; but where the nerve is deeply seated, like the sciatic nerve, I have not been able to demonstrate this differential action of the poles so markedly. In accordance with this principle in general faradization and central galvanization, I almost always use the positive pole, the negative pole being at some indifferent point, as at the buttocks or at the feet. On the other hand, even in these general applications, where there is great anæsthesia, and a pathological tolerance of electricity, as I have seen in some cases of hepatitis and Bright's disease, I use the negative pole.

Note, however, that this differential action is one of *degree*, more than of kind, on an average, say, of a thousand cases. There are individual cases where the differential action is much more decided; and when neurologists hit these cases, they are apt to draw generalizations that are not warranted by large experience.

When a person once fully grasps this fact, that the therapeutic effect of electrical applications is *reflex*, more than direct, there will not be much difficulty in also understanding this other fact—that the differential action, both of the poles and the direction of the current in therapeutics, has been wonderfully over-estimated in literature.

The fourth element, the method of application, is largely included in what has already been said. In electro-puncture a very mild current is painful, whereas with a very broad sponge a strong current would be barely felt. So, also, a current, which with a broad sponge would be agreeable, with a pointed metal would be extremely painful.

Another element of error in determining the dosage of electricity, is that which comes from the action of the mind on the body—what I call mental therapeutics. When we make an application of electricity to the body, we are liable to set in motion the forces of the patient's own mind, just as when we apply metals of different kinds, or magnets; and this element of error from mind acting on body, we cannot eliminate in any given case, for the simple and only reason that we cannot deceive the patient; whereas in the metalloscopy experiments it is easy to deceive the patient, and to bring the subject absolutely within the domain of exact science.

There is yet another factor which must, as all will admit without question, be considered in prescribing a dose of electricity: that is, the temperament of the patient, without any reference to the disease. The habit and tendency have been to suggest and prescribe certain strengths of current for the disease, without reference to the temperament. This factor of temperament is not, however, peculiar at all to electricity, but applies to every form and mode of treatment used in disease; but the relation of the temperament to electricity is demonstrated more speedily and positively than the relation of temperament to almost any other therapeutic agent. I have seen patients drop right to sleep, again and again, within a minute after the application of a mild galvanic current to the head or neck. I have seen unpleasant headaches brought on by the lightest possible application of either current to the head. In the case of the wife of one of my medical friends, a profuse menstrual discharge was brought on by the application of a mild current to the shoulder, for rheumatism. I have seen strong men faint or partially faint at the touch of a mild or comparatively mild faradic current. I have seen neurasthenia or rheumatism made instantly worse for hours, by a single faradization or galvanization. I have seen cases, not a few, who were kept awake all night by a single electrical seance. Observe, all these peculiarities of temperament are quite independent of the disease from which the patient is suffering.

They may appear in those who are but slightly sick, but who have, in their temperament, peculiarities which make them over-susceptible to ordinary doses of electricity. On the other hand, I have seen those who were prostrate in bed, unable to move or raise the head, who could bear in central and general applications all the electricity that one could conveniently give them.

As a rule, if not always, diseases that impair the sensory nerves diminish the susceptibility to electricity. Thus it is that patients with anæsthesia and dropsy can bear stronger applications than in health. If the patient does not feel the current, as a rule, it will not hurt him. But this is a rule which I believe has exceptions, for unpleasant after-effects sometimes appear, even when the patient, from anæsthesia or from the mildness of the current, experienced no sensation, or at least no unpleasant sensation, during the application. In anasarca from kidney disease the tension of the skin causes mechanically an analogous condition in which very powerful faradization is scarcely felt.

One practical lesson that all these facts teach us is, that the dosage of electricity is not a simple, but a complex matter; and that the agent cannot be prescribed, or ordered, or written about in terms of mathematics. To attempt to do so, to follow the lead of those who have filled huge volumes with accounts of the numbers of cells and the resistances of the rheostat that they have employed in electro-therapeutics, is to steer away from science, rather than towards it.

Another and yet more important practical lesson is, that we should not despair of electricity in any case of disease on account of failures of ourselves or of others, at the outset of the treatment. No therapeutic force that we employ has so wide a range of dosage as electricity. Where a strong current or a medium current, or even a mild current, as we use that term, injures or disturbs our patient, a current of exceeding mildness, *below the point where it is felt*, may act with speedy curative power. On the other hand, where mild, medium, or even strong currents seem to do no good, currents of exceeding strength kept up for a long time, or by irritative methods, such as the wire brush or uncovered metal, may bring about the cure.

The *sensitiveness of the patient at the time* is, on the whole, the best general guide for the strength of the current used, although this rule needs the important special modification above suggested.

Conductibility of the Body—Rationale of General Faradization and Central Galvanization.—A question of great interest, and one that is often asked, is, How do we know that electricity applied to the surface of the body affects the internal organs? When, for example, we apply one pole over the abdomen, and the other over the region of the liver, how do we know that the liver is affected? In the processes of general faradization and central galvanization, how can it be proved that the whole body, externally and internally, is brought under the influence of the current? These are fair questions, and science is now, and for a long time has been, in a condition to answer them absolutely! The answer to these questions is not a matter of opinion or of experiment even. Science is only science as it reaches the deductive stage where we know beforehand; and the value of all experiments is, that they furnish the basis by which we can know beforehand what will or will not happen.

Now, this question of the conductibility of the human body is known beforehand, without making any application to the body. The question is answered through physics and through physiology. It is a law of electro-physics that everything conducts electricity; there is no absolute resistance, as there is no absolute conduction—nothing conducts all the electric current, nothing resists it all. The terms conduction and resistance are relative only, although generally supposed to be absolute. It is also a law of electro-physics that substances conduct electricity in accordance with the law of Ohm; that is, the quantity of electricity which flows through any body will vary directly as the electro-motive force, and inversely as the resistance.

A third law of electro-physics is, that electricity passing through a body, the different parts of which have different conductibility, divides itself up in these different parts in exact proportion to the conductibility—all the parts, the poorest as well as the very best, will conduct some of the electricity. It is a common belief, even among scientific men, that electricity, when it has a choice among a number of different conductors, the good and the bad, selects only the very best, avoiding the poor conductors entirely. It is this erroneous belief that stimulates the inquiries above referred to, regarding the different conductibility of the human body. When, now, electricity is applied to the surface of a dead human body, it goes through that body and divides itself up in mathematical harmony with those laws: every part, even the bones (the poorest conductors) conducting some, the warm, moist tissues conducting the most, and the chief *direct* action being at or near the poles. Electro-physics knows this beforehand, without any experiments, just as astronomy knows that an eclipse will happen before it comes off.

Again, when electricity is applied to the surface of a *living* human body, in addition to the physical law of conduction, the physiological law of reflex action comes in. Physiology and pathology agree to this, that reflex actions are constant in the body—that irritation at one point may be transferred to another point. This law is out of the range of discussion or opinion. On the basis of this law we know beforehand that electricity, applied to the surface of the body, is liable to have reflex effects in any part of the body, within or without. All our counter-irritation—blisters, the cautery, water and heat—is based on this law of reflex action; and electricity, no matter how we use it, works reflexly as well as directly. The advantage of applying electricity over the surface of the body thoroughly, as in general faradization and central galvanization, is that we get a larger number and greater variety of these reflex actions, for the same reason that a thorough douching of the spine is more effective than washing the hands or face.

The very remarkable sedative and tonic effects which come from general faradization and central galvanization, and even from local applications, I do not bring up as arguments on this subject at all; they are simply the expression of laws already established; and, besides, they are complicated with sources of error, as the influence of mind over body, and the like, and they do not come under the head of exact science, any more than any other therapeutic results. Even if electricity applied over the body did no good whatever—never relieved pain or cured disease—we yet know beforehand, through the laws of electro-therapeutics and physiology, that the body conducts the current and is reflexly affected by it.

I emphasize this point because it has often been raised, and also because the accepted answers are not, as it seems to me, scientific. We do not need to appeal to the results of electrical applications, or to the cures produced by them, to know that the body conducts electricity. This is true of all the viscera, the liver, stomach and intestines, and also of the brain and spinal cord.

Another suggestive fact connected with this subject is, that it is the great resistance that the human body interposes to electricity that makes electrical applications of therapeutic service. If the body were a good conductor, there would be no such thing as electro-therapeutics. It is resistance to the current that produces the molecular disturbance by which changes are wrought in the nutrition.

Modifying the Dose by Rheostats.—In regard to the use of rheostats, my study and experience bring me to this practical conclusion, namely, that a properly constructed water rheostat is a great convenience in the use of the galvanic current, especially around the head and neck, although not absolutely indispensable, since the best possible results can be obtained without it. By a properly constructed rheostat, I mean one that is so arranged that there could be no sudden metallic connection to cause a shock to the patient.

The water rheostat, as generally made by manufacturers, will soon become untrustworthy; the rod slips too easily, may fall down, compelling metallic connection, and give the worst kind of a shock. I have been accustomed for years to obviate this by placing a ring of rubber around the top of the rod, so that it is impossible to ever make the connection absolute, but allowing the metals to approach within a small fraction of an inch to each other. The resistance of water, as compared with metal, is so great that a very small fraction of an inch resists the current so effectually that when the rod passes over that fraction of an inch and makes a connection, a shock is experienced.

I am now using a rheostat constructed by the Galvano-Faradic Co., which suits me very well indeed. I have the rod marked by a file at a point where it will come within a tenth of an inch of making a metallic connection, and at this point there is a metallic ring and thumb-screw, which is adjustable. By this arrangement, we can make a metallic connection whenever we wish; and there is no danger of its ever being made when we do *not* want it. Another thumb-screw can be so worked as to keep the rod so that it will not fall down of its own weight, but only when force is used. This arrangement seems about perfect. I connect with this generally the whole power of my battery, whatever it may be, or at least a number of cells; and as the column of water in the rheostat is about ten inches long, I have a very wide range of strength of current that I can control by it. This rheostat is interposed in the current by a short conducting wire connecting it with the battery. The horizontal water rheostat I have also used with some satisfaction, but usually frequent refilling with water is necessary.

The advantage which has been claimed for European and other rheostats, where wires of different resistances are used, is, as I have above shown, a delusion in all respects; and the literature that is based on their use in accurate measurements, is very misleading. What we want of a rheostat is to increase or diminish the strength of the current without giving a shock; nothing more and nothing less. A large, wet sponge, used as an electrode, is really a water rheostat, and, as an extemporaneous arrangement, is very convenient, when we have nothing better at hand. It is better, however, for the faradic current than for the galvanic. Any one can tell by a trial that there is a very great difference in the pain which a patient experiences in an electrical application whether the sponge is firmly compressed or applied loosely. This, however, is only to be used when we have nothing better. The rheostat which I recommend is a properly constructed water rheostat, such as I have just described.

There is one other thought connected with this subject, namely, that it is *not* always necessary to avoid shock by interruptions. In some cases where a rapid or slow galvanic current is used, even in applications to the brain, I have sometimes used interruptions with a very mild current to advantage.

Dosage of Electricity compared with that of Drugs.—The dosage of some of our most used drugs has been modified of late, in a very interesting way. It has been proved by trial that the difference in effect between a large and even average dose and a very small dose is great and radical; and that in different doses the same remedy may be used in very different diseases; thus the domain of therapeutics has been greatly widened. Tincture of cantharides, which in doses of ten or twenty drops causes irritation of the urethra and perhaps strangury, in doses of one drop or less is one of the best of all sedatives for irritation of the prostatic urethra and the neck of the bladder; aloes, which is a long known irritant for the lower bowel, has been successfully used in drop doses for prolapsus ani; arsenic, which is so liable even in moderate doses, to produce inflammation of the stomach, in doses of one or two drops or perhaps half a drop of Fowler's solution, sometimes acts with specific and most remarkable power on the irritated and inflamed mucous membrane of the stomach. Podophyllin, which in ordinary doses is so strongly cathartic, Dr. Mays has found in half doses of the fluid extract, to be very excellent in infantile diarrhœa. Calomel, when given in immense doses of from 20 grains to half a drachm and even a teaspoonful (as Dr. Lente tells me is customary in some parts of the South,) is said to have a local sedative effect, with no more cathartic effect than it will produce by a very small dose.

The difference between a dose of ten or twenty grains and of one or two drachms of bromide of potassium, or of any of the bromides, not only in epilepsy, but also in a very large variety of functional nervous diseases, is all the difference between getting no effect at all, and getting some of the most remarkable therapeutic effects in the history of medicine.

Similarly, iodide of potassium in syphilis must be given by ounces; likewise with muriate of ammonia, in certain chest affections. In the southern portions of the United States quinine must be given by the half drachm, or even by the drachm, to break up chills and fever. Ergot, in the old-fashioned dose of ten or twelve drops of fluid extract, does little good in nervous affections; but given by the teaspoonful and two teaspoonfuls of fluid extract, or in five or ten grains of the ergotine, is one of the greatest and most successful of all the remedies in neuro-therapeutics. Sulphide of calcium, until very lately given in doses of a tenth of a grain, for various uses, we are now wont to give in doses of from one-half to two grains, without injurious effects, but with beneficial effects that small doses did not even suggest.

Strychnine, not only in paralysis, but in other nervous troubles, is, in many cases, never felt at all, until it is pushed to a dose far transcending the dose ordered in the books, or until there is severe twitching of the muscles, with head-symptoms.

What is true of these familiar drugs is even more directly and demonstrably true of electricity. The scientific study of the dosage of electricity widens the range of its use in therapeutics, and at the same time makes our electro-therapeutics more precise and satisfactory.

RECAPITULATION.

Some of the points especially insisted on in this paper may be thus recapitulated:

1. The therapeutical effects of electricity—stimulant, sedative and tonic—can be obtained by either pole, and by any direction of the current, ascending, descending, diagonal or reversed, the practical difference being of *degree* rather than of kind. This is true even in electrolysis. On the whole the positive is the more calming, the negative the more irritating.

2. Individual exceptions, as seen in the pathological reactions of some forms of paralysis, and in certain temperaments and phases of disease, do not disprove, but prove this rule. These exceptions are, however, to be respected in practice.

3. The dosage of electricity is a complex resultant of (1) the strength of the current; (2) the length of the application; (3) the quality of the application (size of electrodes, etc.); (4) the method of application (general, central, or local); (5) the position of the poles; and (6) the temperament of the patient.

4. Attempts to prescribe electricity mathematically, by the deflection of the needle of the galvanometer, or by the resistance of the rheostat, are unscientific and illusory. Water rheostats are, however, a practical convenience, because they

enable us to avoid sudden interruptions, and to gradually increase or diminish the current.

5. The therapeutical effects of electricity are very considerably, though not entirely, of a *reflex* character. This is true not only of general and central, but of many local applications. Hence, in part, the mistake of carrying the laws of electrotonus into electro-therapeutics.

6. The range of dosage of electricity is very wide, both in regard to strength and length of application. Although the sensitiveness of the patient is the best guide, yet in some cases currents that can scarcely be felt, and applications of but a moment's duration, are required; while in other cases quite painful currents, or applications prolonged for hours, may be useful.

ART. IV.—A CONTRIBUTION TO THE STUDY OF CEREBRAL LOCALIZATION.

BY R. W. AMIDON, M. D.

WHILE physiologists, by experimentation on animals, have laid a solid foundation for the study of cerebral localization, it remains for the pathologist to rear the superstructure and thus complete the science.

This completion can only be accomplished by the accumulation of an immense number of clinico-pathological facts scientifically recorded.

With no other apology for adding to a subject seeming already trite, the following cases are adduced.

In five of these seven cases the lesion was traumatic, and negative as well as positive cases are introduced.

CASE I.—*Traumatic Capillary Cerebral Hemorrhage.**—The patient, a male aged 42, while drunk, fell backwards down stairs. The symptoms the first day were: Unconsciousness, closed eyes, photophobia, dilated pupils (left larger), downward deviation of the right eye, right facial palsy, a contraction of the muscles of the back of the neck, rotatory movements of the head, paralysis of the right upper and lower extremities, and incontinence of urine.

Respiration 34, pulse 100, temperature normal.

On the *second day* there were contracted pupils; A. M., pulse 125, temperature 39.5° C.; P. M., pulse 126, temperature 40.7° C. On the third day there was stertorous respiration, with twitching of the left side of the face.

The temperature five minutes after death was 43.25° C. Two hours later, 41.25° C., in the axilla.

The lesions were fresh adhesion between the dura and pia mater over the convexity of both occipital and the upper part of the parietal lobes, and small hemorrhages in the cortex, varying from a small pea to a large bean in size. Three were

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* Service of Dr. R. F. Weir, New York Hospital.

located at the base of the left temporo-sphenoidal lobe, one at the base of the right temporo-sphenoidal lobe, one at the posterior part of second temporo-sphenoidal convolution on the left side, and two at the summit of the left hemisphere at the junction of the anterior central and superior frontal convolution. The large cerebral arteries were atheromatous, the small in a state of fatty degeneration.

In accounting for the symptoms, the signs of recent meningitis found at the autopsy may be disregarded, as it made its appearance at the end of the second day when the temperature began to rise. The hemorrhages, however, were evidently present from the first, and to them we must look for an explanation of the early symptoms. The two hemorrhages at the junction of the ascending and superior frontal convolutions of the left hemisphere occupied a region proven by experimental research and pathological data to be included in the motor centre for the upper and lower extremities of the opposite side.

The hemorrhage situated just below the first temporo-sphenoidal sulcus may have caused the peculiar deviation of the right eye, photophobia and the lateral movements of the head, by its proximity to the angular gyrus, irritation of which, in Ferrier's experiments, produced movements of the eyeballs, pupils and head.

The hemorrhages at the base of the temporo-sphenoidal lobes, situated in the non-excitable, sensory district, might, had our patient been conscious enough to betray them, have caused some olfactory or gustatory disturbances.

The presence of right facial paralysis in the present case is inexplicable.

CASE II.—*A Cyst of the Pia Mater, Causing no Symptoms.**—A boy æt. 15 died of septicæmia following a contused and lacerated wound of the leg.

On autopsy, the pia mater covering the left hemisphere was found rather opaque. A cyst the size of a hen's egg was found on the right hemisphere at the upper extremity of the ascending parietal convolution. The cortical substance was depressed 1.5c., but of normal appearance.

* Service of Dr. R. F. Weir, New York Hospital.

This lesion occupied nearly the same relative position as the larger hemorrhage in Case I., the supposed site of the centre for the left arm and leg, but its presence gave rise to no symptoms. Although in an excitable district the lesion was of such a nature as to exert, with considerable pressure, but little irritation on the subjacent tissues. Such lesions Charcot and Pitres* consider very unlikely to produce either spasm or paralysis even when situated in an excitable district, and of large size.

CASE III.—*Cerebral Laceration and Hemorrhage.*†—Male æt. 45. Found unconscious on the street. Was thought to be drunk.

Six hours later his symptoms were : Contractions of pupils, the right being smaller, slow and stertorous breathing, full, slow and regular pulse, and heightened reflex irritability on the right side. On the second day at 8 A. M. the skin was warm and dry, pulse 124, respiration 67, temperature 38.9°, the eyes closed, pupils equal and immovable, conjugate deviation of eyes to the right side, with lateral nystagmus, twitching of the adductor pollicis and interossei of the left hand and of the right corner of the mouth, and fibrillary contraction of the muscles of both legs. 12 M., pulse 143, respiration 55, temperature 40.1° ; 6.30 P. M., pulse 134, respiration 56, temperature 41° ; 8.45 P. M., temperature 41.25°.

On autopsy there were found marks of wet cups on the precordial region, small vegetations on the aortic valves, hemorrhagic infarctions at the base of both lungs, a small embolus in a branch of the left pulmonary artery, fatty liver, cystic left kidney, small amount of fluid and clotted blood over the left hemisphere, a large clot under the left frontal lobe, congestion of the pia mater on the left side, apex of the left temporal lobe disorganized and softened, a cortical clot, the size of a peach stone, at the base of the frontal lobe, and the cerebral arteries atheromatous.

The lesions in this case are in what is known as one of the non-excitable districts of the brain, *i. e.*, the base. Lesions of the basal frontal lobes have been seen far more extensive than

* *Revue Mensuelle*, 1877.

† Service of Dr. R. F. Weir New York Hospital.

in this case, which gave rise to no manifest symptoms (disturbances of motion or sensation).

The conjugate deviation of the eyes and the exalted reflex on the right side, with the absence of paralysis, would lead one to expect to find an irritative lesion on the left hemisphere, but a more exact localization would have been impossible.

CASE IV.— *Old Yellow Areas of Softening Causing no Symptoms.*—A male æt. 38. Intemperate, had had jaundice, and had been troubled by occipital headache for two and one-half years. He had often had attacks of general œdema and vomiting, but never any convulsions, had been deaf for years, more so in the left ear. He first sought treatment for his eyes, both of which were in a state of neuro-retinitis albuminurica. The fundus of each presented exudations, hemorrhages, swelling of the nerves and retinæ, engorged and tortuous veins, small arteries and discs only to be made out by convergence of the vessels. The urine contained hyaline and granular casts and albumen. At first 1860c. c. of urine were passed in 24 hrs., containing 15 grams of urea. Three days before death he passed 120c. c. of urine containing only 1.96 grams of urea.

On autopsy there was found hypertrophy of the left ventricle, an atheromatous aorta, cirrhotic kidneys, and fatty liver. There was an old yellow patch 2.5c. long, 2c. wide, and .6c. deep at the base of the right ascending frontal convolution, covered by thickened, white pia mater. There were four smaller patches on the middle and lower temporo-sphenoidal convolutions of the right hemisphere.

The largest lesion in this case was situated exactly on what is recognized as the centre for the left face, but no left facial monoplegia existed. Complete recovery from an old left facial paralysis might have taken place, however. The smaller scattered lesions in the right, middle and inferior temporo-sphenoidal convolutions manifested themselves by no symptoms during life, unless they were the cause of the deafness from which the patient suffered.

CASE V.—*Pistol-shot Wound of the Head, Causing Aphasia and Agraphia.**—The ball entered 3 c. to the left of the

*Service of Dr. Markoe, New York Hospital.

median line of the forehead and 1.5 c. above the superciliary ridge.

When first seen there was complete relaxation and unconsciousness. On the second day the patient could be aroused, and seemed to understand what was said to him, could answer questions by "yes" and "no," but when asked his name said it was "Smith" (really *Upham*) and was unable to tell his residence. He could not write, although he now used his right hand freely. He recognized friends, ate well and signified his desire to urinate.

On the fourth day, at 2.15 P. M., respiration 55, pulse 145, temperature 42° C., in the axilla. There was right facial paralysis. twitching of the right thumb and abolition of reflex movements in the right leg.

At 4.30 P. M., the patient moved his left lower extremity a great deal, but kept the right very quiet, although reflex action had returned.

At 10.15 P. M., inspiration was forced, expiration noisy, and there was a long pause between the acts. Temperature, five minutes before death, 41.5° C.; temperature, five minutes after death, 42° C.; forty-seven minutes after death, 41° C.

On autopsy, it was found that over the left hemisphere the dura and pia mater were made adherent by a thin reddish exudation. The pia mater was also adherent to the convolutions. The bullet had left a track of disorganized brain tissue 4 centimetres wide, extending from near the longitudinal fissure in front, back through the three frontal convolutions to the fissures of Sylvius and Rolando. The bullet itself was imbedded in the left temporal muscle.

The lesion in this case was, it will be seen, a destructive one of the two frontal convolutions (unexcitable area), causing no symptoms, the third frontal convolution (left side), causing aphasia, and the base of the ascending frontal convolution, giving rise to right facial paralysis.

CASE VI.—*Pistol-shot Wound of the Head, remarkable for Magnitude of the Cerebral Lesion and the Want of Prominent Symptoms.**—The ball entered the right temple and pur-

*Service of Dr. Markoe, New York Hospital.

sued a strictly transverse direction across the anterior fossa of the skull.

When first seen, the right eye was exophthalmic and ecchymosed. The patient was unconscious. His movements, however, were all good. There were no paralysis or spasms. On the second day he conversed in Spanish with his friends, and was, according to their description, not aphasic.

On the third day he was restless. There were occasional tonic spasms of the upper extremities and clonic spasms in the fingers, especially of the right hand. A few minutes before death he spoke intelligibly, attempted masturbation, and, when prevented from accomplishing his object, swore a Spanish oath.

On autopsy the skull was found extensively shattered. There was considerable semi-clotted blood over the convexity of both hemispheres. There was laceration of the tip of the right temporal and lower part of the right frontal lobe. The track of the bullet extended across the base of the frontal lobes, making a wide furrow, severing both olfactory nerves, and at its emergence destroying the whole of the third frontal convolution on the left side. The bullet lay in the left frontal fossa.

The lesion, in this case of the right hemisphere, was confined to the tip of the temporo-sphenoidal lobe and the bases of the three frontal convolutions, not reaching high enough in the third to implicate the centre for articulatory movements. The track of the bullet across the base of the frontal lobes occupied a non-excitable district of the brain, but would, had the patient lived, undoubtedly have caused anosmia from section of the olfactory tracts.

The injury inflicted on the third frontal convolution of the left side ought to have caused aphasia, but if we take the testimony of the patient's friends (of course always unreliable), none, or at least very incomplete, aphasia was present.

A case of cerebral injury exactly similar to this, in which recovery supervened, appeared in the London *Lancet*, May 3d, 1879, reported by Dr. Smith. No spasms or paralysis followed this injury, and the only deviation from the man's usual condition consisted in attacks of extreme irritability and violence,

FIG. 1.

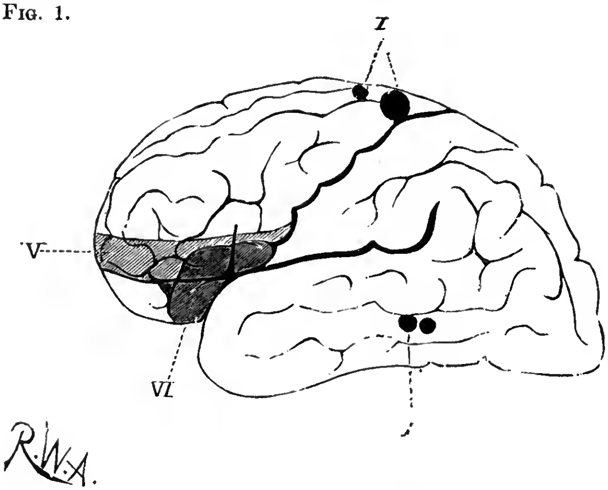


FIG. 2.

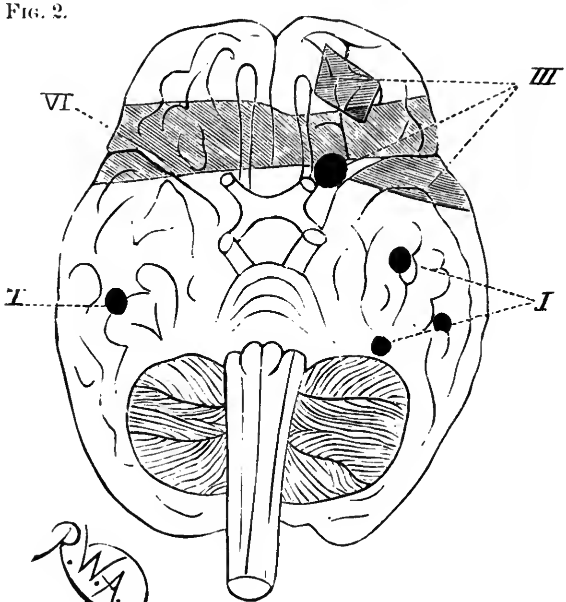


FIG. 3.

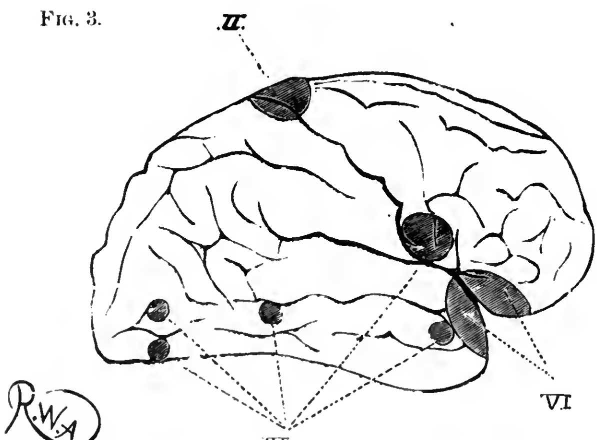


Fig. 1.—I. Four of the small clots in case 1.

V. Cortical disorganization in case 5.

VI. Disorganization of the left hemisphere in case 6.

The outlines for figures 1 and 3 are from Dr. Seguin's lectures "On the Localization of Spinal and Cerebral Disease." (Modified from Ferrier.)—*New York Medical Record*, 1878.

Fig. 2.— I. Four of small clots occurring in case 1.

III. Two patches of disorganization and one clot in case 3.

VI. Track of disorganized brain substance in case 6.

The outline for figure 2, is from Dr. Seguin's "Diagrams for the Study of Cerebral and Spinal Lesions." (Exact reproductions of Henle's plates.)—G. P. Putnam's Sons, publishers, New York.

Fig. 3.—II. Location of cyst in case 2.

IV. Old yellow patches in case 4.

VI. Disorganized brain substance in right hemisphere in case 6.

Even the mental trouble disappeared with complete recovery to bodily health.

Among the six cases the motor region was the seat of lesions in five cases.

The centre for the arm and leg was abnormal in two cases, a destructive lesion in one case causing hemiplegia on the opposite side, while a lesion exerting pressure on the same part in another case caused no symptoms at all.

The center for the face was the seat of a destructive lesion in two cases, in only one of which was the face paralyzed. On the other hand, the face was paralyzed in a case where no lesion of the facial centre existed.

The left third frontal convolution was destroyed in two cases, in one of which aphasia was present.

The commencement of the first frontal convolution in one case, and of the second frontal in two cases, were disorganized and no symptoms were present. The basal frontal or orbital convolutions were the seat of destructive lesions in two cases which exhibited no peculiar symptoms. The tip of the temporo-sphenoidal lobe was destroyed in two cases, no symptoms. The second and third temporo-sphenoidal convolutions showed lesions in two cases, while the only symptoms possibly attributable to them were nystagmus and strabismus in one case, and an obscure deafness in the other. The basal temporo-sphenoidal convolutions contained lesions in one case, to which no symptoms can be attached.

In general it may be said, these cases tend to support the division of the brain into an excitable or motor region (the parieto-frontal) and the non-excitable region (occipital, temporo-sphenoidal and frontal).

In conclusion the writer would add, that in his opinion, localization of destructive or irritative lesions in the motor district has reached as near perfection (thanks to the labors of Ferrier, and especially the French school of observers) as it ever will, and for this reason: Human convolutions have not such an invariable conformation in different brains or even in different hemispheres of the same brain as to allow the fixing of a small area, with no latitude, as the seat of a particular centre.

While in an individual case a very small and circumscribed lesion may produce a certain, clearly defined set of symptoms, identically the same set of symptoms may be produced in another case by an equally small and localized lesion situated at a point seemingly some distance removed from the first centre. For instance, the centre for the arm is considerd to be on the ascending frontal convolution at about its middle, while in cases of monoplegia or monospasm of the arm, lesions are found above, below and at the middle of the ascending frontal convolution in front of it, at the bottom of the fissure of Rolando, and behind the fissure on the ascending parietal.

It would seem very easy for a small patch of grey matter, occupying at the start perhaps a similar position in all brains, in the wrinkling process the cortex undergoes in the development of the convolutions, to be found in two developed (*i. e.*, convoluted) brains at a slightly different level, at the bottom of a fissure or across a fissure on a neighboring convolution.

Another drawback, it would seem, is the common practice of recording the location of lesions on diagrams instead of on sketches of the brain itself. In this way a predominance of some lobes over others may be overlooked.

That there are centres, sensory or otherwise, in the non-excitable districts of the brain not yet localized, the writer thinks not altogether improbable, and with Ferrier* thinks our ignorance of them is due to the fact that the symptoms escape our observation.

**Localization of Cerebral Disease*, New York, 1879, page 129.

ART. V.—CASE OF TUBERCULAR MENINGITIS, WITH MEASUREMENTS OF CRANIAL TEMPERATURES.

BY MARY PUTNAM-JACOBI, M. D.

IN the child, an infant of 22 months, upon whom the following observations were made, a general miliary tuberculosis was developed from the broncho-pneumonia of measles, of which there was an attack about the middle of August. It was under observation for a month, with general and pulmonary symptoms, but without any cerebral symptoms whatever. These first appeared on the 9th of October, and consisted in drowsiness, vomiting, retractions of the head with rigidity, hard irregular pulse, Cheynes-Stokes respirations; apathy succeeding to restlessness and constant crying; beginning retraction of the abdomen instead of the tympanitis hitherto existing.

The first cranial temperatures were taken the day following that on which these symptoms were first observed at the dispensary. They are compared with the normal average, as given by Dr. Gray:

Right vertical, - - -	$95\frac{1}{4}°$	Normal	average,	91.67°
Left " - -	$95\frac{3}{4}$			
Right frontal, - - -	$97\frac{1}{4}$	"	"	93.71
Left " - -	$96\frac{1}{2}$	"	"	94.36
Right occipital - -	$99\frac{1}{4}$	"	"	91.94
Left " - - -	$99\frac{1}{4}$	"	"	92.66

On this day the parietal temperatures, just above the ear, were not taken.

On the 12th of October, the following temperatures were obtained:

Right frontal, - - -	$98\frac{3}{4}°$	Normal	average,	93.71°
Left " - -	$97\frac{1}{4}$	"	"	94.36
Right parietal, - -	$97\frac{1}{2}$	"	"	93.59
Left " - -	$96\frac{1}{2}$	"	"	94.44
Right occipital, - -	$96\frac{1}{4}$	"	"	91.94
Left " - -	96	"	"	92.66
Right vertical, - - -	$95\frac{1}{2}$	"	"	91.67
Left " - -	$95\frac{1}{4}$			

Rectal temperature still 102. On the 14th the temperatures were taken for the third and last time.

The meningitis was then passing into the third or paralytic stage, and paralysis of the right arm occurred in the evening. In the morning of that day the rectal temperature was 99. The pupils dilated, but equal.

Right frontal, - - -	$95\frac{1}{2}°$	Normal	average,	93.71°
Left " - -	$93\frac{1}{2}$	"	"	94.36
Right parietal, - - -	$94\frac{1}{2}$	"	"	93.59
Left " - -	$94\frac{1}{2}$	"	"	94.44
Right occipital, - -	$95\frac{1}{4}$	"	"	91.94
Left " - -	$92\frac{1}{2}$	"	"	92.66
Right vertical, - - -	$92\frac{1}{2}$ }	"	"	91.67
Left " - -	94 }			

The child died the next day; an autopsy revealed the expected generalized miliary tuberculosis, and the following lesions in the brain which I alone transcribe:

EXAMINATION OF THE BRAIN.

Dura adherent in several places to skull. Internal surface adherent in several places to visceral arachnoid.

About ½ pint sanguinolent serum escaped during removal of brain from skull. Much escaped upon first opening dura, showing that it came from meshes of pia on convexity.

In removing dura, the surface of the brain was found pale, shining, soft, evidently highly œdematous. The surface was less rather than more vascular than usual; convolutions slightly flattened.

The arachnoid connecting the convolutions was in several places opaque, but generally not adherent; on cutting it, the pia lining the sulci was everywhere found injected with fine arborizations of varying intensity. Of all examined, the sulcus between the first and second frontal convolutions on the left side, was found the most intensely injected.

A very large vein was observed to run horizontally around the extremity of the frontal convolutions in both hemispheres. The left vein was the largest, and reached backwards as far as the external extremity of the anterior central convolution.

On the left side the three frontal convolutions were tolerably firm. But at the anterior tip of the inner part of the first were several minute patches of opacity in the arachnoid. An inch further back, in the first subsulcus, were opacities extending all along a blood vessel lying in the sulcus, and three distinct yellowish patches crossing it.

The posterior extremity of this first frontal convolution presented a group of radiating opacities just at the edge of the longitudinal fissure of the brain, and extending back to the anterior central convolution. External to this, an intensely injected patch about ½ inch square with a minute hemorrhage extending into the præcentral sulcus.

The inner extremity of the anterior central convolution was injected, and with two or three quite distended vessels, for a distance of one inch from margin of fissure.

In the fissure of Rolando, and in the sulcus præcentralis, the arachnoid was opaque, the pia, injected, adherent, and with minute tubercles along vessels.

In the sulcus calloso-marginalis and over the gyrus fornicatus, the pia was infiltrated with minute elevated opacities.

The superior lobule of the parietal lobe, also superior part of the occipital lobe, were free from injection, opacities, or softening.

Right Hemisphere.—Anterior tip of the first frontal convolution presented a patch of softening, occupying the entire breadth of the convolution. This was followed by about an inch of relatively firm brain substance. Posteriorly to this, was another patch of softening extending from the longitudinal fissure to the superior frontal sulcus. All this portion of brain was paler than normal.

But from the posterior patch of softening, two large veins extended backward to the transverse sulcus anterior to the sulcus præcentralis. The anterior extremity of the most internal of these veins was covered with thickened yellowish opacities, presumably tuberculous. Similar deposits infiltrated the pia of the sulcus.

The sulcus præcentralis was occupied by a distended vein, immersed in yellowish deposit. Another deposit, the largest observed on the convexity, was at the inner extremity of the fissure of Rolando. Internally to it, was a patch of infiltration extending over the border of the longitudinal fissure. In this patch, about an inch square, there were no blood vessels, but the arachnoid was smooth, white, opaque.

There was a small amount of infiltration along the middle of the inter-parietal fissure.

On separating the hemispheres, the corpus callosum was found to be completely softened and broken down, so that it tore at the least touch, exposing the ventricles. These contained little serosity, this having probably escaped. The ventricles were somewhat dilated. The fornix was completely softened. The third ventricle was full of sanguinolent serum.

The head of the *right* corpus striatum was very soft. The *left* was tolerably firm.

The thalami were firm.

The corpora quadrigemina were firm, as also the peduncles passing from them to the cerebellum.

The superior surface of the cerebellum was firm and not injected. There were no tubercles evident in the choroid sulcus or in the tænia semicircularis.

The brain was then laid on one side, and the lateral convolutions examined on the

Left Side.—The pia was infiltrated over the secondary sulci of the lateral part of the third frontal convolution. Nothing observed over ascending ramus of fissure of Sylvius, nor over the superior or middle temporal fissures.

Right Side.—A patch of softening was found at the angle of the supra-marginal convolution, where it curves around the Sylvian fissure to meet the inframarginalis of the temporal lobe. The primary occipital gyrus of the cuneus was the seat of a patch of intense injection, but no infiltration. Entire right hemisphere softer than left.

Base of Brain.—Arachnoid was everywhere thickened and opaque, but not injected. Similarly the arachnoid on inferior surface of cerebellum. This surface was extremely soft. Right olfactory tract and bulb destroyed. The left softened. Pia along both Sylvian fissures adherent. On separating the temporal from the anterior lobes, the Sylvian fissures were found occupied by a fibrinous exudation, infiltrated with a viscid amber colored fluid.

The tip of the left temporal lobe—*i. e.*, the anterior part of the second temporal convolution—was completely softened, over a space the size of a walnut. In the anterior part of this softened patch was a cavity, which might have contained a filbert. This cavity was completely empty, but evidently of recent origin and probably contained pus, which had escaped with the other fluids during the removal of brain. The cavity was lined by no membrane. *This was the only focal lesion found.* There were not even any agglomerations of pus around cranial nerves; no yellow tubercle at base; no pus. A section was made along the left peduncle, through the left corpus striatum to corona. The entire tract was found healthy. A band of fibres passed from tip of temporal lobe into the corpus striatum, and were easily to be distinguished. This was evidently the band described by Meynert as the second form of his first projection system: "A bow-shaped bundle, passing from the cortex of the tip of the temporal lobe, which runs the length of the inner wall of the corpus striatum, until it passes into the anterior territory of its head as the stria cornea." (*Stricker's Handbuch*, Bd. I., p. 725.)*

Comparing the details of the autopsy with those of the thermometric measurements, we find:

That on the fourth day of manifest cerebral symptoms, the temperature of the right frontal region, which, according to our standard, should be 0.65 lower than the left, was 0.75 higher than the left, and 3.29 higher than normal. On the fifth day the temperature in this region was a degree and a half higher still, while the temperature of the left had risen only $\frac{4}{5}$ of a degree. On the sixth day—two days before death—when the rectal temperature was slightly subnormal, and collapse evidently beginning, the temperature of the frontal region, though fallen, still remained higher on the right side than on the left, and 1.79 above normal; while on this day the temperature of the left frontal region had fallen 0.86 below normal average. At the autopsy was found a patch of softening at the anterior extremity of the frontal lobe

* Ferrier's destructive and electrical experiments were made on the superior temporo-sphenoidal convolutions, and not on the middle nor at the tip of the lobe.

(see *ut supra*), indicating a localized encephalitis, that corresponded very well to this high temperature.

Again, on the fourth day of the cerebral symptoms, the temperature in the occipital region on both sides was 99.¼, an excess of 7.31 and of 6.59 over the normal. This excess corresponded well with the inflammation of the pia, covering the inferior surface of the cerebellum, at the base around the chiasma, and in the Sylvian fissures. The temperature of the vertical regions, on the other hand, was lower than any other part of the head, being 95¼ and 95¾, until the commencing collapse at the time of the third measurement. This fact corresponded well with the moderate degree of inflammatory lesion on the convexity of the brain discovered at the autopsy. It would have been interesting to have examined the temperatures at various parts of the convexity, and have compared them with those obtained at a point presumed to be near the fissure of Rolando, where was present the maximum of convexity lesion (excluding the encephalitis of the right frontal lobe).

It is noticeable, however, that on the first two days, the right vertical region was hotter than the left by half a degree, although normally it should be a trifle cooler.

But when the general collapse of temperature, accompanying the cerebral effusion, set in, the right vertical temperature fell to 1½ degree below the left.

In view of the abscess of the tip of the left temporal lobe, it is much to be regretted that the parietal temperatures were not taken on the first day. But on the second (four days before death) the temperature was elevated much above the normal—3.91 on the right side and 2.06 on the left. Thus the highest temperature, and the greatest excess of temperature, did not correspond to the side on which existed evidences of the most marked inflammation. It seems probable that from the situation of the abscess, its temperature could not have been ascertained by measurements on the surface of the skull.

Art. VI.—THE DECUSSATION OF THE SPINAL INHIBITORY FIBRES.

By Isaac Ott, M. D.,

and

Robt. Meade Smith, A. M., M. D.,

Demonstrator of Experimental Physiology, University of Pennsylvania, Member of the Academy of Natural Sciences.

GLUGE first noticed a rhythm of the sphincter ani in a rabbit paralyzed by an accidental injury in the lumbar region, while Goltz, unaware of Gluge's observation, noticed it in a dog after division of the cord in the dorsal region. One * of us has shown in another place, that in the optic thalami are centres which inhibit rhythmical contraction of the anal and vaginal sphincters, and that the fibres arising in these centres pass down the cord in the lateral columns; it is by the division of these fibres that the rhythm is set up. The following experiments were undertaken to determine if these fibres decussated, and if so, where.

Method :—Cats of large size were selected, since in them the rhythm is most strongly marked after division of the cord, fastened on Czermak's holder and tracheotomy performed. The tracheal canula was then connected with a Wolff bottle containing ether, and when the animal was thoroughly anæsthetized the skull was trephined and a hemisection of the brain made with a curved knife immediately behind the thalamus. The spinal cord was then exposed and a hemisection or division of one lateral column made at the junction of the lumbar and dorsal regions; care was taken never to get below this point, so the ano-spinal centre was not interfered with. After allowing the effects of the ether to pass off, the phenomena resulting from the operation were noted for an hour or two, and the animal then killed, and the brain and cord

* *Journal of Physiology*, Vol. II., No. 1.

hardened in alcohol, when sections were made to accurately determine the extent of division of the brain and cord.

Exp. I.—Very large male cat; etherized; tracheotomy; section of the *left lateral column* of the spinal cord at the junction of the lumbar and dorsal regions; no hemorrhage. Hemisection of the brain behind *left thalamus* with very little bleeding. Artificial respiration kept up. Marked rhythm of the anal sphincter ensued.

Exp. II.—Large female cat; etherized; tracheotomy; section of the *right lateral column* of the spinal cord at the junction of the lumbar and dorsal regions without hemorrhage. Hemisection of the brain behind *left thalamus;* no rhythm occurred after continuing the observation for several hours.

Now, since rhythm never occurs unless both lateral columns are divided, these experiments show that the inhibitory fibres arising in the left thalamus must cross to the right side of the cord, and those from the right thalamus to the left side of the cord, somewhere between the thalamus and lumbar region. The next series of experiments were undertaken to determine the seat of this decussation.

Exp. XII.—Large female cat; etherized; tracheotomy. *Left hemisection* of the cord just below where it joins the medulla, with little bleeding; no rhythm. Then the *left lateral column* was divided at the junction of the lumbar and dorsal regions; no rhythm occurred. The *right lateral column* was then divided one inch above the last section, with the production of marked anal and vaginal rhythm.

Autopsy: Cord divided completely on left side with exception of few fibres of the anterior column, three-fourths of an inch below the calamus; sections of cord accurate.

This experiment proves that the decussation of the inhibitory fibres does not take place in the cord itself.

Exp. X.—Very large cat; tracheotomy; etherized. *Left hemisection* of medulla oblongata between the occiput and atlas, the head being strongly flexed; considerable hemorrhage occurred. Then the *left lateral column* was divided at the junction of the lumbar and dorsal regions; respiration very feeble; artificial respiration kept up. The parts about the anus are very sensitive; touching causes a number of rhythmical contractions, but they do not appear to originate spontaneously. The *right half* of the cord was then divided one inch higher up, but with no improvement in the rhythm.

Autopsy: Accurate sections of cord; medulla divided one-quarter of an inch below the calamus; accurate left hemisection.

This experiment proves that the decussation occurs at the inferior border of the medulla, or between points one-quarter inch and three-quarters of an inch below the calamus.

Exp. VIII.—Large female cat; etherized; tracheotomy; transverse section of the middle of the medulla oblongata. Respiration ceased; artificial respiration kept up. Marked rhythm ensued.

Autopsy: Section of the medulla one-third of an inch below the pons, dividing transversely the centre of the medulla and leaving equal portions intact on each side.

From thirteen experiments then, in all of which careful autopsies were made, we conclude that fibres inhibiting the rhythmical contraction of the sphincters arise in the optic thalami on each side, pass down the central portions of the medulla, and at its inferior border cross over to the lateral column of the opposite side of the cord, in which they descend to the ano-spinal centre.

Fig. 1.
A, B, Optic thalami; P, pons; M, medulla oblongata; E E, F F, inhibitory fibres; DD, CC, sensory fibres; S, ano-spinal centre. The numbers represent the location of the sections in the corresponding experiments.

The path of these fibres and the location of the sections from which it was deduced, are diagramatically represented in Fig. 1. Fig. 2 is a graphic representation of the anal rhythm obtained by inserting the rubber bulb of a medicine dropper in the anus and connecting its stem with a light Marey's tambour, the lever of which marked on the smoked surface of a slowly revolving drum. Each spasm of the anal sphincter therefore caused an elevation of the lever, producing the curve A. Each break in the line B represents a second, by which the rate of rhythm can be calculated. The break in the line C representsthe duration of electric stimulation of the sciatic nerve, during which it is seen that the anal rhythm is inhibited, to commence again more strongly a few seconds

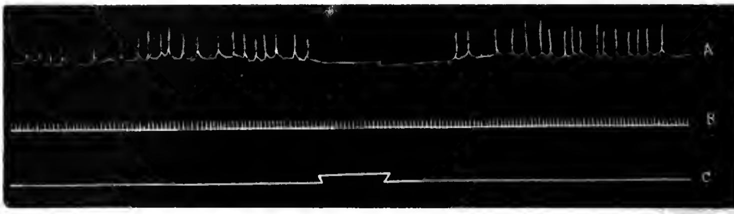


Fig. 2.

after the cessation of stimulation. From this fact, viz., the inhibition of the anal rhythm by powerful stimulation of a sensory nerve, may be deduced an argument as to its reflex origin, notably from the condition of hyperæsthesia of the anal region.

The question now arises, are these inhibitory fibres which we have described identical with the reflex inhibitory fibres discovered by Langendorff in the frog? (*Centralblatt*, 1878, s. 356.) He found that when he made a hemisection behind the optic lobes, hyperæsthesia occurred on the side opposite the section, but when the hemisection was made below the medulla it occurred on the same side, and on both sides when a longitudinal section of the medulla was made. It is seen, therefore, that the course of these fibres in the frog is identical with the path we have described as occurring in the mammal, and it is probable they have the same function in both classes of animals. For, admitting the reflex origin of the ano-vaginal rhythm and its production by hyperæsthesia of those parts, from section of all the spinal inhibitory fibres, section of half the cord will satisfactorily explain the hyperæsthesia occurring in the parts below the section, while the parts on the opposite side above may be anæsthetic. For we may assume that the sensory fibres, after largely crossing over to the opposite side of the cord in the rabbit, (the sensory fibres are said not to decussate in cats,) are in relation with the inhibitory centre on that side, and maintain its reflex inhibitory activity in the same way that the vagus centre in the medulla oblongata is maintained in a condition of activity by the sensory nerves in relation with it. For example, after a hemisection of the cord (H, fig. 1), hyperæsthesia is produced in the parts behind the section on the same side not by the diminished activity of the inhibitory centre from section of its efferent (sensory) nerves DD, in which case there would be crossed hyperæsthesia, but by the destruction of the efferent inhibitory nerves EE, running down the lateral columns. For the sensory fibres CC behind the hemisection are still intact, and passing up the opposite side of the cord maintain the reflex activity of the inhibitory centre A, which by its efferent fibres EE, inhibits the parts in front of the hemisection, while the irritation of the sensory fibres DD in the act of hemisection may serve to explain the transient anæsthesia often observed in such instances in the entire opposite side, and not only in the parts of which the sensory nerves have been divided. Koch * has proved that bodies lying in front of the medulla oblongata, when removed, produce hyperæsthesia; for when the whole brain anterior to the medulla was removed, hyperæsthesia and an increase of reflex activity appear. His statement that this hyperæsthesia is still further increased by hemisection of the cord does not disprove the view of reflex-inhibitory centres anterior to the medulla oblongata. As regards the action of drugs on this inhibitive apparatus, we have been able so far only to test the action of atropia, and found that the rhythm occurred very strongly in a large female cat one hour after the hypodermic injection of two grains of sulphate of atropia. We do not yet feel prepared to infer positively from this experiment that atropia paralyzes the inhibitory apparatus, though it would be in accordance with its action on other inhibitory mechanism, for it may produce the rhythm by exciting the sphincter ani reflex mechanism in such a degree as to overcome the inhibition from the brain. Bleeding also in dogs brings on a marked rhythm, and quite probably here acts by weakening the inhibitory apparatus, thus explaining the hyperæstheia observed in animals after bleeding; when the rhythm has appeared after bleeding, it can still be arrested by electric stimulation of the sciatic. These facts about the innervation of the sphincter ani serve to explain these rare cases in man described by Prof. D. H. Agnew, of sphincterismus, and inability to coördinate the muscles concerned in defecation. The temporary closure of the laboratory† for the summer, has interrupted our experiments.

* *Virchow's Archiv*, 1878.

† Physiological Laboratory, University of Pennsylvania.

ART. VII—ON MIND, INSANITY, AND CRIMINALITY.

BY J. L. TEED, M. D., KANSAS CITY, MO.

IN the October number for 1877, of this journal, is an article on Mind, which was intended as an introductory, to define its meaning, to show its location, and the mode in which it originates and develops. In this article we propose to continue the discussion in the directions indicated by its title.

Webster defines it as follows: "The intellectual or rational faculty in man, the understanding; the power that conceives, judges or reasons; also the entire spiritual nature, the soul."

He defines Idea thus: "The transcript image or picture of a visible object that is formed by the mind; * * * a rational conception."

As it is impossible to separate the understanding from the thing understood, or the idea, the term mind may be defined as the sum total of all the ideas formed, for by this is its extent measured.

In the former article it was shown that mind in its extended sense is a function of nervous organization; for the lower animals possess many of those qualities the aggregate of which make up that complex which we call mind; and which are therefore called mental; in them, however, they are termed instinct. In another place, *Psychological and Medico-Legal Journal*, September, 1874, I endeavored to show that in its very lowest terms mind is a general property of living matter. But the term mind is also employed to designate the highest intelligence capable of existence: thus we say the mind of God. It is evident that such wide and different uses of the term as have been indicated must introduce a source of great confusion in all discussions on the subject, unless carefully guarded against. The mind is made up of the perceptions; the emotions, or the feelings; the reason or judgment; and the will or volition: but these may co-exist in very different degrees. One such variance is known as eccentricity, such persons are affected by surrounding circumstances differently from others; their likes and their dislikes differ from those of others; they arrive at different conclusions in their judgments; they take different courses in their actions; yet they are perfectly sane and responsible for their actions.

Another may be as constantly erring in matters of judgment; he invests and loses, he mistakes continually; in ordinary language, he is a fool; yet he also is sane and responsible for his actions.

Another is headstrong and impetuous, he *will* follow the bent of his feelings or of his desires without let or hindrance, often to his ruin; yet he also is sane and responsible for his actions: although at times all these may be said to enter the border-land of insanity. Even thus restricted mind is a term of wide extent, its measure is the measure of its individual possessor, its variance co-equal with the number of individuals.

Tot homines quot sententiæ.—Mind in its most general and extended sense reaches over an immense expanse before it becomes human. From its first dawn in the lowest living cell; in the plant growing to the light; in the flower opening in the sunshine and closing at its setting; in the sea anemone basking in the sun's rays and closing its tentacles under the shade of the passing cloud; — to the craft of the fox, the cunning of the monkey, the patience of the ox, the knowledge of the horse, the intelligence of the dog, the sagacity of the elephant, with whatever else there is of prominence in the brute creation possessing more or less of those qualities which we call mental, the distance is indeed vast. Yet between the mind of the highest of the brutes and that of the lowest human being the distance is vastly greater. It is measurable only by the difference between the lack and the possession of an immortal soul.

Darwinian evolution may "evolve" the highest of the brutes from some primary cell ancestor, struggling for existence in an uncertain age; it may evolve the perceptions, the emotions, the deliberation, the choice, and the action of the whole brute creation from the dynamic manifestations of that primary cell; but it cannot evolve from any antecedent short of Deity itself that immortal soul, which is the distinguishing mark of humanity, that entity which required for its existence a distinct act of creative power.

While the soul of man is an entity, his mind is a faculty, not an entity—his body is an entity, the different organs of his body are comparatively speaking, entities, and they all have faculties or powers to perform certain functions; one organ performing one function, another organ another function. Among these various functions, mind may be defined as that faculty by which he judges of things and their relations, and controls his actions in accordance with such judgment.

The higher nervous centres are the seat of the influences which control the body, regulating its cell activities, as well as the blood supply by which these activities become possible. They are also the seat of perception, of emotion, of thought, of volition and of active impulse; they are the seat of all mental operations, which are impossible without them—material in structure, immaterial in function, they thus lie as a border-land between the material and the immaterial; a territory occupied by both, and in which each can react on the other.

While, therefore, the mind of man is a function of his body, and especially of that part of it termed his brain, it is the function of a body inhabited by, or conjoined with, an immortal soul; nor is it possible to correctly estimate the conditions, the powers, and the responsibilities of the human mind and its possessor, unless this is kept constantly in view. The moral code is abbreviated into the simple command: Do unto others as ye would men should do unto you. The man who fails to conform to this code from willfulness is a criminal, from disease insane. As sanity is that condition in which we judge correctly of the fitness of things and to control our actions, so insanity is a disease which prevents a correct judgment of the fitness of things and the control of the actions; while criminality is a willful disregard (or careless) of the fitness of things, with absence of control over the actions. As between sanity and insanity there would be no difficulty if it were not for criminality. Criminality is the result of responsibility, while responsibility is the result of the possession of a soul. The brutes have no souls, they are therefore not responsible, and cannot be criminal; man having a soul is responsible and may be criminal; or his criminality may be avoided by insanity, this being a disease of his body, *i. e.*, of his soul's instrument in action, of such a nature, that his body is rendered incapable, in consequence of such disease, of performing the requirements the law makes upon it. The soul acts on the body through the brain; and this by its function, the mind, reacts on the soul; and these actions and reactions differ considerably in their ultimate results according to the source from which they spring. Impressions of a certain kind give pleasure; desire for pleasurable enjoyment leads to action in the renewal of the impressions. If the body be used mainly for the attainment of ethical and intellectual pleasures, this does not deprive it of its adaptation for the enjoyment of animal pleasures. But if the body be mostly used for the attainment of animal pleasures, its capabilities for the attainment of ethical and intellectual pleasures are greatly impaired, and at length the desire for such pleasures becomes lost. And in this condition we find one substratum of crime.

But the higher nervous centres, the agent by which the immaterial acts on and controls the material, may be the seat of such physical disease that the spiritual influences they receive are either improperly appreciated or transmitted, or else they are overcome by more powerful excitations arising either reflexly from some distant part of the body, or by an automatic action of the brain itself. Thus the hitherto chaste person may become affected with inordinate lewdness; the hitherto upright and honest person may become afflicted with irrestrainable dishonesty; the quiet and peaceful citizen may become afflicted with an irresistible longing to commit suicide or homicide. In these and all similar cases the insanity is a somatic disease, not a spiritual disease; it has no relations to any spiritual conditions and lies altogether outside of them; and its treatment, like that of any other form of somatic disease, must be directed to the removal of those disordered somatic conditions on which its manifestation depends.

But lewdness may be chosen for its own sake and the gratification it may yield: so also may dishonesty or cruelty, these are preferred intelligently; and this condition, in which the evil is preferred and the good is distasteful, is depravity, not insanity. Unbridled license to the passions gives greater self-gratification than their restraint, courses of action will be followed, regardless of consequences, all the teachings of ethics are trampled under foot that the animal passions may be gratified, and thus we reach the great substratum on which criminality rests, the utter disregard of moral obligations, with unbridled license of action.

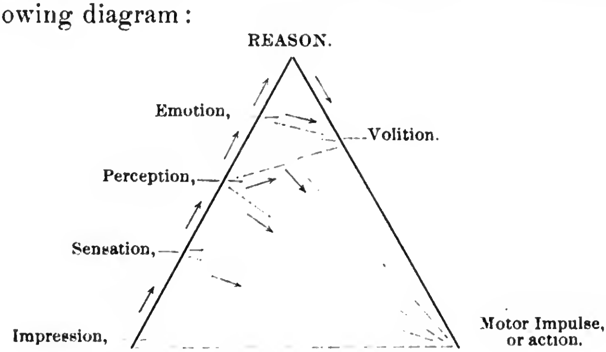
It is not possible to suppose one of the lower animals to be the subject either of depravity or of insanity. Can we suppose one of them studying the code of ethics? or can we suppose one them engaging in any form of intellectual pursuit? Is it possible for any of them to be the subject of delusion? Can the cow imagine herself a cat, and go to catching mice, or the cat imagine herself a cow, and go to nursing the calf? like the poor lunatic playing the part of royalty or the reverse? can the brute imagine itself a man, as may happen conversely? The brutes have disorders in some respects resembling those of man, just as in some other particulars they may exhibit qualities somewhat similar to those exhibited by man. But it is only a resemblance, and not an identity after all. Mania, melancholia, monomania, are exhibited only by those who should be able to judge of the fitness of things, and control their actions in accordance with such judgment.

Although the brutes are capable neither of depravity nor of insanity, yet when we compare the intellectual powers of man with those of the most intelligent animals, and at the same time compare the anatomical structure of the human brain with that of the animals in question, we do not find a difference of structure corresponding to and capable of explaining their differences in functional power. This difference is entirely too great to be one only of degree; it is one of kind: in short, it is just the difference we should *a priori* be led to expect between a mere corporeal existence and the combination of a corporeal with a spiritual existence—one in which a moral factor becomes superadded to the possession of a base vitality.

Yet it requires no stretch of the imagination to picture a man who shall yield himself entirely to the gratification of his animal propensities. Nor is it surprising that such should seem to prove to those that contemplate them, that man has no thing that is not equally shared by the brutes, that for him equally as for them the soul is a myth; and any existence beyond this corporeal, a fable.

While, however, insanity is a disease of the brain, it does not include every disease to which this organ is liable; it is only when the conduct is influenced by it that insanity can be said to exist. The perceptions may be deranged in relation to any of the senses, smell, taste, sight, hearing, or touch: ideational fancies may be frequently arising; but the person so affected may still be conscious that such derangements have no real foundation in fact, and therefore action is uninfluenced by these derangements, because he corrects them by the processes of reason; he has not lost the faculty of judging correctly of the fitness of things, and of controlling his actions. Yet the morbid process which has inaugurated these derangements in the cerebral activities may continue its destructive course until at last this faculty also becomes involved.

In the structure of the nervous system we find afferent lines leading from the periphery to the centre, central organs, and efferent lines leading back to the periphery, both to the point whence the corresponding afferent line begins, and to other parts. The afferent lines receive the impressions of external force and convey it as nerve force to the central organs; these correlate and distribute the force received; and the efferent lines convey it back to the periphery and deliver it as action. The trajectory of the nerve force from the periphery to the centre and back to the periphery may be illustrated by the following diagram:



Thus the impression becomes ultimately returned in the force of action to the external world, from whence it originally came.

But there are numerous cut-offs by which the impression may be converted into action without being transmitted through the whole line of the trajectory; thus, impression may be converted directly into action as in Hallerian irritability of tissues; or reaching a sensory ganglion, and becoming a sensation it may be transferred to the motor tract as in automatic action; or it may be still further transmitted on the afferent line to the point of perception, and be transferred thence to the motor tract as instinctive action; or it may be so transferred from the emotional centres. In none of these cases is the act one of reason or judgment. In the first instance the act is not brought into any relation with volition. In the second, purposive action may or may not be manifested. In the two last the actions may be either voluntary or involuntary. This is based on anatomical as well as on clinical or experimental evidence; for we find the sensory and the motor tracts, throughout their entire length, lying closely side by side, and connected together by an intervening mass of central grey matter; while the motor tract is brought into direct communication with some of the special senses, and also with the cortical ganglion of the hemisphere of its own side.

But insanity has no reference to any action which is not the result of activity in the cortex of the brain; it does not embrace the action of simple irritability, nor any of those actions dependent solely on the activity of the lower ganglia, as high as the corpus striatum, the optic thalamus, and the corpora quadrigemina. Activities from these sources generally take the form of a sudden start, a convulsive motion, or an inhibition of action, sudden in its inception, sudden in its departure, not a paralysis, because as soon as the shock has passed away the faculty of motion returns. Under these conditions, a homicide or an arson may take place, yet no blame could be attached therefor to their unfortunate cause; he would be perfectly sane, the results would be simply misadventure.

Thus we find insanity limited to a diseased condition of the cortical ganglia of the cerebral hemispheres; and we find these ganglia to be composed of the vesicular cells and their connecting fibres, the neuroglia, and the muscular channels with their contents; while their function is dynamic, that of receiving and transmitting impulses of nerve force from and to all the other parts of the body and amongst themselves.

The immediate causes of insanity are therefore divisible into three groups: first, those dependent on intrinsic changes in the vesicular cells and their fibres; secondly, those dependent on disordered conditions in their vascular supply or in the nature and quality of the blood; thirdly, those dependent on dynamic disturbance in the inflowing or the interchanged currents of nerve force.

As it is entirely beyond the scope of this paper to enter minutely into the pathology of insanity, we pass at once to the consideration of its more remote causes. The insane temperament needs only to be mentioned, but closely allied to this is an hereditary condition derived from some other form of constitutional evil in the parents; thus a parent affected with a scrofulous or a gouty diathesis, or some other form of constitutional disorder may transmit such as the insane temperament to his offspring; for variance is co-equal with heredity.

Born sane, the child may receive the tendency to insanity from faulty learning and education; arrived at puberty it may be developed as one result of the somatic changes then occurring; the same may also occur at the climacteric. It may also arise as a sequel to the morbid states, whether such should occur in the nervous system itself as epilepsy or chorea, or in disorders of other organs, as hypochondriasis and hysteria, or in natural conditions, as pregnancy and lactation.

It may also arise in consequence of excessive functional activity of the brain itself, with or without deprivation of that repose which is so necessary to its well being. Thus the excitement of speculation, the intense application required by an extensive business, excessive and prolonged study, may each of them be productive of insanity.

Excessive emotion is often followed by the same result, particularly of a depressing nature, as anxiety, grief, disappointment, anger, or remorse; thus a sane man may commit a murder, the impression of the event is vivid, the recollection of his crime and the thought of his victim are constantly with him, as it were ever before his eyes What would he give if he could undo the deed! Deprived of his liberty, and left to his own reflections he dwells on his sorrow, he loses sleep, the functions of his body become deranged; is it surprising he becomes mad? when his subsequent insanity is used by the learned expert who has shielded him from the just consequences of his crime, as a proof that such insanity existed before his crime was committed. Insanity may be also produced by exhilarating and joyful emotions, though this is much less frequent.

It cannot be stated at present which cells of the cortex are the seat of the disorder, nor even which layer of cells becomes affected, nor the mode in which they become disordered. Of course the variances in the seat of the affection which are supposed to underlie the variances in the forms of its manifestation are also beyond our present knowledge.

We may hypothecate a case in the following terms: a person meets with a sudden calamity by which his family and himself are ruined--the sudden shock throws into violent dynamic, *i. e.*, functional disturbance a portion of his brain cells—it evidently cannot be the entirety of them—their blood supply is immediately increased, while this local increase by its pressure reduces the amount of blood supplied to other parts of his brain. The affected cells suffer an increased metamorphosis of tissue, and the perivascular spaces are filled with the returning waste. Under the continued excitement sleep is prevented, the state of activity becomes prolonged, and the due regeneration of tissue is not effected. The disturbance becomes propagated to the organs of the animal functions so that they are imperfectly performed; sanguification and elimination are both interfered with, and the disordered blood-stream adds new factors of disorder to those already existing, while the change in his surroundings constantly present are as constantly reiterating the original shock. The cerebral disorder, at first limited to a few cells, gradually extends, and implicates either neighboring or connected parts; and the change, which at first may have been quite unappreciable may subsequently be very evident on inspection, as is shown in the histology of the brains of the insane, by J. Batty Tuke.

Excitation of some parts with hyperæmia is accompanied by depression of other parts with anæmia; thus molecular changes occur in various parts, sometimes in some cells and sometimes in others. Thus insanity may occur as a result of excessive grief, with an innumerable variation in the special and particular symptoms manifested by different individual cases.

It is with insanity as it is with every other disease: the prominent symptoms are always present, the subordinate symptoms may vary almost *ad infinitum.*

What are the prominent symptoms of insanity? those by which we determine the presence of the disease? Whereas the healthy brain was performing its functions in accordance with the natural relations of the individual, the unhealthy brain performs its functions in an irregular manner, not in accordance with the natural relations of the individual; and this change in the character and habits is one of the most striking evidences of the disease—insanity is a change from a healthy to an unhealthy condition of his brain; the habits and character of the individual are the indications of the condition of his brain; if there be no change in his habits and character, how can his brain have become changed from a healthy to an unhealthy condition? To this change may be added loss of sleep and disturbance in the animal functions; at last emotional disturbances, extravagancies and delusions render its presence too painfully apparent.

Yet there is often considerable difficulty in determining the presence of insanity as a fact; this is evident on examining the certificates of insanity which are required before a person can be committed as insane to an asylum for treatment; or the expert testimony in criminal cases. The law justly requires that no person can be rightfully deprived of his liberty and consigned to an insane asylum, unless he is actually insane; while with equal justice, it requires the plea of insanity to be fully established as a positive fact before an individual can receive immunity for an act otherwise criminal.

Violent passion does not, *per se*, constitute insanity; anger, hatred, and the desire for revenge, are as much human passions as love, benevolence and pity; and they each and all require to be exercised under the proper control of the reason and judgment. If a man has received a wrong at the hands of another, the law provides him with a remedy, and prescribes the amount and kind of punishment which shall be inflicted on the aggressor. In many cases the common consent of mankind, except legislators, has declared the enactments of the law to be totally insufficient; therefore the injured party takes the measures of retribution into his own hand and inflicts personal violence, perhaps death, on his aggressor. He then in turn becomes an offender, and to avoid the consequences of his crime pleads insanity as his excuse. On his trial, experts are called in, their evidence is often conflicting, not infrequently it displays the spirit of the partisan, instead of the unbiased discrimination of impartial science; they seem rather determined to prove a case, than to act simply as aids to the jury in their deliberations. The lawyer naturally desires their evidence to be so strong as to leave no room for doubt, and they suffer themselves to be used as cats' paws to hook the chestnuts out of the fire, in the shape of contingent fees.

Physicians to an insane asylum are perhaps more likely to view the actions of criminals as manifestations of insanity; physicians to a prison are more likely to view all actions contrary to law in the light of criminality; just as the specialist who devotes his time to the study and treatment of general diseases is to trace all human ailments to some latent syphilitic taint. But lack of control does not necessarily imply lack of the power of control. The violent man will not attempt to control himself; the revengeful man makes no effort to do so; yet in both, the faculty of judging of the fitness of things remains unimpaired.

But the insane man has not only lost the power of self-control, but also the faculty of judging correctly of the fitness of things, in consequence of disease of his brain.

Thus the study of insanity requires the study of character, and of the ordinary relations between motives and actions.

It also requires the study of criminality, and of the inducements which lead to the preference of evil and the refusal of good. It also requires the study of ethics, and of the obligations incumbent on members of society to obey the law; as well as the proper study of insanity, its relations to responsibility, and the means by which its diagnosis is to be established between criminality on the one hand, and eccentricity on the other; and while in this, as in all other studies difficulties will arise, it is above all things necessary to bring to our assistance the laws of evidence.

The author does not presume to be authoritative on the subject discussed. If, however, he should lead others to reflection, and to such action as will tend to prevent the unseemly displays so often made in judicial courts, he will be amply repaid for the labor and thought bestowed upon this article.

Art. VIII.—A CASE OF PARALYSIS OF THE RIGHT SERRATUS MAJOR MUSCLE.*

A Clinical Report, by Dr. Henry Banga, Chicago.

THE patient whose case is here described as exhibiting an interesting disorder of the right shoulder, is a German, fifty-two years of age, medium size, of a moderately strong frame, and the possessor of a rather well developed general muscular system. His trade is that of a butcher, and he has been habituated to considerable bodily exertion every day since his boyhood. As regards his internal organs, everything is normal, as is evidenced by his fresh and healthy looks.

The disorder on account of which he first consulted me some six months ago, first appeared eighteen months or two years previously. It consisted in a kind of weakness of the right shoulder, especially noticeable in raising the arm, and also a certain deformity of the same shoulder, first noticed

*Demonstrated before the Chicago Medical Society, September, 1879.

by the patient's wife, about a year ago. He attributed the symptoms himself to a fall from a wagon, upon the right shoulder. Immediately after being hurt, he suffered great pain, and was unable to work for some days, and after the pain had left him, the weakness of the shoulder remained. For the last few months there has been no aggravation, the patient only complained of that same weakness of the affected limb in certain movements, and occasionally, rheumatic pains in the shoulder. Examining the case, the patient standing erect, his arms falling down alongside, we fail to notice any difference in the position of both scapulæ, the inner edge of both running almost parallel to the vertebral column, at a distance from the latter of about two inches. The lower angles are both at a level as are, of course, also the spinæ. In the outlines of the fleshy parts there is also no difference, so far as the shoulder proper and the musculature of and above the supraspinous fossa is concerned. Only along the lower half of the inner border of the right scapula, between this and the spine, a certain flatness is noticeable, the cause of which is recognized to be atrophy of the muscular substance of that region.

The aspects of both shoulders, however, change at once if the patient begins to *raise* his arms. Let us first analyze the movement of elevation of the left arm, which, as I may anticipate, is healthy; it will, therefore, give a right idea of the function of the different shoulder muscles and especially of the motion of the scapula in elevating the arm. Here we see, 1st, that the scapula remains in the above described position of rest (*i. e.*, its inner border running parallel to the spine) until the arm, being elevated *sideward*, forms, with the thorax, an angle of nearly 90°; 2d, that as soon as the arm transgresses a horizontal line, its further elevation is the result of the *forward* or outward rotation of the scapula, the axis of this rotation being a line vertical to the inside of the dorsum scapulæ. Thus the inferior angle of the scapula passes outward and a little upward, so that, while at the outset it was at a distance of two inches from the spine, one may grasp it now, at the height of elevation, in the axillary space, almost seven inches distant from the spine. It is evident that the upper angle is performing at the same time a contrary motion, in an inward and downward direction, so that, at the end of elevation, the inner edge of the left scapula runs horizontally. At the same time it is closely pressed against the thorax.

Now let us look at the right side. When the right arm is raised, the scapula, instead of making the rotation described in the left side, continues in its former position, with its inner edge running parallel to the vertebral column. Yet at the same time the inner border recedes from the thorax, and is drawn towards the spine, in such a way that, while the upper angle is firmly applied to the corresponding spinous processes, the lower angle is directly drawn over the spine, but at a distance of almost 1½ inches above the spinous processes. The inner border of the scapula forms thus with the spine an acute angle of about 5° to 10° on the upper angle. We recognize the contours of the firmly contracted musc. rhomb., lev. ang., trapez., keeping this part of the shoulder-blade closely pressed against the thorax. From the lower angle we can place almost the whole hand in the subscapular fossa. In short, the scapula has assumed what is properly described as a winglike position. Elevation is hardly possible up to the horizontal line. On trying to lift the arm further, the patient, instead of really raising the arm, makes a combined motion in bending his body backward, and at the same time turning his right side upward, by which procedure he arrives at raising his arm somewhat above the horizontal. However, if I press the scapula firmly against the chest, the elevation is executed more vigorously, and when I try to illustrate the above described rotation of the scapula, in pushing the lower angulus outward and forward into the axillary space, it can be noticed that the patient is able to bring his arms to nearly normal height.

Exactly the same position is assumed by the scapula if the arm be raised forward, the only difference being, in that case, that the scapula is drawn a little outward, and away from the spine.

Now let us take a look at the shoulder region from the front. While the arms are hanging down alongside, we see no remarkable difference; both shoulders are equally round, of the same height, both pectoral muscles are of the same appearance and strength. However, a striking difference is noticeable on comparing the regions just below and outward from the pectoralis; there we can feel on the left side the strong bundles of the serratus major, while on the other side almost all the fleshy parts are wanting. There the chest is finely curved and rounded, here it is flat and shallow. And yet the difference becomes still more evident if the arm be raised. We see on the left side the outer edge of the scapula gradually coming forward as the arm is elevated, and thus producing, together with the contracting bundles of the serratus major, the beautiful contours of the torso so often represented by ancient sculptors. The right side, on the other hand, is bounded by an ugly straight line, causing the impression as though there was a large piece removed from the thorax.

This is a most simple and clear case of paralysis of the right serratus major muscle. This diagnosis is based both upon the tangible atrophy of the muscle, and upon the characteristic mechanical impairments. We know that this powerful muscle takes its origin from the outer surfaces of the first to eighth rib with eight distinct bundles, which unite to a strong belt, the tendon of which is attached to the inner border of the scapula. The only motor nerve of the serratus is the nerv. thorac. long., coming from the upper part of the brachial plexus. If the arm is at rest the serratus is also at rest. Its function begins with the elevation of the arm, and in order to fully understand its action we must study separately the elevation up to the horizontal line, and the further rise above this. Elevation up to the horizontal is almost solely dependent upon the deltoid muscle. The antagonist of this muscle, the serratus major, presses the shoulder blade firmly against the thorax, thus giving the deltoid muscle a fixed point. In this action the serratus is assisted by the rhomboideus, levat. ang. scapulæ, and the corresponding portion of the trapezius. Elevation above the horizontal line is the result, chiefly, of the action (of the lower portion) of the serrat. maj., combined with the action of the above-named muscles. Bearing these facts in mind, it will be an easy task to explain the symptoms offered by our patient. We have noticed that during elevation of the arm the right scapula, in the first place, recedes from the thorax (around a sagittal axis); in the second place is drawn towards the spine; and thirdly, rotates upon its vertical axis.

1. It is simply the action of the deltoid muscle that removes the scapula from the chest-wall, since, the serratus being absent, the scapula follows the traction of the former muscle.

2. The scapula is drawn inward, towards the spine, by the rhomboideus, levat. anguli and a certain portion of the trapezius, muscles that, otherwise, ought to help to press the scapula to the thorax during elevation, but which now, being deprived of their antagonist, the serratus, besides firmly applying the *upper angle* to the chest, draw the entire scapula towards the vertebral column.

3. Elevation above the level is, of course, impossible, it being almost entirely the result of contraction of (the lower part of) the serratus major alone.

Paralysis of the serratus major alone is a rare occurrence. However, we should not think so in looking at the vast literature upon the subject and the comparatively large number of reported cases. Yet, I deem it not necessary to go over this field, since so many writers have been misled by the fact (as we are allowed to infer from their statements), that their cases were complicated ones, *i. e.*, besides the serratus, other muscles were paralyzed, principally the trapezius. For the same reason the symptomatology of this disease as given by most text-books is, in some respects, contradictory to what we see in our patient. So I quote from Erb ("Nervous Diseases," *Ziemssen's Cycl.*): "*We find that whilst at rest, with the arm hanging down, the scapula is somewhat raised and approximated to the vertebral column, and so rotated upon its axis that its inferior angle is approximated to the vertebral column, its anterior border inclined downwards, and consequently its inner border directed somewhat obliquely upwards and outwards.*" In contradiction with this statement of Erb, in our case, there is no difference in the position of both scapulæ as long as the arm is at rest—the flatness around the lower angulus excepted. It is owing to atrophy of the corresponding part of the trapezius—and so far even our case is not entirely a pure case of palsy of the serratus. And again Erb: "*Thus it is difficult to cross the arms in front of the chest, and to per-*

form the movement of the apex of the shoulder forward." That the movements of both shoulders are executed on both sides to the same extent and with the same energy, I have demonstrated in ordering the patient to perform such movements.

In an able paper on paralysis of the serrat. ant. maj. (*Virch. Arch.*, LXXIV. 4, 1878), Lewinsky comes to the conclusion that, in case of true paralysis of the serrat. major there is nothing abnormal to be seen in the affected shoulder *as long as the arm is at rest*, the deformity is manifested only on elevating the arm, and is entirely dependent upon the isolated action of the deltoid muscle—a statement previously laid down by Duchenne, and of the truth of which our case is a most striking example.

In concluding, I will say that in our case undoubtedly, the fall upon the shoulder has done injury to the long thoracic nerve, the result of which was atrophy of the muscle. As to the cure of the disease there is little or no hope of success. For, besides the aversion of the patient to any protracted treatment, the atrophy of the muscle is such that its restitution seems hardly possible. There is little or no reaction to the faradic current, also the sensibility is greatly diminished in the whole region of the affected muscle. The patient makes a living as a driver, and seems, in fact, to be annoyed very little by his infirmity.

Art. IX.—EMOTIONAL INSANITY IN ITS MEDICO-LEGAL RELATIONS.

A Lecture delivered before the Philosophical Society of Chicago, Dec. 27, 1879.

By H. M. Bannister, M. D.

THE subject of insanity is one that interests more or less every individual, not alone because of his or her possible personal liability to it, but as a citizen and member of society. An insane man is not merely an unfortunate to be pitied for having lost the use or control of that which makes him a man, he is also a positively detrimental and even a dangerous element in the community. The safety either to himself or to others, of even the most apparently harmless lunatic is a matter of some uncertainty—we cannot in any event, place him on the same plane in this respect as the person of sound mind. And at the present time when, either owing to the special character of our civilization or to other causes, insanity is apparently so increasingly prevalent, this question of its relation to the safety of the individual and the public obtains an importance that it never had before.

The title selected for me for this essay, "Emotional Insanity in its Medico-Legal Relations," is one that has a direct bearing on this question of the public safety. It is, however, a title that needs definition, for it includes a wider range of possible subjects than was perhaps anticipated when it was chosen. If I am not mistaken, it suggests to most who hear it, a very dubious plea of insanity by the defense in criminal cases, a kind of convenient mental disorder that is never proven to exist except when it is needed to defeat justice. "The insanity dodge" and "emotional insanity" are alike expressions of derision in the daily press, which indicate the popular prejudice against this plea. How much this is deserved will be discussed later on, here we can only note the fact of its existence.

In a wider sense emotional insanity may include the disorders of the whole range of the affective faculties, where the intellect is unimpaired or only so in a secondary and subordinate manner. In this class fall a very large proportion of all the cases of insanity in our asylums, the melancholics, many of whom present very slight, if any, traces of intellectual weakness or delusion. But it is not with this class of patients, simply as such, that we have specially to do in this essay, though there are as regards them, many interesting medico-legal points to be considered. I may narrow my theme more especially to the subjects of morbid impulse, moral, and some forms of epileptic insanity, and that class of cases that have come before our courts at various times, in which it has been claimed that the patient, apparently rational at all other times, was at the moment of a certain act irresponsible and insane. The question is, do these conditions exist, or are they merely convenient inventions with which to gull courts and juries and aid in the defeat of justice.

But before we can decide whether emotional insanity in this sense is a reality or not, we must first decide what insanity is in its more general sense. And here I may say that a medical definition and a legal definition of insanity are two different things, and that with the latter I have just here nothing to do. A medical definition of insanity must of necessity be a very comprehensive one, and perhaps as good a one as can be given is, that "insanity is a disease or defect of the brain causing disordered action of the mind." It makes but little difference whether, according to this definition, the brain is considered as the organ of the mind or the mind the function of the brain; it is compatible with either spiritualistic or materialistic ideas. To the physician, dealing with the physical ailments of man, insanity can never be anything else than the result of physical disease, although the structural lesions with which it is connected are not always to be found.

If insanity, in its more general sense, is a physical disease of the brain, in order to prove the existence of emotional insanity as a separate disorder it must be shown that the cerebral functions are so separated in the organ that they may each be disordered apart from the others; that the emotional part of our nature, apart from the intellect, may be put out of order by disease of the brain. Few persons, I think, will say that our emotions are dependent upon the thinking faculty, judging directly from their own experience; it is only after they have attempted to analyze them that some philosophers have claimed a necessary connection between feeling which includes the emotions and intellect. Their philosophy is not that which recommends itself to the physiological student, to whom the emotions fall naturally into the same general class as the sensations, the feelings, which by no means necessarily imply intellection. The philosophy which makes the emotions called out or awakened by the intellect, and is that on which the theories of the absolute unity or solidarity of the mind seem to depend, appears to me to ignore the simpler and rudimentary emotions to consider only those higher ones that are so closely associated with intellectual concepts that their separation is almost impossible. But when we consider the simplest feelings of pleasure and pain that lie at the basis of all emotions, and on which all the complicated emotions are built, we can conceive of their being experienced even by an oyster, or the simplest living organism that possesses a nervous system, and under such conditions it is certainly difficult to associate them with any intellectual operations whatever. The fact is or at least it seems most probable that it is the fact, that our emotions, reduced to their simplest expression, are very closely allied to, if not essentially identical with, our sensations, and necessarily are antecedent, like the sensations, to every species of intellection.

Now, considering the brain as the organ of the mind, if any of the mental functions can be exercised apart from the others, or antedate them in the order of their appearance or development, the conclusion is inevitable, that there exist nervous apparatuses in the brain directly connected with these functions, and not necessarily with any other. That is, there must be emotional cerebral centres, as we know there are motor centres. The researches of the past ten years have made known to us that localization of functions exists in the brain for very many complicated movements, and it has been long known that the exercise of a very important intellectual function, that of speech or language, and even of almost every method of expression, depended upon the integrity of a particular region of brain substance, the left third frontal or Broca's convolution, and the neighborhood of the island of Reil. The proof of the existence of these emotional centres is not so direct, but it is very strong from analogy. We know that our sensations have their cerebral centres; there are such conditions as psychic blindness and deafness, that have been produced experimentally in the lower animals. Thus, by destroying a superficial portion of the brain of a dog by injecting currents of warm water through holes in the cranium, a condition has been produced in which the animal lost completely the power to recognize objects with the eye of the side opposite the injury of the brain, while it still retained sufficient vision for all automatic or reflex movements that required its guidance. Conscious vision we may say was absent, while automatic sight was as perfect as ever. Now every sense has this internal centre in man as well as in the lower animals, and recognizing, as I do, the emotions as only inner and somewhat obscurer sensations, I maintain that they too have their cerebral centres.

The best subjective evidence that we have of our possessing such centres is to be found in the effects of disorders of the various bodily organs that have no direct sensory connections with the external world, and of the sexual organs, upon the feelings. The only centre that could be exactly called emotional, that Ferrier was able to localize in the brain of monkeys, was that for the sexual feeling, but this fact is an important one. The influence of this purely organic instinct on our emotional and moral nature is sufficiently obvious, I think, to require no lengthy explanation. The mere fact of the moral and other mental deficiencies of those persons in whom the natural evolution of this instinct has been hindered by design or accident, and which are known to all of us, is an amply adequate illustration.

If we observe the mental effects of the various diseases of the different viscera, the suggestion of their connection with emotional states is very strong. The hopefulness of consumption, the mental distress of functional heart disorders, and the melancholia of dyspepsia are well known to the public as well as to physicians. And the bodily effects of emotional excitations on the other hand, showing the reaction of the cerebral centres when emotionally excited, are equally well known, and have modified all the expression of passion and emotion in all languages. It was, in fact, only last year that a physician, basing his argument on these and similar facts, wrote a work to demonstrate that the whole moral nature resided in the ganglionic system or great sympathetic, the nervous system of the automatic organic life.

Now there is nothing more certain than that all our conscious life, is, in our present existence, dependent on the brain, and all the above-mentioned facts can signify is, that the centres in the brain which receive impressions from certain bodily organs are very closely connected with those parts which have to do with the exercise of the emotions, and that the reaction is reciprocal. They are, in fact, evidence, if not direct very nearly so, of the existence of special emotional centres in the brain, which, in a condition of comparative health, can be put into action by visceral disturbances, and which, when excited through the sensations or by ideas, react in producing various visceral sensations. What share the development of our bodily organs may have had in the evolution of these centres, like the part performed by our external sensory organs in the evolution of the intellect, is an interesting question, but one that cannot well be discussed here. Dr. Maudsley has taken it up and ably treated it in the last edition of his Physiology of the Mind. The question with us here is only in regard to the evidence of the existence of emotional centres in the brain.

I trust I have said enough to show that, in a physiological point of view, it is not unreasonable to admit the existence of special emotional organs in the brain. The brain is not a single organ, and though we cannot follow all the vagaries of phrenology, there is no doubt that the bottom principles upon which it was founded, the localization of functions, psychical as well as physical, in the cortex of the brain, are correct. And admitting that the centres exist, it must also be admitted that like all other brain structures they are liable to disease, and from disease their functions may become disordered, may be abolished, hyper-excited or perverted. And in this possible disease of these centres with the consequent disordered function, we have all the possibilities of emotional or moral insanity in all their phases.

Although much more might be said on this point, I have probably given enough space to show that from a stand-point of physiological psychology, emotional insanity may exist apart from any participation of the intellect. It must be kept in mind, however, that I have only attempted to show that in the present state of our knowledge, it is reasonable to assume an *a priori* possibility of its existence, not that it necessarily exists. I cannot even say that the emotional centres exist in the brain, at least not in the human brain—they have not yet been demonstrated. But it is every way reasonable to believe that they do exist, and that they will be demonstrated at some future time I am altogether confident. I have only tried to answer such *a priori* objections as may be raised, and, indeed, have been employed. Men seem to appreciate the dangerous character of the doctrine that a man may be irresponsible and insane, with full intellectual powers, so fully that they have strained every metaphysical point to prove its falsity. It is not long since that a prominent asylum superintendent excluded simple melancholia from the species of insanity that he recognized, as I understand him, to be freed from the necessity of the admission that a person might be insane and yet reason well and have no delusions. Such a course looks to me like a confession of weakness, by a perversion of inconvenient facts for his side of the question.

If enough has been said for the reasonable psychological possibility of emotional insanity, we may next pass to the pathological evidence of its occurrence. Simple melancholia, a species of insanity admitted by nearly all authorities, even the most conservative, and included by Pritchard in the first rank of his moral insanity, has been already alluded to. In this variety of mental disorder there may be no delusion, the sufferer is often conscious of the ungrounded nature of his feelings and fears, and may even endeavor to reason himself out of them, but is unable to do so. It has been called, very appropriately it appears to me, a psychic neuralgia, and has been attributed by one of the highest German authorities, Dr. Krafft-Ebing, in accordance with the views above enunciated, to a neurosis of the cortical psychic sensorial centres of the brain. The insane of this class are often intensely suicidal; indeed, they form quite a proportion of all the cases of suicidal insanity. Suicide, however, when it can be attributed to insanity, as in these cases, has hardly any forensic importance; and the same may be said even of homicide, which may be committed by these patients. Their insanity is so little dubious that it is seldom brought in question before the courts.

There is, however, a certain value to the argument, that insanity without intellectual derangement being so generally admitted in these cases, they carry with them the proof of the existence, or possible occasional occurrence of any one of the whole range of forms of emotional insanity. I do not care, however, to rest my case on this argument. The fact that simple melancholia, without intellectual deficiency, is a caùse of irresponsible suicide, is admitted by some who refuse to recognize other forms of emotional insanity, and even claim, it appears to me inconsistently, to reject the whole theory. They may be, perhaps, misled by the very obviousness of the mental alienation in these cases, being prepossessed with the notion that only questionable cases can properly be called emotional. Be this as it may, the argument is not an absolutely convincing one; they may admit this one form and reject all others; and there are few who are so consistent as the alienist, already mentioned, who rejected simple melancholia altogether as a species of insanity.

I will, therefore, pass to the consideration of the other forms of moral or emotional insanity that have been claimed to exist, and that have come into public notice in proceedings before the courts. Writers have described or enumerated a number of species, basing their classification on the special criminal tendencies of the patients. Thus we have the so-called homicidal insanity, pyromania or mania to commit arson, kleptomania, oinomania or dipsomania, and erotomania, etc. Now dipsomania and erotomania may be and probably are, genuine diseases o syndromes of symptoms dependent upon hereditary nervous defects or intense organic irritation producing its effects upon the brain, which need not be considered here, as they only indirectly fall into the category we are considering. As to the other varieties, homicidal and suicidal mania, pyromania, kleptomania, etc., I should certainly hesitate to admit them as indicating that the uncontrollable desire to kill, burn, or steal, constituted special varieties of insanity. So far as they occur they seem to me to be only symptoms of a much more general condition, that of morbid impulse, impulsive or reflex insanity. This is one of the forms most in dispute, it has been railed at by the press, denounced by courts and denied by almost innumerable medical experts. One of the latest opinions in regard to it is by a physician of this city, who is often before the courts as an expert in cases where insanity is plead, and is published in an article on traumatic insanity in the last number of the *Medical Journal and Examiner*, a local medical journal of this city. The gentleman said :

"The plea of impulsive insanity, as from time to time presented in our courts (witness the Sickles, Cole and McFarland cases), has no foundation in scientific observation. It is simply the cunning device of astute lawyers and so-called experts, who either have badly digested views on the subject, or else are impelled to their opinion by motives other than the love of science."

I should do the gentleman, I presume, an injustice if I classed him with those who go the length of denying all forms of morbid impulse leading to criminal acts, for the cases he mentioned by name are those in which insanity is supposed to have been manifested at but a single instance in the patient's life, and then under very strong emotional excitement, and the criminal act in defense of which insanity was plead had at least a very apparent criminal motive. There is certainly but very little seeming difference between these acts and those committed under the influence of ordinary anger or passion, which has not been considered heretofore as insanity. But his language is not explicitly limited to these cases; he speaks of impulsive insanity, and it is therefore in so far unguarded. Moreover, to say that even these cases have no foundation in scientific observation is a rather rash statement considering the standing of those who have testified in regard to them, and to asperse the motives of these gentlemen, is itself an unscientific proceeding. The only good defense for either is to prove the absolute *a priori* impossibility of such impulsive insanity, and this cannot be done. Intense feeling or excitement may make a hitherto apparently healthy person permanently insane, and, as the greater includes the less, I know of no reason why it may not put him temporarily in the same condition. It is true that these cases are from their nature very difficult ones, and it may be a question how far the law should recognize any difference as regards responsibility between them and all ordinary hot blood or passion, which I believe it does take into consideration to some extent in fixing the penalty for crimes. But I see no scientific basis for absolutely denying their occurrence.

There is another kind of impulsive insanity that appears less dubious, though its occurrence has also been denied in the usual *ex cathedra* manner by certain alienists. I allude to *morbid impulse* in its more limited signification as an uncontrollable tendency to certain unreasonable or injurious acts which the patient's own judgment condemns. There is no need of going far for evidence of this kind of insanity; normal individuals often feel peculiar tendencies to do ridiculous or improper acts, and perhaps many of those present could give instances in their own experience. But in them the will is strong enough to sustain the better judgment, and the act is not committed. It is not difficult to suppose that these impulses may, in certain disordered conditions of the great nervous centres, be so intensified as to be uncontrollable. That this is actually the case, we have abundant evidence; repeated instances have been known to occur where individuals have voluntarily subjected themselves to the restraint of an asylum, in order to overcome morbid tendencies which they were conscious were gaining the mastery of them. I was once consulted by a woman whom I had never spoken to before nor seen more than once or twice, and asked to give my medical testimony as to her insanity before the court. She appeared to be in great distress of mind, said she had an uncontrollable, unreasoning impulse to kill her baby, had restrained herself so far, but feared she could do so no longer, and desired to be put legally under restraint. She was not exactly melancholic, and had no delusions, hallucinations, or other special symptoms of insanity, but was evidently out of health, and a pronounced case of what is known as the insane temperament or diathesis, a condition in which a person, though not insane, is of that peculiar nervous organization that seems habitually on the verge of mental unsoundness. I declined to testify on so little acquaintance, and advised her to obtain other witnesses, which she did. She was declared to be of unsound mind by the jury on the testimony of her family and others, and her own willing admissions, and was committed to an asylum, from which she made her escape within a week, and returned to her friends. After giving them a great deal of trouble and annoyance by her unreasonable, though not necessarily insane conduct, she was after a few weeks returned to another asylum on the old verdict. This time she remained several months, always protesting, however, that she was unjustly detained, and frequently arousing the sympathy of visitors as a sane person confined as a lunatic. In fact, during her stay this time, she never exhibited any signs of actual insanity of any kind, and the superintendent finally dismissed her as not needing further detention, though he did not consider her in all respects sound in mind. Now I believe this woman was perfectly honest in her first statements to me, and that she was a good example of homicidal impulsive insanity, in which under close observation no other symptoms indicating actual insanity or epilepsy, or other nervous diseases, were detected, but in which a sort of general mental unsoundness existed, giving rise to very peculiar general conduct. There was at no time intellectual involvement, it was purely a moral insanity. I do not consider her now, wherever she may be, as a perfectly safe individual to be at large.

Many other cases more or less like this are reported by Maudsley, Ray, Hammond, and others, and even such disbelievers as Caspar and Blandford do not absolutely deny their existence, though they seem to me to use every possible subterfuge to discredit them.

I have known a person who was afraid to trust herself in a high place, not on account of vertigo but on account of the morbid impulse to throw herself over, and this was an individual of more than average strength of mind and good sense. But I need not go further to multiply instances; in the case I have given above, there was the insane temperament and an aggravated condition of what has been called "the temper disease," but neither of these are, in my opinion, absolutely essential factors in the case. The morbid impulse might have existed, as it has in other instances, without any other, even remotely related, symptom of mental unsoundness.

There is an adequate physiological explanation of this phenomenon of morbid impulse that has not yet been alluded to, except as it was indicated in the designation, "reflex insanity." Maudsley has compared the impulsive acts in these cases to the involuntary convulsive movements in chorea, and claims that, "as a derangement of the motor nervous centres destroys the co-ordination of movements and gives rise to convulsive or spasmodic muscular action, so a derangement of the psychic centres destroys the healthy co-ordination of ideas, and gives rise to spasmodic or convulsive mental action. In the one case the individual is incapable of correctly performing his movements; in the other he is incapable of correctly composing his ideas; and in each, faulty action is produced in spite of his volition and knowledge. This explanation, or statement of the explanation, is objectionable, in that it lays too much stress on the intellectual element—the idea—in these acts, which is not at all connected with the insanity. It is the impulse; the idea may occur to anyone, sane or insane; the uncontrollable impulse is the essential factor of the disorder. I prefer the statement of the cerebral mechanism of these impulses and acts given by certain other authors, the best known of whom is, perhaps, Prof. Luys, of Paris. These authors class them with the reflexes only; in these cases the motor impulse is supposed to start from the psychomotor centres of the cortex of the brain. We know that some of the reflexes from the spinal cord are uncontrollable, normally, by the will; others are readily intensified to this extent when even slightly disordered. One of the most obvious of the reflexes not under voluntary control—the tendon-reflex of the knee—I have seen so intensified by disease, as to produce almost a convulsion of the whole body. Now, the brain is in reality, when we consider it according to the law of its development, only a very highly specialized segment of the cord; it presents some very striking anatomical homologies with the latter. The points of comparison need not be dwelt upon here; they seem to multiply as our knowledge of the structures is increased. And, as Luys says, we may reasonably ask why, with these striking anatomical homologies, may we not also look for the same in a physiological way? Of course, a psychic reflex is a more complex and elaborate physiological phenomenon than a simple motor one; but there is no impossibility of its occurrence, in the sense we have supposed; certainly not so far as we have any knowledge at present.

I need only allude here to certain very complex involuntary movements produced in animals by experimental injuries to the brain (the *Zwangsbewegungen* of the Germans), for while they are suggestive in this connection, the actual subjective condition of the animals is, of course, not at all understood. It may be that they also are closely allied pathologically to this condition of morbid impulse.

The actual relations between an uncontrollable morbid impulse and certain forms of epilepsy, may be nearer than at first sight is apparent. The pathology of epilepsy is not a subject of which our knowledge is exhaustive, and we cannot tell at present how many different series of symptoms the essential lesion of this disease, or class of diseases, may produce. And while I cannot admit that all the subjects of uncontrollable morbid impulse are epileptics, in the sense in which we now understand the word, there may be, and very probably are, amongst them many unrecognized cases of the disease; and when we come to understand it better we may have to class them all together. This will require, however, a much greater extension of the signification of the term, epilepsy, than is at present allowed.

I will pass by without consideration the cases of epileptic insanity, properly so-called, in which the primary cerebral disease is manifest, to take up the last discredited species in my list—moral insanity proper, or the general moral mania of Ray and others. While the existence of this form of mental disorder has been strenuously denied by a very large number of authorities, and as strongly maintained by others, less numerous, it may be, but perhaps more respectable in a scientific point of view, it is admitted by some even who reject the impulsive form, which I have considered above. Among these latter is Dr. J. C. Bucknill, the late Lord Chancellor's Visitor in Lunacy, and joint author with Dr. Hack Tuke, of the leading English text book on the subject. He says, in a lecture given a year or two ago: "The moral insanity of Pritchard must not be treated in the lecture room with that disdain which it has received in the courts. Homicidal insanity has been invented, but moral insanity, unfortunate as the term is, has only been misrepresented." After giving, as an example, an interesting English case, that of William Dove, who was executed for murder at York, in 1856, as a type of this form of insanity, he says: "How remarkable is the resemblance of this case of William Dove and that quoted from Pinel, with many other examples of so-called moral insanity recorded by various authors. There is almost constantly heredity, which may or may not be noted; there is good physical health; there are the malice, mischief, and cruelty of early age, with or without intellectual stupidity, but with no idiotic defect of intelligence; there is the remarkable variation of reason with unreason in the conduct of life; and there is, up to a late period of the history, the power of self-control, under the fear of detection or the threat of punishment. The offense is always malicious, and often cruel, in cold blood, thereby differing from the apparent cruelty of epileptic furor." And Dr. Bucknill continues, instancing as one of this class, a noted case in this country—the boy Jesse Pomeroy, whom he examined several years ago in Boston, where I believe he is still imprisoned.

Some two years ago I published a paper on "Moral Insanity," more particularly the form we are now considering. In it I took the ground that man possessed a distinct moral faculty or sense that gave him the idea of right or duty as regards conduct; and that this moral sense, whether considered as a direct endowment from the Creator, or as a derivative evolved in the course of human development, must, nevertheless, be considered as primary as far as the normal individual was concerned. I also held that this faculty must have its special nervous mechanism in the brain, by disorder of which it could itself be deranged or abolished, and that there were sufficient reasons to believe that it could be thus affected separately from all other faculties, among which reasons I adduced the following:

1. Analogy with other special faculties and senses that we know may be separately affected.

2. Because the reception of moral impressions is the highest and best capacity of the human mind and the latest in development. The functions of its cerebral mechanism are, therefore, the highest in the whole economy, and are not developed to any such extent in the lower animals, which, nevertheless, give very decided indications of intellectual development. It is natural, therefore, to think that our brain mechanism may sometimes fail in this, its highest and most elaborated function, while still meeting all lower demands.

3. The facts of dreaming, trance, and somnambulism directly indicate that the moral sense may be suppressed and weakened without affecting the other mental faculties, or, at least, without directly embarrassing the intellectual powers, so far as they are exercised.

It will be seen from the above that my distinction of moral from other kinds of insanity, is not limited to merely those cases spoken of by Dr. Bucknill. Moral insanity may even include cases of morbid conscientiousness, when it reaches such a degree as to completely distort the moral notions and produce insane conduct. There are such cases; but I think they are more rapidly followed by other forms of mental derangement than are their opposite conditions. In other words, this excessive moral hyperæsthesia or sensitiveness is apt to become that general psychic hyperalgesia or neuralgia that we call melancholia, and to be, sooner or later, complicated with delusion. But it may not be always so; some phases of the *folie du doute*, or doubting madness, of Legrand du Saulle, seem closely related to this variety of moral insanity, and I am not sure that it has not close pathological relationships with a number of nervous conditions that have been described of late years under the names of agoraphobia, clithrophobia, mysophobia, etc., which are not even considered as insanity, and have hardly any forensic importance.

In what has been said I have tried to give, in a general way, the principal arguments by which a belief in the reality of emotional or moral insanity can be supported. Admitting, as to me it appears reasonable to admit, the occurrence or existence of these varieties of mental disorder, I may now give a few words to their medico-legal relations. These are almost, if not quite, entirely with the criminal law, and are comprised in the question of the responsibility of the subjects of these conditions for their criminal acts. I need not here speak of those sufferers from simple melancholia or moral hyperæsthesia that I have alluded to before, but only of those of impulsive insanity or of morbid impulse, and of the moral insanity or evolutional insanity as recognized, for example, by Dr. Bucknill, the complete, or nearly complete, absence of the moral sense, with predominating immoral or wicked tendencies. I can, of course, only treat this subject in a medical aspect, and certainly have not the time to treat it exhaustively, even from this point of view, were I able to do so.

As was said in the beginning of these remarks, there is a great difference between a medical and a legal definition of insanity. The best medical definition I can offer has been already given, the legal definition is not so easy. As well as I can judge from all my study of the subject, the underlying idea of all legal definitions of insanity, and especially as regards their relations to criminal jurisprudence, is absolute irresponsibility for acts. This is certainly not the sense which a medical man can accept, to him there exists every degree of responsibility among the insane, and very few above the condition of idiocy, are absolutely irresponsible. The therapeutics (taking the word in its broadest signification) of insanity would be very materially altered if the doctors shared the lawyers' views on this point. For example, many physicians, and among them the very highest in their profession, if asked as witnesses or experts whether a sudden emotion could make a man temporarily insane in a certain case, would be obliged to answer "yes," according to their conscientious convictions. But this would be very different from saying that the particular case was irresponsible, though that *might* also be the fact. But with the legal idea of insanity as equivalent to irresponsibility, the mere medical opinion of insanity might carry sufficient weight, in any criminal case, as to lead to an acquittal, notwithstanding the fact that, as far as the question of moral and legal guilt was concerned, the opinions of the physicians might be directly opposed to judges' and jurors' understanding of them. Too little account of this point of difference between the medical and legal ideas of insanity, it appears to me, is taken; we often hear of courts charging juries, that if they find the accused insane from the evidence, they should bring in a verdict of acquittal, or what is often equivalent, a verdict of insanity. Courts and juries are without doubt the proper judges of responsibility, but they ought always to understand medical testimony as it was intended by the medical witnesses; and I am inclined to think that the lack of this correct understanding is, sometimes at least, to blame for the discredit that has been given it. I feel certain that courts would more generally recognize and put a proper valuation on certain forms of insanity recognized by medical men, if the distinction I have stated was more constantly and generally kept in mind.

But leaving these generalities, which seemed to me proper here, I will say something upon the medico-legal bearings of the special forms of insanity of which I have spoken. As regards the dubious cases of transitory mania, like those of Sickles and McFarland, beyond looking for physical evidences and generally examining the individuals for traces of nervous disease, medical science is of little avail. The doctor may state his belief in the possibility of transient congestive or other mania, but the case will have to be decided by the court and jury according to their best judgment, taking into account criminal motive, provocation, etc., as in other criminal cases. It may, perhaps, afford a doubt, of which the jury may give the prisoner the benefit, but unless signs of nervous disorder are present, medical testimony can do little more. It must be remembered moreover, that these cases are very similar to the ordinary conditions of passion, that persons of such unstable mental tendencies should be held to a certain responsibility for the control of their explosive emotional natures.

As regards the criminals who may claim to be subjects of true morbid impulse, it seems to me that in genuine cases there ought always to be something in the history, condition or conduct of the individual to assist in ascertaining his or her mental condition. The absence of a criminal motive is more probable in these cases; while it is rarely wanting in the crimes of the insane of other classes—I should except the epileptics and idiots. And in these cases epilepsy should always be sought for carefully. Of course the sufferers from this form of impulsive insanity are irresponsible to the degree that their impulse is uncontrollable; it is this element of lack of ability to control conduct, whether alone or combined with other symptoms of mental derangement, that essentially constitutes nearly all of the irresponsibility of the insane. Even an uncontrollable impulse ought to be guarded against if it is known to exist, and there may be a degree of responsibility even in these cases.

The general moral insanity described is a peculiarly interesting condition in point of view of responsibility. Crimes committed by persons of this class lack one especial moral element, and the extent to which the law should take account of this fact is a very important question. There are three necessary elements that constitute a crime, morally considered, (1) the knowledge of right and wrong, (2) ability to control conduct; and (3) a moral sense or feeling of obligation or duty to do the right, even when contrary to inclination or interest. It is the lack of the last of these that constitutes moral insanity, as I understand it. The morally insane are as well aware of the standard of right set up in the community in which they live, as any one, they know the direct and even the remote consequences of their acts, but they have no feeling of moral responsibility or of the moral dictation we call conscience. One who lacks this guide to conduct and yet is subject to the evil tendencies and passions common to mankind, is a most dangerous person; he is not an ordinary villain, but a very extraordinary one. The most abandoned criminals of the ordinary type possess a remnant of conscience that often makes cowards of them in their more desperate undertakings, but nothing but the fear of direct consequences can check a moral lunatic. It the object of punishment is, as has been stated by some writers, merely the prevention of the repetition of crime, I know of no class of criminals that needs it more than this. Criminal law has, however, in its later developments, taken more and more account of ethical conditions, and I leave it to the lawyers how much may be allowed to the sufferers from a most unfortunate mental deficiency, for the existence of which they may be in no way responsible. I am convinced that these cases exist, and that they are more numerous than is likely to be generally acknowledged.

To the plea that the safety of society demands the non-recognition of moral insanity as a species of mental disorder, I would say that there are two sides to the question. If it exists it is a danger to society that there is no wisdom in ignoring, all the more dangerous in that it may not invariably be associated with what constitutes legal crime. Dr. Ray tells of a lawyer, a man of remarkable intellectual power and accomplishments, and yet a moral lunatic, a habitual violator of moral rules and social proprieties, and a public nuisance. Though often arrested, his knowledge of the law was such that no prison could hold him, there were no legal tests of insanity by which he could be committed and detained in an asylum, and notwithstanding the fact that other marked evidences of mental derangement finally appeared, he continued his evil courses as long as he lived, using to his last days the protection of the letter of the law to violate in every possible way its spirit. I know of no better argument against the non-recognition of moral insanity than consideration of the possible evil that may be done by such an intellectually strong but conscienceless man if unrestrained.

In conclusion, I would say that the fact of partial responsibility of the insane has been too little considered by our lawmakers. If we exclude the absolutely demented and idiotic from consideration, there are only two general conditions of mental disease that are accompanied by absolute criminal irresponsibility. The first of these has been already sufficiently mentioned: it is the complete lack of power to control actions. The other is such a condition of delusion as puts a man's moral sense in direct opposition to that of society and to the laws by which society is governed. The moral nature in these last-named cases is not diseased or wanting, it is merely misled, and these are properly cases of intellectual and not moral insanity. It is necessary for the protection of society that such cases as present either of these conditions, leading to the commission of capital offenses, should be sequestrated and rendered incapable of doing the harm that their insane impulses and delusions may suggest; nor in my opinion should such cases, after once having been sent to an asylum instead of receiving punishment as criminals, be ever allowed again at large. But neither of these classes form any considerable proportion of the insane that commit criminal acts; for these there are in the vast majority of cases very evident criminal motives. This is always the case with the morally insane in the narrowest sense of the word, and is often so even in the other classes. If the irresponsible lunatics should be shut up for life for the protection of society, there should certainly be no favorable exception made for those who are more or less responsible for their acts. While we cannot treat them justly as ordinary criminals, it is equally the case, looking at them from a medical point of view, that they cannot be in all cases associated with ordinary insane, with any justice to the latter. Some special provision, therefore, ought to be made for the criminal insane, in the correct sense of the word, for the almost complete immunity that they at present enjoy has, I believe, a bad effect. At the present time, an epileptic liable to occasional insane impulses may commit a capital crime, during a period and under circumstances in which he was in no way insane; he may be a habitual law-breaker, and his offense be committed with all the appearance of sanity; the question is, shall this man receive the full benefit of the doubt as to his mental condition on account of his occasional insanity? I believe that in the present state of the law, or according to the usages of courts which I suppose constitute the law, there is no alternative in these cases between conviction and practical acquittal. Ordinary asylums are not proper places of detention for determined criminals, who I think always, sooner or later, make their escape.

The above is an extreme case, but not at all an impossible one in my opinion. Cases are constantly coming before our courts in which insanity is plead and proven, and yet the necessary connection between the crime and insanity is by no means clear. In civil courts, I believe, a better usage prevails than in criminal cases, a man's civil capacity is adjudged in some measure by the character of the act in question; a will, for example, if in all respects such as a sane person would make, has been allowed to stand even though the testator was known to be insane at times, and it may be, even at the time of its making. Human life, which is involved in the penalty for capital offenses is of course a more serious thing to deal with than property, that is usually under consideration in civil cases. But in this matter it need not be involved; no insane man should ever be executed. English courts have for hundreds of years been trying to make hard and fast lines of demarcation between sanity and insanity for these cases, and not one of their dicta can stand medical criticism. If, however, we leave out the extreme penalty of the law in all dubious cases, there is little that can prevent an easy settlement of every case on its own proper merits, and nothing at all in a medical point of view, certainly not if instead of a penitentiary there is a special criminal lunatic asylum to which to send the criminal or patient, whichever way he may be considered, for life. This recognition of partial responsibility seems the only way to meet the needs of the case. And certainly the present state of the law, recognizing no distinction in this respect between the different forms of insanity, bringing a stigma on a legitimate plea by allowing the guilty to escape, and often we fear, unduly punishing the irresponsible, is in all respects eminently unsatisfactory.

Reviews and Bibliographical Notices.

I.—VOISIN: GENERAL PARALYSIS.

TRAITÉ DE LA PARALYSIE GÉNÉRALE DES ALIENES. Par le Docteur Auguste Voisin, Medecin de l'Hospice de la Salpétrière, etc. Avec XV. Planches dessinées d'apres nature, lithographiées et coloriées. Graphiques, fac-simile. (*Treatise on the General Paralysis of the Insane.*) Paris, 1879; 540 pages.

A volume like this on a single morbid species has a very formidable appearance. If medical monographs generally were on the scale of the one before us, we might say as regards medical literature, with St. John, that "even the world itself could not contain the books that should be written." We would not say that the author ought not to have written his work as he has, but only wish that he had used his faculty of condensation more, or rather, his powers of expansion less, for he gives at the end of nearly every chapter an excellent *resumé* of its facts, and these collected together and expanded a very little would themselves make up a very good general treatise on the disease.

If any species of insanity, however, deserves and is capable of such an extended monograph, it is the one that forms the subject of this memoir. General paralysis is not only a very important disorder, becoming increasingly prevalent, but it is almost the only form of insanity the exact somatic basis of which is at all approximately known. Moreover there are many misconceptions prevalent in regard to it; in the present state of awakening of the average medical mind, every case of megalomania is liable to be hastily diagnosed as general paralysis. In our large cities, which furnish the greater number of cases of the disorder, this mistake is especially liable to be made, not only by medical men but also by some of the laity, the judges and juries, who have sometimes to do with the commitment of the insane. Thus a case of temporary congestive mania may be diagnosed as a case of probably hopeless mental derangement, and the consequences of such a mistake are, naturally, not invariably beneficial. Any amount, large or small, of enlightenment, therefore, on the subject, should be welcome.

After a short introductory chapter, in which he mentions the unity of general paralysis as a morbid species, M. Voisin proceeds to the description of the ordinary forms of the disorder. In the second chapter, he describes the general features of the prodromal period in which the first symptoms of mental trouble up to the appearance of the actual insanity are developed, and which is characterized mainly by change in character, disposition, and habits, enfeebled judgment, loss of memory, etc., with neuralgia and other disturbances of sensibility. There may also be melancholic symptoms, and not infrequently great increase of appetite for food and drink, even to an actual dipsomania as regards alcoholics, and an increase also in the sexual instincts, and the subjects are liable to fall into the commission of petty crimes and improprieties of which they do not seem to appreciate the real nature. Then follows a description of the intermediate period, during which, while the insanity is manifest, yet the signs do not indicate positively the nature of the mental disorder, or at least, do not as yet confirm the diagnosis of general paralysis. To the question whether these and preceding conditions are to be considered as appertaining to the general paralysis, if the latter ensues within two years, he answers in the affirmative; if the somatic symptoms only make their appearance after a longer period, then the initial insanity was not necessarily connected with them. This excludes the long remissions claimed by some authors, of five, ten, or even twenty years; according to our author the maximal duration of the time between the first appearance of actual insanity and that of the physical signs, in this disorder, is four years, two of which at the most may be comprised in the period of remission. The onset of the insanity in this intermediate period may be sudden or gradual, and it may take on the character of nearly every form of mental disease, the depressive as well as the expansive. In the sudden form, we have the acute periencephalitis, in the other, the initial stages of the diffuse cerebral inflammation.

In the third chapter, the symptoms are described. Of course we cannot follow in all its details the elaborate and minute enumeration and description that is here given, but will only notice the more prominent points.

In speaking of the first period of general paralysis, M. Voisin says, the five principal and most valuable symptoms, as being most constant and persistent, are (1) the loss or diminution of the sense of smell; (2) tremulous speech; (3) fibrillary twitchings of the lips and the facial muscles; (4) the pupillary phenomena; (5) the existence of fever.

The first of these signs is one that M. Voisin has himself especially brought before the profession in these cases, and he attaches particular importance to it, as not occurring except as a result of manifest local disease, in any other form of insanity. The other symptoms enumerated are those usually observed, except the fever, which has not been especially considered as an essential or constant symptom by other observers. M. Voisin lays stress on this sign as of diagnostic importance in certain cases, in regard to which particulars are not obtained, the patient being in a condition of stupor, saying nothing, and the pupils being equal. He wonders why Parchappe and Calmeil, with their convictions of the inflammatory character of the disease, should have overlooked so essential a symptom. The points he makes in regard to the temperature, are—

1. That in general paralysis the average temperature is below the normal.
2. That every eight or fifteen days it rises above the average.
3. That it stays above the normal mean sometimes only one day, sometimes for many days consecutively.
4. That in cases in which this elevation of temperature continues for several days, the temperature is always higher in the evening than in the morning.
5. That the increase as well as the decrease of the temperature is sudden.
6. The figure indicating the temperature is never high, it rarely attains 39° (=102.2° F.) and more generally is between 37.8° and 38° (100.04 and 100.4° F.)

The author sees the advantages in careful temperature observation in this disorder, that by it the diagnosis can be made or confirmed, certain complications can be foreseen and in some cases prevented, and important rational therapeutic indications are to be derived from it. Considering the slight range above the normal of the temperature, here stated, it would seem that perhaps he lays too much stress upon this symptom, and the fact that other careful observers have not noted it, looks the same way. Nevertheless, it may be all that M. Voisin claims.

We need not go at length into the description of the accessory somatic symptoms of the first period, but will pass to what is said of the psychic changes. These, it is stated, are only an exaggeration of those of the prodromal and intermediate periods. Sometimes there is no delirium, but only an enfeeblement of the intellect and perversion of the feelings, but in others, and the majority of cases, there is either the ordinary expansive mania so often described by writers on this disease, or a melancholic form recognized by Falret, Calmeil, Pinel, Lunier, Baillarger and others, though by no means commonly recognized as characteristic, and third, the hypochondriac form studied by Baillarger, with whom our author agrees in deeming it hardly ever found with the same characters in any other disorder. Still, in certain exceptional cases, of which he gives an example, this peculiar form of hypochondria may occur in other cases.

The melancholic type of mental disorder in these cases is fully discussed, M. Voisin claiming that its thorough description has been heretofore a lack in medical literature, though it has been often enough recognized. He separates it into five special clinical forms : (*a*) melancholia with agitation, which is distinguished from a similar state in other forms of mental disease by the elevated temperature; (*b*) melancholia with stupor, the patients, however, in this do not preserve the obstinate silence nor present the muscular facial contraction usual in such cases with other relations; (*c*) religious melancholia, a rare form; (*d*) melancholia with ideas of persecution, and sometimes (*e*) ideas of poverty, in which the patients refuse to eat because food is too dear, to be clothed because they are too poor to buy clothing, etc., etc.

M. Voisin also makes three varieties of the hypochondriac form of depression, viz.: (A) the denial of the possession of certain organs, (B) the negation of existence, and (C) micromania, or belief of the patients that they are infants or children. The suddenness of the appearance of these forms, their absurdity, and the variable character of the delusions as in other forms of the mania of paralysis, he thinks sufficiently separate these varieties of hypochondria from the non-paralytic forms.

If there is no proper delirium or mania or delusions in this stage of general paralysis, he says the mental trouble takes on the form of dementia. The dementia in this first stage may range between very slight intellectual enfeeblement and absolute loss of mind. In the first case it is sometimes said, that the disease exists, as far as regards somatic symptoms, without mental alienation, but this view he rejects altogether, claiming that there exists no veritable general paralysis without intellectual involvement.

We may pass by the carefully detailed description of the symptoms of the second and final stages of general paralysis, to notice certain points in the fifth chapter on the forms, duration, and terminations of the disease.

M. Voisin recognizes five principal varieties: (1) the acute and rapid form; (2) the ordinary form with grand delirium; (3) the senile form; (4) general paralysis with all the characters of dementia; (5) spinal general paralysis. Each of these has its typical physiognomy, but mixed forms or cases are frequent, and this he claims as a proof of the essential unity of the disorder in all its phases. The first of these is an acute periencephalitis that may terminate fatally in a few days or weeks, but under energetic treatment promptly applied recovery is possible, as in a case related. The second form is the well-known type of the disease. The third variety is characterized by a progressive enfeeblement of the intellect, with less prominence of the other symptoms. It is often of long duration, six, eight or ten years, and the author says is more frequent in females than in males. It is highly probable that from the lack of post-mortems, and perhaps too little scientific observations, the cases of this variety in our insane hospitals are not infrequently unrecognized, but are credited to other forms of insanity in the classification.

The fourth variety is here introduced as the author's own discovery, he having first described it in 1868. It is comparatively rare, he having met with only a few examples. The essential lesion in these cases is general arterial atheroma, the characteristic lesions of general paralysis are comparatively little marked, and it is mainly on account of the similarity of the symptoms that it is included in the category of the disease. Of course the antiphlogistic treatment that may succeed in the other forms is of no avail here. Its progress is rapid, two years is the extreme duration as far as observed.

The fifth variety is that which has been called by some writers general paralysis without alienation, in which the spinal symptoms are most marked, and the intellectual disorders may be almost imperceptible, at least in the earlier stages. M. Voisin, as said before, does not recognize any general paralysis without mental symptoms, and therefore claims that close and careful examination will always reveal mental weakness or loss of memory, or the diagnosis is not assured. The reader may or may not accept this manner of view, for ourselves we would say that it appears scarcely reasonable to make the mental symptoms essential to the disease from the very beginning. Contrary to what M. Voisin says here, posterior spinal sclerosis is sometimes diagnosed before the appearance of recognizable ataxia, and the name, locomotor ataxia is not deemed more important in the diagnosis than the essential lesion. So we see no objection to diagnosing general paralysis without mental alienation merely on the ground that the name generally indicates an accompanying form of insanity.

The prognosis of spinal general paralysis is somewhat better than that of other forms, if proper and sufficiently prompt treatment is resorted to. Its progress is comparatively slow, and may be still further delayed.

The chapter finishes with remarks on the duration and terminations of the disorder. No reliable average duration can be fixed, according to our author. He strongly opposes the prevalent notion of the incurability of the disease, and gives the accounts of all the cases, ten in number, which he could collect and consider reliable of a definite cure of the disease. We notice that he does not here refer to the cases of Ludwig Meyer, whose remarkable results with powerful derivative treatment were noticed in this journal for April, 1878. The fatal termination that is generally looked for in general paralysis, occurs usually either from diarrhœa, mechanical asphyxia, or exhaustion, cystitis, or from some one of the complications mentioned in the chapters following those we have noticed.

Our author adopts Bouchut's definition of the term complication; it is "a secondary morbid phenomenon developed under the influence of the pre-existing disease." Under this head he discusses only the disorders of the central nervous system that appear in the course of general paralysis, and are apparently due to the same general cause as the proper symptoms of the malady. A few points only need be specially mentioned by us, the space we can give is not sufficient to follow the author in detail.

M. Voisin sees a very close relation between epilepsy and general paralysis, and appears inclined to consider the epileptiform attacks in this disease as not very different to those of true epilepsy. He says nothing about any different pathological conditions in the two classes of cases, of hyperæmia in the one and anæmia in the other, as we think is indicated by the facts already obtained in regard to them. Nor does he consider that the lesions of general paralysis correspond with the clinical symptoms in such a manner as to support the theories of localization as developed by Hitzig and Ferrier.

The spinal complications are given a rather short chapter, but are well summed up at its close. He recognizes among the cases in which the spinal and cerebral symptoms appear simultaneously, a particular group of very rapid course, which he calls acute or galloping general paralysis. Among those in which the spinal troubles appear first, he recognizes three groups of cases: (1) those in which there is no causal relation between them and the subsequent cerebral disorder; (2) those in which this relation does exist, and in which, he says, the spinal symptoms are principally manifested in very severe and obstinate neuralgic pains; and (3) those in which the spinal disorder, whatever its original location, gradually invades higher regions, till the inflammatory affection of the brain is fairly established. The spinal lesion seems to have a predilection for the posterior portion of the cord or the posterior meninges; it is only exceptionally situated in the anterior cornua, producing muscular atrophy. It may, however, in some cases, consist in a generalized or local myelitis.

In the remarks on diagnosis in the twelfth chapter, the points of difference between the psychic symptoms of general paresis and those of other states that resemble them are reviewed at some length. M. Voisin puts forth a suggestion that many cases of so-called senile dementia may be in reality general paralysis. This may be so, but he adds to it the suggestion that certain cases of idiocy in children may be of the same nature. We are not prepared to criticize these views thoroughly; the extension he gives to the term general paralysis in these cases is, however, rather striking. He seems to think that generally the diagnosis from cerebral syphilis can be satisfactorily made, and does not appear, in our opinion, to recognize sufficiently the fact, that whatever their origin may be, the symptoms of general paralysis depend upon the location and destructive character of the cerebral lesions, and that these latter may be syphilitic in their beginning. This point was well pointed out by Dr. E. C. Spitzka in a very able paper in this journal for April, 1877, and illustrated by a very well reported autopsy of a case of this kind.

Under the head of etiology, are discussed the causal relations to general paralysis of heredity, moral hygiene, age, sex, temperament, intellectual occupations, physical over-exertion, habits, social surroundings, climate, traumatisms, insolation, epilepsy, pellagra, acute diseases, child-birth, suppression of functions, some of them at some length. M. Voisin does not agree with Marechal de Calvi in admitting diabetes as a cause. The abuse of sexual indulgence he recognizes as a cause, but makes less of it than do some other writers, such as Cavalier and Blandford, who considered it as the principal if not the sole etiological factor. The super-activity of the sexual functions that occurs previous to the complete manifestations of the disorder, and which is only a prodromal symptom, he thinks is often mistaken for a cause.

Considerable space, comparatively, is given to the subjects of the relation of neuralgias which sometimes precede the disease, and of other forms of insanity to general paralysis. As to the first of these, he recognizes no cause in vaso-motor innervation, and leaves the question still in doubt. It appears to us that, at least, a congestive migraine, which may easily be one of the class of generalized neuralgias that often precede general paralysis, may have more direct relations than he is willing to admit, and the vaso-motor theories he here rejects we think have a better physiological standing than he allows.

We will pass by the chapters on the physiological pathology and the pathological anatomy, to which we can hardly do justice in the space at our command. The only remark we offer is, that while the chapter on the pathological anatomy is very full, it is yet not quite complete, and there are some researches, not too recent, that seem to have been ignored.

The chapter on the medico-legal relations of paralytics is short. M. Voisin opposes sequestration of the patient in the early stages as too severe a measure, but advises holding the family or friends responsible for his acts if injurious to the community, the patient himself being, in our author's opinion, absolutely irresponsible for criminal acts. As regards their civil capacity, he disagrees with Legrand du Saulle, who objected to the strictures of the French code on this point, and holds that when the diagnosis of the disorder is once fully confirmed, their incapacity should be absolute.

The chapters on treatment commence with a remonstrance against scepticism in therapeutics, especially that dogmatic medical nihilism that denies even the possibility of the cure of the more serious forms of insanity like the one under consideration. M. Voisin takes an altogether more hopeful view than is generally held by the profession of the curability of general paralysis, even in confirmed cases. The treatment must be (1) to modify the cerebral action by appropriate hygiene, and (2) to combat the encephalic lesions, as early in the disease as possible, with rational antiphlogistic measures. The hygienic measures should insure proper regulation and cultivation of the moral as well as the intellectual faculties, exercise, the prohibition of mental labor, etc., etc. The use of a certain class of medicinal agents is in his opinion very undesirable, among them he includes opium, and its alkaloid morphia, which had been recommended by certain authors, among them Potain, Jaccoud and Reiner. Among the dubious remedies, he includes calabar bean, nitrate of silver, arsenic, antimony, and ergot, all of which he has tried without advantage. Digitalis and the bromides, and perhaps the iodide of potassium as recommended by Lunier, may be of advantage in meeting certain phases of the disorder.

Of the general antiphlogistic means, in the early part of the disease, and in plethoric individuals, M. Voisin advises light venesections and leeches to the arms. Purgatives are useful in both the first and second degrees of the disorder, sinapisms and warm foot baths are useful at the beginning, blistering the scalp and nucha, actual cautery along the spine and setons in the neck are also useful. As before stated, the very vigorous derivative treatment of Ludwig Meyer is not mentioned, nor does our author put so much value on direct local applications to the scalp; he states that he has had as good results with blisters to the nucha as to the scalp. It is to cold baths given daily and continued for a long period, that he attributes the most value. The details of this treatment, its indications and contra-indications, must be left for the reader of the volume itself ; they are too many, and all the conditions bearing upon it are too fully discussed to be given in a notice like this; suffice it to say, he recommends the continuance of the treatment at all stages of the disorder and during the remissions, and even after the complete disappearance of all morbid symptoms in cases where it has been apparently successful. M. Voisin reports several cases cured or arrested by this treatment, and others in which marked beneficial results in modifying the disease were obtained, though the fatal termination could not be finally avoided.

The fifteen illustrative plates at the end of the volume will doubtless be of service to the reader, and certainly add much to the general appearance of the volume.

Our general impressions of the work are, that it is a very valuable one, and perhaps the most complete monograph of a single species of mental disorder that has ever appeared. It has its defects, however, as is almost inevitable in a work of this magnitude, and one of the chief of these is that it is not in all respects quite up to the times. But few papers published since 1874, and those mostly by French authors, are alluded to, and hence there are some valuable suggestions and results of investigation that are not embodied here. Taking it as a whole, however, it is a work with which no practical alienist or neurologist should be unacquainted.

II.—SYPHILIS OF THE NERVOUS SYSTEM.

I. Syphilis of the Brain and Spinal Cord, showing the Part which this Agent plays in the Production of Paralysis, Epilepsy, Insanity, Headache, Neuralgia, Hysteria, Hypochondriasis, and other Mental and Nervous Derangements. By Thos. Stretch Dowse, M. D. New York: G. P. Putnam's Sons, 1879. Chicago: Jansen, McClurg & Co.

II. Mémoire sur les Affections Syphilitiques Précoces des Centres Nerveux. Par le Dr. Charles Mauriac. Paris, 1879. (*Memoir on the Early Syphilitic Disorders of the Nerve Centres.*)

The importance of syphilis as a cause of nervous disease, and the protean forms in which it may thus manifest itself are so evident, that the literature of the subject seems hardly equal to the demands. Apart from a few foreign works, such as Heubner's valuable treatise, of which we believe no English translation has appeared, and that of Fournier, noticed in this journal last year, there has been no important memoir devoted especially to this class of syphilitic manifestations published for many years. The volumes before us, therefore, though not extensive or exhaustive, are nevertheless very useful and timely publications.

In his opening chapter Dr. Dowse gives his views of the history and nature of syphilis. He endorses on the strength of his own experience the statement of Wilks, "that in those cases where the primary and secondary manifestations of syphilis are least marked, the viscera and nervous system are affected in an inverse ratio." This fact, so far as it is a fact, has some important clinical bearings, as he says, for patients may thus be entirely ignorant of ever having had the disease, when its effects on the nervous system are very decided. The diagnosis of nervous syphilitic disease is a very important matter when, in cases like the above, the causal history is lacking. In syphilis of the brain, Dr. Dowse, like other writers, lays special stress upon headache as a diagnostic point, when the dura mater is the seat of the syphilitic hyperplasia; an intense headache, remittent, and unrelieved by pressure. Inflammations of the pia mater, on the other hand, are accompanied with only slight pain, but are far more serious in their further progress. The headache in these cases is diffuse, there is more constitutional disturbance; and the damage to brain substance is liable to produce various physical and mental disturbances, epileptiform symptons, etc. As regards the arterial changes in cerebral syphilis, Dr. Dowse thinks that the facial expression, and the difference between real and apparent age are of special value in cases of brain symptoms with no syphilitic history, in suggesting the syphilitic infection. A peculiar headache has been observed by the author in cases of syphilitic degeneration of the cerebral arteries, coming on at intervals of two to four weeks with great severity, but without complete freedom between these points; it is a dull, heavy, diffused ache, and is accompanied often by various transient sensorial and motor symptoms, with general heaviness and lethargic condition. The appearance of the paralyses, etc., is as a rule slow, while their subsidence is rapid; this the author states is peculiar to syphilis.

Dr. Dowse does not agree with some authors who have stated that syphilitic disease of the spinal cord and its membranes occurs many years after the primary affection. He thinks it is rare to find a true paraplegia, unassociated with brain disease, seven years after the primary infection. In seventeen cases analyzed by himself, only one occurred after six years from the original disease.

Syphilis of the sympathetic system is illustrated by several cases of functional nervous disorder, with pronounced symptoms referable to the vaso-motor system, in persons with a syphilitic history, who were cured by specific treatment. Syphilis of peripheral nerves is also briefly treated; we see no mention, however, of the possible connection of the nervous system with the cutaneous and other lesions of syphilis. We have seen, for example, a syphilitic eruption following the course of certain peripheral nerves, much as the eruption in zoster follows the intercostal or other nerves, but we have not, as far as we recollect, seen this phenomenon specially mentioned in the literature of syphilis, though it may have been often noticed.

The treatment of nervous syphilis is described in the fifth chapter. We cannot give all the points of this chapter and will only note a few of them. In cases in which the syphilitic tissue changes are of a lardaceous or albuminoid character, he adopts a tonic and purgative line of treatment before applying specific medication, claiming that in cases like these, though the brain is the part affected, the usual treatment by iodides and mercury is as harmful as the use of opium in uræmic coma. He has much faith in the value of alcohol in certain cases; he certainly is not of the total abstinence therapeutic school. Iodide of potassium is, in some measure, discredited by Dr. Dowse, he not putting the same confidence in its potency for good in syphilitic states as do some others. Still he does not get along without it, and gives directions as to its use by the bath, in cases where it is not tolerated by the mouth. He advises the addition of chloral to the iodide solution in painful conditions of the peripheral nerves.

The secondary conditions that may arise are noticed, and their proper treatment insisted on as of the utmost importance. General hygienic measures are also prescribed in some detail.

Taking the word epilepsy in its more limited sense, as merely including the *grand mal*, Dr. Dowse judges from his own experience that syphilitic epilepsy proper is an extremely rare affection, as the result of acquired syphilitic disease. But with his views as to hereditary nervous syphilis, holding as he does that this disease is more effective than any other agency in producing unstable conditions of the nervous system, he believes that primary idiopathic epilepsy is more often due to hereditary syphilis than to any other cause. The *petit mal*, however, which we deem to be as much epilepsy as the other, he admits may be due to acquired syphilis.

The pathology of cerebral syphilis is discussed at some length, and fourteen cases are reported illustrating the remarks. Dr. Dowse believes that syphilitic hyperplasias may occur in the membranes of the brain in the second stage of syphilis

The general make-up of the volume is very good, the illustrations are especially good. There are some rather noticeable typographical errors, and one or two cases of misuse of words by the author, and he leaves out of consideration certain facts relative to his subject, that are noticed fully in the volume second on our list. But it is a work that we can cordially recommend to the profession of this country.

M. Mauriac's treatise is quite different in its scope from that of Dr. Dowse. It treats of a class of syphilitic nervous disorders that are not especially noticed in the latter, and which in fact have been too often ignored by writers on these subjects,—the early manifestations of nervous syphilis. As M. Mauriac says, according to the hitherto published views on the evolution of syphilis, it seems strange and indeed almost impossible that such a constitutional disorder should affect the central organs at a period so near to the original infection.

In the first part of his work he gives in detail seven cases in which the nervous accidents appeared in from two to twelve months after the primary infection, with elaborate comments on the same. In the second part are the considerations on the statistics, the pathogeny, the symptomatology, etc., of these accidents. We cannot give a better idea of the results of the work, in the space at our disposal, than by translating the author's conclusions in full. They are as follows:

(1) At a period very near in point of time to the primary infection, syphilis may invade the nervous centres.

(2) The early cerebro-spinal syphiloses are those that develop during the virulent period of the disorder; that is, during the two or three first years after infection.

(3) There are degrees in the precocity of cerebro-spinal syphiloses: Those of the first degree are those that make their appearance within the first twelve months; the second degree includes those that develop in the second and third year of the constitutional malady. Statistics seem to show that those of the first are more frequent than those of the second, but these results are not extremely important.

(4) Among the early visceral determinations of syphilis, the cerebro-spinal are incomparably the most frequent.

(5) They are also the most dangerous. Their gravity is not at all in direct proportion to their diathetic age; those that occur

during the first months of syphilis are as serious as those that appear in the latest stages.

(6) All the forms, degrees, and phenomenal combinations that constitute the symptomatology and processes of these syphilitic determinations to the nervous axis are as well seen in the early cerebro-spinal syphiloses as in the later ones.

(7) There are, nevertheless, some symptomatic formulæ that appear to predominate. The most frequent are those that consist in an attack of hemiplegia involving all one side of the body.

(8) Among the attacks of hemiplegia, those constituted by the symptoms of aphasia with right hemiplegia exceed in number all the others.

(9) The paralytic forms are much more numerous than the convulsive or epileptic forms in precocious cerebral syphilis.

(10) In the cerebro-spinal syphiloses, psychic disorders and inco-ordination of movement are never systematized as in insanity, general paralysis, and locomotor ataxia.

(11) The absence of systematization in the cerebro-spinal syphiloses should be regarded as one of their chief characteristics. The only exception is aphasia with right hemiplegia.

(12) Early determinations of syphilis to the spinal cord are much less frequent than those to the brain.

(13) Circumscribed or diffuse hyperplastic suffusions, but rather circumscribed in the cortical layers of the brain and in the pia mater, syphilitic alteration of the Sylvian arteries and consecutive ischæmic softening, such are the lesions that appear to belong to precocious cerebral syphilis.

(14) In some cases of early cerebral syphilis followed by death, we find no lesion, but then we do not thoroughly understand the arterial syphilosis. It may be presumed that death was the result of a sudden anæmia, extinguishing at once the nuclei of innervation of the centres indispensable to life.

(15) Only vague conjectures are possible as to the etiology of precocious cerebral syphilis. In the majority of cases the primary symptoms, as well as the subsequent cutaneous and mucous manifestations, were very mild.

(16) The general progress of the constitutional disease is not modified by the appearance of precocious syphilitic accidents of the nerve centres. The other manifestations are produced before, after, or during the involvement of the nervous axis, without undergoing any change in their forms, their degrees, their progress, or their topography.

(17) The precocity of cerebro-spinal syphiloses furnishes no particular indications as regards treatment. Whatever the age of the constitutional disease, the manifestations in the nervous centres demand the same specific treatment. The circumstances proper to the determination itself furnish the secondary indications relative to the choice, dose and combinations of the two specific agents.

The above conclusions comprise the substance of the work, but the most of the arguments are well worthy of perusal. We can only refer the reader for these to the volume itself, which should be in the library of every neurologist. The subject is one that has up to this time been too sadly neglected.

III.—TEXT BOOKS OF PHYSIOLOGY.

I. A Text Book of Physiology. By M. Foster. London: MacMillan & Co. 1879. Pp. 720.

II. Handbuch der Physiologie. Herausgegeben von Dr. L. Hermann. Leipzig: F. C. W. Vogel. 1879.

I. A test, not altogether unreliable, of the merits of a book, is its sale. On this score Mr. Foster cannot complain, since his Physiology has passed through three editions within the three years of its existence, and a fourth cheaper students' edition is promised by the publishers. Since the first edition the work has been slightly enlarged, and numerous cuts of instruments have been added, not merely ornamental but decidedly instructive. On the whole, the book can be called the standard work in the English language, while it has none superior in any other tongue. It is, perhaps, the only work in our language which represents physiology fully as an experimental science. Its completeness is admirable. The anxious student can find not only the actual facts of the science, but also the mode in which they were obtained. Modern bibliographical references are given very fully, while the sources of older quotations are sufficiently indicated. The author proves to the student not only a compiler, but also a judicious critic. Where conflicting results are given, both sides receive an impartial representation, while any differences in the experimental conditions are fully alluded to. Older or unreliable statements are not ignored, but allowed the space which they deserve. A commendable feature of the book is also the arrangement of topics. By introducing a thorough description of the general mechanism of the nervous system in the first part of the book, the author is enabled to complete each chapter with the full details of the nervous connections of the organs considered.

Foster's Physiology is one of those books which can bear to have their faults pointed out fully. Of actual errors we have met with but one—the statement (p. 68) that the negative variation of the nerve-current can cause secondary (induced) contractions. This, though an error, is not a very serious one. As regards any omissions, but very few authors of any importance are not mentioned in connection with the topic which they have investigated. Perhaps the most flagrant instance is the omission of the researches of Francois-Franck and Pitres, on the excitability of the cerebral cortex. These researches have certainly added much to our positive knowledge of cortical centres, a subject which Foster treats with some scepticism. Flechsig's account of the strands in the spinal cord is alluded to altogether too briefly; it deserves a more thorough reference.

More numerous are the omissions of entire topics. Hunger, thirst and inanition are too important subjects to be altogether neglected. The effects of loss of blood, as well as transfusion, might also have been incorporated with advantage. We miss also any general considerations on the chemistry of foods; the occurrence of conjugate acids in the urine is likewise not mentioned. The entire topic of internal sensations, apart from those of the special senses, is only treated casually and too meagerly. In the part on the nervous system, we fail to find any separate article on the sympathetic. This is compensated for mainly by excellent descriptions of the vaso-motor system, etc., in connection with the different organs; but some supplemental article would be desirable. The difference between the action of the vagus and spinal accessory nerve on the larynx is not given satisfactorily; in fact, the cranial nerves are touched upon but too slightly. But the most glaring defects are found in the chapter on the dioptrics of the eye. The words, ophthalmoscope and ophthalmometer are not even mentioned. The optic measures of the eye are neither explained nor stated; only the figures of the schematic eye are detailed. The student could certainly not bear an examination on the formation of optic images if he were to depend on this book alone. A few cuts would in this place be of considerable assistance.

In order to attain the completeness which the book really possesses, the author writes with commendable brevity. The clearness of the description does not suffer thereby, it is true; the style is very clear and generally elegant. But he errs occasionally in the extreme of brevity. With the exception of the chapter on diabetes, we fail to find a single connecting link between physiology proper and experimental pathology. There are numerous conditions, bordering on the morbid state, which deserve at least a short explanation in systematic treatises. Neither anatomical nor histological data are to be found in the book, and this quite justly, since the book has a scope of its own. But it would certainly add to the interest if the connection between physiological facts and the corresponding structural peculiarities were oftener pointed out. That the student should have a fair anatomical and histological knowledge of an organ, the physiology of which he wishes to learn, is no unreasonable demand; but the understanding of mechanics and physics which Foster requires, exceeds in many instances the education of the American student. A more elementary description of blood-pressure and other mechanical phenomena would, hence, not be amiss. Still, there is not a paragraph which a student cannot understand, if he only perseveres. But a more picturesque and striking language, perhaps, in imitation of Brücke's (German)

Physiology, would greatly enrich the work. As it is, Foster's book is easy to read, but difficult to remember.

All these faults we hope to see remedied in future editions. They impair the value of the book, but not enough to deprive it of the credit of being the only work in our language which both acquaints the student with the methods of research and enables him to criticize the validity of the results.

To the practitioner, to whom the files of physiological journals are not accessible, the book is simply indispensable.

The publishers deserve credit for their work, which is quite elegant, considering the low price of the book. They have promised, moreover, a still cheaper students' edition.

II. The encyclopedic work of Hermann can truly be said to fill a long-felt want. Since the time of Wagner's *Handwoerterbuch d. Phys.*, and Bowman's *Encycl. of Anat. and Phys.*, no similar work has appeared, if we except the French dictionaries, which are, however, of a somewhat different nature. The time has again arrived, when both the professional physiologist as well as the medical practitioner desire a complete balance-sheet of the scientific gain of the last thirty years. That such an outlook cannot be obtained from a text book of ordinary bulk, the labor of a single compiler, is evident.

The solid list of well-known co-operators found on the title page, gives the work a fair prospect. Most of the gentlemen are considered authorities on the subjects allotted to them. There are nearly twenty-five co-operators, each one charged with a complete subject. The arrangement is such that the chapter on each system is accompanied by the full description of the nervous connections of the organ involved. Thus there are but few chapters on the nervous system exclusively. On the whole, this is the most satisfactory plan. The entire work is to consist of six volumes, each in two parts. Up to the present time the first two volumes have appeared with pleasing punctuality.

The work begins with the physics of muscle, by Prof. Hermann. The editor has also written on the general physiology of the peripheral nervous system in the first half of the second volume. Both chapters are characterized by thoroughness and precision. The style is plain and elegant. The arrangement of topics is very methodic. This is especially noticeable in the chapters on electricity of muscle and nerve. This very complicated subject is treated in such a masterly manner, that the many obscurities with which it is beset are much less apparent than in any previous works. But, on the other hand, this finished treatment is now and then a blemish; although the author never conceals the defects in our knowledge by mere phrases, he does not point them out sufficiently. We had hoped that this work would appear more as a true balance-sheet in laying open the countless gaps existing everywhere in physiology. In short, it lacks in suggestiveness; a fault, however, less apparent in the chapters written by Hermann than in the rest, as far as it has come to hand.

The part written by O. Nasse, the chemistry and tissue-change of muscles, can truly be called a model. Like the chapters written by Hermann, it is not open to any reproach of verbosity, a fault not easily avoided in such a work.

The last chapter in Part I., Vol. I., comprises protoplasmic and ciliary motion, by Engelmann. As far it goes, it can be fairly compared with the preceding parts; but the absence of suggestiveness is even here more painfully noticeable, on account of the nature of the subject.

In the first half of the second volume we find the special physiology of the spinal, cranial and sympathetic nerves, by Sigmund Meyer. This part is certainly less satisfactory; it is a mere compilation, although very complete as such. The methods of research are not described; hence, where conflicting statements are mentioned, the reader has no clue by which to test their separate validity. The writer's judgment, in such instances, it would not always be safe to accept implicitly. It certainly seems to us that the eminent labors of Cl. Bernard, on some of the cranial nerves, do not receive the credit which they deserve.

The second part of Vol. II. contains the central nervous system (excluding the cortex) by Eckhard, and the cerebral cortex by Exner.

The first of these writers abounds in refreshing scepticism; but this is frequently carried to such an extreme, that the reader sees rather the negative than the positive side of our knowledge. Again, we find but an imperfect account of methods and experiments, so that the reader's own judgment cannot come into play. The author shows an admirably thorough knowledge of the literature; he is, besides, competent to speak authoritatively on the basis of his own large experience. Nevertheless, the reader of the treatise cannot avoid referring to the original memoirs quoted for satisfactory information. Pathological observations are neglected, perhaps, unjustly; thus the division of the spinal cord into strands, which can only be recognized when degenerated or while still undeveloped (Flechsig), is dismissed in too few words. The systematic arrangement, however, is very satisfactory. But decided criticism can be applied to the language. It is clear, it is true, but by no means agreeable: the sentences are often unnecessarily long and complicated; the paragraphs are of such a length as to become wearisome.

Exner's consideration of cerebral physiology is both exhaustive and impartial. The cortical centres of animals receive an excellent description. The corresponding parts of man are necessarily dismissed with a briefer description, but this is the fault of the subject. Perhaps, most exception can be taken to the unnecessary amount of space devoted to a rather sterile discussion of Fechner's psycho-physical law. H. G.

IV.—TREATMENT OF THE INSANE IN THE UNITED STATES.

Reports from Asylums for the Insane in the United States. Reports from the following Asylums have been received and used in this notice: State Lunatic Hospital, Northampton, Mass., 1879; State Lunatic Hospital, Harrisburg, Pa., 1879; Insane Asylum North Carolina, Raleigh, 1878; Kansas State Asylum, Osawatomie, 1878; Connecticut Hospital for Insane, Middletown, 1877 (biennial); Insane Asylum State of California, Stockton, 1877; Eastern Kentucky Asylum, Lexington, 1878; Eastern Lunatic Asylum Virginia, Williamsburg, 1878; New York City Lunatic Asylum, Blackwell's Island, 1877; New York City Asylum, Ward's Island, 1877; City Hospital, Boston, 1879; Alabama Insane Hospital, Tuscaloosa, 1878; Pennsylvania Hospital for Insane, Philadelphia, 1878; State Asylum for Insane Criminals, Auburn, N. Y., 1878; Butler Hospital for Insane, Providence, R. I., 1878; Willard Asylum for the Insane, Ovid, N. Y., 1878; Northern Hospital for Insane, Elgin, Ill., 1878; State Lunatic Hospital, Utica, N. Y., 1878; West Virginia Hospital for the Insane, Weston, Va., 1878; Illinois Southern Hospital for Insane, Anna, Ill., 1878; State Homeopathic Asylum for Insane, Middletown, N. Y., 1878; Longview Asylum, Cincinnati, Ohio, 1878; Virginia Western Lunatic Asylum, Staunton, Va., 1877–78; State Hospital for the Insane, Danville, Pa., 1877–78; Lunatic Asylum No. 1, Fulton, Mo., 1878; Iowa Hospital for the Insane, Mount Pleasant, Iowa, 1876–77; Indiana Hospital for the Insane, Indianapolis, Ind., 1878; Central Hospital for the Insane, Jacksonville, Ill., 1878; New Hampshire Asylum for the Insane, Concord, N. H., 1879; Western Pennsylvania Hospital, Dixmont, Pa., 1878; Dayton Asylum for the Insane, Dayton, Ohio, 1878; Wisconsin State Hospital for the Insane, Madison, Wis., 1878; New Jersey State Lunatic Asylum, Trenton, N. J., 1878; Western Kentucky Asylum, Hopkinsville, Ky., 1878; South Carolina Lunatic Asylum, Columbia, 1878; Lunatic Asylum of the State of Georgia, Milledgeville, 1878; State Lunatic Hospital, Taunton, Mass., 1878; Cleveland Asylum for the Insane, Cleveland, Ohio, 1878; State Asylum for the Insane, Morristown, N. J., 1878; State Lunatic Hospital, Danvers, Mass., 1878; State Lunatic Asylum, No. 2, Jefferson City, Mo., 1878; Central Lunatic Asylum (for Colored Insane), Richmond, Va., 1877–78; Athens Asylum for the Insane, Ohio, 1878; Minnesota Hospital for the Insane, St. Peters, Minn., 1878; Hartford Retreat for the Insane, Hartford, Conn., 1878; Annual Report Commissioners of Emigration, New York, 1879; Vermont

Asylum for the Insane, Brattleboro, Vermont, 1878; Maine Insane Hospital, Augusta, Me., 1878; Northern Hospital for the Insane, Winnebago, Wis., 1879; St. Louis Insane Asylum, 1878–79, &c.

In civilized countries no other class of unfortunates has a higher or more pressing claim on public beneficence, than the insane. The situation of persons of this class, it should never be forgotten, is peculiar. As a rule, insane persons have arrived at the age of accountability. Happily the periods of infancy and childhood, which furnish so large a proportion of those who are merely bodily sick, are comparatively exempt from mental ailments, of the kind we now have in view. Then again, though insanity belongs in a great degree, to the later history of youth, and to the adult age, and therefore falls within the period of moral and legal responsibility in the history of the individual, yet as a rule, the insane are considered as practically irresponsible. They are held to be unfitted, by disease, for the safe and rational exercise of personal liberty. They are held to be not amenable, as a rule, to the laws of the land, in a criminal sense, no matter how frightful the injury they inflict on others about them. Their testimony as witnesses, in courts of law, is not received as valid evidence. In a vast number of cases, they are hence deprived of personal liberty, as truly, and to a certain extent for the same reason, as the criminal. The individual may be removed from his own home, from the midst of friends, perhaps against his own will, and is confined within an asylum where there are special provisions to prevent escape, no matter what the desires or sufferings of the patient. He is placed in the hands of strangers, those in immediate charge day and night being, as a rule, ordinary nurses, who if they choose may employ violent measures, under the forms of law, and with pretence of control, in which the moral and legal rights of the insane person may be trampled on in the most flagrant manner, and yet the sufferer is deprived of almost every opportunity and means for redress. No matter how brutal his or her treatment may have been, no matter how clear the memory and apprehension of the insane person as to the facts of the case, no matter how consecutive and truthful the account nor how many insane witnesses look on, yet unless the facts were observed by some sane person, a third party, as in the nature of the case they seldom can be, they are not heard by the law, as complaints of patients of any other class would be. The nature of the maladies from which the insane suffer are such as to make restraint, and opposition to their wishes and purposes, to a considerable extent necessary, and except in the most judicious and humane hands, the exercise of these dangerous functions is peculiarly liable to degenerate into abuse. The management of no other class of persons, requiring public care, presents naturally so many practical difficulties to be overcome, as that of the insane. For these and other reasons the situation of this class of persons, as already said, is peculiar, and hence demands peculiar attention. This has been felt for a long time past, at least ever since the time of Pinel and his immediate co-workers and successors. As a result of the efforts of philanthropic individuals both in and out of the profession, the management of the insane has been wonderfully improved every way during the past fifty years. At the present time it should be a matter of peculiar satisfaction to every person who has the interests of suffering humanity at heart, that, upon the whole the insane are, so many of them, so well cared for, unfitted by disease as they so often are, to care for themselves. All this may be admitted, as it ought to be. But a candid consideration of things as they are, in contrast with a reasonable ideal in respect to the management of the insane, will lead any one to see that the existing *status* is not only not all that could be reasonably desired for the future, but not all that is plainly attainable in the present.

This declaration is not made in any spirit of fault-finding, but as the result of a rather prolonged study of things as they seem to be at present. In order to make this more apparent it is our purpose to survey briefly the Reports of Asylums for the Insane in the United States, for the years 1878 and 1879, at least as far as we have been able to procure them, adding matter from other sources where occasion may seem to require.

In order to make such a review profitable, it should have some distinct aim, or follow some definite plan. Accordingly we will set up in the beginning what would seem to be a reasonable standard of asylum provision and management, to guide us in our endeavors to estimate comprehensively and justly the present state of these matters in this country. We would lay down the following among other points, to which the administration of such institutions should conform:

1. In the public care of the insane it is the duty of the State to provide for all who may require asylum treatment. Separate provision should be made for the care of the acute and chronic cases, or rather, the "curable" and the "incurable," and that the present generation should provide for its own unfortunates, rather than for the generations to come, in the erection of buildings, and therefore, that the strictest economy should be practiced, consistent with reasonable comfort and security.

2. The appointment of superintendents, and in general of the medical staff, to hospitals for the insane, should be made on purely scientific and medical grounds. All political considerations should be put out of the question. No superintendent of a hospital for the insane should acquire or hold his position by political favor.

3. The active duties of the medical superintendent, and his immediate assistants, should be entirely separate from the property and business management of the institution, though in a general way the latter should be under the control of the super-

intendent. All purely business affairs of such an institution should be placed in the hands of a competent steward, or warden, that the time of the medical staff may be given wholly to their medical duties.

4. Careful and elaborate histories, according to a well-studied plan, should be made of each case, as it enters the hospital. The most careful inquiries should be made and the results duly entered, as respects the sensibility, whether special or general; the motility, or the state of the muscular system; the condition of all the leading systems of the body, digestive, secretory, circulatory, respiratory, &c., &c., as well as respecting the mental states of the patient, according to their development in time and place, including the use of instruments of precision. This should be done as far as practicable for all the patients admitted to the asylum. To these histories should be added the subsequent developments of the case, whether toward health, or the contrary.

5. Careful post-mortem observations should be made, as far as possible, and the phenomena apparent after death should be recorded in the use of the very best methods, and in view of our best knowledge, or the results of it, of the structure and functions of the nervous system, that the results may be brought face to face with the phenomena of the ante-mortem histories.

6. There should be such a number of trained and reliable assistants and nurses, as to make it possible to do away in the greatest possible measure with purely mechanical restraint.

7. There should be some effective system for inspecting the internal management of hospitals for the insane, so as to secure the highest degree of efficiency, and the closest responsibility possible on the part of attendants and nurses.

Such is a list of the more important points which it is reasonable to demand, should be conformed to, in the establishment and management of hospitals for the insane. Other points of more or less importance might easily be mentioned, but we shall pass these by at present. With this seemingly reasonable, though not novel, list of requirements before us, let us take up various annual reports of the asylums for the insane in the United States, and see to what extent from internal evidence they conform to them in their administration.

1st. That in the public care of the insane it is the duty of the State to provide for all who may require asylum treatment, &c.

If it is the duty of the State to provide for any of the insane, it is equally its duty to provide for all. The proportion of the insane to the sane in civilized countries is not so great but that it is practicable to provide for all who require public care. Many of the insane possess the means which may enable them to secure needful care at their own expense. All such patients can be cared for at private asylums, or in their own homes. This class need not be considered in this connection. We now refer only to those who have not the means to provide for themselves, and hence, must become a public burden. There is no class of persons in any civilized country which tax-payers contribute more cheerfully towards the support of than the insane. Now what are the facts in this country as shown by the "Reports" from the asylums, and by documents issuing from census bureaus and from other official sources? It is but fair to state that at a moderate calculation not much more than one-half of the aggregate of the insane in the United States are cared for within asylums worthy of the name. The remaining one-third, to one-half, amounting to *very many thousands*, are left as a private burden, or, what is worse, to drag out a miserable existence in miserable alms-houses and jails. The existence of this great mass of human beings, supposed to be deprived of the use of their reason, and in a majority of cases from the enjoyment of their personal liberty, is most pitiful and distressing. These facts do not in any of the "reports" find that earnest statement and discussion their importance demands, and which it is natural to suppose, the chiefs of insane asylums are in a situation beyond all others to understand, and show in all their true aspects. Men in position to know the real condition of our insane, inside of the regular asylums, should, in the words of the prophet, "cry aloud and spare not," until their calls are heeded by those in power, in behalf of those who cannot be heard for themselves.

Then again, as to separate provision for the care of incurables: Without insisting on the correctness of the terms used, the words "curable" and "incurable" may be taken as denoting a real, practical distinction between cases. Recent, are more curable, as a rule, than chronic cases. But all acute cases are not curable, nor are all chronic cases incurable. But the facts are that a large minority of the insane, to say the least, are incurable by any known means. Among these many die in a short time, while others survive, a large proportion of them many years, hopelessly impaired in body and mind. Recent, and it may be curable cases demand, from every point of view, different treatment as compared with the chronic demented and the incurable. The former require the application of all known means for promoting recovery. The latter as a rule, require simply support and protection. They have passed to a stage of their maladies in which the physician can be of no lasting benefit.

To what extent does our present asylum system conform to the arrangement just indicated? The facts go to show, that up to this date, except in one or two States, the curable and incurable receive the care of the State in the same building, generally a costly one. The quiet and demented incurables are confined in different wards of the same structure, with the violent and recent cases. Instead of building cheap structures, comparable to "pavilion hospitals," for other classes of patients, which might serve as a plain and comfortable home for incurables and convalescents, the plan not only has been, but yet seems to be, to erect costly buildings to answer the urgent demands for more room, or if the means to do this is not forthcoming, as it seldom is, the alternative is to permit a large proportion of the insane in the country to linger in jails and alms-houses. The problem at present is less one of more money, than it is of a wise expenditure of what is wrung from the tax-payers, in the name of charity. Instead of erecting costly asylums likely to endure for hundreds of years, let the buildings we now have at such fearful cost of public treasure, be reserved for acute cases or those which may be considered curable. On the other hand, let all the others be provided for in a far cheaper, but comfortable way, rather than have them continue to usurp the places year by year which belong to recent and more hopeful cases, or rather than relegate them once more to the county alms-house or the jail. Erect cheap structures expected to serve the present generation. Let the coming generation build its own asylums. We have looked over all the arguments urged in favor of the costly asylums of the past and present, but they do not for a moment stand in the presence of the solemn and distressing fact, that a large proportion of the insane in the United States have no asylum protection and care worthy of the name, that the other half may live in a brick or a stone palace calculated to stand for centuries, when it can be demonstrated that by a less showy, but upon the whole not less useful plan of building, all or nearly all could have been accommodated, and the average of benefit and comfort been greatly increased.

This is not a new phase of the great practical humanitarian question, as to the best mode of provision for the insane. But it is none the less important because not new. In looking over the reports of the chiefs of the various asylums, we do not feel that any adequate attention is given to the matter. Such a subject ought to be one of the annual burdens of these reports until legislators are provided, not only with the incentive to action, but with a good plan. The alienists of the country are certainly not awake as they should be to the importance of this great question.

2. In regard to the appointment of medical officers of asylums. Any one who is aware of the modes in which medical appointments to asylums for the insane are made, need not be told, that in the majority of cases, political, rather than scientific and practical, considerations have prevailed. When an appointment is to be made, as a rule, the board or body in which the appointing power rests, is non-professional. Such a thing as a board of trustees for such institutions, though largely medical, being composed of capable scientific and medical men, has, perhaps, never been seen in this country. They are usually made up of politicians and business men. Hence, those who desire to secure appointments generally appear freighted with letters of recommendation from politicians, from local magistrates, governors, members of congress, and from more or less prominent business men, and it too frequently happens that the man who has been most industrious and successful in procuring such documents

secures the appointment, though it may be true that some other applicant less successful in this way, possesses in a higher degree the necessary scientific and medical qualifications. Whatever else is needed on the part of the medical officer of an asylum, great stress is laid upon his so-called "executive and business," rather than his medical qualifications. Hence it has come to pass, too frequently, that the superintendent of an asylum is chiefly remarkable for business qualifications and seldom remarkable for a high range of attainments in his particular department in medicine. The knowledge they acquire of insanity in its various forms is in too great a degree such as may be picked up by an intelligent nurse, from long observation of the insane. Such knowledge, it must be admitted, is valuable, and must form a portion of the acquirements of any one, however high their attainments in the scientific study and treatment of insanity, and other diseases of the nervous system. The system which was adopted in the early history of insane asylums in this country, in the progress of time was likely, it is easy to see, to lead, as it has done, to that state of affairs of which we are now complaining. The medical officers of asylums for the insane should not be held responsible for the adoption of the system which now prevails; but they are responsible in no small degree for its continuance. Among the medical officers of asylums for the insane in the United States there have been many instances of great industry and of a high order of talent and of attainment in the sphere of their legitimate work. As a body they have been highly respectable. But "by their fruits shall ye know them." If they are tried by this simple practical rule, their contributions to professional knowledge within the past twenty-five years in the special department in which they have labored, have been shamefully meagre, if we should except a very few, numbering in all but a few hundred pages. It may be said, that outside of "annual reports," not much has appeared worthy of being preserved. This is all the more surprising and to be deplored, because the medical officers of asylums, unlike practitioners of medicine in general, have opportunities for the observation and study of the diseases which it is their province to treat, such as are enjoyed, perhaps, by no other professional men. Asylum officers live under the same roof with their patients. They have, as a rule, a very considerable number of assistants to work under their direction, with opportunities also to secure the means needed in the prosecution of scientific and practical researches. Their patients are all under control, in the strictest sense of the word, and there is, hence, absolutely no excuse, except the lack of industry, or of ambition, or the lack or loss of a true scientific spirit, and the prevalence of ignorance. From the exceedingly meagre work which has been done, but few important therapeutical researches have been undertaken and carried out, cases have been seldom studied with even respectable care, whether before or after death, and hence the best opportu-

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nities which are presented, from year to year, in these great collections of patients affected with diseases of various kinds, and of various parts of the central nervous system (more particularly the brain), are absolutely lost. But what better can be expected, so long as there is so low a standard of scientific attainment among medical officers of these institutions, and so long as they acquire and hold their positions largely on political grounds, and so long as they are in danger of removal, as they have often been, for political reasons? It is useless to expect any considerable change in the scientific and medical character of these appointments in this country until a more or less radical change takes place in the mode of selecting medical officers for asylums. They should be men of great personal integrity, and of good business ability of course, but after every requirement has been met, in respect to moral character, the main inquiry should be directed as to the actual knowledge possessed, scientific and practical, in regard to diseases of the nervous system, more particularly of the brain. No man should be appointed in these days as a superintendent to an asylum who has not a comparatively thorough knowledge of the *present* anatomy and physiology of the brain and nervous system, at least in general, as well as of other parts of the body. He should be well acquainted with the best literature of its diseases, and should have had a thoroughly practical acquaintance with insanity in all its ordinary forms and phases. Without this knowledge, which is quite possible to be attained in these days, no man should be given the responsible position of superintendent to an asylum for the insane.

(*To be Continued.*)

V.—ANATOMICAL STUDIES ON THE BRAINS OF CRIMINALS.

ANATOMISCHE STUDIEN AN VERBRECHER-GEHIRNEN, FUR ANTHROPOLOGEN, MEDICINER, JURISTEN UND PSYCHOLOGEN BEARBEITET. Von Moriz Benedikt. Mit 12 Tafeln und 8 Holzschnitten. Wien, 1879. Wilhelm Braumüller, K. K. Hof, und Universität Buchhändler. (*Anatomical studies of criminals' brains for anthropological, medical, judicial and psychological research and purposes.* By Moriz Benedikt. With 12 engravings and 8 woodcuts.)

This work is dedicated to a number of physicians and others, mainly Hungarian and Croatian. Assistance is acknowledged from many persons, such as ministers of justice and prison inspectors, for material furnished. This is noticeable as indicative of inter-Carpathian Adriatic progress against superstitious prejudice, which hitherto has withheld such material from students.

The introduction may be condensed as follows: That there is a correspondence in anatomical plan and physiological development of the brains of men as well as in their thoughts, feelings, volition and capabilities, is a discovery as old as Erasistratus, who first gave it utterance, at a time, too, when but crude judgments could consider it. The indifferent progress of exact knowledge of brain structure and functions was due to the want of any wide-spread recognition of these analogies, a belief in which was latent for more than 100 years among the learned classes before their demonstration.

The philosophies of Blumenbach and Gall appeared with the general advance of science. They paved the way to more accurate knowledge, and their stores of thought were not enough appreciated. A new impulse was then given to anatomical brain studies, which previously had received very little attention. Although Gall's incitements to studies in this new field were great and successful, so many were the mistakes in details that he made, that opposition hailed these as evidences of the entire falsity of his doctrine, and antitheses were as numerous as the works of adherents. Since then the literati of all lands have forwarded our knowledge of the skull and brain. Notwithstanding the direct psychological tendencies of these revelations, there has been no other than argumentative persecution raised against the study of the subject.

In France, Leuret, Gratiolet and Broca, in Germany, Huschke, Virchow and Bischoff, in England, Owen, Huxley and their schools, and in Italy, Lombroso, are recalled to mind as most prominent in these researches and most useful to the author in his present work.

Opposition has been manifested at all points toward exact research in encephalic anatomy, and especially has the constancy of cerebral features been denied. Yet every new conquest in psychology has been through the discoveries made in brain architecture.

For many years, special studies have been prosecuted into such peculiarities, if any, as might be found in such remarkable classes as malefactors, but such a thing, before to-day, would scarcely be permitted.

Refractory criminals have defied all endeavors for their reformation, and a feeling of hopelessness pervades such portions of society as have attempted to change them for the better. The superior power exerted among the pernicious craft for their moral destruction is everywhere recognized, and the necessity is obvious for a better understanding of what constitutes the essential psychological characteristics of these individuals. The most suitable cases for such examinations constitute over half of those condemned to death.

As in the first rank for consideration, and of special importance, we may mention the difficulty of determing whether circumstances have not blunted the moral perceptions and nullified the otherwise good intent of the individual, and whether aberrations of mind leading to criminalities do not complicate and mask permanent psychological peculiarities. For the determination of these matters superior dexterity must be acquired by the investigator. Defects of structure are noted in the record of each criminal's brain, and particularly is there found deficient *development of the gyri and convolutions, thereby creating excessive width of fissures and sulci. These blemishes are very evident, and are distributed over the entire brain.* This was to be expected, *a priori*, except where the faulty tendency might become corrected or compensated for by the individual working at some trade likely to promote cerebral development. The author emphasizes as follows: "*Criminals generally have nothing analogous to monomaniacs. They* (the criminals) *tend to develop distinct peculiarities of organization and psychic features, and these peculiarities are the product of their social condition.*"

By recording carefully all minutiæ the records have been wholly cleared of epileptics and imbeciles. Any discovery of an "encephalopathic" condition would be sufficient reason to omit the case, as a complication of this kind would invalidate the deductions, and further, the previous habits of each was investigated as necessary to a full comprehension.

The notes of each case separately have an additional bare formal meaning, as we do not yet know the value of physiologico-psychological single facts in brain structure. Even the atypical brains, though grouped according to comparable defects, yield scarcely an item of information worthy of discussion, and we absolutely know nothing as to the reasons why certain brains exhibit a straightness and clearness of convolutional development while others are so defective, nor have we been able thus far to attach psychological values to either the typical or the badly developed cerebrum.

One weighty force at work in brain evolution is the race type, and its modifications. This consideration affords grounds for an endless discussion as to the primary facts and the causes of the special deviations from race-type brain-structure.

Unfortunately the material from which to draw conclusions on this score is of little value so far as investigators have published their examinations, and we may say that race differences of brain composition are comparatively unknown.

Benedikt hopes that his published notes may at least contribute a few kernels toward the enduring harvests of the future, and that theses and antitheses may result in established knowledge. The comfort he derives is, that however little one may add to our knowledge, that little holds its own, and lives to be taken into account with other facts; all tends toward clearing up our perceptions and render less defective subsequent investigations.

The preface follows, divided into parts, the first five of which detail accurately and fully the typical convolutions and fissures as described by Ecker and others. The nomenclature of Pansch was published after this book was written, hence the older terms are used, but in translating we will use the later system.

The normal type agrees with the description already given in the preceding number of this journal, under the title "Cerebral Topography." Benedikt defines the limits of the occipital lobe, a difficult and somewhat useless task. Next the cerebral covering of the cerebellum which exists in man. A retraction of the posterior part of the cerebrum leaving the cerebellum uncovered would be atypical. The sixth part of the preface depicts the confluent fissure type. This atypical form of confluent fissures is owing to a law thus recorded: "Whenever one fissure or sulcus departs from the regular order by reason of insufficient development of adjacent lobules, all other sulculi, fissures and sulci, participate in the disorder, smaller sulci being extraordinarily developed in length and breadth, often becoming confluent with each other." Radiating sulculi prolong and run into the fissures most frequently as follows:

Stárting with faulty extra development of the sulcus Rolando, there is a great tendency on the part of the sulcus parietalis to project upward a furrow toward the sulcus calloso-marginalis termination, another downwards toward the sulcus Rolando and fissura Silvii, actually joining with these principal clefts. The sulcus frontalis superior projects forwards farther upon the superior orbital extremity and backward to join with or cross the sulcus Rolando. The præcentral sulcus runs into the fissura Sylvii through the operculum (which should involve deficient development of this speech centre). Extra sulci join the Sylvian fissure with the parietal and superior temporal sulci, or the occipital extremity and the Sylvian fissure with the sulcus temporalis superior anteriorly. A sulculus becomes a sulcus in front of the gyrus supra-marginalis. On the median surface the calloso-marginal sulcus joins the occipital fissure, owing to the extra length of the rami of the sulcus collateralis, the upper branch runs into the calcarine fissure.

Then follow twenty-two "observations" of individual malefactor brains. Short histories of each precede detailed descriptions of departures from the normal type. These are finely illustrated by photographic engravings.

In the "Epilegomena," the peculiarities are grouped by hemispheres, as follows, for 38 hemispheres:

The fissura occipitalis continued into the sulcus occipitalis transversus or sulcus parietalis; 38 hemispheres examined; 27 of these were thus defective—15 rights and 12 lefts, 10 of these double-sided, half-sided, 5 rights 2 lefts.

The occipital fissure continuous with the sulcus occipitalis transversus and "Wernicke's sulcus" (at end of first temporal), 4 rights 2 lefts, continued thence into first or second temporal, 9 rights 7 lefts.

The sulcus Rolando continued into fissura Sylvii, 11 rights 13 lefts (9 brains both sided 6 one-sided and 4 faultily confluent).

The sulcus Rolando confluent with præcentral, 6 rights 7 lefts; with first frontal, 2 rights 8 lefts.

Communications between the Rolando fissure and parietal sulcus, 4 rights 7 lefts.

A third communication between the Sylvian fissure and parietal sulcus, 16 rights 12 lefts.

A confluence of Sylvian fissure with the first temporal sulcus, 12 rights 10 lefts; with the fissura orbitalis, 7 rights and 7 lefts; with the parietal sulcus, 14 rights 11 lefts.

In 38 half brains, 113 communications are noted between the Sylvian fissure and adjacent sulci.

Fissura Hippocampi with fissura occipitalis, 11 rights 8 lefts; with the collateralis, 7 rights 4 lefts; with calloso-marginalis, 1 direct, making 31 total connections with hippocampi.

Calloso-marginalis fissure with occipital fissure, 6 rights 3 lefts; with sulculi of the præcuneus gyrus, 2 rights 6 lefts.

Between fissura occipitalis and solitary sulculi of præcuneus, 4 rights 4 lefts.

Between collateralis and three temporal sulci, 3 rights 4 lefts; with calcarine, 4 rights 5 lefts, with fissura occipitalis longitudinalis inferior, 2 rights and lefts.

Six brains insufficiently covered the cerebellum. After this the author regales us with the relationship between cerebrum and cerebellum; the anthropological laws of criminal brains; the relationship of Kant's *Antinomienlehre* to these rules, the identity of the primates and mammal brains; the laws of radiating sulculi; notes on the relationship between brain and skull; measurements of brains; on criminal psychology methods.

Altogether forming a work of 151 pages, handsomely printed and embellished.

Examining page by page the "Epilegomena," we are pleased with Benedikt on many accounts, but cannot find that any addition has been made to knowledge in the direction he worked, as a philanthropist desirous of ascertaining why criminals are criminals.

In the comparisons of retrograde types, such as this study affords, with the brains of lower animals, an opportunity was lost to point out here resemblances to the ape's cerebrum, occurring especially in the confluence of the Sylvian fissure and first temporal sulcus, and the prolongation of the occipital fissure on the parietal surface by flowing into old or forming new sulci. The author takes the fox instead and ingeniously points out resemblances. Now when we consider that the crucial sulcus of the carnivora is physiologically comparable to the sulcus Rolando as determined by localization of function inquiries, these two sulci bearing no morphological or anatomical relationship to one another, the impossibility of elucidating matters in this direction is manifest. The gross retraction of the occipital lobe so as to uncover the cerebellum, noted in six cases, teaches nothing, for man is not the only animal with an overlapping cerebrum, nor is defective development here connected with peculiar psychological blemishes. This retraction could be caused by want of development in almost any part of the cerebrum, which falling forward produces this departure from type forms.

We are inclined to doubt whether a special study of criminals' brains would afford any results apart from investigations among any other class of men. Circumstances make the murderer and robber as well as would any abnormal brain development. If the latter were alone a cause of crime, then responsibility to the law would end, and every malefactor should be adjudged insane.

Lenret's engraving of the beautifully constructed brain of the rascal Fieschi compared with the unsightly retrograde brain of Asseline, the member of the Mutual Autopsy Society of Paris, who was not known to have ever committed a crime, show that some other direction must be taken by investigators to evolve any relationship between brain structure and mental traits. That such relationship exists none can doubt, but it does not seem to occur to every one that the microscope would be the proper aid to such studies. If structural connections between crime and brain-shape exist, then why not make the investigation complete and descend to cells and fibres, ganglia and peduncular tracts as well? Our deductions could be summed up thus:

1. There is no distinct criminal type of brain, any more than a criminal has nose, eyes, feet or hands peculiar to his class.

2. That if faulty convolutions or fissures are created by deficient nerve-cell development, the microscope would be the proper

instrument with which to search for the location of faults, for the starting point of abnormalities cannot be found by unassisted ocular inspection.

3. Before any psychic connection can be traced to peculiarities of brain structure, very much more than a mere outline of the supposed character of the individual must accompany the investigator's record. Heredity, disease, accidents, associations, incentives and, what is seldom if ever known, the inner life of the man, have their share of influence.

The bare record of which Benedikt speaks as pertaining to each case, so far from having no significance might become the most valuable part, if it only went far enough, *i. e.*, microscopically. Had we several thousand such bare records made by conscientious, able students, we might possibly begin to tabulate the most astounding results.

Notwithstanding the negative outcome of such work thus far, as the author says, "it will live" and help to guide other research es, and however labyrinthine an anatomico-psychological study may appear to be, when we compare it with other sciences and the advances they have made toward perfection against opposition of the fiercest kind, we may take encouragement, and such memoirs as the one before us are at least suggestive, even though they do not add to our stores of positive knowledge.

S. V. C.

SHORTER NOTICES.

I. Atlas of Skin Diseases. By Louis A. Duhring, M. D. Part VI. Philadelphia, 1879. J. B. Lippincott & Co. Chicago, Jansen, McClurg & Co.

II. A Clinical Treatise on the Diseases of the Nervous System. By M. Rosenthal. (With a preface by Prof. Charcot.) Translated from the author's revised and enlarged edition, by L. Putzel, M. D. New York, Wm. Wood & Co., 1879; 555 pages. Chicago, Jansen, McClurg & Co.

III. Lectures on Electricity in its Relations to Medicine and Surgery. By A. D. Rockwell, A. M., M. D. New York, Wm. Wood & Co., 1879. Chicago, W. T. Keener.

IV. First Lines in Therapeutics, as Based on the Modes and the Processes of Healing, as Occurring Spontaneously in Disease, and on the Modes and Processes of Dying, as resulting naturally from disease. In a series of lectures. By Alex. Harvey, M. A., M. D. (Edin.) New York, 1879, D. Appleton & Co. Chicago, Jansen, McClurg & Co.

V. INFANT FEEDING AND ITS INFLUENCE ON LIFE, OR THE CAUSES AND PREVENTION OF INFANT MORTALITY. By C. H. F. Routh, M. D., M. R. C. P. L. Third Edition. New York, 1879, Wm. Wood & Co.

VI. DISEASES OF WOMEN. By Lawson Tait, F. R. C. S. New York, Wm. Wood & Co., 1879. Second Edition. Thoroughly revised and enlarged, specially prepared for "Wood's Library."

VII. REPORTS TO THE ST. LOUIS MEDICAL SOCIETY ON YELLOW FEVER. Consisting of the report of the committee appointed to inquire into the relations of the epidemic of 1878 to the city of St. Louis, and a report on the meteorological conditions and etiology of yellow fever and of certain other diseases associated with a high temperature, and on the treatment of yellow fever. By W. Hutson Ford, A. M., M. D. Revised by the Committee of Publication: Thos. Kennard, M. D., chairman; Walter Coles, M. D., John Bryson, M. D. St. Louis, Geo. O. Rumbold & Co., 1879; 320 pages.

VIII. CONSUMPTION, AND HOW TO PREVENT IT. By Thos. J. Mays, M. D. New York, G. P. Putnam's Sons, 1879. Chicago, W. G. Holmes.

IX. HEALTH PRIMERS—THE SKIN AND ITS TROUBLES. New York, D. Appleton & Co., 1879. Chicago, Jansen, McClurg & Co.

X. A DICTIONARY OF THE GERMAN TERMS USED IN MEDICINE. By Geo. R. Cutter, M. D. New York, G. P. Putnam's Sons, 1879. Chicago, Jansen, McClurg & Co.

I. The sixth part of Duhring's Atlas of Skin Diseases, will serve to maintain the reputation acquired by its predecessors. It contains elegant and life-like colored plates of four forms of skin eruptions, syphiloderma (pustulosum), erythema nodosum, seborrhœa, eczema (papulosum). No practitioner who has to meet these troubles of the skin, and we know of none who do not meet with them, should be without access to a work of this kind, and of its whole class we know of no better work than the one before us. Indeed, in our opinion it is not only unexcelled, but excels all others in value.

II. We have already noticed Rosenthal on Nervous Diseases, both in the original German and the translation, and need say nothing additional on the points already mentioned. The publishers have in this edition presented the translation in a very convenient and much more elegant form than in their very useful dollar series. It will undoubtedly meet with favor by the profession.

III. This is a short and easily mastered treatise on Medical Electricity. It consists of eight lectures on, respectively, Electro-

Physics, Electro-Physiology, Electro-Diagnosis, Methods of Application, Apparatus, Special Electric Treatment of various Disorders, and Electro-Surgery. In an appendix is related a case of dysmenorrhœa attributed to spasm of the os uteri and relieved by electrical treatment. There is nothing especially new or valuable in the work, it is however conveniently brief and eminently practical. It will doubtless be of service to such as may become its possessors.

IV. The title of this work gives some idea of its contents and method. The author has endeavored to explain, to some extent, the general physiological and pathological principles that must underlie all therapeutics ; to make, in short, an introduction in these lectures to rational procedures of treatment. That such an introduction is needed or, at least may be useful, is hard to deny; the irregular and unscientific method of teaching therapeutics in too general usage, is not encouraging or helpful to the honest student, and is to blame, in our opinion, for much of irregular vagaries of practitioners and so-called schools of practice. Even so unscientific a system as homeopathy, we think, owes much of its support to its pretense of system and its so-called laws of cure. If the ideas of this work could be inculcated amongst the general public as well as amongst the medical profession, it would be a decidedly good thing. It is one of a class of general medical works that it is profitable for a physician to read, and we recommend our readers to form their opinions from the volume itself, taking what we have said only as an incentive to its careful examination.

V., VI. These are the two latest volumes of Wood's Dollar Library of Medical Works, and they keep up the reputation of the series as cheap, practical contributions to the medical literature of this country. Though the first publication of these works in America, they are not absolutely new. The fact that they have passed through two and three editions respectively in Great Britain, speaks well for their value. Dr. Routh's work is especially likely to be of use, as we know of no other that covers the same ground in the same compass. It is a clearly written, practical and sensible book adapted to this longitude and latitude, though bearing numerous marks of having been especially written for Great Britain.

VII. The importance of any real addition to our scientific knowledge of yellow fever, should make this report welcome to the profession, and the value of the data it contains, especially in regard to the etiology of certain diseases and their relations to meteorological conditions, will be readily appreciated by the reader. It is a monograph of the disease, as it appeared in St. Louis in 1878; the facts are compiled with great care and ably discussed. As a work of reference on a very important subject, it is a valuable contribution.

VIII. The fact shown by statistics that in this, as well as in other northern countries, consumption is the most fatal of diseases, and the other idea argued out by this little volume, that it can to a great extent be prevented, are an ample excuse for its publication. We can best give the author's ideas by quoting his general conclusion. He says: "In summing up the considerations in the preceding pages, I think it appears conclusive that consumption, or the tendency to it which exists in many individuals, is essentially a premature dissipation of the force and matter of the body, and that improper food, bad air, deprivation of sunlight, poor clothing, want of physical exercise, disease, imperfect digestion, all accelerate this process of waste. Therefore in all our efforts at prevention the path of duty lies straight before us, and consists in conserving these two elements of the body by laying a good foundation in infancy, by preserving the organs of digestion, by eating an abundance of rich and nutritious food, such as fat, butter, meat, milk, eggs, etc., by breathing pure air, by living on dry soil, by wearing warm and comfortable clothing, by taking plenty of physical exercise, and by avoiding disease and injurious occupations."

The work is intended for the lay public, as will be seen by the above quotations, and ought to be very useful if it can induce healthier modes of living in those for whom it is intended.

IX. This is much like the preceding, a little popular handbook of special hygiene. Instead, however, of treating of a single important disease, it covers briefly, yet usefully, a very extensive field. As an exceedingly brief manual of hygiene of the skin, it is well adapted to be put in the hands of every one, and nearly every one of the laity could profit by its perusal. The remarks on arnica and some other popular applications are good, and we only wish that various other remedies and nostrums extensively advertised and employed in this country had also been mentioned.

X. A work like this has long been a desideratum. The variance between the technical medical language of the Germans and that of the French and English is extreme, and this fact, with the German practice of compounding words, renders their medical treatises often almost unintelligible to the American reader with only an ordinary school knowledge of German. On examination, such as we have been able to give it, this work seems quite full and complete, though, from the nature of the German language with its agglutinative character, it is impossible that it should be absolutely so. The volume will be almost indispensable to the student of German medical literature. This class ought to be large enough to make the publication exceedingly profitable.

Editorial Department.

THE CURABILITY OF INSANITY.

IN his last two or three annual reports of the Northampton Asylum, Dr. Pliny Earle has devoted more or less space to the curability of insanity, analyzing and comparing the statistics of American Hospitals for the insane, deducing from these analyses the conclusion that the number of recoveries reported far exceeds the number of persons recovered, and hence that permanent recovery, free from the liability to relapse, may from these statistics be almost considered the exception rather than the rule.

In the current number of the *Alienist and Neurologist*, the new psychiatric journal published in St. Louis by Dr. Hughes, which has just come to hand, there are two papers by Dr. Earle. In the first of these a table which has adorned asylum reports and furnished a basis for arguments in favor of the present style of asylum treatment, is mercilessly analyzed. The wonder is that this was never done before, and that its illogical assumptions, pointed out by Dr. Earle, have ever carried any weight.

He traces up the subsequent history of its twenty-five selected cases of insanity subjected to early treatment and discharged as recovered, and finds that nine of these have died insane, one other died sane after repeated attacks, two died only a short time after their discharge. Two others died long enough after discharge to justify the judgment that their recovery was definite. Of the eleven still living, only three can be called altogether of sound mind, and one of these has been insane since his discharge. This is certainly a sufficiently bad showing for asylums as hospitals for the *cure* of mental disease. But in his second paper, which is written in reply to some strictures by Dr. Isaac Ray, Dr. Earle takes up more general statistics that fully bear out his former assertions. We cannot do better than reproduce his conclusions and their proofs as they are summed up at the close of the article. They are as follows:

1. The reported recoveries from insanity are increased to an important extent by repeated recoveries from the periodical or recurrent form of the disease in the same person.

Many proofs of this are given in the pamphlet entitled "The Curability of Insanity," but here as a matter of convenience, we will take the cases which have just been adduced for the purpose of relieving Dr. Ray from a doubt.

At	the	Frankford Asylum	5	persons	recovered	52	times.
"	"	Hartford Retreat	5	"	"	54	"
"	"	Bloomingdale Asylum	10	"	"	122	"
"	"	Worcester Hospital	10	"	"	136	"
"	"	Concord Asylum	10	"	"	120	"

Consequently the 40 persons recovered 484 times.

The number of recoveries is more than *twelve* times as large as the number of *persons* that recovered.

2. The recoveries of *persons* are much less numerous than the recoveries of *patients* or *cases.*

Proved by the same statistics as conclusion No. 1: The number of *persons* is *less than one-twelfth* of the number of *recoveries*—each recovery, of course, representing a *patient* or a *case.*

3. From the number of reported recoveries of *cases* or *patients,* it is generally impossible to ascertain the number of persons who recovered.

Proved likewise by the same statistics: The 484 recoveries were published merely *as* recoveries, without any explanation. Consequently, no reader of them could tell how many *persons* furnished those recoveries. The natural inference was that there were 484, whereas there were but 40.

4. The number of reported recoveries is influenced, sometimes largely, by the temperament of the reporter, each man having his own standard, or criterion of insanity.

This conclusion is not susceptible of absolute proof, but it is a legitimate inference from the known diversity of organization, temperament, and mental character among men. There are, however, two instances, at least, in which statistics appear to warrant the conclusions:

(*a*) There was a change of superintendents at the Worcester Hospital in the official year 1871–72. In the three next *preceding* official years, under the old superintendent, the reported recoveries were equal to 43.32 per cent. of the admissions; whereas, in the three next *succeeding* official years, under the new superintendent, the reported recoveries were only 22.16 per cent. of the admissions. The reported proportion of recoveries in the first three years, was very nearly *twice as large* as in the last three years. There is no conceivable and plausible cause for this difference, other than that mentioned in the conclusion.

(*b*) At the McLean Asylum there was a change of superintendents in March, 1871. During the next *preceding* seven years (1864 to 1870 inclusive), the proportion of reported recoveries equaled 44.19 per cent. of the admissions; but in the *succeeding* seven years (1871 to 1877 inclusive), that proportion was only 19.94 per cent. The proportion of the reported recoveries in the first period was *more than* twice as large as it was in the second period, or as 221 to 100.

5. The large proportion of recoveries formerly reported was (a) *often* based upon the number of patients *discharged*, instead of the number *admitted;* and (b) *generally* upon the results in a number of cases too small to entitle the deduction therefrom of a general formula of scientific truth; and (c) those proportions were evidently increased by that zeal and (for want of a better word) rivalry which frequently characterize the earlier periods of a great philanthropic enterprise.

(a) At a large proportion of the American hospitals forty years ago, the ratio of recoveries was calculated on the number of patients discharged.

(b) The most widely known of all remarkable percentages of recoveries of cases of recent insanity, those of the Hartford Retreat, in 1827, were based upon only twenty-three cases, of which twenty-two recovered; and one of the others, that of the Williamsburg, Virginia, Asylum, in 1842, upon only thirteen cases, of which twelve recovered.

(c) There are various evidences of the existence of that zeal and rivalry in the earlier history of the hospitals, which need not be mentioned here.

6. The assumed curability of insanity, as represented by those proportions, has not only not been sustained, but has been practically disproved by subsequent and more extensive experience.

The assumption was that from 75 to 90 per cent. of the recent cases of insanity could be cured. The conclusion is proved by many statistics, but most especially by those of the Frankford Asylum, based upon the treatment of 1,061 *cases*, treated in the course of about thirty-nine years. Only 65.69 per cent. of these *cases* recovered. But so many of these were the repeated recoveries, on re-admission of the same persons, that the percentage of *persons* who recovered was only 58.35. Many of these were not *permanent* recoveries. The actual proportion of persons who, after one recovery were never re-admitted, was only 48.39 per cent.

7. The reported proportion of recoveries of all cases received at the institutions for the insane, has been constantly diminishing during a period of from twenty to fifty years.

This conclusion is derived *solely* from the results of the table on page 45 of the pamphlet on "The Curability of Insanity." In that table it is shown that, at twenty American hospitals, the average diminution of reported recoveries, in an average period of about twenty-five years, was from 46.08 to 34.26 per cent. of the admissions. So that "for every hundred that recovered, on an average of twenty-five years ago, only a fraction over seventy-four (74.34) recovered."

These conclusions it will probably be remembered, were first published in the paper to which exceptions were taken by Dr. Ray, but the comments in reply appear for the first time in the paper we have quoted.

We cannot do better, perhaps, than leave Dr. Earle's statements to speak for themselves. They certainly have every appearance of being well founded, and it cannot be objected to them, that they are the result of a study of the subject by one who has not "lived among the insane." Such discussions lead the way to a wider recognition of the fact, that different provision should be made for the majority of cases, since it turns out that they are incurable by any means which may be adopted. We have been more than pleased by the plain and vigorous papers of Dr. Earle, on the Curability of Insanity.

The first number of the *Alienist and Neurologist*, the new journal announced some time since, by Dr. Hughes, of St. Louis, reaches us as we go to press. It contains articles by Drs. Hughes, Curwen, Beard, Pliny Earle, McLane Hamilton and Stevens, a translation from the *Rivista Sperimentale*, of Maragliano and Seppili's article on Cerebral Thermometry, by Dr. Joseph Workman, and various abstracts and selections, altogether, with an editorial department, making a number of one hundred and twenty-five pages. There are no reviews or book notices in this issue.

The editor in his introductory, promises to make his journal especially practical in its character, and as regards the subjects of mental disorders, to favor more the views "of those who, fulfilling the injunction of the great Esquirol, have lived with the insane, and by long personal familiarity with their maladies have learned the most that is thus far knowable of them," than those, we suppose, who have not held official asylum positions. We take for granted, therefore, that in all questions of lunacy reform, the views of the American Association of Su perintendents will be in the main upheld in this new periodical. While we shall probably find abundant occasion to differ with Dr. Hughes on qnestions that may arise, we must, nevertheless, take this opportunity to congratulate him on the evident merit and good appearance of his journal.

We have also received the first number of the *Archives of Comparative Medicine and Surgery*, edited by our esteemed contributor, Dr. E. C. Spitzka. It is a quarterly journal of scientific veterinary medicine, but of a class and character that raises it above being the mere organ of the practitioners on the lower animals, and places it well up among the scientific periodicals of the country. It will be none the less, but the more useful to veterinary practitioners from this fact. Dr. Spitzka is well qualified for the task he has assigned himself, and we wish his enterprise its deserved success.

Periscope.

a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

Cerebral Anatomy.—At the meeting of the N. Y. Academy of Medicine, Oct. 16 (rep. in *N. Y. Med. Record*, Nov. 1), Dr. J. C. Dalton read a lecture on Cerebral Anatomy, with special reference to the corpus striatum. We believe that the same, in substance, was also read by Dr. Dalton at a recent meeting of the National Academy of Sciences, at Washington. The lecture and the discussion that followed are thus reported in the *Record:*

The anatomy of the brain, said Dr. Dalton, is complicated in its details, but simple in its general structure. It consists of grey and white matter. The grey matter is arranged in two separate divisions, occupying two separate localities: 1. Exterior, convolutions; 2. Interior, cerebral ganglia, the corpus striatum, and the optic thalamus. The white matter is a continuation of the longitudinal columns of the spinal cord. The ascending fibres of white substance were then traced through the medulla, the pons varolii, crura cerebri, internal capsule, and to the fan-shaped expansion, the corona radiata. In the cerebro-spinal system, counting from without inward, there are three distinct deposits of grey matter: 1. The grey matter of the spinal cord; 2. The grey matter of the cerebral ganglia; and 3. The grey matter of the convolutions.

The doctrines now in vogue—even the recent views of Meynert and others, when divested of superfluous nomenclature—regarding the anatomy of the brain, were based upon the general view of three successive deposits of grey matter, connected with each other by three successive sets of white fibres. Of these three deposits of grey matter, the middle consists of the large cerebral ganglia, both of which occupy about the same level.

Dr. Dalton then referred to differences between the corpus striatum and the optic thalamus—the latter, on section, presenting a rather uniform grey tint, and the former showing white fibres arranged in bundles visible to the naked eye, and giving it a striated appearance. The corpus striatum was made up of two distinct parts: 1. Anteriorly, the intra-ventricular portion, or caudate nucleus; and 2. Posteriorly, the extra-ventricular portion, or lenticular nucleus. The optic thalamus was a single ganglion by itself. Of late it had become quite customary to restrict the term, corpus striatum, to its intra-ventricular portion.

He then alluded to the situation of these masses of grey matter with relation to the internal capsule and the crura cerebri, and passed to the consideration of the internal capsule. It could not be seen that the internal capsule was composed throughout of fibres which run continuously from the medulla oblongata below to the convolutions above, but, on the contrary, there was a strong conviction that they were not the same fibres, and that in the passage from below upward there was an interchange of fibres, in the cerebral ganglia, not visible to the naked eye. In a physiological point of view there was no doubt that it was the channel of conduction between the hemispheres and the spinal cord.

Dr. Dalton then passed to the consideration of certain general and specific differences between the human brain and the brains of animals. The general difference consisted in the greater development of cortical substance. The specific differences were two: first, the fissure Sylvius was double in the human subject, consisting, 1, of a posterior branch, which was simply an elongation of the Sylvian fissure, as seen in the brain of the fox; and 2, an anterior branch; and between the two there was a triangular mass which was known as the *operculum*, and below them a group of convolutions known as the island of Reil. He then directed attention to the formation of the fissure of Rolando, which was simply a dividing line between the descending and ascending portion of a curve the convolutions made in addition to the double curve formed on the convexity of the hemisphere; to the cuneus, the precuneus, and the paracentral lobule; to the gyrus fornicatus; and then spoke of the special anatomy of the corpus striatum, which was usually described as a grey mass having an enlarged club-shaped extremity, directed forward and occupying the anterior horn of the lateral ventricle, and a cylindrical tail-like prolongation directed backward, and running along the outer edge of the lateral ventricle, and terminating somewhere about the posterior end of the optic thalamus. In reality it was much more extensive than that. In fact, the extent of the corpus striatum was almost that of a complete ring encircling the crus cerebri and internal capsule, exactly as did the gyrus fornicatus. That arrangement could sometimes be seen simply by opening the lateral ventricle throughout its entire extent. It had enlargements in its course, and was more or less interrupted by oblique fibres, which came from the tænia semicircularis.

The anterior extremity of the corpus was connected with the grey matter of the convolutions at the base of the brain, just in front of the Sylvian fissure; and in a similar way the end of its curved portion was connected with the grey matter at the inferior extremity of the posterior horn of the lateral ventricle, with the amygdala just underneath the lenticular nucleus. In the smaller portion of the corpus striatum the striations were lost. The corpora striata were masses which correspond in structure exactly with the remainder of the hemispheres.

In the discussion that followed, Dr. E. C. Seguin directed attention to two points: 1. The great importance of clearly separating the nucleus caudatus from the nucleus lenticularis. They were almost completely separated anatomically, and the functions of the two parts were distinct. The nucleus caudatus had a more intimate connection with the motor tract than had the nucleus lenticularis.

2. The importance of understanding the true relations of the internal capsule. If any fact had been demonstrated by the help of pathological anatomy. it was that there was a continuous connection, by means of the white matter, between the cortex of the brain and the spinal cord. It was

interesting to notice the growth of opinion relative to the physiological importance of the internal capsule, the nucleus caudatus, and the nucleus lenticularis. There were competent observers who doubted whether hemorrhage into the lenticular nucleus was a cause of hemiplegia. Charcot was of the opinion that the hemiplegia was produced by the pressure exerted upon the internal capsule. If the lesion destroyed the anterior portion of the internal capsule, motor disturbances followed; if the lesion was in the posterior portion, sometimes distinct motor symptoms were developed, but most prominently sensory disturbances upon the opposite side.

Dr. E. G. Janeway referred to a case which threw doubt upon the belief that destruction of the posterior part of the internal capsule always produced hemianæsthesia. In a case of hemiplegia the leg almost entirely recovered, the arm remained a trifle stiff, but possessed considerable power, and there was no anæsthesia. The patient died a year and a half afterward, and it was found that the lesion involved the entire posterior two-fifths of the caudate nucleus, all the internal capsule between it and the lenticular nucleus, besides producing well-marked atrophy of the lenticular nucleus and anterior part of the optic thalamus. With reference to effects produced by lesion in the lenticular nucleus, he referred to a case in which a tumor was limited to that region, was not capable of producing much pressure on surrounding parts, and yet the symptom was simply aphasia with a certain kind of dizziness having no special significance. He had also seen a case in which the lenticular nucleus was the site of an old cyst, which produced persistent aphasia. How explain the aphasia?

Dr. Wm. H. Welch said that the valuable contribution of Dr. Dalton to the anatomy of the corpus striatum proved that there was still room for work in the topographical anatomy of the brain. The statement of Dr. Dalton, concerning the termination of fibres of the internal capsule in the basal ganglia, needed modification, since the researches of Flechsig had shown that the fibres which convey voluntary motor impulses from the central convolutions passed through the posterior third of the internal capsule, without terminating in the caudate or the lenticular nucleus. This discovery was in opposition to Meynert's theory of the three projection systems. Dr. Janeway's case of absence of anæsthesia with a lesion of the posterior part of the internal capsule, was rather in accord with Flechsig's views than with those of Charcot, who placed the motor fibres in the anterior two-thirds of the internal capsule.

Notwithstanding Meynert's brilliant investigations, the purely anatomical methods, while they taught us the topography of the brain, had given us very little certain information concerning its inner achitecture—that is, the course pursued by nerve fibres and the connections between the different nerve centres. For a knowledge of these most important relations we were to look also, in the future, to embryology, comparative anatomy, pathology and experimental physiology. Flechsig's embryological researches and the experiments of Gudden on young rabbits were referred to. Comparative anatomy might be expected to give important information, after the homologies between the different parts of the brain of man and those of the lower animals had been more clearly determined than was yet the case. But caution was requisite as regards applying directly to man the observations made on the nervous system of the lower animals, since it had been shown that the pyramidal fibres, for instance, occupy very different parts of the spinal cord in different animals. As a basis for the study of the localization and of the connections of nerve centres and of nerve fibres, an accurate topographical anatomy of the brain was indispensable.

Dr. W. A. Hammond, on invitation, remarked that it was held by neurologists in general that lesion in the optic thalamus was followed by temporary paralysis upon the opposite side, and hemianæsthesia; that a lesion confined to the intra-ventricular nucleus gave rise to transient hemiplegia upon the opposite side, with derangement of sensibility; that a lesion involving the extra-ventricular nucleus also produced transient hemiplegia upon the opposite side; that a lesion involving the anterior portion of the internal capsule produced permanent hemiplegia upon the opposite side, much more so than lesion involving either the corpus striatum or optic thalamus; that a lesion involving the posterior two-thirds of the internal capsule produced permanent paralysis, hemianæsthesia, and permanent contraction of the muscles. He thought that when contractions of the muscles came on later, they were not cerebral in origin, but depended upon secondary degeneration of the spinal cord.

Dr. Dalton replied to Dr. Welch, who thought that we should look for the most permanent advancement in our knowledge of the brain in pathological observations and physiological experiment, because so little real information had been obtained by purely anatomical investigations, and did so with the greatest respect for his opinion, by entering a protest against his view, for the reason that too much had already been done in that direction. For example, a section is made directly through certain nerve fibres, and certain effects are produced upon distant parts, and immediately we deduce anatomical facts from physiological experiment—a method of reasoning which he believed was entirely wrong. The same was true with regard to pathology. For example, a tumor in a certain portion of the brain is associated with symptoms produced in a certain part of the body, but it was impossible to say that nerve-fibres extended from the first place to the second. He thought one of the faults that had been committed was conducting purely anatomical investigations of the brain by means of physiological experiments and pathological observations. Both had their distinct values.

Dr. E. C. Spitzka, on invitation, spoke of the development of the corpus striatum in the lower animals, and also in man, and said that he had found the portion most posterior to be composed more of neuroglia and atrophic elements than of real ganglion tissue. With regard to Dr. Dalton's interpretation of the amygdala, he thought it would bear further investigation. He also thought that the results obtained by Flechsig, referred to by Dr. Welch, had been over-rated, for F. had so confounded anatomical parts that his opinion could be regarded as one not having very great value. He then spoke regarding the striated appearance of the corpus striatum and the arrangement of the convolutions.

Dr. Welch remarked that he placed physiological experiments as the least valuable of those mentioned, as a means of research. He thought, however, that experimental physiology and pathology had been of no slight service, inasmuch as they had taught us the location of psycho-motor and psycho-sensory centres in the cerebral cortex, and the course of certain groups of important nerve fibres in the brain and the spinal cord.

The Academy then adjourned.

Visual Sphere of the Cerebral Cortex.—Further communications on the above subject were made by Munk, in the Berlin Physiol. Soc. (July 4, 1879, *Arch. f. Phys.*, Heft 5 and 6, p. 581, 1879). He had previously discovered that the extirpation of a cortical fragment near the upper and posterior apex of the occipital lobe destroys in the dog the remembrance of visual impressions as far as the eye of the opposite side is concerned. The animal sees, but does not understand what it sees. From this state of blindness the animal can recover by practice. Further destruction of the cortex around this "visual centre" renders the blindness permanent.

In the monkey the same results could be obtained, with this difference, that each cortical centre is connected with one-half of both retinæ. Hence hemiopia is produced by destruction of the centre, the retinal halves on the side of the lesion failing to perceive.

But in the dog, the optic decussation is also not complete, as Gudden has shown anatomically, while the experiments of Nicati and others have confirmed this point.

Munk therefore wished to learn how in this animal, the retina is connected with the hemisphere of the same side. For this purpose he extirpated the complete cortical visual sphere of the *left* side in many dogs, observing the following results in a number surviving, during weeks and months. After the surgical fever has passed off, the dog appears almost normal. His movements and senses, except sight, are perfect. But he turns more readily to the left than towards the right side. If the right eye is closed he sees apparently well with the left. But if the left eye be covered, the dog will not move spontaneously, but if forced to walk he protrudes the head, advances carefully, turns often towards the left and strikes against obstacles on the right side.

This blindness improves slightly in the course of some weeks. On taking greater care in the examination, Munk learned that the extreme right portion of the right retina was still sensible, that the animal could hence see objects in the corresponding part of the field of vision, *i. e.*, when placed on the left side of the head. But though that portion of the retina could still see, the animal recognized objects but imperfectly with it. This faculty, however, improved by practice. The corresponding extreme left portion of the left retina was absolutely blind. Hence the conclusion, that in the dog each hemisphere is connected with the greater (median) half of the other retina, and the corresponding lesser (lateral) portion of the retina of the same side.

Partial extirpations in the region of the visual centre showed that the different regions of the retinæ are represented by distinct and corresponding cortical localities. The extreme lateral portion of each retina connects with the lateral part of the cortical visual sphere of the same side. The remaining large median half of each retina is united to the balance of the cortical centre in the opposite hemisphere, in such a manner that the lateral border of the retina corresponds to the lateral border of the cortical centre, while the median retinal end belongs to the median part of the cortical spheres.

The upper and lower borders of the retinal expansion are similarly represented by the anterior and posterior ends of the cortical centre. The middle portion of the cortical centre—the destruction of which causes the greatest visual impairment comparatively—corresponds to the point of acutest vision of the opposite retina, the homologue of the human fovea centralis, which in the dog is situated about 30° laterally from the retinal centre. H. G.

CHANGES OF MUSCLE-IRRITABILITY DEPENDENT ON THE BLOOD SUPPLY. —In an article of somewhat ill-proportioned length, the following experimental results are given by Dr. J. Schmulewitsch (*Arch. f. Physiol.*, 1879, Heft 5 and 6, p. 479).

Ligature of the aorta or crural artery increases slightly but positively the irritability of the muscles of the leg (rabbit) as tested with the induced current. The removal of the ligature and return of the blood supply diminishes the irritability again slightly below the standard of the normal leg. The author does of course not deny that the muscle ultimately dies if deprived of blood;—his statements refer only to the immediate result. This influence of anæmia upon the muscle-irritability is manifested also, in case the motor nerve had previously been divided. It is hence not due to any action of the spinal cord.

A transitory increase of the direct muscle irritability is also caused by section of the motor nerve. This effect is due also to anæmia caused by the temporary state of excitation of the vaso-constrictor fibres contained in the motor trunk. Hence no further rise of irritability of the nerve-section occurs if the aorta is left ligated during the experiment. This view is further corroborated by the fact that section of the motor nerve is of effect upon the irritability of the muscle, even though the animal be curarized, provided the dose is too small to paralyze the vaso-motor fibres. H. G.

MOVEMENTS OF THE DIAPHRAGM.—Important researches on this topic were communicated by Kronecker and Marckwald to the Berlin Physiol. Soc. (July 25, 1879, *Arch. f. Phys.*, Heft 5 and 6, p. 592).

According to a previous statement of Budge, rabbits can survive the division of both phrenic nerves. This applies only to animals above several months in age. Young ones die at once from asphyxia. The section of these nerves increases the duration of the respiratory movements, while the abdominal movements of course cease.

The nature of the diaphragmatic movement was investigated by a registering lever, perforating the abdominal wall and resting against the diaphragm. It was thus found that irritation of the divided phrenic nerve by means of a single induction shock caused a muscular contraction lasting from 0.125 to 0.3 sec. (0.5 in the fatigued muscle). This is but ⅛ to ¼ of the duration of a normal diaphragmatic contraction. Hence the normal respiratory movements do not consist of single contractions, but are tetanic in nature.

After destruction of the medulla oblongata an artificial satisfactory respiration could be maintained by rhythmic faradic stimulation of the phrenic nerves. To produce a perfect diaphragmatic tetanus, about 20 shocks per second were required.

In order to study the physiological mode of activity of the phrenic nerves as produced by the respiratory centre, the authors severed the medulla from the pons in such a manner that the natural breathing was not impaired. It was then found that a single induction shock passed through the upper part of the medulla, could reinforce the diaphragmatic movement if it coincided with the inspiratory effort. If the stimulating shock occurred during the expiratory period, it caused an extra (premature or supernumerary) inspiration.

But *during the apnœa produced by violent artificial ventilation of the animal, the electric stimulation of the medulla remained without effect.* If, on the other hand, the line of division of the medulla was so low, that normal breathing was impaired, a satisfactory respiration could be maintained *in a reflex manner* by rhythmic stimulation of the medulla. Similar results were obtained by stimulating the central ends of both vagi nerves instead of the medulla itself. H. G.

Medullated and Non-Medullated Nerves.—Some new physiological and anatomical points are communicated by Kühne and Steiner in *Untersuchungen aus dem Physiol. Institut*, Heidelberg, 1879, p. 163.

The non-medullated nerve examined was the olfactory nerve of the pike. On this object the laws of animal electricity could be demonstrated (for the first time) as well as on the usual medullated nerves. The current derived from the surface and cross-section of the divided nerve is even considerably stronger, than the corresponding current furnished by a frog's sciatic of the same size. The authors hence conclude from this inequality of the electro-motor activity, that the current is furnished only by the axis cylinders and not by the myeline. The negative variation could also be demonstrated, but, as is also the case with medullated nerves, a nerve muscle preparation could not be excited by the negative variation of the nerve current. Finally, the authors describe a new sheath of medullated nerve-fibres.

The sciatic nerve (of the frog) is violently teased with needles in a 0.1 to 0.2 per ct. solution of osmic acid. As the result of this, the axis cylinders swell to about six times their thickness. In this swollen state they present a distinct but delicate membrane inside of the internal horn sheath. Chromic acid or bichromate of ammonia could now be used to cause some shrinkage of the swollen fibres, whereupon this sheath became more distinct. The sheath is destroyed by a solution of HKO of 1 to 5 per cent. in strength. The authors propose to call it the *axolemma*. It is probably identical with the colorless seam surrounding the intra-muscular nerve terminations after staining with gold. On the fibrillæ of the non-medullated olfactory nerve (pike) nothing similar could be found.

PHYSIOLOGY OF NERVE AND MUSCLE.—Sundry communications on this subject are made by Messrs. E. Bleuler and R Lehman in *Pflüger's Archiv* (Bd. XX., Heft 6 and 7, p. 354), according to experiments performed in the Zurich Laboratory.

In the first place the authors repeated some old experiments of Schiff's, according to which, section of one or both hypoglossal nerves causes the appearance of fibrillary contractions in the tongue. Schiff claimed that this irregular twitching could be stopped by irritation of the lingual nerve, until about the end of the second week, at which time the lingual itself acquires a motor influence upon the tongue.

In the authors' researches these muscular twitchings commenced about seventy hours after the nerve sections, and continued until the divided hypoglossal was regenerated. They could not find any inhibitory influence whatever of the lingual nerve in rabbits. After a lapse of about seven days, during which period the latter nerve is inactive, it gains its motor influence, and now its stimulation increases and regularizes the movements of the tongue. But in a single experiment on the dog, the inhibitory influence was evident; Schiff, indeed, experimented only upon dogs. The fibrillary movements were checked by a tetanizing induced current, but reinforced by a strong constant circuit.

Schiff claimed that this twitching was kept up by the stimulus of the blood. The authors, however, modify this statement to the effect, that the blood is simply necessary in order to maintain the contractility for any length of time, while it does not act itself as stimulus.

In a second paragraph, Bleuler and Lehman refer to a notice by Helmholtz, according to which both the latent period and the active duration of a muscular contraction are prolonged by cooling the motor nerve above the place where it is stimulated. This they deny absolutely on the strength of their own experiments.

Finally, the authors cite their researches on the time of survival of muscles after death of the animal (frog). Munk claimed lately, that muscles die sooner the longer the portion of motor nerve is left in connection with the muscle. This statement the authors cannot corroborate, since they found no influence whatever exerted by the nerve. As an explanation of this mistake by Munk, they observed that different, even symmetrical muscles, die at very different periods of time. H. G.

THE TRANSFER OF SENSIBILITY.—Among the numerous papers read before the Sixth International Congress of Medical Science, held in Amsterdam, during the week of September 7, and reported by the *British Medical Journal*, September 27, was one by Prof. Eulenburg, of Greifswald, called "Researches on the Transfer of Sensibility." The question asked, was: Do the agents which modify to a certain point (either by increasing or lessening it) the sensibility of the cutaneous region of either half of the body, produce consecutively the same disturbance in a corresponding spot of the opposite half of the body? The author then proceeded to give an account of the agents which have appeared to him the most capable of modifying the sensibility of the skin. The following were the proceedings employed to increase the local sensibility: Cutaneous faradization (along the dorsal part of the right forearm till a circumscribed redness was produced); or mustard poultices prepared especially for this purpose by Aebler and Rumpf. The latter agent seems to be less reliable and to act less rapidly. For the purpose of diminishing the local sensibility, the author has used Richardson's method, which consists in irrigating the part with pure ether or "compound fluid," by means of a pulverizer. The effects of the proceeding were heightened by combining it with Zesamendi's modification (a superficial incision of the epidermis after irrigating the spot for about two minutes). In a very short time, a circumscribed ischæmia is produced, with loss of sensibility.

M. Eulenburg has measured in all his experiments: *a.*, the perception of space (Raumsinn) of the skin, by means of Sieveking's æsthesiometer; *b.*, the faradic sensibility, by testing the minimum of sensibility with volta-faradic currents, according to Munk and Leyden's method. The following are the results obtained from the experiments made on ten persons (medical students):

1. The faradic stimulation of the skin produces an increase in the sense of space and in the electric sensibility of the stimulated part; simultaneously a decrease takes place in both these classes of cutaneous sensibility in the corresponding part of the body. These alterations migrate from one part to the other; in some cases, there is even a period of oscillations following the initial decrease in the corresponding part, during which the faradic sensibility seems to be increased. The normal condition is restored in both parts almost simultaneously.

2. Local hyperæsthesia (decrease, in the "perception of space," and in the faradic sensibility) that is caused by the ether spray is constantly accompanied by a considerable increase in sensibility in the symmetric spot. The oscillations are absent in most of the cases, but the decrease is much more sharply defined than the increase in the opposed region. These experiences prove that transfer is a physiological fact which is simply exaggerated in pathological cases. Perhaps the cutaneous sensibility belongs to the bilateral symmetrical functions (similar to the secretion of sweat). The application of certain metals, or the approach of a magnet, would suffice to produce centripetal effects (functional alterations) in the regulating centres of this symmetric action.

THE EXPRESSION OF GRIEF.—This has recently been a subject of investigation by the eminent Italian physiologist, M. Paolo Mantegazza, who has studied with great care all the contractions which suffering produces in the human face, and endeavored to arrive at an exact distinction of the phenomena of real from those of simulated sorrow. All the forms of dolorous hypocrisy he exposes mercilessly. The following, according to M. Mantegazza, are signs of feigned grief: 1. The expression is nearly always exaggerated relatively to the cause of the grief; 2. The visage is not pale, and the muscular disturbance intermittent; 3. The skin has its normal heat; 4. There is not harmony in the mimicry of grief, and one sees certain contractions, certain relaxations which are wholly wanting in real grief; 5. The pulse is frequent, in consequence of the exaggerated muscular movement; 6 A surprise, or any object which vividly attract the attention, suffices to make the tragic mask immediately fall off; 7. Sometimes one succeeds in discovering among the tears, the sobs, and the most heart-rending lamentations, the presence of a chuckle, which expresses, perhaps, the malignant pleasure of practising a deception; 8. The expression is very eccentric, or is wholly wanting in concentric forms.—*Med. and Surg. Reporter*, Nov. 15, 1879.

THE NERVES OF THE CORNEA.—At a session of the Soc. de Biologie, in May last (rep. *in Le Progrès Médical*), M. Ranvier read a paper on the nervous terminations in the cornea, of which the following are the conclusions:

1. The nutrition of the cornea continues to be regularly carried on, after cutting all its nerves. There are, therefore, no trophic nerves in the cornea.
2. The nerve fibres form a plexus, and not a net-work in the cornea.
3. The plexiform appearance of the nerves of the cornea is in relation with the transparency of the organ.
4. The corneal nerves are nerves of general sensibility.

PATHS OF CONDUCTION OF SENSORY AND MOTOR IMPULSES IN THE CORD.—Drs. Isaac Ott and R. M. Smith publish, *Am. Jour. Med. Sci.*, Oct., 1879, an account of their experimental investigations on this subject. They employed rabbits for their experiments, using Woroschiloff's instrument for the spinal sections, and testing the sensibility and voluntary motor power of the different limbs, after sufficient time had elapsed for the effects of shock to pass off. After testing motion by irritating the ears, and sensibility by irritating the limbs with electric currents or a hot wire, and observing the movements of the head, the animal was killed and the cord prepared and mounted for microscopic examination. Thirty experiments, in all, were performed, and the sections, with one or two exceptions, were made above the origins of the nerves going to the anterior extremities. Artificial respiration was employed to keep the animals alive. After detailing their experiments, the authors say: "From these experiments it is seen that after hemisection of the cord sensation is present in all parts behind the section. When the division is made under the fourth cervical vertebra, hyperæsthesia occurs on the opposite side, and not on the side of section, as claimed by Schiff, Brown-Sequard, etc., while, when the division is practised under the second cervical vertebra, it appears on both sides, but more marked on side of section. After hemisection, motor power is reduced in both posterior extremities, more marked on the side of section, and, when the division is made under the fourth cervical vertebra, the fore limb on that side is paralyzed, since the section destroys the portion of the cord from which part of the nerves to the anterior extremity arise. The pupil is contracted on the side of section, and there is vaso-motor paralysis of the ear and weakened respiration on the same side.

When all except one lateral column is divided, the ear on that side of section is most sensitive; there is vaso-motor paralysis of ear and contracted pupil on same side. Hyperæsthesia occurs in the posterior extremities on the side of section, with diminished sensibility on the opposite side; motor power is diminished in all the limbs, though there is a more marked loss on the side of section; respiration is arrested on the side of section.

It may be concluded, therefore, that there is a partial crossing of both sensory and motor fibres in the cervical portion of the cord in the rabbit, and there is a greater decussation of sensory fibres than of motor.

The section of a lateral column was followed by hyperæsthesia on that side, thus agreeing with the statement of Woroschiloff, that fibres administering hyperæsthesia run in that column.

From thirty experiments on rabbits, all of which furnished results in accordance with the examples we have given, we draw the following conclusions:

1. That the motor and sensory fibres in the cervical segment of the spinal cord run exclusively in the lateral columns.
2. That the nerves administering to respiration, vaso-motor nerves, and cilio-spinal nerves also run in the lateral columns.
3. That the posterior columns are concerned in co-ordination.
4. That irritation of the cervical cord causes co-ordinated jumping movements.
5. That no sensory fibres pass to the brain in the posterior columns.

The following are a few of the recently published papers on the Anatomy and Physiology of the Nervous System:

Charles, on the Mode of Propagation of Nervous Impulses, *Brit. Med. Jour.* Oct. 11 (favoring a chemical theory of nerve transmission); Arndt, on the Axis-Cylinder of Nerve Fibres, *Virchow's Archiv*, LXXVIII.; Ott, on the Path of the Inhibitory and Sensory Fibres in the Medulla Oblongata, *N. Y. Med. Jour.*, Jan.

b. — PATHOLOGY OF THE NERVOUS SYSTEM AND MIND; AND PATHOLOGICAL ANATOMY.

Cause of Puerperal Convulsions.—Dr. E. T. Williams, in December, 1878, read a paper before the Roxbury Society for Medical Improvement (*Boston Med. and Surg. Jour.*, Nov. 20, 1879), on this subject, in which he protested against the correctness of the common view that puerperal convulsions are of necessity due to uræmic poisoning. He would acknowledge that the latter may be an important factor in many cases, that it may be an *exciting* cause; but he was wholly unprepared to allow that it is the *real* and *essential* cause, preferring to consider the disease as simply the climax of nervous excitation reflected from the irritated uterus upon the brain. The reasons for questioning the uræmic theory may be stated as follows: (1.) Puerperal convulsions may occur without evidence of renal affection, that is to say, without albuminuria or any evident diminution of the urinary flow. (2.) Extreme anasarca and albuminuria are phenomena constantly recurring, and yet labor often goes on without the slightest trouble. (3.) The ordinary effect of uræmic poisoning in the non-pregnant state, that is, in Bright's disease, is rather coma than convulsions. The latter may, to be sure, occur, but the poison, be it urea, carbonate of ammonia, or what not, acts as a *narcotic* poison. It is to be borne in mind that convulsions do occur in nearly all forms of narcotic poisoning. The clinical difference between genuine uræmic poisoning (from Bright's disease) and an ordinary case of puerperal convulsions, is sufficiently marked in most cases to strike even a very careless observer. Puerperal convulsions are most like those of infancy arising from cerebral disease and the ordinary epileptic fit; but no one has suggested uræmia as the cause of these affections. The pathology of an ordinary convulsive attack consists in a high degree of irritation of the motor region of the brain or medulla, which irritation may be either *centric*, as in the case of injuries, inflammations, morbid growths, etc., or *eccentric* or reflex, from the same causes acting in distant parts of the body. The cases of convulsions due to cerebral hyperæmia or anæmia, and those due to the actions of poisons circulating in the blood, and acting by direct contact, probably, with the cerebral structure, may properly be classed as centric convulsions. In pregnancy we have an organ richly supplied with nerves, connected with the stomach, brain, kidneys, and other organs by the closest sympathies, which is brought into a state of peculiar functional activity. The rest of the system naturally participates; about the period of labor, the crowning act of the whole, this excitement reaches its acme. What wonder if the brain is sometimes dragged into sympathy to such an extent as to break forth into the manifestations of uncontrollable excitement! But how do we account on this theory for the almost constant presence of albuminuria in these cases? The same power of nervous sympathy which produces reflex irritation of the brain, may produce a reflex irritation of the kidneys and urinary organs. The renal irritation thus excited shows itself by albuminuria and diminution of the urinary secretion, retention of urea and other urinary products in the blood. These in turn give rise to uræmic poisoning and aggravation of the nervous excitement or irritation already existing. The reader did not deny the importance of this factor as a complication of the case; he only objected to its being considered as the essential cause of the disease, and hence as the principal indication for treatment.

Dr. Edes remarked, that undoubtedly there are cases of puerperal convulsions without evidence of renal disease, but usually there is albumen or casts, or both, in the urine. Some women have chronic trouble with the kidneys, and yet not always convulsions in pregnancy. Some seven or eight years ago a physician sent him the urine of a patient who had had puerperal convulsions. The kidneys were found to be diseased, and they still remain so. Yet she has been a second time confined without convulsions. Some remarks having been made as to the use of opium in puerperal convulsions, Dr. Edes said that, according to one theory, there is anæmia of the brain in such cases, and there would be no contra-indication of its use then. Even intra-cranial hemorrhage may not contra-indicate its use. The degeneration of the kidneys causes that of the blood-vessels.

HEMIOPIA.—Dr. Curschmann, *Sitzungsber. d. Berl. Gesellsch f. Psychiatrie*, rep. in *Centralbl. f. Augenheilk.*, July, 1879, and *St. Petersb. med. Wochenschrift*, Oct. 13, 25, reported the following case: A man, aged 50, always healthy previously, took, May 13, a considerable swallow of sulphuric acid, which was followed by the symptoms of sulphuric acid corrosion of the intestinal tract. Nutrition was kept up by enemata; the circulatory apparatus appeared normal. On the 22d of May embolism occurred in the right brachial artery. On the 23d there was complete loss of vision in the left visual field of both eyes; central and right-sided vision remaining normal; ophthalmoscopic examination revealed nothing wrong. This condition of the eyes continued the same till death; besides slight delirium there were no symptoms of local cerebral disease. Death occurred June 7, from inanition. The autopsy showed (1) the expected alterations of the intestinal tract; (2) an inflammation of the intima aortæ, due to adjacent œsophageal inflammation; (3) an impacted embolus in the right brachial artery; (4) in the brain, while the cerebellum and optic tracts were apparently normal, a large, softened patch in the right occipital lobe, extending to the surface, especially on the flat side and at the point of the lobe. This case confirms the results of Munk's experiments on animals, and, on account of the lack of other local cerebral symptoms, amounts practically to the value of an experiment on the human subject.

In the discussion following, Prof. Westphal stated that he had recently examined, *post-mortem*, a case of lesion of the same region. The patient had, from time to time, suffered from unilateral convulsions, with retention of consciousness—the so-called central epilepsy. The patient was not paralyzed on the convulsed side, but had hemiopia on this side. The autopsy revealed a patch of softening on the opposite side of the brain.

Méniere's Disease.—At the International Scientific Congress, at Amsterdam, in September last, Section of Otology (reported in *Le Progrès Médical*), M. Guye read a paper on Méniere's vertigo, of which the following are the conclusions:

1. In the most general sense of the word, we may consider as Méniere's disease all cases of vertigo caused by abnormal irritation of the nervous apparatus of the semicircular canals. The irritation may be due either to a normal cause exaggerated, such as violent rotatory movement of the head or body, or to an abnormal cause, such as sudden change of temperature, generally a reduction, variations of intra-tympanic pressure, and circulatory or inflammatory disorders.

2. In a more restricted sense, the designation of Méniere's disease applies to cases in which an inflammatory condition, either of the semicircular canals themselves, or of the middle ear (tympanic or mastoid cavity), is the cause of a vertigo which may be continuous, or may be only provoked by the normal movements of the head, or still may be produced only in the form of isolated attacks, with intervals of weeks or months.

3. Cold, or catarrhs of the tympanic cavity, play a large part in the etiology of Méniere's disease.

4. The majority, if not all, of the cases of Méniere's disease are secondary, that is, are caused by catarrhs of the tympanic or mastoid cavities.

5. In typical cases the vertigo is accompanied or preceded by sensations of rotation which follow in a constant order; the attack commences with a feeling of turning around a vertical axis, and always in direction corresponding to the side diseased, sometimes with a feeling of rotation of going and coming; next, in severe cases, a sensation of rotating around a frontal axis, in front and rear, the vertigo becomes general, the patient falls, with or without loss of consciousness; frequently there is vomiting. In some cases the attack is over in from ten to thirty minutes; in others the vertigo is revived by every motion of the head during one or two days, and the patient is compelled to keep a recumbent position.

6. In some cases the sensations of rotation are produced experimentally by therapeutic operations on the affected ear (either insufflation of air into the tympanic cavity, which is the seat of an acute inflammation, or injection of fluid into a mastoid cavity after trepanation of the mastoid apophysis). In these cases the sensation of turning is always around a vertical axis, and corresponding in direction to the diseased ear.

7. In certain cases the attacks are accompanied with intense subjective sensations of sound, in others a slight tinnitus exists all the time without any exacerbation during the attack; sometimes auditory sensations are altogether lacking.

8. In cases of long duration a slight feeling of vertigo exists during the intervals, produced chiefly by the first movements of the head on awakening. Sometimes the patient feels as if falling forwards or backwards; others are compelled to keep the head fixed constantly in one position, as every motion in the plane of any one of the semicircular canals gives them a sensation as if a heavy body within the head followed the movement. (In one very characteristic case observed by me, the patient held his head inclined forward and to the left, and thus prevented every movement of rota-

tion in the plane of the left sagittal semicircular canal. The left ear was the one involved.)

9. Besides the rather frequent complications with hysteria, Méniere's disease often produces in children a condition akin to chorea, and in adults clonic contractions of the facial and bodily muscles, which may entirely disappear with local treatment of the middle ear.

10. Méniere's disease is often cured with or without loss of hearing.

11. Local treatment alone is often efficient in cases not too obstinate.

12. For internal treatment, quinine, recommended by M. Charcot, is most deserving of confidence, One is often able to delay the attacks by its use. Quinine has also the paradoxical action sometimes of making the tinnitus disappear while the deafness increases. This effect is generally limited to the period of its employment.

M. Méniere remarked on the above that he did not agree with M. Guye, that the majority of cases of the disease were the result of catarrhal affections of the middle ear or the mastoid process, and that he thought the author had generalized too much in making all cases of vertigo Méniere's disease. The vertigo was only a symptom.

Cerebral Complications of Chorea.—L. Putzel, M. D., in *New York Med. Record*, Sept. 6, 1879, gives an account of three cases of chorea complicated with mental disorder, one of dementia, and two of mania, which were relieved by the ordinary remedies for chorea: iron, arsenic, chloral, cod-liver oil, etc. In one of the maniacal cases there was a marked heredity of insanity; in the other two the family history was negative. In the first of course the prognosis as to complete recovery was bad; but in the others Dr. Putzel regards it as good. He says: "In the majority of cases the mental disturbances disappear as soon as the choreic manifestations have subsided, or within a couple of months thereafter. Cases of maniacal chorea furnish, however, a large contingent of the mortality in chorea, not so much on account of the complication with insanity, but because the choreic movements are so severe that they interfere with sleep and nutrition. This fact furnishes an important guide-post with regard to the treatment of these cases. The faulty nutrition is best met by resorting to rectal alimentation (milk, blood), or to the milk diet per orem. The lack of sleep must be combated by the administration of large doses of chloral and bromide of potassium (the quantity must vary with the individual case), and in some very obstinate cases, chloroform has been successfully employed.

Chorea sometimes simulates insanity, although the mental powers are intact. Thus, choreic patients may appear to be incoherent in their speech, owing to the fact that articulation of speech is interrupted by involuntary movements of the muscles of phonation, giving rise to the involuntary utterance of words or of disjointed sentences foreign to the matter under discussion. This apparent incoherence of ideas, together with the apparent destructive tendencies manifested by the patient on account of his lack of control over the muscles, has led physicians, in several instances, to make a diagnosis of insanity, although the intellect was normal. An English alienist, whose name escapes me, has reported two cases of this nature which had been committed to an insane asylum. The differentiation of such cases from those of choreic mania must depend upon the exercise of the judgment of the physician.

TETANUS.—Dr. Metzquer, *La France Médicale*, Aug. 13, gives an account of a patient who came under his care for a crushing injury to the end of the left index finger, which progressed favorably in all respects for fifteen days, excepting there was an unusual depression of mind, then a chill, some vague pains in the joints, headache, pharyngeal inflammation and difficulty of swallowing set in. In a day or two these symptoms disappeared and the patient felt well, but on the next night the symptoms of tetanus appeared and carried him off within five days.

The peculiar feature of the case, however, was the patient's and his family's belief that tetanus would supervene, that it was a hereditary disease. A brother had died some fifteen years before of this disease, following an insignificant injury, and it was thought to be a family disease. The doctor asks, is this a simple coincidence, and desires to call out further testimony as to the possible hereditary character of tetanus, from others' experience. Though the case he gives is too isolated to prove much, it is yet suggestive, and worthy of attention.

OPTIC NEURITIS IN BRAIN AFFECTIONS.—Perinaud claims as the result of his experiments that cerebral compression does not have the immediate and mechanieal effect upon the circulation in the bottom of the eye that has been claimed for it. He would not affirm, however, that it is impossible to produce optic neuritis artificially, but it can only be obtained, in all probability, by exciting, if that is possible, an hydrocephalus and the alterations in the brain substance that attend it; for such is in his opinion the immediate cause of every œdematous neuritis and the necessary intervention between the alteration of the papilla and the different intra-cranial lesions that excite it.

His conclusions are: That the different intra-cranial affections do not produce œdematous optic neuritis (*Stauuingspapilla*), except as they are complicated with hydrocephalus.

In acute meningitis, in particular, no connection can be established between the inflammation, the seat of the exudations, the encephalic lesions and the alteration of the papilla, which, on the contrary, always accompanies ventricular effusion.

In cerebral tumors, the seat and size of the morbid products play but a secondary importance. Optic neuritis may be wanting with large tumors and is observed with very small neoplasms, if they are complicated with hydrocephalus.

In order to produce optic neuritis, the hydrocephalus must itself be quite extensive, and to find in the cranial walls a resistance sufficient to modify the intra-cranial tension.

The different theories given to explain the rebound of the intra-cranial pressure upon the papilla are insufficient.

That which refers the alteration of the optic nerve to venous stasis is entirely contrary to clinical observation and to results furnished by experimentation.

The immediate relation between the intra-cranial pressure and the circulation in the fundus of the eye is not obvious.

The theory of optic neuritis by emigration, in which a driving out of the cephalo-rachidian liquid or inflammatory products from the cranial cavity into the cribriform lamella and papilla, through the sub-vaginal space or the nerve itself, conforms better with observation, but has its objections.

An exaggerated importance has been given to the fluid driven into the sub-vaginal space. Optic neuritis could be produced just as well if this space did not exist.

Intra-cranial pressure itself seems to be insufficient to rebound upon the papilla.

Hydrocephalus does not produce optic neuritis except by the cerebral œdema it excites. The œdema of the nerve is of the same nature as that of the brain; it is the consequence of the lymphatic stasis produced by the ventricular effusion.

The lymphatic net-work of the optic nerve is a dependence of that of the encephalon; it is as natural for the nerve to feel the effects of the hydrocephalus as the encephalon itself. The histological modifications furnish strong arguments in favor of this view of the neuritis.

No objection can be found in the inflammatory alterations produced in the course of time; these same alterations are observed in the passive œdemas of other parts of the body.

The strangulated optic neuritis (*Stauuingspapilla*), better named œdema of the optic nerve, furnishes no precise indication as to the seat or nature of the intra-cranial affections that produce it. It has but one signification: the existence of hydrocephalus and cerebral œdema.—Dr. H. Perinaud, *Annales de Oculistique*, July–Aug., 1879.—*Lancet and Clinic*, Nov. 15, 1879.

The Sinew-Reflex.—At the last meeting of the German Naturalists' and Physicians' Association,. Dr. Senator, of Berlin, gave the results of his researches on the sinew-reflex, which are, as reported in the *Deutsche med. Wochenschr.*, Nov. 29, as follows: He experimented on dogs and rabbits. First, he confirmed the statement of Tschiriew that section of the cord between the fifth and sixth lumbar vertebræ prevented the appearance of the patellar tendon-reflex, and further determined that only light blows on the sinew, either laid bare or covered with the natural integument, produced the contraction of the extensors cruris, and that other forms of excitation, pinching, pricking, or faradization of the sinew, had no such effect. Hemilateral section of the cord affected this reflex only on the side of the cut, thus showing that the nerve fibres involved did not decussate. Moreover, he made the astonishing discovery that section of the posterior columns is without influence on the phenomenon; it certainly does not decrease, but perhaps increases it. Injury of the posterior horns is also without effect. As far as Senator can at present say, the phenomenon is only certainly suppressed by section of the antero-lateral columns, perhaps, also, with part of the anterior horns. In conclusion he referred to the connection of the results with the latest pathology, and especially to the difficulty in reconciling them with the commonly accepted theories of the phenomenon.

THE PATHOGENESIS OF BASEDOW'S DISEASE.—Filehne (of Erlangen), at the Association of German Naturalists, last year, read a paper on the pathogenesis of Basedow's disease, of which the following report is given in the *Deutsche med. Wochenschrift*, Nov. 29.

As is well known, authors differ as to whether the symptoms of this disorder are referable to paralysis or to irritation of the sympathetic, since part of them (palpitations and exophthalmus) indicate irritation, while another part (struma) seem referable to paresis of the nerve fibres in the sympathetics. The author, incited by this difference of opinion, undertook a thorough analysis of the clinical features of the disease, which led him to the conjecture, that in it we have to do with a central paralysis that produces not only relaxation of the vascular tonus of the parts affected, but also irregularity of the heart's action. This can only indicate one organ—the medulla. And, in fact, in his experiments, section of the restiform bodies in not quite full-grown rabbits, produced all the cardinal symptoms, but only one or two of them at the same time. Still it could not be said beforehand which one of them would appear. Most frequently the author observed the tachycardia of Basedow; next in frequency the exophthalmus (due to paralysis and dilatation of the orbital vessels), and most rarely enlargement of the thyroid.

How far these results will apply in the case of man, can only be proven by pathological anatomy.

REFLEX PARALYSIS AND NEURITIS MIGRANS.—Treub, *Arch. f. exp. Path.*, X., 398 (abstr. in *Cbl. f. d. med. Wissench.*), from observations on frogs, the reflex irritability of which was tested by the application of peripheral irritation with section of the medulla, and also in rabbits in which he produced reflex paralysis by crushing the kidneys or sections of the intestines, came to the conclusion, in opposition to Lewisson, that (1) a complete abolition of reflex movements during powerful irritation was not demonstrated, and (2) that, if such irritation influenced the voluntary movements, a complete paralysis was never the result.

Moreover, in six rabbits he irritated the sciatic in the knee, part by cauterization and part by transfixion with a thread, and produced an interstitial neuritis, characterized by infiltration of the perineurium with pus-cells, and partial breaking down of the nerve-elements; which (contrary to Rössing's and Rosenbach's results) advanced more or less distance in a centripetal direction, but never passed over a part of the nerve, to reappear further up, as stated to occur by Tiesler, Feinberg, Klemm and Niedieck. The medulla always remained intact.

Hence Treub denies the occurrence of neuritis migrans, but considers that many cases of so-called reflex paralysis would prove, by closer investigation, to be only the results of a continuously advancing neuritis.

DECREASE IN BODILY WEIGHT AFTER EPILEPTIC ATTACKS.—P. Kowalewski, *Medicinskoje Obosrenje*, Oct., 1879 (abstr. in *St. Petersb. med. Wochenschr.*). By regular daily weighing of epileptics, during their attacks, as well as in the intervals, the author comes to the following conclusions:

1. In all epileptics and in all kinds of epilepsy there is a decrease of body weight after each attack, corresponding to its duration and intensity.

2. In old cases, in which the attacks are very frequent, and the organism has become accustomed to them, the decrease is very slight after each attack ($\frac{1}{2}$ pound, Russian); in recent cases, on the other hand, in which the attacks occur as yet but seldom, there is a notable decrease ($\frac{3}{12}$ pound) after each attack.

3. When several attacks follow one another in quick succession, the greatest loss of weight follows the first one; that after the succeeding ones being very slight.

4. The greatest loss of weight in all forms of motor or somatic epilepsy is found after epileptic convulsions (*grand mal*), equaling sometimes 12 pounds after a single attack; it is very much less after epileptic vertigos. But the greatest loss of weight is met with in psychic epilepsy, in which case it may equal one-fourth of the whole body weight.

The recovery of body weight after the attacks, follows very quickly, requiring only a few days.

Trophic Alterations of the Maxilla in Tabes.—Dr. Vallin, physician to the Hospital Val de Grace, Paris, calls attention (*L'Union Médicale*, No. 132) to trophic changes of the jaw in locomotor ataxia. Two cases of his own observation are reported; in one the general symptoms of tabes were not nearly so advanced as in the other, but in both there was an atrophy of the spongy tissues of the bones and breaking down of the alveoli, and in the more pronounced case a manifest atrophy of the muscles of the left side of the face. He also gives briefly a *resumé* of several other observations reported at various times by other writers.

The two cases mentioned were the whole of Dr. Vallin's observations of this kind, though he had many cases of ataxia. The condition must, therefore, be a comparatively rare one.

The Principles and Practice of Gynæcology as Related to Insanity in Women.—At the fourth annual meeting of the American Gynæcological Society, held in Baltimore, September 17, 18 and 19, reported in *Am. Jour. of Obstetrics*, October, 1879, Dr. Alexander J. C. Skene, of Brooklyn, presented a paper on The Principles and Practice of Gynæcology as Related to Insanity in Women. In it he gave the results of his observations in gynæcological practice in the Brooklyn Insane Asylum. He there met with an entirely new phase of practice, in which the ordinary methods of investigation were of little value. No correct histories could be obtained from the patients themselves, and the records kept by the physicians in charge afforded but little information to the gynæcologist. Searches for information regarding gynæcological practice among the insane were made in records, but without avail, and he was obliged to devise a method of examining patients.

The system of investigation adopted, and the phenomena observed, together with the deductions drawn from them, formed the subject-matter of his paper, and Dr. Skene restricted his discussion of the subject to the relations which gynæcology bears to insanity.

From his investigations he had been led to the belief that, up to the present time, the effects of disease of the sexual organs in women, causing and keeping up insanity, have been more correctly studied than the influence which insanity exercises upon the sexual organs. The reasons for holding that belief are, that the one line of investigation is more easily made than the other, and our literature shows that most investigators have chosen the sexual organs as the starting-point of their inquiries.

With reference to the way in which diseases of the sexual organs cause insanity, the rule has been to attribute insanity (when developed during the existence of uterine or ovarian disease) to reflex action. No doubt that is an important factor in the cause of mental derangement, but it is far from covering the whole ground. There are many cases of insanity which can be traced to the sexual organs, but in which reflex action takes no part.

One of the most marked and important causes of insanity among women is clearly traceable to frequent child-bearing and lactation among the poorer classes. That he had proved by clinical observation and a perusal of the records of all the asylums in this country.

There is too little in our literature on the subject of mania caused by the exhaustion of the nervous system from child-bearing and nursing. Our books tell us of anæmia from prolonged lactation, but say little of the nervous exhaustion which may or may not accompany the anæmia. It may be questioned if even physicians, at all times, fully appreciate the demands made upon the female organization by reproduction. From cases occurring in his own practice he is satisfied that, occasionally, the normal functional activity of the reproductive organs tends to undermine the brain and nervous system to an extent sufficient to lead to insanity.

He is satisfied, also, that the prevailing opinion that insanity, as the result of reflex action, occurs very frequently at puberty and the menopause, is not always true. The point which the author of the paper made was, that a clear distinction should be drawn etiologically between the insanity caused by existing active disease of the sexual organs, and insanity arising from brain exhaustion produced by prolonged or excessive functional activity of those organs while free from disease; and he inclined to the opinion that as many, or even more, cases can be traced to the latter than to the former.

The next question discussed was, the effect of insanity upon the functions of the reproductive system. Observations had been made on 200 women, ranging from seventeen to forty-six years, the period of active functional life of the sexual organs.

In the greater number of cases there was amenorrhea, due, doubtless, to deranged innervation. A number who came under his care menstruated regularly, and some of them had menorrhagia. According to the rule that insanity tends to suspend menstrual function, all the insane should have amenorrhea; but they did not, and then, why not? The answer is, that menstruation is affected in proportion to the degree of insanity.

Formulated, his deductions were as follows: Well-developed insanity, with impaired general nutrition, causes suppression of the functions of the sexual organs.

Deranged innervation tends to produce the same result. In mild forms of insanity, menstruation may continue normal.

Excessive menstruation among the insane is usually caused by uterine disease, and should be accepted as evidence of such.

The next question was, "*What effect does insanity exert upon diseases of the sexual organs?*"

First—Of the functional diseases depending upon impaired innervation and blood circulation, to use a popular but unscientific expression, insanity tends to cure functional diseases of the uterus. Clinical observation compels that conclusion, and renders it worthy of the highest consideration. The same action has been observed in the pathology of other diseases. But the influence of insanity in arresting the progress of uterine disease relates almost exclusively to functional disorders, and does not apply to other forms of local disease of an organic character. The class of insane women who have simply functional diseases of the sexual organs requires no care from the gynæcologist, beyond what is necessary to establish the fact that there exists no organic disease. When the diagnosis is settled in the negative, the patient should be left to the treatment of the psychologist. The importance, however, of clearly distinguishing disease of the sexual organs that causes and tends to keep up insanity, and mental derangement which exists independently of lesion of other organs, can hardly be over-estimated.

Second—Organic diseases of the sexual organs exercise a most important influence in causing insanity, and tend to retard recovery from it. Under that head are included all the appreciable diseases of the ovaries, uterus and vagina that are characterized by change of structure or position. It is to that class of genital affections among the insane that the science and the art of gynæcology apply with most marked advantage, and the relief that can be afforded is, certainly, very much.

"*What are the ascertained effects upon the insane, of curative treatment, regarding co-existing diseases of the sexual organs?*"

A careful consideration of that subject has led to the conclusion, that acute affections of the brain and nervous system, wholly due originally to disease of the sexual organs, will be relieved, in a large majority of cases, by curing the primary affections; and insane women, having diseases of the sexual organs, will be improved in their general condition by restoring the sexual organs to health. The effects of treatment will be in proportion to the duration and the severity of the mental derangement.

Attention was next invited to the subject of diagnosticating diseases among the insane.

Dr. Skene then spoke of the difficulty experienced in obtaining the clinical information which is of value to the gynæcologist. Physical exploration of the pelvic organs of insane women has heretofore been beset with many difficulties. Practically, the use of ether as an anesthetic has proved very unsatisfactory. To overcome all these difficulties he uses nitrous oxide gas, and it has answered the purpose most admirably. The mode of administering it is with the apparatus used by the dental surgeons, using a rubber cup which fits over the mouth and nose instead of the mouth-piece. The physical signs of disease vary but little from those found in ordinary cases, with a few exceptions, as follows:

The absence of tenderness is almost always marked.

When the mental derangement has existed for several months, or longer, and the menses have been absent, the vagina and cervix are found to be pale and anæmic, resembling the menopause.

The rectum is, as a rule, found distended.

The diagnosis of ovarian disease is especially difficult among the insane. The valuable sign of tenderness on pressure is lost.

The diseases which occur among the insane are not peculiar or worthy of special notice, and their physical signs are the same. It is possible that malignant disease of the uterus occurs more frequently among the insane than among the sane, and there are also reasons for believing that the products of former diseases, such as pelvic peritonitis and cellulitis, are found more frequently among this class of patients than among sane women.

The treatment of diseases of the reproductive organs among insane women is based upon the general principles which guide us in ordinary practice.

The frequent repetition of local treatment, such as electricity, leeching and blistering the uterus, hot-water douches, etc., cannot be resorted to among the insane as among the sane women, and modifications in treatment must be made accordingly.

In treating ruptured perineum, he has resorted to the use of silk sutures and the marine-lint tampon in place of the douche, and fair results have been obtained although the patients walked about during the healing process.

The most important difficulty is encountered in the management of displacements among those having imperfect perinei.

Contractures.—At a recent session of the Academy of Sciences, Paris, M. Gosselin presented a communication of MM. Brissard and Ch. Richet, entitled "*Some facts relating to Contractures,*" which is thus reported in *L'Union Médicale*, Sept. 13.

We may, with the majority of physicians, define contracture as a more or less permanent shortening of a muscle, that cannot be relaxed voluntarily. Thanks to the kindness of M. Charcot, we have been able to study several varieties of contractures. We give here rapidly the *resumé* of our observations and experiments.

1. In hystero-epileptics, we may cause a contracture of a muscle by the tension or strong contraction of a muscle. Thus every time one of these patients makes a sufficiently energetic contracture of one of her muscles it remains contracted.

This contracture may be observed in various muscles. It is most easily produced in the brachial biceps, the flexors and extensors of the fingers, the deltoid, the muscles of the thenar eminence, the sterno-mastoid, the orbicularis ocularum, the peronei and the solei. It is probable that it may be produced in all the other muscles.

Naturally these phenomena are not produced with the same facility in all hysterical cases; they are the more manifest, the more pronounced the disease. As the hystero-epileptic attacks become less frequent, the liability to contracture is diminished.

2. In recording by the graphic method, the muscular contractions produced by electricity, when the muscle is part of the time in its normal state, and part of the time contracted, we can show that the muscle in the condition of contracture is still capable of further convulsive contraction. This fact shows that the condition of contracture is an intermediate one between the maximum physiological tetanus and relaxation.

It has been demonstrated to us by exact tests that the muscle, either in a cataleptic or in a condition of contracture, is nearly as excitable as when relaxed and in its normal state.

To make the contracture disappear it is sufficient, as indicated by M. Charcot, to excite the antagonist muscles. We have been able to demonstrate this new fact, that, to cause the muscle to relax we have only to excite its tendon by rubbing it with the hand at the same time that we try to extend the muscle. It appears, therefore, that there exists between the fleshy body of the muscle and its tendon, an antagonism, so that while the excitation of the muscle causes its contraction, that of its tendon makes it to relax.

3. It is probable that this contracture is reflex, in the same way that the muscular tonus is a reflex, starting from and returning to the muscle. We may, therefore, admit that the contracture of a muscle is due to the excitation of centripetal nerves from the muscle, an excitation provoked either by the contraction or the muscular tension. A very simple experiment proves that this is the case:

If we completely deprive a limb of blood by winding it with a rubber bandage, at the end of a varying period of time (about twenty or thirty minutes), the muscles deprived of blood are incapable of being voluntarily moved, and after half an hour or thereabouts, the excitability of the muscle to electricity has altogether disappeared. But the contracture disappears still more rapidly; indeed, if we apply the rubber bandage around a contracted arm, we see the contracture disappear completely within five or six minutes, while the arm can still be moved by the will and its electro-muscular excitability has not been appreciably affected. The excitability of the muscle to contracture is, therefore, that which first disappears under the influence of anæmia.

If next we take away the rubber bandage from the relaxed muscle, the contracture returns as strong as, or even stronger than before, as the muscle recovers its blood.

There is, therefore, in the relaxed muscle a veritable *latent contracture.* However paradoxical this expression may seem we think it indicates with sufficient exactness the fact, that the muscle was strongly excited by the motor nerve and the cord, and that if did not respond, it was only because it could not, being deprived of blood. We may, therefore, say, that the bloodless muscle not responding to the neuro-medullary excitation, is in a condition of latent contracture.

4. In one of M. Charcot's patients the contracture was very slight, but the least muscular contraction provoked it at once. Without insisting on the details of this phenomenon we would remark that this form of con

tracture is nearly related to catalepsy, and that it forms a transition between catalepsy, properly so-called (*flexibilitas cerea*) and contracture.

Finally, we have met with a young man 22 years old (who is neither hysterical or epileptic), in whom we can easily produce a contracture (or cramp as he calls it) by stretching the muscles, or telling him to contract them forcibly.

5. Since these contractures, in a dynamic fashion, have their points of departure and return in the muscle, we propose to call them *myo-reflex* contractions.

In comparing them according to the method frequently employed by M. Charcot, to the organic contractures of hemiplegia, we find that both employ the same symptomatic apparatus, and that both have as a common cause an excessive excitability of the motor regions of the cord.

Finally, it follows from the sum of these facts, that between the normal tonus, catalepsy, common cramp, the myo-reflex contractures, and those of hemiplegia, there are very direct relations It is probable that if the attention of physicians is directed to this point they will observe every transition between these different states.

Hydrophobia.—At a recent session of the French Academy of Sciences, M. Bouley presented a communication by M. Galtier on the above subject, of which the following are the conclusions, as reported in the *Union Médicale*, Sept. 6:

1. Hydrophobia of the dog is transmissible to the rabbit, which becomes a sort of convenient reagent for determining the state of virulence or otherwise of various liquids derived from rabid animals. The author has already utilized it many times for the study of the various salivas, and many other liquids taken from the dog, the sheep, and the rabid rabbit.

2. Hydrophobia of the rabbit is transmissible to other animals of its own species. I am as yet unable to say whether the hydrophobic virus of the rabbit has the same intensity of action as that of the dog.

3. The predominant symptoms in the rabid rabbit are paralysis and convulsions.

4. The rabbit may survive from a few hours to one, two, three, and even four days after the manifestation of the disease.

5. Not only is the rabbit susceptible of contracting the disease and of living a certain time after the outbreak of the disease, but it is invariably the case, according to all my experiments, that the period of incubation is shorter in it than in other animals; this, as I repeat, contributes to render it a valuable test of the virulence of this or that liquid. The twenty-five cases of hydrophobia related in the preceding experiments give an approximate mean of eighteen days of incubation in the rabbit.

6. Salicylic acid given by hypodermic injection, in the daily dose .0068 gram, for fourteen days following the fiftieth hour after the inoculation, has not delayed the development of the disease in the rabbit.

I started these investigations with the view of finding an agent capable of neutralizing the virus subsequent to its absorption, and thus preventing the appearance of the disease, for I was persuaded, from my microscopic examinations, that hydrophobia once developed, will remain for a long time, if not forever, an incurable disorder, because of the lesions it induces in the nerve centres. I therefore thought that the discovery of an efficient preventive would be almost equivalent to that of a curative, especially if its action were really efficacious a day or two after the bite and the inoculation of the virus.

7. The saliva of a rabid dog, taken from the animal and diluted with water, is still virulent, five, fourteen, and even twenty-four hours afterwards.

This fact is very important and instructive, and I shall return to it again in publishing the results of further experiments. At present it seems to me well established that the water of a vessel in which a rabid dog has dropped his saliva in attempting to drink, should be considered as virulent for at least as long as twenty-four hours, and, in the second place, that the saliva of a dog that has succumbed to the disease or has been killed, does not lose its poisonous properties by the simple refrigeration of the cadaver; one should be on his guard, therefore in making autopsies, against the possible dangers of inoculation in examining the buccal cavity or the pharynx.

Hepatic Colic.—M. Laborde sums up as follows the results to which he has been led by his experimental physiological investigations as applied to therapeutics in regard to the subject of hepatic colic:

1. The excretory biliary ducts are endowed with contractility, and may therefore enter a spasmodic condition under the influence of excitations, direct or indirect; this contractility is of the nature of that of the smooth muscular fibres of organic life, and the existence of these fibres in the walls of the said ducts is demonstrated by histological anatomy, here perfectly in accord with experimental physiology.

2. The mucous membrane of these ducts is endowed with a very acute sensibility, revealing itself at the time under the influence of more or less intense excitations, by painful impression and expression, and by reflex phenomena of which the immediate manifestation is spasm of the canals.

3. These phenomena are especially brought about by the presence and contact of foreign bodies (biliary calculi), and the spontaneous passage of these is from this same cause rendered very difficult, and only takes place, when it occurs, after a more or less long period of time, with the peculiarity that these bodies may pass back again into the gall bladder.

4. The so-called anæsthetic and antispasmodic medicines are most appropriate for the treatment of this morbid state, the conditions of which are easily produced experimentally.

5. These remedies, notably among them morphine, chloroform, and hydrate of chloral, act by exerting at once an anæsthetic and a paralysant influence, whence results cessation of the spasm, the dilatation of the ducts and the accumulation of the biliary liquid, which acts on the foreign body as a *vis a tergo* propelling it toward the intestine.

6. The association of chlorate of morphine with chloroform or hydrate of chloral, that is, the simultaneous administration of these medicinal agents,

forms the most efficient means of obtaining the results sought for, viz., the anæsthesia of the biliary ducts, preventing the pain and exerting a favorable influence for the migration and rapid passage of the foreign bodies.—*(Trib. Méd.) Gaz. des Hopitaux.*

The Pathological Anatomy of Infantile Paralysis.—At the Session of the International Medical Congress, at Amsterdam, Sept. 11, 12, and 13, 1879 (rep. in *Le Progrès Médical*), M. Damaschino communicated for himself and M. Roger the results of their researches on the pathological anatomy of infantile spinal paralysis. The following were the principal facts: 1. The anatomical lesions of infantile spinal paralysis are located in the motor regions of the cord. 2. These lesions consist in a central myelitis, with *foyers* of softening and atrophic destruction of the cells of the grey matter; there is also sclerosis of the lateral columns and considerable atrophy of the anterior roots as well as of the nervous tubes corresponding to the paralyzed muscles. 3. The atrophy of the cells has doubtless, as was first shown by M. Charcot, a great importance in a pathogenetic point of view, but MM. Roger and Damaschino deem it necessary to insist on the fact that this atrophy of the cell-elements is not the whole morbid process, as it appears to be in progressive muscular atrophy. And it is probably in this histological difference that we must seek the explanation of the clinical differences manifested by the two diseases. 4. It may yet be asked, as is asked by M. Leyden, whether there are not two forms of infantile myelitis, the one *en foyer* and the other diffused; but new facts are needed to answer the question, which remains undecided in the present state of our knowledge. 5. As regards the question whether the inflammation of the cord begins primarily in the connective tissue (interstitial myelitis), or in the motor cells (parenchymatous myelitis), this is a point as yet unsettled.

A Rare Form of Diphtheritic Paralysis.—Dr. Dahlerup describes (*Ugeskrift for Läger*, 3d series, Vol. XXVI.) the case of a boy aged 12, who ten or twelve days after recovering from an attack of diphtheritic angina, was seized with difficulty of breathing, which increased to severe dyspnœa at the end of fourteen days. On examination, there was found to be orthopnœa, cyanosis, œdema of the feet, and moderate œdema of the lungs. The heart-beat was somewhat quickened, irregular, and very weak; the area of cardiac dullness was not increased. The heart-sounds were distinct. The pulse was rather feeble. The urine contained a large quantity of albumen. Under the use of digitalis and stimulants, there was slight improvement at the end of a week; the dyspnœa then increased, as did also the œdema of the extremities and lungs; and the patient became collapsed, and died. The temperature at no time of his illness rose above 98.6° Fahr. Dr. Dahlerup believes the case to have been one of progressive diphtheritic paralysis of the heart.—*British Med. Journal*, Sept. 27.

Inebriety.—Dr. T. D. Crothers, *Medical and Surgical Reporter*, Sept. 27, discusses the pathology and etiology of inebriety, and especially calls attention to its hereditary or acquired neurotic and neurasthenic antecedents. After reporting several cases of habitual drunkenness which could be traced apparently to the conditions arising from nervous strain and exhaustion, bad nutrition, and want of rest, he summarizes as follows:

1. Pathologically, in most cases of inebriety there is present a defective condition of brain and nerve organization.

2. This condition is often a lesion of nutrition, consisting of a loss of balance between the waste and repair going on in the system.

3. Every condition which interferes with the proper repair and rest of the body predisposes to this disorder. The use of alcohol in such cases is always attended with more or less danger.

Chloral Inebriety—Its Symptoms.—The effects of alcohol, opium, chloroform or ether intoxication are well known to all in the profession and the most of the laity. But the introduction of chloral into medical practice being quite recent, the effects of its continuous use are less clearly understood. Dr. J. B. Mattison has, in a late paper collected numerous cases of chloral inebriety, and given us a clear outline of the usual symptoms. Its earliest morbid phenomena relate to the digestive system. Nausea and vomiting come on; the tongue is covered with whitish fur; appetite is capricious, and in well marked cases almost extinct; the breath is fetid, or gives off the odor of chloroform or alcohol; jaundice appears, though oftener there is a pallid, anæmic look from blood vitiation; the bowels are torpid, and the alvine dejections are hard and peculiarly pale. Respiratory movements are diminished in frequency, and attended with more or less dyspnœa.

The hearing is dulled, with tinnitus aurium, and vision obscured or lost. The ophthalmoscope reveals great retinal anæmia.

The pulse becomes weak, rapid and irregular; heart sounds feeble, and a tendency to syncope. The jaundiced skin and ash colored-evacuations point to an interference with the hepatic functions.

There are peculiar pains in the limbs, simulating neuralgia or rheumatism, yet, unlike the former, they are not limited to the course of the nerve, and differ from the latter in not being exactly in the joints, but girdling the limb or finger just above or below them, without pain on pressure, and unaggravated by movement. The loss of power in the lower extremities is sometimes very marked and strongly suggestive of serious spinal mischief. From its influence on the nervous system there may be anæsthesia, hyperæsthesia, or both; tremors of the tongue and muscles, sub-normal temperature, 97° or under; chilliness, profuse sweats, sometimes cold: again a peculiarly dry skin, irregular wandering pains, general irritability, restlessness, insomnia, exhaustion, vertigo, inability to stand erect, with tendency to fall forward, as in ataxic trouble; lack of co-ordinating power, so as to be unable to write, whistle, etc.; facial paralysis and progressive failure of motor power to entire paraplegia. The ill effects on the mental power may appear in a few months or not for years. There may only be slight irritability of temper or complete imbecility or dementia. The evidences of enfeeblement of the intellect or moral sense appear earlier and are more profound than those from opium or alcohol.

It is impossible to tell how prevalent chloral inebriety may be, but that it exists every physician can testify from observation. Like opium inebriety, it is susceptible of long concealment from other than careful observers. The facts should place the profession on its guard in the long-continued use of chloral. It is also useful to remember these facts in the study of certain cases hitherto inexplicable. It strikes us that less chloral is used by the people as a domestic remedy than formerly. Many deaths reported in the papers from such use serve an excellent purpose in teaching a healthy caution.—*Detroit Lancet*, Oct.

THE following are the titles of some recent papers on the Pathology of the Nervous System:

CALHOUN, Tobacco Poisoning and its Effects upon the Eyesight, *Herald of Health*, Nov.—SPENCER, Case of Idiopathic Inflammation of the Spinal Dura Mater, *Lancet* (Am. Repr.), Nov.—PUTNAM, Two Cases of Chorea in the Kitten, *Boston Med. and Surg. Jour.*, Nov. 13.—PAGE, Color-Blindness, its Examination and Prevalence, *Brit. Med. Jour.*, Oct. 25.—COGHILL, Irritable Spine as an Idiopathic Affection, *Ibid*, Oct. 11.—BERNHARDT, On the Pathology of Peripheral and Spinal Paralysis, *Virchow's Archiv*, LXXVIII., II. —STROHMBERG, Cases of Poisoning with Seeds of Thornapple (Datura Stramonium), *St. Petersb. med. Wochenschr.*, Dec. 13.—BEARD, Nervous Diseases connected with the Male Genital Function. Nervous Symptoms connected with True Spermatorrhœa. True and False Hypochondria, *N.Y. Med. Record*, Dec. 6.—BAUER, Nervous Affections of Malarial Origin, *St. Louis Clinical Record*, Dec.—HOWARD, Idiocy and Imbecility not Insanity, *Canada Medical Record*, Dec.—BRUEN, Anasarca as a Symptom of Deficient Vaso-motor Tonus, *Phil. Med. Times*, Dec. 20.—BIGELOW, Morbid Impulses, *Med. and Surg. Rep.*, Jan. 3.—ROBERTS, Cases of Hysteria in Boys, *Practitioner*, Nov. —ERLENMEYER, Relapses of the Opium Habit, *Cbl. f. Psych*, Nov. 15.— HOLMES, Puerperal Convulsions, *Boston Med. and Surg. Jour.*, Dec. 18.— BRAKENRIDGE, Clinical Lectures on Locomotor Ataxia, *Brit. Med. Jour.*, Dec. 6.—BEACH, Case of Tumor of the Brain associated with Epilepsy and Catalepsy, *Jour. of Med. Science*, Oct.—BROWER, Traumatic Insanity in its Medico-Legal Relations, *Chic. Med. Jour. and Exam.*, Dec.

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c.—THERAPEUTICS OF THE NERVOUS SYSTEM AND MIND.

Carbolic Acid.—Dr. J. Sumner Stone, in the ***Philadelphia Medical Times*** of Sept. 27, has a paper on "The Physiological Action of Carbolic Acid on the Nervous System," in which, after giving the results of a number of experiments on the frog and also on the dog and rabbit, he draws the following conclusions:

I. In large doses carbolic acid may cause immediate paralysis through spinal depression. Smaller doses cause clonic convulsions of spinal origin. Convulsions and paralysis may exist at the same time in one animal, the posterior extremities being paralyzed first.

II. Neither motor nor sensory nerves nor muscles are affected by carbolic acid.

III. Reflex action with small doses is first diminished through irritation of Setschenow's centres; it is then increased through its subsequent paralysis, the irritation explaining the ordinary occurrence of *apparent* muscular weakness in the early stage of the poisoning, while convulsions follow its paralysis. Larger doses may paralyze Setschenow's centre immediately.

IV. It is probable that the spinal action of carbolic acid is confined to the motor columns.

Atropia in Pertussis.—Dr. Arthur Wiglesworth, *Lancet* (Am. Rep.), Aug., 1879, gives his experience in the use of atropia in whooping cough. He met with good results, reduction of the number and duration of the paroxysms, and favorable modification of their character from the use of 1-120 grain once, and in extreme cases, twice a day. The discontinuance of the medicine was always followed by a subsidence of its beneficial effects.

As to the *modus operandi* of the drug, Dr. Wiglesworth thinks pertussis is essentially a neurosis, consisting in a peculiar irritation of the laryngeal branches of the pneumogastric, which excites the reflex centres even to the point of producing convulsions. The treatment should hence be directed to the reduction of the reflex excitability, and he holds that there is no agent that is so directly a nervine sedative to the pneumogastric and sympathetic nerves as belladonna, and that atropia consequently relieves and ultimately cures whooping cough by its sedative action on these nerves.

Chloral.—At the meetings of the French Academy of Sciences, Paris, Sept. 15, 22 and 29, a note of M. Arloing, on the Anæsthetic Action of Chloral, was read, the following report of which we take from the *Bull. Gén. de Thérapeutique*, Oct. 15:

The three following questions are before us to-day: (1) Does chloral decompose or not in the animal body? (2) If it does, is this decomposition a necessary condition of the production of anæsthesia? (3) What respective parts are to be attributed to chloroform and to the alkaline formiates in the phenomena following the absorption of chloral?

The author has made, after a sort, a synthesis of chloral in the interior of the vessels by injecting separately the quantities of chloroform and of alkaline formiate that would be formed by an anæsthetic dose of chloral, and has registered the effects, on the theory that if he could obtain by this experimental procedure all the circulatory modifications that characterize anæsthesia by chloral, he would have the *modus operandi* of the decomposition of chloral in the blood. In former communications he had described the effects of chloral, chloroform and formiate of soda on the circulation. But, injecting a solution of formiate of soda into the veins of an ass or a horse, already chloroformed, he observed the traces of arterial and venous pressure of the pulsations and the quickness of the blood in the arteries, take gradually the characters of traces of the circulation. The circulatory troubles produced by chloral, therefore, are the resultant of the modifications that are due to chloroform and the alkaline formiate. The decomposition of chloral in the blood, therefore, seems evident.

The anæsthetic effects of chloral are not due, as M. Byasson thinks, to the combined action of nascent chloroform and formic acid, for the experiments of M. Arloing with an alkaline formiate, have convinced him that this salt does not diminish the sensibility. He considers the chloral anæsthesia as due to chloroform; as regards the alkaline formiates that develop simultaneously, they contribute to the anæsthesia by their vaso-dilator action, carrying the chloroform more rapidly and in greater quantity to the nervous centres and terminations of peripheral nerves.

The author therefore concludes:

1. That chloral decomposes into chloroform and alkaline formiates in the blood of animals.
2. That the anæsthetic effects of chloral are due to chloroform.
3. That the alkaline formiates mechanically favor the production of anæsthesia by increasing the rapidity of the circulation, and thus facilitating the impregnation of the nervous elements by the anæsthetic agent.

Witkowski, *Deutsch med. Wochenschrift*, Oct. 4, in an article entitled, "The Action of Morphine and Chloral Hydrate," after combating the opinion that morphine acts largely on the circulation, and claiming that it affects principally the respiratory and digestive functions, says:

The case is quite different with chloral hydrate, the principal concurrent therapeutic agent to morphine in practice. Its action on the circulation is almost without exception. This has been observed by nearly all investigators, in animals, and in man there is observed, frequently after the first dose, and almost regularly after long employment of the agent, the phenomena of the chloral rash, first described by Schuele. An hour after administration, shortly after a meal, but sometimes after imbibing alcoholics, there appear scattered patches of redness on the head and chest. The pulse is often 140 or more, but frequently it remains normal. This condition lasts from half an hour to an hour, and is generally not accompanied with any special psychic disturbance. Similar erythematous phenomena not unfrequently occur in nervous persons from the same causes without their having used any chloral, but after the employment of this agent they are so common and they disappear so regularly one or two days after its disuse, that its causal relation cannot be doubted.

Moreover, experience teaches that persons who suffer from the chloral rash after medium or moderately large doses (2—6 grammes) are most liable to the fatal accidents from chloral, of which there are now numerous cases in literature. The chloral erythema, indicating a condition of weakness and irritability of the vaso-motor system, is a warning symptom worthy of consideration, telling the physician that the period for withdrawing the remedy has arrived. In such cases one may preferably substitute morphine, which first affects the respiration and, as a rule, does not disturb the circulation. Especially must the consideration whether we have anything to fear on the side of the circulation be taken into account in the choice of these two hypnotics.

Dr. Witkowski disputes the assertions of Schweninger as to the action of morphine long continued in producing dilatation of the heart, and that of Binz and Heubach as to the effects on the blood pressure.

He concludes with recommending the combination of morphine and atropine as a useful anodyne in many cases, instead of morphine alone.

Hypodermic Injection of Arsenic in Chorea.—Dr. W. A. Hammond, *St. Louis Clin. Record*, Oct., recommends the hypodermic use of arsenic in the treatment of obstinate cases of chorea. He says that he has compared the duration of acute chorea as treated by the gastric and hypodermic use of arsenic; and has ascertained that the period is shortened one-half by the latter method. He finds that it often suffices, for the speedy cure of acute chorea, to give four drops of Fowler's solution hypodermically every alternate day for a week or ten days, and then to increase the dose to five drops for a like period.

In recent or slight cases this method is not usually necessary, but in rebellious ones he finds it of great advantage. The dose, he says, may be larger than that by the stomach. He has given as high as thirty-five drops of Fowler's solution hypodermically as an initial dose.

To avoid abscesses and other unpleasant complications, a few precautions are requisite: A point for injection should be selected where the skin is loosely attached to the underlying tissues. Over the deltoid is not a good place. Dr. Hammond recommends the front of the forearm, about midway between the wrist and the elbow. The skin should be lifted up and the injection made into the cellular tissues just under the skin, and not in the skin itself or in the muscles. The point of the syringe should be carried just through the skin and then for half an inch parallel to the face of the arm. The injection should be made slowly, and it is well to lift the skin over the place so as to facilitate the absorption. The Fowler's solution used in the injection should be diluted with at least an equal quantity of water or glycerine. If any of these precautions are neglected there is danger of producing abscess or erythema, or both, as arsenic has a decided tendency to produce them. But if attention is paid to these points, the Doctor says, there will rarely be any disturbance.

Chloroform, Chloral and Ether.—The following is the report of a communication read by M. Arloing to the French Academy of Sciences, last August, as given in the *Bull. Gén. de Thérapeutique:*

In order to produce anæsthesia and to register the accompanying circulatory modifications, we inject into the veins of a large animal (horse or ass) chloral in a one-fifth solution, and chloroform and ether dissolved and suspended in a larger quantity of water (20 volumes). The necessary quantity should be injected in several injections and always slowly, into a vein distant from the heart. If, before and during the operation, we take cardiographic traces with Chauveau and Marey's instruments, we find that chloral, chloroform, and ether do not have the same effects. All three produce acceleration of the heart-pulse, most pronounced and prompt in the case of chloroform; but one of the three—chloral—first causes a slowing; moreover, both chloral and ether lower the pressure in the right ventricle, while chloroform increases it; and, finally, ether and chloroform increase the force of the systoles, which chloral diminishes. From these facts we may conclude that the pulmonary circulation is quickened by chloral and ether, and reduced by chloroform.

From the examination of the simultaneous modifications of the circulation in the arteries and veins, it follows: (1) that the coursing of the blood in the capillaries is feebly diminished in the beginning of chloralization and etherization, to be later increased; (2) that this capillary circulation, after a very temporary increase, is diminished from the beginning of impregnation by chloroform, to then become gradually more considerable, without, nevertheless, attaining their physiological rapidity.

This does not fully inform us as to the condition of the cerebral circulation during anæsthetic slumber. The better procedure to ascertain whether the cerebral circulation is increased or diminished in rapidity, consists in studying the changes in the rapidity of the blood in the artery going to the head, leaving the cranium intact, and comparing these changes with those of the pressure in the vessel and the corresponding vein. Thus operating, we are assured: (1) that all anæsthetics do not produce the same effects on the capillary system, and that it is impossible to draw conclusions from the action of one alone; (2) that the sleep produced by chloroform is accompanied by anæmia, that from chloral and ether, by cerebral hyperæmia.

Action of Atropia on the Circulation.—Cavazzani (*L. Spallanzani; Jour. des Sci. Méd.*, 1879, p. 466) concludes from comparative experiments made upon both frogs and man: 1. That atropia paralyzes the cardiac fibres, since the diastolic period lasts longer, while the systolic period diminishes. 2. With the frog the cardiac revolutions become rarer from the beginning of the experiment. 3. The capillaries and the ultimate arterial and venous ramifications experience a notable constriction, proportional to the dose made use of, but less than that obtained from quinine. The constrictive effect may be uniform, but sometimes it is jerky from the constriction of the separated fibres. 4. Small doses augment the rapidity of the peripheral circulation, and the cavities of the heart become more entirely filled. 5. Larger doses, constricting the capillaries, and thus placing a considerable obstacle in the way of the peripheral circulation, cause slowing of the blood-currents. 6. The blood globules evidently lose their property by absorbing oxygen. 7. Large and small doses give identical results with regard to the circulatory centre and the vascular net-work; but large doses slacken the peripheric circulation by augmenting cardiac hyposthenia and constriction of the vessels. 8. Death occurs after large doses by paralysis of the heart, which is arrested by diastole. 9. The narrowing of the capillaries, the enfeeblement of the cardiac impulse, the diminished oxidation of the blood, offer an explanation of the therapeutic action of this substance on man, and especially of the favorable action of atropia in acute and chronic articular rheumatism.—*Phil. Med. Times*, Sept. 27, 1879.

Citrate of Caffein.—Dr. L. Shapter, *Brain*, Oct., 1879, recognizes in citrate of caffein, besides its diuretic properties, a vaso-motor stimulant, of advantage in a large class of cases in which a vaso-motor neurosis with relaxation of vascular walls, is a prominent or predominant element. He says: "With such pathological elements, we have a vast and important class of diseases in which we may obtain important results. In melancholia, in the brain of over-workers, in the sleeplessness and depression of spirits of drunkards, in poisoning by opium or aconite, and in such forms of acute mania as have been called by M. Gubler asthenic," where a defect of incitation, an eye pale, and a pupil large, indicate excitants—in all these and allied cases, we may reasonably hope that citrate of caffein, so readily given hypodermically, will find a permanent place. As regards the administration of the drug, it should be given in sufficient doses. Three grains of the citrate should be looked upon as the minimum dose; in cases associated with pain or asthenic mental excitement, the dose will probably have to be increased and be frequently repeated; but in cases of heart disease, where it will serve as an adjuvant to digitalis, three to five grains given every night will usually be found sufficient to establish free diuresis, and induce that proper state of nutrition from which sleep, as not the least of the important ends to be attained, may be expected.

Apomorphia.—We give here the conclusions of a paper by Dr. Edward T. Reichert, of Philadelphia, *Phila. Med. Times*, Dec. 6 and 20, and Jan. 3, on the Physiological Action of Apomorphia Hydrochloras. The experiments were performed on dogs, cats, rabbits and frogs, and were over two hundred in number. The conclusions are summed up at the close, being otherwise scattered throughout the paper. They are as follows:

1. That when locally applied, it is a depressant to all the highly organized tissues of the body.

2. That upon the cerebrum it is primarily a stimulant, secondarily a depressant.

3. That the sensory nerves are paralyzed, the paralysis being progressive from the periphery to the centre.

4. The motor nerves are primarily stimulated; secondarily paralyzed.

5. That the loss of voluntary motion is due to narcotism.

6. That the loss of reflex activity is due to a paralysis of the sensory nerves and a stimulation of the inhibitory reflex centres of the spinal cord.

7. That the convulsions are principally spinal, and due to a paralysis of the inhibitory reflex centres of the spinal cord.

8. That the motor conducting tracts are paralyzed before the motor nerves succumb.

9. That the hyperæsthetic condition which is sometimes observed to exist after the total abolition of reflex activity, is due to a depression of the inhibitory reflex centres of the cord.

10. That the increase of pulse-rate is due to a stimulation of the accelerator fibres of the vagus, and the decrease to a depression of the heart-muscle.

11. That the increase of respiration rate in dogs and cats is due to a stimulation of the peripheral vagi nerves, and in rabbits to a combined stimulation of the vagi centres.

12. That the primary and secondary fall of blood pressure is due to a direct depressant action on the heart, and the temporary rise to a stimulation of the vaso-motor centres in the medulla.

13. That the temperature is primarily increased, secondarily diminished.

14. That both the voluntary and involuntary muscular systems are depressed, and finally, paralyzed.

15. That it is a cardiac depressant.

16. That the secretion of the salivary gland is markedly increased.

17. That the emesis is due to a stimulation of the vomiting centres in the medulla oblongata, and that the drug acts primarily as a stimulant, secondarily as a depressant to these centres.

18. That absorption takes place very rapidly through all parts of the body.

19. That it is probably eliminated by all the secretions, and that the elimination takes place rapidly.

20. That the most characteristic test is the solution of gold chloride, which gives a purple precipitate, which may be distinguished from a reaction with a tin salt by the precipitate changing to a brown when it is boiled.

21. That the dilatation of the pupil is due to a paralysis of the motor oculi centres.

22. That there are no characteristic lesions found after death.

In nearly twenty autopsies I never found, in a single specimen, the slightest evidence of the hyperæmia of the pons varolii which Quehl states to be a characteristic lesion.

THE ACTION OF MERCURY.—Dr. S. V. Clevenger, of this city (Chicago) from an extended series of experiments on the physiological action of mercury, has been led to the conclusion that all its salts are reduced in the system to the metallic state, and that their proper constitutional effects are due to the metal itself. He has been able to discover mercury in the capillaries, and believes he has seen diapedesis of mercurial globules in the capillaries and lymphatics of the frog. A full and detailed account of his experiments and results will shortly be published.

THE following are the titles of some of the papers on the Therapeutics of the Nervous System and Mind, published since our last issue:

RINGROSE ATKINS, Metalloscopy in Hysterical Hemianæsthesia. *Brit. Med. Jour.*, Nov. 15.—CHANNING, Care of the Insane in Massachusetts, *Boston Med. and Surg. Jour.*, Nov. 27.—REICHERT, The Physiological Action of Morphine Hydrochloras, *Phil. Med. Times*, Dec. 6.—POOLE, Electricity a Paralyzing Agent, *N. Y. Med. Record*, Nov. 1.—HUTCHINSON, Climatic Cure in Nervous Diseases, *Ibid.*, Jan. 13.—BURMAN, On the Separate Care and Special Medical Treatment of Acute and Curable Cases in Asylums, *Jour. of Ment. Sci.*, Oct.—HAWKINS, "After-Care," *Ibid.*—VULPIAN, On the Influence of Cutaneous Faradization of Limited Portions of the Skin in Cases of Anæsthesia due to Cerebral Lesions, Lead Intoxication, Hysteria and Zona, *Bulletin Gén. de Therap.*, Nov. 30.—PETIT, Metallotherapy, *Ibid.* (cont. art.)—DEBOVE, The Hemianæsthesias Accompanying Motor Hemiplegia, Hemichorea and Contracture, and their Curability by Æsthesiogenic Agents, *L'Union Médicale* (cont. art.)—JOFFROY, Bromide of Potassium in Spasm of the Glottis, *Revue Mensuelle*, Oct.

BOOKS, ETC., RECEIVED.

Topische Diagnostik der Gehirnkrankheiten. Eine Klinische Studie, von Dr. Hermann Nothnagel. Verlag von August Hirschwald. Berlin, 1879.

Die Acute Atrophische Spinallahmung der Erwachsenen (Poliomyelitis Anterior Acuta). Eine Klinische Studie, von Dr. Franz Muller, Stuttgart. Verlag von Ferdinand Enke. 1880.

The Relations of Mind and Brain. By Henry Calderwood, LL. D., Professor of Moral Philosophy, University of Edinburgh. Macmillan & Co., London, 1879. Chicago, Jansen, McClurg & Co.

Contribute Clinico Anatomo-Pathologico alle Localizzazioni Cerebrali. Del Prof. Augusto Tamburini. Reggio Nell' Emilia. 1879.

Olai Martini Läkiare Book efter en I Karolinska Medico-Kinergiska, Institutets Bibliotek Befintlig Handskrift, Utgivfen, med. Inledning och Aurnarkringar af J. V. Broberg. Stockholm, 1879. Kongl. Boktryckeriet.

Das Sanitatswesen bei Plewna. II. Theil. Studien ueber Militair-Sanitatswesen. Gewidmet allen Gliedern der Armee, von Dr. Kocher. (Beilage der St. Petersb. Medicin. Wochenschrift), St. Petersburg, 1880. Buchdruckerei von Rottger & Schneider, Newsky-Prospect No. 5.

Real-Encyclopädie der Gesammten Heilkunde. Medicinisch-chirurgisches Handwörterbuch für praktische Aerzte. Herausgegeben von Dr. Albert Eulenburg. Mit Zahlreichen Illustrationen in Holzschnitt. I. Lieferung, Band I., Bogen 1–5. Wien, 1880.

Proceedings of the Association of Medical Officers of American Institutions for Idiotic and Feeble-Minded Persons. Sessions Syracuse, June 8–12, 1878. Lincoln, May 27–30, 1879. Philadelphia, J. B. Lippincott & Co. 1879.

Lunacy Reform. Historical Considerations. E. C. Seguin, M. D. Reprinted from Archives of Medicine, Oct., 1879. New York, G. P. Putnam's Sons.

Transactions of the Twenty-Ninth Anniversary Meeting of the Illinois State Medical Society, held at Lincoln, May 20 and 21, 1879. Chicago, 1879. 302 pages.

Early Medical Chicago, an Historical Sketch of the First Practitioners of Medicine, with the present faculties, and graduates since their organization, of the Medical Colleges of Chicago. By James Nevins Hyde, A. M., M. D. Chicago, Fergus Printing Co. 1879.

Psycho-Physiological Training of an Idiotic Hand. By Edward Seguin, M. D. (Reprinted from Archives of Medicine, Oct., 1879.) New York, G. P. Putnam's Sons, 1879.

A Glance at Insanity and the Management of the Insane in the American States. By Pliny Earle, M. D. Read before the Conference of Charities, held at Chicago, Ill. June 19, 1879. Boston, Rand, Avery & Co., 1879.

Some further thoughts concerning the Origin and Spread of Yellow Fever and the means of preventing it. By N. S. Davis, M. D., Chicago, Ill. (Reprinted from the Chicago Medical Journal and Examiner, December, 1879.)

Alcoholism, Its Treatment, from an Analysis of one hundred and twenty-five cases, by E. C. Helm, M. D. (Reprinted from the Chicago Journal and Examiner, December, 1879.)

The Radical cure of Hernia, by the Antiseptic use of the Carbolized Catgut Ligature. By Henry O. Marcy, A. M., M. D., Cambridge, Mass. (Reprinted from the Transactions of the American Medical Association, 1878.)

Choreic and Choreiform Movements in Hysterical Children. By Landon Carter Gray, M. D. (Reprinted from Archives of Medicine, October, 1879.)

Osteo-Cephaloma of the Thigh. By J. G. Meacham, Jr., M. D., of Racine. (Reprinted from the transactions of the Wisconsin State Medical Society., 1879.)

A Contribution to the Hæmatinic Properties of Dialized Iron. By Robert Amory, M. D., of Longwood, Mass. (Reprinted from the Boston Medical and Surgical Journal, April 3d, 1879.)

Annual Address before the American Academy of Medicine at New York, September 16th, 1879. By Lewis H. Steiner, A. M., M. D.

Œsophagismus, with remarks on the subject. By J. J. Henna, M. D. (Reprinted from the Hospital Gazette, October 18, 1879.)

On the Electrical Excitability of the Skin. By S. Tschiriew, M. D., and A. de Watteville, M. A. (Reprinted from Brain. Part VI.)

The Hot Water Vaginal Douche. By E. C. Dudley, M. D. (Reprinted from the Chicago Medical Gazette, January 5, 1880.)

The Sanitary Problems of Chicago, Past and Present. By J. H. Rauch, M. D. (Reprinted from the Transactions of the American Public Health Association, Volume IV.)

Neurasthenia, with Remarks on Treatment. By Geo. M. Beard, A. M., M. D. (Reprinted from the St. Louis Medical and Surgical Journal, May, 1879.)

Morbid Fear as a Symptom of Nervous Disease. By Geo. M. Beard, M. D. (Reprinted from the Hospital Gazette, July 19, 1879.)

A Clinical Inquiry into the Diagnostic Significance of Absent Patellar Tendon-Reflex. By C. H. Hughes. (Reprinted from the Alienist and Neurologist, January, 1880.)

Responsibility restricted by Insane Delusion. By T. L. Wright, M. D. (Reprint from Cincinnati Medical News, Nov., 1879.)

The History of Massage. By Douglas Graham, M. D., Boston, Mass. (Reprinted from the Medical Record, August 16 and 23, 1879.)

The Education of Girls. By Nathan Allen, M. D., LL. D., of Lowell, Mass. Read before the American Institute, at its Fiftieth Annual Meeting, July 10, 1879.

Tobacco-Poisoning and its Effects upon the Eyesight. By A. W. Calhoun, M. D., Atlanta, Ga. (Reprinted from Transactions Medical Association of Georgia.)

Report of the Resident Physician of Brigham Hall, a Hospital for the Insane, for the year 1878.

The Therapeutic Society of New York. (Reprinted from the New York Medical Journal, June and July, 1879.)

Ninety-Seventh Annual Catalogue of the Medical School of Harvard University, 1879–80. (Reprinted from the Catalogue of the University.)

THE FOLLOWING FOREIGN PERIODICALS HAVE BEEN RECEIVED SINCE OUR LAST ISSUE.

Allgemeine Zeitschrift fuer Psychiatrie und Psychisch. Gerichtl. Medicin.
Annales Médico-Psychologiques.
Archiv fuer Anatomie, Physiologie, und Wissenschaftl. Medicin.
Archiv fuer Path. Anatomie, Physiologie, und fuer Klin. Medicin.
Archiv fuer die Gesammte Physiologie der Menschen und Thiere.
Archiv f. Psychiatrie u. Nervenkrankheiten.
Brain.
British Medical Journal.
Bulletin Générale de Thérapeutique.
Centralblatt f. d. Med.Wissenschaften.
Centralblatt f. d. Nervenheilk., Psychiatrie, etc.
Cronica Med. Quirurg. de la Habana.
Dublin Journal of Medicine and Surgery.
Deutsche Medicinische Wochenschrift.
Edinburgh Medical Journal.
Gazetta Medica de Roma.
Gazette des Hopitaux.
Glasgow Medical Journal.
Hygeia.
Hospitals Tidende.
Journal de Médicine et de Chirurgie Pratiques.
Journal of Mental Science.
Journal of Physiology.
Journal de Medecine de Bordeaux.
Journal of Pscych. Medicine.
La France Médicale.
Lancet.
Le Progrès Medical.
Lo Sperimentale.
L'Union Medicale.
Mind.
Nordiskt Medicinskt Arkiv.
Norsk Magazin for Lagensvidenskabens.
Practitioner.
Psychiatrisches Centralblatt.
Rivista Clinica di Bologna.
Rivista Sperimentale di Freniatria e de Medicina Legale.
Revue Medicale du Nord-Est.
Revue Mensuelle de Medicine et de Chirurgie.
Schmidt's Jahrbuecher der In- und Auslandischen Gesammten Medicin.
St. Petersburger Med. Wochenschrift.
The Practitioner.
Upsala Lakarefornings Forehandlinger.

The following domestic exchanges have been received:

Alienist and Neurologist.
American Journal of Insanity.
American Journal of Medical Sciences.
American Journal of Obstetrics.
American Journal of Pharmacy.
American Medical Weekly.
American Practitioner.
Archives of Dermatology.
Archives of Comp. Med. and Surgery.
Atlanta Medical and Surgical Journal.
Boston Medical and Surgical Journal.
Buffalo Medical Journal.
Bulletin National Board of Health.
Bulletin of Medico-Legal Society.
Canada Medical Record.
Canadian Journal of Medical Sciences.
Chicago Medical Gazette.
Chicago Medical Journal and Examiner.
Cincinnati Lancet and Clinic.
Clinical News.
Detroit Lancet.
Hospital Gazette.
Index Medicus.
Maryland Medical Journal.
Medical Brief.
Medical News and Library.
Medical Record.
Medical and Surgical Reporter.
Michigan Medical News.
Nashville Journal of Medicine.
New Remedies.
New Preparations.
New York Medical Journal.
Ohio Medical and Surgical Journal.
Pacific Medical and Surgical Journal.
Proceedings of Med. Society of the County of Kings, N. Y.
Pharmacist and Chemist.
Philadelphia Medical Times.
Physician and Pharmacist.
Physician and Surgeon.
Quarterly Journal of Inebriety.
Richmond and Louisville Medical Journal.
Southern Practitioner.
Southern Clinic.
St. Louis Courier of Medicine.
St. Louis Medical and Surgical Journal.
St. Louis Clinical Record.
Toledo Medical Journal.
Virginia Medical Monthly.

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Original Articles, Selections and Translations.

Art. I.—ON THE COINCIDENCE OF OPTIC NEURITIS AND SUBACUTE TRANSVERSE MYELITIS.*

By E. C. Seguin, M. D.,

Clinical Professor of Diseases of the Nervous System in the College of Physicians and Surgeons, New York.

Mr. PRESIDENT and Gentlemen:—For nearly thirty years since the first researches of Budge and Waller, of Claude Bernard and of Brown-Séquard, on the spinal innervation of the eyeball, physicians have been acquainted with various ocular symptoms of spinal diseases. The more prominent of these associations have been the myosis and atrophy of the optic nerves observed in the course of sclerosis of the posterior columns of the spinal cord, or progressive locomotor ataxia. Again, myelitis of the cervical spinal cord, whether

* Read before the New York Neurological Society, March 2d, 1880.

inflammatory or from compression (Pott's disease, tumors, etc.), has been known to cause variable states of the pupil, due to irritation or destruction of the cilio-spinal centre, so-called, a region of anterior grey matter extending from the level of the fifth or sixth cervical nerve to that of the third or fourth dorsal nerve.

But the literature of spinal affections has been searched in vain for an example of transverse myelitis associated with an acute affection of the optic nerve. All of the recorded changes in the optic nerves in the course of spinal affection, were of a chronic and degenerative kind.

In the last year three instances of the remarkable coincidence of optic neuritis and transverse myelitis have occurred, and I have thought it might prove interesting to lay them before you.

Although two of the three cases had been observed and recognized by me before reading an account of the third, I think it but right to place this first in order of relation, because it was the first published. The observation is by the distinguished neurologist, Dr. W. Erb, now Professor in the University of Leipzig. His paper was read on May 17, 1879, at the fourth meeting of the Neurologists and Alienists of Southwestern Germany, held at Heidelberg; and it was published later in the autumn in *Westphal's Archiv.**

CASE I., by Prof. Erb.—I was consulted, on July 18, 1877, by a man aged 52 years, who, previous to the present illness, had enjoyed good health, and had never had syphilis. He had experienced a combination of rapidly developed and peculiar blindness with alarming paralytic phenomena.

The following is a history of the case: In February, 1877, the left eye became suddenly affected; diminished vision; central scotoma, and in a few days total amaurosis; and after a few weeks return of vision. The ophthalmoscopic examination was negative. Soon afterward the right eye was similarly affected. Blindness followed by recovery, negative results

* W. Erb.—"Ueber das Zusammenkommen von Neuritis Optica und Myelitis Subacuta."—*Arch. f. Psych. und Nervenkrankheiten.* Bd. X., Hft. I., p. 146.

to ophthalmoscope. The beginning of the illness was marked by slight headache.*

After a while there was still another attack; this time in both eyes, commencing with bi-temporal hemiopia and color-blindness; progressing rapidly to complete blindness. On this occasion the ophthalmoscope revealed a well-marked optic neuritis, with some distinct atrophy. At no time was there choked disc.

In the last few weeks improvement has once more shown itself. The patient can now read Jäger No. 4; distinguishes the outlines and colors of objects, but cannot yet recognize faces.

The treatment consisted in 76 inunctions with unguent. hydrargyri cinereum, local abstraction of blood, purgatives, and a seton in the neck.

During the three or four weeks preceding the consultation, there had occurred drawing and tearing pains in the legs, trunk, and in the lower thoracic regions (cincture pain); there was but little pain in the arms. In the course of 14 days the following phenomena were added: Rapidly increasing weakness of the *right* leg, which soon became completely paralyzed, and at the same time anæsthesia of the *left* leg. Later still the left leg also became weak. Associated with these symptoms were retention of urine, later incontinence (now present) and anæsthesia of the urethra and rectum.

Examination on July 18.—The patient is a strong, healthy-looking man. He has slight fever (38.5° C.); amblyopia of both eyes; pupils and movements of the eyeballs are normal. The other special senses are normal. Memory and intelligence preserved; no headache or vertigo.

The upper extremities present no symptoms. The right

* The ophthalmic notes concerning the first stages of the disease, including the three distinct attacks of blindness, are by Dr. Steffan, of Frankfort-on-Main. These notes differ from Dr. Erb's summary in the important particular that in the first two attacks (each optic nerve alternately) a slight optic neuritis, œdema of edges, without swelling, was seen with the ophthalmoscope. Besides, some interesting limitations of the field of vision were noted.

Dr. Steffan will publish a full account of the eye-symptoms in this interesting case.

hand is often the seat of slight pain, but there are no paræsthesiæ or disorders of motility.

The right lower extremity is entirely paralyzed, and the left thigh though paretic, can be moved in all directions; the muscles of the abdomen and back are very weak.

The sensibility of the right leg is generally preserved, though in a few places it is diminished. The right half of the abdomen is evidently hyperæsthetic, as is a region round about the thorax at the level of the nipples. The left lower extremity and the left half of the abdomen are very distinctly anæsthetic; the left side of the back is anæsthetic, the right sensitive. These are the unmistakable signs of a lesion involving one lateral half of the spinal cord, as given by Brown-Séquard. The lower dorsal region is the seat of some pain; no spinal tenderness, or deformity, or stiffness.

The cutaneous and tendon-reflexes in the legs are increased; reflex movement of abdominal muscles not present.

No atrophy or bed-sore. There is paralysis of the bladder; there is occasionally involuntary evacuation of urine; the patient is constipated, and he is not fully conscious of the passage of fæces.

Prescription.—Cold compresses, according to Priessnitz's method, to the spine; every three days dry cups along the vertebral column; iodide of potassium; extreme cleanliness, and attention to bowels.

July 27.—In the last few days signs of acute cystitis; bowels distended with gas; from time to time the legs jerk. Other symptoms not much changed. The right lower extremity is still completely paralyzed, the left a little weak. Sensibility very slightly diminished on the right side; there is no longer any hyperæsthesia; the cincture feeling is gone; the right half of the abdomen shows muscular tension. Plantar reflex and the tendon-reflexes are greatly increased; dorsal clonus is easily produced. No bed-sore; eyes as before.

In the next few days, probably in consequence of the cystitis, there were several chills, and the temperature rose to 40.3° C.

In the next few days improvement began, and the following is noted on August 11: The left leg once more possesses all its movements and is quite strong; the right lower extremity is also movable, but is weaker than the left. There is hardly a trace of the alteration of sensibility; there are next to no pains in the legs. Reflexes less marked; bladder and rectum unchanged; eyes in *statu quo.* The patient's general condition is much better. Ordered same treatment except that the iodide of potassium is omitted, and a little morphine given for insomnia.

Progressive improvement took place so that on September 28, it is noted that the legs are strong enough to enable patient to take a few steps (no ataxia); the sensibility is normal, and the bladder acts well. At times he has a sense of tension in the back, and an occasional pain in the legs. The eyes have improved a little.

Toward the close of the year the patient's objective symptoms were about gone; the reflexes were still strong, but he complains of various paræsthesiæ in the legs, a "ringing" or vibration while sitting, sensations of weight and of swelling.

In the spring of 1878 the patient was well, except that he had sensations of slight heat and crawling in the legs and back.

From November 12, 1878, to March, 1879, the patient had a galvanic treatment for his eyes, with marked improvement.

Dr. O. Becker of Heidelberg, found the following: Slight myopia of both eyes; pupils rather small, acting well. R. V. $\frac{6}{60}$, L. V. $\frac{6}{\infty}$; fingers counted at 6 metres, with +3 R. V. Jäger No. 3. L. V. No. 6. Both eyes are blind for green and red.

The ophthalmoscope shows atrophy of the optic nerves, with slight excavation; nerves bluish. Lesion more marked on left visual field, slightly reduced concentrically; no scotoma.

At the close of treatment, March 4, 1879. R. V.—$1=\frac{6}{18.12}$, L. V.—$1=\frac{6}{24\ 18}$, with +3, can read No. 3 Jäger and make out a few words of No. 2; with +4 and +5, can read newspaper print easily.

CASE II.—Drs. H. D. Noyes and T. A. McBride. On September 5, 1879, I saw Mr. D., a patient of Dr. H. D. Noyes, at the request of Dr. T. A. McBride. Dr. McBride has already made an exhaustive examination of the case, and the following is a history based upon a memorandum which he sent with the patient. I desire to express my thanks to Dr. Noyes and Dr. McBride for permission to make use of the case. Mr. D., a clerk, aged twenty-five years, suffered from debility during the whole of the past summer. Since March has had several "bilious attacks."

On August 9, was seized with severe diffused headache, which lasted day and night for a week. Was constipated and nauseated. No headache since.

August 18, retention of urine occurred, for which the catheter was used three or four times in the course of ten days. The bladder has been sluggish since. During the same period (last two weeks of August) patient noticed stiffness and pain in the muscles of the back, preventing his bending forward. The pain was in the lower dorsal region. In the last ten days no pain, but a sense of numbness and anæsthesia has appeared in all parts below the waist. The loss of sensibility was discovered in the bath; he did not feel the contact of water normally. About the same time (ten days ago) he also noticed a dimness of vision, which has since increased almost to blindness, at times. No symptoms in upper extremities. Patient denies syphilis, or injury to the head and spine. Several members of his family have died of phthisis. Examination: walks well; no disturbance of equilibrium, or inco-ordination. Dynamometer shows in right hand, 65, 63, 65; in left, 60, 56, 61 (weak instrument). No actual paresis of the lower extremities. Knee tendon-reflex normal. Sole reflex deficient, especially on the right side. Sensibility is much impaired below the waist. Touch is badly perceived (an æsthesiometer point seems like a finger), and pricking or pinching still less. There is, consequently, more analgesia than anæsthesia. At times the legs tremble; no spasm, or formication. Sight is very defective, the fields of vision are irregularly limited, there is marked loss of color perception. The ophthalmoscope shows typical choked disc on both sides. The temperature in the mouth is 100.25° F. The heart is normal; percussion of skull and vertebræ produces no pain.

The above was Dr. McBride's examination. My own gave corroborative results, viz.: a paraplegiform anæsthesia (incomplete), and double neuro-retinitis. The latter lesion seemed less than as described by Dr. McBride, and vision less impaired: he could count fingers and trace features easily.

My diagnosis was double lesion, one at the base of the brain involving the optic nerves and the chiasm, and a focus of myelitis in the centre of the cord in its lower dorsal region. I advised a continuance of the iodide of potassium in full doses.

[The following are additional notes furnished by Dr. Noyes. Dr. Noyes took part in the discussion on this paper and exhibited to the Society diagrams illustrating the extraordinary changes in the fields of vision in his patient.]

"Vision became impaired at the same time that the bladder trouble came on. No phosphenes; no tenderness over lower portion of spinal column.

September 2d.—The field of vision, O. S., normal. O. D.: Perception absent on nasal side, encroaching centrally beyond the median line, with contraction of the peripheral portion in other localities. Ophthalmoscope shows, O. D., the inner half of disc is most swollen—there is a small segment downwards and outwards, which is not much affected. It looks more like a neuritis descendens, than a true choked disc. Not much choking of left disc. O. D. $H=\frac{1}{15}$.

The patient was next seen September 6th.—The condition of fields of vision being much the same, except that the sight has improved. Sight returning in the infero-nasal quadrant. O. S. normal.

September 11.—To-day for the first time, find that the left eye on the outer has lost its perceptive power, almost entirely, there being only a small ovoid spot on the horizontal meridian, where perception remains. The right now shows that the field is changed from the showing on the 6th, and things are reversed—seeing now only in the nasal quadrant. The patient feels satisfied that September 8th the change began for the worse in his left eye—at the same time that his right eye had changed as to field, viz., seeing only in the infero-nasal quadrant. The inner half of the right optic disc is swollen—the vessels are tortuous—the outer half is pale. The inner half of the left disc is swollen, the same as the right, the outer half being pale.

September 16th.—His sight, in his own opinion, has not altered much. Examination shows recovery of a considerable amount of his lost fields of vision—the right being normal except for the presence of a scotoma; while the left shows the previously mentioned oval area of perception lower in the temporal portion of the field to have increased considerably in size; otherwise the field in O. S. is similar to last entry.

September 20th.—Fields of vision have improved, there being only a central scotoma, of small size, in each field of vision. The sight is better, but it is not possible to measure it accurately. Both discs are in parts swollen, but not so much as at last examination—yet plainly to be seen still. There is an unusual pallor of other parts of the discs, that were at the earlier stages swollen.

September 26th.—Patient says that his sight was much better yesterday than it has been for some time. His fields have not altered—the scotomata being still present. The color perception is poor. He recognizes blue and most of its shades. Red is recognized next. Grey, violet and green are mistaken.

October 4th.—V.=$\frac{20}{70}$ O. S.

October 14th.—O. D. V.=$\frac{20}{200}$. O. S. V.=$\frac{20}{50}$. Cannot find positively any true scotoma in either eye. There is a certain amount of dullness of perception over the small scotomata found at the last examination.

October 21st.—O. D. V.=$\frac{20}{50}$. O. S. V.=$\frac{20}{30}$.

October 30th.—O. D. V.=$\frac{20}{30}$. O. S. V.=$\frac{20}{30}$. Inner half of both discs swollen—the outer pale.

December 20th.—V.=$\frac{20}{20}$ O. D. No scotoma—color perception good. Fields of vision perfect for both objective and color tests.

January 24th, 1880. V.=$\frac{20}{20}$ in each eye. Fields for objective and color tests normal."

The paraplegia had long since disappeared.

CASE III.—Personal.—Shortly before reading Prof. Erb's paper, I had the opportunity of seeing the following interesting case, and of treating it. The patient was originally under the care of Prof. Willard Parker, who, on December 9, 1879, transferred the case to me.

J. P. M., a banker, aged 35 years, had enjoyed excellent health for many years, and had never contracted syphilis. For some time previous to the development of the present illness he was in business in Virginia City, Nevada, at an altitude of more than 7,000 feet.

On September 5, 1879, he first noticed numbness in his feet and legs, but was perfectly able to walk. This numbness was stationary for three or four days; then a feeling was noticed as if there were an iron bar or block in the perineum; the legs became noticeably weak about the 28th. Mr. M. came east by way of Panama, and while on board the ship he used his legs actively. Arrived in New York in the first week of October: he could still walk to his meals in the hotel, though he dragged his feet—the right more. The numbness continued. He suffered a "distress" in the sacrum, but had no pain in back or legs. After a week, during which he exerted himself a good deal, the paralysis increased, and he ceased walking; sensibility became impaired. For a fortnight (middle of October) there was absolute loss of motility below the waist and much anæsthesia, though he never lost his feet in bed. At one time he had the feeling of numbness as high as the groins.

Sensation and motion returned in the left leg first; and since the end of October both legs have gradually but steadily improved. He can now move every joint in the lower extremities, but he has not yet tried to stand or walk. He has had a band-like feeling around the calves of his legs, and a pressure-feeling in front of the abdomen. He never had retention of urine, but at times involuntary squirts. Was greatly constipated. There have been no active symptoms in the arms, but it was noticeable that if placed in an awkward position they easily became numb. The paralyzed muscles did not waste, no bed-sores formed, and the general health remained good. During the period of convalescence Mr. M. noticed severe tonic and clonic spasms in the legs; less lately.

During the past two weeks blurred vision of the right eye has been noticed. This was preceded one week by severe pain in the right orbit and near the brow. Lately sensibility has greatly improved; a little tight feeling remains around the insteps.

Examination.—Patient is surprised to find that he can stand. Closing eyes does not impair equilibrium. The legs are weak, but every muscle and articulation can be moved. Tendon-reflex at knee and sole-reflex are exaggerated. Sensibility is normal to touch and pinching; localizes impressions correctly. No ataxia; the muscles are well nourished; spine not tender; erections (absent for a time) are returning.

Treatment was begun only at the time when paralysis became marked, seven or eight weeks ago. He was then given moderate doses of iodide of potassium, one-thirtieth grain of strychnia three times a day, and he was rubbed.

December 15.—At my request Dr. Arthur Mathewson, of Brooklyn, saw the patient and examined his eyes. The following are Dr. Mathewson's notes: "On first examination the nerve of the right eye was found whitish and œdematous, with outlines rather indistinct; vessels only slightly tortuous, veins full and dark (in both eyes); media clear; refraction nearly emmetropic, but the most prominent part of the nerve disc was in focus with a No. 16 convex glass. Vision was not tested accurately for want of means at patient's house, but he could read about Jäger No. 10 with the affected eye. There was also a slight lateral tremulous motion of the right eye, a sort of nystagmus."

These two examinations justified the diagnosis of sub-acute transverse myelitis in the lower dorsal region, with optic neuritis limited to one eye.

I will not weary the Society with a transcript of my full notes of the further progress of the case. Suffice it to say that improvement in vision and in the power of walking, with decrease of reflexes, occurred, until at the present time the patient is nearly well. The treatment consisted in the withdrawal of the strychnia; the gradual increase of the iodide of potassium up to more than 4 grams three times a day, galvanism to the spine and muscles, and massage.

My friend, Dr. L. C. Gray, of Brooklyn, had the immediate management of the case, and I saw the patient nearly once a week. In January there was added to the above treatment an evening dose of 2 grams each of fluid extract of ergot and bromide of potassium, which had the desired effect of lessening the reflexes. On February 20 Mr. Martin came to New York to see me. His gait was quite normal; the knee tendon-reflex rather strong (no spontaneous reflex movements); he complained of only a trace of numbish sensation in the calves and in the nates; in walking a slight sense of constriction is experienced upon each leg below the knee, on the inner side. Vision of right eye is nearly normal; the nerve is whitish, and the nystagmus (horizontal) is still present.

March 1.—Dr. Mathewson has kindly sent me the following memorandum: "I have just carefully examined Mr. M.'s eyes as they stand to-day, and send you the result. There is now no limitation of the fields of vision, and no scotomata, and there is no marked diminution of color perception. The œdema of the nerve disc of the right eye has now wholly passed away, so that its outlines are perfectly distinct, and the disc is paler than normal, and quite in contrast with the nerve of the other eye, which is rather hyperæmic, with outlines not quite well defined. There is a manifest hypermetropia, of $\frac{1}{36}$ (by ophthalmoscope $\frac{1}{24}$ +), of the right eye, its vision is $\frac{20}{20}$; while the left is nearly emmetropic and has perfect vision. There is still a slight trace of the nystagmic movement, though it is not constant."

The optic neuritis in this case was intermediate in type between the conditions observed in the two other cases. There was œdema of the periphery of the nerve with some swelling of the disc—a degree of choked disc. This was followed by atrophy without marked loss of vision. All the morbid processes occurred in one eye.

It is interesting to note that the distribution of the inflammatory lesions varied in each case within very considerable limits. In the eyes it affected alternately each optic nerve, and both at one time in two cases. In Dr. Noyes' case the changes in the fields of vision were singularly capricious. In the third case only one optic nerve was affected. These irregularities and the peculiar symptoms of bi-temporal hemiopia (in case I.) are, it seems to me, explicable only upon the supposition of a lesion at the base of the brain involving the chiasm and optic nerves. The phenomena in the third case (symptoms in one eye only) would seem to exclude most positively a central cerebral lesion.

In the spinal cord the inflammatory changes were in the dorsal region in all the cases, but in all other respects there were marked differences.

In case I. the right half of the spinal cord no doubt contained most of the lesions.

In case II. the æsthesodic region of the cord (posterior grey matter or peri-ependymal region?) was chiefly involved.

In case III. the entire structure of the cord must have been slightly affected, the motor region most. The comparative escape of the bladder in case III. (no retention) is instructive anatomically, as the limitation of the numbness to the altitude of the groin would indicate that the lesion was in the lowest dorsal or upper lumbar region of the cord, below the vesical centre. In cases I. and III., where the limits of numbness and the constriction band indicated disease of the mid-dorsal portion of the cord, retention and cystitis occurred.

The question naturally arises: Is there any causal or physiological relation between the two sets of phenomena observed in these three cases?

Prof. Erb answers in the negative, and it seems to me that with our present knowledge of the relations between the optic apparatus and the spinal cord we must in agreement with him consider this association of optic neuritis and transverse myelitis as accidental.

Art. II.—THE NATURE AND MANAGEMENT OF SLEEPLESSNESS.

A Lecture Delivered in the Chicago Medical College,
By J. S. Jewell, M. D.

GENTLEMEN: The subject to which I wish to invite your attention this morning is sleeplessness. No morbid condition more troublesome is met with by the physician. In this case as in so many others, a correct mode of treatment depends so largely upon a correct conception of the physiology of the process (that is, sleep) as to make it necessary to consider with some little care what are its real conditions. But unhappily thus far, too little is known in respect to this subject. The more one observes and reflects upon it the more singular does it appear. A person in perfect health and in the enjoyment of the normal condition of the bodily and mental powers, continues through the day at ordinary employments, responsive to every sense impulse, and alert in every thought process, fully alive to their condition and surroundings in what is called the waking state, and at the conclusion of a day's activities a sense of fatigue or exhaustion comes on, and the individual retires for rest, and suddenly loses consciousness. He ceases to think or feel, hears, sees, tastes, or feels nothing, and in most respects appears as if dead, except that to external appearance he continues to breathe.

To such an extent is this true, that sleep has been called the twin brother of death, which in some respects it so closely resembles. Now what kind of a change is it in the action of the brain that underlies and produces sleep? What is the cause of the loss of consciousness? By what means are the senses locked up and a period put to all or nearly all mental activities, and that relaxation produced of the physical organism, which we witness in healthy, complete sleep? As I have said already, the more we reflect on this subject, familiar as it is to ordinary observation, the more curious does it seem. It has accordingly been a fruitful theme for speculation for a long time past. Not only so, but physiologists have made it the subject of a comparatively careful study, and yet we are without a satisfactory theory of sleep. Not to enter upon the discussion of fanciful opinions, it may be remarked that it has been held, that sleep depends upon an *altered circulation in the brain.* Under this relation the favorite view has been that there is during sleep anæmia of the brain. This has been held by many, such as Durham and others, cited by Dr. Hammond in his work on sleep. This is also Dr. Hammond's opinion. The brain is supposed to be in somewhat the same condition as that in which it is in a syncopal attack. Too little blood is present to maintain its normal activities, and by consequence they are more or less completely suspended according as the sleep is more or less profound.

Then again it has been imagined that sleep is a condition due not only to the exhaustion of the power of the brain, but to a production of waste matter, or "fatigue products," more especially certain acids, which are either known or presumed to be the results of the wear and tear of the brain during its active state. These products are supposed to remain more or less in the parts of the brain, among the waste products of which they are, and to act the part of benumbing or hypnotic agents. Other hypotheses have been advanced having various degrees of probability, but those already mentioned are perhaps the only ones worthy of serious discussion. But unfortunately neither of them in the form in which they have been stated by their adherents fully covers the ground of the case.

At present it is not my purpose to enter upon an extended discussion of a subject upon which volumes have been and might be written, but rather to give expression to opinions which are the outcome of some little observation and study. As a rule sleep comes on suddenly, therefore, some sudden cause for the production of the phenomena must exist. In this case as in every other, the general law must be respected as true, that every phenomenon must have a cause. Not only so, but the peculiarities of the phenomena furnish clues as to the nature of their causes. For my own part I have not a reasonable doubt but that the phenomena of sleep are greatly dependent upon rather sudden modifications of circulation in certain regions of the brain. I have said *certain* regions of the brain, because it is my opinion that all parts of the brain need not alike be subject to the supposed sudden changes in circulation. These changes refer more particularly to the sensitive and "emotive" regions of the brain rather than to the motor. Certain parts of the brain in relation to others, sustain the relation of *excitors.* Such in my judgment are those parts of the cortex which are the seats of sense perception and of the emotions. Other parts of the brain act chiefly as they are stimulated by these latter through connecting fibre systems. These sensitive and excitable regions of the brain are especially affected, it seems to me, in sleep. When we take into consideration the fact that particular regions of the brain are provided with blood circulations of their own, which are in great measure independent of the circulations of neighboring vascular areas, we will be able to understand how it comes to pass that the circulation in one part of the brain may be profoundly modified without involving serious modifications in the circulation of other parts of the brain. The researches of Heubner in Germany and Duret in France, and since the labors of these observers, those of others, enable us to understand how these things may occur. They have shown substantially that in the final distribution of blood vessels (arteries) to the cortex, as well as to the basal system, that the *arteries* do not communicate with one another as they do in other parts of the body. It is only at their peripheral distribution in the capillaries that the connection of one area with another is made, and even here there are no capillary connections between the vascular channels of the basal and brain systems proper. But to return, it appears to me as altogether reasonable that a decided change in the circulation of blood in the exciting regions of the brain occurs as one of the factors of sleep.

The blood-vessels, it is to be presumed, which supply this region, contract. A greatly diminished blood supply is the result. No other hypothesis, it seems to me, has any considerable amount of evidence in its favor. Let us admit then as probable, that a sudden change in the circulation of blood, at least in certain parts of the brain, occurs as the immediate cause of sleep. It may be regarded as certain that this change is not toward an increased blood supply, or in other words, towards hyperæmia. Such a state is only consistent with wakefulness, and an active state of the brain, or with stupor if the condition is extreme. It is far more probable that the condition is one in which there is a greatly diminished blood supply within the sensory regions of the cortex of the brain. The same condition happens for the brain as a whole in syncope, or in the case of those epileptic seizures in which consciousness is lost. It seems to me there cannot be the slightest doubt that in these cases the loss of consciousness is due to a greatly diminished blood supply to the sensitive regions of the cortex of the brain. In case of syncope, the failure of a blood supply depends upon more or less complete cessation of the heart's activities. In the case of epilepsy it depends upon sudden contraction of the muscular arteries prior to their termination in the capillaries. This contraction it seems probable is carried to such a pass as to almost close the arteries for the time being, and to prevent in a measure the entrance of blood to those parts of the brain to which they are distributed. This diminished blood supply leads to the cessation of cerebral activities, and hence, to that loss of brain sensibility (or of consciousness) which both epilepsy and sleep imply.

Admitting this to be the true condition of affairs, let us consider still farther the probable mechanism of sleep. The arteries which are supposed by their contraction to diminish the blood supply to certain parts of the brain do not act on their own account, but only as stimulated to do so through the channels afforded by the nerves distributed to the muscular tissue in their walls. These are the now well known vasomotor nerves, and, as a rather satisfactory hypothesis we may continue to admit these nerves as being of two kinds, vaso-dilators and vaso-constrictors. These nerves do not terminate peripherally in the muscular tissue of the vessels to which they go, but rather in the small nerve cells which are found seated upon, or disseminated through the structure of the muscular walls of the vessels. The action of these little mechanisms are supposed to be controlled by the two classes of nerves which terminate in them. The vaso-dilators inhibit or prevent their action in varying degrees, while to the contrary, the vaso-constrictors reinforce or aid them in their action upon the vessels. But these nerves are not capable of action *per se.* They can only act when stimulated to do so by the nerve cells of the ganglia in which they root themselves, or out of which they proceed. This leads us back along the course of the vaso-motor nerves which more particularly ascend the carotid and vertebral arteries to the minute blood vessels of the brain. In the medulla oblongata and cervical portion of the spinal cord are, in my judgment, the vaso-motor nerve centres from which at various levels the nerves in question pass out.

But even these central vaso-motor cell mechanisms no more than the nerve fibres which proceed out of them can act on their own account. They must be excited from without. Now if it be true that the immediate cause of sleep is a marked diminution in blood supply to the sensitive regions of the brain, and if it be true that this circulatory change is produced through the mechanism I have just described, from what source or sources do the excitations come, that play upon and bring it into action? It is my opinion that they can only come from certain parts of the brain itself. But here we are launched fully upon the sea of conjecture or hypothesis. But I am aware of this and shall try and not forget it, neither now nor hereafter.

It is my opinion that in the progress of the brain's action, such a state comes to pass as regards the nutrition and circulation of certain of its parts as to give rise to excitations of varying strength, which may be conveyed downwards from the cortex of the brain to those vaso-motor mechanisms in the medulla and cord from which the nerves are emitted that produce by their action upon certain vessels a comparative anæmia within the sensitive or excitor parts of the brain. It is not necessary for us to suppose that all parts of the brain or even a considerable portion of the same shall be brought into this supposed anæmic state. But the contrary rather is true.

Those parts of the brain which are devoted to unconscious action of one sort or another, more particularly those parts which stand related to the motor or active organs of the body, it may be presumed continue even during sleep to have a free circulation of blood. It is only necessary to suppose that those parts which are the seats of sense perceptions, and it may be of the emotions, present such a modification of the circulation. I am aware as already intimated, that what has been said is largely hypothetical. But hypotheses differ as regards the degree of probability belonging to them.

In order to support the opinion just emitted, in regard to the nature and cause of sleep, it may be useful to recapitulate briefly the reasons which may be urged in its behalf. In the first place the suddenness with which natural healthy sleep occurs, demands some cause acting suddenly. It often happens that the interval, or the transition period, between the waking and sleeping states comprises but a few seconds. Now, upon a full survey of the probable and, I was about to say, possible, causes for the production of the unconsciousness which characterizes sleep, I can find nothing that will account for it, except some sudden change in the vascularity of the brain, at least in those parts which are the seats of sense perceptions and of our emotions; and none of the more careful observations that have been made go to show that the change in vascularity of the brain is one which comprises hyperæmia. Hyperæmia in all but its extreme stages, either grows out of, or leads to, cerebral activity. In its extreme conditions it may, and often does, lead to stupor, not to sleep. It may be hard to draw a distinction at all points between natural sleep and stupor, seeing that it is possible to have the two conditions present at the same time, and, therefore, mixed. But in most cases it is entirely possible to distinguish between genuine, uncomplicated sleep and stupor.

To my mind there is not the slightest reason for supposing that true sleep is the outcome of cerebral hyperæmia, though according to the view I am advocating it is possible to have even during healthy sleep hyperæmia outside of the sensitive zone of the brain. Everything connected with sleep goes to show that certain parts of the brain are functionally, in great measure, inactive during sleep. Nothing is more common to be seen by the observing physiologist in all parts of the body than a diminution in functional activity depending directly upon diminished blood supply. Then, in the second place, there are various morbid conditions in which a disturbance or loss of consciousness, very much resembling that loss of it which we observe in sleep, is known with more or less positiveness to depend upon a suddenly diminished blood supply to the brain. This certainly happens in some forms of epilepsy which include, as all cases of typical epilepsy do, sudden loss of consciousness. It is also witnessed in the loss of consciousness occurring in syncope or fainting which occurs either from great and sudden loss of blood, as in profuse hemorrhage, or in those cases of shock in which there is sudden and extreme dilatation of the blood vessels within the cavity of the abdomen in that region which is dominated by the splanchnic nerves, or which is seen in cases of ordinary syncope, which include sudden and greatly diminished activity of the heart, so that it ceases temporarily, in great measure, to supply blood to the brain, with the result in each case of a more or less complete cessation of cerebral activities. The same thing occurs in those cases of insomnia which are relieved by prolonged pressure upon the carotids, by which the supply of arterial blood to the brain is, in a measure, cut off. In all these cases, and many others of like kind, it is more or less certainly known that the immediate cause of the disturbance or loss of consciousness, or, to speak in more general terms, that the suspension of cerebral activities is due to a sudden diminution in blood supply, and, so far as we can see, to that alone. Upon the restoration of blood supply to the brain, its activities are immediately resumed, the person, or the animal, as the case may be, arousing from a torpid or an apparently sleeping state.

The lesson taught by cases of this kind, though applied by inference in an explanation of the phenomena of sleep, are not at all thought of as they deserve to be. Then, again, this view is supported by a consideration of the means which are usually employed for procuring sleep, at least in a certain class of cases. The bromides, for example, and other remedies which belong to the same class, there can be little doubt, act, at least partly, by diminishing the activity and imparting steadiness to the blood supply of the brain, not to speak of other parts of the body. Other reasons could be offered in support of the view I have just taken, but I can scarcely take the time to adduce them. So much, then, for natural, healthy sleep, in so far as it appears to depend upon changes in blood circulation. Besides this, I have no doubt that something must be ascribed to the exhaustion of the cerebral tissues, and it is probable also to the action of the "fatigue products," of which mention has been made by Preyer and others. But neither brain exhaustion nor fatigue products appear with such suddenness as to account for the sudden production of sleep. Sleep must result, therefore, from some cause which acts suddenly, and the operation of which may be suddenly suspended, as must be when a person is roused by any sort of stimulation from a sound sleep. There is no known or probable cause to which the phenomena may be ascribed so readily and with such show of reason, as to a suddenly modified circulation of blood, which I have tried to show, occurs in the production and maintenance of healthy sleep.

I wish now to turn to the consideration of sleeplessness. There are various reasons for this state. In the first place, severe physical pain may greatly disturb, or even prevent for a considerable time, sleep. Great mental anxiety often prevents one from procuring sleep. Then again external disturbances, such as noise or other annoying outward circumstances will sometimes prevent suitable sleep even in a healthy person. But it is not to cases of the kind just enumerated that I wish to direct your attention principally. I wish rather to speak of those in which the sleeplessness does not directly depend upon any external cause nor grow out of any bodily conditions of a felt disagreeable nature. I would now refer to those cases of sleeplessness which depend chiefly upon morbid conditions of the brain and its circulation. Here we fall at once upon two groups of cases, in one of which there is cerebral hyperæmia, and in the other there is or may be manifest anæmia, and in either case, sleeplessness results, of a more or less pronounced character. If what has been already said is true in respect to anæmia being the immediate cause of the loss of sensibility, or of consciousness, it will be readily seen, if hyperæmia of the brain really exists in a given case, that natural sleep cannot occur so long as it continues. No fact is better established than that of occasional persistent hyperæmia of the brain. In order to understand its relations to sleeplessness we must consider more closely the mode of production of cerebral hyperæmia. Venous hyperæmia, as is well known, occurs in some cases of disease of the right side of the heart, or at any rate disease within the chest in the course of the great venous channel draining blood from the upper part of the body. It also occurs in consequence of disease of the sinuses of the dura mater, more particularly from thromboses, or by reason of pressure upon the sinuses by tumors and the like. But passive venous congestions I wish to put out of consideration for the present. I now have in mind arterial hyperæmias involving as a matter of course the capillaries to which the arteries lead. Active hyperæmia occurs in consequence of the play of activities of the brain, as during the progress of severe thought, or of strong feeling. The active parts of the brain become more or less decidedly hyperæmic. But under favorable circumstances the hyperæmia subsides immediately after the action of the brain ceases, and the circulation of the part in question regains its normal state. This is active hyperæmia. It may be of various degrees and endure for varying periods of time in conformity to the degree and duration of the brain activity, which in a sense causes it. But for various reasons hyperæmia which is active in the beginning may become at last passive, if the distended blood vessels become unduly fatigued and lose their contractile power. Though the brain activity should cease, yet the hyperæmia continues in consequence of a loss, either of the contractile power of the muscular tissue of the vessels, or by exhaustion of the vaso-motor nervous apparatus upon which the vessels depend. In point of fact this state of things occurs with great frequency in consequence of over action or over excitation of the brain, and there is protracted hyperæmia, at first active, and lastly, worst of all, perhaps, passive; producing a great many symptoms, according to its seat and degree, among which is disturbed sleep or even sleeplessness. The presence of a large quantity of blood and hence of an excess of materials for supporting and stimulating brain activity, is inimical to brain rest, or sleep. Hence sleep is disturbed or even banished, as in persistent insomnia. So long as this condition continues, healthful natural sleep cannot occur. The form of hyperæmia about which I am speaking, occurs in point of fact very frequently. The sleeplessness which results is that which has associated with it evidences of undue vascularity about the head; often elevated temperature of the head; generally, though not always, somewhat contracted pupils; feelings of fullness and pressure within the head, increased rather than relieved upon assuming the recumbent posture; strong throbbing of the carotids, and other symptoms. But in passive *localized* hyperæmias these symptoms are not necessarily present. Cases of sleeplessness depending upon hyperæmia are those benefited by the use of the bromides, ergot, by hot foot-baths, by the application of cold to the head, by sleeping in the sitting posture or on an inclined plane, by thorough massage or frictions, or by blood letting.

I wish now to turn to that class of cases which occur apparently in connection with cerebral anæmia. This class of cases taken altogether is most important, as it certainly is one of the most troublesome which the physician is called upon to treat. As regards the cerebral anæmia a few words of explanation are necessary. In the class of cases to which reference is now made, it can only be said rarely that there is in strictness cerebral anæmia. As a rule which has its exceptions, it must be said that in such cases two, if not three, factors are present. Though the volume of blood circulating in the brain may not be far or at all below what it should be, yet it is true in most of these cases that the blood is impoverished in materials necessary for the nourishment or support of the brain. To a certain degree, therefore, we have the results of anæmia without the fact, that is to say, the volume of the blood may be up to its maximum but its quality far below it. In many of these cases, however, the blood is not only poor in quality but less in quantity than it should be. In such cases there is positive anæmia. Not only this, but the anæmia like the hyperæmia already discussed, may possibly be active. The second element in this class of cases refers to *blood pressure*, sometimes called arterial, at other times cardiac pressure. In the majority of cases of sleeplessness arising apparently from anæmia there is diminished blood pressure, and this seems, at least in some cases, to play an important part in sleeplessness; and the third and last element in cases of sleeplessness from anæmia is that of *brain irritability.*

This is an exceedingly important element in the cases now being considered. It occurs naturally in some persons, but in most cases appears in consequence of a lowered brain nutrition, in which waste has preponderated greatly over repair. Growing out of this nutritive lesion there is excessive irritability of brain structure. The wearing out of brain tissue in the course of its activities seems to give rise not only to a sense of fatigue, but to a state of irritation of the worn parts which may be considered as a warning that brain wear has been carried beyond anything like safe limits. An almost inflammatory reaction against the farther progress of wear and tear is set up. Nothing but rest and renewed nourishment can allay it. This undue excitability, which is natural in the case of a few persons, is rather easily produced in many, and may finally be produced in all persons.

The brain becomes so irritable as to render sleep unsatisfactory or impossible, though there may be neither hyperæmia nor anæmia. The brain becomes so sensitive to impressions made upon it that the slightest disturbances will prevent sleep. This state of things is especially liable to occur in connection with anæmia. It may occur without it, as there is reason to think it does in some cases of passive hyperæmia. The slightest sound or even the cardiac impulses in the arteries of the brain are sufficient to prevent sleep. Any little disturbance in the heart's action, or in the stomach or alimentary canal lower down, or excitations of the skin, or of the genito-urinary apparatus of whatever kind are, in common with many other circumstances, sufficient to prevent refreshing sleep or even to prevent it altogether. It is this state of imperfect nutrition of the brain, whether depending upon diminished volume or impaired quality of the blood, to which the attention of the observer should be directed, rather than upon mere circulatory changes. It is this class of cases to which the hypnotics, pure and simple, are directed with the best results. This is the class of cases in which the use of chloral is successful, and other therapeutic agents of its class, including opiates and alcoholics. Any remedy that will benumb or lower the sensibility of the brain to a considerable extent without necessarily modifying its circulation, may in such cases lead to sleep. Our remedies should be given with the view in the first place of increasing vascular tension, and in the second place of diminishing the sensibility of the brain.

This recommendation made *a priori*, happily agrees with the results of experience. By increasing vascular tension the circulation in the brain takes place under greater pressure. Blood is supplied more freely to the brain. The physical conditions favorable to the exudation of nutritive materials from the vessels to the tissues about them are improved, and the morbid sensibility has thus been more or less lowered, and as a result sleep is rendered possible, at least afterwards.

It hence appears that we have three forms of sleeplessness, regarded from a clinical standpoint:

First, that which depends chiefly upon cerebral hyperæmia. The occurrence of this form of the disorder depends either upon some change in the walls of the muscular vessels within at least certain vascular areas of the brain, whereby their contractile power is diminished, the vessels relaxing or losing their tonus, and giving way to the expansive pressure of the blood which passes through them, or the hyperæmia may depend upon some disease of the vaso-motor nervous apparatus upon which the vessels in question depend. The disease of the vaso-motor apparatus being of such kind as to render it incapable of responding to those excitations which are supposed to descend from the cortex as results of its fatigue or exhaustion. My supposition is, that in the progress of cerebral activity, the wear and tear of the cortex in certain parts reaches a point where irritation sets in. This may arise out of the simple process of nutritive waste, or be caused by fatigue products which have been mentioned. But at any rate, as a result of prolonged cerebral activity, certain regions of the brain become fatigued and irritated. From these points excitations descend by means of fibres to the vaso-motor apparatuses already referred to, which in turn act responsively in a reflex way upon the vessels of the brain, causing their contraction, and hence the degree of anæmia that is needful for brain rest. In this way the brain becomes in a sense the arbiter of its own fortunes. When brain exhaustion arrives at a certain pass it sets in play the vaso-motor mechanism, the action of which upon the circulation of the brain leads to sleep or brain rest at the time when it is needed. Now if by reason of some incapacity of the muscular tissue in the vessels to adequately respond to the impulses which reach them by way of their nerves, or if the vaso-motor apparatus itself should be exhausted or disordered, then sleep would either occur imperfectly, or not at all, nothwithstanding brain exhaustion may have arrived at that pass which makes brain rest necessary. In this way sleeplessness occurs in connection with hyperæmia. The natural mechanism for bringing about sleep in the manner already described is crippled or inefficient. Artificial means are therefore necessary. Such we have in the bromides, ergot, in cold to the head, in the use of purgatives, in the upright posture, in the protracted warm bath, etc.

In the second place, we have sleeplessness coupled with abnormally increased cerebral irritability, which latter is the chief factor in such cases. It may be present not only in cerebral anæmia but in cerebral hyperæmia. But it is of the utmost practical importance to recognize it, for in such cases those remedies which are adapted to cases of sleeplessness from hyperæmia will be unsuccessful, and may even aggravate the insomnia. It is to such cases that chloral hydrate, opiates and stimulants, are adapted.

Then in the third place, there are cases of sleeplessness which do not depend upon hyperæmia, or to any considerable extent on undue sensibility of the brain, but upon unpleasant physical conditions, such as severe pain, great difficulty in breathing, unusual external circumstances, such as loud noises.

Such in brief is an account of the mode of production of normal sleep, and of the pathology of the chief forms of sleeplessness, with some of the indications as to the classes of remedies adapted to the same. As said in the beginning, I am aware that much of the account given you is conjectural, but I have a strong suspicion that it will be found upon further investigation to be near the truth.

Hereafter, in speaking of nervous therapeutics, I shall expect you to remember what I have just said in regard to the pathology of insomnia, and I shall then take occasion to speak more at length concerning the therapeutics of this disorder.

ART. III.—SUBACUTE MYELITIS OF THE ANTERIOR HORNS, WITH LIMITED SCLEROSIS OF THE LATERAL AND POSTERIOR COLUMNS.

BY DR. J. C. SHAW,
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THE following case is of interest for several reasons: Comparatively few cases of acute or subacute myelitis of the anterior horns have been reported with autopsy and microscopic examination; and in America I think that but two cases have been reported: one by Webber, of Boston, and another by Edes, of Boston.

This case was seen by me through the kindness of my friend, Dr. B. A. Segur, and the autopsy obtained through his efforts. The following is the history inscribed by Dr. Segur's house physician, Dr. Wm. Stephenson:

Mrs. K., aged 50, Canadian, seamstress, married, had six children, the last twenty years ago; admitted to the hospital (St. Peter's) May 26, 1879. Constitution and general health have been and are good; this attack is supposed to have been brought on by taking cold seven weeks ago; disease was ushered in by chills, fever, and pain through chest; a short time after she had pain in feet and cardiac region; simultaneously with appearance of above symptoms she had paralysis of all extremities; on admission she lies on her back in a helpless condition, and motion is painful to her; pulse 100; temperature 98°; tongue dry; great thirst; constipation; urine acid 1011; no albumen. Dr. Shaw saw her June 14 (Dr. S.'s examination will be given at end of history); urine and fœces passed involuntarily; she is conscious of their passage but has no power to prevent it. June 29, patient gradually growing weaker and worse. July 8, severe pain in back like that which was present when attack first came on. July 11, lies with eyes open, groaning, partly from her helplessness; cannot speak; tries to protrude her tongue when requested to, but cannot. She remained in this helpless condition until July 14, when she died apparently from exhaustion. When I saw the patient, on June 14, she was absolutely paralyzed in upper extremities; in lower extremities she could move her feet a little; she appeared to be distressed, and had an anxious expression of countenance; she complained of pain in her chest, it appeared to be quite an effort for her to talk, she passed urine and fœces at times involuntarily; in the lower extremities tactile sensibility was slightly impaired; there was loss of faradic reaction in the muscles; muscles of arms and forearms were atrophied to a considerable degree; there was no rigidity of the muscles, and handling them did not appear to cause her pain; there were no bulbar symptoms at this time. I made the diagnosis of subacute myelitis of the anterior horns, complicated with a lesion in the æsthesodic tract. I did not see the patient again until about three days before she died; she was then in a dying state, semiconscious, unable to move, speak, or swallow, and took very little notice if any when spoken to.

The autopsy of the nervous system showed nothing abnormal except a slight posterior spinal meningitis in dorsal and lumbar regions.

After hardening in bichromate potassa sections were made in the spinal cord stained in hæmatoxylin, carmine, eosine and coffee, and mounted in Canada balsam after Lockhart Clark's method. The lesion which pervades the entire cord is that of the anterior horns, and here we have characteristic lesions of the ganglion cells; throughout the cord the external lateral group of cells have suffered most; a large number of these cells have a swollen, cloudy aspect; nucleus obliterated, absence of processes; other cells have undergone pigmentary and fatty degeneration, a great many of the cells have vacuoles, some one or two, others contain a large number; very few cells have entirely gone, a few have become smaller; one or two cells in the posterior horns are pigmented.

In certain parts of the anterior horns, and especially in the cervical enlargement, besides the changes in the ganglion cells there are to be seen here and there parenchymatous changes;

perhaps the best description of these changes can be given by speaking of them as the granular disintegration which has been described by Lockhart Clark; this change is in small circumscribed patches of a somewhat oval shape, and seen most generally in the neighborhood of these external lateral groups of cells which have been previously described as being most diseased; in some cases this disintegration is seen around the ganglion cell.

Sections in the cervical enlargement showed a light sclerosis of the lateral columns; in this region there was also a sclerosis of the columns of Goll (see Fig. I.).

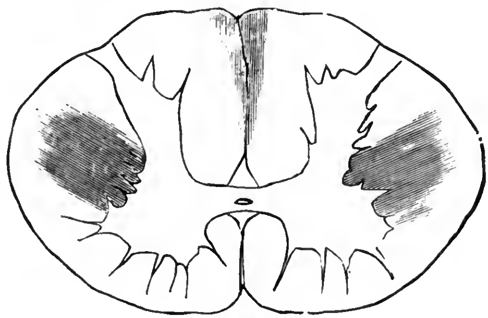


FIGURE 1.

Sections in the upper dorsal region showed a sclerosis of a very light character, or more truly a degeneration of the fibres of the posterior root zones, *rubans externes* (Charcot, Pierret); this degeneration is of such a light character that after sections have been made and stained it is almost impossible to see the change; this degeneration extends down to below the mid-dorsal region; there is no sclerosis of the lateral columns here (see Fig. II.).

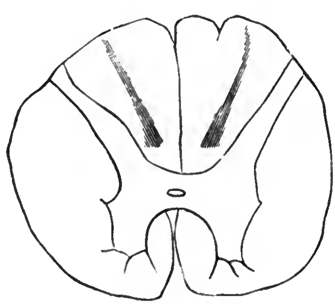


FIGURE 2.

In the lumbar region there is no lesion of the posterior or lateral columns. Sections in the medulla show simply a few pigmented cells in the nucleus of the hypoglossus and pneumogastric.

The symptoms of myelitis of the anterior horns were most marked in this case, and the post-mortem showed the characteristic lesions, which have been heretofore discovered in these cases; the lesion of the lateral columns in the cervical enlargement, alone and of a slight character, is interesting, as regards its origin and relation to the lesion in the anterior horns; this will be the subject of consideration by me at a not distant date.

The lesion in the posterior columns raises the question: which of these two lesions was the primary one, or were they simultaneous? This is very difficult to answer; the very slight degeneration of the fibres of the posterior root zones shows that it must have existed but a short time, in fact the changes were so slight that had I not carefully examined the hardened pieces with the naked eye and the magnifying hand-glass, it certainly might have passed unobserved in the mounted sections. I have learned to examine very carefully the specimens hardened in bichromate, with a magnifying glass of about six to twelve diameters, as in this way very slight changes in the color, and which indicate disease, can be detected, and which are not so readily seen after fine sections are made, stained, and mounted.

The observation of this lesion of the posterior columns is of value as it is in support of the demonstration and teachings of Prof. Charcot and his pupil M. Pierret, who have shown, and as is demonstrated by these specimens, that the lesion in the rubans externes is *the* lesion in locomotor ataxia, and that the involvement of the other portions of the posterior columns is secondary; these specimens also show proof of this second point; the involvement of the columns of Goll is secondary, and is really an ascending degeneration; this is shown in Fig. I. from the cervical region, where the columns of Goll are diseased, and this extends up to the beginning of the decussation.

Dr. Seguin, in his Monograph on Myelitis of the Anterior

Horns, questions whether the degeneration of the ganglion cells is the only lesion in these cases; the case of Webber, of Boston, and this one are proof that this is not the only lesion present.

The absence of very marked lesions in the medulla when there were decided symptoms referable to the medulla, is doubtless due to the fact that the onset of the bulbar symptoms caused death so rapidly; the appearance of bulbar symptoms in a case of this kind is quite exceptional, and shows that there is a variety of exceptional cases from the typical localized diseases of the spinal cord.

Art. IV.—THE ARCHITECTURE AND MECHANISM OF THE BRAIN.

By Edward C. Spitzka.

CHAPTER I.

THE CENTRAL TUBULAR GREY.

Treating of the cranial nerve nuclei and the roots of the cranial nerves, from the third to the twelfth pairs, inclusive.

THE central tubular or axial grey is found in its clearest relations in the spinal cord. This is partly because there are no extraneous ganglionic systems here, *all* the spinal grey belonging to the central tubular form, partly because the spinal cord retains more of the features of the embryonic medullary tube than does the more complex encephalon. As a key to the elucidation of the systemic and functional relations of the cranial nerve nuclei, it will be, therefore, desirable to briefly review the most prominent features of the analogous spinal centres.

§ 55. Surrounding the central canal of the cord on all sides in the shape of the "grey commissure," the spinal grey sends out two *cornua* into each half of the cord, an anterior and a posterior, which respectively enter into intimate relations with the anterior [(1)] and posterior roots of the spinal nerves. Since the anterior nerve roots are known to be eminently devoted to conducting motor impulses, and the posterior ones are employed for the transmission of sensory impressions, the anterior cornu has come to be looked on as a motor nucleus, the posterior as a sensory one. There are numerous pathological and physiological facts which support this view; I should say, though, right here, that in a strict physiological sense, a sharp demarcation, especially as regards the sensory functions, does not exist. However, for the present we will in its general bearings consider the traditional view as correct.

§ 56. Under the microscope we find that the posterior grey column possesses one peculiar character, which is not observed in the anterior grey column. On its inner and posterior border, in short where the posterior nerve roots enter, a transverse section reveals the existence of a translucent grey matter, which appears like a band encircling the posterior horn. This, from its consistency and appearance has received the title of a *caput gelatinosum.* As this structure is observed in the spinal cord only where the *sensory* nerves enter the grey substance, we shall, when encountering similar tissues in the medulla oblongata be justified in suspecting them to have some relation to sensation. And that this histologically peculiar structure *has* exclusively sensory relations is strengthened by the fact of its appearance not only in those nuclei of the medulla which are related to the great nerve of sensation of the head, the trigeminus, but also in certain intercalated ganglia such as the olivary bodies, which are in relation with the *posterior* columns of the cord.

§ 57. While the sensory grey column is thus characterized by a special variety of ganglionic substance, the motor column has also a feature peculiar to itself. We find here groups of nerve cells of considerable dimensions possessed of powerful and numerous processes.(2) *Exactly* such cells have not yet been discovered in any nerve centre whose function has been ascertained to be *exclusively* sensory. Unless contradictory evidence is adduced, we have therefore strong reasons for considering an accumulation of multipolar cells with numerous processes, and those processes merging *gradually* into the body-outline of the cells, as a group of cells related to motility.

Thus far we have derived two guides from spinal anatomy which can be utilized in cerebral anatomy. First, where we find a peculiar gelatinous nerve tissue we will suspect it to have sensory relations; second, where we encounter groups of nerve cells, with numerous and powerful processes, we may presume that it has motor relations.

§ 58. In that portion of the spinal grey which intervenes between the anterior and posterior cornu, there are found in certain altitudes two peculiar cell groups. One of these lying in the angle formed by the junction of the posterior cornu with the grey commissure, known as the column of Clarke, in clear connection with the posterior nerve roots, exhibits nerve cells which partake on the one hand of characters usually attributed to trophic cells, such as those of the intervertebral ganglia, on the other of the inflated fusiform cells of certain sensory ganglia. Although in its best development in the dorsal region, and losing its distinctness in the cervical cord, we find analogous cell groups reappearing in a corresponding area of the grey in the medulla oblongata.

The other cell group is situated at the outer contour of the trigonum, and becomes developed in the cervical region, giving origin to the *lateral* roots of a motor nerve. The cells are similar in every respect to those of the anterior horn. The *intermediate* grey therefore is neither solely sensory, motor nor trophic, but partakes of several different characters. If we are justified in speaking of the anterior cornu and its intra-cranial homologue as a *motor system*, and of the posterior cornu and its intra-cranial homologue as a *sensorial system*, we can properly designate the intermediate as a "*mixed*" *system*. It attains an immense importance in the medulla oblongata, and we can distinguish in it, distinct categories of nerve cells, one resembling those of the columns of Clarke, others those of the spinal accessory origin.

§ 59. After a careful comparative study of the cell groups and ganglionic masses of the spinal cord I have been able to establish the following formulas:

(*a*) As indicated in the preface (§ 4,) the central tubular grey masses vary in size with the periphery projected in those masses. A large muscle or group of muscles will have a larger nucleus than a small muscle or group of muscles.

(*b*) There is a tendency in higher animals to a differentiation of the motor cell groups into sub-nuclei related to separate muscles or groups of muscles.[4]

(*c*) The nearer the muscle is to the ventral aspect of an animal, the nearer will its nucleus be to the median line of the cord.[5] *Per contra*, the nearer the muscle is to the dorsal line of the animal the nearer to the so-called lateral cornu will its nucleus have to be sought for. Flexor nuclei are therefore in internal, extensor nuclei in external and posterior cell groups.

(*d*) Hypertrophied segments of the body such as the extremities, are accompanied by lateral extensions of the cornua,[6] in which flexor and extensor muscles probably occupy the same relative position as the one stated under *c*.

(*e*) Whether groups of muscles be flexor or extensor, it will be found that the nearer they are to the animal axis, the nearer will their nuclei be to the central canal. This is especially true of the flexor nuclei.[7]

(*f*) The differentiation of the motor cell groups seems to keep step with the increasing complexity of the co-ordinations presided over by those cell groups, but no corresponding differentiation can be traced in the sensory nuclei of the cord. We can simply state that the mass of the caput gelatinosum keeps pace with the surface extent of the sensory segment.[8]

All these statements apply to the medulla oblongata, with some variations, which are dependent on the peculiar transformation that this part of the medullary tube has undergone in the embryo.

§ 60. While the spinal cord retains this one character of the embryonic nerve axis, that it *remains* a closed tube, the medulla oblongata does not remain closed, but opens out on the dorsal aspect, so as to uncover its part of the medullary canal, as the floor of the fourth ventricle.[9] Now while the spinal grey of each half of the cord might be aptly compared to one of the vertical lines of the letter H, and the grey commissure represents its cross piece (supposing the observer to hold a section of the cord before him in such a way that the anterior cornu looks downwards, and the posterior looks up), it follows that when the walls of the central canal separate and move farther and farther apart to lie in almost the same plane, that the vertical branches of this H can no longer remain vertical but must also approach the horizontal. From this it results that what was an *anterior* horn in the cord must be tilted more *internally* in the medulla oblongata, what was *posterior* in the cord must be correspondingly tilted *externally* in the medulla, and what was *lateral* in the former must be *intermediate* in the latter. The transition is gradual, and can be traced excellently in reptiles, where the decussations are not so disturbingly voluminous as in mammals.

The *motor* grey of the medulla oblongata is therefore to be sought for nearest the middle line, the *mixed* grey to its outer side, and the *sensory* is the *outermost* of all. Instead of the anterior, lateral and posterior cornu of each half of the spinal cord, we have an internal, middle and external cornu in each half of the medulla. The positions alone have changed, the functions or rather the relations to nerve roots having corresponding functions are homologous.

CORD. MEDULLA OBLONGATA.

Posterior Horn——External Horn. Middle Horn. Internal Horn.
Lateral Horn——
Anterior Horn——

§ 61. In the internal horn of the medulla oblongata we find multipolar cells like those of the anteror horn of the spinal cord, in the middle horn we find them of a mixed character, and in the external horn we find a caput gelatinosum. So that histologically the cell groups and nuclei of the medulla oblongata are as much homologous with the nuclei of the spinal cord, as they are morphologically similar.

§ 62. Proceeding further forwards, we find that the medullary canal of the embryo retains its closed character in the mesencephalon, just as it did in the cord. Consequently the nuclear or central tubular grey is arranged around the *Aqueduct of Sylvius* in as unbroken a continuity as in the cord. The relations of the sensory, trophic and motor nuclei are topographically, therefore, similar. The motor nuclei are ventral (inferior-anterior in cord), the sensory are dorsal (superior-posterior in cord), and the trophic are lateral or intermediate. In the lower amphibia the central tubular grey of the mesencephalon resembles the embryonic relations more closely than that of any other part of the central nerve axis. (Fig. 7.)

§ 63. So far as we have gone in our description, it applies to the central tubular grey of the medulla oblongata as found in reptiles, and also at an early period in the mammalian fœtus; in the adult mammalia, and particularly in man, further complications arise.

Coeval with the preponderating development of the hemispheres and great basal ganglia, interrupting and decussating fibre systems seek passage through the medulla oblongata, and encroach more or less on its primitive architecture. While in the spinal cord, where in obedience to a law which I announced above (§ 59, *d*), prolongations of the grey substance jut forth into the white columns, such prolongations are in perfect continuity with the body of grey substance, they in the medulla oblongata are cut off by the fibre masses alluded to, and separated from it more or less completely.

It thus happens that while hypertrophied segments of the spinal grey show a *peninsular* arrangement some medullary nuclei become *insular*. Of this arrangement the inferior accessory, facial and trigeminal nuclei, as well as the *nucleus pyramidalis* are types.

Other masses of ganglionic substance separated in a similar manner, appear to have lost their position as a part of the central tubular grey proper, becoming connected with and subsidiary to the nerve strands alluded to. Such cell groups I shall refer to in this chapter only in passing, their proper consideration will come within the scope of other parts of the essay. That ganglionic masses derivable from the central tubular grey should attain different morphological and physiological attributes, is only in accordance with the laws announced in the preface (§ 36, 38).

§ 64. It was stated above that the nearer a motor nucleus is to the median line of the cord, the more apt would that nucleus be to represent a muscle situated near the median line of the body (§59). As the median line of the cord becomes changed to the horizontal expansion of the fourth ventricle in the medulla oblongata, we may surmise that the more axial muscles will be represented by nuclei situated near the ventricular floor, the more appendicular muscles further away from it. This is borne out by the fact that the hypoglossal and oculo-motor nuclei are at the ventricular floor, while the spinal accessory, principal facial (muscles of branchial arches) and trigeminal nuclei are distant from the same.

§ 65. The law of segmental harmony, although subjected to considerable local modification, holds good for the medulla oblongata as it does for the spinal cord. The motor nuclei of the nerves supplying certain segments of the head are in about the same level with the sensory nuclei of nerves supplying the sensory peripheries of the same segment.[10] Thus the facial and motor trigeminal nuclei are in the same level as the trigeminal sensory nuclei, corresponding to the temporal, auricular and facial sensory zones. This fact is another guide in the cerebral architecture. It is well known that one cerebral nerve has an origin extending the entire length of the encephalic axial grey. The nuclei of origin of the trigeminus reach in an almost uninterruptedly continuous series from the grey matter surrounding the aqueduct to the caput gelatinosum of the cervical spinal cord. On the strength of the law of segmental harmony, we can theoretically infer, that the part of the trigeminus origin situated in the level of the cervical spinal cord corresponds to the temporal cutaneous branches, which, with the upper cervical nerves that originate at the same level, share the distribution to the occipito-temporal region.[11] That part which is in the level of the hypoglossal nucleus will presumably correspond to the distribution of the lingual branch of the fifth. Further forwards in the level of the facial and motor trigeminal nuclei, we will have the dental mental and infra-orbital distribution projected, and this in such a way that the projection of the nerves of the upper jaw will be in front of that of the lower. Still further forwards in the altitude of the oculo-motor muscles, will be the centre of the ophthalmic distributional area, which with its important trophic and secreting functions is represented by peculiar cells, whose resemblance to those of the interspinal ganglia and columns of Clarke we shall note (§ 93, 94).

§ 66. Taking the central tubular grey as a whole, and tracing it from the altitude of the upper cervical nerve roots, we find that it undergoes the following metamorphoses in man:

1. The gelatinous matter around the central canal, which is insignificant in dimensions in the dorsal cord, increases as we pass towards the medulla oblongata.

2. The connections between the heads of the anterior and

posterior horns of grey matter and this central gelatinous grey become very much attenuated. The neck of the anterior horn is scattered and reduced by the interrupting strands of the pyramidal decussation. The neck of the posterior horn becomes diminished on account of the great distance to which its head is driven; this is due in its turn to the increasing bulk of the posterior white columns, which crowd the head of the posterior column outwards.

3. As soon as the level of the medulla oblongata is passed, this relation changes; while the neck or root of the anterior cornu undergoes complete atrophy and disappears altogether, that of the posterior cornu, after reaching its maximum attenuation at the level indicated, begins to hypertrophy and develops peculiar processes.

4. These processes growing out of the neck of the posterior horn, constitute the nuclei of the column of Goll[12] and the column of Burdach;[13] they remain in connection with the central tubular grey, though they have no relation to the nerve roots, and in the system of the cerebral mechanism must be considered as intercalar ganglia. They gradually disappear as the central canal opens into the fourth ventricle.

5. As soon as the nuclei of these posterior columns are developed, the apex of the posterior column, exhibiting the convoluted gelatinous head, becomes more or less separated from its neck. At the same time it moves out still more laterally.

6. The anterior cornu,[14] now entirely cut off from its basis by the massive pyramidal decussation, shows a progressive differentiation into three divisions, that portion nearest the median line retains its multipolar cells and molecular substance, and constitutes the nucleus pyramidalis. The lateral and posterior portion, which has relations to the spinal accessory nerve, is driven upward and outward. The balance of the anterior horn undergoes a reticular breaking up and becomes *intercalar*. On its edge near the pyramidal nucleus, a gelatinous lamina becomes developed, which is the parent mass of the olivary nuclei.

Summing up all these changes, we find that the medulla oblongata, somewhat below the point where the central canal begins to expand into the fourth ventricle, contains the following grey substances: 1st, The enlarging central grey substance[15] around the canal; 2d, a lateral extension of the same, corresponding to the neck of the posterior spinal cornu, and bearing the nuclei of the columns of Goll and Burdach; 3d, the gelatinous head of the posterior cornu; 4th, the nucleus pyramidalis; 5th, the internal accessory olive; 6th, the reticular grey of the lateral column; 7th, scattered motor nuclei cut off from the lateral mixed system.

Of these we eliminate from consideration in this chapter the nuclei of the columns of Burdach and Goll, the internal accessory olive and its dependent developments in higher altitudes, also the reticular grey of the lateral column.

All the other masses, viz., the central grey substance, the posterior cornu with its gelatinous head, the *nucleus pyramidalis* and the scattered nuclei cut off from the lateral mixed system, constitute the *central tubular grey of this altitude*, morphologically and physiologically being *in direct relation with the nerve roots.*

§ 67. The homologies of this central tubular grey become clearer as we pass to still higher altitudes of the medulla oblongata—the region of the alæ cinereæ. The development of a raphe, and the completed opening of the central canal, have at this point led to the separation of the central grey matter into two lateral halves. In each half we find large and distinct nerve cell groups developing. It is not difficult to see that the group nearest the median line corresponds to the *base* of the anterior cornu; this is the *hypoglossal nucleus.* The group further away from the median line can, in a similar way, be seen to correspond to the central part of the lateral mixed system; it is the common origin of the pneumogastric and spinal accessory nerves. Still further outward, and indeed driven quite far down into the lateral part of the dorsal half of the medulla oblongata, we recognize a *caput gelatinosum*, which is the continuation of the spinal *caput gelatinosum*, and is the origin of one of the sensory fasciculi of the trigeminus.

We have then in this altitude of the medulla a motor, a mixed and a sensory nucleus side by side in the infra-ventricular grey. In addition we have auxiliary insular nuclei.

The nucleus pyramidalis, which is the amputated part (as it were) of the same cornu, of which the hypoglossal nucleus constitutes the base, is an accessory nucleus for this nerve. Exactly so the scattered masses separated from the lateral system, constitute accessory nuclei of the spinal accessory nerve.

§ 68. Passing up still higher, to the level of the auditory nerve root, we find that the caput gelatinosum loses in distinctness, that the *central* or infra-ventricular motor grey, in which we previously identified the hypoglossal origin, is barren of cells and atrophic, that the nucleus pyramidalis and the vago-accessory origins have disappeared, the latter, however, being represented (in the relatively minute cell mass of the glosso-pharyngeal nerve), and that from the region corresponding to the neck of the posterior cornu, a large nuclear complex has arisen which, in common with an embryologically speaking foreign addition, constitutes the origin of the auditory nerve. The auxiliary nuclei of the lateral mixed system disappear.

Here the homologues of both the anterior and lateral cornua, in their infra-ventricular as well as insular auxiliary masses, show a tendency to atrophy,(16) which is shared by the head of the posterior cornu. The neck of the posterior horn on the other hand is greatly increased.

§ 69. As we proceed further upward, in the altitude of the lower margin of the pons varolii, we find that the region corresponding to the hypoglossal nucleus, again becomes rich in cells, which are the origin of the entire abducens, and a correlated division of the facial nerve. The lateral mixed system is represented only by its peripheral or insular division, in the powerful lower facial nucleus. The auditory nucleus, representing the neck and base of the posterior horn, is disappearing.

Towards the middle of the pons, the infra-ventricular motor (abducens-facial) nucleus loses its cells, the insular part of the lateral division (lower facial) is replaced by the motor trigeminus nucleus, the base of the lateral and posterior cornua is represented by molecular and barren neuroglia, while the gelatinous head of the posterior cornu *reappears* in the shape of one of the sensory nuclei of the trigeminus. The spinal type is very faithfully reproduced here, therefore.

§ 70. In the altitude of the valve of Vieussens, all the auxiliary insular nuclei disappear, the central tubular grey begins to approach that closure which is completed somewhat further forwards, at the aqueduct of Sylvius. The infra-ventricular motor region is occupied by the nucleus of the fourth pair, the posterior cornu is absent,(17) but the central or infra-ventricular division of the lateral mixed system *reappears* in the cells of the substantia ferruginea.

In the altitude of the optic lobes,(18) the peripheral or insular nuclei have disappeared entirely, only the central or subependymal motor, and mixed nuclei are represented, the former by the oculo-motor origin, the latter by the large round vesicular cells from which a descending root of the trigeminus nerve takes its origin. Here also there is no posterior cornu.(19)

§ 71. From the preceding it follows that, while in the spinal cord the nerve-cell groups are continuous, they are interrupted more or less by barren intervals in the medulla oblongata. Hence the greater distinctness of the nuclear type in the latter as contrasted with the cord.

Taking up the nuclei of each system, without regard to the others, we find, that the subventricular or subependymal motor system begins with the hypoglossal nucleus, that then there is a barren interval, followed by the common nucleus of the entire sixth and part of the seventh nerves, then another barren interval followed by the nucleus of the fourth nerve, a third barren(20) interval, to which the most anterior of the cranial nerve nuclei, the oculo-motor, succeeds. Further forwards the central tubular grey, lining the sides of the third ventricle, extending dorsally over the optic chiasm, and prolonged into the infundibulum of the hypophysis, contains nothing of note physiologically (§ 46).

The auxiliary insular motor system begins and ends with the nucleus pyramidalis.(21)

The sub-ependymal "mixed" system begins with some hitherto imperfectly described cell groups at the junction of the cord with the medulla oblongata; these are more or less continuous with the common superior nucleus of the pneumogastric and spinal accessory nerves; this column terminates with the glosso-pharyngeal nucleus, and disappears for a considerable distance, to recommence in the substantia ferruginea, and to conclude with the vesicular cells of the upper trigeminus origin.

The auxiliary mixed system begins with the spinal accessory cells of the cervical cord, at the level of the fifth or sixth cervical nerve roots; it is almost uninterruptedly continuous up to the level of the uppermost root of this nerve and seems to be exclusively motor. There is a gap of slight extent and the system recommences with the inferior facial nucleus, which gives place to the motor trigeminal origin. This is its termination.

The sensory system begins far down in the cord,[(22)] in the shape of the head of the posterior horn, which constitutes the most considerable origin of the sensory trigeminus root. Its place is for some distance occupied by the nuclei of the auditory nerve, with whose disappearance it again resumes its old relations, and terminates as a gelatinous nucleus in the level of the emerging root of the great sensory cranial nerve.

The accompanying table shows the succession of nuclei following each other in different altitudes of each system, and it also shows at one glance, the nuclei of different systems as found in each of six principal altitudes.[(23)]

In such a table only the coarser metamorphoses can be exhibited, the more minute particulars can only be learned by studying the roots and nuclei of each nerve *seriatim.*

§ 72. The Hypoglossal Nerve and Nucleus.—With an intricate mass of muscles, capable of complicated and important co-ordinated movements, related to the proper distribution of food during mastication, to which in man is added a subservience to articulate speech, a large ganglionic mass provided with numerous multipolar cells keeps step in development. This is the *nucleus hypoglossi.* In the amphibia, such as the frog, there is no special nucleus; the tongue is projected in the same cell mass from which the first cervical pair takes its origin, and indeed the nerve of the tongue is merely a branch of that cervical nerve.[(24)] In the lower mammalia, a closer relation exists between the origin of the two nerves than exists in man, and it is noteworthy that the

ALTITUDE.	MOTOR COLUMN REPRESENTATIVE.		MIXED COLUMN REPRESENTATIVE.		SENSORY COLUMN REPRESENTATIVE.
	SUBEPENDYMAL.*	INSULAR.	SUBEPENDYMAL.	INSULAR.	
1. Of lower roots of XII Pair.	Nucleus of XII Pair.	Nucleus Pyramidalis.	Common Vago-Accessory Nucleus.	Inferior Accessory Nucleus.	Gelatinous Nucleus of V Pair.
2. Of roots of IX Pair.	Barren.	Absent.	Nucleus of IX Pair.	Inferior Accessory Nucleus.	Auditory Nucleus.
3. Of roots of VI Pair.	Common Nucleus of VI and VII Pairs.	"	Absent.	Inferior Facial Nucleus.	"
4. Of exit of V Pair.	Barren.	"	"	Motor Nucleus of V Pair.	Gelatinous Nucleus of V Pair.
5. Of valve of Vieussens.	Nucleus of IV Pair.	"	Substantia Ferruginea.	Absent.	Absent.
6. Of roots of III Pair.	Nucleus of III Pair.	"	Vesicular cells of most anterior V origin.	"	"

*By "subependymal" I do not mean to imply that the nucleus and the ependyma are in direct apposition in all cases.

cells of the apex of the anterior cornu, which in man have dwindled down to a mere remnant (the nucleus pyramidalis), in the ungulate mammals (horse, ox, hippopotamus, rhinoceros) should extend in massive development far upward into the medulla oblongata.

The roots of the nerve run in a beautiful sweep from the nucleus to the fissure between the anterior pyramid and the olivary eminence, where they emerge. In this course they cut through the olivary nuclei, and this differently in different individuals, and differently also in various altitudes of the same medulla oblongata. Often they enter the hilus of the nucleus dentatus and break through its denticulations; as frequently they pass between the nucleus dentatus and internal accessory nucleus to cut off more or less of the outer edge of the latter in emerging. In lower levels it can be clearly seen that the nucleus pyramidalis, or the relic of the anterior cornu, contributes to its nerve fibres, in the shape of axis cylinder processes from its multipolar cells. In man this contribution is insignificant, in the large herbivora it is considerable. From the fact that the nucleus pyramidalis is a continuation of the cell mass which in the cervical cord must be looked on as the origin of the nerves innervating the cervical muscles, and further as the hypoglossal nerve, through the *Ramus descendens hypoglossi*, establishes relations with the omo-hyoid, sterno-hyoid and sterno-thyroid muscles, I am inclined to look on the nucleus pyramidalis as the origin of those fibres of the hypoglossal which innervate the retractors of the hyoidean apparatus. In man this relation has fallen so far into the background that Volkmann was able to state that this innervation was due rather to the fibres which the ansa-hypoglossi receives from the cervical *communicans duodecimi* than to those derived from the hypoglossal nerve itself. This is in accordance with the atrophic condition of the human nucleus pyramidalis.

§ 73. The proper hypoglossal nucleus is a development of the subependymal motor grey. It commences below the point where the central canal opens into the fourth ventricle, and reaches as far as the *striæ acustici.* The nucleus does not, like that of the mixed system, lie immediately beneath the ventricular ependyma, but is separated from it by a layer of fibres which arch over it from the raphe to the nucleus of the mixed system. It is, however, recognizable on the ventricular floor by an elevation—the *ala alba medialis*—or the inner white triangular field of the posterior half of the fourth ventricle. While the middle triangular field, which is grey and corresponds to the common vago-accessory nucleus, has its apex directed *forwards*, the hypoglossal, or inner white triangular field, has its apex directed *backward.* It would be entirely erroneous to suppose that the maximum development of the nucleus corresponded to the greatest width of the *ala alba medialis,* as the field becomes wider the nucleus becomes flatter and poorer in cells. Its best developed portion is at just above and just below the end of the calamus scriptorius, where indeed it is overlapped by the vago-accessory nucleus.

Its cells are numerous, rich in processes, and arranged in complex groups, so that it is resolvable into sub-nuclei. The root fibres enter these groups either directly or by sweeping round the outer contour, or finally by forming intricate loops(25) among and around the individual groups. There is one very well marked mass of cells at the inner angle of the nucleus, just by the side of the raphe; it is so distinct as to be visible, as a deeply tinted mass in stained sections, by the naked eye. The cells of this group present a marked contrast to the others, which are typical "motor" cells; they are round, inflated, bipolar, with slender processes, and presumably play the rôle of a trophic ganglion for the nerve.

§ 74. There is one fasciculus of the hypoglossal roots which does not enter the hypoglossal nucleus, but emerges directly from the raphe. Some of these fibres connect with spindle-shaped cells lying among the raphe fibres. The size of the raphe root is about the same in different individuals, but the number of the spindle-shaped cells shows extreme individual variation.(26) I must, therefore, maintain, against many observers, the existence of a *direct root* from the anterior pyramidal tract (through the raphe) for the hypoglossal nerve. The peculiar presumably "trophic" cell group described above, lies in the track of this root after it has left the raphe.

One beautiful group of cells, at the lower outer angle of the nucleus, consisting of from five to twenty cells in a section, sends its powerful axis-cylinder processes out and downwards towards the spinal accessory nerve root, and though it may serve to *associate* certain innervations shared in by the eleventh and twelfth pairs, it must be looked on as an origin of the spinal accessory, not of the hypoglossal nerve.

The "Accessory Hypoglossal Nucleus" of Duval has no existence.(27)

I am not prepared either to maintain or to deny the existence of a mutual nerve fibre connection between the hypoglossal nuclei of opposite sides of the medulla. Their molecular basis substance is continuous in lower levels, in higher ones they are separated by the raphe. Certainly there is no such bond of union as could be dignified by the term, commissure, between them.

§ 75. In comparing the hypoglossal nuclei and roots of different animals, to discover whether any structural differences related to the absence or presence of articulate speech exist, we find the following facts:

1. The land carnivora (dog, cat, bear) exhibit as large a nucleus, containing as numerous cell groups and cells, as rich in processes as man. The same applies to the monkeys, anthropoid and non-anthropoid.

2. The large ungulates (hippopotamus, horse) have proportionately as large a nucleus, but the cells do not form as distinct groups, nor are the cells provided with as numerous processes.

3. The direct raphe root is not found in the ungulates, it is feebly developed in the carnivora and apes; in this respect man surpasses the lower animals.

4. The number of fibres passing into the nucleus from the raphe is greater in man than in the apes and carnivora, and greater in the latter than in the ungulates.

5. The seal and porpoise have a very small hypoglossal nucleus.

We thus find that comparing the size of the nucleus and its number of cells, that these depend upon the *mass* of the tongue, that those animals possessing intricate co-ordinations have richer cell processes than those possessing less intricate co-ordinations, and that these co-ordinations being subservient to a hemispheric control, necessitate hemispheric connections through the raphe. The co-ordinations *mechanically* considered, which the cat exhibits when it converts its tongue into a drinking gutter, or by the dog when lapping up various substances, or the sun-bear when using this organ for purposes of prehension, are as complicated as any involved in the speech function. Hence the nuclei show no variation *as* *such.* But with the engrafting of the speech purpose on the already present mechanical co-ordinations, an increased number of controlling nerve tracts, bringing the hypoglossal nucleus under the control of a greater hemispheric area, became necessary. While the psycho-motor tract is well developed in speechless animals, in accord with the high importance which the glossal movements have, and is better developed in those having a freely movable tongue, like the land carnivora, than in the heavy tongued herbivora, it is made subservient to a more extensive series of combinations when the speech function is developed. (Chapter IV.)

§ 76. The mixed system, as far as it contains the roots and nuclei of the accessory, vagus and glosso-pharyngeal nerves, must be considered in the aggregate. The origins of these three nerves monopolize that entire portion of the mixed system which is situated inferiorly to the *striæ medullares.* As already indicated, it extends down into the cord, to the level of the exit of the fifth or sixth cervical pairs.

The subependymal column of the mixed system begins in the altitude of the first cervical nerve root, where on a line with the central canal are found from three to ten inflated cells in a section. In the altitude of the pyramidal decussation these cells become fewer; but a series of longitudinal fibres develops on the outer and inferior contour of the grey matter, which among other fibres conveys those originating from the subependymal column to higher levels. The cells become larger, more inflated and numerous when the limits of the pyramidal decussation are reached. They increase so much in number that the nuclei of both sides almost coalesce in the median line, in that grey substance which separates the central canal from the posterior median fissure. This takes place at the level of the inferior roots of the twelfth pair.[28] When the ventricle opens, two distinct cell groups are noticeable in the nucleus. The innermost extends continuously up to the level of the *striæ acustici*, and is the proper prolongation of the cell mass just described. The outermost is only found in such sections as fall within the points of emergence of the ninth pair. Its cells are multipolar, angular, and are intermediate in appearance between the ordinary inflated cells of the same nucleus and the multipolar and angular cells of, for example, the auditory origin.

Occasional insulated masses of the round celled variety are found scattered through this level and along the emerging nerve roots of the mixed system.

§ 77. The auxiliary and insular column of the mixed system is a continuation of that lateral group of cells found at the junction of the root of the anterior cornu with the *trigonum cervicale* of the cord, from which the spinal fibres of the spinal accessory take their origin. With the breaking up of the anterior cornu into its encephalic continuations, this cell column is driven outward and upward to just below the caput gelatinosum and ascending trigeminal root (§ 66). From this isolated mass spinal accessory rootlets continue to spring. Throughout its entire extent it is characterized by the presence of well marked "motor" cells. It early shows a subdivision into two nuclei, which lie close together but are separated by white substance. The innermost(29) lies immediately above the external accessory olivary nucleus; the outermost lies parallel with and around the emerging roots of the mixed system. Towards the altitude of the *striæ acustici* both nuclei disappear.

§ 78. THE TRI-NEURAL FASCICULUS.(30)—In intimate relation with the mixed nuclear system, there is a peculiar bundle which, running parallel with the axis of the medulla, begins some distance below the altitude of the obex and terminates with the altitude of the glosso-pharyngeal nucleus. It may be briefly characterized as a condensation of certain of the root fibres of the accessory, vagus and glosso-pharyngeal nerves, and has for its object that mutual interchange of motor, sensory and trophic fibres which is so noteworthy a feature, not only in the extra-cerebral course of the three respective nerves, but, as we shall see, is also a suggestive peculiarity of their intra-cerebral rootlets.

Immediately above the "pineal"(31) decussation, arched fibres, running parallel with and among those of the restiform decussation, and some of them in fact derived from the pineal decussation, sweep outward and upward in the plane of the transverse section, till they reach the outer inferior aspect of the subependymal nucleus of the mixed system. Here they curve around, become longitudinal, and continue forwards, as stated, to the altitude of the glosso-pharyngeal nucleus.

This bundle furthermore receives accessions from the insular nuclei of the mixed system, particularly in its lower altitudes.[32] Through this admixture those two nerves of the mixed system, whose origin from the subependymal nuclei had provided them solely with sensory fibres, obtain a portion of their motor admixture.

§ 79. THE SPINAL-ACCESSORY ROOTS.—From the entire extent of that cell-group which lies at the junction of the base of the anterior cornu, delicate rootlets ascend through the substance of the lateral column, and emerge considerably nearer the posterior than the anterior spinal nerve roots. So great is the disturbance into which the central tubular grey is thrown by the decussations in man, that from the level of the first cervical nerve root to the level of the hypoglossal nerve, fewer such fibres join the spinal accessory nerve than in the spinal or the olivary altitudes. Its principal origin in the medulla oblongata is from the *two* insular nuclei which lie in the interval between the olivary nucleus and the ascending root of the trigeminus nerve. These are the real *nuclei accessorii*, though, as we shall learn, the same cell-masses also enter into relation with other nerves.

Of the two nuclei, the upper and outer one is the larger; the emerging nerve roots can be traced from it with great distinctness. The inner and lower nucleus is less clear in its relations. While in lower altitudes it can be seen to send its fibres to the eleventh pair, in higher ones it does not do so directly, but by sending its fibres in the direction of its fellow nucleus. In this region that remarkable connection with the hypoglossal nucleus, of which I spoke when treating of the latter, is noticeable. Parallel with those fibres which join the inner *nucleus accessorii* to the external sub-nuclear group of the *nucleus hypoglossi*, are noticed others, which coming from the raphe and those of its fibres which run up from the anterior pyramids, presumably place the inner accessory nucleus under an extensive hemispheric control. Besides this the spinal accessory roots receive an inconsiderable accession from the tri-neural fasciculus. No fibres can be traced from the subependymal nucleus of the mixed system in the altitude of its upper roots.[33]

§ 80. In studying the anatomy of this nerve we have observed, first, that it is connected almost exclusively with the *motor* (insular) nuclei of the mixed system; second, that one of its nuclei is intimately associated with, and receives an accession from, the hypoglossal nucleus (§ 74, 79); and third, that this particular part of the nerve is under a more extensive control of higher centres, through raphe fibres, than any other.

That periphery of the spinal accessory distribution which is subject to the most intricate co-ordinations, associated on the one hand with the functions of the hypoglossal nerve, on the other hand implying an extensive hemispheric control, is the muscular laryngeal. To locate the origin of that part of the spinal accessory nerve which subsequently leaves it to run in one sheath with the vagus, and supplies the *laryngeal muscles* in the inner and lower *nucleus accessorii*, is therefore based on very plausible grounds. We shall see that the continuation of the inner accessory nucleus in higher altitudes sends its fibres to the vagus *within* the medulla oblongata. This systemic relation of this nucleus to the vagus becomes very suggestive of a relation to the laryngeal periphery in lower altitudes, as the latter would be an origin of fibres joining the vagus *outside* the medulla, and would, therefore, imply a physiological analogy. While not considering the subject as beyond doubt, I shall, for purposes of brevity, term the inner insular accessory nucleus the NUCLEUS LARYNGEUS.[34]

On the strength of the law of segmental harmony, we predicate for the spinal nuclei of the accessory nerve a relation to the *cervical* muscles innervated by it, namely the trapezius and the sterno-mastoid.

By exclusion, there remains one group of motor innervations to locate in the outer *nucleus accessorii*, namely the deglutitory. The movements of deglutition are shared in by the accessory, vagus, and glosso-pharyngeal nerves, and wherever the roots of these three nerves emerge there will we find this outer cell column, whereas the inner column is either absent or atrophic in the glosso-pharyngeal altitudes.

Inasmuch as it will be shown in the sequel (Chapter III.), that the tri-neural fasciculus is a presumable path for visceral innervations presided over by higher ganglia, it is quite in accordance with this latter assignment of function to the outer nucleus, that it is traversed by that portion of the accessory rootlets which is derived from the tri-neural fasciculus. On a basis of presumption, I shall term this the NUCLEUS PHARYNGEUS.(34)

§ 81. The Vagus Roots.—The inner cell mass of the subependymal nucleus of the mixed system, is the principal origin of the vagus nerve from the grey of the first category. Another powerful origin is from the tri-neural fasciculus, the greater part of this considerable nervous column giving off its fibres to the great visceral nerve. As the cells of the inner group are of the inflated variety, and as the tri neural fasciculus is derived from the corpora quadrigemina through the pineal decussation, particularly from the posterior pair, in whose ganglion the inflated cell form predominates, and as we have predicated for the inflated cell form a presumable relation to sensorial or vegetative functions, we can perceive a suggestive agreement between the histological observation and the physiological results. It is well known that the vagus is a nerve which at its origin from the medulla oblongata is almost exclusively related to the movements of organs of vegetative life and to general sensation.

Destruction of the spinal accessory nerve at its origin and above the point where it gives off a powerful and important deputy ramus to the vagus, while it enables us to exclude the vagus from any participation in the higher function of phonation, at the same time shows that the deglutitory movements of the pharynx and the *respiratory* movements of the larynx are not abolished. We must therefore seek for some connection of the vagus with the motor detachments of the mixed system. It is accordingly found that the *nucleus laryngeus*, as soon as the accessory altitude is passed and the vagus exit reached, sends off its fibres upwards to arch over the tri-neural fasciculus into the peripheral root of the vagus.(31) It may be assumed that just as the accessory division of this nucleus innervates the intrinsic muscles of the larynx concerned in phonation, that this vagus division innervates the *crico-thyroid*, the intrinsic muscle which carries on the respiratory movements of the larynx.

In a similar manner we would infer that the vagus origin from the *nucleus pharyngeus* presided over the movements of deglutition carried on through the pharyngeal plexus.(35) The greater part of the subventricular nucleus, that is, nearly the entire length of the ala cinerea, and its innermost portion, is a NUCLEUS VAGI, being almost exclusively connected with the pneumogastric nerve. Its cells throughout are inflated and fusiform, with few, and those slender processes. Inconstant groups of similar cells are often found at some distance in the reticular field of the medulla oblongata, and are connected either with the arched or the direct root. From the raphe a large bundle of fibres arches over the hypoglossal nucleus, crowding the latter away from the ependyma, and entering the *nucleus vagi.* These fibres apparently come from about the middle of the raphe where they enter as arched fibres. Few if any are continued to the anterior pyramids.(36)

With these fibres a special group of small cells is developed, which lies in the posterior of the angles formed by the junction of the striæ acustici and the median fissure of the ventricular floor. Its structural resemblance to those intercalar masses which we shall study in the fifth chapter, as *nuclei arciformes* and *raphe* nuclei, is to be noted. Very probably it has a relation to the same fibre systems in whose course the latter are interpolated.(37)

Whether in their course through the ascending sensory trigeminal root and the remnants of the *caput cornu posterius* the vagus roots receive any accessions, or whether they give off any fibres to the ascending root, I am unable to determine. One fact deserves mention in regard to these merging roots. While the spinal accessory, a motor nerve, *never* passes through the posterior cornu or the ascending trigeminal root, but below it, the vagus, at its origin a predominatingly sensory nerve, *constantly* does pass through them.

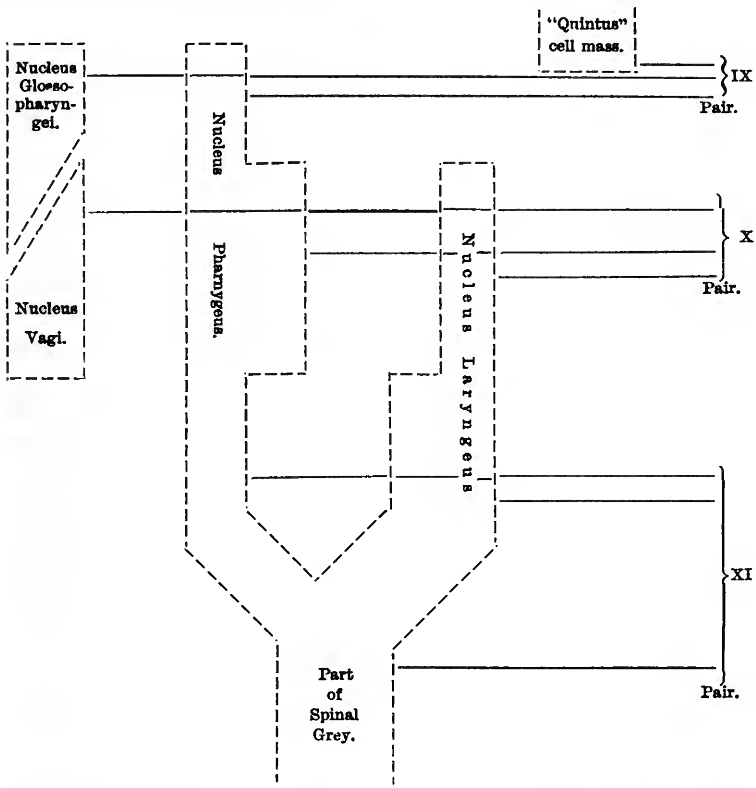
§ 81. The Glosso-Pharyngeal Roots.—As passing forwards, the *Ala cinerea* becomes narrower and narrower, its outer group of larger cells (§ 76) becomes better and better developed, while the inner proportionately disappears. Soon the ventricular floor about a millimetre or two behind the apex of the *ala* is monopolized by the group of larger cells, and the NUCLEUS GLOSSO-PHARYNGEI occupies the entire field of the sub-ventricular detachment of the lateral mixed system, the *nucleus vagi* having disappeared. From this nucleus which as the auditory nucleus becomes prominent, is crowded away from the ventricular floor, the chief roots of the glosso-pharyngeal nerve take their origin. An important addition is derived from the tri-neural fasciculus, which terminates in the glosso-pharyngeal altitude by giving off those fibres which remain after supplying the accessory and vagus nerves, to the emerging glosso-pharyngeal roots.

The insular or motor nuclei of the mixed system have become atrophic at this altitude; the one which I designated as the *nucleus laryngeus* is altogether absent, and the remnant of the other, which I termed the *nucleus pharyngeus*, after furnishing the glosso-pharyngeal roots with their slender motor contingent, disappears. The cells which lie on the contour of the ascending trigeminal root, send numerous processes to the roots of the ninth pair as they pass through this region. As these cells belong to the homologue of the posterior cornu an explanation may be sought here for the contradictory results which physiologists have obtained in regard to the relation which the fifth and ninth pairs have to the sense of taste.

The sense of taste, like that of hearing and sight, involves a higher differentiation than the ordinary senses of contact, temperature and the visceral sensations. The fact that the cells of the gustatory nucleus, like those of certain auditory nuclei and of the ganglion geniculatum externum, are larger, and more multipolar than the ordinary cells of the "sensory" grey masses, is suggestive in this regard.[38]

§ 82. The lateral mixed system so far as it embodies the origins of the ninth, tenth and eleventh pairs, consists of very different grey masses, which unite their emerging fibres among each other for convenience in peripheral distribution, just as the corresponding nerves enter into mutual union, or exchange fibres outside of the brain, for a similar purpose.

Schematizing these masses briefly in their relation to nerve roots we have the following:[39]



§ 83. THE NERVUS INTERMEDIUS, or the nerve of Wrisberg, should be regarded as a nerve of the mixed system, and be classed as an aberrant fasciculus of the glosso-pharyngeal. Through the researches of several Continental and American anatomists[40] it has now been definitely ascertained that this nerve attaches itself to the seventh pair only to leave it again as the chorda tympani, and to furnish the gustatory filaments of the anterior portion of the tongue. Duval found that the nerve of Wrisberg originated from the anterior extremity of the glosso-pharyngeal nucleus, an important and suggestive discovery.[41]

The nerve of Wrisberg is connected with the medulla in an exact line with the glosso-pharyngeal, and its roots take the same course, piercing the ascending trigeminal root, connecting with the nuclear mass associated with this root and receiving the last fibres from the glosso-pharyngeal nucleus as well as from the tri-neural fasciculus. Throughout, therefore, it is a reproduction of the nerve whose functional counterpart it is.

The relation of the nerve roots thus far described to the cerebellum will, like their other relations to higher centres, be discussed in another place.

§ 84. THE AUDITORY NUCLEI and AUDITORY NERVE ROOTS.—At the point where the peduncular axis underwent its most pronounced incurvation, the motor and "mixed" systems disappeared, the sensory column alone becomes represented here, and while the homologue of the head of the posterior cornu exhibits no change at this altitude, accompanying the ascending trigeminal root to whose fibres it adds, the *neck* undergoes an exuberant development, and invading the region occupied in lower and higher levels by the other systems, usurps the entire width of the ventricular floor. Thus it constitutes the GREAT OF INTRA-MEDULLARY AUDITORY NUCLEUS.(42) The embryonic auditory nerve also exhibits a ganglionic thickening, which attaining a distinct individuality and insinuating itself between the main root and the flocculus cerebelli becomes in the adult the EXTRA-MEDULLARY OF EXTERNAL AUDITORY NUCLEUS.(43) It is this addition of nerve matter, not derivable from the central tubular grey, that gives the auditory nerve a separate position from the remainder of the ten last cranial pairs. In the human being there seems to be a gradual transition from the intra-medullary nucleus to the tectorial nuclei of the cerebellum. Many of the peculiar relations of this important nerve are based on its connection with the latter body, and cannot be discussed within the limits of this chapter, which is limited to a discussion of the nerve nuclei proper.

There are two divisions of the auditory root: one skirting the contour of the medulla, enters the intra-medullary nucleus from above, covering its ventricular surface with a part of its fibres, known as the STRIÆ ACUSTICI;(44) the other enters the same nucleus from below, and in higher altitudes pierces it and enters the cerebellum in various ways. The former is always found externally to the latter when both are struck in a transverse section; it may, therefore, be termed the *external* root. The same root is also found in its best development in lower or more posterior altitudes than its comrade; it for this reason may be also called the *posterior* root.

The POSTERIOR AUDITORY ROOT shows more variation in the animal scale than the anterior, being more voluminous in man than in any other animal.[45] Particularly does its superficial portion, the striæ medullares, vary, being well marked only in the human being. It is this latter portion which, traversing the floor of the ventricle, dips down at the median fissure into the raphe, and can be traced in the latter to a considerable distance. This is the only path by which the sound impressions can reach the cerebrum in a direct circuit.

The ANTERIOR AUDITORY ROOT enters the medulla at the corresponding point to that one entered by the *nervus intermedius*, its fibres cut through and around the ascending trigeminal root. It is well developed in reptiles, with whom the posterior root is undemonstrable, and shows little variation in the animal scale, perhaps exceeding the posterior root relatively more in the aquatic carnivora than in other of the mammalia. There is strong presumptive proof that while the posterior auditory root is the tract of hearing, or the true *nervus acusticus* representing the *ramus cochleæ* of the peripheral distribution, the anterior root is the tract of those impressions in the labyrinthine periphery which determine the equilibrium, and represents the *ramus vestibuli.*

The connections described by Clarke and Meynert as existing between the auditory nuclei and those of other cranial nerves, are given with much reservation, and are altogether so difficult of identification that I omit them from this, the more descriptive part of the essay. Meynert calls attention to several features of the nerve, which are incompatible with Deiters' scheme of ranging it in one system with the facial, as the latter's sensory equivalent. In this our observations fully support him.

The cells of the intra-medullary and extra-medullary nuclei are large and multipolar, though the processes are comparatively slender. The cells of the extra-medullary nucleus are more inflated than those of the intra-medullary one, and approximate the spindle-shaped inflated type.

§ 85. The Facial Nerve and its Nuclei.—Aside from slight peripheral admixtures exclusively motor, the facial nerve originates from two nuclei, the one being a representative of the purely motor subependymal system, the other of the insular and purely motor *division* of the mixed system. Its origin from the former is less considerable than from the latter. The course and relations of this nerve are best studied by beginning at its origins in lower levels, and following the course of its peculiar root, which to a certain extent imitates the course of the fibres leaving the *nucleus laryngeus* to join the vagus. (§ 81.)

The cell columns of the nucleus laryngeus and nucleus pharyngeus cease at the lower auditory level, but after a short barren interval, a conglomerate of cells corresponding in shape, though larger and more numerous, and arranged in groups or sub-nuclei, appears as their ideal continuation. This is the inferior facial nucleus; the respiratory and emotional co-ordinations mediated by the facial nerve are referable to this nucleus.

In numerous delicate strands the rootlets originating in this nucleus tend towards the ventricular floor, curve over forwards under this floor, receive an accession of fibres from the *common nucleus of the facial and abducens nerves* and descend then, to emerge a short distance beyond the altitude of the lower facial nucleus. They thus form an arch like an inverted U, and have hence been collectively termed the horse-shoe shaped root of the facial. As there is but one individualized root, it requires no special designation.

This root may be considered then for purposes of description as consisting of an ascending portion, an arch[(47)] and a descending portion. The ascending portion inclines a little more forward from the transverse plane, with its upper end, the descending portion inclines backwards with its lower end so that it emerges from the posterior border of the pons at no great distance from the point where the rootlets from the inferior facial nucleus begin, on a plane anterior to the lowest of the latter roots.

It is the arch which, rising under the ependyma, produces the round eminence near the median ventricular fissure lying in front of the striæ acustici, and known as the *eminentia teres.*[18] At the same time that this portion of the facial root is curved from behind forwards, in the sagittal plane, so as to be convex upwards, it is slightly bent in the horizontal plane, with the convexity of this lesser curve looking inwards.

§ 86. As it passes down into the descending portion, on the anterior and external aspect of the common nucleus for the sixth and seventh pairs, a considerable accession of fibres is taken up and passes out of the medulla with the descending branch. Some of these fibres can be seen in the horizontal plane joining the descending portion directly, but by far the larger portion emerges from the common nucleus in a beautifully distinct fasciculus,[49] which ascending and inflected forwards within the out-looking concavity of the facial arch joins it in such a way as to be visible only in sagittal sections. All these fibres can be traced to a particular division of the common nucleus, which occupies its outer region, and from its demonstrable connection with the facial nerve, may be called the UPPER FACIAL NUCLEUS; it is the primary centre of the *orbicularis oculi.*

§ 87. The great variation of the lower facial nucleus in the animal range, its atrophic condition in reptiles (while the upper nucleus is well developed), and its greater complexity in animals possessing mimicry, such as man and the simians, lead us to the inference that the muscles of expression must be here projected. But from the fact that it is well developed also in the elephant, whose muscles of expression are not very prominent, that it is present in the herbivora and not entirely absent in any mammalian air-breather, we must infer that other co-ordinations mediated through the facial muscles have their seat in this nucleus. The important and intricate co-ordinations of the elephant's trunk have led to a great hypertrophy of the nucleus, and indeed it might be here possible by a careful comparison to determine in which of the finely marked groups of cells the nasal muscles are represented. In certain ungulates (horse) a paralysis of the nostril dilators would be almost certain death. All mammalia require the muscles of suction to be under an early co-ordination, and hence it is that only birds of air-breathing animals have the lower facial nucleus *entirely* absent.[50]

There is an anatomical reason for the distinctness of the upper and lower facial nuclei. The periphery of the upper nucleus was in the embryo near the median line, and developed much earlier than that of the lower nucleus, which originating from certain of the embryonic visceral arches, was originally on the lateral plane of the body. (§ 62.)

There seems to me to be a slight connection between the auditory nerve fibres (internal root) and some of the outermost and lowermost cells in the lower facial nucleus. This may constitute a reflex path controlling the innervations of the tympanic periphery of the facial nerve, the *musculus stapedius.*[51] The raphe connections of the facial will be considered in another chapter.

§ 88. The Abducens Nucleus and Roots.—From the inner and lower portion of the common nucleus, a series of well marked roots arise which, piercing the posterior-most fibres of the pons, pass out of the isthmus in a direct line.

The cells are multipolar, resembling those of the facial nuclei from which they differ in being smaller. They are smaller even than those of the outer part of the common nucleus.

The abducens as well as the facial portion of the common nucleus receive fibres from the *posterior longitudinal fasciculus*, a path which will be considered in its important relations in the following chapter;[52] they are thus placed under the controlling influence of the optic lobes.[53]

The roots pass out in the transverse plane very regularly[54] until the transverse fibres of the pons are reached, when they become irregular in direction, and usually deflected backwards. The roots thus collect at the posterior border of the pons.

§ 89. The Trochlearis Nucleus and Nerve.—Beneath the ependyma of the posterior one-quarter of the Sylvian aqueduct, in an area homologous with that of the preceding nucleus, is found a more or less roundish accumulation of cells, of the same character as those described for the "motor nuclei," but of smaller calibre. This mass is separated from the oculo-motor nucleus, which lies directly in front of it, and the abducens-facialis nucleus, which lies behind it, by a barren interval of that continuous column of molecular nerve tissue in which these three nuclei are imbedded.

The roots on emerging from the nucleus, first run parallel with the peduncular axis, enclosed within the central tubular grey, and then gradually rising to the dorsal region, approach the surface of the valvule of Vieussens, where imbedded in its tissue, the nerves of opposite sides meet and undergo a decussation.

This decussation is as well marked in reptiles as in mammals.(55) A slender fascicle on the outer side *may* represent an uncrossed part of the nerve, but its relations are still doubtful to myself; the facts of the decussation, and that if not an entire, it is a nearly entire decussation, are undoubted.(56)

The trochlearis nucleus receives fibres, and sometimes even a distinct bundle of fibres, from the retino-muscular tract of the posterior longitudinal fasciculus.

§ 90. THE OCULO-MOTOR NUCLEUS AND NERVE.—From a similar mass of cells lying beneath the middle third of the Sylvian aqueduct, the third pair of nerves originates. Its roots pass in a fine sweep, first concave then convex outwardly, through the "red nucleus" of the tegmentum, an intercalar ganglion with which they have no connection,(57) and concentrating emerge on the boundary line between the crus cerebri and the inter-peduncular ganglion. The nucleus receives direct fibres from the optic lobes of both sides, and is intimately related in its development to the posterior longitudinal fasciculus.(58)

All the nuclei connected with the ocular muscles are subservient to the retinal impressions, and must be considered as a group distinct from the other cranial nerve nuclei.

§ 91. THE TRIGEMINAL NUCLEI AND ROOTS.—This nerve which so closely approximates the type of the ordinary spinal nerves, to the superficial view, is in reality the most complex of the cranial nerves. Its motor origin is derived from the insular division of the lateral mixed system, and also receives presumably vaso-motor or secreting fibres from the sub-ependymal division of the same system. The former is the homologue of the lower facial nucleus, the latter correspond to the sub-ependymal nuclei of the pneumogastric and glosso-pharyngeal nerves.

It is the sensory root which exceeds all other cranial nerve origins in its extent. Beginning in the cervical cord, this origin, under the name of the *caput cinereum* of Rolando, attains a considerable magnitude in the lower part of the medulla oblongata, and continues upward with brief interruption to the level of the nerve exit.

Throughout this extent it is characterized by a more or less convoluted mass, on the external aspect of which the nerve fibres collect to run to the point of exit, and this mass is identical in structure with the gelatinous mass of the posterior cornu in the spinal grey.

The grey matter which immediately adjoins the *caput gelatinosum* is also to be regarded as a part of the origin of the sensory root, parallel fibres coursing through it, and either joining the nerve root to other nuclei or passing to higher centres through the restiform column, and reticular field of the medulla.

We have three groups of fibres to distinguish in the rootlets of the trigeminus: 1. The motor. 2. The sensory. 3. Fibres whose function is not positively known, but which are with considerable probability devoted to some of the specific functions which the nerve exercises on the secretions and tissue nutritions.

§ 92. The Motor Root and Nucleus.—A mass of large nerve cells with numerous and well-marked processes, is found as a continuation of the lower facial nucleus, from which it is separated by a barren interval,(59) and somewhat nearer the ventricular floor than the latter. The altitude at which this nucleus is found may be characterized as being internal to the exit of the trigeminus nerve. It is the origin of the lesser or motor root of the fifth pair.

The root runs upwards and is therefore not visible in its entire length on exactly horizontal sections. It receives an accession from another mass of cells before emerging (§ 94).

§ 93. The Sensory Roots.—These are divisible into three separate fasciculi: 1. Direct roots, originating at or a little above the level of the exit of the nerve; 2. Cerebellar roots; 3. The great ascending root.

1. The direct roots are derived from a homologue of the caput gelatinosum lying at the same level as the motor nucleus, and from the SUBSTANTIA FERRUGINEA, which lies in more anterior as well as in the same planes. The substantia ferruginea is remarkable for the resemblance of its cells to the cells of the columns of Clarke and the *nucleus vagi;* in addition they are deeply pigmented in the *adult* human being.

2. The cerebellar root will be discussed when the cerebellum comes under consideration.

3. The great ascending root extends the entire length of the medulla, originating in the cervical cord, and curves round into the common emerging sensory trunk at the latter's level of exit. In its course it is frequently traversed by roots of the mixed system as well as the auditory root. It constitutes a prominent feature of the transverse sections from the medulla and lower half of the pons, and increases in its number of fibres from below upwards and forwards.

§ 94. THE TRIGEMINAL NUCLEUS OF THE MESENCEPHALON AND THE DESCENDING ROOT.—The central tubular grey around the Sylvian aqueduct, contains at its margin a fine series of large spherical cells, resembling those of the inter-spinal ganglia, and at the lower end of the nucleus they exhibit a transition to the shape of the cells of the substantia ferruginea.[60] The large nerve fibres emerging from these cells run parallel with the peduncular axis, until they reach the level of the nerve exit, where they join the motor root of the fifth pair.

Thus the mixed system sends one bundle, that from the substantia ferruginea to the sensory root, another that from the mesencephalic nucleus to the motor root.

§ 95. Only a portion of the trigeminal sensory origin can be considered as the segmental partner of the motor root, namely, that portion arising at the same and somewhat lower levels. The other portions of the sensory root have their segmental partners, that complement the respective reflex arches, in other motor nerves, such as the hypoglossal, for the lingual periphery; the facial, for the cutaneous periphery of the face, and the upper cervical motor rami, perhaps, for the post-auricular sensory periphery, which it shares with their sensory branches. (§ 65.)

There is a powerful raphe connection with the emerging root, that seems to be distributed to both the sensory and motor divisions; it is found in the corresponding level of the pons. This and analogous connections of the other cranial nerve roots and nuclei will be better understood as we proceed to the study of those higher centres which exercise their controlling influence through these tracts.

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(1) It would add much to the clearness of our terminology, in my opinion, if the adjectives, "anterior" and "posterior," were to be discarded. Physiologists and anatomists are so often forced to deal with the nerve axes of lower animals, in whom what is with man the anterior root becomes inferior, and what is in the former posterior becomes superior, that they have either been confused themselves or have written confusedly, or finally have, to avoid all misunderstanding, utilized the terms applicable to man alone also for quadrupeds. The nervous axis, however, occupies one definite position, which should determine the topographical designations. What in man is the anterior, and in quadrupeds the inferior root or cornu, is always ***ventral;*** while what in the former is posterior, and in the latter superior, is always ***dorsal.*** The present treatise is not the proper place for renovating nomenclature, but I have thought it well to call attention to the matter in passing, and in anticipation of a work on comparative neural morphology which I have in preparation.

(2) In this direction a gross error has been committed, and is repeated every day, one for whose origin the French anatomists, particularly Luys, are largely responsible; while to Charcot and his followers we owe its dissemination. They have stated the ***large*** nerve cells to be motor, and ***per contra***, the small cells to be sensory. Now I can show that very small cells are found in unquestionably motor nuclei (origin of third pair), and very large ones in patently sensory centres, such as the ***ganglion geniculatum externum.*** So that any differentiation of nerve cells, as to function based on dimensions solely, is fallacious. It has been also predicated as characteristic of the motor cell, that it is richly multipolar; but there are on the one hand richly multipolar cells in the sensory nuclei, such as the auditory, and on the other we find that undoubted motor cells in very low vertebrates have few processes. So that this line of demarcation must be overturned. So far, there is but one character which I should be willing to predicate for the so-called motor cell, namely, that the transition from the body to the processes is so gradual that it is difficult to say where the body ends and the process begins, while in unquestionably sensory cells the transition is always abrupt. Viewing the question in the abstract there is no ***a priori***

reason why sensory elements should differ from motor ones. Comparing a large number of sensory with motor cells, we may say that the character above given seems to be the only one on which an anatomical differentiation can be based; exceptions there seem to be, but not in the case of any cells whose physiological rôle is clearly established.

Quite a notable feature in many of the sensory nuclei is the presence of fusiform elements, whose bodies are inflated and which have two processes —one at each end—and few or no processes otherwise. There is a greater resemblance between the trophic and these sensory nerve cells than between the trophic and the motor ones.

As regards the caput gelatinosum, a few words regarding its structure may not be out of place here. Chemically, and in the manner in which it takes up staining matter, it corresponds so exactly *to the protoplasm of the nerve cells, and not to the neuroglia*, that I regard it as the homologue of a large number of nerve cells, whose differentiation into cellular units has been arrested at the embryonic stage. It would, therefore, with its characteristic *free nuclear bodies*, its fine-grained inter-nuclear basis substance, which stains deeply in carmine and hæmatoxylin, and its delicate, almost unrecognizable nerve fibrils, correspond to that condition of the embryonic grey substance which I spoke of as representing a uniform blastema, with nuclei and fibrils, and in which the latter had not concentrated around particular nuclei to constitute individual ganglionic bodies (§ 19, 20, 23). In other words, the most purely sensory grey of the cord stands histologically lower than the most pronounced motor grey.

(3) If the terms, "motor" and "sensory" were to be used in their strictest signification, only muscles would be properly designable as motor, and only the peripheral end organs of sense as sensory. The phrase used in the text, "related to motility," would be more expressive when applied to certain cells, than to say, "motor" cell. However, like other inaccurate expressions, these are so firmly rooted that I content myself for the present with calling attention to the matter. The function of a nerve cell is not determined by any intrinsic peculiarities, but by its peripheral connections (§ 16, 22).

(4) One need but compare the intricate relations of the antero-lateral horn in the brachial enlargement of man or a monkey with that of an ox; or, better still, that of any mammal with that of a reptile, to find this borne out.

(5) Thus the cell group in the apex of the anterior horn, as well as in the lateral cornu, is fairly developed in the dorsal region, while that portion of grey substance situated internally is deficient in cells, in evident relation to the deficiency of the prevertebral muscles. Then again in the sloth, an animal whose flexors preponderate extremely over the extensors, the inner cell groups also preponderate.

(6) As shown in the intumescences of the brachial and lumbar regions, there is much more differentiation of the cell groups in such extensions in the multi-digitate animals than in solipeds, as is shown by comparing the cord of man with that of the horse. In the thumbless Ateles or spider monkey, one particular cell group at the middle apex prolongation of the anterior horn and in the lower cervical region, which is well developed in the human cord, appears to be absent.

(7) The increasing development of a cell group in the upper cervical region near the central canal in animals with powerful head and neck flexors, seems to be in support of this statement. Extensors remote from the axis, such as the trapezius, have their origin quite remote from the central canal.

(8) The caput gelatinosum is more massive in the lumbar than in the brachial enlargement, and more massive in the latter than in the dorsal and middle cervical regions.

(9) This peculiarity of the medulla oblongata has been attributed to the sudden inflection which this part of the medullary tube undergoes in the embryo. It has been very aptly explained by His, on purely mechanical grounds. (*Unsere Korperform.*) I doubt whether mechanical factors exclusively account for it, as even the teliost fishes and lamprey, who do not show at any time such an incurvation of the medullary axis as the embryos of higher animals do, have an open fourth ventricle. I believe that some ancestral feature is potent in this direction, and that the inflection is secondary to a weakness in the dorsal part of the medullary tube at this point. Gotte has shown that the traditional view, according to which the medullary tube has at one time equally thick walls at all points, is not correct, and with regard to the medulla oblongata I can affirm positively, that in the embryo of no animal and at no period of development, is the roof of the future fourth ventricle ever as thick as its floor. Some zoologists have advanced the ingenious view that the inflection of the medulla and the atrophy of its roof are arrested steps of a process, which perfected in the arthropoda, leads in the latter animals to a perforation of the central nervous system by the pharynx. The circumoral or œsophageal ganglia of the insects, spiders and crustaceans, would, therefore, correspond morphologically, as they do physiologically, to our medulla oblongata. This interesting embryological feature furnishes the great dividing line between the vertebrata and arthropoda; the mouth having opened through the neural lamina becomes situated at the opposite side in the latter to the position occupied by it in the former. The limbs being determined in their position by that of the mouth, it follows that the back of the vertebrates corresponds to the ventral aspect of the arthropoda, and thus the central nervous system of insects *et cetera*, is ventral instead of being dorsal as in man.

(10) It must be borne in mind that the real morphological relation of the cephalic segments is much obliterated in the mammalia, and particularly in man. These relations are clear in the embryo, however, and can be excellently studied in the protean amphibians and elasmobranch fishes.

In some of the lower animals the *peripheral nerve trunks* are united outside of the brain in the same union that I have predicated in the text for their nuclei. In *Lepidosiren* the three motor nerves of the eyeball are completely fused with the ophthalmic division of the fifth, in the amphibia the same are also more or less intimately united :* in higher animals the partial union

* Huxley adds, "I am greatly disposed to think that the motor nerves of the eyeball, more nearly retain their *primitive* relations in Lepidosiren than in any other vertebrate, and that they are really the motor portions of the nerves of the orbito-nasal cleft, the third and fourth appertaining to the inner division of the ophthalmic, the sixth to its outer division." Now the internal side of the orbito-nasal cleft is, morphologically speaking, also more anterior than the outer side; for this reason the nucleus of the sixth nerve is more posterior than that of the other two nerves of the eyeball muscles.

of the third pair with the ophthalmic through the ciliary ganglion is the last relic of their ancestral fusion. In the amphibia the facial may be completely united with the ganglion of the trigeminus, and in close relation with its second and third divisions. The oculo-motor and ophthalmic nerves may be regarded as the motor and sensory nerves of the orbito-nasal cleft (Huxley); the motor trigeminus and facial, with the sensory fibres of the second and third trigeminal divisions, as the motor and sensory nerves of the maxillary process and first visceral arch. The ninth pair is the nerve of the second visceral cleft and pharynx. The tenth pair is distributed to viscera which, like the heart, stomach and larynx, are originally in the cephalic or nuchal segments of the body (§ 5). It may be chiefly regarded as the sensory nerve of the second and succeeding visceral clefts. Some parts of it share in supplying the first visceral cleft with the glosso-pharyngeal, and in some animals the two are intimately united. In some respects this union persists in man. The spinal accessory has an origin in the medulla oblongata as well as in the spinal cord. The cerebral origin represents the laryngeal periphery, the cervical origin the cervical muscular periphery. That is, the sensory and motor peripheries of the larynx; the former through the vagus; the latter through the cerebral root of the accessory, are projected in the same altitude of the central tubular grey; the muscular and sensory peripheries of the neck are projected in the same altitudes of the cord, the former through the spinal origin of the accessory and the motor roots of the cervical nerves, the latter through the sensory roots of these same nerves.

(11) The occipital region does not properly originate from the cephalic part of the germ, but from the nuchal; it is therefore supplied by nerves from the nuchal region of the central tubular grey.

(12) Nucleus funic. gracilis.

(13) Nucleus funic. cuneatus. Improperly termed restiform nucleus by Lockhart Clarke.

(14) Improperly termed nucleus of the lateral column by Köll and Henle.

(15) It loses its gelatinous character and becomes what Henle calls molecular, that is, it assumes the structure of the ordinary spinal grey tissues.

(16) This point is the one at which the greatest strain is exerted on the medulla oblongata when it becomes flattened out in the embryo. For the same reason that the fourth ventricle is widest at this point, the nerve nuclei are here atrophic. The exception which the auditory nerve shows to this influence, is probably due to the early development and great size of the embryonic auditory nerve. In other respects this nerve presents very exceptional features, and while I find that it resembles the typical sensory cranial nerves in many respects, in which the other nerves of the highest special senses, namely the olfactory and optic, differ from them, yet in some points it seems to deserve a separate position.

(17) The ganglia of the posterior pair of the corpora quadrigemina are developed from the embryonic blastema corresponding to the posterior cornu; so also is the cerebellum; but as both these ganglia attain physiologically rôles which separate them considerably from the central tubular grey

in relation with nerve roots, the statement that the homologue of the posterior horn is wanting, is correct.

(18) Only the *anterior* pair of the corpora quadrigemina are designated by the term optic lobes in this essay. See JOURNAL OF NERVOUS AND MENTAL DISEASE, "Contributions to Encephalic Anatomy," 1879, also "Some Remarks on the Corpora Quadrigemina," *N. Y. Med. Record*, March, 1880.

(19) The cortical grey of the optic lobes in which a part of the optic nerve terminates, may be a derivative from the blastema homologous to the posterior horn, especially as in the menobranchus there is no other grey matter in the mesencephalon except the central tubular variety. But to consider the cortical grey of this region in the *adult* as comparable to the nuclear grey, as Forel would have it, when he attempts to place the optic nerve on the same basis with the other cranial nerves, is simply inadmissible.

(20) There are very small multipolar cells in this area, and this may have led Meynert to conclude that the nuclei of the third and fourth pairs constituted in reality one nucleus. As the characteristic cells of the motor nuclei are however absent, and no root fibres of the nerves in question enter here, I must assent to the views of Forel that these nuclei *as nuclei* are distinct, though the molecular basis substance be continuous.

(21) Reference is here made to the purely motor *systems;* there are purely motor *nuclei in* the mixed system, and the auxiliary insular mixed system seems for a considerable distance to be purely of motor relations.

(22) As to the exact point to which the origin of the trigeminus can be traced in the cord I am uncertain; I have been able to follow this lower root to the level of the third cervical nerve. A common catch-question at examinations conducted on the cram-quizz principle, is to ask: What nerve enters the skull to leave it again? Or what nerve that leaves a cranial foramen is in reality not a cranial nerve? The anticipated answer is that it is the spinal accessory. Now both these questions are based on false assumptions. Not all of the spinal accessory "enters" the skull to leave it again, and as regards the assumption of the second question, the spinal accessory nerve through its upper root coming high up from the medulla oblongata, documents itself as a strictly cranial nerve. But admitting the assumptions the anticipated answer would not be accurate, at least in a physiological sense, for the fifth pair has the same peculiarity as the eleventh. The only difference between the two is, that the former's spinal root runs within the tissues of the nerve axis, the latter's freely through the arachnoid space.

(23) In speaking of "altitudes" in the isthmus, I mean the level of a given transverse section, such section being vertical to the peduncular axis, in conformity with the plan of Stilling and Meynert (not of Gudden). See "Contributions to Encephalic Anatomy," Part I., JOURNAL OF NERVOUS AND MENTAL DISEASE, 1878.

(24) A relic of this connection exists in mammals, in the shape of the very constant and considerable anastomosis between the twelfth cranial and first cervical pair.

(25) First described by Meynert (*Stricker's Handbuch der Gewebelehre*, II.).

(26) In the raphe of some human individuals it is very difficult to find a single well developed cell, in others they are crowded and scattered through-

out it, especially near the ventricular floor. In the chimpanzee the former condition was found, in the orang, the latter.

(27) In a foot-note to his translation of Huguenin, accompanied by illustrations, turned upside-down, so that the student is compelled to rotate the volume while studying these diagrams, there is a nucleus designated as the "noyau accessoire de l'hypoglosse," which is nothing more nor less than a nucleus of the spinal accessory nerve belonging to the insular detachment of the mixed system, and which receives the fibres from the external group of cells of the true hypoglossal nucleus described in the text.

(28) I have frequently found extreme pigmentary degeneration, and also pigmentary deposit, in some of these cells, where their neighbors were perfectly normal. What inference is to be drawn from the fact that while occasionally this appearance has been found in the insane, it has also been found in sane persons, particularly such as suffered from chronic pulmonary and cardiac affections, a more extended observation and comparison will have to show. Of one fact I am positive, that pigmentary degeneration is neither characteristic of, nor even unusually common, in epilepsy and general paresis, as the "pathologists" of some of our insane asylums maintain.

It appears to me that there is a great field for research in the pathological changes of the subependymal nucleus of the mixed system in progressive paresis, and possibly also in long-standing cases of inveterate epilepsy. This nucleus being immediately underneath the ependyma, it participates in and suffers from its pathological changes. Especially in progressive paresis I have found that the connective tissue hypertrophy associated with the formation of the well known ependymal granulations, invades this nucleus, and leads to a gradual and serious diminution of its cells. The visceral lesions of this disease may not be independent of such change.

Simple pigmentary deposit of some of the vagus cells I have come to look on as a normal occurrence in advanced life. And if this view is accepted, another example of the histological harmony prevailing through different nuclei of the same system will be furnished, as higher up the cells of the same system (substantia ferruginea) are characterized by this feature.

(29) The accessory hypoglossal nucleus of Duval.

(30) "Solitary fasciculus" of Lenhossek, Meynert, and Stilling, "Runde Bundelformation," Stilling. There are other "round and solitary" fasciculi in the nervous system, and I have therefore presumed to modify the nomenclature. The name selected certainly characterizes the part named, and has the advantage of not being ambiguous.

(31) This, a portion of the "upper sensory fine-bundled pyramidal decussation" of Meynert, but which as Flechsig and I have stated is a decussation of fibres of the inner division of the reticular formation which was a continuation of the lemniscus, presents on transverse sections a very close resemblance in outline to a fir-cone; in the absence of any other *brief* and expressive designation, and as Meynert's designation does not correctly apply to it, I have therefore termed it "pineal decussation" (See Chapter III.). The objection cannot be made to this title that it might lead to the misconception of supposing it to refer in some way to the "pineal gland," as the latter term may be considered as stricken from the nomenclature; it is

neither a "gland" nor "pineal," for example in the horse it is globular, in the hippopotamus, tongue-shaped. (See *Epiphysis cerebri*, Chapter III.)

(32) I am able to trace nerve bundles from these insular masses, particularly the inner one, which are certainly not continuous *outwardly* with any nerve root, to the tri-neural fasciculus, which they enter like the arched fibres after sweeping around its contour. These have, it seems to me, been confounded by some with the nerve roots emerging in the same plane.

(33) Meynert maintains such an origin with Stilling, but in rather general terms. Henle terms the subependymal nucleus of the mixed system, nucleus accessorius, a designation which is entirely faulty, since this nucleus gives but a very insignificant contribution to the spinal accessory nerve. See illustrations to the fifth chapter.

(34) Its lower half for the accessory fibres, its upper for the pneumogastric.

(34) Its lower third for the accessory division, its greater middle portion for the pneumogastric division of the *plexus pharyngeus*, and a relatively small portion for the stylo-pharyngeus and hyo-pharyngeus of the glosso-pharyngeal. Claude Bernard has shown that the movements of deglutition, although properly performed when the accessory is torn out, are yet not so skillfully performed as when this nerve is intact. Probably there is here a similar relation between the vagus and accessory nerves as in the case of the larynx, the purely automatic co-ordinations being confided to the vagus, the psycho-motor elaborations to the accessory.

(34) An arrangement noted also in some of the accessory fibres from this nucleus and repeated in the horse-shoe shaped root of the facial. The lower facial nucleus is in part the ideal continuation of the *nucleus laryngeus;* the roots from corresponding nuclei seem to follow a corresponding course.

(35) The importance of these masses for the pneumogastric nerve, is obvious from one fact in my observations. As is well know to comparative anatomists, the spinal accessory nerve is absent in snakes. Now, while that portion of the insular nuclei of the mixed system which falls below the exit level of the pneumogastric is atrophic, that part which corresponds to its exit and origin is well developed.

(36) Meynert describes a raphe root which runs under the nucleus hypoglossi and crosses the hypoglossal root. It seems to me to pass in great part into the nucleus laryngei, both in the vagus and accessory altitudes, but chiefly in the latter.

(37) Henle (*Handbuch d. Syst. Anat.*, III., p. 209) figures this nucleus erroneously as the nucleus hypoglossi.

(38) Even the scattered cells around the ascending trigeminal root, from which a part of the ninth pair originates, are of a larger and better individualized type in this altitude and that of the *nervus intermedius*, than lower down or higher up in the trigeminal origins.

(39) This diagram embodies only the central tubular grey origins, and does not represent the important raphe and tri-neural fasciculus contributions.

(40) Horatio Bigelow (*N. Y. Med. Record*, Jan. 17th, 1880).

(41) Communication to the Societé de Biologie, March 30th, 1878. In a letter published in the *N. Y. Med. Record*, I mentioned this discovery of

Duval, and stated that I had not been able to confirm it, having traced the nerve to a molecular mass with nuclei, corresponding to the caput gelatinosum and internal to the ascending trigeminal root. I have, however, on a repeated examination of a series of sections taken in a plane, which, at the same time that it is transverse inclines a little backward, been able to confirm Duval's description and to extend it. The chief origin is from the "quintus" nucleus; the next most considerable is from the last bundles of the tri-neural fasciculus, which are interrupted by a ganglionic accumulation containing very small cells (described by Meynert for lower levels); and the least considerable, as far as my observations extend, is from the "gustatory" nucleus of the glosso-pharyngeal. As the nerve of Wrisberg creeps into the medulla through the interstice between the seventh and eighth pairs, it makes a sweep backwards; the space between the convexity of this sweep, the auditory nerve and the border of the medulla oblongata, is filled up by a ganglionic accumulation, the *intra-radicular* ganglion of the nerve, containing numerous and moderately large cells, similar in shape to those of the acustic ganglia. Some of the fibrils of the nerve of Wrisberg can be traced into this ganglion. It is this mass which Henle (I think erroneously) designates "*unterer Acusticuskern.*" Meynert, strangely enough, ignores the very remarkable relations of the *nervus intermedius* entirely!

The tri-neural fasciculus and glosso-pharyngeal nucleus have in the altitude here spoken of, become driven almost to the middle third of the depth of the medulla by the encroaching of the auditory nuclei. It may be well to bear in mind that the nucleus ends before the last emerging roots from the tri-nuclear fasciculus do.

(42) *Internal* and *external* auditory nuclei of Meynert, Dean, Stilling and Clarke. I can see no occasion for subdividing the great or intramedullary nucleus into two nuclei. Their substance is continuous, and the cerebellar fibres which separate them at certain altitudes do so but imperfectly. In lower animals the division is still less marked. Where the substance of two cell groups is continuous, and both are connected exclusively with the same nerve, while it may be very well to speak, for topographical purposes, of an inner and outer division, as I shall, it is altogether superfluous to make distinct nuclei, and to increase the already bewildering complex of terms by two more.

(43) *Anterior* auditory nucleus of Meynert, Clarke, Stilling, and Dean. *Inferior* auditory nucleus of Henle. I suspect that the latter author has not discriminated between the intra-radicular ganglion of Wrisberg's nerve (see note 40) and the *extra-medullary* nucleus of the auditory. The terms I propose have, it is trusted, the advantage of defining the most essential topographical features of the two auditory nuclei. I believe, further, that the classification given is simple and meets all the demands of the case.

I exclude the nerve cells of the auditory root from the nuclear system. Meynert, who correctly insists that this accumulation is distinct from the extra-medullary nucleus (his anterior nucleus), classes it as a nucleus of origin. It is, however, no more entitled to that position than the scattered nerve cells or peripheral ganglia of the extra-cranial parts of the nerves. I follow Henle in passing it over as a ganglionic intumescence of the nerve.

(44) *Striæ medullares albæ acustici* of authors.

(45) The porpoise seems to have the largest auditory nerve root in the animal kingdom. Unfortunately, the specimen of a porpoise's medulla which came to my possession, was not in a very favorable state. I am uncertain, therefore, from what I could distinguish, whether it has a connection with the raphe and possesses striæ medullares.

(46). As the anterior root is well developed in a large range of animals, and the posterior seems to keep step with the predominance of the hemispheres, it is not unreasonable to suppose that the latter conveys those impressions which are in relation to higher conscious appreciations. The intimate relations of the anterior root to the cerebellum are in favor of a relation to the sense of equilibrium. The intra-medullary nucleus seems, in one sense, to be a forerunner of a higher cerebellar development. In the alligator its *external portion* rises to a remarkable series of folds bordering the fourth ventricle, and in birds more intimately connected with the cerebellum; while in mammals a gradual transition, both in structure and continuity, to the tectorial cerebellar nuclei is manifest.

(47) *Genu facialis* of Deiters. The prominence of this part of the facial tract at the ventricular floor subjects it to all the vicissitudes of pressure *et cetera*, to which the ventricular floor is liable in a higher degree than any other nerve. It has often occurred to me whether the existence of facial spasm and paralysis, or of ocular deviation with cerebellar tumors, abscess and hemorrhage, might not be due to pressure from the overhanging uvula or nodulus of the cerebellum.

(48) This is the only "teres" which ought to be retained in the nomenclature. A good account of the confusion into which the use of the terms, "eminentia teres" and "fasciculus teres," has fallen, is given by Duval in the French translation of Huguenin. He still suggests terming the subventricular part of the facial arch as a *fasciculus* teres; but this is clearly improper, as only individualized bundles, not *segments* of well ascertained tracts, merit such distinction. It would be as just to cut up the remainder of the patently continuous facial tract into "fasciculi" as to apply such a special term to the arch.

(49) First discovered by myself in a longitudinal section from a cat's brain. Here the abducens fibres can be seen emerging from the *lower*, the facial fibres from the *upper* part of the common nucleus. As the sections fall through the outer part, the facial fibres predominate; at the inner part the abducens roots monopolize the nucleus. The fibres visible in the horizontal plane have been confirmed by Deiters, Dean, Meynert and Duval.

(50) A remarkable fact, one which, like the prominence of the elephant's lower facial nucleus, has not yet been studied in sections, is the great development of the facial root in the porpoise, although the ordinary facial muscles are atrophic. To this atrophy there is one exception—the remarkable "blow-hole" muscles and cö-ordinations.

(51) I have not been able to identify any connections with other nuclei,

although I am not able to exclude such connections with the trigeminal motor nucleus.

(52) See Chapter II.

(53) *Ibidem.* "Anterior pair" of the corpora quadrigemina.

(54) On a longitudinal section the roots are seen to be, as it were, gathered up near their origin from the nucleus into a denser bundle, and, diverging somewhat below, resemble a *cauda equina.*

(55) Particularly finely marked in turtles.

(56) Bruecke claims to have found that the junction of the two nerves is a commissure and not a decussation, after attempting to demonstrate that for physiological reasons a decussation was improbable (*Physiologie Vorlesungen*). Rohon, whose extensive material from a large range of animals should have enabled him to come to an independent conclusion regarding this very demonstrable point, blindly follows him (*Das Selachiergehirn*).

(57) The larger this ganglion the more completely it entraps these roots. Therefore they are relatively free in lower animals where the tegmental nucleus is small or absent. Thus the roots pass out directly without separation in reptiles.

(58) Forel has properly excluded a raphe connection (*Unters. über die Haubenregion*).

(59) Its lower extremity is struck somewhat above the disappearing anterior end of the lower facial nucleus in horizontal sections; but the two seem to be always separated even when, as here, in the same plane.

(60) Against Forel (*Unters. üb. d. Haubenregion*).

ART. V.—A CASE OF PROGRESSIVE FACIAL ATROPHY, WITH REMARKS ON THE PATHOLOGY OF THE DISEASE.*

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THE case upon which I propose to say a few words this evening is that of a girl fourteen years old, who came to my clinique at the University Medical College during the early part of February. The photograph which I now exhibit very exactly represents her appearance, except that the atrophy of the anterior auricular muscle and lower part of the temporalis is not so clearly shown as would have been the case had the face been turned a little more to the right.

The affection was of gradual growth, and did not attract marked attention till about two years ago. It was then noticed that the left side of the face was different from the right, and careful examination showed that there were two depressions: one just above the angle of the mouth, and one just below and a little external to the other. Subsequently, the one above and slightly in front of the left ear began to appear. All of them have continued to increase up to the present time, and in addition there is a decided difference in the size of the two sides of the face. There has at no time been any apparent paralysis. Occasionally, there are what may be called paroxysms of numbness, extending over the left side of the face and never passing the mesial line. These only last a few minutes. At no one of my examinations have I been able to detect any loss of sensibility except of a limited region over the left half of the orbicularis oris muscle. The centres of atrophy were not preceded by any whiteness of the skin. The

* Read before the New York Neurological Society, March 2d, 1880.

hair, however, is markedly thinner on the antero-superior auricular centre of atrophy, than on the sound side.

Examination shows what had not previously been noticed, that the left half of the tongue is much smaller than the right, and that the palatine arch on the same side is flatter than on the opposite side. The tongue when protruded is deflected towards the affected side. There is no difficulty of swallowing, no defective articulation, no loss of taste, and no deficient sensibility of the tongue, or any part of the mucous membrane lining the buccal cavity.

The patient has very much the aspect of a person suffering from facial paralysis of the right side, but there has never been a symptom of such a condition.

The questions connected with the morbid anatomy and pathology of progressive facial atrophy relate to the essential character of the disease; and here, as there has yet been no *post-mortem* examination in the case of any person suffering from the affection in question, we have for the most part nothing but conjecture to guide us. Thus:

Bergson * regarded it as consisting in a morbid condition of the subcutaneous cellular adipose tissue, and that neither the sensory nor motor nerves, nor those influencing the glandular functions, were involved. He asked himself what was the cause of this "morbid condition"? And while avowing his inability to answer the question, calls attention to the facts, that in the case which came under his observation, the pulsations of the left common carotid artery were less marked than those of the right, and that hence the left side received a smaller quantity of blood than the opposite side; he thought, therefore, that there might be a lesion of the nerves which are distributed to this artery.

His patient had become affected with progressive facial atrophy subsequently to an attack of scarlet fever, in which the eruption had suddenly disappeared, and an abscess had formed in the left tonsil. Farther than this, Bergson did not venture to go in the direction of pathological discovery.

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* *De Prosopodysmorphia, sive nova atrophia facialis specie.* Berlin, 1837. Cited by Lande. *Essai sur l'Aplasie Lamineuse*, etc. Paris, 1869, p. 95.

Hueter* located the morbid process in all the tissues of the parts involved, and considered that the muscles were certainly atrophied; as to the essential nature of the disease, he thought there were three possible theories, either of which was tenable:

1. A perversion of the vitality of the primitive cells by reason of which they receive a less than normal quantity of the nutritive fluid which reaches them by exosmosis from the blood vessels.

2. A diminution of the supply of blood to the affected parts.

3. An interruption of the trophic functions.

Romberg † considered the disease to be "a tropho-neurosis," but declared that the primary seat was unknown.

Samuel ‡ basing his views upon one of Hueter's cases thought that the affection was due to a lesion of the trophic system of nerves.

Gutman § seems inclined to regard it as being due to what he designates a weakness of the trophic nerves.

Lande, ‖ in an essay in which he reviews very fully the opinions of others, gives his own as based upon two cases that came under his own observation, and a careful study of several others reported by various writers, from Parry, in 1825, to Olliver, in 1869. The name which Lande gave to the disease (*aplasie lamineuse*, laminar aplasia) sufficiently indicates his idea of the pathology, which was, that the cellular tissue of the face was the primary seat of the morbid action.

Eulenburg,¶ bearing in mind the fact that the principal manifestations of the affection are exhibited in those parts which are supplied by the fifth pair of nerves, regarded it as the result of a lesion of this system, or at least of a derangement of its function.

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* *Singularis ejusdam atrophiæ casus nonnuelli.* Marburg, 1848. Cited by Lande, p. 96.

† *Klinische Wahrnehmungen und Beobachtungen.* Berlin, 1851.

‡ *Die trophischen Nerven.* Leipzig, 1860.

§ "Ueber einseitige Gesichtsatrophie durch den Einfluss trophischer Nerven." *Archiv für Psychiatrie und Nervenkrankheiten.* Berlin, 1868.

‖ *Essai sur l'aplasie lamineuse progressive*, etc. Paris, 1869.

¶ *Lehrbuch der functionellen Nervenkrankheiten.* Berlin, 1871.

In this view Fremy * after full discussion entirely concurs.

Vulpian † asserts that we are ignorant whether there is or is not a primary lesion of the nerves or nerve centres, but is strongly of the opinion that in either case there is nothing to show that the disease is produced by vaso-motor disturbances.

By other authors, the sympathetic has been regarded as the primary seat of atrophic facial atrophy.

In an interesting paper based upon two cases, Dr. Bannister‡ arrives at the conclusions that the trophic functions of the fifth nerve are especially implicated, and that in some cases there are positive lesions of other cranial nerves. He considers it proved that the symptoms indicate a chronic trophic asthenia or paralysis rather than any irritative action.

In a previous publication § in discussing the question of the primary seat of the disease under consideration, I said : " As regards its primary seat, nothing definite can be said at present in the absence of investigations into the condition of the nervous system ; but I have felt warranted in placing it provisionally, at least, in the class which consist in inflammation of the nuclei of certain nerves.

" So far as analogy is concerned there is a marked affinity, not to say resemblance, between the symptoms of progressive muscular atrophy affecting the muscles of the face, the tongue and the pharynx, and those of some cases of progressive facial atrophy, in which not only the face is involved, but also the tongue and in one case, at least, the larynx.

" We have seen that in glosso-labio-laryngeal paralysis the muscles of the same regions are involved, but instead of atrophy we have paralysis. Now, when we come to seek out the primary seat of progresive muscular atrophy affecting the face, tongue and throat, and that of glosso-labio-laryngeal paralysis, we find both in the bulb, and especially in the nuclei of origin of the facial, the hypoglossal, the spinal accessory and pneumogastric nerves.

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* *Etude critique de la tropho-neurose faciale.* Paris, 1872.

† *Leçons sur l'appareil vaso-moteur*, t. II., 1875, p. 432.

‡ " Progressive Facial Hemiatrophy," JOURNAL OF NERVOUS AND MENTAL DISEASE, October, 1876.

§ *A Treatise on the Diseases of the Nervous System.* (Art., " Progressive Facial Atrophy.") Sixth Edition. New York, 1876, p. 543.

"If two such different but cognate diseases may occupy the same anatomical situation, why may not progressive facial atrophy, different but cognate, be also an affection of the same region? The fact that the atrophy involves other parts than the muscles, is no valid objection against this hypothesis. We have seen that in infantile spinal paralysis there is sometimes an atrophy of the bones. And yet we all agree to consider this disease as a primary affection of certain cells in the anterior tract of grey matter.

"I am, therefore, of the opinion, that progressive facial atrophy is an affection of the trophic cells of the bulb which are the nuclei of the facial, the hypoglossal, and the spinal accessory nerves. That ordinarily, the lesion does not extend farther than the facial, but that sometimes when the tongue is involved it reaches the nucleus of the hypoglossal, and occasionally that of the spinal accessory.

"In those cases in which there are aberrations of sensibility, the nucleus of the sensory root of the fifth pair may be affected and in those in which the temporal and masseter muscles are involved, the motor root may also be implicated, or the pain which is sometimes an accompaniment of the disease, may be due to the contracting process going on in the muscle and connective tissue, by which the terminal branches of the trigeminus are compressed."

The opinion which I then entertained relative to the possible existence of multiple lesions in progressive facial atrophy is strengthened by my subsequent experience. Since that time, two cases of the disease have come under my observation. The first passed from notice before I had the opportunity to study it completely or even to make notes of the symptoms, but my recollection is clear relative to the fact that muscles supplied by the facial, the motor branch of the trigeminus and the hypoglossal were the seat of atrophy, and that it did not differ in any essential particulars from the one which forms the subject of the present paper.

Thorough examination of this case shows: that muscles supplied by the motor branch of the fifth nerve, by the facial and by the hypoglossal, are atrophied, that the skin, hair bulbs, cellular tissue and even the bone (temporal) are similarly affected, and that there are sensory disturbances in the skin supplied by the fifth nerve. Under these circumstances I arrive at the conclusion that the nuclei of these nerves are the primary seat of the disease in this case.

The only other view that it appears necessary to discuss in this connection, is the one, that all the phenomena may be the result of primary implication of the fifth nerve or its nuclei. The involvement of the motor nucleus only, would certainly not account for the multiple muscle lesions observed in this case; the only muscle affected supplied by the motor branch of the fifth nerve is the temporal, and this only in a very limited portion of its substance. We have, therefore, merely to inquire as to the implication of the sensory nucleus, it being admitted that the motor nucleus is, to some extent affected, as shown by the effect produced upon the temporal muscle. The existence of a third root, as contended for by Merkel,* and to which he assigns trophic functions, can scarcely be regarded as demonstrated, and though its probability may be admitted, we need not in the present state of our knowledge take its possible influence into consideration. So far as the derangements of sensibility are concerned, it is conceded that they are due to lesion of the sensory nucleus or of the nerve itself in some part of its course.

Now, how far could a lesion of the nucleus of the sensory root of the fifth nerve, or one of the root itself, tend to produce all the phenomena observed in this case and others of progressive facial atrophy?

If the intra-cranial portion of the nerve be divided, we meet, in addition to loss of sensibility in the parts to which the nerve is distributed, with an invariable series of results which are entirely different from those observed in progressive facial atrophy. These, however, are intimately related to the function of nutrition. Thus the cornea ulcerates, the conjunctiva becomes inflamed, the glands innervated by the nerve have their functional activity diminished or altogether arrested, and occasionally, apparently by reflex influence, ecchymoses appear in the lungs and stomach.

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* "Die trophischen Wurzel der Trigeminus." *Centralblatt*, 1874, p 902.

Certainly these are not the accompaniments of progressive facial atrophy.

The phenomena due to an irritation of the sensory nucleus or of the nerve in any part of its course are so entirely different from those characterizing the disease in question that it is not necessary to dwell upon them more particularly.

It appears to me therefore, that all the atrophic phenomena present in cases of progressive facial atrophy are, like those met with in progressive muscular atrophy and spinal paralysis of infants and adults, the result of lesion of the nuclei of motor nerves—and probably of trophic cells—forming with the motor cells the centres of origin of these nerves. In these diseases atrophy takes place without the intervention of any sensory nerve or sensory root, and there is therefore, no necessity for the introduction of the sensory part of the trigeminus into the pathological circle presiding over progressive facial atrophy.

So far as the motor nerves which are in relation with the parts affected in progressive facial atrophy are concerned, we know very well that in other diseases in which their functions are abolished wholly or in part, the resulting paralysis is always accompanied with atrophy—the nerves of course containing the fibres coming both from the trophic and motor cells of the nuclei. Take for instance the hypoglossal, a purely motor nerve. There are a few cases on record in which the hypoglossal, on one or both sides, has been so compressed by tumors that its functions were completely interrupted, and this interruption was invariably followed in a short time by atrophy. Lockhart Clarke divided one of the hypoglossal nerves in a rabbit, and within a month after the operation the corresponding half of the tongue was markedly atrophied.

It may be well to allude to the theory that progressive facial atrophy is the result of lesion of the sympathetic system —if only to say that there are no facts which tend to its support.

As regards the eccentric conditions no exact investigations had been made relative to the changes produced, till my own in regard to the alterations in the muscular tissue, published in 1876.* These showed that there was muscular atrophy without degeneration—that the primitive bundles of fibres and of course the ultimate fibrillæ were diminished both in length and diameter and that the internal perimysium had also undergone shrinkage.

I have here under the microscope ($\frac{1}{4}$ inch objective) specimens of the muscular fibre taken by means of Duchenne's trocar, from the sound and atrophied buccinators. In the one from the right or normal muscle the primitive bundles are seen to be of full size and in every respect of healthy appearance. In the left or affected muscle, the bundles are perceived to be less than one-third the diameter of the others and to be much paler in hue. There is no trace of fatty degeneration—not a single fat corpuscle or oil globule being visible anywhere. The difference is so striking that one can scarcely resist the at least momentary belief that a sudden change in the magnifying power has been made. Accurate measurement shows that the bundles of fibres from the sound muscle are of the average diameter of $\frac{1}{650}$ of an inch while those from the unsound muscle are only $\frac{1}{2200}$ of an inch. The size of the fibres from the sound side is therefore greater than that ordinarily existing in the facial muscles, and may probably be indicative of hypertrophy. Kölliker found that in the muscles of the face the fibres are smaller than in the other parts of the body, the largest being $\frac{1}{750}$ of an inch in diameter, but in the portion of muscular tissue from the right buccinator on the slide I have found very few fibres as small as this, they ranging generally from the $\frac{1}{600}$ to the $\frac{1}{700}$ of an inch, and $\frac{1}{650}$ being a fair average.

Thus in two cases in which microscopical examination has been made of the muscular tissue in progressive facial atrophy there has been found an identity of lesions—atrophy without degeneration—I hence feel warranted in concluding, at least till these results are successfully controverted, that this is one of the concomitants of the disease.

**A Treatise on the Diseases of the Nervous System.* Sixth edition, New York, 1876; p. 550.

ART. VI. — THE RAPIDITY OF PERCEPTION OF COLORED LIGHTS.

BY ISAAC OTT, M. D.,

AND

MICHAEL T. PRENDERGAST, STUDENT OF MEDICINE.

WHEN light strikes the retina of the eye it produces in it a sensation of light. If this same light be transmitted through a prism we have various colored lights, which are usually denominated the seven colors of the spectrum. These colors give rise to different sensations dependent on the wave-lengths of these rays. According to the Young-Helmholtz theory the seven colors of the spectrum are resolvable into three colors called the primary ones—the red, green and violet, and that hypothetical fibres exist in the retina corresponding to these colors, being sensitive to different extents to the rays of light; whilst the theory of Hering is that the primary visual sensations are white, black, red, yellow, green and blue. The means by which different colors are perceived is not known, but judging from the eye of the owl and bat, which have no cones, these bodies are necessary for the perception of color, whilst the rods are not. The inability to distinguish colors existing in some persons is a well-known fact. It seemed to us that it would be a desirable object to determine which of the three colors frequently used in railroad signals was the quickest perceived. Lamansky saw the colors quickest as follows: first, green, then blue, and finally, red, whilst Kunkel saw red first, then blue, and last, green.

Method: The color-signals used by us were made by placing the various colored glasses in front of a lantern lighted up by a wax candle. The light was placed either in the room of the experiment at a distance of about eight feet, or about fifteen feet distant in an adjacent room. Then on one end of the cylinder of a Marey-Secretan apparatus was placed a circular disc of card-board fastened to the cylinder and revolving with it. At the outer edge of the card-board a circular hole was made in the card-board. This aperture was about an inch in diameter. At the other end of the cylinder was placed a card-board which was immovable and carried a long tube made of paper which extended to within two inches of the revolving card-board. This tube was about half an inch in diameter. When the circular opening in the revolving card-board was opposite the opening of the tube through which the operator was looking, then the colored light became momentarily visible. When the operator saw the light, we permitted the signal lever to return to its level. Now knowing the time at which the light became visible with the apparatus at a stand-still, and the time at which the light was signaled when the apparatus was in motion, it was easy to determine the time required to perceive the light, and to act upon it by signaling with the hand and lever upon the smoked drum. The time was noted by a tuning-fork which registered two hundred and forty vibrations per second, being run by a large Daniell cell. The experiments were made at night. Here the color must—1st, excite by its waves the terminations of the optic nerve; 2, conduction of this excitation to the brain; 3, the conversion of this sensory impulse into a motor; 4, its conduction in the spinal cord; 5, its conduction in a motor nerve; 6, the impulse generating a muscular contraction. Now if all the preceding periods except the first are assumed to remain the same during a series of observations extending over half an hour, then the difference in time when signaling a color must be due to a slower or more rapid excitation of the retina by the waves of light.

Baxt,* under the direction of Helmholtz, made experiments on the time required to distinctly perceive an object, that is the time an object must act upon the optical apparatus of the eye till a correct view of it may be obtained. He experimented with letters, test-type and more or less complicated curves, and found that the time required to obtain a correct view of them was greater the more complicated the object, and that within certain limits it was independent of the inten-

* *Pflüger's Archiv*, IV.

sity of the picture on the retina. Larger objects were perceived in a shorter time than smaller ones. Sagot,* who also experimented upon this subject, obtained similar results, whilst Kries and Auerbach found that to distinguish between colors required .012 second. Now the colors employed by us were always the same in extent and the glass in each case of the same thickness. Care was taken in our observations that weariness had no effect in introducing errors. In our experiments the mean time in several signals is taken as the time required to signal the color. The numbers in the experiments mean so many one hundred and twentieths of a second. We give here a few of our experiments.

WITH COLORED LIGHTS IN THE ROOM. *Prendergast.*			WITH COLORED LIGHTS IN AN ADJOINING ROOM. *Ott.*		
Red.	Blue.	Green.	Red.	Blue.	Green.
20½	23	21	26	28	25
18½	23	23	26	30	29
20	24	24	26	31	29
21	22	21	26	27	29
20	22	23	23	28	28½
19½	22	22	26	29	27½
6)119.50	136	134	6)153	173	168
19.9	22.6	22.3	25.5	28.8	28

The time occupied in the perception of the blue light was 2.7 (Prendergast), and 3.3 (Ott) in excess of that required to perceive the red color; whilst the time occupied to perceive the green was 2.4 (Prendergast) and 2.5 (Ott) in excess of that required to see the red. The question now arises, What is the time necessary to distinguish one color from another, or the time of thought? To estimate this, red and blue cards at intervals were thrust in front of the circular opening of the revolving card-board, and only signaling when the red card was perceived, it was easy to determine the time of thought required in determining that the card present at the aperture was red. This was done by deducting from this time the time required to signal a red card, when the color was known beforehand. To Mr. Prendergast the time of thought by the color-test was $\frac{1}{24}$, and for self, $\frac{1}{20}$ of a second. This time of thought exceeds the differences in time required

* Herman, *Handbuch*, Zweiter Band, Zweiter Theil.

to perceive the colors, red, blue and green. Yet these small intervals may be sufficient at certain periods to be of value to the engineer or switchman.

Our experiments agree with each other, while they disagree with those of Kunkel, who perceived the blue before the green. The cause of this difference we are at present unable to state. The observations of Lamansky differ decidedly from those of all other observers. It took him three times longer to perceive the red than the blue. If the observations of Lamansky are correct, and we have no reason to doubt them, then not only is it necessary that railroad employees should be examined as to color-blindness, but those who are not color-blind as to their quickness in the perception of colors. It is quite probable as some men hear sounds, yet certain sounds only feebly, so the eye may see colors, but some of them in a feeble, uncertain manner.

ART. VII.—PERI-ENCEPHALITIS.

BY J. BAXTER EMERSON, M. D., NEW YORK.

MR. B. was the youngest of a family of seven children. His mother died of acute cerebritis, terminating in abscess; a maternal uncle and aunt both showed marked symptoms of dementia, late in life. These three were the youngest of a family of six children. His father died of cancer. All the members of Mr. B.'s family show a decidedly nervous temperament. One of his sisters has suffered more or less for several years with hysteria. A second sister has at the present time posterior spinal sclerosis. Until his fifteenth year, his health was always good. About that time he was thrown from a carriage, and received a severe scalp wound on the posterior part of his head, one-half inch to the left of the external occipital protuberance, from which he seemed to recover. A few months later, he had an attack of varioloid, so slight in degree that he was not confined to his bed. After this for some years he suffered with furuncles, and about the same time he began having attacks of "congestion of the face," followed by epistaxis, which occurred so frequently as to compel him to give up his gymnastic exercises. His habits were regular except for two years during the war. He then occupied a position which compelled him to lose much sleep. He smoked several cigars a day and took wine at dinner, but indulged in neither to excess. He was much troubled with naso-pharyngeal catarrh, but his handkerchiefs were "mostly soiled with blood." At the age of twenty-eight he entered Wall Street, and by a series of speculations lost all the property he possessed and involved himself in debt, which worried him excessively. The catarrhal symptoms, accompanied by congestion and epistaxis, increased in frequency and severity. At the advice of a non-medical friend, he took two boxes of Dr. Pierce's Catarrh Remedy, with the result of checking the catarrhal symptoms; but he soon found that he was losing flesh and strength, that his appetite was poor and his digestion bad. He also had night sweats, was exceedingly peevish, and had a tendency to fall when walking or on turning suddenly. His brother, in whose bank he was employed as book-keeper, noticed that he was much slower in his work. He discontinued the medicine, the catarrh symptoms and epistaxis returned, and he was apparently much better. During the month of January, 1874, the above symptoms returned, were more marked, and moreover, he began to stammer, and would often forget localities and names. These symptoms were intermittent in character: at times he was apparently well. In the month of September, 1874, he was married, contrary to the advice of those who knew him best. While on his wedding trip, his wife noticed these symptoms, and that if he endeavored to walk down a flight of steps, he would become pale and complain of vertigo. Shortly after he returned to his business for one week, when during the night he was attacked with most intense pain in the head, accompanied with great irritability, photophobia, and inability to stand alone. These acute symptoms lasted several days, and for several weeks he had to be led to prevent his falling. About a month later he returned to his business for two days, when a second time during the night he had a similar attack, this time losing the power of speech and being "delirious." A few days after, he came under Dr. Hammond's care, who has published his case in his *Treatise on Diseases of the Nervous System*, 6th edition, p. 244. After he passed from Dr. Hammond's care, he complained of "pain in the forehead," numbness of the extremities, occasional twitching of the muscles, and was unable to walk without assistance. On two occasions he asserted that he was blind, which assertion he persisted in for two days. He was exceedingly childish in his actions. He once went to his brother's office for two days, but was unable to transact business. These symptoms were much more marked at some times than at others; but the tendency was to a gradual increase. Towards the latter part of the summer of 1876, he became violent, his hallucinations and delusions being of an exalted character.

Mr. B. came under my care October 5th, 1876. His general appearance was good; body well formed, except congenital absence of the left testicle, and well nourished; teeth and nails excessively brittle; several small ulcers on the sacral region; appetite capricious but ravenous; digestion good; bowels constipated; heart, lungs, and kidneys negative; left pupil dilated; tongue tremulous; power of co-ordinating the muscles much impaired, those of the left side more so than the right; left biceps permanently contracted, so as to keep the forearm at an angle of about 135° with the axis of the arm; contractile power of the muscles on the right side more marked than on the left; an almost incessant movement of either the forearm and hand, or grinding of the teeth; partial anæsthesia of the left side; special senses apparently normal; aphasia of both varieties, but principally amnesic; hallucinations and delusions of a very exalted character, seeming to dwell principally on financial subjects; emotions not under control; sense of decency lost; using the most obscene language; responding to calls of nature regardless of surrounding circumstances; dementia very marked; at times so violent as to necessitate restraint; insomnia.

On the 14th of November, 1876, he had an attack with the following symptoms: Complete left hemiplegia and hemianæsthesia; complete aphasia; congestion of head and neck;

extremities cold, especially the left; head drawn to the right and fixed; both eyeballs drawn to the right as far as the recti muscles could draw them; left pupil widely dilated; conscious, with sense of sight and hearing intact; facial muscles slightly paralyzed on the right side; those of deglutition interfered with; respiration irregular and sighing in character; pulse 84, irregular and intermittent; temperature 100°. Soon after the above symptoms were noted the muscles on the paralyzed side began to twitch, first in the extremities, gradually extending to the trunk, until finally all the muscles of the left side were in a constant state of spasmodic contraction. Cold was applied to the head, heat and friction to the extremities, and potassium bromide given internally. In the course of an hour the patient was in a stupor, from which he could easily be aroused, the twitchings continuing but getting gradually less. The next morning the symptoms were all gone, except slight paralysis and aphasia, and the patient apparently better, both physically and mentally, than before the attack. These attacks occurred about once a month during the remainder of the patient's life; at times were exceedingly slight, only one or more groups of muscles being involved; at others were more general, the tendency being to be lighter in summer and fall, and more severe in winter and spring, but on the whole to become less severe as the disease advanced. Dementia became more marked, and on April 25th, 1878, I succeeded, for the last time, in getting the patient to read a few lines in one of the daily newspapers. During the latter year and a half of his life, he was much troubled with diarrhœa, which was at first easily controlled by diet and bismuth, and later with more difficulty. His appetite continued good until three weeks before his death, when he refused all but liquid food. He persisted in keeping up the movements of his right forearm and the grinding of his teeth to the last; consequently their muscles retained their normal size, while all others underwent atrophy from disuse; but to the day of his death he was able to walk with assistance, and usually sat up the greater part of the day in an arm-chair. Only with the greatest care and cleanliness, ulcers, which repeatedly formed on the sacrum, were kept under control. His urine was normal to the last, but he had retention for five days previous to his death, which occurred May 13th, 1879, from exhaustion.

A post-mortem examination was made 26 hours after death, with the following results: Body much emaciated; cadaveric rigidity well marked; ulcer, the size of a dime, on sacrum. *Brain.*—Dura mater much thickened throughout its whole extent, adherent to the pia mater in spots, and firmly adherent along sup. long. sinus, and in the temporal regions, much more so on the left side than on the right. About a half inch from the sup. long. sinus, on the left side near the centre of the calvarium, were two depressions about the size of a split pea, where the inner table of the skull had been absorbed. There was about 1 oz. of clear serum in the cavity. The pia mater was much thickened and congested, and had numerous hemorrhages, from the size of a pin's head to that of a split pea, imbedded in its structure. These were principally on the left side, with a few on the right side, all confined to the upper surface. The pia mater was adherent to the base of the skull and the brain in spots. Brain was much congested, weight 40 oz. The convolutions on the right side seemed deeper, and the grey matter thicker than on the left. The white substance was slightly darker than normal and much congested. The consistency of the whole normal, and all other parts negative.

A large portion of both hemispheres was removed and put into Müller's fluid for two days, then in a weak solution of chromic acid until it was sufficiently hard for section, after which it was kept in dilute alcohol. Much of it became so soft as to render examination impossible. The remainder was studied by myself at Dr. Heitzmann's laboratory, under his supervision and assistance.

The pia mater was composed principally of bundles of decussating fibres of connective tissue, coarser than normal, traversed by dilated and enlarged blood-vessels, distended with blood, and around many of them were bundles of spindles and inflammatory elements. This condition of connective tissue is characteristic of an inflammatory process of chronic nature, which process led to the formation of new connective tissue, while an acute recurrence of the same process has given rise to a dissolution of the basis substance, and a reappearance of the embryonal condition of the protoplasmic bodies, and a new formation of inflammatory elements. The dura mater was found structurally in the same condition as the pia mater, but had no hemorrhages in it.

A vertical section through either hemisphere of the cerebellum with a low power of the microscope (200 diameters) gave the following appearances: The blood-vessels could be traced from the pia mater, especially in the sulci between the convolutions, through the external grey and granular layers into the white substance, profusely branching and ramifying and almost invariably engorged with blood. In numerous places there were ramifications closely resembling those of the capillaries, with sharp, well defined, fluting outlines, colorless and of a high refractive power. Such groups were found principally in the granular layer, but extended somewhat into the contiguous layers. There were also numerous isolated highly refracting bodies scattered throughout the whole cerebellum, but mainly in the granular layer. With a higher power of the microscope (500 diameters) peculiar changes of the capillaries were shown, first described by C. Wedel of Vienna; namely, the capillaries were transformed into either single or double rows of brilliant, colorless globules, or completely transformed into a glistening rod-like mass, with fluting outlines and numerous partly pedunculated buds. The large isolated bodies have all the characteristics of the well-known corpora amylacea, namely, they are concentrically striated and umbilicated. In some instances the umbilicus was found in direct union with capillaries which had undergone the above described changes. Exceptionally I found the cells of Purkinje with their off-shoots presenting the same glistening, highly refractive appearance as the capillaries and corpora amylacea. Some of the latter looked as if they were composed of a number of shining globules, closely packed together, the outlines of the globules being just traceable within the clusters.

I used the following re-agents:

Carmine (both ammonia and alumen solutions), which stained the tissues but left the globules colorless.

Iodine (both tincture and aqueous solution, both with and without sulphuric acid); the result was unsatisfactory, for only once, after the use of the aqueous solution, did I perceive any change in the globular bodies, and then the pale blue tint was very indistinct, and only a few of the bodies affected.

Hæmatoxyline produced a distinct violet upon tissues and the blood-vessels, while the globules were little affected, if any, by it.

Chloride of Gold (½ per cent. solution) made the outlines more distinct, but did not change the color of the globules.

Violet Methyl-Aniline stained the granular layer a deep blue, the external grey layers and the white substance a dirty, greyish blue; the blood-vessels both in the normal and pathological condition were unaffected.

Fuchsine produced a pink stain in the grey layers; the globular bodies and blood-vessels were untouched.

Osmic Acid (one per cent. solution) produced a marked brown discoloration on the globules, but by no means as deep as that we are accustomed to see on fat globules.

Picro-Indigo gave the blood-vessels and globules a bright green color, while the surrounding tissues were of a much paler tint of green.

In unstained specimens the refractive power of the globules and corpora amylacea were so characteristic as to allow of no diagnosis except calcareous degeneration of capillaries, corpora amylacea, and exceptionally cells of Purkinje, thus forming the so-called brain sand. In the whole list of my re-agents there was nothing found contradictory to this, though I must admit very little to confirm it. The capillary blood-vessels in several instances showed rows of calcareous globules on both walls, while in the centre a row of blood corpuscles was still recognizable in that portion of the capillary nearest the pia mater, while the central end of the capillary was completely filled with the shining globules. The change, therefore, which led to the formation of these globules must have taken place in the walls of the capillaries, and in turn has led to the consolidation of the entire blood-vessel.

A higher power of the microscope (1,200 diameters) showed in many capillaries of the cerebellum an enlargement of the endothelia, with a coarser granulization therein, and a splitting of the original endothelia into coarsely granular clusters of protoplasm. The peri-vascular sheaths (His) in some instances were considerably dilated, and sometimes filled with globular elements, either protoplasmic in nature or of a slightly increased refractive power. From the above facts it would seem that the shining globular bodies are products of the endothelia, which first becomes inflamed, then proliferates, and the inflammatory elements thus formed become infiltrated with lime salts from the over-charged liquor sanguinis. Concerning the formation of the corpora amylacea, we at present know nothing; but, being formed, we can readily understand how they, as well as the cells of Purkinje, could become infiltrated with calcareous salts.

The grey layers of the cerebellum with a high power of the microscope (1,200 diameters) showed the reticular structure first described by C. Heitzmann of this city. The white substance of the cerebellum was composed almost exclusively of nerve fibres, with numerous varicosities. Whether those varicosities are due to post-mortem changes, or to a morbid process during life, we are at present unable to say; but this much seems to me certain, that the common explanation, that they are formations of myelin only, is not justifiable. The analysis of accidental isolated nerve fibres showed a reticular structure both in the nerve fibre and in the varicosities. On broken ends of nerves, I could trace several sheath-like layers, composed of a row of spindles, bounding the swollen pear-shaped ends of the nerve fibre, while the centre of the so formed body showed a delicate reticular structure. Such formations we know, never are seen so long as myelin is present. It therefore follows, that either the myelin has oozed out after death, or has been absorbed during life, perhaps in the same manner that adipose tissue disappears in wasting diseases. The boundary layer of the nerve fibre in all instances was shining and homogeneous, thus representing a complete sheath. There is no reason, therefore, to my mind, for denying the existence of a sheath in the white substance of the cerebellum, and I may also add cerebrum, for they were both similar in this case.

The grey substance of the cerebrum was similar in structure to that of the cerebellum. The calcareous corpora amylacea were less frequently, and the calcareous globules exceptionally found. The blood-vessels were as a rule distended with blood. The perivascular sheaths were in some instances dilated. Several specimens showed a fatty degeneration of the blood-vessels and of the ganglionic bodies, both demonstrated by their refraction and by the action on them of osmic acid, which produced a black stain. The fat granules were arranged in the ganglionic bodies in a cresent shape, the convexity being on one side of the ganglion, and the concavity towards the nucleus. In the cerebrum I frequently found empty spaces, as they were found also in the cerebellum, the so-called vacuoles. Most of the vacuoles had in their interior a pale nucleus, and their origin must be attributed to an accumulation of fluid around the nucleus after death, or to a hydropic destruction of the ganglionic elements, due to serous exudation. The latter view is corroborated by similar formations around the blood-vessels, where not only lymph sheaths were found dilated, containing protoplasmic elements, but also around the lymph sheaths a large space. Several ganglionic bodies with partly fatty degeneration also showed closed empty spaces on the periphery.

The diagnosis, as obtained from the microscope, in this case is *pachy-meningitis, meningitis, and cerebritis, terminating in atrophy.*

Since the conclusion of my examination, I have learned that at one time Mr. B. had a sore on the penis, followed by a bubo which did not suppurate. Whether it was a chancre or chancroid, I am unable to ascertain. This much I can say, that never was I able to discover a single symptom of secondary syphilis, nor of the tertiary stage, unless we assume that the symptoms which resulted from the inflammatory changes were those of syphilis. Mr. B.'s attacks were periodical, and he was always apparently much better after them; hence we cannot say how much effect the potassium iodide had in his improvement. Moreover, if the symptoms had been the result of syphilis, the improvement which apparently resulted from the potassium iodide would have been more permanent; and finally, one of his severest attacks took place while he was under the full effect of potassium iodide and mercury.

The treatment while he was under my care was simple. The patient had all the best hygienic surroundings as well as the minute attentions which can only be given in a home life. During his acute attacks, potassium bromide and occasionally hypodermics of morphine were used; but in several instances nothing whatever was done, the patient progressing in the same manner as when medicines were used. Hence, I am unable to say whether improvement was due to my drugs, or to the natural course of the disease. Indeed, the latter seems to be the most plausible inference.

The skin over the whole body gave evidence of defective circulation and nutrition, as shown by coldness of the extremities, the epidermis resembling somewhat that of ichthyosis, and by the formation of ulcers on those parts of the body most subject to pressure. These symptoms were much improved by the systematic use of alcohol and tar soap accompanied with friction, the ulcers healing when protected from pressure and treated with carbolized vaseline.

I have endeavored to give as briefly as possible the facts of a case which every practitioner is liable to meet with in practice; and the only hope of accomplishing a satisfactory result will lie in our making a correct diagnosis in the first stage of the disease. If we can then induce the patient to abandon all exciting occupations and lead a temperate life as much as possible in the open air, and if we can improve his bodily condition by tonics and suitable food, we will have used the only means of permanently curing a disease which, when fully developed, is, in our present knowledge of medicine, utterly hopeless.

The main points of interest in the case are:

1st. A distinct hereditary tendency to nervous diseases on his mother's side, this tendency affecting the youngest members for two generations.

2d. The periodicity of the attacks, which continued throughout his whole illness, with almost complete intermissions at first.

3d. The average duration of the disease is given by most authors as three years. In this case we can trace the active disease over a period of eight years; and, if we consider the symptoms of congestion of the face followed by epistaxis as of any significance, we can trace the origin of the disease back to an attack of varioloid which occurred during his fifteenth year, thus making it extend over a period of twenty-one years.

4th. The symptoms during life, and the changes found after death, would lead us to infer that his acute attacks were the result of congestion, probably from paralysis of the vaso-motor nerves as a primary cause; while the intermediate symptoms were due to degenerations resulting from interference with nutrition consequent on the repeated congestions, capillary hemorrhages occurring in those portions of the brain where the least support was given to the degenerated blood-vessels by the surrounding tissues, as on the surface of the brain and in the pia mater.

5th. While under my observation, the muscular and sensory derangements were confined to the left side, and while he was under Dr. Hammond's observation they were confined to the right side. The post-mortem examination showed that the left side of the brain was the most implicated. This does not correspond with our present knowledge of the cerebral action, nor can I explain it.

ART. VIII.—THE IMPORTANCE OF THE POSITION OF THE FISSURE OF ROLANDO, AS AN INDEX TO THE INTELLIGENCE OF ANIMALS.

BY S. V. CLEVENGER, M. D.

IN studying the external configuration of the brain, I was struck some time since, by the variable position of the fissure of Rolando in the brains of different persons when compared together.

This fissure has acquired universal importance latterly, in the progress of research into the localization of function in the cerebral cortex. I began, accordingly, a study of the position of this fissure in different classes of animals, as well as in different specimens of the human brain, the results of which are given in the following paper.

In all animals lower than man, the sulcus Rolando or its homologue, occupies a region far in front, and as the frontal lobes are developed this fissure is thrown backwards toward the parieto-occipital part of the brain. I have noticed that in the brains of some idiots the position is similar to that observed in dogs, baboons and anthropoid apes, and the more abject has been the condition of the imbecility, the farther forward the situation of the sulcus.

The simplest method for examination is as follows: Divide the brain antero-posteriorly (on an imaginary semicircle) into ten parts from the orbital to the occipital extremities (exclusive of basilar measurements), along the upper arch of the longitudinal fissure. The summit of the sulcus Rolando ending in or near the great longitudinal fissure will be found to be six to six and one-half removes from the orbital extremity, four to three and one-half from the occipital in the average human brain. It is usually farther back on the left than on the right hemisphere.

Other methods may be suggested, but this is the least difficult, and can be rapidly and accurately employed even during hasty autopsies.

"That the high, broad, and prominent forehead marked intellectual power, was a belief which the ancient Greeks entertained, and which has long been popularly held ; and the notion that lowness and narrowness of the forehead indicates intellectual inferiority is in harmony with the observations that in the negro, and more markedly in the Bosjesman, the anterior part of the hemispheres is narrower than in Europeans, and that the narrowing of the frontal lobes to a point is one character by which the brain of the monkey differs from that of man."*

That this was not absolutely correct has long been admitted. The skull may have a general tendency toward adaptation in shape to its contents, but in physiological as in ordinary affairs it may be incorrect to judge the value of a package by the size or appearance of the box in which it is contained. The endeavors of Gall and Spurzheim, but more particularly those of their followers, to trace cranial relationship to mental traits, have made a *reductio ad absurdum* of what is known as phrenology, and they have thus delayed the recognition of many useful points in craniology and brain studies. Many explorations have been made in the field of comparative anatomy to connect psychic peculiarities of animals with visible brain shapes. Gratiolet at one time suggested the possibility of the Sylvian fissure as an available landmark for anatomico-psychological purposes,† but failed to elucidate matters, as he seems often to have mistaken the frontal or crucial sulcus for that fissure, and was arbitrary in his estimates of the places corresponding to that fissure in brains where it did not exist. At one time, according to Pozzi,‡ it was suggested that the Rolandic sulcus would indicate the "race type" by its position, but Broca demonstrated that this was inexact.

The most surprising feature is that in all these discussions it should not have occurred to any one to seek for at least an

* Maudsley, *Physiology of the Mind*, p. 260.

† *Anatomie Compareé du Systéme Nerveux.* Leuret et Gratiolet, Atlas, pl. VII., et seq.

‡ *Dictionnaire Encyclopedique des Sciences Médicales*, tome XVII.

approximate boundary for the frontal lobe. As the brain was subjected to various distortions by cranial growth, influence of gravitation from the habitual postures of the animal, and compression by extra development of the temporal muscles in keeping with the large size of the jaw, the different shapes assumed by the anterior as well as all other parts of the brain have served to puzzle anatomists. But we now have the means of more clearly defining what should be considered frontal lobes and what posterior. The position of the "giant cells" of Betz in the cortex of the brain, as indicated by the place occupied by the crucial or Rolandic sulcus, approximately affords us the means of bounding posteriorly the frontal lobe, and if there is any truth in the generally accepted notions of the relativity of frontal lobe preponderance in the scale of intellect, we have the data necessary for fully demonstrating it.

Proportions of total brain weight to body, absence or presence of convolutions, preponderance of cerebral over other lobes, as the optic, etc., in animals, will not be discussed here, as not *directly* applicable, though having a general reference to the subject.

The foregoing is deduced from the preponderance, in lower animals, of sensory over motor cortical areas, and is based upon the proportionate development of the latter, exhibited in an ascending scale of intelligent animals. As it may not be necessary to conduct others over the route by which this conclusion was attained, I shall begin *in medias res*, and leave definitions and discussions for subsequent treatment.

The psycho-motor cells of the cortex cerebri and the nerve fibres with which they are connected, are greater relatively in mass and number than the sensory cells and their connections, in the same cortex, in proportion to the intelligence of the animal.

Assuming that the essentials of the modern doctrines of localization are established truths, and that the motor centres in the frontal and parietal lobes are capable of separation histologically from the sensory cells of the parietal, occipital and temporal lobes, it is evident that to demonstrate the proposition made, it is only necessary to separate such cells and fibres and compare their areas and volumes in a series of animals. But as at present no records of such comparisons exist, I shall seek a means to approximate such measurements from the best available material at hand. The sulcus Rolando separates the posterior sensory and anterior motor regions somewhat closely, more nearly than at first sight might appear, for most of the centres back of this sulcus evoking motor phenomena by electrization, Ferrier concludes, must be sensory, since ablation of such parts does not produce motor paralysis.* The sulcus Rolando of man and the apes is physiologically comparable to the crucial sulcus of quadrupeds with convoluted brains.

At the third month of human fœtal life the hemispheres rise above the optic thalami and the fissure of Sylvius appears. Soon after movements of the fœtus in utero begin, the cerebrum divides laterally, by the formation of the sulcus Rolando, though at a very early stage of development of the cerebral vesicles there is a shallow fossa to indicate the future position of this sulcus.

In the following table, column I. indicates the estimated masses of the frontal lobes as bounded by the sulcus Rolando, 100 equaling the entire cortex; II., the distance of the summit of this sulcus back from the orbital extremity, the entire antero-posterior length to the occipital extremity equaling 100; III., the percentage of anterior lobe included by a line projected in the plane of the medulla oblongata axis; IV., the angular dimensions of the psycho-motor region measured from the basilar surface with the corpora mammillares as a centre, and gyrus paracentralis as the movable point, the posterior boundary of this gyrus being the median surface termination of the sulcus Rolando; column V., is an attempt towards a mean expression of the factors in the preceding columns by dividing the sum of the columns by the number of columns for each individual. Adding angles to numbers would be unjustifiable were this result better than an approximation. The angles, however, increase in the same direction toward 180° as do the numbers toward 100, hence there is nothing unfair in this treatment. An arbitrary set of figures is thus obtained whose only use is to illustrate the ten-

* *Functions of the Brain*, p. 166.

dency of these crude comparisons to form the series here indicated.

The greater part of the table was arranged, by me, from the excellent engravings of Leuret and Gratiolet's Atlas: *Anatomie Comparée du Système Nerveux, considéré dans ses rapports avec l'intelligence.* Paris, 1839–57. Huxley, Benedikt, Mivart and Pozzi afforded a few illustrations as indicated in the margin. In forming the means of the last column, where the information necessary to fill the four columns was lacking, I bestowed upon each individual numbers as closely characteristic of his class or species as possible, drawn from neighboring numbers or angles; as in the case of Benedikt's criminals, the two incomplete columns I supplied by conferring upon all, the figures obtained by measurements of the brain of "Charruas," his calibre seeming to resemble that of the criminals, though he was not a criminal, and had a far better brain than any of these malefactors.

Fœti.	I.	II.	III.	IV.	V.	
14 weeks	25	45	25	40°	33.8	
4½ months	35	40	25	80°	45.0	*Dic. Encl. Sci. Médicales,*
5 months	30	30	30	75°	41.2	t. XVII., p. 381.
5½ months	35	45	45	80°	51.2	
6 months	40	45	45	80°	57.5	
6½ months	40	45	50	95°	58.8	
Age not stated	40	50	40	95°	56.2	
7 months	45	50	40	115°	61.2	
8 months	45	55	40	110°	62.2	*Op. cit.*, p. 385.
At term	50	61	45	115°	67.7	
At term	50	55	45	115°	66.2	*Op. cit.*, p. 384.
Children.						
White infant, age unk'wn	50	70	45	110°	68.8	
7 months old	50	50	45	110°	63.8	
Microcephalous, 4 yrs	25	40	30	85°	45.0	
" "	25	45	25	70°	40.0	
Marie Martel, imbecile	40	50	35	95°	55.0	
Adults.						
Viellard	55	65	..	....	72.5	
"L'homme adulte"	55	60	50	125°	72.2	
Charruas	50	50	45	120°	66.2	
Fieschi	55	70	35	125°	71.2	
Criminals.*						
Balazo	45	51	..	....	60.2	Robber and murderer.
Madarazo	50	59	..	....	68.5	Thief. Worse than Balazo.
Kuss	45	47	..	....	64.2	Killed his son. Drunkard.
Perndinucz	45	44	..	....	63.5	" "
Sinka	60	68	..	....	73.2	Bank note forger.
Maglenov	50	53	..	....	67.0	Vengeful, mentality low.

* *Anat. Studien an Verbrecher-Gehirnen.* Benedikt. Wien, 1879.

CRIMINALS—Continued.	I.	II.	III.	IV.	V.	
Paunoviczo	50	49	--	----	66.0	Mentally weak; murd'r
Faczuna	50	58	--	----	68.2	Habitual thief.
Budimcic	45	43	--	----	63.2	Murderer; incapable of culture.
Rozsa	50	48	--	----	65.8	Robber by heredity; noted.
Pantalic	50	44	--	----	64.8	Hired murderer.
Mia	50	48	--	----	65.8	" "
QUADRUMANA.						
Chimpanzee	30	40	--	110		
"	30	40	--	----	52.2	Mivart, "Man and Apes," p. 318.
"		--	30	----		Huxley, "Man's Place in Nature." Frontispiece.
Orang-outang	30	30	--	115		
"	20	30	--	----	47.5	Mivart, p. 318.
"		--	30	----		Huxley, ibid.
Cynocephalus	25	--	40	105	46.2	
"	15	20	--	----		
Saimiri, adult	25	25	20	75	36.2	Mivart, p. 318.
QUADRUPEDS.						
Beaver		--	25	----	29.0	
Agouti	10	10	--	----	18.0	
Porcupine	15	15	--	----	23.0	
Paca	10	10	--	----	18.0	
Rabbit	10	10	--	----	18.0	
Dog	15	15	20	60°	27.5	
Wolf	15	15	15	60°	23.8	
Fox	20	20	20	63°	30.8	
Lion	20	20	30	60°	32.2	
Cat	20	20	30	50°	30.0	
Panther	17	25	30	65°	34.1	
Brown Bear	20	25	35	50°	32.2	
Brown Coati	20	25	35	50°	27.5	
Polecat		25	--	----	25.0	
Ferret		15	--	----	20.0	
Otter	16	20	30	40°	26.5	
Sheep	12	19	25	55°	27.7	
Ox	20	20	25	55°	30.0	
Horse	25	30	25	65°	36.2	
Stag	20	25	--	----	34.0	
Roebuck	18	25	--	----	33.0	
Boar	15	20	--	----	30.0	
Kangaroo	8	10	--	----	15.0	
Tonquin pig	10	15	20	45°	22.5	
Elephant	25	35	30	70°	40.0	
Embryo of Cow	10	10	15	10°	11.2	

I do not propose to laboriously twist the foregoing figures to suit any theoretical notions of how they should be interpreted. In the first place they are not accurate enough; then there are many things to be considered in connection with the figures, which require more consideration than the limits of this article will admit, or our present literature and knowledge justify. Assuming these results as somewhere near the truth, we would naturally be attracted by some discrepancies—the five months' fœtus in one case being less developed anterior to the sulcus Rolando than the preceding fœtus of four and a half months. There is in this case nothing stranger than that one child may be born with more defective lungs than another. The capacity for cells and fibres may exist without their actual presence, so when estimating by measure and weight we must microscopically demonstrate the existence of the cells and their connections, or the estimate will be valueless. A rough way of correcting such measurements seemed to present itself in the angular differences with which each medulla oblongata joined the base of its brain. Invertebrates with determinable nervous cords and cephalic ganglia have all lying in the same plane, and in a general way as we ascend through the vertebrate series we find that either the spinal cord or the medulla or both tend to form less obtuse angles with the anterior base of the cerebrum. In some human brains this angle is quite 90° The more posterior situation of the foramen magnum in lower quadrupeds and its migration forward in bimana and quadrumana must be in pursuance of a law, and it seemed most rational to refer it not alone to an attempt to equilibrate the cranial weight, for the massive jaws of the orang, chimpanzee and gorilla are not thus relatively compensated. The more upright the habitual position of the animal the greater would this straightening process proceed between spine and cranium, but the increase in mass and weight of the frontal lobe seems to determine the cerebral overlap of the cerebellum and the creation of less obliquity between the medulla axis and brain base. The much-admired brain of Fieschi, the would-be regicide, according to my hypothesis indicated great brain capacity by the posterior position of the paracentral gyrus; but the angle at which the medulla joined the brain, if we are to rely upon the excellent engraving of Leuret, implied that while the larger anterior mass existed it was not well stored with psycho-motor cells and tracts. This is the aspect these features presented to my mind. Under rigorous examination they may prove utterly worthless in this connection, but as bare facts read in this way they promise something at least to the investigator. Taking the position of the occipital outlet by itself, the little Chrysothrix would most resemble man, and this would warn us that broad classifications cannot be made upon single anatomical facts, though this case is exceptional, the positions of the foramen magnum being most posterior in the lemurs and passing forward in the order Mycetes, Cynocephalus, Gorilla.

Gratiolet, Van der Kolk, Vrolik, Marshall, Rolleston, Mivart and Huxley record their verdicts in favor of the advanced position the orang should occupy in the scale of animals, owing to the resemblance between its brain and man's. But, if Mivart's engraving facing page 138, in his *Man and Apes*, faithfully represents the position of the sulcus Rolando, the brain of the orang according to the views here announced is certainly far behind the chimpanzee in indications of intellect as the animal itself is in sprightliness and ability to learn "tricks." Gratiolet represents the brains of the chimpanzee and orang so nearly alike as to suggest the probability of some error in the text in naming them. The mean of the measurements, by lowering Gratiolet's orang and elevating Mivart's, places the chimpanzee at the head of the apes as having the greatest area of cortical motor centres. This is a position to which the chimpanzee is entitled according to Spitzka's careful investigations, as will incidentally appear from the following, which I abstract from articles by that gentleman, on the peduncular tracts of the anthropoid apes, published in the Journal of Nervous and Mental Disease:

"Meynert has shown that the relations of the peduncular tracts and basal ganglia to each other present well-marked differences in different animals, and that the superiority of the cerebral hemispheres in man is projected in a corresponding predominance of the pes pedunculi, the pons proper and the anterior pyramids."

"On examining the base of the chimpanzee's brain we are struck by the close resemblance to that of a child, especially is this resemblance marked in the peduncular tracts. The corpora mammillares are prominent and distinct from each other, being separated by a deep notch. The crura are almost cylindroid, they have a bold convex contour and are not irregularly bulged out by deeper ganglia as in lower animals. The pons is massive. The posterior outline is straight, and beneath it a coecal depression exists exactly as in the human subject.

It is noteworthy that the diminution which the medulla undergoes from before backwards is gradual and even, not sudden as in the baboon, Ateles and Cebus."

"Taking these parts as a whole, and comparing them with lower animals and man, we remark as points possessed in common by man and his anthropoid relatives the massive character of the pons, especially in its anterior third. A second feature is the bold contour of the pyramids at their point of exit from the pons. In monkeys even with as high a hemispheric development as Semnopithecus, Macacus and Ateles, the anterior half of the medulla oblongata narrows down very suddenly in joining the posterior half. The suddenness of this reduction in mass is, as Meynert has shown, most marked in lower brains, and is therefore still greater in the dog and rabbit than in the monkeys mentioned. *It is due to the presence in the anterior half, and absence in the posterior half, of a considerable amount of molecular nerve substance.*" (Italics mine.) "Comparing the base of the chimpanzee's peduncular tracts with those of a well-developed human brain, we observe that the pons is slightly less voluminous and the pyramids flatter between the olivary bodies. Particularly in its anterior half does the chimpanzee's pons resemble the same part of certain human brains—in depth especially."

"The crura cerebri of the orang are more convex and are separated by a deeper interpeduncular notch than in the other human-like apes. There is a great discrepancy in regard to the columns of Türck; none of my human specimens show less than .0369, the chimpanzee measures .0295 and .0300, the cebus monkey .0243, taking each entire area to equal 1.0000. It is noteworthy that the anterior pyramids are proportionately defective as compared with those of man. The fibres of the motor decussation occupy a much larger area in man, and as the pyramidal fibres which are still vertical in this altitude are also more voluminous, it results that with the same configuration of the grey substance the antero-posterior diameter of the human medulla is relatively greater. Taking the transverse diameter as a standard of 10, the antero-posterior is 9.2 in man, 8.8 in the anthropoid. The nucleus cuneatus is larger in the chimpanzee, while the nucleus gracilis is of the same dimensions and as scattered as in the latter. The further we pass from the decussation to the pons, the flatter does the chimpanzee's medulla become as contrasted with that of man; this approximation to the lower animals is, however, still more pronounced in the baboon and lower monkeys. The proportion of anterior pyramid in man is .1555 to the chimpanzee .1111. At the altitude of the middle olivary region the anterior pyramids vary from .1050 to .1750; in the same sections the chimpanzee has .0825, the cebus .0500. We have now arrived at that region, in which, according to Meynert, the proportions of the fibre masses subservient to the intelligence can be best ascertained as contrasted with the fibres and ganglia concerned in automatism. *It is well known that the pes or basis of the crura stands out more or less prominently in different individuals:* in some it is flat and broad, in others narrow and high, and in still others as broad as in the former and as high as in the latter. This third condition I have found especially associated with well convoluted hemispheres. I believe that many insanities may yet be traced to an inadequate projection of a well-developed hemisphere. If we were to represent the average development of the higher (hemispheric and cerebellar) tracts of the human being as 100, the chimpanzee would rank about 75, the baboon at 40, the cebus at 25, the dog at 7½."*

"In the rabbit the crura cerebri are small, and the pons, which is derived from them, is rudimentary; on both sides of the point where the anterior pyramids emerge, there is a band of transverse fibres known as the trapezium (Dean), which is about as deep as the pons itself. In the dog, the pons already preponderates over this trapezium, in the baboon but a small edge of the latter is visible, in the chimpanzee and the human being it is completely hidden from view. With the increase of the pes pedunculi and parallel increase of the pons proper and progressive concealment of the trapezium, the anterior pyramids gain in bulk, they become more columnar in character, and a body which has hitherto lain behind them is pushed to the outer side. This is the explanation for the presence of

* Spitzka—"Peduncular Tracts of Anthropoid Apes." This journal, July, 1879.

a distinct olivary protuberance in man, and of its absence in the lower mammalia.

"We thus perceive that anatomical peculiarities apparently of the most independent and disconnected character, are, in reality, but an expression of one great harmony, and that the shape, volume, and relations of the basi-cerebral parts are but the expression of the ratio of prosencephalic preponderance. This preponderance increases to such a degree in the anthropoid apes and man that the cerebral hemispheres may well be likened to a great empire, on whose strength depends the proper subjection and prosperity of tributary states."* I have chosen the foregoing as the best differential measurements on record, most pertinent to the present subject. It is to be regretted that the friability of Dr. Spitzka's specimens prevented him from continuing his investigations above the basal ganglia. The point, however, is sufficiently demonstrated, that the connections of the psycho-motor area of the cortex even as low down as the pyramids, and with intervening ganglia interposing themselves, preponderate in a ratio agreeing with the views of this paper, and indicate that the cortical region under discussion, itself, is likewise proportionately developed.

Meynert stated that the diameter of a fasciculus depends upon the mass of grey matter with which it is connected. Spitzka modifies this, and claims that "with the increasing development of the cortex the aggregate mass of projecting associating and commissural fibres grows more rapidly than the cortex itself. A richly convoluted brain has relatively more white substance than a poorly convoluted one; the higher we ascend the thinner becomes the relative thickness of the grey substance as compared with the white lamina entering it, but the *absolute* thickness of the cortex increases, and not only this, *but it also becomes richer in cellular elements.* The outer layer of the cortex, which is very poor in nerve cells in all animals, is relatively thinner in man than in lower animals. As we ascend in the scale of intelligence this layer is displaced by the formation of cells in the layer just beneath.

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* Spitzka—"Contributions to Encephalic Anatomy." This journal, July, 1878.

"The nerve cell of the cerebral cortex is a free nucleus in the menobranchus, bipolar in the amphiuma (Schmidt), has but few processes in the scaly reptiles, fewer in the rabbit than in the dog, in the dog than in the ape, and in the ape than in man. (Herbert Major states in his paper on the cortex of a cynocephalus baboon, that he could discover no other difference between the nerve pyramids of the human and simian cortex than the lesser richness in processes of the latter. We can confirm this observation for macacus and cebus; in the chimpanzee we could discover no difference, taking into account that the staining was imperfect.) The proteus, amphiuma, reptile, rabbit, dog, ape and man occupy with regard to the respective number of processes appended to the cortical cell the *same order which they occupy in the intellectual series*."*

Betz † claims that on the surfaces of the hemispheres there are two fundamental regions which are nearly divided by the sulcus Rolando, anterior to that fissure the grey cortex is characterized by a predominance of large pyramidal cells over the globular cells. The orbital region is included in this division. Back of this furrow are all the sphenoidal and occipital lobes and the median portion to the anterior border of the quadrilateral lobule. There the granular cells preponderate and the large ones are relatively rare. "The anterior lobe," says Charcot, "may be called the department of the giant pyramidal cells or the motor cells *par excellence.* This department embraces the entire ascending frontal convolution, the superior extremity of the ascending parietal convolution, together with the paracentral lobule. *Betz has observed in the dog the same kind of cells at those points designated by Fritsch and Hitzig as motor centres, otherwise spoken of as the parts neighboring the crucial sulcus.* Interest is added by the fact that in the dog the giant pyramidal cells exist *nowhere else* but in the regions called psycho-motor." Histologically as well as physiologically the sulcus Rolando and crucial sulcus are analogous, the main point being that homologous psycho-motor centres, indicated by these giant cells, are further back in man than in lower animals.

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* Spitzka.—"Architecture of the Brain." This journal, October, 1879.

† P. Betz of Kiew—*Anatomischer Nachweis zweier Gehirncentra.*

Such centres situated back of the Rolandic sulcus as elicit movements by stimulation are in most cases only apparently motor. In the case of the angular gyrus Ferrier * says, that inasmuch as its destruction causes no paralysis it must be regarded as a sensory centre from which the excitation has been conveyed forward to motor parts. The centre for movements of the eyes and head is the farthest forward, and in the animals where this centre was found at all it bordered posteriorly the region known as "inhibitory" (to be mentioned hereafter), and was situated farther forward in the descending scale of intelligence. Centres for movements of the arms and legs cluster in the vicinity of the summit of the Rolandic sulcus and paracentral gyrus at the point where the largest motor cells were found. These centres are also moved forward gradually in a descending series of animal life, and maintain a position posterior to what Leuret calls the crucial and Owen the frontal sulcus.

Dr. Herbert Major † carefully examined the minute structure of the chacma baboon's brain and noted general resemblance to the human brain, except that the large cells of the second layer of the frontal and parietal convolutions were not so frequent and the processes of these cells are less numerous than in the corresponding cells of the human brain. He believes that the more numerous and complex anastomoses have relation to the superior functional activity of man. Bevan Lewis ‡ details the results of his examination of the cortices of the human brain and those of a cat and sheep. He found the clusters of these motor cells to be more numerous in the human brain, the processes numbering from seven to fifteen to each cell, with a remarkable constancy in their occupancy of definite areas; the largest cells were found at the summit of the lobulus Rolandicus anterior. The cat's brain presented fewer cells with less numerous processes, the average number of the latter being eight, those of the sheep being still less numerous. The largest cells found in the anterior lobe of the human brain measure .126 millimetre; in the sigmoid gyrus of the cat .106; in the corresponding position in the sheep .065.

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* Op cit., p. 166.

† *Journal of Mental Science*, January, 1876.

‡ *Brain: A Journal of Neurology*, London, April, 1878.

Dr. H. D. Schmidt, of New Orleans* found the first traces of these cells to exist in the human fœtus at the third and fourth month, becoming very noticeable at the seventh month. M. Tarchanoff† at the Soc. de Biologie, June 28, 1878, stated that from his investigations and Soltmann's, the psycho-motor centres in rabbits and dogs do not appear till the tenth day, when the senses are developed. The actions of external agents are, therefore, indispensably necessary for the formation of these centres. In Guinea pigs and hedgehogs, born with full exercise of their senses, the cortices were better developed. The brain of the rabbit contains but few giant and no pyramidal cells. He found that the administration of phosphorus accelerated the development of the functions of the psycho-motor centres.

The activity of this anterior cerebral area was brought forward in a paper on Cerebral Thermometry, read by M. Paul Broca, before the Association Française pour l'avancement des Sciences, August 30, 1874.‡ Dr. Landon Carter Gray, of Brooklyn, N. Y., § devised an apparatus for making cerebral thermometric measurements, and fixes the normal temperatures of parts of the skull, from a great number of observations, as follows: The average temperature of the left frontal station is 94.36°, the right being 93.71°; left parietal station, 94.44°, right, 93.59°; left occipital, 92.66°, right, 91.94° Dr. Gray observed a rise of temperature in the parietal motor area of from .50° to 2.50° in persons after mental exercise; in general the extreme frontal and occipital regions lowering in temperature, the left side being warmer than the right. Results varied, occasionally giving an elevation of temperature in the occipital, but there was always an increase noted in the region of the sulcus Rolando. Drs. Maragliano and Seppilli ‖ reviewed the results of Broca and Gray, adding experiments of their own upon lunatics. They describe an elevation of 1° to 2° (Fahrenheit) in the motor area, with a smaller increase posterior to this during the period of agita-

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* Journal of Nervous and Mental Disease, July, 1877; p. 436.

† *Le Progrès Médical*, July 6. This journal, October, 1878.

‡ *Le Progrès Médical*, 1877.

§ Journal of Nervous and Mental Disease, January, 1879.

‖ *Revista Sperimentale de Freniatria e di Medicina Legale.*

tion, over that noticed during the period of calm, in these cases.

There are certain craniological bearings naturally pertaining to this subject, but there are so many elements which combine to defeat any endeavor to connect cerebral and cranial prominences, that, except in a general way, I cannot see how we can be enabled to attach any importance to mere skull shape. Dr. Gustave Le Bon, at the Soc. de Méd. Pratiques,* gave the results of his cranial measurements, and demonstrated that there was no asymmetry of right and left sides. It is probable his measurements were confined to the outer surfaces. In cutting open the skull of a mongrel dog, the deep indentations in the bones made by the convolutions beneath, and the great thickness of the cranium suggested to my mind the idea that doubtless a relatively large brain may be imparted to offspring by one parent, and a thicker skull may be derived from the larger boned or less intelligent parent; so that through life the unfortunate individual thus endowed will possess a brain which in its growth is cramped and retarded by its osseous envelope, having actually to erode and absorb the bony tissue to make room for brain development. The dog mentioned was quite intelligent, but suffered from epileptic attacks, during one of which it was shot. The meninges were quite adherent to the skull, and no other than the defects mentioned existing, color was lent to the supposition that this terrier and mastiff mongrel had suffered from incongruity between brain and brain case. This blemish may readily occur in mulattoes or other progeny of mismated races or individuals. Herodotus † notes the thickness of the skulls of the Egyptians, and attributes it to the action of the sun upon their uncovered heads. Sœmmering ‡ says the skull of a centenarian is two-fifths lighter than in middle age. This is, however, in keeping with the lessened weights of all bones in the aged. There is, nevertheless, a remarkable variation in skull thickness between crania generally, that has never

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* *La France Médicale*, No. 28, 1878.—JOURNAL OF NERVOUS AND MENTAL DISEASE, Oct., 1879.

† *Thalia*, XII., quoted by Holden, *Osteology*, p. 110.

‡ Holden, loc. cit.

been satisfactorily accounted for. Schroeder Van der Kolk agrees with Gall that the skull thickness is modified by brain growth.* The skull of Asseline (the recently deceased member of the Mutual Autopsy Society of Paris) was so thin in places as to be translucent, according to the published accounts.

Ferrier† claims that "the reaction between the sensory and motor centres involves consciousness, and that in general the lower down the animal as regards the perfection and complexity of the nervous system, the less marked are the distinctions of cortical areas, and the more capable are the subordinate centres of performing the offices apparently devolving on the cortex in the higher animals."

Dr. W. H. Broadbent, of London, in a communication to the International Medical Congress, at Geneva, Switzerland, Sept. 9–15,‡ concludes that: "The cortical motor centres are the points of departure for the descending voluntary impulses, the starting places for ideo-motor actions. The cells of the motor zone (which resemble those of the anterior horns of the cord) are the apparatuses by which the dictates of the intelligence are formulated for expression or for transmission outwards."

Aside from diagnoses and autopsies, the only person on record who has ever made a practical use of the connection between cortical and peripheral apparatus, to educate the centres through their peripheral connections, was Dr. Edward Seguin, of New York, the author of *Idiocy and its Treatment.* In an article entitled the "Psycho-physiological Training of an Idiot Hand,"§ Dr. Seguin describes the satisfactory progress he made toward developing the mentality of an idiot child through a skillful course of manual instruction. The child was taught gradually to use the hitherto "lifeless" hands. The automatic centres were first exercised in this way, and eventually the child was induced to exert volition,

* *Functions of the Brain*, p. 294.

† "Atrophy of left hemisphere of the brain, with co-existent atrophy of right side of the body."

‡ *Gaz. des Hopitaux*, No. 30, 1877.—JOURNAL OF NERVOUS AND MENTAL DISEASE, Jan., 1878.

§ *Archives of Medicine*, October, 1879.

by instruction in certain motions to be repeated at the command of the trainer. In this way the highest centres were reached, and the Doctor experienced all the results he could have hoped for. The most astonishing part of this transaction is this passage in the monograph at its conclusion: "If the idiot whose case is represented to you has improved under the care of his good teacher, if hundreds of others improve in public institutions (under the care of women whose names are never pronounced with sufficient respect), *the sovereignty of the brain is at an end*, and the physiological doctrine of *decentralization* contains in germ a new doctrine and new methods of education." It would thus appear that while the Doctor was practically making use of a physiological fact, he was actually deducing from his methods and results most erroneous "decentralization" ideas. What was really accomplished in this case, was the exercise of hitherto dormant psycho-motor cells.

While the region in the vicinity of the sulcus Rolando, and more especially the portion immediately in front of it in the brains of the primates, is devoted to what may be strictly termed psycho-motor areas, Ferrier * demonstrated that the orbital extremity of the frontal lobes possessed characteristics not to be overlooked. He found that by cutting off these extremities, no paralysis ensued, but that the animals thus operated on, "while not actually deprived of intelligence, *had lost, to all appearance, the faculty of attentive and intelligent observation.*" This part of the brain Ferrier designates as the "inhibitory." Simple inspection of the relative thicknesses of these corresponding portions in the ape and man show that the latter has a vastly superior development of this part. The hollow appearance of the basilar part of the orbital extremity of the monkey's brain, and the flattened and higher appearance of the supra-orbital cerebral division obtaining in man, are to be seen at a glance. Necessarily the diminution of this space would occur *pari passu* with the anterior advancement of the psycho-motor centres in a descending scale of animal intelligence. Cruveilhier associates idiocy with defective development of the frontal lobes; and the follow-

* Ferrier, *Localization of Function in Diseases of the Brain.*

ing authors are cited by Ferrier * as recording instances where accidents or disease had destroyed the integrity of the anterior portion of the brain, with consequent mental deficiencies supervening: Harlow, Bouillaud, Trousseau, Selwyn, Pitres, Morrin, Padeau, Tavignot, Fayrer, Marot, Renault, Petit, Charcot, Andral, Bergeron, Hertz, Reed, Begbie, Cholmeley, Evans, Hewitt, Lepine, Bouilly, Baraduc, Davidson, and others. Treves cited one case of the kind where even bilateral destruction of the anterior frontal region caused neither motor nor sensory disturbance.

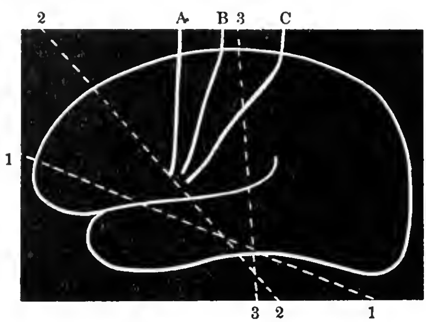
Carpenter,† in discussing the functions of the nervous system in general, says, that "when different organs are so far specialized as to be confined to distinct portions of the system, and each part, consequently, becomes possessed of a different structure, and is appropriated to a separate function, this repetition of parts in the nervous system no longer exists; its individual portions assume special and distinct offices; and they are brought into much closer relation to one another by means of the *commissures* or connecting fibres, which form a large part of the nervous system in the higher animals. It is evident that between the most simple and the most complex forms of this system there must be a number of intermediate gradations, each of them having a relation with the general form of the body, its structure and economy, and the specialization of its distinct functions. This will be found, on careful examination, to be the case; and yet, with a diversity of its parts as great as exists in the conformation of other organs, its essential character will be found to be the same throughout." This extreme anterior portion of the brain seems to be essentially for the inter-relation of the psychomotor cells, and, while uniting them commissurally, is diminished necessarily in the same ratio of diminution of the cortical motor areas downward toward the invertebrates.

The few accompanying illustrative figures are adapted from Ferrier, Pozzi, Mivart, Benedikt, Gratiolet and Leuret. A much more intimate acquaintance with the habits of animals

* Ibid.

† *Principles of Comparative Physiology*, p. 642.

than at present exists, would be needed for a critical comparison between brain features and intelligence; and even upon the order of precedence of domesticated creatures, there are a variety of opinions. It seems to me that in estimating animal peculiarities we do not sufficiently consider that there are gradations of reasoning powers between individuals of each kind as well as between different men. In the different breeds of dogs will this Rolandic position vary especially.

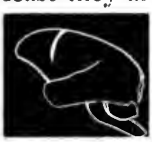


This figure indicates by the position of the Rolandic sulcus A, low mental types. It is situated a little farther forward in the baboon, an animal which Mivart mentions as "low, brutal and degraded." It is also about the position of the sulcus at the sixth month of fœtal life and in idiots. B marks its place in the infant at birth and in imbecility, as represented by Pozzi's drawing of the brain of Marie Martel. The orang-outang's sulcus Rolando is slightly posterior to this, but the frontal lobe is quite pointed and less massive than that of human beings. This location for the sulcus also resembles that represented by Benedikt in the brain of Budimcic, the murderer, who was "incapable of culture." An attempt is made at C to locate the sulcus as usually placed in man. The bank note forger Sinka, and Fieschi, owned sulci occupying places situated more posteriorly.

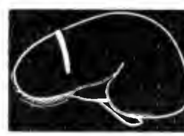
The dotted lines projected through the medulla axis, mark boundaries for frontal areas. 1 is peculiar to human fœti under six months, microcephales and to lower animals. Even the chrysothrix, whose foramen magnum is situated centrally in the skull base, has, as may be seen in another cut, this obliquity of cerebro-medullary junction. 2 is characteristic of the fœtus after six months, and nearly represents that feature in Fieschi. 3 indicates the centrally balanced cerebrum of adult man.

In this figure the diminutive frontal region of the kangaroo is shown. An intelligent gentleman, a pharmacist, residing at Sandhurst, Australia, assured me that the ordinary sheep is the intellectual superior of the kangaroo. I mention this because Gratiolet notes the placid expression and peacefulness of this animal as an evidence that it should occupy the exalted place he accords it, near the ox and horse. Were such things as mildness indicative of mentality, the gentle idiot would rank before Blucher or Frederick William the First.

The horse, as here sketched, has comparatively a large frontal lobe. Some horses doubtless are as intelligent as elephants, at least they are as capable of being trained.



The adult saimiri (chrysothrix) or squirrel monkey is diminutive in size but resembles man closely in many anatomical features. The sharpness of its orbital lobe, the anterior situation of the sulcus Rolando, and the medullary angle are indicated in the figure.



Aristotle, Buffon and Gratiolet exalt the character of the elephant, the first claiming that "the elephant surpasses all animals in comprehension," * while menagerie attendants state that this animal is very brutal, with overestimated reasoning powers and is to be mainly governed by violence and through fear. His frontal brain development places him between the horse and baboon in intelligence.

Microcephalic brain of a child four years of age. Leuret shows the cerebrum to be much distorted and very little of the brain is in front of the sulcus Rolando. The medulla joins the brain at an angle greater than is found to exist in the lowest anthropoid.

This last figure is intended to show that however closely the chimpanzee's brain may resemble man's, the medullary junction and the lesser anterior brain mass separates the two completely.

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* Aristotle I., ix; ch. 72.

The estimated position of the proposed line projected through the medulla axis may afford a rough means of ascertaining the relative degrees of mentality indicated by fossil as well as by later crania. In this way it would appear that the megatherium was beneath the pterodactyl. But so great is the range of this matter of comparative intelligences and so varied are the views of authors that we can do no more than to refer to them in this connection. The later works on this subject that we have seen are by George J. Romanes,* and W. Lauder Lindsay.† The latter attempts to outline the subject of mind in the lower animals, and to illustrate their possession of the higher mental faculties as they occur in man.

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* Nineteenth Century, 1878. Dublin Lecture, British Association, Aug. 16, 1878.

† *Mind in the Lower Animals in Health and Disease.* Appleton & Co.

Reviews and Bibliographical Notices.

I.—TREATMENT OF THE INSANE IN THE UNITED STATES.

(*Continued from last No.*)

REPORTS FROM ASYLUMS FOR THE INSANE IN THE UNITED STATES. Reports from the following Asylums have been received and used in this notice: State Lunatic Hospital, Northampton, Mass., 1879; State Lunatic Hospital, Harrisburg, Pa., 1879; Insane Asylum North Carolina, Raleigh, 1878; Kansas State Asylum, Osawatomie, 1878; Connecticut Hospital for Insane, Middletown, 1877 (biennial); Insane Asylum State of California, Stockton, 1877; Eastern Kentucky Asylum, Lexington, 1878; Eastern Lunatic Asylum Virginia, Williamsburg, 1878; New York City Lunatic Asylum, Blackwell's Island, 1877; New York City Asylum, Ward's Island, 1877; City Hospital, Boston, 1879; Alabama Insane Hospital, Tuscaloosa, 1878; Pennsylvania Hospital for Insane, Philadelphia, 1878; State Asylum for Insane Criminals, Auburn, N. Y., 1878; Butler Hospital for Insane, Providence, R. I., 1878; Willard Asylum for the Insane, Ovid, N. Y., 1878; Northern Hospital for Insane, Elgin, Ill., 1878; State Lunatic Hospital, Utica, N. Y., 1878; West Virginia Hospital for the Insane, Weston, Va., 1878; Illinois Southern Hospital for Insane, Anna, Ill., 1878; State Homeopathic Asylum for Insane, Middletown, N. Y., 1878; Longview Asylum, Cincinnati, Ohio, 1878; Virginia Western Lunatic Asylum, Staunton, Va., 1877–78; State Hospital for the Insane, Danville, Pa., 1877–78; Lunatic Asylum No. 1, Fulton, Mo., 1878; Iowa Hospital for the Insane, Mount Pleasant, Iowa, 1876–77; Indiana Hospital for the Insane, Indianapolis, Ind., 1878; Central Hospital for the Insane, Jacksonville, Ill., 1878; New Hampshire Asylum for the Insane, Concord, N. H., 1879; Western Pennsylvania Hospital, Dixmont, Pa., 1878; Dayton Asylum for the Insane, Dayton, Ohio, 1878; Wisconsin State Hospital for the Insane, Madison, Wis., 1878; New Jersey State Lunatic Asylum, Trenton, N. J., 1878; Western Kentucky Asylum, Hopkinsville, Ky., 1878; South Carolina Lunatic Asylum, Columbia, 1878; Lunatic Asylum of the State of Georgia, Milledgeville, 1878; State Lunatic Hospital, Taunton, Mass., 1878; Cleveland Asylum for the Insane, Cleveland, Ohio, 1878; State Asylum for the Insane, Morristown, N. J., 1878; State Lunatic Hospital, Danvers, Mass., 1878; State Lunatic Asylum, No. 2, Jefferson City, Mo., 1878; Central Lunatic Asylum (for Colored Insane), Richmond, Va., 1877–78; Athens Asylum for the Insane, Ohio, 1878; Minnesota Hospital for the Insane, St. Peters, Minn., 1878; Hartford Retreat for the Insane, Hartford, Conn., 1878; Annual Report Commissioners of Emigration, New York, 1879; Vermont Asylum for the Insane, Brattleboro, Vermont, 1878; Maine Insane Hospital, Augusta, Me., 1878; Northern Hospital for the Insane, Winnebago, Wis., 1879; St. Louis Insane Asylum, 1878–79, etc.

3. In looking over the various Reports, with a view to ascertaining by them to what extent the medical officers of asylums give their attention to strictly professional matters, we are led to make the following remarks. We know quite well what is the usual round of the asylum superintendent. The great mass of his duties are extra-medical. He must receive company, superintend the erection of buildings, and their interminable repairs, the laying of drains, the erection of barns, and other buildings, plan for planting crops, make contracts for and purchases of supplies, and in fact have a personal supervision over all the *material interests* of his asylum. He has usually under his direction a functionary called a "Steward," who with few exceptions acts the part of a clerk rather than that of an independent officer, under the general direction of the Superintendent, but responsible to the usual Board of Trustees. Hence, burdened by the material interests of the Institution, the chief medical officer has either but little time for strictly medical and scientific duties, or has a plausible excuse for neglecting them. He seldom visits the patients in the wards, and almost never removes one to his office for careful deliberate observation and study. He has mayhap, an hour for "visiting the wards"—a walk through them—and the remainder of the day is spent in "executive business," and in other ways; and thus the time passes. Hence, with the exception of about two or three "reports" out of the whole number cited at the head of this article, none have anything in them of scientific and practical (medical) importance. There are in a few instances, platitudes on the "causes" of insanity; on the social relations of the insane, etc., etc., and the usual tabular statements, framed, too often, after defective analyses, and defective classifications of cases of insanity, and besides these as a rule, also, accounts of the various farm and garden products, live stock, poultry, stewards', engineers', and other reports, and especially the annual pleadings with boards of trustees and legislatures for larger accommodations, indefinite repairs, and in general for more money. In a large majority of cases, these purely business matters form the bulk of the Reports of the chief medical officers, instead of one from a separate proper business head, of the purely material and business interests of the asylum.

We can see quite readily how such a state of affairs, in the early history of asylums in this country, came to exist, and to some degree, reasons for its continuance. But in the present temper of the public, and condition of asylum interests in this country, we can see no good reason for its continuance, nor can we see from anything these reports contain, that the real difficulty at this point is appreciated by asylum chiefs. We must think, that if the evil of burdening the medical officers of asylums for the insane with purely business occupations, the conduct of which does not require professional knowledge or skill, was felt as it ought to be, that some way would be found at once, by individual officers, and especially by the "Association of Superintendents," to remedy this past and present anomalous state of affairs, as regards the usual wretched misdirection of the energies and perversion of duties of the chiefs of asylums for the insane which exists. The great bulk of their attention and labor daily, should be with their patients, rather than in so-called "executive business." There is urgent present need for reform in this matter. No dignified indifference, too transparent in its nature to be mistaken, no indignant replies, or denials, or taunts in relation to the ignorance of outside observers, or specious defenses or arguments, can obscure to the eye of common sense, the real state of affairs in this case. The fact still remains that *physicians*, presumably of high standing and having a valuable experience, are employed at large salaries to assume control of costly institutions, filled with sick people, who instead of devoting themselves to their difficult professional duties as *medical* men, give *most of their time* to mere business occupations, such as could be entirely performed by a clerk or "Steward," to giving unimportant audiences, in executing the prescriptions of red tape, and in spending weeks in lobbying, too often for factitious, as well as the real needs, of the institutions over which they preside.

4. In the fourth place we have noted that "Careful and elaborate histories, according to a well-studied plan, should be made of each case, as it enters the hospital. The most careful inquiries should be made and the results duly entered, as respects the sensibility, whether special or general; the motility, the condition of all the leading systems of the body, digestive, secretory, circulatory, respiratory, etc., etc., as well as respecting the mental states of the patient, according to their development in time and place, including the use of instruments of precision. This should be done as far as practicable for all the patients admitted to the asylum. To these histories should be added the subsequent developments of the case, whether toward health, or the contrary."

It is perhaps not too much to say that there is probably not an asylum in the country in which the clinical histories referred to are taken with the thoroughness reasonably demanded as a basis not only for a trustworthy opinion as to the real state of the patient, but in order to be useful as a basis for *post-mortem* examination in case of death. Where an autopsy is made, it is needless to say that for scientific purposes such a *proceeding* is almost useless, unless accompanied by a thoroughly careful and practically exhaustive ante-mortem history. Not only the age, sex, social condition, habits, hereditary tendencies, accidents, occupations, and peculiarities of a patient should be ascertained and recorded when present, or their absence be noted when not present, but a thoroughly pains-taking series of observations should be made as to the actual physical and mental condition of the patient at the time of admission. These inquiries should include not only the general appearance, figure, color of the skin, the state of the flesh, weight, and the like, but full inquiries with the view of ascertaining when practicable, the state of the sensibility—whether general or special; the state of the muscular system as a whole and in detail; the presence or absence of paresis, or paralysis, tremors, convulsive movements, and the state of co-ordination, in walking, in the use of the hands, in speech, in swallowing, and in the state of the sphincters. An estimate made of the degree of vascular tension, of reflex excitability in various relations; as in respect to the muscular system, the vascular system, the secretory, etc.; the state of the mind, determined in detail as regards perception, the feelings, appetites or propensities, of the emotions in general, of the coherency of thought, of the power for control, of the presence or absence of suicidal or homicidal tendencies, of mental peculiarities, and all other particulars indeed which are needful in presenting a full picture in the history of such cases. To this should be added the subsequent developments of the case, while under observation.

This sort of a clinical history, of course, implies labor. We do not underestimate it. But we do not hesitate to assert that such histories of patients as a rule, are plainly possible in every well regulated asylum. In the majority of these institutions it is probable that not more than 300 new cases are admitted during one year. In the majority perhaps far less than this number. This would make at the most, not more than one case each day on the average for careful study. We feel that we make a statement which cannot be successfully contradicted when we declare that there is no valid excuse for such histories not being made, and that without such histories it is not possible to study and treat such cases as intelligently as it is the plain duty of the physician to do. In too many of these institutions it is to be said that if the instrumental means for the successful observation of patients affected with disease of the central nervous system are on hand, they are not used, except in the most inefficient and occasional way. In looking over the various reports of asylums, we do not find when the histories of cases are given, the slightest proof that the careful work, to which we have adverted, is done. In a few reports we find the histories of cases so wofully incomplete and unsatisfactory, as to create a feeling of surprise that they should ever have been published. This is a matter of so great importance, and is so universally neglected, as to justify us in recalling attention to it with special emphasis.

5. The next point to which we called attention in an earlier part of this notice is the following:

"Careful post-mortem observations should be made, as far as possible, and the phenomena apparent after death should be recorded in the use of the very best methods, and in view of our best knowledge, or the results of it, of the structure and functions of the nervous system, that the results may be brought face to face with the phenomena of the ante-mortem histories."

There was a time when an autopsy meant the simple opening of the cavities of the body, with the view to making observations as to the gross appearances of the same, whether healthy or diseased. Almost no effort was made, as a rule, toward more delicate observations in the use of careful methods. But as time has passed these imperfect observations, though they had a certain value at the time, have ceased to possess any real interest, except in so far as they may satisfy simple curiosity. In these later times the performance of a post-mortem examination, after death more especially from nervous diseases, if the observations are to possess any value, as is well known, is a much more serious matter. In the first place it is necessary to *accurately localize* the disease. This must be done not only by showing where the lesion is, but where it is not. Having fixed the site of the disorder, it is necessary next to determine its *nature* and also its actual or probable origin. These two or three points having been settled as far as possible, it is necessary last of all, in view of the seat of and nature of the lesion, to *explain the symptoms* which marked the case, *intra vitam.* In doing this it is absolutely necessary to recur at every step to a fairly minute and comprehensive knowledge of the anatomy and physiology of the nervous system. These steps presuppose, at least, accurate knowledge of the best writings upon these subjects, and of the best methods of conducting post-mortem examinations, and of examining both healthy and morbid parts by the microscope. But even all this labor and knowledge is rendered, in great measure, valueless when applied in making post-mortem examinations, unless placed face to face with equally complete histories of cases before death. Indeed there is no rational excuse for making a post-mortem in most cases, unless it be with the purpose of finding a rational explanation of the morbid conditions faithfully observed during life. Now to what extent does it appear from a study of the asylum reports, or of other sources of information, that such work is done as is here contemplated? In the whole number of reports cited at the head of this notice, we do not find more than three in which any attempt is made to give the results of post-mortem examinations. We will select as altogether the most pretentious and best, the report from the New York State Asylum, at Utica, presided over by Dr. Gray. This asylum has had for some years past a *special pathologist*, whose sole business it appears to be to make a study of the materials furnished in the autopsies made in the institution. The aim in this case is a most laudable one. We call the attention of our readers to the work itself. We take the report for the year 1878. There is, first of all, an account of the methods of preparation of the material, and a scarcely useful description of microtomes. Take the following as an example of the clinical histories published in this report, the first found on page 45:

"CASE 4.—Man, age 29; laborer; had no education, but was industrious and "ordinarily smart." He had a slight maniacal attack a year previously, but was thought to have recovered, and was running an engine, when he broke out into another acute maniacal paroxysm. He was talkative, restless, profane, expressed delusions of his own importance and power, declared he was President of the United States, and had been around the world. After two months he quieted down; became demented, and refused food which was administered to him daily for some weeks. He then began to take food freely, gained in flesh and appearance, but continued feeble in mind and indifferent to all surroundings. This state increased until he became careless and negligent in his habits, and demanded the care of an infant. There was no special change in his condition for a year and a half. He then grew more feeble, was obliged to remain in bed, and demanded increased care. There was no cough or expectoration, but the physical signs of phthisis were well marked. He lingered some two months in this condition, and died of tubercular disease."

Again, take this from page 47:

"CASE 5.—Man, age 27; laborer. Was of intemperate habits and had indulged in sexual excesses; was vicious and ugly when under the influence of liquor, and frequently engaged in personal quarrels. Two years before admission he received a violent blow on the head with a club; this was followed by slight unconsciousness. Some six months after the reception of the injury he manifested first indications of insanity in the expression of exaggerated delusions regarding his wealth. He wandered about the country, being considered a feeble-minded man, till just before he was brought to the asylum. He was then arrested, as he claimed that God had promised to give him a gold hat if he would kill himself or some one else before twelve o'clock that night. His speech had been disturbed for some six months. On admission he presented the marked characteristics of paresis; asserted he had just come from France, and was soon to return to Paris, where he was to marry the handsomest woman in the world, who was worth five thousand dollars; he attempted to strangle himself, as he said, at the command of the fallen angels; had hallucinations of sight and hearing; asserted that Jesus came down and took him up into heaven, and retained other exaggerated delusions. He lost in flesh and strength, but kept up and was on the ward daily till the time of his death; after a residence of six months in the asylum, he died suddenly of apoplexy."

Also, the following from page 50:

"CASE 2.—Woman; aged 60; widowed. In 1852, patient had an attack of pulmonary hemorrhage, which was followed by consolidation of lung tissue and general failure in health. The next year she was brought to the asylum in an attack of melancholia, from which, however, she recovered in a few months and went home in a much improved physical state. Again, in 1865, she was returned to the asylum insane, and with progressive disease of the lung. Under treatment she gradually gained in strength; the ulcerative processes within the lung ceased; she then recovered her normal, mental state, and was able to return home and resume the care of her household. In 1869 she had another hemorrhage from the lung, and then began a slow process of breaking down of lung tissue; the same year the loss of her husband and the consequent grief and anxiety, together with her weak physical state, caused sleeplessness and a depression which gradually deepened into melancholia, and she was returned to the asylum; she regained a comfortable condition of mental health, though she did not fully recover. The disease of the lungs slowly progressed, as was evidenced by repeated hemorrhages and by failure in her physical state; she died suddenly from phthisis."

And so on to the end of the list. To each of these histories which are cited verbatim a rather full account is given of the post-mortem appearances, most of the points recorded being unimportant and throwing no light, whether positive or negative, of value on either the cases themselves or on cerebral pathology. Of what imaginable use are the most careful post-mortems of cases, the histories of which are given in such a painfully meagre and unsatisfactory way as in the instances we have just quoted? What symptom or problem do such published histories explain or contribute toward solving? Such an examination would probably satisfy a more or less vague curiosity, but would not in the slightest degree contribute to the advancement of our knowledge of diseases of the nervous system. Of what use, we repeat, is even the most elaborate and formally scientific study of a nerve lesion, unless by its study we are enabled to explain some definite symptom or symptoms manifest during life? We venture to say, that the paucity of results of scientific value in the reports from asylums or in the published writings of the alienists of this country, is something remarkable at this day.

But even if careful clinical histories were made, how many asylum physicians have made serious endeavors to make themselves acquainted with the use of the microscope? with the best methods of preparing the nerve tissues for microscopic examinations, and with the appearances of healthy nerve tissue when so prepared, and with the appearance of even the more common morbid products and formations met with in disease of the nerve centres? How many are to such a degree acquainted with the newer anatomy and physiology of the central nervous system as to enable them to locate with tolerable accuracy a lesion? How many know the names of the different convolutions and fissures of the surface of the brain? How many have kept pace with the progress of the doctrine of the localization of functions in the cerebral cortex? How many are aware of the peculiarities of the cerebral circulation as now rather generally understood, and of the significance of the same in nerve physiology and pathology? How many have taken any reasonable pains to make themselves familiar with the fundus of the eye in health and disease?

How many are aware of the modes of employing electricity in the diagnosis, not to speak of the treatment, of disease of the kinesodic or motor tract of the nervous system? How many are aware of the importance of the observation of the temperature of the head in different states or localities, as determined by symmetrical observations by surface thermometers, after the method of Broca and others? From anything that these reports show, or that we have been able to learn in any other way, we feel obliged to conclude that almost nothing is known or done in these institutions by their medical officers in these respects, at least as should be in the present state of our knowledge of the nervous system and its diseases. How does it come to pass that all, or nearly all, precise knowledge and good work, so far as publications go to show of this kind, is done by physicians in private practice, who have certainly not more, but even less, command of their materials than asylum physicians? Is it because those who produce papers and write books embodying valuable original materials, have more time or better opportunities than asylum physicians? For our own part, we attribute the difference to entirely different causes. These causes are such as to make it, in a pronounced degree, a shame that the unrivaled opportunities for study of rare cases presented in asylums, should be utterly wasted.

Even one case thoroughly well studied each year at each of our asylums, and published as a contribution to our knowledge of diseases of the nervous system, would be a phenomenon of the most surprising character in the "Reports" or in the medical periodicals of the country.

We earnestly hope the time is near at hand when we will cease to behold the almost universal inexcusable inactivity on the part of asylum physicians.

6. The next point we would observe is the following:

"There should be such a number of trained and reliable assistants and nurses, as to make it possible to do away in the greatest possible measure with purely mechanical restraint."

This brings us to the "vexed question" of restraint in the management of the insane. From the best we are able to learn from the reports under consideration and from other sources, the following appears to be not far from the truth: That in the management of the insane, physical restraint in some form is often *necessary*. Again, that the only way to diminish the degree of purely mechanical restraint is to increase the number and efficiency of attendants or nurses. The greater the number relatively of trained and watchful nurses, the less will be the mechanical restraint; the fewer the number of attendants relatively, the greater the amount of mechanical restraint necessary. In this connection it may be observed that when compared together, English asylums, for example, have for a given number of insane, more attendants and less restraint than American. The only way to diminish the restraint is to increase the number of the attendants. This is what it appears to us, from a pretty full survey of the situation, is necessary in our asylums as a whole, and we hope to see a more general practical move in this direction than has thus far been witnessed.

7. The seventh and last point to which it is our intention to invite, briefly, the attention of our readers, is as follows:

"There should be some effective system for inspecting the internal management of hospitals for the insane, so as to secure the highest degree of efficiency, and the closest responsibility possible on the part of attendants and nurses."

This is a peculiarly important and delicate subject. It is the most difficult of all in asylum management to arrange satisfactorily. The present practice of asylums in this matter so far as we are aware is not based upon any well defined plan. The oversight and the fixation of responsibility of the immediate attendants of the insane, has been greatly advanced and defined in the last thirty-five years, in all parts of the world. The treatment formerly received by the insane was brutal and often horrid beyond adequate description. It is a matter for satisfaction that at present such pains are taken to secure efficient management.

But scarcely a year passes in which some distressing details are not brought to light, either accidentally, or at the point of an investigation, and under circumstances too, such as to shake even a generous confidence in the internal administration of our hospitals for the insane. It may be with the means at command, impossible to improve the present condition of affairs. But there is plain need in our judgment, for the development and practical perfection of some system, the aim of which shall be, to secure in the highest degree the personal rights and humane management of insane individuals while incarcerated within the walls of an asylum, remote from friends and acquaintances. It is our firm belief that our asylums, as a general thing, are not as carefully organized in this respect as they ought to be and as they might be, otherwise it would not be possible for the grossest abuses to spring up and flourish within the precincts of asylums hitherto in good repute, so frequently. We are aware that this subject is one of peculiar difficulty, one which has engaged the anxious attention of conscientious medical officers of these institutions for years. No *system*, however wise, there is reason to think, could provide at all points against abuses and failures in administration. While it will be impracticable for us in this notice, to enter fully upon the discussion of this subject, yet we will not dismiss it without calling attention to it, with emphasis.

Since writing this notice we have received the reply of the Committee of the New York Neurological Society, to that of the State Senate Committee, at Albany, and which latter has been already noticed at length in a former issue of the Journal. We have also received the report of the meeting of prominent citizens in New York City, which had for its object the inauguration of asylum reform. But though they are instructive they do not require any change in the statements we have already made, but rather confirm them. We shall watch with no little interest the progress of reform where it is needed and practicable in the management of the insane, whether within or without the asylum association, with a rather firm confidence that the time will not be long until this practical subject will be placed on a better basis and in a better light than ever before.

II.—NOTHNAGEL: DIAGNOSIS OF BRAIN DISEASE.

Topische Diagnostik der Gehirnkrankheiten. Eine Klinische Studie. Von Dr. Herman Nothnagel, a. ö. Professor der Pathologie und Therapie, Director der medicinischen Klinik in Jena. Berlin, 1879. *(The Local Diagnosis of Cerebral Diseases. A Clinical Study.)*

Amongst the various works on the localization of cerebral disease that have made their appearance during the past four or five years, the one the title of which is given above, is preëminent in many respects. None of its predecessors can be said to fill the field it occupies so fully or satisfactorily; as a rule, they have attempted more and done less. We do not except any works we are acquainted with in making this statement. It embodies the results of later investigations and observations, and of a complete knowledge of the subject, and is written, moreover, in such a careful, scientifically critical spirit, that while it may and will be added to and amended, its positive conclusions will not be readily overthrown. The remarks, therefore, made by us some years since in a notice, in this journal, of Bastian's Paralysis from Brain Disease, that it met a want in medical literature, are equally appropriate when speaking of the present work, and the welcome it receives from the profession should be the more cordial, the more fully it embodies the results of recent research. It deserves more space than we shall be able to give it in a review like the present one.

The design of the work is laid down by the author in his rather lengthy introduction. It is an attempt to formulate the symptoms of localized lesions of the brain on the basis of clinical and pathological observations solely, the bearings of physiological experimentation on this subject being, of design, not utilized in the present volume. As such it has the imperfections due to the as yet scanty material, for it is only within a comparatively short period that sufficiently accurate and detailed observations have been made, and these do not by any means include all that have been published in late years. As regards the older ones, like those collected by Gintrac for example, they are for the most part absolutely worthless in furthering accurate local diagnosis of brain disease, and they are, therefore, very properly rejected by our author. As might naturally be supposed from his own reputation as an investigator in cerebral physiology, he does not undervalue experimental research, but, as he says, he wishes to avoid all confusion from the application of physiological experiments as yet insufficiently or doubtfully interpreted, and unverified theories, to the actual facts of clinical observation. He intends to treat of the physiology of the brain in its relation to the localization of its functions, and to compare the results of experiment with pathological facts in a future volume. At present the local diagnosis of brain disease must be based on observed facts of clinical pathology.

As not all clinical observations of recent date are sufficiently full and accurate for his purposes, Dr. Nothnagel gives in detail his method of selecting those that he deems worthy to utilize in drawing his conclusions. First, of course, he rejects all such as are not verified by an autopsy, and both this and the clinical history must be minute and detailed. Next the lesion, whatever be its character, must be localized, so that all confusion of symptoms due to diffuse or multiple lesions may be avoided. In his definition of a local lesion, Nothnagel is much more rigid than many authors, recognizing for his purpose only those in which the affection remains chronicly the same, is altogether isolated and limited, and which cannot affect neighboring parts in any manner, either through pressure, disturbances of the circulation or inflammatory action. This, taken strictly, excludes local circumscribed meningitis, which is not properly an intra-cerebral disorder, and tumors which may exercise pressure; but our author does not seem to us to strictly follow his own rule in regard to these latter formations at least. The principal varieties of local lesion are, of course, hemorrhages and softenings of embolic or thrombotic origin. To be of use these must not be of too recent date, otherwise the immediate effects of the lesion would complicate the symptoms, and the value of the case for the local diagnosis will be impaired. Nothnagel fixes six to eight weeks as the period that should have elapsed before death so that the case can be utilized as an illustration of cerebral localizations.

In short, only the two classes that have been designated by Hughlings Jackson as "destroying" and "discharging" lesions can be employed, and these under all precautions as to isolation and singleness. The objections to tumors in this regard are admitted, but it is maintained that in well selected and scrutinized cases they sometimes afford sufficiently accurate data for local diagnosis. This we believe is true, but it may be equally so in some cases of localized meningitis, which may also produce isolated local irritation of cortical regions. In excluding these as much as he has, it appears to us that the author has perhaps drawn his criticism a little too close. In all other respects we can fully agree with him in his standards of selection.

After the introduction the volume is divided into two sections, respectively entitled Special Symptomatology, and Review of the Local Symptoms. The first of these takes up each region of the brain separately, describes the symptoms of its various kinds of lesions—hemorrhages, embolisms, tubercle, tumors, abscesses, atrophy, etc.,—illustrating each with detailed selected cases, which are afterwards subjected to a close general analysis, and followed by a summary of conclusions or diagnostic propositions. In the second part, each symptom or set of symptoms is discussed in relation to the various lesions with which it is connected. This forms as it were a very convenient sort of cross index, and renders the volume as a work of reference on its subject exceedingly convenient.

In noticing the first part of the work, that on Special Symptomatology, we could, perhaps, convey to our readers the best idea of the opinions of our author and the results he reaches, by translating bodily the diagnostic conclusions with which he ends the discussion of the symptomatology of the lesions of each special region of the brain. We shall do this to some extent. To transfer them bodily, even in their condensed form, would occupy more space than we can devote to them in the present notice.

The first part taken up is the cerebellum, the functions of which have been, perhaps, more than those of any other intracranial organ, the subjects of dispute, and which might therefore naturally be presumed to have the most various and manifold symptoms attending its injuries and disorders. The author, of course, recognizes no truth in the popular notion, originated by Gall, that this is the organ for the sexual impulse. His conclusions are as follows:

1. "Cerebellar affections may remain entirely latent, and defy diagnosis. This is regularly the case with permanent or destroying lesions located in one hemisphere.

2. "Space-limiting lesions may, on the other hand, produce extraordinarily manifold and complex phenomena.

3. "As characteristic of cerebellar disease, *i. e.*, of those immediately dependent upon and connected with it, we reckon only disturbances of coördination, especially a sort of reeling gait with severe vertigo. Nevertheless, these symptoms are also present in other central nervous affections, and cannot therefore be regarded as pathognomonic here. The presence of cerebellar disease must rather be assumed from the sum of positive and negative symptoms.

4. "Cerebellar reeling always indicates a functional implication of the middle lobe, whether this be the original seat of the disease, or whether it is only embarrassed by some crowding or pressure lesion.

5. "On the other hand, disorders of coördination and vertigo may be wanting in pronounced disease located chiefly in the hemispheres; exceptionally it may be lacking in tumors localized directly in the vermis, but of slow growth. If an affection situated in the posterior cranial region, below the tentorium, is suspected on other grounds in these cases, the diagnosis of original or secondary disease of the cerebellum can be only approximative. Its disorder is possible, but cannot be absolutely proven.

6. "Besides those noted under head 3, no symptoms are at present known that can be considered as the expression of a disorder of the cerebellar functions, and therefore due to disease of the organ. Perhaps certain forms of disorder of speech (anarthria(?) in extensive atrophy of the cerebellum) may be considered as such, but still we cannot be certain.

7. "Vomiting when continuous and severe may support the diagnosis of cerebellar affection, but is not conclusive, since it happens in other cerebral diseases. It is lacking altogether in cases of destroying lesions, and is by no means regular in its occurrence in crowding lesions.

8. "The same is true of amblyopia and amaurosis, respectively, choked disk and optic neuro-retinitis.

9. "Headache is also present only in case of crowding or pressure lesions. Its fixed locality in the occipital region under certain circumstances may suggest cerebellar disorder, but is no more conclusive in this respect than its location in the frontal region would be in an opposed sense.

10. "The most various disturbances in the functions of cerebral and spinal motor and sensory nerves may attend cerebellar disease, but only in case of pressure lesions. They have, therefore, no diagnostic value, but are liable to mislead. Nevertheless, sometimes some one symptom may be isolated which will permit a closer local diagnosis. Thus, complete right-sided paralysis of the whole facial indicates the seat of a tumor on the right side, and pronounced hemiplegia its location on the under surface. But in general positive conclusions must be guarded against.

11. "Psychic disorders are lacking, except under such circumstances in which they may accompany any lesion of the brain

whatever. Nevertheless, they are perhaps a regular phenomenon in general atrophy of the organ."

It will be seen that in the above, Nothnagel does not here consider at all the tetaniform phenomena that Hughlings Jackson mentions as symptoms of tumor of the cerebellum, and which he considers may be perhaps localized according to the portion of the middle lobe involved in the irritation. Nothnagel does not recognize this as a cerebellar symptom anywhere, either here or in the second portion of his work, where the symptoms are discussed by themselves. Indeed, he holds that tetanus, either of the neck musculature above, or of the whole body, are not of any value in local diagnosis.

From the comparatively few observations that are sufficiently exact to serve his purpose, Nothnagel concludes that as regards lesions of the crura cerebelli, only those of the median crus to the pons afford a symptom that is at all diagnostic. It consists in a peculiar deviation of the eyes, the one downward and outward, and the other upward and inward, the body turned in the direction of the side toward which both eyes (apart from their direction in a vertical sense) were directed; at least, thus far, clinical observation has demonstrated these symptoms as attending no other lesions than those of the middle cerebellar peduncle. Other symptoms that may attend lesions of the cerebellar crura are conjugate deviation of the head, eyes and body, vertigo, and inclination to fall to one side or the other. Whether disturbances of coördination may be due to these lesions, is not yet satisfactorily determined. The author makes a remark in regard to the conjugate deviations, that they are sometimes toward and sometimes away from the side of the lesion, and that the cause of this difference has not as yet been ascertained.

The diagnosis of local lesions of the pons varolii is treated at some considerable length. Recent hemorrhages into this part can be diagnosed with certainty, according to our author, only in cases where its special cross paralysis is present, but it may be presumed probable when the apoplectic attack is accompanied with general convulsions, contraction of the pupils, and death occurs within a few hours. The following are the diagnostic conclusions.

1. "Stationary intra-pontine destroying lesions may produce disorder of the functions of the motor, sensory, and vaso-motor nerves of the extremities, the 5th, 6th, 7th, 8th (?), 11th (?), and 12th cranial nerves. Pressure lesions may also produce symptoms implicating the 9th and 10th nerves.

2. "The number of nerves involved varies widely in different cases, according to the size and seat of the lesion. Still we are not yet able to say with certainty, from the nerves involved, what part (in cross section) of the pons is injured.

3. "In many cases, stationary lesions of the pons produce the same series of symptoms as some of those in the cerebrum, and cannot be distinguished from them.

4. "Dys- and anarthria are more frequent with lesions of the pons than with other localized lesions, excepting those in the medulla oblongata. They point with a certain probability to lesions in the pons.

5. "Lesions of the pons, destroying lesions, and tumors alike, have an altogether peculiar character in the presence of alternate paralysis. This forms, when present, the most important diagnostic mark. Nevertheless, it is not pathognomonic, since it may occur in basal affections. But in the latter case, we have to do with slow, chronic affections, tumors, meningitis, etc. A sudden appearance of this symptom indicates almost certainly a lesion of the pons.

6. "This alternate paralysis involves the motor and sensory nerves of the extremities of the side opposite the lesion, and the trigeminus, abducens, facialis (acusticus?), and hypoglossus nerves on the same side. Within these limits the form of the paralysis may vary widely in different cases.

7. "The paralysis of the extremities, motor as well as sensory, (and vaso-motor?) is always contralateral with the lesion; the implication of the cerebral nerves mentioned under 6, may be sometimes crossed and sometimes on the same side.

8. "Whether a conjugate ocular paralysis of the external rectus on one, and the internal rectus on the other side, is characteristic of lesions of the pons, is still uncertain.

9. "It is true that anæsthesia is proportionately more frequent with lesions of the pons than with those of the cerebrum; nevertheless, it is not of diagnostic value. As regards the implication of special nerves, that of the abducens, if on the same side as the lesion of the brain indicated by the other symptoms, indicates almost certainly its location in the pons.

10. "Difficulty in swallowing has only a limited value for diagnosis, it may in given cases assist it, but cannot be its foundation.

11. "The same is true of disturbances of respiration and circulation.

12. "Ataxia appears in a few rare cases of affection of the pons, and it would therefore not contra-indicate their diagnosis as such. Still it has been as yet so rarely observed and is so much more frequent in cerebellar disease, that its presence does not stand in the first line of symptoms of disease of the pons.

13. "Some other motor phenomena, various so-called impulsive movements (*Zwangsbewegungen*), such as impulsive, backward, pendulum movements of the members, etc., are so far only noticeable accidents, and therefore of no value for diagnosis. Lateral decubitus or moving or drawing to one side have not been observed in man, except with implication of the crus cerebelli in the lesion.

14. "Spastic phenomena, limited to a single group of muscles are rare, and can assist the diagnosis only with a special combination of symptoms, such, for example, as trismus.

15. "General epileptiform convulsions have a certain diagnostic value only in cases of recent hemorrhages or embolisms. They are wanting in stationary lesions and tumors.

16. "Sensory phenomena do not belong to the probable symptoms of affections of the pons, and as yet there have been too few observations as regards the auditory nerve. Still, the appearance of unilateral disturbance of hearing must be taken into consideration in forming a diagnosis. Contracted pupils, when present in an apoplectic attack, possibly point to the pons.

17. "Vomiting, headache, vertigo, are present in cases of pressure lesions of the pons under the same conditions in which they appear in other portions of the brain."

As regards ataxia from disease of the pons, we have a case now under observation that presents the characteristic facial paralysis crossed with unilateral ataxia. All notable traces of actual paralysis of the members have passed away. The right side is apparently as strong or stronger than the left, but its coördination is impaired. The only probable diagnosis we have been able to make is hemorrhage of the pons; the condition followed an apoplectic seizure, with several days' unconsciousness and temporary partial hemiplegia. If the diagnosis of disorder of the pons, which seemed justified by the symptoms, be correct in this case, then the ataxia, which here is unaccompanied with vertigo, and is unilateral, is altogether different from that following cerebellar disorder, as far as we have observed it.

Diagnosis of lesions of the medulla oblongata can only be made with approximate certainty, and then only in a small number of cases. The best distinguishing features are the implication of the various cranial nerves, producing dysarthria, anarthria, dysphagia, aphonia, and disturbances of respiration and circulation; the last three being most important, as they have not hitherto been observed with other lesions. The paralysis may be either hemiplegic or paraplegic in form, but pronounced anæsthesia has not as yet been observed with these lesions.

Lesions of the crura cerebri afford quite well-marked symptoms, but, naturally, as the author says, for anatomical reasons these are to be referred mostly to the accidents involving the basal portion and those nearest to the pons, than to those situated higher where the crus becomes lost in the basal ganglia of the cerebrum. The characteristic phenomenon of crural lesions is a paralysis of the motor oculi, usually involving all its branches on the same side with the lesion, and opposite the contralateral hemiplegia of the extremities. This may also appear with basal lesions, but if the paralysis, both of the members and the motor oculi are sudden and simultaneous, a lesion of the crus may be presumed. It is not absolutely determined, according to Nothnagel, whether or not in some cases crural lesions are entirely latent, but we are inclined for some reasons to believe that they may be. We have knowledge of one as yet unpublished case, that points to this conclusion.

It appears that good cases of isolated lesions of the tubercula quadrigemina are exceedingly rare in medical literature, and therefore only a few observations of tumor, tubercle, etc., could be utilized for fixing the questions as to local diagnosis. From these, however, the conclusion was deduced that disorders of the anterior and posterior pairs produced quite different symptoms. Disease of the anterior pair almost always is accompanied with decrease of visual power, or blindness. This symptom, however, must not be referred to the optic lobes necessarily, unless the amaurosis (with non-reäcting pupils) is sudden in its appearance, and accompanied by other symptoms of local disease, but with negative results on ophthalmoscopic examination. Lesions of the posterior pair are accompanied (not invariably) with paralysis or paresis of (certain branches?) the motor oculi; but the presence or absence of this symptom is not sufficient for diagnosis. This paralysis it appears may be bilateral with a unilateral lesion, and in this case, if unattended with paralysis of the members, it suggests the optic lobes as the part involved. Disorders of equilibrium and coördination, comparable with those accompanying cerebellar lesions, are also sometimes observed.

The question of the functions of the optic thalami are so much in dispute, and consequently the special symptomatology of its lesions may be expected to be somewhat uncertain. Following out his plan announced in the beginning, Nothnagel takes up the subject on its purely clinical side, and gives the comparatively small number of selected observations that he admits as of value for his purpose a careful analysis. The following are his conclusions:

1. "As regards the majority of the symptoms taken as dependent on the thalamus, it is dubious whether they are directly dependent upon it, or occur only indirectly by the implication of adjoining parts. And other symptoms actually due to the thalamus are ambiguous, since they occur with lesions localized elsewhere.

2. "An absolute diagnosis of isolated lesion of the thalamus is therefore at present impracticable in most cases; only under a specially favorable combination of circumstances is it, perhaps, possible to make it with probability.

3. "Motor paralysis, in our opinion, does not support the diagnosis of thalamic lesions. On the contrary, if it is present we must presume the implication of other parts, even if the thalamus is the region principally involved.

4. "The same is true of anæsthesia. If, on account of the relations that injuries of that portion of the inner capsule that passes near the thalamus have to sensibility, it is sometimes diagnosed that the lesion is situated near or in the thalamus (in such a way that the inner capsule is also involved), this still does not make out a diagnosis of thalamic disease.

5. "What is stated under head 4 is true also of the paralysis of vaso-motor tracts.

6. "Disturbances of vision may occur with lesions of the posterior third of the thalamus; but whether this be in the form of contralateral amblyopia, or homonymous hemiopia, cannot now be stated positively. But disease of the thalamus cannot be diagnosed certainly from such visual symptoms, since they may also occur with lesions of other localities (occipital lobes, corpora quadrigemina, optic tracts).

7. "A certain series of peculiar irritative motor phenomena (hemichorea, athetosis, unilateral tremor) possibly depend upon thalamic disorder. Nevertheless, were this fact positively established, these phenomena would in concrete cases furnish nothing certain for the localization, since they may appear with lesions located elsewhere.

8. "It is not true that a diminution or increase of reflex irritability indicates lesions in the thalamus.

9. "Possibly disturbances of the muscular sense form a symptom of thalamic lesions, and—

10. "The same may be said of disorders of psycho-motor actions. Nevertheless, in regard to both these points, further observations and researches are needed."

All things considered, in the present state of our knowledge, a lesion of the optic thalamus may, perhaps, be reasonably conjectured under specially favorable conditions, such as a combination of those under heads 6, 7, 8 and 9, but it cannot be diagnosed with certainty.

By far the greater number of cerebral hemorrhages occur into the corpus striatum, and the symptomatology of the lesions of these parts is, therefore, for the most part that of the typical hemiplegia. But of late years, the anatomy of the brain has been revised, the subdivision of the old corpus striatum into the two nuclei, the lenticular and the caudate, has been recognized, with also the internal capsule and its functionally distinct sections as pointed out by Charcot, and a more exact localization has become possible than was formerly allowed. Our author studies separately the lesions affecting six different localities, viz.:

I. The lesions involving only the lenticular nucleus.

II. Those involving only the caudate nucleus.

III. Those involving only the anterior portion of the internal capsule.

IV. Lesions involving only the caudate or lenticular nucleus respectively, with the anterior portion of the internal capsule.

V. Lesions of only the posterior portion of the internal capsule, and—

VI. Lesions affecting only the lenticular nucleus, or the optic thalamus, with the posterior portion of the internal capsule, or the adjoining part of the radiant crown of Reil.

In regard to these various lesions, Nothnagel first quotes in full Charcot's conclusions on the same points, but without special comment. His own diagnostic propositions, however, deduced from the cases that pass his criticism, agree in the main with

Charcot's views, but go further. The analysis of the observations is also more complete and full than in the case of the parts of the brain previously discussed. The following are his conclusions :

1. "Destroying lesions in the corpus striatum may produce contralateral motor, sensory and vaso-motor paralysis.

2. "If the lesion be not altogether too small motor hemiplegia is regularly present.

3. "This hemiplegia may gradually disappear if the lenticular or the caudate nucleus alone is involved. It is permanent in case the internal capsule is affected, whether alone or with the grey nuclei. In these permanent paralyses, that is, in lesions of the internal capsule, there is frequently set up subsequently a secondary contracture.

4. "The motor hemiplegia from stationary destroying lesions affects regularly both extremities of one side, and the inferior facial branch of the seventh nerve; the muscles of the trunk are also usually paretic. The hypoglossal nerve is either unaffected or only so in the beginning; it is rarely permanently involved.

"In rare cases the extremities or the facial (including its superior division) are involved alone.

5. "The symptoms of lesions of the lenticular nucleus are not such as to permit of their differential diagnosis from those of the caudate nucleus.

6. "Motor paralysis is the only symptom if the lesion involves only the anterior portion of the corpus striatum — the region supplied by the lenticulo-striate artery.

7. "In some cases a hemianæsthesia occurs with the hemiplegia. This hemianæsthesia is characterized by the fact that, besides the cutaneous anæsthesia, the nerves of special sense, sight, hearing, taste and smell, on the affected side, may be impaired. Still, this is not essential in hemianæsthesia from lesions of the striate body, which is more frequently limited to the skin alone.

8. "The hemianæsthesia indicates the implication of the most posterior portion of the inner capsule, with the adjoining foot of the radiant crown. Still, lesions may exist in the posterior section of the internal capsule between the optic thalamus and the lenticular nucleus without causing anæsthesia.

9. "Usually the hemiplegia and anæsthesia disappear together; it is only exceptionally the case that the first leaves the patient so that only the latter remains.

10. "Sometimes disturbances of vaso-motor innervation, increased temperature, redness, etc., occur in the paralyzed members. These also point to a lesion in the posterior portion of the internal capsule.

11. "Hemichorea, it is true, often accompanies anæsthesia, nevertheless, its relations to the lesions of the parts considered as anatomically belonging to the corpus striatum cannot at present be stated with certainty."

Lesions of the centrum ovale are next taken up. In these an anatomical preface is required, since there is no well-marked separation of its different parts, and the literature of these lesions that is of such a character as to be available for our author's purpose is hence exceedingly scanty. He divides the centrum into eight different regions by sections vertical to the cortex, all but the two most posterior ones corresponding very closely to those made by Pitres, who has also specially studied this subject, and published the results in 1877. We need not follow Nothnagel closely here; his conclusions are mostly negative, the localized symptoms, so far as they can be detected, are comparable to those due to lesions of the cortical or basal regions connected by the fibres involved. Thus, lesions in his anterior and posterior central regions, which contain the fibres passing from the central ganglia to the anterior and posterior central convolutions on either side of the fissure of Rolando, the motor region of the cortex, produce crossed motor hemiplegia comparable to that due to lesions of the striate body, or those of these convolutions (monoplegias). And in the same manner aphasia has been noticed to appear after lesions of the white central matter at the foot of the left third frontal convolution.

The cortex as the most important mass of grey matter of the brain, receives a longer space in the volume than any other single portion. The author's plan does not, of course, admit of his utilizing the results of the physiological investigations of the past ten years, but these have had their influence on pathology, and clinical observation has during this period kept almost equal step. The conclusions deduced from an analysis of a very large number of carefully reported observations are:

1. "Disease of the superficies of the brain, *i. e.*, the grey matter and the white medullary substance directly underneath it, cause in one series of cases marked phenomena; in another they remain latent without symptoms.

2. "Psychic disorders in general indicate an affection of the cortex, but narrower localization is as yet impracticable.

3. "Dysphasic and aphasic phenomena point to cortical lesion.

"This proposition is not absolutely valid, since lesions without direct implication of the cortex, under certain circumstances, may cause aphasia (centrum ovale). Nevertheless, these cases are so rarely met with and their percentage is so small, that conclusion 3 may be generally accepted in clinical diagnosis.

4. "In purely ataxic aphasia, the first locality to be suspected for the lesion is the third left frontal convolution, but the possibility of a lesion of the insula must also be considered.

5. "If, as it appears probable from some observations, lesions of other parts of the brain may cause aphasia, this occurs so exceptionally that the location given under 4 must always be first thought of. Moreover, it is impossible from the character of the speech disorder to decide on the locality.

6. "Word-deafness indicates most probably a lesion of the (left) parietal lobe, particularly the third temporal convolution.

7. "Hemiopia by itself is not at all conclusive as to cortical lesions. At best, one may only be suspected, most probably in the occipital region, if this symptom appears suddenly as the only phenomenon, perhaps after an apoplectic attack, with absolutely negative ophthalmoscopic appearances.

8. "Unilateral disturbances of vision may occur with cortical lesions. Hitherto, they have been observed only with diffuse cortical lesions (progressive paralysis, cysticerci). Nothing can be stated certainly in regard to their significance for local diagnosis.

9. "Disorders of cutaneous sensibility have as yet no diagnostic signification for cortical disease.

10. "We offer with much hesitation the conjecture that unilateral disorder of the muscular sense, when it appears as the only symptom, without accompaniments, perhaps indicates a lesion of the parietal lobes.

11. "Motor disorders accompany cortical lesions, and under certain conditions they give evidence of the locality of the latter.

12. "Sometimes the paralysis takes the form of an ordinary cerebral hemiplegia, such as is commonly observed with lesions of the striate body, accompanied or not with secondary contractures in the paralyzed limbs.

"Naturally, the diagnosis is impossible in such a case. Nevertheless, the notion of a cortical lesion would be supported if there was also aphasia, but in these cases the motor paralysis may be dependent on a lesion of the striate body coëxisting with that of the third frontal convolution.

"An isolated ptosis coëxisting with the paralysis of the extremities, the facial and the hypoglossal nerves, makes it probable that a cortical lesion exists.

"On the contrary, any pronounced disorders of sensibility occurring with the motor hemiplegia, indicate either that the lesion is not a cortical one, or that if it is actually such it must be very extensive and extend deeply into the medullary substance below.

13. "Paralyses depending upon cortical lesions are comparatively frequently monoplegias, partial hemiplegias, isolated paralysis of the facial, and hypoglossal nerves of the arm, rarely of the leg, or of the arm and leg, or arm and face.

14. "These monoplegias, their intra-cerebral origin being first established, point, not with absolute certainty, but with great probability, to a cortical lesion.

15. "The form and development of these monoplegias does not at all indicate their cortical origin.

16. "On the other hand, certain forms of motor irritative phenomena are of the greatest value for the diagnosis of cortical lesions.

17. "These reveal themselves as partial convulsions limited to certain muscular regions, which occur by occasion either of a hemorrhage or softening, or of the development of a tumor, and which later are connected with a paralysis of the muscular region involved. In such cases cortical damage may be diagnosed, if not with certainty, as highly probable.

"In some cases, the partial clonic convulsions first make their appearance in muscles already paralyzed. In these, according to experience already attained, a cortical lesion may be assumed.

18. "In other cases, the motor irritative phenomena take on the character of general epileptic attacks, but with this peculiarity: that the typically recurring spasm always begins in the same group of muscles, in one extremity or one half of the face. This form of convulsion always appears subsequent to an already existing paralysis. It may be considered as a presumable symptom of cortical lesion.

19. "By the presence of motor symptoms dependent on cortical lesions, the seat of the latter may be referred to the anterior and posterior cortical convolutions and the paracentral lobule. For further particulars in reference to these monoplegias the reader must refer to the discussion in the text."

According to Nothnagel's conclusions, lesions of the remaining portions of the brain, the cornu ammonis, the claustrum and the external capsule, cannot be diagnosed for the most part with certainty. Under a specially favorable combination of circumstances, the presence of polyuria may allow of the diagnosis of a lesion in the fourth ventricle; those of the lateral ventricles, he holds, have no special pathognomonic or diagnostic symptoms. The diagnosis of injuries to the basal regions of the brain must naturally, as far as they can be recognized, be from the combination of phenomena on the side of the different cranial nerves.

The second part of the work, the "Review of Local Symptoms," is a very useful supplement to the preceding portion, forming, as we have already said, a very convenient cross reference index. But it cannot be analyzed or reproduced in a notice like the present one.

We have not ventured to criticize the author's opinions to any extent, but have preferred to give his views largely in his own words, and thus convey an idea of the contents of the volume. It is one that should be generally read by physicians, and we hope that it will soon be presented to the English-speaking medical public in the form of a translation. As it is, it is written in very easy German for the American reader.

III.—BEARD: NERVOUS EXHAUSTION.

A PRACTICAL TREATISE ON NERVOUS EXHAUSTION (NEURASTHENIA), ITS SYMPTOMS, NATURE, SEQUENCES, TREATMENT, by George M. Beard, A. M., M. D. New York: Wm. Wood & Company, 1880. Chicago: W. T. Keener. Pages, 198.

We must confess to a feeling of regret that the esteemed author of this little work should have written it in such haste. It lowers, rather than sustains, his previous reputation. This is, and will be, a source of unfeigned regret to his many friends.

There are various features in the work which we dislike. Among them are the following: It is wanting, in no small degree, in the first place, in a true scientific spirit. Observations are hasty and partial. Analyses of facts, or of what pass for them, are made loosely. Things which should be together, are separated, in view of superficial differences. Things which are radically different, are grouped together, in view of superficial resemblances. Hence, groups are artificial, rather than natural, and are formed in the author's mind, rather than found in the nature of things. Species of disorders and names are produced with wonderful ease and profusion. Many things are brought, as might be expected, in subordination to nervous exhaustion, which have no radical relation to it, such, for example, as those disorders of the *space sense*, which pass under the name of "agoraphobia" (Westphal), "vertige mentale" (Lasegue), etc. The author seems to have lost sight of the more cautious methods of discussion, at least formally adopted in that best of all his productions, his essay on "Trance." This work is in no sense a *scientific* contribution to the important subject of which it treats.

Then again, Dr. Beard makes a serious mistake, from which a little attentive reading would have saved him. He plainly entertains the notion that the disease, if not new, or if not an American disease, has been, at least, discussed for the first time on this side of the Atlantic, and that among American physicians the author of the present work is, taken altogether, its discoverer. His enthusiasm, in view of this condition of things, is of a warm and lively character. But every thoughtful physician knows that "nervous exhaustion" has probably existed from Adam down to this hour. It is not a new disease. Dr. Beard says neurasthenia "is even now but just beginning to find recognition in the literature of nervous diseases." Or again, it "has, indeed, been the Central Africa of medicine." He regards his own articles on the subject (*Boston Med. and Surg. Jour.*, April 29, 1869) and a certain chapter in the work on Medical and Surgical Electricity, by himself and Dr. Rockwell, "as the first systematic treatises on neurasthenia ever published."

For ourselves, we do not hesitate to say that the old work of Robert Whytt, published first in Edinburgh, in 1767, contains an account of the disorder which passes under the name of neurasthenia, more full and, in some respects, more judicious than this one of Dr. Beard, especially if we take into the account the different state of nerve physiology then as compared with what we now behold. Our author would have been benefited by reading this old book. The works of J. P. Frank, of Axenfeld, of Stilling (*Ueber Spinal Irritation,* 1840), of Marshall, Cerise, Moreau (de Tours), Bouchut (*De l'etat Nerveux Aigu et Chronique ou Nervosisme,* etc. Paris, 1860), Sandras et Bourguignon (*L'etat Nerveux.* Tome I., pp. 2–103), Laycock, Henle, (*Rationellen Pathologie,* Bd. I., pp. 162–263), Reich (*Ueber Ursachen u. Verhutung der Nervositat,* etc. Neuwied, 1872), Briquet, Krishaber, Eulenburg (*Lehrbuch der Nervenkrankheiten,* etc. Bd. II., specieller Theil, 1879), Brachet, Borel (*Le Nervosisme,* etc., 1873), Romberg (*Klinische Wahrnehmungen,* etc.) These and a host of other European writers of more or less note, though they may not have used the same name, have more or less perfectly appreciated and described the condition which passes under the name of neurasthenia. And we would willingly undertake to point out passages in the writings of Hippocrates which show a clear appreciation of the existence of nervous exhaustion.

Dr. Beard, however, only seems to have alighted on the works of Grasset, of Rosenthal, and that of Erb. The latter writer, as compared with many other and older European authors, has produced but little on the subject under discussion.

It is indeed somewhat difficult to account for the stress laid by our author on Dr. Erb's views in respect to neurasthenia, unless it may be that the latter author has become a disciple of the former, or because the author of the present work is able to report valuable new information derived (so we are informed) from conversations had with the former Heidelberg professor.

But notwithstanding these and other defects, the work, upon the whole, is suggestive, and will be of some value to the profession. It will serve, at least, to awaken a wider circle of observers to the not new, but highly important fact and facts of nervous exhaustion.

Dr. Beard announces that it is his purpose to prepare a work on American nervousness. While it is our hope that he may prepare an essay on the subject of nervousness, we must express in advance our feeling that a mistake will be made if a book is written on *American* nervousness. We have had some little opportunity for observations in this respect, not only in Europe, but in Asia and Africa, and must say that among the peoples in the south of Europe and in the Orient, it is by no means an uncommon thing to meet with bad cases of nervous exhaustion, so far as we can see, entirely similar to that met with among our own people on this side of the Atlantic.

The subject is an exceedingly important one; but it is not new. It is not an *American* disease; and we are sorry to have to record our judgment that this little book does not greatly advance our knowledge of it. In respect to the pathology of the disease the book is meagre and defective. That part in which the treatment is given is the best of all.

IV.—MULLER: SPINAL PARALYSIS.

Die Acute Atrophische Spinallaehmung der Erwachsenen. Poliomyelitis Anterior Acuta. Eine klinische Studie. Von Dr. Fr. Müller. Stuttgart, F. Enke, 1880. (*Acute Atrophic Spinal Paralysis of Adults.*)

In this agreeably written monograph the author details four cases of this rare disease under his own observation. From these, and a compilation of the literature, he sketches the natural history of the disease. The interest centering in his own cases depends upon the fact, that they are the only ones on record in which electric examinations were carefully made.

The scanty knowledge upon this subject will justify a somewhat detailed review of Müller's description of the course of the disease. The author recognizes two distinct stages. In the first period the paralysis reaches its greatest intensity and remains unaltered for a variable length of time. The second stage begins with the retrogression of the palsy, which constitutes really the criterion of the disease. The invasion commences always with fever of variable intensity. In those few instances in which no fever is said to have been present, the temperature was not taken at the very beginning. A constant initial symptom is pain of a shooting character, without definite location. It may be the first and for a time the only symptom. Its duration is variable, one to fourteen days being the limits in the cases recorded. A diagnosis is of course not possible until the paralysis sets in. Later on pains of a different character are present. These are dull in nature, but well localized in the muscles. They rarely occur spontaneously, but are produced by pressure or passive motion. Other disturbances of sensibility are manifested in formication in the limbs as forerunner of the paralysis. This probably occurs also in the spinal paralysis of children, who are unable to make precise statements. But deficiency of sensibility, anæsthesia, is altogether absent in the course of this disease.

The disease is characterized by the muscular paralysis, its sudden onset, intensity and extension, as well as its gradual but partial retrogression. The paralysis begins quite suddenly, being complete in some hours, or at the utmost some days. The palsied limbs are completely relaxed, and no contractures appear. The disease produces in the adult mostly diffuse palsy, more rarely paraplegia, and but seldom monoplegia, while the kindred affection in children results quite often in monoplegias. A peculiarity is the escape of some muscles out of any entire group involved in the palsy. The various reflex movements cease ordinarily as soon as the paralysis is established. Their return does not always coincide with the return of volitional movements, being sometimes tardy in appearance. The different vegetative functions of the body are usually not involved. The paralyzed limbs appear livid and cold, but according to Müller's measurements this is preceded by a rise of local temperature.

The changes in electric excitability agree on the whole with the usual symptoms of nerve degeneration. The irritability of the motor nerves to the faradic current sinks at once, and is completely gone about the fourth day after the beginning of the paralysis. The constant current may yet be able to induce indirect contraction for one or two days. Unlike their behavior in ordinary peripheral paralysis, the muscles involved lose their irritability to the induced current within six to seven days, while the action of the constant current remains, and indeed becomes intensified about the third week. But within another week the muscle becomes also less sensitive to the constant current, and this sinking of irritability continues until absolute loss of function and atrophy occur, or recovery begins. An important observation, not new but still unexplained, pertains to the fact that the will regains control over the muscles, while both muscles and nerves are as yet but little sensitive to electricity. The sensibility to the faradic current is usually the last to return.

A further criterion of the disease is the visible atrophy of the muscles, distinct within ten or twelve days, and progressive in those muscles which have lost their sensibility to the induced current. This atrophy proceeds more rapidly than the degeneration following traumatic nerve lesions. Its extent can be foretold by an early electric examination. It remains irreparable *in all muscles upon which the induced current loses its action in four to five days.* The atrophy involves the entire muscle, not merely some bundles as in progressive muscular atrophy. In consequence, the limbs involved lose in circumference.

The recession of the disease begins generally within some weeks; sometimes the first stage is over in from four to twelve days. The regeneration commences in the muscles least involved, while the return of motility may not occur in the more completely altered muscles until after the lapse of some months.

The loss of sensibility to the faradic current does not preclude the chance of recovery, as long as this insensibility to the induction shock has not occurred before the close of the second. If, however, a muscle responds no longer to any stimulation but that made with the anode, it is doomed to atrophy. The reparation of function is very slow, requiring six to eight months or even more. It is never complete, there remains always a number of paralyzed muscles, but the palsy is not diffused, but localized in distinct parts. Occasionally false hope is inspired by the increase in the size of the limbs due to fatty degeneration. The prognosis is hence always unfavorable as regards the persistence of localized paralyses, but so far, no fatal case has been reported.

The author has had no chance for pathological studies. So far but three subjects have been examined after death from other causes, the most complete report being that by P. Schultze (*Virchow's Arch.*, Bd. 73, H. 3; p. 444, 1878.) All three autopsies characterize the disease as an acute inflammation of the anterior grey horns of the cord, with tendency to spread longitudinally, but not laterally. The later consequences were atrophy of the motor cells and motor nerve fibres and degeneration of the muscles. The author's comments upon these observations we can omit; they contain nothing that is not to be found in all similar articles. They show us, moreover, that he has not escaped the tendency of most writers of monographs, to cover space. The disease is of course, to be ranked with the spinal paralysis of children as well as with progressive muscular atrophy of the adult, differing from the latter of these affections, but mainly by its acute course. We fail to find any discussion however, as regards the peripheral origin, so ably defended by Friedreich, for progressive muscular atrophy. The striking case of the latter affection published by Lichtheim (*Archiv f. Psychiatrie*, Bd. VIII. 3; p. 521) in which the nervous system was found intact, ought to be remembered in all discussions on the pathology of this class of diseases.

As regards the etiology, but little can be ascertained. The age must be of some influence, since the recorded cases show the largest percentage between 14 and 30 years. The only direct cause that could be found was taking cold, in most instances.

The treatment is of course as yet very indefinite, considering our want of precision in other more common spinal diseases. Antiphlogistic treatment has been tried in the beginning without marked effect. The intense pain has been relieved only by the use of morphia. Hammond and others recommend ergot in large doses, claiming to have seen a cure as the result. Müller does not seem to have had any experience with it, but has used belladonna to advantage, without, however, definitely stating the details. The second stage requires tonic influences as well as all assistance we can afford nature in this absorption of inflammatory products. Müller recommends warm baths, but disadvises strychnia on theoretical grounds. The main confidence is placed in electricity. The author has used the constant current daily, applying the anode to the back and the cathode alternately to the palsied muscle, and finishing after the lapse of five minutes with some voltaic alternations. He claims to have obtained better results since the use of this method, both in this disease and in spinal paralysis of children. We cannot, however, find any of his therapeutic statements made in a manner calculated to render them authoritative. H. G.

V.—DISEASES OF CHILDREN.

Handbuch der Kinderkrankheiten. Herausgegeben von Dr. C. Gerhardt. Vol. V., part I. Tübingen, 1879. (*Handbook of Diseases of Children.* Vol. V., part I.: *Diseases of the Nervous System.*)

According to the original plan of this work, a separate volume has been devoted to diseases of the nervous system in children. The one before us comprises the first part: Functional Nervous Diseases, by O. Soltmann; Malformation of the Spinal Cord, by L. Fürst; Hyperæmia and Hemorrhage of the Cord, by A. Monti; and Meningitis, Myelitis and Tumors of the Cord, by O. Kohts. On the whole, the work ranks on an equal footing with the general style of encyclopedic works now so fashionable in Germany. Each chapter, entrusted to a well-known authority, is intended for a complete résumé of our knowledge. While the completeness is, on the whole, very satisfactory, we cannot spare this volume the reproach of diffuseness. Condensation would indeed have been a virtue, especially in the article of Soltmann, in which too much space is allowed to unprofitable historical opinions.

The functional nervous diseases are divided, according to the usual style, into motor and sensory disturbances, excess of function (spasms, neuralgias, etc.), and reduced functions (paralyses, etc.), diffuse and localized. While the clearness of style is quite admirable, we find but few points necessitating any critical comment. One of the most instructive chapters is that on Infantile Eclampsia, in which the author lays, it seems to us, too much stress upon the importance of his discovery, the absence of cortical centres and spinal inhibitory apparatus in the new-born infant. The most unsatisfactory part in Soltmann's chapters is the treatment. It is true, the author acquaints the reader with everything of value. He also formulates his advice with good judgment; but he lacks that very preciseness which the practitioner would seek most in a work of this kind. Two other sections of the work, the chapters by Fürst and by Kohts, are fully up to the standard of the entire work. But we cannot say as much for the chapter, written by Monti, on Hyperæmia and Hemorrhage of the Spinal Cord. The first of these conditions is based upon pathological observations of such doubtful value, and is so variable and uncertain in its symptoms, as to render its existence altogether fanciful; while hemorrhage of the cord is not a trouble of sufficient frequency to justify the space devoted to it.

H. G.

SHORTER NOTICES.

I. THE ESSENTIALS OF ANATOMY. DESIGNED AS A TEXT-BOOK FOR STUDENTS AND AS A BOOK OF EASY REFERENCE FOR THE PRACTITIONER. By Wm. Darling, M. D., F. R. C. S., Professor of Anatomy in the Medical Department of the New York University, and Ambrose L. Ranney, A. M., M. D., Adjunct Professor of Anatomy in the Medical Department of New York University. New York: G. P. Putnam's Sons, 1880. 629 pages. Chicago: Jansen, McClurg & Co.

II. THE MICROSCOPE AND MICROSCOPICAL TECHNOLOGY. A TEXT-BOOK FOR PHYSICIANS AND STUDENTS. By Heinrich Frey, Professor of Medicine in the University of Zurich. Translated and Edited by George R. Cutter, M. D., Surgeon New York Eye and Ear Infirmary, etc. Illustrated by three hundred and eighty-eight engravings on wood. Second edition. New York: Wm. Wood & Co., 1880. Chicago: W. T. Keener.

III. A MANUAL OF THE PRACTICE OF SURGERY. By W. Fairlie Clarke, M. A. and M. B. (Oxon.), F. R. C. S. From the last London edition. Revised and edited, with additions, by an American Surgeon. New York: William Wood & Co., 1879.

IV. THE TRANSACTIONS OF THE AMERICAN MEDICAL ASSOCIATION. Instituted 1847. Vol. XXX. Philadelphia: Printed for the Association, 1879.

V. TRANSACTIONS OF THE TENTH ANNUAL SESSION OF THE MEDICAL SOCIETY OF VIRGINIA. Held in Alexandria, October 21, 22 and 23, 1879. Part I. Commencing Vol. III. Richmond, 1879.

I. The title of this work almost sufficiently explains its contents. It is an arrangement or tabulation of the principal facts of general descriptive human anatomy in such a way as seems to present them in a readily accessible and intelligent manner to the student and practitioner. It is not intended to supplant the complete manuals, but rather to supplement them; to aid rather than to charge the memory. The illustrations given are all schematic rather than accurate representations of parts, but for the reasons above given the absence of the latter is not at all to the damage of the value of the work for the purpose for which it was intended.

We have examined the book and find it fully as complete as any of the recent general treatises on descriptive anatomy that we have seen, and very conveniently arranged. The tables are especially useful in giving a sort of bird's-eye view of special series of anatomical points. The book is likely to be a useful one to any one who chooses to buy it.

II. The appearance of this second edition of a work that has already found favor with the medical public of this country only needs a few words from us. The editor and translator, Dr. Geo. R. Cutter, has thoroughly revised the text and made large additions, and in its present form the size of the page is enlarged, and many new illustrations are given. The type has been changed, and the general appearance of the volume has been improved. As a work on the management and use of the microscope, and microscopic technology, it appears to be quite full and complete.

III. This is one of the last of Wood's dollar series for 1879, and like several of the others, is an American reproduction of an English work. The American editor, whose name is not given, has, however, made numerous additions, so that it is not exactly a reprint. As it leaves his hands it forms a very condensed manual of surgery; not one to be relied on by the practitioner, but one that coming as it does is worth its cost, and may furnish valuable hints.

IV. The Transactions of the American Medical Association forms the usual volume of about a thousand pages, containing the proceedings and addresses, and a number of papers on various subjects of medical interest. The part that especially interests us, however, is the Prize Essay on Primary and Secondary Degeneration of the Lateral Columns of the Spinal Cord, by Dr. Allen McLane Hamilton. This is a well-written essay of some eighty-two pages, showing considerable study and research. Its title, however, is hardly indicative of its contents; they include not only the subject of degenerations, but those of congenital deficiences, "functional neuroses," and hysterical manifestations involving the functions of the lateral columns. That these spasmodic phenomena have any spinal origin, or involve necessarily any pathological spinal condition, is, in our opinion, more than doubtful; hence, it seems scarcely relevant to introduce them into a thesis on secondary spinal degenerations, from which even those structural changes following cerebral disease are intentionally excluded.

The essay is marred by a number of typographical errors in the spelling of foreign titles, such, for example, as *Archives fuer Psychiatrie* instead of *Archiv fuer Psychiatrie*, Ludwig's "Arbeiter" instead of "Arbeiten," etc. These are not necessarily important matters, but it would have been better had they been rectified.

There are no other papers of special neurological interest in the volume, except, perhaps, Dr. H. F. Campbell's theory of the production of urinary calculus by trigeminal irritation in infantile dentition. His idea is: that the uric acid being produced abundantly by the digestion of the albuminous food of infancy, the tendency to the formation of calculi is favored by a functional disturbance of the liver, a hepatic paresis, due to reflected dental irritation; that as glycogenesis is produced by irritation of the fourth ventricle, so, he claims, lithogenesis in the nursing infant is morbidly produced by reflected dental irritation of the fifth pair implanted in the same nerve centre. The calculi once started become in turn excitors of reflex irritation, and thus aggravate the condition that produced them, and augment their own growth. This is the substance of his theory, and we leave it to our readers to accept it, or not, as it commends itself to their judgments.

The other papers in the volume are apparently of the usual character and merit. It appears to be a very fair representation of the series.

V. The Transactions of the Medical Society of Virginia, which have already appeared according to the custom of the society in the columns of the *Virginia Medical Monthly*, are here collected in a neatly printed pamphlet of one hundred and fifty-two pages. The addresses and reports are fully equal to the average in merit and evince a progressive spirit. The paper of neurological interest in the volume is that by Dr. J. Marion Sims on abscess of the liver, in which he details briefly two cases that have come under his observation, both of them in the practice of Dr. W. A. Hammond. The first was that of a gentleman who came to him in Paris for a renewal of the symptoms after having had his liver aspirated in New York. It was the opinion of Dr. Brown-Sequard, to whom the case was turned over by Dr. Sims, that the liver was not involved, but the patient had afterwards a large quantity of pus aspirated, to his great relief, by a physician in the south of France. The other case was that of a well-known medical journalist, in whom Dr. Hammond diagnosed hepatic abscess from the cerebral symptoms alone, and gave relief by the operation. Dr. Sims gives some interesting particulars of Dr. Hammond's experience in this line, that have not, so far as we know, been published elsewhere. He has operated thus far twenty-six times, in fifteen with success. In eleven no abscess was found, but the operation did no harm. In the introduction of this operation for the relief of melancholia, it would seem that Dr. Hammond had done a real service to the world.

Editorial Department.

WE have elsewhere in this number of the JOURNAL stated our convictions in regard to various points of asylum management. The defects we have criticised have been exclusively those that have come within our knowledge in American asylums; that they existed elsewhere we had no doubt, but our business was with reforms at home, and we had and still have an opinion that, as compared with their foreign co-workers, American alienists are sadly inactive in the really scientific departments of their specialty. A common defense against this charge is, that asylum superintendents have so much to do in the line of executive or administrative duties that their time for scientific study and research is limited. This, as asylums are at present constituted, is undoubtedly largely the case, but the superintendents are themselves responsible for this state of affairs, and some of them at least refuse to acknowledge any change as practicable. They themselves and their association are, we are sorry to have to say it, too often the greatest obstacles to certain needed reforms in American psychiatry.

A recent communication in a leading French medical periodical, *Le Progrès Médical*, Jan. 10, takes up one phase of this subject as seen on foreign ground and from a foreign point of view. It is interesting, moreover, as showing that the changes advocated here are also thought of there. It seems that in France, the theory of having a one-man power has led to the same evils that are experienced in this country, that there is something there also that renders administrative details too attractive to medical men. As the French writer says: "The administrator dwarfs the physician. We might enter into particulars, and show how by the office details of the superintendent precious time is absorbed that might be better employed by him as physician among his patients. For example, if it is the proper task of the physician to see after the feeding and cleanliness of his patients, cannot he perform this duty without having to occupy himself with the choice of breeds for the poultry yard, the raising of pigs and chickens, the overseeing of the kitchen and the choice of soap for the laundry? It is for him to say that this or that insane patient ought to be employed, and to designate the kind of labor that will be most advantageous, but is it necessary to this end that he should trouble himself with the condition of the crops, the soiling of the farm, or the products of the workshops? New buildings, modifications of older ones, and even repairs, ought not to be attended to without his advice or against his instructions, but the projects once ordered, ought he to be burdened with the oversight of their proper execution? All these purely administrative cares and many others are indispensable to the prosperity of the asylum, but they can just as well as not be devolved upon a man absolutely ignorant of medical science and mental disorders. They absorb time that could be better employed in observing and treating the patients, or in scientific researches that may be of benefit, if only indirectly, to them."

If the above is applicable in France, it is still more so in the United States; if the physician is dwarfed into the executive functionary there, he is too frequently completely absorbed here. If the cause of this is that there is something in the administrative duties of a large establishment that renders them more attractive to a certain class of medical men than are the regular duties of the physician, then these men have mistaken their calling, and should retire from a profession that they do not honor. If, on the other hand, the organization of our asylums is such that the sense of financial responsibility necessarily overweighs that which the physician ought properly to have of his duty to those whose physical and mental welfare is placed in his charge, then he should be relieved from such cares, if not otherwise possible, by special legislation.

We never could see how a medical man was otherwise than degraded by being made an executive officer at the expense of his proper professional functions. We do not mean to be understood by this as recognizing special social distinctions that do not exist in this country between professional and business men, but that we see about as much propriety in a medical superintendent devoting himself too exclusively to administrative duties as there would be in a clergyman neglecting his proper spiritual functions for the sake of keeping a profitable boarding-house for his parishioners.

It is no excuse for this state of affairs to say that the patients can be properly served by the assistant physicians. These are not as a rule considered to be so eminently qualified by experience and medical knowledge as the superintendents, and whatever may be the real state of the case, this fact disarms any such plea on the part of the superintendent. It is the superintendent who is called on as the medical expert in the courts, and who is generally credited with all the good that the asylum can do. Moreover, in nearly all our large asylums the assistants are over-worked and under-paid, and they have no voice or recognition in the association that should be the medico-psychological society of this country. It is only clinching the degradation of the medical service, the real function of the asylum, to devolve it all upon them under such circumstances. If they are to be the actual medical officers they should receive the credit of it, and should not be made secondary to one who is practically only a steward, whatever his official title may be.

We believe there are many of the men at the head of American hospitals for the insane, who see these matters in the same light that we do ourselves, but who cannot individually rid themselves of the burdens imposed upon them by the present vicious systems of asylum administration. But we only state again our honest convictions, when we say that the superintendents, as a body, are themselves actively or passively responsible for the evils of which we complain.

The *Index Medicus*, which fills a field in medical journalism not previously occupied, has entered on its second year of publication. It has become indispensable to every one who looks extensively into medical literature, and we sincerely hope that there are enough such to give it an ample support. It should circulate extensively, not only in this country, but everywhere else, for it has no rival in any land. We should ourselves very seriously feel its loss were it to be discontinued.

Dr. H. H. Kane, of New York City, specially requests members of the profession with any experience whatever in the use of the hydrate of chloral, to answer the following questions, and give any information they may possess with reference to the literature of the subject:

1. What is your usual commencing dose?

2. What is the largest amount you have administered at one dose, and the largest amount in twenty-four hours?

3. In what diseases have you used it (by the mouth, rectum, or hypodermatically), and with what results?

4. Have you known it to affect the sight?

5. Have you ever seen cutaneous eruptions produced by it?

6. Have you ever known it to affect the sexual organs? If so, how?

7. Do you know of any instances where death resulted from or was attributed to its use? If so, please give full particulars as to disease for which given; condition of pulse, pupils, respiration and *temperature;* manner of death; condition of heart, lungs and kidneys; general condition, age, temperament, employment, etc., etc., etc. If an autopsy was held, please state the condition there found.

8. Have you seen any peculiar manifestations from chloral—as tetanus, convulsions, or delirium?

9. Do you know of any cases of the chloral-habit? If so, please state the amount used, the disease for which the drug was originally administered, the person's temperament, and the present state of the patient, both as regards *general* mental and physical condition of the various organs and systems.

Physicians are earnestly requested to answer the above questions fully, especially 7 and 9, in order that the resulting statistics may be as valuable as possible.

All communications will be considered strictly confidential, the writer's name not being used when a request to that effect is made. Address all letters to Dr. H. H. Kane, 191 West Tenth street, New York City.

Periscope.

a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

The Influence of the Nervous System on the Formation of Sugar has been studied in a very trustworthy manner by M. Laffont (*Progrès Méd.*, No. 10, 1880). Claude Bernard has shown long ago that division of the spinal cord between the seventh cervical and the first dorsal vertebræ, prevents the diabetes otherwise produced by puncture of the fourth ventricle, and causes even the sugar to disappear from the blood. From such experiments Bernard concluded that the "diabetes puncture" causes an excitation of nerve fibres which pass downward in the cord and thence through the first dorsal roots to the liver.

M. Laffont determined in the first place that the first dorsal roots contain the vaso-dilator fibres of the liver. Exposing them in young puppies he found, that the liver reddened decidedly on stimulating the roots. It has been known that stimulation of the central end of the vagus or the depressor nerve causes a reflex dilatation of vessels and sinking of blood pressure. M. Laffont repeated this experiment upon rabbits, watching the urine at the same time, and learned that this vascular dilatation is accompanied by diabetes. In this result, however, he had been anticipated by Filehne. This author had claimed, that stimulation of the depressor nerve could only produce diabetes, but that the central end of the trunk of the vagus had no such power. Laffont, however, found that diabetes would also result from long-continued excitation of the vagus. He could even cause diabetes by the frequent repetition of painful impression. Upon examining the patients in the Hotel Dieu in this respect the author found that a large number of affections, indeed, cause occasionally a temporary glycosuria, for instance, pulmonary and cardiac diseases, rheumatism and typhoid fever.

Continuing his experiments upon animals he found finally that section of the first and second (sometimes third) dorsal roots prevents both the production of diabetes by puncturing the medulla or irritating the vagus (or depressor nerve), and the reflex sinking of blood pressure caused by the latter procedure. Direct excitation of these roots, when well isolated, lowers the pressure in the abdominal arteries. They contain hence the vaso-dilator fibres of the abdominal organs. G.

The Effects of Sudden Anæmia of the Head, and Subsequent Return of the Blood-Supply, are described by S. Mayer in the *Centralblatt* (No. 8, 1880). The starting-point was from the well-known experiments of sudden ligation of all four arteries of the head. The animals used were rabbits and rats. The symptoms due to the sudden cerebral anæmia he divides into three stages. In the first stage, 20–30 seconds in duration, the respiratory movements are quicker and fuller, until the expiratory tetanus, and soon after the spasms of all muscles set in. A second stage occurs after the convulsions cease, during which the animal remains inactive, and without breathing, for the space of ½ to 1½ minute, until the third stage begins with respirations, which become shallower and slower, and finally cease after the lapse of 2 to 3 minutes. During this stage the respiratory movements are passive.

These phenomena are identical with the course of asphyxia. But during suffocation the convulsions do not begin quite as soon. The same symptoms are seen, no matter how the circulation is stopped. During the second and third stages consciousness is absent, and no reflex movements requiring other nerve centres than the spinal cord can be produced.

The animal can of course be kept alive by artificial respiration after ligature of the arteries of the neck. But usually œdema of the lungs sets in, which puts a stop to the experiment. Mayer learned, however, to avoid this œdema by the following device: After exposing the arteries and surrounding them with loose threads, the animal is suffocated by causing it to inhale air from a small vessel. After the first stage of asphyxia is over the arteries are closed and the artificial breathing is commenced. Under these conditions no pulmonary œdema occurs.

If the ligatures are removed from the arteries after the lapse of 10 to 15 minutes the animal begins to breathe soon, and after some minutes, artificial respiration can be discontinued.

In this state there exists no consciousness and no reflexes can yet occur, the centre of which is above the first cervical vertebra. The active breathing consists but of inspiratory movements at the rate of about 12 per minute. The mouth and nostril are widely opened with each inspiration. If the vagi are now cut, no effect on the respiration is observed. On suffocating such an animal none of the ordinary symptoms of asphyxia occur, the respiration simply becomes shallow and finally ceases. The animals appear to be in a state of complete narcosis. But during this state it is not possible to induce apnœa by energetic artificial respiration.

The result of the entire experiment is simply this, that the anæmia removes the irritability of the entire brain, without producing shock to the cord, while the restoration of the blood supply revives partially the medulla oblongata. G.

The Personal Equation has again been examined by Hall and V. Kries (*Archiv f. Anat. und Phys.*, 1879, Suppl. 1). The question to be determined was, whether the interval of time elapsing between the excitation of various sensory nerves and a motor reaction answering the stimulus is always of the same length. As a result they found the time necessary for the conversion of a sensory impression, which has reached the brain, into a voluntary motor impulse, varied considerably, according to the sensory nerve employed. Thus a difference was observed between the length of time in the reactions to electric sparks, seen with the lateral or median halves of the retina. As a rule the time is shorter the more delicate the sensibility of the part supplied by the nerve. Apart from their intrinsic interest, these observations are valuable in showing that it is not possible to determine the velocity of the nerve current in sensory nerves, when a motor reaction is used as an index.

THE MEDULLATED NERVE FIBRE.—The numerous recent statements regarding the structure of nerve fibres, which have been abstracted in the various numbers of this journal, have been carefully re-examined by Fr. Hesse (*Archiv f. Anat.*, 1879, V. and VI., p. 341). Many technical details, confirmatory and otherwise, are there stated, which we cannot reproduce. A result, however, of much importance is the contradiction of Rumpf's statement. According to Hesse the axis cylinder *is not* dissolved by distilled water or solutions of HCL. Rumpf's errors are referred to the swelling and transparency of the axis cylinder when acted upon by these agents. But it can again be rendered visible by the coagulating action of alcohol.

Hesse further claims that the horn sheaths described by Kühne and Ewald do not exist in the form of separate sheaths. He points out that they are invisible both in the normal fibre and in the fibre the myelin of which has left its place on account of the flowing caused by the action of water. This we cannot admit. The segments of Schmidt can be seen even in the living nerve, and there is no justification for calling the horn sheaths, as demonstrated by their discoverers, artificial products. Hesse is compelled to admit the existence of the neuro-keratin, the substance of which these sheaths are composed. He claims, however, that this material is not prearranged in the form of sheaths, since the drops of myelin escaping from the end of the fibre placed in water contain it in the form of convoluted trabeculæ.

NERVE CELLS OF THE CEREBRO-SPINAL GANGLIA.—G. Retzius, *Nordiskt. med. Arkiv*, XI., 1879, Fjärde Häftet, after having given a summary of previous investigations on the prolongations of the nerve cells of the spinal ganglia, as well as of the theories and various points of view formulated in regard to these prolongations, describes certain new researches made by him on the nerve tubes of the cells in question in the frog, the cock, the rat, the rabbit, the cat, the dog and in man. He found in the spinal ganglia of all these animals rather numerous divisions of medullated nerve tubes; the nerve cells never showed but one prolongation becoming a medullated nerve fibre; in many cases he succeeded in following this tube as far as to a division exactly like those of other nerve fibres, and this in representatives of different classes of animals, also in the human subject. He has examined many of the ganglia of cerebral nerves, but at present publishes only his researches on the ganglion of Gasser and the jugular ganglia of the vagus, in which he finds exactly the same relations as in the spinal ganglia.

CONDUCTION OF SENSIBILITY IN THE SPINAL CORD.—Schiff, *Wien. med. Wochensch.*, 1879, No. 43, publishes the results of investigations on the routes of sensory conduction in the spinal cord. He cut the white substance with a knife and then excited an inflammation by irritation or injections, and awaited its breaking down and absorption. Examination after death of the animals, to see whether the destructive process had extended as far as desired, was made by hardening the spinal cord in pure alcohol, cutting it into sections and examining these by transmitted light with polarization apparatus. By this means a very clear line of distinction between the grey and the white and the degenerated and intact portions was obtained.

By this method of procedure Schiff destroyed the whole of the white substance of a section of the cord during life without destroying sensation or motor power. It is sufficient therefore, for the retention of these functions, that a bridge of grey substance alone remains, and this may be situated either in the middle or on either side of the central grey matter, and its corresponding portion may be cut a centimetre above or below without altering the condition. But when the whole grey substance was destroyed with the posterior white columns, there was still some voluntary motion, but all sensation was permanently lost.

The Physiology of the Visual Sphere of the Cerebrum.—Munk (Lecture before the session of the Berlin Physiological Society, July 4, 1879, *Centralbl. f. d. Augenheilk.*, 79, p. 255, abstr. in *St. Petersb. med. Wochensch.*) had already in 1877 and 1878, found by experimentation on dogs and apes, that the cortex of the whole occipital lobe, with the exclusion of the face of the gyrus medialis turned toward the falx, served for the function of visual perception. After extirpation of this so-called visual sphere, there was in the dog, total blindness of the eye of the opposite side, and in apes double hemiopia, or loss of vision in the half of each retina corresponding to the injured side. Extirpation of a special portion of this visual sphere produced psychic blindness, that is, the visual perceptions remain intact, the animal sees everything, but the visual conceptions (*Vorstellungen*) the associations (*Erinnerrungsbilder*) of former visual perceptions are completely gone, the animal knows or recognizes nothing that he sees.

More recent experiments, now related, ought to establish the relative position of the sensitive retina on the one hand and the perceiving cortical region on the other, and also clear up the contradiction between the results of experiments on dogs and apes. They have yielded the following important results (first relating to the dog). Each retina is arranged with its external lateral portion connected to the most lateral portion of the corresponding visual sphere. The much greater remaining portion of each retina is connected with the larger part of the contralateral visual tract in such a manner that it is projected on the latter so that its lateral margin corresponds to the lateral margin of the remaining visual tract, its inner margin to the median portion of the same, its upper margin to the anterior, and its lower border to the posterior portion of the cortical visual tract. The position of the cortical visual region, extirpation of which causes psychic blindness, indicates that it is co-ordinated with the region of intelligent vision in the retina, and since this has always been claimed as acting in intelligent vision, so must needs the cortical region to which it is connected be the seat of intelligent visual perception, and, hence the "recollected images (*Erinnerrungsbilder*) of visual perceptions, in somewhat the same order as their perceptions came before consciousness, are disposed in a certain measure around in a constantly enlarging circumference around a central point." The controversy over the perfect or imperfect decussation of the optic nerve in the chiasm is decided by the above experiments in favor of the latter; each optic nerve contains external to the chiasm, a crossed and an uncrossed bundle of fibres, of which the first is greater as we ascend the series from the rabbit up to man, the last being correspondingly smaller. Hence is explained why the bilateral diminution of the visual field following extirpation of one cortical visual tract is more readily recognized in apes than in dogs.

Electro-Muscular Contractility.—At the session of the Paris Academy of Medicine, at Paris, December 9 (rep. in *L' Union Médicale*), M. Onimus read a paper entitled "Particularities of Electro-Muscular Contraction and the mode of action of Curare."

We know, said the author, that when we apply electric excitation to nerve fibres in an animal poisoned by curare, we obtain no contraction of the muscles, while when we electrize the muscular masses directly with the same currents we cause contractions as pronounced or nearly as pronounced as in the normal condition. From such experiments we draw the logical conclusion that curare abolishes especially the physiological activity of the nervous system, leaving intact the irritability of the muscle itself.

In opposition to Cl. Bernard, M. Onimus believes that curare does not act on all parts of the motor nerves, that it poisons only the nerve trunks, leaving intact the terminal filaments.

According to him it follows from incontestable facts, that induced currents have no direct action on the muscular fibre, and when they cause a contraction we may logically assume that it is through the mediation of the nervous system. But M. Onimus' researches have led him to believe that curare has an elective action on the trunks of the motor nerves, and that if it does not paralyze the nerve centres, no more does it paralyze the terminations. It acts on the nervous element that is most easily modified, and should be considered as a purely dynamic poison. It kills, so to speak, accidentally, because it paralyzes momentarily, the motor nerves of respiration; but its action on the cord, on the sensory and vaso-motor nerves as well as on the terminal plates, is very slight.

In a clinical point of view, M. Onimus excludes, from his experiments, the total absence of contractility by induced currents when the nervous elements are completely destroyed, while the muscle still contracts by other excitants. In these cases we may affirm that the nerves are altered as far as into their intra-muscular prolongation, and that the terminal plates themselves are affected; but on the contrary, in spite of the absence of farado-muscular contractility, we should not admit any muscular alteration unless after trial of continuous currents or mechanical excitants.

Acuteness of Vision and Perception of Colors in Uncivilized Nations.—Dr. Cohn, in a contribution to the *Centralblatt für Praktische Ohrenheilkunde* for 1879, states that he examined the visual powers of eleven Nubians, and found the acuteness of vision twice as great in them as in the healthy eyes of Europeans. Only their chief and priest, who had studied Arabic for nine years and had read much, was myopic. The perception of colors in the Nubians was found to be excellent. As Virchow has already observed, they are deficient in verbal expressions for different colors, there being no distinctive words for green and blue. Experiments with colored wools, however, showed the incorrectness of the opinion of Geiger, Gladstone, and Magnus, that the linguistic deficiency indicates a defect of vision for colors. Virchow also found, on examination of some Lapps who were in Berlin, that their vocabulary does not enable them to express the differences in color which they perceive, although their sense of color is well developed. In connection with this, a remarkable fact was observed. While all the Lapps used the same word—aliicht—for blue, and had no hesitation in selecting the color, the Nubians had the greatest difficulty with this color. Even green was distinguished by the Lapps pretty accurately, though with less certainty. The colored ribbon, also, which the Lapp women wore, indicated the acuteness of their perception of colors.

According to Dr. Almqvist, the Tschukssches of the East Cape in Siberia, have a well-developed perception of color. Among the Georgians of the Caucasus in the Russian army, Reich found the acuteness of vision to be higher than normal in 83.5 per cent.; in 32.1 per cent. it was double, and in 3.5 per cent. more than double the normal average.—*British Med. Jour.*, Feb. 7, 1880.

The Island of Reil in the Porpoise.—Dr. E. C. Spitzka, *Archives Comp. Med.*, Jan., 1880.—The history of comparative cerebral morphology has been a repetition of erroneous dogmas, from its beginning to the present day. This is in great measure referable to the fact, that rarely has cerebral anatomy been studied by zoötomists so much for its own sake, as for the support of one side or other in a controversy.

Most of our readers may yet have a recollection of the Owen-Huxley dispute, in which one of the greatest English anatomists, Richard Owen, immortalized by the most careful and monumental researches on the extinct animals of the Pampas, the giant birds of New Zealand, and Jurassic reptiles of England, was, in the zeal of discussion, betrayed into making the declaration that man alone had a posterior cornu and hippocampus. It was instantly shown by Huxley, that all monkeys, even including the lemurs, possessed both. We have recently found a finely developed posterior cornu in the common porpoise.

Countless such errors have been committed; but there is one which has been perpetrated to the present day that we intend to refer more particularly to, inasmuch as on the erroneous assumption equally erroneous theories have been based.

It is believed, not among zoötomists, but by certain medical writers, that no animal exhibits as large and as well convuluted an Island of Reil as man, and also, that in this region and its neighborhood must be localized the function of speech for that reason.

The localization of the function of speech, or rather of the associated innervations on which it depends, may (from pathological experience most probably) have their main seat in the region indicated, but the reason, quoted from the evidence afforded by comparative anatomy, is highly fallacious. The facts are quite opposed to such a deduction.

We have in a previous publication ("The Organology of the Island of Reil," JOURNAL OF NERVOUS AND MENTAL DISEASE, 1879) shown, that while the great atrophy of the island in the seal, which we have since verified to be the same in the California sea-lion (*Zalophus Gillespiei*) lends countenance to the impeached theory, the development of this area in the hippopotamus is so great that, according to this theory, it should possess, if not speech, very complex symbolic faculties!

But the objection might be here made, that the island of the hippopotamus is not strictly homologous to that of man. Simply stating for the present, that the exuberantly developed island of the hippopotamus, which is relatively three times as large as that of the horse, being homologous to the latter, must be, therefore, homologous to that of man (since it is admitted that the equine and human islands correspond), we will now refer to another still more damaging fact to the deduction in question.

We dissected the brain of a porpoise, obtained from the New York Aquarium this July, and were astonished to find an Island of Reil twice as extensive and with four times as many convolutions as the human average brain shows.

This region is triangular, with its longest side convex towards, and following the convexity of the hemisphere. The two shorter sides were so directed that the angle formed by their meeting was downwards. The longest of the short sides was in front, and met the superior contour at a very sharp angle. The shortest posterior side ran upwards and backwards. The island of Reil is *absolutely covered by the overlapping operculum and temporal lobe*, more decidedly so than in the elephant, and in this respect corresponding to man and the anthropoid apes.

The gyri having the same direction as in man, are dovetailed as in the latter, with corresponding gyri on the inner face of the operculum. They are so regularly arranged as to simulate the corrugations of corrugated iron, differing from the human in exhibiting no subdivisions. There is also this difference—the human island is highest in front and gradually tapers down as we go posteriorly; in the porpoise it is just the opposite.

If we place side by side the following brains, we shall perceive an almost uninterrupted gradation: Bear (better still coatimondi), otter, sea-lion, earless seals, (*Callocephalus grœnlandica*) and porpoise. The transformation may be signalized as follows:

1st. The hemispheres become broader on account of the increasing disproportion of the cranial diameters. 2d. The cerebellum becomes flatter and more completely covered. 3d. The pons varolii conceals the trapezium. 4th. The olfactory lobe atrophies. 5th. The corpus striatum diminishes.

This progression is the more noteworthy, as in the light of the evolution doctrine (we say "doctrine," not "theory," for we can readily afford to disregard the senile lucubrations of even a Virchow in opposition), the cetacea, or whale-tribe have most likely developed from seal-like creatures, while, on the other hand, the transition from the earless to the eared seals, and from these to the otter, is very easy. The whale is in fact the terminus of an aberrant twig from the phyllogenetic ancestral tree of the carnivora.

Now, while there is this gradual metamorphosis of the brain, we find that the Island of Reil cannot be included in it. In fact, although it rises in this respect that it becomes more and more completely covered as we pass up in the series, as regards area and the development of grey matter, it sinks from the bear to the seal, to rise again in the porpoise (and whales ?) to the highest degree of development known to obtain in the entire animal series.

In explaining, on the basis of mere speculation, the atrophy of the seal's island, we suggested the correlated atrophy of the hypoglossal and facial peripheries, the facial muscles being atrophic, and the mobility of the tongue limited.

But on this purely theoretical ground, the porpoise, with these peripheries still less developed, ought to have a still more atrophic island, whereas it has the highest development attained. There is one group of innervations which is developed in the porpoise (all *cetacea*), to a degree not even remotely approached by any other animal. These are innervations which, from their physiological associations with those of the tongue and face, we should predicate an identical or closely neighboring cortical field for, assuming the doctrine of cortical localizations to be correct. We refer to the muscles of the larynx and blow-hole.

The blow-hole muscles belong to the territory governed by the facial, those of the larynx to the spinal accessory. Their innervations must be of a complex character, when it is recollected that the larynx of the porpoise is prolonged as a free tube, passing vertically up through the pharynx to reach the blow-hole.

But all these suggestions are purely tentative and theoretical. We believe, however, that so far as the localization doctrine is admissible, that a careful and judicious comparison of animals possessing remarkable peripheries will do much to support and extend it.

The Transfer of Sensibility.—The following is the abstract of a paper by Th. Rumpf, read before the S. W. German Association of Neurologists and Alienists, on the 17th of last May, and published in the *Berliner klin. Wochenschr.*, No. 36, 1879, as given in the *Deutsche med. Wochenschr.*, Nov. 15.

The author experimented on healthy individuals with metal plates, spirits of mustard, and sponges soaked in hot water, which he applied unilaterally or simultaneously on symmetrical points on both sides, and then examined the disorders of sensibility produced. The results of his investigations he collects in the following propositions:

1. The almost identical sensibility of corresponding points on the two sides of the body, varies to a considerable extent on different days, and may be simultaneously increased or decreased on the two sides by various irritations.

2. A unilateral alteration of the sensibility produced by irritation, causes a simultaneous opposite alteration at the corresponding points on the other half of the body.

3. The unilateral disturbance returns in positive and negative variations, which nevertheless have opposite courses on the two sides, back to the original normal condition.

4. In the use of metal plates we must distinguish two actions, one due to the initial difference of temperature, and a very slight one, coming into play after long-continued irritation, which is also followed by an increase of sensibility on the side of the metal and a decrease on the opposite side.

5. The duration of the various changes depends very probably upon that of the irritation; the longer this continues, the longer is the sensibility affected. The author is inclined to look for the explanation of these phenomena in vaso-motor alterations, either peripheral or central.

ACCELERATOR NERVES OF THE HEART.—The following are the conclusions from a series of experimental investigations by M. Francois Franck, read before the Sociéte de Biologie in August last, and reported in *L'Union Médicale*, Nov. 22, 1879.

1. Comparison of the activity of the right and left accelerator nerves in the dog. The first accelerator nerve of each side being isolated, they were simultaneously divided, and successively excited at intervals of several minutes. In forty-one different subjects, only twice did the first accelerator nerve of the right side, with the same intensity of excitation, cause a more notable acceleration than that of the left side. These two cases are insufficient to invalidate the conclusion that, contrary to that which appears indicated regarding the moderator nerves, there is no predominating action of the nerves of either side.

2. Simultaneous excitation of symmetrical accelerator nerves. When the nerves of the right and left sides are simultaneously excited, there is no increase of accelerator effect; hence it appears that these nerves on each side command a common terminal apparatus, which will be equally influenced by excitation of the accelerators of only one or both sides.

3. Successive excitations of symmetrical accelerators and of the same accelerator nerve. When a first excitation, either of symmetrical accelerator nerves or of only one, has aroused the activity of the terminal apparatus, not only is the frequency of the heart-beat not increased, but the total duration of the acceleration is not exaggerated.

FUNCTIONS OF THE POSTERIOR COLUMNS OF THE CORD.—At the session of the Societé de Biologie, Nov. 29 (rep. in *Gaz. des Hopitaux*), M. Laborde reported the results of experiments on young kittens, by section of special portions of the cord. These animals offer special advantages for physiological experimentation; they have great vital tenacity, their bones are still soft, and they can be preserved after extensive injury by simply returning them to the care of the mother cat, who affords them the best sanitary conditions and nursing. He was able to make partial sections of the cord in these animals, and afterward observe the effects, without complications vitiating the experiments. Notably among these, he had made section of the posterior columns, and noticed as a consequence no other functional disturbance than a slight degree of inco-ordination of movement, especially in the posterior members. Sensibility, except in being, perhaps, slightly heightened, was not affected appreciably. In a brother of this same kitten he divided, under the same conditions, the central grey axis, producing complete loss of sensibility by defect of conduction, a confirmation of existing ideas. But as regards the posterior columns, the experiments indicate that their real function is still unknown.

At the session of Dec. 6, M. Laborde reported similar experiments upon Guinea pigs. Section of the central grey axis produced the same effect as in the cat; section of the antero-lateral columns produced paralysis of the posterior limbs with preservation of sensibility.

Vaso-Dilator Effects of Excitation of the Peripheral End of the Trigeminus.—At the session of the Soc. de Biologie, Dec. 13 (rep. in *Le Progrès Médical*), MM. Jolyet and Laffont announced the results of experiments on the trigeminus. They had already made known that intracranial division of the facial by a method they had devised (but which, unknown to them, had already been employed by M. Vulpian), destroyed the effects of excitation of the chorda tympani on the sub-maxillary gland, while it left absolutely intact the vaso-dilator effects of that excitation. These experimenters hence concluded that the facial, in its course from the pons to the internal auditory canal, contained no vaso-dilator fibres, and were led to try and search out the real origin of the latter. Previous experiments led them to exclude, as sole origins of these dilator nerves, the pneumogastric, the spinal accessory and the glosso-pharyngeal. The tearing away of the last-named nerve from its points of origin with Jacobson's nerve and Andersch's ganglion, of which they made a microscopic examination to assure themselves of the success of the operation, did not, fifteen days and three weeks after the operation, prevent the vaso-dilator effects of the excitation of the peripheral ends of the superior maxillary, the chorda tympani, or the buccal nerves.

They then, taking dogs in whom they had previously removed the cranium and extracted the hemisphere of the side on which they wished to operate, sought out the origin and removed the superior portion of the bony ring in which the nerve passes.

1. They then found that excitation of the intact trigeminus by the faradic current caused dilatation of the vessels and of all the buccal mucous membrane of the side operated upon, and simultaneously a general salivation.

2. Dividing the nerve at its point of emergence, they applied the excitation to the peripheral portion, well isolated, of the divided nerve, and the same general dilatation was observed. It seemed to them even that in the tongue the dilatation was as marked in the posterior portion behind the V of the caliciform papillæ as in the anterior part.

No secretory effect was observed during this excitation of the peripheral portion, while both vascular and secretory effects followed that of the intact nerve. Therefore from MM. Jolyet and Laffont's experiments, which they propose to continue till the question is definitely settled, the trigeminal nerve supplies to the facial, by a route they are not at present able to indicate, the vaso-dilator fibres contained by the latter in its course within the petrous portion of the temporal bone, and the same trigeminal nerve is also one of the principal sources of the vaso-dilator nerves of the head.

The Medullary Development in the Spinal Ganglia.—Bernhard Rawitz, in *Centralbl. f. d. med. Wissensch.*, No. 42, Oct. 18.

In the course of my investigations on the structure of the spinal ganglia, the first part of which I hope to soon have ready for the press, I have made one observation, which, on account of its general significance, appears worthy to be announced beforehand.

In longitudinal sections through the spinal ganglia of adult animals, I found that the sensory roots, with a few scattered cells included, penetrated through the ganglion as a broad axis, and that the main portion of the ganglion cells were arranged on both sides as narrow masses.

This condition indicates, as I will preliminarily remark (I shall be compelled to return to this point more fully in the proper place), that the ganglion cells are grouped in a circle around the central axis; and we have here, after a fashion, an arrangement somewhat similar to that of a nerve cross section.

This arrangement exists, with certain modifications, throughout the whole range of vertebrates, so far as I have examined, but is not found if, instead of adult animals, those newly born, or at most ten to fourteen days old, are chosen for examination. In dogs, cats, and rabbits I always found in longitudinal sections at all heights the ganglion cells much predominating over the fibres, almost concealing them and rendering it almost impossible to follow the sensory root completely through the ganglion. The nerve fibres of the root are lost in the maze of cells and help to increase the confusion.

I know of no other explanation of this highly interesting fact, than that the medullary sheaths of the separate systems of fibres, which my preparations show to exist in the ganglion, do not become developed simultaneously. In a word, I see in this a confirmation and (perhaps) an extension of Flechsig's classic researches. Flechsig found that in man the medullary development of the separate fibres of the spinal cord finishes when extra-uterine life commences. Here we find now, though only in the nervous appendages of the central organs, that in mammals that have but a shorter intra-uterine existence than man, this development is not completed at birth.

THE CHORDA TYMPANI NERVE.—Dr. H. R. Bigelow, of Washington, D. C., offers (*N. Y. Med. Record*, Jan. 17) the following conclusions, to which he has been led by experimentation on dogs trained in the manner described by Cl. Bernard for noting the impairment of taste:

1. The chorda tympani nerve is distinct and integral throughout its entire length.

2. It is derived from the nerve of Wrisberg and not from the facial.

3. Its especial sensory function is derived from the ganglion upon the nerve of Wrisberg, into the granular protoplasm of which the ultimate fibrils may be traced.

4. The lingual branch of the fifth presides over general sensibility only. Isolation of the chorda tympani as completely as possible destroys the sense of taste in the anterior two-thirds of the tongue, the fibres undergoing degeneration.

5. Section of the lingual destroys sensibility, but only modifies the sense of taste, this modification being due exclusively to the branches from the chorda tympani.

6. Section of the facial, behind the origin of the chorda tympani, destroys the sense of taste *only after a lapse of time*, and this not because the facial at this point contains gustatory filaments, but because this nerve is cut off suddenly from its supply, and has received such a shock that it undergoes degeneration. If the chorda tympani be drawn out at the point where we first notice its filaments of origin, and divided, the sense of taste will be almost entirely destroyed. If the nerve of Wrisberg be cut in the aqueduct behind the ganglion, the sense of taste is lost. From which it may be inferred that the intermediary nerve is continued in the chorda tympani, and that this latter is a carrier of the sense of taste from the cells in the intumescentia gangliformis.

As supporting these views, the author claims the fact that paralysis of the facial, in the human subject, behind the origin of the chorda tympani, is attended with loss of taste in the anterior two-thirds of the tongue.

AMONG other recently published articles on the Anatomy and Physiology of the Nervous System, we may mention the following:

POOLE, Cerebral "Irritation" as a Source of Nerve Power, *N. Y. Med. Record*, Dec. 13.—LANDOWSKY, Demonstration of the Constituents of the Axis-Cylinder of Medullated Nerve Fibres, *Cbl f. d. Med. Wissensch.*, 1879, No. 48.—HAMMOND, A Lecture on Sleep, *Gaillard's Med. Jour.*, Feb.—OTT, The Decussation of the Motor Fibres in the Medulla Oblongata, *Detroit Lancet*, March.

b.—PATHOLOGY OF THE NERVOUS SYSTEM AND MIND, AND PATHOLOGICAL ANATOMY.

Hydrophobia.—In a memoir lately published in Paris, Dr. Duboue of Pau, France, holds that hydrophobia consists of a morbid process which travels very slowly centripetally towards the medulla, but when once it has reached that point the centrifugal irradiations are extremely rapid. The period of incubation is, he states, as a rule, shorter, the less the distance between the point bitten and the medulla, and the symptoms of the disease appear at the moment the latter is attained. Thus the incubation is shorter in infants than in adults, and in cases of wounds of the face than of the members. The first signs of the morbid process having reached the medulla are often pain shooting down the nerves of the side bitten to the point of infection.

The lesions of hydrophobia are of two kinds, the primary, only detected by the microscope, consisting in greater opacity of the nerve cells and a granular condition of these cells, and of a certain number of afferent or efferent nerve fibres; and the secondary lesions, visible to the unaided eye, and consisting in more or less marked congestions of the various organs. He classes hydrophobia in a large class of affections of peripheral origin, such as certain eruptive fevers and certain neuroses.

According to his theory of the transmission of the hydrophobic virus by the nerves, he draws his therapeutic conclusions, which are: 1. To destroy the virus at the point of its entrance. 2. To prevent its attaining the medulla when not destroyed. 3. To blunt in advance, the sensibility of the medulla, throughout the whole period of incubation, in cases where the previous indications have not been met. 4. To act also on this sensibility of the medulla by medicinal injections into the veins; and, finally, to combat the usually rapidly progressing asphyxia.

Analysis of Bones in Ataxic Arthropathies.—It appears from an analysis reported to the Societé de Biologie, Nov. 29, by M. P. Regnard, *Le Progrès Médical*, Dec. 13, that the condition of the bones in the joint affections is somewhat comparable to that in osteomalacia. He found in a femur from an ataxic patient in which the bone was much eroded, the following constituents: In 100 grams there were 75.80 grams of organic and 24.20 grams of inorganic matter. The organic matter consisted of osseine, 38 grams (normal proportion), fat 37.68 grams. The inorganic matters comprised only 11 grams of carbonate of lime, and only 11.9 grams of phosphate of lime. The fatty matters therefore, had replaced the phosphate of lime normally present in the bones.

Atrophy of the Cerebellum.—G. Seppilli, *Rivista Sperimentale di Freniatria*, vol. IV., finishes an article on atrophy of the cerebellum, including the description and discussion of a case, with the following conclusions:

1. The microscopic alterations that in general characterize atrophy of the cerebellum, are, the enormous development of the connective tissue and atrophy of the cells of Purkinje. These are either completely absent or are diminished in volume, irregular in contour, with granular contents, the nuclei and nucleoli slightly or not at all developed, and their prolongations infrequent and attenuated. The nerve fibres are also diminished in number and size.

2. The principal morbid symptom accompanying cerebellar atrophy is inco-ordination of movements, but this is not a constant phenomenon since it may be lacking in some cases.

3. The latency of the ataxia in cerebellar atrophy may be explained by a normal structure of the organ while it is diminished in size, or to an augmented functional activity of such of its parts as are not subject to the morbid process, or to the integrity of the vermis, or lastly to conscious voluntary effort by which the cerebrum makes up for the lacking co-ordinating activity of the cerebellum.

4. Disorders of cutaneous sensibility are not present in atrophy of the cerebellum.

5. It is erroneous to locate the sexual appetite in the cerebellum.

Changes in the Cutaneous Nerves in a case of Vitiligo.—The pathological anatomy of vitiligo, especially the changes occurring in the cutaneous nerves, has hitherto received but little attention; a fact which will increase the interest in the following observation reported by MM. Leloir and Charrier. The patient was a man, twenty-three years of age, who had been attacked three years before with vitiligo, and who, during infancy, had suffered from various skin affections, such as impetigo, pemphigus, psoriasis, etc. Eight years previously he had contracted syphilis; five years afterward ulcerations appeared on the penis, and their vicinity was shortly marked by large characteristic spots of vitiligo. These spots surrounded by deeply pigmented circles, increased in size, and new ones appeared in consequence of the irritation of the skin by the application of medicinal substances. This led M. Fournier to believe that the affection was of nervous origin. A small piece of skin was removed from a three year old patch, situated on the lower portion of the abdomen, and submitted to MM. Leloir and Charrier for examination. They found that a large number of the nerve fibres were greatly changed, presenting distinctly the lesions of nervous atrophy. These changes pointed to the fact that there had been a slow degenerative process. Besides the nervous lesions, it was also shown that the epidermis was greatly thinned; the papillæ had entirely disappeared, and the corneous layer alone remained. Is this an exceptional case, or are these lesions always present in vitiligo? If they are present in all cases, this disease resembles other trophic troubles of the skin—for example, anæsthesic leprosy and certain forms of pemphigus.—*Le Courrier Medical.*—*N. Y. Med. Record*, Feb. 21, 1880.

SECONDARY SYPHILITIC EPILEPSY.—Fournier, in an article on this subject in the January number of the *Annales de Dermatologie et de Syphilographie*, says, that epilepsy occurring in the earlier stages of the evolution of syphilis shows very different symptoms from that variety due to lesions of the brain, and which ordinarily occurs in the latter stages of the disease. The latter is well known, and has been described by himself in his recent work on syphilis of the brain. After giving notes of three cases out of a dozen which he has observed, Fournier gives the following conclusions:—1. It is impossible to regard the symptoms shown as due to any other cause than syphilis, for these attacks occur for the first time in adult age, while non-syphilitic epilepsy begins in youth; non-syphilitic epilepsy does not begin and end abruptly. Again, in syphilitic cases, such exciting causes as lead or other poisoning, alcoholism, worms, etc., may be excluded. Thus, syphilis only will account for the symptoms. 2. In every case observed, the epileptic attacks have occurred in the earlier months of the secondary stage, just when nervous troubles are commonest, and most of the cases have been women, who are particularly liable to nervous syphilis. 3. The epileptic attacks occur simultaneously with the appearance of various other syphilitic manifestations, as skin troubles, adenopathy, alopecia, cephalalgia, insomnia, neuralgic pains, etc. 4. The epileptic symptoms pursue a parallel evolution with the other syphilitic symptoms. They appear when these are at their worst, they grow better as these improve. 5. As to the curative influence of specific treatment, in each of the cases noted by Fournier the epileptic disease was rapidly and certainly cured by the administration of mercury.

Finally, the appearance of epilepsy at this stage of syphilis is not surprising. Secondary syphilis is exceedingly fertile in nervous troubles. In some individuals, notably in women, it gives rise to a state of general nervous disturbance. There appears to be a condition of erethism, which seems to accumulate until it discharges itself in a series of epileptic attacks. In a future communication Prof. Fournier intends to show the distinction between this secondary form of epilepsy and the tertiary form.—*Phil. Med. Times*, March 13, 1880.

THE ETIOLOGY OF TABES DORSALIS.—Berger, *Breslauer Zeitschr.*, 1879, No. 8, p. 70 (rep. in *Deutsche med. Wochenschr.*), offers some points as to the etiology of tabes, derived from an analysis of one hundred and eighty-five observations of typical cases. The proportion of men to women was one hundred and forty-five to forty, or three and six-tenths to one. In eighty-three per cent. of the cases, the disease began between the ages of thirty and fifty. The author considers sexual excess at most only a predisposing cause; the principal exciting causes are exposures to chill. The question, Whether there is a syphilitic locomotor ataxy? he believes must be answered in the affirmative. Among his cases he found twenty per cent. syphilitic. In several cases, tabes was developed a short time (six months to two years) after syphilitic infection, without any other apparent cause; and in a comparatively large number he obtained notable though only palliative effects from specific treatment; and in one case, of a retired officer, treated ten years previously, who had most marked disturbances of sensibility and coördination, he obtained a definite cure. If, therefore, in suitable cases, a specific treatment is employed at the right time, the prognosis of tabes may be considered more favorable than it has been heretofore.

Some peculiarities of great interest in the clinical history of ataxy are recorded by the same author in the *Centralbl. f. Nervenheilk.*, etc., No. 5, 1880. In a number of cases, the exact state of cutaneous sensibility had been noted some years since. At the time of first observation it was found reduced, sometimes to anæsthesia. Since that time the disease had progressed, but *the sensibility of the skin had again increased*, in some instances even up to the normal standard. Indeed, Berger has seen hyperalgesia take the place of a former anæsthesia.

The sensibility of the subcutaneous tissues, for instance, the muscles, had not been altered. In one well observed case of clear ataxia, Berger has also seen the tendon-reflex become reëstablished after a total absence of it for some years. The patient had been treated for some months with nitrate of silver, and daily baths at 24.30° C., and had improved in all symptoms.

Cerebral Anomalies.—At a recent meeting of the Philadelphia Academy of Natural Sciences, Dr. A. J. Parker stated that Dr. Mills had lately found, while examining the brains of a white person, that the central fissure ran completely into the sylvian fissure, without any bridging convolutions. This was the third record of such an occurrence, and had an important bearing on the morphology of the convolutions. Bischoff's theory regarding the arrangement of the fissures and convolutions was criticized in this connection; and the opinion was expressed that the fissure of Rolando must be assigned to a position with the frontals.—*N. Y. Med. Record*, Jan. 24.

Recurrent Headaches in Children.—Dr. Francis Warner, *Brit. Med. Jour.*, Dec. 6, calls attention to the frequency of recurrent headaches in children, and describes the objective signs by which he claims to recognize these cases. In a large proportion of cases the teeth were found flattened on their edges, as the result of "tooth-grinding"; the teeth mostly ground were the incisors and canines, but the special teeth flattened depended upon their arrangement in the jaws. The pupils were measured in some cases with a catheter-gauge, after the manner suggested by Dr. Hutchinson. No special conclusion was arrived at; on the average, they were not large, except in a few cases near the age of puberty.

A certain facial expression, indicative of depression, was often observed, and, when seen, appeared to give strong evidence characterizing the child as the subject of recurrent headaches. To analyze this condition of the face the faces of adults, the subjects of migraine, were studied. The most noticeable point was the look of depression, and heaviness and fullness about the eyes, especially the under eyelid. If a paper were held so as to cover either half of the face, the expression observed still remained, proving the condition of the face bilateral; if the forehead above the eyebrows was covered, or the face below the lower margin of the orbit, in each case the expression seemed still apparent; while, if the paper was held so as to cover that portion of the face which lies between the eyebrows and the lower margin of the orbit, it seemed impossible to recognize the peculiar *facies* under consideration. If these observations be confirmed, it appears that this expression must be due principally to the condition of the orbicularis palpebrarum. Specially observing this muscle, and the parts adjacent, there seemed to be a loss of tone in the muscle; there was an appearance of fullness and flabbiness about the lower eyelid; the skin hung too loose, with an increase in the number of folds; and, in place of falling against the lower eyelid neatly, as a convex surface, it fell more or less in a plane from the ciliary margin to the lower margin of the orbit, a condition that is often best seen by looking at the patient's face in profile. This condition of the parts about the eye was unaccompanied by any general changes in the skin of the face, such as the flabbiness seen in emphysema and the loose inelastic skin of senile decay; further, the facial expression is not at all necessarily permanent, but may disappear with improving health. It is not suggested that this muscular condition only accompanies headache; it appears common to other conditions of depression.

A peculiar passive condition of the hand was also frequently observed. When the hands were held out the wrists drooped slightly, thus being partially flexed upon the forearm; at the same time, the first phalanges of the fingers were extended backwards upon the metacarpus, the second phalanges being slightly flexed, and the ungual phalanx either flexed or kept in a straight line with the middle phalanx. This may be the position of all the phalanges equally or in a varying degree. The thumb is usually simply extended backwards, and somewhat abducted from the fingers. Such a cramped position of the hand appears to be very common in those nervous children who suffer from recurrent headaches. The same thing is often seen in those convalescent from chorea. This position of the hand is exactly represented in the statue of the Venus de' Medici, at Florence, being used by the unknown sculptor to represent feminine coyness.

Having attempted to demonstrate that we may ascertain something of the condition of the brain by observing these muscular movements, we may now look for signs of irritation of the cranial nerves. Evidence of the motor division of the *fifth nerve* is seen in the great frequency of tooth-grinding; the condition of the muscles supplied by the facial and hypoglossal nerves has been referred to. Irritation of the pneumogastric nerve appears to be indicated by many symptoms. The varying appetite, which is often voracious, though nutrition is deficient, while at other times it is markedly defective; the frequent epigastric pains, and the retching or vomiting with headache, appear to indicate disturbance of the gastric branches; occasional palpitation without heart-disease, and the frequent hacking cough without signs of lung or throat mischief, indicate probable irritation of the cardiac and respiratory branches.

As to the disturbance of sensory nerves, it was difficult to obtain evidence, as the patients were often unable to describe their sensations with accuracy. In five cases, varying from nine to fourteen years of age, distinct dysæsthesia of vision accompanied the attacks of headache, the patient seeing colors, sparks, or other illusions during the attack of headache; in all but one case the mother also suffered such spectra with headache.

As to the condition of the higher nerve centres, we must look to the mental state and conditions of sleep; as to these points, some account has already been given. Disturbed and restless sleep was very common; night terrors were frequent; often the child would scream out, that "a lot of people are coming to kill him," that he "saw the school-board man" coming, etc. In six cases, there was the distinct history of somnambulism; in four of these the acts performed during sleep had been complicated and curious; in one case, that of a boy nine years old, such attacks were frequent at the time he came under observation on account of his headaches; in the remaining cases, somnambulism had occurred at an earlier period.

Seeing that these cases resembled chorea in the amount of irregular muscular movement, other points of similarity were looked for. The history of rheumatism in the individual or in the family was very unfrequent; so, also, was the presence of heart disease. As in chorea, so here, the urine was often of high specific gravity, reaching up to 10.30, 10.35, and so loaded with urea as to crystallize readily on the addition of an equal bulk of nitric acid. Uro-hæmatin was found to be abundant in many cases; the urine, when floated on sulphuric acid, developing a deep red or purple color at the junction of the fluids; this test was applied in cases not under the influence of bromine or iodine. Dr. Geo. Harley has shown that the amount of uro-hæmatin is dependent upon the amount of tissue consumption in the body.

In seeking the lines of causation of recurrent headaches in children, the cases were arranged in a tabular form, according to age and sex:

Ages......	......	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	12–13	13–15
Males.....	25	1	2	2	8	2	1	2	2	4	1	0
Females ..	33	0	2	3	1	2	5	5	4	2	4	5
Totals..	58	1	4	5	9	4	6	7	6	6	5	5

As among other groups of nervous cases, the preponderance of number is with the female sex. Heredity appeared to produce a marked predisposition to this neurotic condition. There was a history of recurrent headaches in the mother in twenty-four cases, and in the father in eight, while in three cases there were examples of insanity in the family. As to treatment, the restless, excitable condition of these children, and the great want of rest in sleep, appeared to indicate the use of bromides and other sedatives; and this plan of treatment was generally adopted, tonics being occasionally used, together with small doses of chloral at night for short periods, till the habit of sleep was induced. Following upon such treatment without any hygienic change, marked improvement occurred in many cases, the child gaining one or two pounds in weight in a month or six weeks, at the same time losing the headaches, sleeping quietly at night, and again becoming fit for a child's school-life. It must, however, be acknowledged that many cases relapsed on discontinuing the treatment.

Paralysis Agitans.—In a typical case of paralysis agitans which had been under observation for many years, M. Demange, ***Rev. Méd. de l'Est***, Oct. 15, 1879 (abstr. in *Revue des Sci. Méd.*), found the cord and brain revealing no microscopic abnormalities, but in making sections at different heights and hardening them in chromic acid, he and M. Barabin were able to demonstrate microscopically the following lesions: a peri-ependymitis with obliteration of the ependymal canal, an irritation of the posterior roots, sclerosis of the columns of Goll, and a very slightly marked disseminated interstitial myelitis at some points of the white antero-lateral columns. These agree in part with what had been already observed by Joffroy.

The obliteration of the ependymal canal is of slight importance, in the author's opinion, but the peri-ependymal inflammation, and the pigmentation of the cells of the vesicular columns of Clarke, that had been noticed by Joffroy, are important. They indicate that the inflammatory process is concentrated on the sensory system of the cord, and on its analogue in the medulla. It is true that we have as yet no anatomical demonstration of this process in the medulla, but M. Demange believes it will be found there.

If marked disorders of sensibility, such as anæsthesias as in ataxia, are not observed, it is because the morbid process in this disease seems to stop short of actual sclerosis. There is a permanent excitation of the sensory roots, causing, in a reflex way, automatic movements of the muscles innervated by the corresponding motor branches. These movements are unconscious, as they are not due to cerebral action. The will still retains some control over the tremor, but if a hemiplegic attack occurs in a patient with paralysis agitans, so that the internal capsule is involved, it loses this power.

M. Demange adduces a case in support of this manner of view. A man 58 years of age was suddenly taken with the symptoms of paralysis agitans, following a sudden emotion; two years later he suffered from a hemiplegic attack affecting the whole left side, and during several days could perform no voluntary movement on that side, but the tremor was in no way diminished. He recovered his motor power to some extent, but the trembling persisted and progressively increased. He rejects the idea that he had here anything like post-hemiplegic chorea, but claims that the cerebral hemorrhage occurred during the existence of true paralysis agitans.

As regards the lesions found in this disorder, he does not hold that they are necessarily primary, but thinks the functional trouble may precede them for a considerable time, and this may be the explanation of the frequent negative findings in autopsies of this disease.

The Temperature in the Paralytic Insane.—The following are the conclusions, from an analysis of the observation of thirty-four cases, by Dr. Kroemer, of Halle, in *Allgem. Zeitschr. f. Psychiatrie*, XXXVI., II. and III. Hft.:

1. The general temperature of paralytics is usually and on the average lower than in sound persons.

2. The temperature curve exhibits a certain undulatory movement, the longer undulations with slight daily variations corresponding to the greater degree of psychic quietude and equable conditions, and are more common in the melancholic, tabetic, and stupid forms of paralysis. The shorter undulations, with greater daily variations, correspond to the accidents of general paralysis, which may be pronounced paralytic convulsive attacks, or instead of these, occasional irritative conditions or temporary exacerbations of the psychic and motor disorders, which clinically indicate the same thing.

3. In the last stages there is a marked vacillation of the existing higher temperature, with great daily variations, corresponding to the general predominating paralytic symptoms.

4. The paralytic accidents are always accompanied with rise of temperature, the higher the severer the convulsive phenomena of the attack. As a rule, before the attack it is low, and the first minutes after the attack it falls still lower, an expression of the cerebral irritation by which the attack was produced.

5. In those paralytics in whom the paralytic phenomena are very pronounced, the general temperature is higher, likewise in those in whom, on account of vaso-motor paralysis, stasis in the vascular system has already taken place.

THE following are the titles of some of the recently published papers on the Pathology of the Nervous System and Mind, and Pathological Anatomy:

BECHTEREW, On Lesions of the Motor Zone of the Brain, *St. Petersb. med. Wochenschr.*, Dec. 27, 1879, and Jan. 3, 1880.—COWLING, Influence of Shock on Memory, *Am. Pract.*, Jan.—CLEVELAND, Relation of Epilepsy to Insanity, *Lancet & Clinic*, Jan. 17.—SHAW, General Paralysis of the Insane, Clinically and Pathologically considered, *Proc. Med. Soc. Co. of Kings*, Jan. —BENNING, Hystero-Chorea, *Med. & Surg. Rep.*, Dec. 6.—ATKINSON, Some Phases of Cerebral Syphilis, *Va. Med. Monthly*, Dec., 1879.—MOSSDORF, A Case of Aphthongia, *Cbl f. Nervenheilk.*, Jan. 1.—CLARKE, Epilepsy, *Canadian Jour. of Med. Sci.*, Jan.—SCHULTZE, On the Spinal Affections produced by Suddenly Lowered Atmospheric Pressure, with Remarks on Secondary Degeneration.—On Combined Columnar Degeneration in the Spinal Cord, *Virchow's Arch.*, LXXIX., I.—SHAW, Phthisis as it Affects the Nervous System, *Proc. Med. Soc. Co. of Kings*, Dec., 1879. — ARMAINGAUD, Clinical Researches on the Causes of Hysteria, *Jour. de Médecine de Bordeaux*, Dec. 13. — MACKENZIE, Cases of Cerebral Disease, *Lancet & Clinic*, Feb. 14.—CROTHERS, Clinical Studies of Inebriety, Disease versus Vice, *Med. & Surg. Rep.*, Feb. 21.—REINHARDT, Salivation in the Insane, *Centralbl. f. Nervenheilk.*, Nov. 1879.—ARNOLD, Obscure Affections of the Nervous System, *Maryland Med. Jour.*, Feb.—HUGHLINGS-JACKSON, Remarks on Tumors of the Cerebellum, *Brit. Med. Jour.*, Feb. 7. 1880.—TAYLOR, Clinical Notes on Syphilitic Sciatica, *N. Y. Med. Jour.*, Mar., 1880.—MITCHELL, The True and False Palsies of Hysteria, *Med. News & Abst.*, Feb.—GOWERS, The Gulstonian Lectures on Epilepsy, *Brit. Med. Jour.* (Cont. Art.)

c.—THERAPEUTICS OF THE NERVOUS SYSTEM AND MIND.

SUTURES IN DIVIDED NERVES.—Dr. W. C. Dabney, *Va. Med. Monthly*, Jan., in a paper entitled "Sutural Re-union of Divided Nerves," after a brief recapitulation and discussion of some of the principal published facts, comes to the following conclusions:

1. The effects of nerve section and nerve irritation are very dissimilar, but have generally been confounded.

2. Nerve section causes a very gradual degeneration of the peripheral portion of the nerve and of the muscles to which it is distributed (if it is motor in function)—several months usually elapsing before such a result occurs.

3. If re-union of a divided mixed nerve takes place, sensation is usually recovered first and motion more slowly—the irritability of the muscles returning gradually.

4. The two ends of a divided nerve should be approximated as nearly as possible; but re-union has several times occurred in young subjects when the ends were an inch or more distant from each other.

5. It is advisable to stretch the two portions of a divided nerve in order to approximate them more closely if they are far removed from each other.

6. Sutural re-union may be practiced several months even after the division of a nerve, so long as a trace of muscular irritability remains, and the peripheral portion contains nerve fibres.

7. Small, carbolized catgut sutures are preferable, and the nerve sheath only should be pierced.

THE EFFECTS OF CHLORAL—At the meeting of the Clinical Society of London, held January 9th, the committee appointed by the society to investigate "What deleterious effects follow the prolonged and continuous use of chloral in ordinary doses," reported that seventy special replies and three printed papers had been received in reply to nearly one thousand circulars, distributed throughout the profession, followed a few months later by a second appeal, made public through the freely accorded medium of the medical press. Twenty-nine answers stated that, after extensive experience of chloral, in long-continued doses, no ill effects had been observed. Ten of these correspondents had special opportunities for observation afforded by asylum practice; and M. Curgenven, Dr. Theodore Williams, Dr. William Squire, Dr. Buzzard, Dr. Clifford Allbut, and others, furnished cases in which chloral had been regularly and beneficially taken for periods varying from two to ten years. Before proceeding to analyze the replies received from those who had observed inconvenient effects to follow the use of chroral, the committee had drawn up a brief summary of what had already been recorded on the subject. Their special information was arranged under the various headings of the schedule.

A. *Nervous System.*—Fourteen answers recorded cases in which nervous debility, mental enfeeblement, and convulsive seizures appeared to follow the use of chloral; Dr. Maudsley, Dr. Christon, and Dr. Lindsay expressing themselves as strongly opposed to its employment in insanity. B. *Circulatory System.* —Two answers, under this heading, noted some cardiac enfeeblement. C. *Digestive System.*—Six replies mentioned digestive disturbance as occasionally following the administration of chloral. D. *Cutaneous System.*—Nine correspondents gave the details of cases in which they observed itching of skin, lichenous eruption, with deep flushing of face and head, following the taking of stimulants. E. *Urinary System.*—Two replies indicated the possibility of urinary irritation being produced by chloral. Inquiry amongst some of the leading druggists of the metropolis had not established the probability that there was any remarkable abuse by the public of the facilities of purchasing any quantity of chloral. The drug was not included by the legislature amongst those the sale of which was guarded by the name and address of the purchaser being required to be registered by the vendor. In conclusion, the committee expressed their regret that, in spite of repeated appeals to individuals and the profession by circular and through the medical press, they had failed to obtain any more definite information than that contained in the report; and, although the opinions expressed by numerous gentlemen of experience would doubtless be received with the respect which was their due, the committee would have been glad if more facts, from which definite conclusions might have been drawn, had been placed at their disposal. Dr. Bristowe drew attention to the absence from the report of any expression of the views on the subject held by members of the committee, and thought that it would have been much increased in value if it embodied the experience of Dr. Andrew Clark and Sir William Jenner. Dr. Henan had noticed an erythematous condition of the skin following the administration of chloral. Dr. F. Taylor recorded a case in his own experience of a gentleman aged 84, who had taken nightly doses of twenty-five to fifty grains of chloral with benefit. There were no bad symptoms, and digestion was unimpaired. The patient suffered from enlarged prostate and cystitis. He had, however, noticed that semi-unconsciousness and delirium were present at night. He regretted that the report did not record the ages of the patients who had been observed. Dr. Farquharson said he feared that detailed evidence would unduly increase the bulk of the report, but that the ages would be included in it. Sir William Jenner, he added, had no personal experience to give in relation to the question; but Dr. Andrew Clark had promised the histories of five or six cases which had been under his immediate observation, and these would be incorporated in an appendix to the report.—*Brit. Med. Jour.*, Jan. 24, 1880.

Hyoscyamia.—At a stated meeting of the New York Therapeutical Society, held February 13, 1880, reported in the *N. Y. Med. Record*, March 27, Dr. E. C. Seguin made a report on hyoscyamia as a hypnotic and an anti-spasmodic, which was divided into four parts: 1. A brief sketch of the history of our knowledge of the drug, and a summary of the conclusions and the views of physicians who have used it; 2. A relation of his own experience in testing the value of the drug as a hypnotic; 3. The relation of cases showing the power of hyoscyamia as an anti-spasmodic; and 4. Provisional conclusions respecting its utility—and the best modes of administration.

The following were among the more important points noted in the first division of the report: The reliable preparations were made by E. Merck, of Darmstadt, and were two: a colored resinous extractive, $7 a drachm, and a white crystallized substance, 75 cents a grain. The physiological effect of hyoscyamia was very like alcohol intoxication. It was a sedative to the heart, and was useful in convulsive affections. It was excreted through the urine. Reference was made to various writings upon the action of the drug, notably those of Lawson, of the West Riding Hospital, in the 6th vol. of reports, 1876. In the second division, clinical experience was given in the use of the drug as a hypnotic. It had been found most beneficial in acute and sub-acute mania. There was a singular unanimity of opinion with regard to the uselessness of the drug in melancholia. Dr. J. C. Shaw had favored him with the report of cases, and concluded by saying that he regarded it as a most valuable medicine, and certain in its action in acute mania, outside and inside of the asylum. He had used it in doses of one-fourth to one-half a grain of Merck's crystallized alkaloid. Cases illustrating its favorable effect were contributed by Dr. A. B. Ball, who obtained prompt results by the use of Keith's preparation; by Dr. F. P. Kinnicutt, who administered doses of $\frac{1}{50}$ of a grain of Merck's crystallized alkaloid twice a day in a case of delirium tremens; Dr. Andrew H. Smith gave $\frac{1}{50}$ of a grain of the crystallized alkaloid to a patient suffering from restless delirium and about to be removed to an asylum; by Dr. E. C. Seguin, who used hypodermically from $\frac{1}{60}$ to $\frac{1}{25}$ of a grain of the crystallized substance in a case of morbid dreams, with very satisfactory results. In the third division, hyoscyamia as an anti-spasmodic or paralyzing agent was considered and the conclusion reached that it was a powerful though temporary anti-spasmodic. Dr. Seguin had used it in one case of paralysis agitans, and it was the only remedy which he knew had the power to do good in that affection. He also reported a case of rhythmical hysterical spasmodic hammering, prolonged for two months, the patient sometimes striking 100 blows with the hand to the minute, which was subdued by doses of $\frac{1}{100}$ of a grain of the crystallized substance. A case of chronic chorea was contributed by Dr. R. W. Amidon in which he used $\frac{1}{75}$ of a grain of the crystallized substance hypodermically, with good effect, giving the patient quiet, which he had not had for eight years.

Provisional Conclusions.—1. It acted upon the pupil as a mydriatic.

2. It reduced the pulse gradually and increased arterial tension.

3. It checked body heat.

4. It produced hallucinations and delirium.

5. Its use was occasionally attended by rash.

6. In large doses it produced sleep, and something like paralysis or paresis, and might induce retention and dysuria.

7. Theoretically, it was indicated in mania attended by restlessness, delusions, and suspicions, and in insomnia and convulsive affections.

8. It had been of special service in acute or subacute mania, insomnia, and those cases characterized by mischievous delirium.

9. It induced sleep more certainly than chloral, and without being followed by bad effects.

10. In paralysis agitans it could do what no other remedy could do.

11. It was a diuretic of no mean power.

12. The curative power did not seem to be great.

In acute chorea its use may play an important part.

Mode of Administration and Doses of.—It could be given in small doses with ease hypodermically. The doses were from $\frac{1}{20}$ to 1 grain of the amorphous, and from $\frac{1}{100}$ to $\frac{1}{25}$ of a grain for hypodermic use. Distinct effects might be obtained from $\frac{1}{100}$ of a grain.

The following formula was given for hypodermic use:

℞ Hyoscyamia (Merck's crystallized), - -	gr. i.
Glycerine, - - - - - - -	
Water, - - - - - - - - - -	$\overline{aa}$ m 100.
Pure Carbolic Acid, - - - -	gtt. i.

Each minim contains $\frac{1}{200}$ of a grain. Tablets containing $\frac{1}{50}$ of a grain were convenient for use by the mouth.

The report being before the Society—

Dr. E. R. Squibb remarked that, although not in the way of acquiring experience in the clinical use of the drug, he felt that he could support all that Dr. Seguin had stated. It had been used in several insane asylums, though generally not as a curative agent, but as a chemical restraint. He had only one suggestion to make in addition, and that was with regard to the same effects produced by different sized doses. He had some testimony that the amorphous substance was about as good as the crystallized alkaloid of Merck. In speculating upon what might be the cause of the difference in size of doses that had been found efficacious, he had been led to think that the difference in result had been produced by the difference in the *alkalinity* of the secretions with which the drug came in contact. It was easily split up by alkalies, so loosely was it crystallized, and therefore rendered inert in a great measure by their action. It was possible, as a matter of speculation, that that was one of the causes why different doses were required to produce a desired result. It was one of the most unreliable of drugs when put into the stomach, and he had been led to believe that that fact was due to two causes: 1. Because of the difference in alkalinity of the secretions found in the stomach; and 2. The influence exerted by the digestive processes of the stomach. It was well known that many of the alkaloids were loose in their molecules, and hyoscyamia the most so of all, and therefore the experimentations of the committee in the way of hypodermic injection of the drug were most important. The drug when put into the stomach, must, he believed, be very unreliable, because of the nature of the secretions with which it came in contact. Dr. Squibb thought that Merck's preparation was a chloride. Both the crystallized and the amorphous form were *salts* of hyoscyamia and not alkaloids. So far as he knew, Dr. Kempster, of Oshkosh, Wis., never administered the salt by the mouth; and Dr. Gray, of Utica, also stated that when the system did not respond to it when it was put into the stomach, effects had readily been produced when it was used hypodermically.

Dr. Seguin remarked that his preference was for the hypodermic method.

Dr. Squibb further remarked that Dr. Kempster believed that hyoscyamia did not produce sleep by a narcotic action, but by abstracting the condition which prevented sleep. It frequently produced quietness without producing sleep, and when sleep followed it was because bad dreams and delusions, etc., were removed, and thus the patient allowed to go to sleep.

Dr. Andrew H. Smith remarked, that he had taken $\frac{1}{50}$ of a grain for the purpose of studying the effect of the drug. Taken into an empty stomach on going to bed, it produced great drowsiness, dryness of the throat, sleep was not continuous, and on the following morning he had some nausea, disinclination to eat, and a general feeling as if a dose of morphine had been taken. There was also some difficulty in the power of accommodation.

Action of Nitrite of Amyl on the Vessels. — The statements of different observers who have studied the action of nitrite of amyl vary considerably, both with regard to the vessels affected—some stating that only the arteries, and others that all the blood-vessels, are dilated—and with regard to the degree of dilatation. With a view to settle these disputed points, Dr. Gospey, of Heidelberg, undertook a series of experiments on curarized frogs, with the following results:

1. Observations on the uninjured tongue showed that the action of nitrite of amyl on this organ is very marked, and is developed very rapidly, and that it affects both arteries and veins. The effect of the drug was noticeable immediately after the inhalation was begun, and continued to increase for about two minutes. The duration of the action depended upon that of the inhalation. When this was continued about two minutes, the vessels returned to their normal calibre in from ten to fifteen minutes. The degree of the dilatation of the vessels amounted at most to one-third of the original diameter. The rapidity of the blood current remained about the same; in the first minute it often seemed somewhat increased, but always fell back soon to the normal point. To determine whether the nitrite of amyl acts also on already dilated vessels, the intact frog's tongue was irritated with a one-and-a-half per cent. solution of common salt, which, according to Thoma, causes dilatation of the vessels and increased rapidity of the blood stream. It was found, then, that the dilatation produced by the amyl amounted at most to one-fifth of the previous diameter of the vessels.

2. Observations on the intact web of the frog's foot showed the same changes as in the tongue during the inhalation of amyl, but the dilatation was less marked, although it appeared as soon and lasted about as long. The blood current was at first more rapid, but soon became much slower, and sometimes the blood stagnated entirely.

3. Observations on the tongue, after it had been cut with a knife, showed the same changes in the vessels as in the uninjured tongue. Vessels that had been divided and had ceased to bleed under irrigation with the salt solution, began to bleed again when the amyl was inhaled. The migration of the white blood-corpuscles was not affected by the inhalations.

4. Observations on the mesentery showed the same changes as in the tongue. As in the web of the foot, the blood current was at first, and for a very brief period, more rapid, and then became for a time slower than normal.—*Medic.-Chir. Rundschau*, Nov., 1879.—*Med. Record*, Feb. 28, 1880.

THE RELATIVE PARALYZING ACTION OF ATROPIA AND PILOCARPINE ON THE HEART.—Sidney Ringer, M. D., and E. A. Morehead, L.R.C.P., in the *Journal of Physiology*, Vol. II., No. 4, draw the following conclusions from an experimental investigation on the relative paralyzing action of atropia and pilocarpine on the heart.

1. Sulphate of atropia topically applied is almost as powerful a paralyzer of the heart as pilocarpine.

2. Atropia paralyzes either the excito-motory cardiac apparatus, or the cardiac muscle, or both these structures.

3. Extract of muscarin paralyzes the cardiac muscular substance and probably the excito-motory apparatus.

4. In part at least, atropia antagonizes the action of muscarin by possessing for the cardiac structures (excito-motory apparatus and cardiac muscle) a stronger affinity than muscarin, whereby atropia, a cardiac paralyzer, replaces muscarin, also a cardiac paralyzer; but atropia has a far weaker paralyzing action than muscarin; hence when atropia replaces muscarin in the cardiac structures, the powerful paralyzing effect of muscarin is replaced by the far weaker paralyzing effect of atropia; and so a heart weakened or arrested by muscarin becomes strengthened, or commences to beat again, on the addition of atropia.

5. Pilocarpine, which weakens or arrests the heart, also antagonizes the action of muscarin, which still more powerfully paralyzes the heart. We suggest the same explanation for this antagonism as for the antagonism of atropia for muscarin, namely, that it is due to chemical displacement. Pilocarpine having a stronger affinity for the excito-motory apparatus and for the muscular substance, displaces muscarin and substitutes its own weaker paralyzing action for that of muscarin.

6. Our experiments do not show that the antagonism between atropia and muscarin is not in part due to their antagonism on the inhibitory apparatus. In which case atropia, having a stronger chemical affinity for the structures of the inhibitory apparatus, displaces muscarin and substitutes its paralyzing action for the stimulant action of muscarin.

MORPHIA AS AN ANTIDOTE TO ACONITE.—Dr. A. Clark (*N. Y. Med. Record*, January 3,) gives an account of a case in which he was called in consultation to a woman who had taken a small (unknown) quantity of tincture of aconite, and who was pulseless at the wrist, skin cold, features pinched and bloodless, and heart feeble and slow. She seemed almost *in extremis*, was exceedingly restless, and could retain nothing on the stomach or bowels. After trying ineffectually to obtain a pulse by an enema of brandy and water which was at once rejected, fifteen drops of Magendie's solution was injected hypodermically to quiet the restlessness. The effect was unexpected and almost magical; the restlessness was gone within five minutes, and in ten minutes more she was quietly sleeping. The pulse returned at the wrist. The patient slept from 10:30 P. M. till 4 A. M. and then awoke with a repetition of the vomiting and purging, and restlessness, but was again quieted with ten drops more of the hypodermic injection. At 8 A. M. she complained of nothing but weakness and soreness of muscles from their agitation the previous evening.

The case had been previously published from imperfect notes, but the report of a similar case by Dr. O'Brien in the *Record* for February 8, 1879, caused its republication with corrections.

BLOOD-LETTING FOR HEADACHE.—J. Brown, L. R. C. P. (*Brit. Med. Jour.*, January 3) reports three cases of persistent congestive headache with insomnia, not relieved by chloral, bromides, etc., which were completely cured by abstraction of sixteen to twenty ounces of blood without other remedies. The symptoms were those of venous congestion of the brain, fullness of the jugular veins, injection of conjunctiva, and in one case, in which ophthalmoscopic examination was made, distension of the retinal veins was observed. Leeching alone was ineffectual, as only a rapid abstraction of blood gave immediate relief.

NERVE-STRETCHING IN LOCOMOTOR ATAXIA.—Langenbeck gives (*Berliner Klin. Wochenschr.*, No. 48, 1879, (abst. in *St. Petersb. med. Wochenschr.*) an account of a case of pronounced tabes dorsalis dolorosa in which the fulgurant ataxic pains resisted all sedatives, treated with the best results by stretching of the left sciatic nerve. The wound treated antiseptically, healed by first intention, the motor and sensory disturbances ceased in a few days, and the pains did not return. Thus encouraged, Langenbeck operated on both crural nerves and the right sciatic in the same manner, with the same good results as regarded the pain. When the patient after the operation made his first attempts to walk, he asserted that he now again knew what was under his feet, and as he gradually improved in his locomotion the astonishing fact was revealed that the ataxia had completely disappeared.

This method of treating the disease by nerve-stretching is recommended by the author to be extensively tested, especially in recent cases.

THERAPEUTIC ANALGESIA PRODUCED BY IRRITATION OF SYMMETRICAL REGIONS ON THE OTHER SIDE OF THE BODY.—At the session of the Paris Académie de Médicine, November 4th last, and reported in the *Gazette des Hopitaux*, No. 128, November 6, 1879, M. Dumontpallier read a paper of which the following were the principal points as summed up at the close by the author:

1. Every hypodermic medical injection is a complex operation, in which we have the actions both of the drug and the local irritation.

2. The local irritation is transmitted from the periphery to the sensory

centres, and causes in these centres a modification, the result of which is the cessation or diminution of the peripheral pain.

3. The real anatomical seat of peripheral pains is in the sensory centres This appears demonstrated to us by the crossed action of provoked peripheral irritation.

4. The irritation provoked *loco dolenti* or in the vicinity of the painful point, calms the pain or causes it to disappear. Further, when the irritation is applied at symmetrical points on the side of the body opposite the seat of pain, this irritation often suffices to cause complete and lasting relief.

A NEW METHOD OF APPLYING ELECTRICITY IN TORTICOLLIS.—Dr. Allen McLane Hamilton describes in the *N. Y. Med. Journal* for February, under the title "The Physiological Treatment of Wry-neck," the following procedure : He takes a double covered sponge electrode, one pole of which is connected with the positive pole of a battery of twenty cells, and the other with the negative pole of an induction coil, and applies it to the back of the neck. The negative pole of the battery is applied to the insertion of the sterno-mastoid of the *affected* side, so that a descending current is passed through the muscle. The positive pole of the induction machine is placed at the corresponding point on the other side, so that that sterno-mastoid muscle receives the stimulating action of an ascending faradic current. In this way he thinks the spasmodically contracted muscle is placed under a relaxing influence of the descending constant current, while its atonic antagonist is simultaneously actively stimulated to contraction.

The use of apparatus to counteract the spasm he considers unphysiological, besides there is, he says, in many cases, an hysterical tendency which is aggravated by forcible restraint.

Two cases subjected to this method of treatment were decidedly benefited; one of them being practically cured, while the other suffered a relapse and passed out of Dr. Hamilton's hands. Another still under treatment was very much improved.

The cases most readily helped are those dependent on rheumatism and hysteria, and their prognosis is decidedly favorable. If the diagnosis of the hysterical form is certain, he says that a shower of sparks from a Holtz machine directed upon the muscle will favor a sudden disappearance of the spasm.

NICOTIN POISONING.—It was shown by Rosenthal, in 1867, that nicotin produces a comparatively permanent effect upon rabbits and frogs, since a second poisoning differs, to a certain extent, in symptoms from the first action.

This subject has now been studied further by a pupil of Rosenthal, Dr. B. von Anrep (*Archiv f. Anat. und Phys.*, Supplement, 1879, p. 167).

Using a ten per cent. aqueous solution of nicotin for subcutaneous injection, Anrep learned that $\frac{1}{200}$ of a drop of pure nicotin produces manifest symptoms in frogs. After a stage of excitement lasting three or four minutes, the animal places its fore-legs on the side of the abdomen, and retracts its hind-legs, so that the thighs form right angles with the trunk, while the flexed feet touch with the toes. This peculiar position is now retained immovably. The breathing is at first accelerated, later retarded and dyspnœic. Fibrillary twitchings, mainly in the hind-legs, now occur during the space of some 30 to 60 minutes. After their disappearance there remains a certain languor, but in the course of a few hours the animal appears perfectly normal. The intensity of the symptoms increases with the dose. Larger quantities cause, moreover, *violent clonic spasms* at once, which cease when the peculiar position above described is assumed. Such a large dose increases likewise the ultimate debility, until it amounts to actual paralysis. But recovery, if it occurs at all, is always complete in less than 40 hours. One-tenth of a drop of nicotin is the least fatal dose for a frog.

If the animal is poisoned a second time a few hours after the apparent recovery, neither the clonic spasms nor the fibrillary twitchings occur, but the paralyzing action is more marked and persistent, and death may result from a smaller dose. It is necessary to wait between three and eight days, according to the size of the first dose, before the animal reacts to the drug in the same way as the first time.

Unlike the usual accustomation to neurotics, we see here diminished susceptibility, as far as the spasms and twitchings are concerned, but exalted impressionability to the paralyzing action.

The increased paralyzing effect of a second dose the author explains on the strength of the following observations: If the heart is observed during nicotin poisoning, it can be seen that its beat is at first slackened, but hereupon accelerated. This effect is due to the action of the drug upon the vagus, as can be ascertained by cutting the nerve or paralyzing it with atropin. But independent of the vagus, which is ultimately paralyzed by nicotin, the drug causes a second slackening of the heart's action. This is due to a depressing effect upon the cardiac muscle or ganglia. The repetition of the nicotin poisoning involves the cardiac muscle more severely than the first dose, although the animal may seem to have recovered completely. Evidently the heart remains under the influence of the first dose in a latent manner, so to speak, for some days. Since the second dose thus impairs the circulation more than the first one, the poison cannot be eliminated as rapidly, and hence its paralyzing effect remains more persistent.

The reason why a second dose does not produce the spasms and twitchings could not be fully ascertained. The spasms (caused by large doses only) are tetanic, and last but a few minutes, until the animal assumes its peculiar position. These spasms are not reflex in nature, but due to excitation of the spinal cord. The twitchings are evidently both of peripheral and central origin. After division of the nerve the exposed muscles still show faint fibrillary contractions, caused by the action of the drug upon the nerve ends. But these are feeble compared with the ordinary twitchings due to excitation of the medulla, and hence not checked by cutting off the blood supply of the muscle. Experiments on the irritability of the nicotinized nerves showed that the drug enfeebles both motor and sensory fibres (or their terminations), that the sensory nerves are acted upon first and more persistently, that small doses exalt the irritability of the motor fibres slightly before depressing it, and that repeated doses affect the nerve excitability exactly like the first poisoning. Since the effect of nicotin on nerve excitability has passed off, while the animal is still in the condition in which the twitchings cannot be reproduced, the question is yet involved in obscurity; although the second dose of nicotin does not cause spasms, other agents, like strychnia and picrotoxin, act in the usual manner and dose.

THE following are the titles of a few of the papers on the Therapeutics of the Nervous System and Mind, that have appeared since our last issue:

LEVIS, The New Anæsthetic, the Bromide of Ethyl, *Phil. Med. Times*, Jan. 17. — SASSEZKI, The Action of Amyl-Nitrite on the Bodily Temperature, *St. Petersb. med. Wochenschrift*, Nov. 8.—EARLE, The Cinchona Cure for Intemperance, *Chic. Med. Jour. & Exam.*, Feb.—REED, Nitrite of Amyl —Its History, Physiological Action, and Therapeutics, *Detroit Lancet*, Feb.—PETERS, On the Therapeutic Uses of Some of the Ranunculaceæ, Especially in Nervous Diseases, *The Physician*, Jan.—ELY, Observations on the Effects of Tobacco, *N. Y. Med. Jour.*, April.—PARK, The Treatment of Exophthalmic Goitre, *Practitioner*, March.

BOOKS, ETC., RECEIVED.

Dictionnaire Encyclopédique des Sciences Médicales. Premiere Série, A–E. Tome Vingt-troisiéme, 2de Partie. Cristalline-Crusius. Paris, 1879. Pp. 353–790. Deuxiéme Série, L–P. Tome Triezième, Seconde Partie. Nourrice-Nysten. 1879. 868 pages. Quatriéme Série, F–K. Tome Cinquiéme, Premiére Partie. France (suite). Seconde Partie. France (Fin.) Paris, 1879. 892 pages.

Beiträge zur Kenntniss der Endigung der Sensiblen Nerven. Von Vicente Izquierdo, Dr. Med. Mit drei Tafeln. Strasburg, 1879. 80 pages.

Des Névroses Spasmodiques, de leur Origine de leurs Rapports et de leur Traitement. Par le Dr. E. Gélineau. 1er Fasc. Paris, 1879. 132 pages.

Les Relations Pathogéniques des Troubles Nerveux, on les Troubles Nerveux Études dans leurs Rapports Reciproques de Cause a Effet avec les antres Phenomènes Morbides. Par le Dr. Aug. Fabre. Paris, 1880. 530 pages.

Specielle Pathologie und Therapie der Krankheiten der peripheren Nerven. Von Dr. Heller. Wien, 1879. 320 pages.

Lehrbuch der Psychiatrie auf Klinischer Grundlage, für Practische Ärzte und Studirende. Von Dr. R. v. Krafft-Ebing. Band III.: Klinische Casuistik. Stuttgart, 1880. 203 pages.

Nouveau Dictionnaire de Médicine et de Chirurgie Pratiques. Tome Vingt-huitieme, Pil–Poi. Paris, 1880. 764 pages.

Ueber den Urspung der Milch und die Ernährung die Frucht im Allgemeinen. Von Dr. A. Rauber. Leipsig, 1879. 48 pages.

Maladies des Voies Digestives. Leçons Professées a la Faculté de Médecine de Paris. (Suppleance du Cours de Pathologie Interne.) Par F. Damaschino, Agrégé à la Faculté de Médecine, Médecin de l'Hopital Laennec. Receuillies par le Dr. M. Letulle, Interne Laureat des Hopitaux, et revues par l'Auteur. Paris, 1880. 930 pages.

Common Mind Troubles, and the Secret of a Clear Head. By J. Mortimer-Granville, M. D., M. R. C. S., etc. Edited, with additions, by an American Physician. Philadelphia, 1880. D. G. Brinton. 185 pages.

Spermatorrhœa. Its Causes, Symptoms, Results and Treatment. By Roberts Bartholow, A. M., M. D. Revised Edition. New York: William Wood & Co., 1879. 128 pages. Chicago: W. T. Keener.

The Hypodermic Injection of Morphia. Its History, Advantages, and Dangers. By H. H. Kane, M. D. New York: C. L. Bermingham & Co., 1880.

On the Nomenclature and Classification of Diseases of the Skin. By L. Duncan Bulkley, A. M., M. D. (Reprinted from Archives of Dermatology, April, 1879.)

A New Method of Permanently Removing Superfluous Hairs. By L. Duncan Bulkley, A. M., M. D. (Reprinted from Archives of Dermatology, October, 1878.)

Notes on the Anatomical Relations of Uterine Structures, with Surgical Remarks and Therapeutical Suggestions. By T. H. Buckler, M. D. Baltimore, Md. (Reprinted from the Boston Med. and Surg. Journal.)

On the Use of Water in the Treatment of Diseases of the Skin. By L. Duncan Bulkley, A. M., M. D. (Reprinted from the Chicago Med. Jour. and Exam., January, 1880.)

The Problem of Insanity. A paper read before the N. Y. Medico-Legal Society, March 3d, 1880, by Geo. M. Beard, A. M., M. D. (Reprinted from the Physician and Bulletin of the Medico-Legal Society.)

Gleanings from the History of Medicine. An address delivered in Evansville, Ind., Nov. 4, 1879, by J. A. Ireland, M. D., President of the Tri-State Medical Society. (Reprinted from the St. Louis Med. and Surg. Jour.)

Mechanical Therapeutics, Chemistry and Toxicology of Mercury. By S. V. Clevenger, M. D. Chicago. (Reprinted from the Chicago Med. Jour. and Exam. for April, 1880.)

A Case of Molluscum Verrucosum Presenting Certain Unusual Features. By James Nevins Hyde, A. M., M. D., Prof. of Dermatology, Rush Medical College, Chicago.

Does Spiritualism Transcend Natural Law? A paper read by W. G. Stevenson, M. D., before the Poughkeepsie Literary Club, Feb. 3, 1880.

On the Connection of the Hepatic Functions with Uterine Hyperæmias, Fluxions, Congestions, and Inflammations. By L. F. Warner, M. D. Boston, Mass. (Reprinted from the Transactions of the Am. Med. Association, 1878.)

Aspiration of the Knee Joint. By Henry O. Marcy, A. M., M. D. Cambridge, Mass. (Reprinted from Transactions of the Am. Med. Association, 1879.)

The Radical Cure of Hernia by the Antiseptic Use of the Carbolized Catgut Ligature. By Henry O. Marcy, A. M., M. D. (Reprinted from Transactions Am. Med. Association, 1878.)

Introductory Address Delivered at the Opening of the Second Course of Lectures of the Washington Training School for Nurses, by J. T. Johnson, A. M., M. D., Oct. 27, 1879.

A Case of Reproduction of the Membrana Tympani. By S. O. Richey, M. D. Washington, D. C.

A Clinical Lecture upon the Operation for Inversion of the Lower Eyelid. By F. C. Hotz, M. D. (Reprinted from the Chicago Medical Journal and Examiner for January, 1880.)

The Fallacies of Popular Clinical Medicine. By Jarvis S. Wight, M. D. An introductory lecture delivered at the Long Island College Hospital, Brooklyn, N. Y., Feb. 5, 1880.

Norris on the Discovery of an Invisible or Third Corpuscular Element in the Blood. Abstract, with a critical note, by Mrs. Ernest Hart.

Annual Report of the State Asylum for the Insane. Napa, California, 1879.

Seventh Annual Report of the Northern Hospital for the Insane of the State of Wisconsin. 1879.

Sixth Annual Report of the Cincinnati Sanatarium. 1879.

Trustees' Report of the Hospital for the Insane of the Territory of Washington. 1879.

Report of the Resident Physician of Brigham Hall. 1879.

Fourteenth Report of the Board of Trustees of the Connecticut Hospital for the Insane. 1880.

Fourth Biennial Report of the Iowa Hospital for the Insane at Independence. 1878–1879.

The Regulation of Medical Practice by State Boards of Health, as Exemplified by the Execution of the Law of Illinois. By H. A. Johnson, M. D. (Extracted from the Transactions of the Am. Med. Association, 1879.)

Address on Mental Disorders, delivered before the Medical Society of Pennsylvania, by John Curwen, M. D. (Extracted from the Transactions, 1877.)

The Cinchona Cure for Intemperance. By Chas. W. Earle, M. D. (Reprinted from Chicago Med. Jour. and Exam., Feb., 1880.)

A Protest against Meddlesome Midwifery. By H. Gibbons, Jr., M. D. Read before the San Francisco County Medical Society.

Emotional Prodigality. By C. Fayette Taylor, M. D. Read before the N. Y. Odontological Society, March 18, 1879. (Reprinted from The Dental Cosmos, July, 1879.)

Electricity in Medicine and Surgery, with Cases to Illustrate. By John J. Caldwell, M. D. Baltimore, Md. (From Gaillard's Med. Jour., March, 1880.)

Reflections upon the History and Progress of the Surgical Treatment of Wounds and Inflammations. By Edward Brock, M. D. (Reprint from Transactions Missouri State Medical Association, 1879.)

A Glance at the Past and Present Condition of the Insane. By A. M. Shew, M. D. (Extract from the Fourteenth Annual Report of the Connecticut Hospital for the Insane.)

A Plea for Cold Climates in the Treatment of Pulmonary Consumption. By Talbot Jones, M. D., St. Paul, Minn. (Reprinted from the N. Y. Med. Journal, Sept., 1879.)

The Structure and other Characteristics of Colored Blood Corpuscles. By Louis Elsberg. (Printed in the Annals of the N. Y. Academy of Sciences. Vol. I., Nos. 9 and 10.)

Responsibility Restricted by Insane Delusion. By T. L. Wright, M. D., Bellefontaine, O. (Reprint from Cincinnati Medical News, November, 1879.)

THE FOLLOWING FOREIGN PERIODICALS HAVE BEEN RECEIVED SINCE OUR LAST ISSUE.

Allgemeine Zeitschrift fuer Psychiatrie und Psychisch. Gerichtl. Medicin.
Annales Médico-Psychologiques.
Archiv fuer Anatomie und Physiologie.
Archiv fuer Path. Anatomie, Physiologie, und fuer Klin. Medicin.
Archiv fuer die Gesammte Physiologie der Menschen und Thiere.
Archiv f. Psychiatrie u. Nervenkrankheiten.
Archivio Italiano per le Malatie Nervose.
Brain.
British Medical Journal.
Bulletin Générale de Thérapeutique.
Centralblatt f. d. Med.Wissenschaften.
Centralblatt f. d. Nervenheilk., Psychiatrie, etc.
Cronica Med. Quirurg. de la Habana.
Dublin Journal of Medical Science.
Deutsche Medicinische Wochenschrift.
Edinburgh Medical Journal.
Gazetta Medica de Roma.
Gazette des Hopitaux.
Glasgow Medical Journal.
Gazetta degli Ospitali.
Gazette Medicalle de Strassbourg.
Hygeia.
Hospitals Tidende.
Journal de Médicine et de Chirurgie Pratiques.
Journal of Mental Science.
Journal of Physiology.
Journal de Medecine de Bordeaux.
Journal of Psych. Medicine.
La France Médicale.
Lancet.
Le Progrès Medical.
Lo Sperimentale.
L'Union Medicale.
Mind.
Nordiskt Medicinskt Arkiv.
Norsk Magazin for Lagensvidenskabens.
Practitioner.
Psychiatrisches Centralblatt.
Rivista Clinica di Bologna.
Rivista Sperimentale di Freniatria e de Medicina Legale.
Revue Medicale du Nord-Est.
Revue Mensuelle de Medicine et de Chirurgie.
Schmidt's Jahrbuecher der In- und Auslandischen Gesammten Medicin.

St. Petersburger Med. Wochenschrift.
The Practitioner.
Upsala Lakarefornings Forehandlinger.
Vierteljahrschrift f. d. Praktische Heilkunde.

The following domestic exchanges have been received:

Alienist and Neurologist.
American Journal of Insanity.
American Journal of Medical Sciences.
American Journal of Obstetrics.
American Journal of Pharmacy.
American Practitioner.
Annals of the Anatomical and Surgical Society.
Archives of Comp. Med. and Surgery.
Archives of Dermatology.
Archives of Medicine.
Atlanta Medical and Surgical Journal.
Boston Medical and Surgical Journal.
Buffalo Medical Journal.
Bulletin National Board of Health.
Canada Medical Record.
Canadian Journal of Medical Sciences.
Chicago Medical Gazette.
Chicago Medical Journal and Examiner.
Cincinnati Lancet and Clinic.
Clinical News.
College and Clinical Record.
Detroit Lancet.
Gaillard's Medical Journal.
Hospital Gazette.
Independent Practitioner.
Indiana Medical Reporter.
Index Medicus.
Maryland Medical Journal.
Medical Annals.
Medical Brief.
Medical Herald.
Medical News and Abstract.
Medical Record.
Medical and Surgical Reporter.
Michigan Medical News.
Monthly Review.
Nashville Journal of Medicine.
Neurological Contributions.
New Orleans Medical and Surgical Journal.
New Remedies.
New York Medical Journal.

Pacific Medical and Surgical Journal.
Proceedings of Med. Society of the County of Kings, N. Y.
Pharmacist.
Philadelphia Medical Times.
Physician and Bulletin of the Medico-Legal Society.
Quarterly Journal of Inebriety.
Richmond and Louisville Medical Journal.
Sanitarian.
Southern Practitioner.
Southern Clinic.
St. Louis Courier of Medicine.
St. Louis Medical and Surgical Journal.
St. Louis Clinical Record.
Therapeutic Gazette.
Toledo Medical Journal.
Virginia Medical Monthly.
Walsh's Retrospect.

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Original Articles, Selections and Translations.

Art. I.—MICROSCOPICAL STUDIES ON ABSCESS OF THE BRAIN.

By H. G. Beyer, M. D., P. A. Surgeon, U. S. Navy.

THE subject of my studies is a brain, the history of which is published in the Transactions of the N. Y. Path. Society, Vol. I., page 1, edited by John C. Peters, M. D.

At a meeting of this Society held on January 13th, 1875, Dr. J. Lewis Smith presented a specimen with the following history, which I will quote in detail, viz.:

"Maggie, aged two years and six months, was admitted into the Catholic Foundling Asylum on the 1st of September, 1874. She seemed in good health, was plump and well developed, and had no serious sickness. After the admission she continued well, having her usual appetite, amusing herself every day, and presenting no symptoms to attract attention till Dec. 6th. On the evening of Dec. 5th she ate her supper as usual and was placed in her crib, *apparently in perfect health.* At 3 A. M. the sister who was in charge of the ward, found her in severe general eclampsia. Immediately, in addition to the usual local treatment, she administered 5 grs. of bromide of potassium, and repeated it at intervals till six or seven doses were administered. Nevertheless, the general spasmodic movements continued with more or less violence till 1½ P. M., and in the muscles of the neck somewhat longer.

"On my arrival at the asylum at about 6 P. M., I found her lying quiet, rather stupid, but easily aroused. Her vision was evidently good, and she was conscious; the pupils responded to light, and the direction of the eyes was normal; pulse; 104; no cough; respiration natural; temperature, as ascertained by the thermometer in the axilla, also normal. There was no apparent loss of motion of the muscles of the face, but the right arm and leg were paralyzed, though the palsy was not complete. The great toe flexed on tickling the sole of the foot, but the foot itself showed little or no motion, but on attempting to flex the leg, which was extended, some rigidity of the muscles was observed. At times, the patient produced slight movement of the thigh upon the trunk. I think, during the two or three days succeeding the convulsions, sensation in the right limbs was not entirely lost, though greatly enfeebled. Subsequently paralysis in the right limbs, both of the nerves of sensation and motion, became nearly or quite complete, and continued so until death. Nevertheless, tickling of the sole of the foot caused some movements of the great toe. On the left side, sensation and motion were perfect.

"December 9th: Has vomited to-day for first time; apparently sees well, and the appearance of the eyes is normal; has no retraction of the head or rigidity of the muscles of the neck, nor along the spine; pulse, 96; temperature in axilla, normal; lies quiet with eyes shut; is stupid and not particularly fretful when aroused; her bowels moved regularly.

"December 11th: Continued to vomit at intervals; pulse 68.

"December 16th: Pulse 80, temperature 100; vomited once yesterday, not to-day. Lies in a constant doze; takes bromide of potassium, grs. iv., three times daily.

"December 18th: Moans at times, as if in pain; pulse 180, temperature 100° F.; takes bromide of potassium, grs. iv., every four hours.

"December 19th: Pulse 180, temperature 103°; there is convergent strabismus, and her eyes have a wild, almost insane look; but she can see, and grasped hurriedly a percussion-hammer presented towards her. Paralysis of nerves of motion and sensation in the right extremities nearly complete; slight movement could still be induced in the great toe by titillation; the vomiting has ceased; tongue covered with a thick fur; movements of the bowels pretty regular, has a slight cough such as is common in cerebral disease.

"December 22d: Lies quietly on her side in perpetual slumber, with eyes constantly shut; pulse 118, temperature 101½; the bowels still moved nearly normally. The pupils, when exposed to the light, were seen to oscillate, but are constantly more dilated than in health; the urine passes freely. Has at intervals circumscribed flushing of the features. A rash, like lichen, appeared over the abdomen and chest, possibly due to the large quantity of bromide of potassium administered.

"December 24th: Pulse intermittent; pupils dilated.

"December 25th: Died in profound stupor to-day, having lived nineteen days from the commencement of the malady.

"Autopsy.—Thirty hours after death, weather cool. On removing the calvarium and dura mater, which presented no unusual appearance, the vessels of the pia mater were found rather more injected than common, but not more so than we sometimes observe in those who die of diseases which do not involve the brain. The cerebro-spinal fluid was scanty, and the surface of the brain rather dry. The vertex of the left hemisphere was unusually prominent, rising perhaps half an inch higher than that of the opposite side. At the highest point, which was about one inch and a half from the median line, was a circular yellowish spot upon the surface of the brain, about one and a half inches in diameter. Pressure upon the spot made lightly, so as not to produce rupture, communicated the sensation of a large cavity underneath, filled with liquid, and approaching to within two or three lines of the surface. There was no adhesion or exudation at that point; and the surface of the brain appeared entirely normal, except slight cloudiness of the pia mater, which could be covered by a five-cent piece, at the base of the brain, a little posterior to the optic commissure. The incised surface of the brain at a distance from the abscess showed no increase of vascularity. The right hemisphere appeared in every way normal, except that its lateral ventricle was filled with pus, but not distended.

"On the left side, occupying the centre of the hemisphere, was an abscess as large as the fist of a child of two years, extending from within two or three lines of the vertex, where its site corresponded with the yellow spot on the surface of the brain, to the roof of the lateral ventricle. Through this roof the abscess had burst, filling and distending the ventricle with pus, and thence making its way into the lateral ventricle of the right hemisphere. The whole amount of pus contained in the abscess and the two ventricles was perhaps two ounces.

"The walls of the left lateral ventricle were much softened, the upper part of the corpus striatum and thalamus opticus being nearly diffluent. The walls of the right lateral ventricle were slightly softened, but to a less depth. The parietes of the abscess, which extended from the roof of the ventricle to the vertex, as already stated, were indurated to the depth of one and a half lines, in consequence of proliferation of connective tissue; except at the base of the abscess, which corresponded with the roof of the ventricle, where softening had occurred. The spinal cord, so far as it could be examined from the cranial cavity, had the usual vascularity, but was slightly softened. The diseased portion of the brain was sent to Dr. Heitzmann, immediately after its removal.

"The cause of the encephalitis from which the abscess resulted was obscure. The inflammation, so far as could be ascertained, was idiopathic, which is known to be a rare disease. There was no history of otitis, which is one of the most frequent causes of cerebral abscess; nor of heart disease so as to produce embolism. It seems probable, since there was no fever till about the fourth day after the convulsions, that an abscess had primarily occurred in the hemisphere between the roof of the ventricle and the vertex, possibly some weeks previously. The bursting of this into the lateral ventricle, and the constitutional disturbance, inflammation and softening, to which these would inevitably give rise, affords sufficient explanation of the history of the case, after the commencement of the convulsions.

"It is customary to refer the paralysis of young children to disease of the spinal cord; and if no opportunity occurs of discovering the true lesion by an autopsy, it is usually taken for granted that the malady has a spinal origin.

"This case, however, shows that sudden and incurable paralysis sometimes occurs in very young children from brain disease, as it does in the adult. Indeed, as regards the laceration and destruction of brain substance, the condition was very similar to that in severe apoplexy of the adult, which so often gives rise to hemiplegia. It is well known that in right hemiplegia of the adult, loss of speech is very common. This child lay quiet and speechless, but no attempt was made to discover whether or not speech was possible, as no attention was given to this feature of the case. Dr. Heitzmann made the following report of the microscopic appearances:

"The left hemisphere of the brain, brought to me by Dr. Lewis Smith, about half an hour after having been removed from the body of the child, was very soft. The internal membranes of the brain were in a high degree hyperæmic, and a little dim, especially on the base. On the lateral surface of the parietal lobe there appeared a yellow patch of the diameter of about one and a half inches, transparent through the arachnoid and pia mater. After hardening the specimen in a solution of bichromate of potass., I removed the upper portion of the hemisphere, when an abscess presented itself of the size of about a child's fist, located in the white substance of the hemisphere; it was divided into two parts by a segment surrounded by a wall of harder consistence than the adjacent tissue. The latter was softened by œdema.

"By applying some pressure on the wall of the abscess, a large quantity of pus issued from the open lateral ventricle, so that a communication between the two ventricles was evident. The cerebellum and the medulla spinalis presented only a softer consistence than normal.

"In the freshly removed pus were suspended a number of granular and rod-like corpuscles, which moved freely in the liquid, like the so-called micrococci and bacteriæ. Besides these, there were dispersed plaques of greatly varying sizes, composed of a number of closely situated dark granules. Most of these plaques were several times larger than ganglion globules. In some of them were observed a few indistinct nuclei.

"The largest portion of the pus consisted, of course, of pus corpuscles, with one, two or more nuclei; some of them were also without nuclei. These corpuscles when examined with a high power, showed very distinctly the structure of the protoplasm like in the colorless blood corpuscles. The only difference between the two was, that in the pus corpuscles the living matter appeared in the form of granules of a larger size than those of the blood corpuscles. Moreover, in the pus there were corpuscles corresponding in their shape and size to those of ganglion globules, with different transitions of their protoplasm into pus corpuscles, appearances which (so far as I am aware) have only been described by Meynert of Vienna, and Andrew R. Robinson of this city. Similar transitions were found in the layer of the nuclei of the grey matter of the brain, in the immediate vicinity of the abscess."

The specimen was kept in a very dilute solution of chromic acid for several months, after which time it was hardened in alcohol and imbedded in a mixture of paraffine and wax, whereby care was taken to enclose mainly the wall of the abscess and its immediate surroundings. Previous to the beginning of my studies a certain number of sections had been made of the wall of the abscess itself as well as from other parts of the brain, such as the cerebrum, the cerebellum, the medulla oblongata and the grey matter. These sections everywhere had been found holding a large number of so-called amylaceous corpuscles, exhibiting all the characteristic chemical and morphological features of these formations. No other changes could be traced out, nor did the blood-vessels show any anomalous conditions excepting the capillaries, which were found dilated and choked with blood corpuscles within the inflammatory focus as well as in its neighborhood.

I made a number of sections, both from the wall of the abscess and the surrounding portion of the brain, which sections embraced the grey matter of the corpus striatum, thalamus opticus, the cortex of the left hemisphere, also the white substance of the same, which, as is evident from the history, was the seat of the abscess. The specimens thus obtained were stained, partly with an ammoniacal solution of carmine, partly, after thorough washing out with distilled water, with a one-half per cent. solution of chloride of gold. The different sections were mounted in glycerine, half diluted with distilled water, this method of mounting, as experience teaches, being far superior to the method of mounting in Canada balsam or dammar varnish. While glycerine mounted specimens, if taken from properly hardened material, keep almost any length of time, never losing their sharp and definite outlines of detail, Canada balsam specimens, on the contrary, very soon become so transparent that their minute details are completely lost to sight, and only the coarser formations remain distinguishable. Canada balsam specimens, therefore, are fit for lower powers of the microscope only; they are worthless for a power exceeding 400 diameters, or for any power intended to give a display of the more minute anatomical features. Our lack of knowledge of the minute pathological anatomy of the central nervous organization is mainly due to the method of mounting in Canada balsam.

The subject of these investigations will be treated under the four following heads, namely: Inflammatory changes of—

1st. Wall of abscess.

2d. White substance.

3d. Non-medullated nerve-fibres.

4th. Grey substance.

I. Wall of Abscess.—Transverse sections through the wall of the abscess, which in different places varied in width from one to two millimetres, exhibited the following characteristic features. (See Figs. 1 and 2.) A layer of fibrous connective tissue (*a*) forms the boundary of the abscess, its innermost portion presenting a somewhat jagged appearance, due to a number of attached pus corpuscles. The bundles of connective tissue in this situation were partly infiltrated with, partly transformed into, pus corpuscles and were arranged in the shape of rows, between which a scanty basis substance was traceable. In their general direction, these rows corresponded to that of the bundles in the subjacent tissue stratum, which was built up by dense bundles of fibrous connective tissue in a more or less parallel course, and with but few decussations enclosing narrow, oblong spaces. These connective tissue fibres held a large number of small spindle-shaped and a somewhat larger number of globular protoplasmic bodies, the former representing what has been termed connective tissue corpuscles, the latter inflammatory elements. The meshes between the bundles contained granular layers of protoplasm, with a number of inflammatory elements, and also a moderate amount of capillary blood-vessels. In this layer all stages of newly developing connective tissue could be observed: clusters of medullary or inflammatory elements; clusters in which these elements had already assumed an oblong or spindle shape; delicate spindles, closely packed together and transformed into basis substance, with a relatively small number of protoplasmic bodies left.

Max Schultze's view, that every variety of basis substance of connective tissue—myxomatous, fibrous, cartilaginous and osseous—originates from protoplasm, now-a-days is adopted by the best histologists. We know that in normal development basis substance is formed from the original medullary or embryonal elements. I can add that the same law holds good also in the formation of morbid fibrous connective tissue, such as we find in the wall of the abscess of the brain.

Besides the optical changes taking place whenever protoplasm is transformed into basis substance, the half per cent. solution of chloride of gold is an excellent means for discriminating between protoplasm and basis substance, inasmuch as the former takes up the purple stain very readily, while the latter remains unchanged or becomes stained but very little.

Beneath the above described layer of fibrous connective tissue, the so-called membrana pyogena of the older writers, there followed a broad layer of connective tissue, exhibiting all the characteristics of the variety termed myxomatous. (See Figs. 1, 2 *b*, *b*.) The connective tissue bundles, while dense in the innermost layer, had become loose in the myxomatous portion, changing to a more or less vertical course and enclosing large meshes of a homogeneous basis substance. The coarser bundles formed strings, which by inosculating with each other produced a reticulum, built up almost exclusively by spindle-shaped elements, either nucleated and protoplasmic in nature or transformed into basis substance.

Within the meshes of this reticulum is contained a very delicate fibrous connective tissue with numerous, mainly spindle-shaped protoplasmic bodies; large fields of the meshes hold an almost homogeneous or very slightly granular basis substance. (See Fig. 2 *e*, *e*.) A number of capillary blood-vessels of a considerable size, and partly filled with red blood corpuscles, were also met with. (See Fig. 1, *c*, *c*.) The endothelia of these capillaries were very large, and found to take up the carmine stain much more readily than endothelia under normal conditions. Around the wreath formed by these endothelia, in many instances a light space was present, which space was enclosed by a collection of spindle-shaped bodies, the perivascular sheath. Outside of this myxomatous layer of connective tissue, in the wall of the abscess is seen the white substance bounding the layer of connective tissue in a very nearly straight line, and considerably altered in structure, as will presently be described. (See Fig. 1.) In addition to the above described changes within the wall of the abscess, one of the most striking phenomena exhibited in some of my specimens, is the retrograde movement of already newly-formed capillary blood-vessels into their embryonal state, namely, the dissolution of their walls into medullary or embryonal or indifferent elements, resulting in the formation of solid connective tissue bundles. (See Fig. 2 *d*, *d*.)

II. White Substance.—The white substance around the abscess, as mentioned above, was in the condition of softening, and even after careful preservation of the specimen, difficult to cut. With lower powers of the microscope, in the immediate vicinity of the abscess, the capillary blood-vessels of the white substance were seen to be considerably dilated and engorged with blood corpuscles. The perivascular space, in many instances, was also dilated and filled with a finely granular, evidently serous or albuminous exudation. The changes in the nerve-tissue were best marked on the periphery of the blood-vessels. The nerve-fibres had lost their myeline sheath to a considerable degree, and their axis cylinders lay either bare or were surrounded by a layer of a faintly reticular protoplasm, which again was bounded by a thin homogeneous or granular sheath. Owing to a want of direct observation I am not enabled to tell what, really, had become of the myeline. It is, however, very probable that during the initial stages of the inflammatory process, the myeline is dissolved out, serving as nourishing material in the lively new formation of elements accompanying the inflammatory process.

In many places the white substance was transformed into a finely granular mass, in which protoplasmic bodies, so-called medullary elements, could be traced out, alternating with groups of shining homogeneous granules and relatively little changed nerve-fibres.

Higher powers of the microscope (1200 diameters immersion lens) gave a complete series of the changes of the axis cylinders, which had led to the formation of medullary elements. (See Fig. 3.) First, the axis cylinders exhibited delicate nodular enlargements and, at certain irregular intervals, a more regular rosary-like arrangement. (See Fig. 3, *a*, *b*.) In certain districts the axis cylinder was transformed into a relatively coarse, shining, beaded fibre, also presenting a great many club-like enlargements (*c*). Next, some of the granules alongside the axis cylinders appeared enlarged and were provided with delicate vacuoles, and lastly, the axis cylinders were transformed into a chain of pale protoplasmic bodies, the so-called medullary or inflammatory elements (*d*).

Within the inflamed portion of the white substance were observed numerous varicosities, each of which was in direct connection with an axis cylinder, thus presenting somewhat the appearance of the stem of a pear. In many instances, the interior of these varicosities could be made out to be of a delicate reticular structure; they were invariably bounded by a dense and homogeneous layer, continuous with the axis cylinder. All the formations of the above description were uninterruptedly connected with each other by extremely delicate threads.

In some places small abscesses had formed outside the wall of the main abscess; these abscesses were detected only with the microscope. In such localities the medullary elements had assumed a more uniform size, a somewhat coarser granulation, and, having also lost their mutual connections, they were transformed into what we call pus corpuscles. As a matter of course, that portion of the white substance which had undergone such a change into pus corpuscles, was devoid of blood-vessels. The manner in which blood-vessels are lost, shortly before the tissues break down and are transformed into pus, was easily traceable in the neighborhood of such small abscesses. The endothelia of both the blood-vessels and the perivascular sheath became considerably enlarged, coarsely granular, or were supplied with at least several large shining granules, which might justifiably be considered as newly-formed nuclei. By a process of splitting of the enlarged endothelia into medullary elements, the calibre of the blood-vessels, as well as of the perivascular sheath, became obstructed, and thus, what formerly had been a capillary, now was seen to have become transformed into a row of medullary elements. These elements at first remained in connection with each other by means of delicate processes, traversing the newly-formed cement substance, afterward broke apart and became pus corpuscles, in shape and size fully identical with those sprung from other portions of the inflamed tissue.

The above-mentioned varicosities of the nerve-fibres, by different authors are considered as post-mortem changes and due to an irregular coagulation of the myeline. The varicosities which I have described here have nothing to do with myeline, but are formations of the axis cylinders themselves, and due to structural changes in the substance of these axis cylinders proper, viz.: enlargement of the thread, exhibiting the ordinary structure of protoplasm, and in close connection with the inflammatory changes of the nerve-fibres in general.

These changes in the axis cylinders can be understood only if we look upon the latter as formations of living matter. The assertion of the late Max Schultze (*Stricker's Manual of Histology*, article "Nervous System,") that the axis cylinder has a delicate fibrous structure, cannot be corroborated by observation with good magnifying lenses of the microscope. Broad axis cylinders exhibit a distinctly reticular structure, such as we see in all protoplasmic formations; only the finer ones, owing to a high degree of refraction, present a more homogeneous appearance without a distinct reticular structure. The very finest of these axis cylinders look homogeneous even under the highest magnifying powers of the microscope. Since the reticulum, which is visible in protoplasm, has been claimed to be living matter, the latter must be looked upon as being, evidently, the essential formative material in the structure of the axis cylinders in general.

In the inflammatory process the granules of living matter in protoplasmic bodies increase in size, sometimes to such an extent that the protoplasmic body is transformed into a shining, homogeneous lump of living matter, which readily splits up into smaller particles, each of which in turn may become a medullary element. The axis cylinders, being formations of living matter, also become coarsely granular, beaded or rosary-like, and each one of these granular enlargements may give rise to a new medullary element, eventually a pus corpuscle. In this manner we understand the formation of rows of medullary elements and of pus in the midst of the white substance of the brain.

Ever since Julius Cohnheim asserted that the main, if not the only source of inflammatory elements and pus corpuscles are the emigrated colorless blood corpuscles, some authors had entirely overlooked the changes taking place in the constituent elements of an inflamed tissue. Nobody, now-a-days, is intending to deny the emigration of colorless blood corpuscles from capillary blood-vessels and small veins during the inflammatory process. Specimens obtained from the brain under consideration, by the immediate transportation of softened parts of the white and grey substance under the microscope, plainly demonstrated the existence of such a process. Along the wall of an enormously enlarged and engorged blood-vessel, were seen colorless blood corpuscles of a club shape, with one blunt extremity still in the calibre of the blood-vessel, with a thin pedicle still embedded in its wall, with the other blunt extremity protruding outside the periphery of the blood-vessel. Not infrequently a colorless blood corpuscle was seen to be attached to the wall of the vessel by means of a slender pedicle, the main mass of the corpuscle being outside the wall of the blood-vessel or within the lumen of the perivascular space. There cannot be any doubt that the emigrated colorless blood corpuscles share in the formation of pus corpuscles, yet, I lay stress upon the fact that the main source of inflammatory elements and pus corpuscles must be looked for in the living substance of the inflamed tissue itself. More especially in the white substance of the brain under consideration, all the stages were traceable, from the granular enlargement of the living matter of an axis cylinder up to the complete development and formation of inflammatory elements and pus corpuscles therefrom.

III. NON-MEDULLATED NERVE-FIBRES.—A certain portion ot my specimens, which was taken from the vicinity of the abscess, exhibited a large number of non-medullated nerve fibres in bundles cut longitudinally and transversely. In the longitudinal bundles the grey nerve-fibres were so closely packed together that but a very faint striation could be traced out. In the midst of such bundles there were numerous nests of medullary elements of a prevailing oblong shape and independent of any blood-vessels. Around these nests the following changes in the non-medullated nerve-fibres could be made out: First, the nerve-fibres had assumed a beaded or rosary-like appearance; next, they had become spindle-shaped and coarsely granular; after this, evidently from an increase in the size of the granules, the nerve-fibres had been transformed into an oblong cluster of protoplasm, within which, through the formation of a separating cement substance, medullary elements made their appearance, in clusters, still retaining their spindle shapes. Lastly, a number of such spindle-shaped nests had coalesced, and rows and clusters of medullary elements could be seen, separated from each other only by a small number of unchanged non-medullated nerve-fibres.

Wherever such a transformation of nerve-fibres into clusters of medullary elements had taken place in a larger territory, the result was the formation of an inflammatory nest, in which the inflammatory elements were connected with each other by delicate threads. I have not seen an abscess in the midst of non-medullated nerve-fibres, but it is obvious from what I said before, that through the breaking apart of these medullary elements, as yet connected by delicate threads, pus corpuscles may arise and, in this manner, an abscess may form even in the very midst of a bundle of non-medullated nerve-fibres.

I claim, basing myself upon direct observation, that inflammatory foci, with crowded inflammatory elements, can arise from direct changes of the bare axis cylinders constituting non-medullated nerve-fibres, independently of either blood-vessels or emigration of colorless blood corpuscles.

IV. Grey Substance.—The grey substance of the brain and spinal cord, as was first shown by C. Heitzmann ("Untersuchungen über das Protoplasma." *Sitzungsberichte der K. Academie der Wissenschaften*, Wien, 1873), consists of a delicate reticulum of living matter, the points of intersection of which reticulum, with lower powers of the microscope, represent the granules, while the meshes contain a lifeless, so-called protoplasmic fluid. This reticular structure greatly varies in size, according to the closer or wider arrangement of the points of intersection. In this layer of protoplasm there are stored up a number of round nuclei, which, as a rule, supplied with nucleoli, again are of a reticular structure. The nucleoli represent a larger lump of living matter, which is connected to the reticulum, traversing the nucleus by delicate radiating processes. The most peripheral points of intersection inosculate with the peripheral layer inclosing the nucleus. Around this is seen a light rim, traversed by delicate radiating spokes, by which latter the continuity of the shell of the nucleus with the surrounding reticulum of the grey substance is established.

Within the tissue of the grey matter of the brain and spinal cord we find numerous ganglionic elements, greatly varying in size and number in different regions of the grey substance. The smallest of these ganglionic elements do not surpass the size of nuclei, differing from them only by offshoots, the axis cylinders. From this size we meet with all the transitions, up to the largest ganglionic elements found in the anterior or motor columns of the spinal cord. The reticular structure of these ganglionic bodies was first discovered by Frommann, who saw the radiating spokes emanate from the nucleoli; the nuclei and the granules scattered throughout the substance of such ganglionic nerve elements. The reticulum, however, is by no means peculiar only to the ganglionic elements, as Frommann believed it was, but identical with the reticulum of living matter, common to all protoplasmic formations, as first pointed out by C. Heitzmann. Ganglionic elements are characterized by offshoots, either narrow (axis cylinders) or broad (protoplasmic processes of Deiters); each element is surrounded by a light rim, the so-called periganglionic space, of greatly varying dimensions in different specimens. These variations are so great that we are not able to define its diameter in a normal condition. If the space be narrow, it is invariably traversed by delicate spokes of living matter; but if, on the contrary, it be wide, it holds a regular fibrous reticulum (Obersteiner). In the vicinity of the abscess of the brain, I have met with a number of changes in the grey substance. First, the points of intersection of the living matter were enlarged, wherefrom resulted a coarse granulation of the grey substance. In many places, with the highest powers of the microscope (1,200), the points of intersection of the reticulum were clustered together to such an extent that lightly granular, nearly homogeneous groups appeared, each of which was surrounded by a light rim. Owing to an augmented afflux of nourishing material, the formations of living matter had evidently very much increased in size, and by approaching each other, produced densely granular or homogeneous lumps of living matter with the appearance of indifferent or medullary elements. In certain places the whole mass of the grey substance had been transformed into such medullary elements, between which bundles of non-medullated nerve-fibres and blood-vessels, mainly capillary in nature, were still recognizable.

The nerve-fibres traversing the grey substance were mostly increased in size and transformed into beaded fibres or chains of small homogeneous lumps. The blood-vessels, besides being completely obstructed with red blood corpuscles, exhibited changes in their endothelial walls fully identical with those described above in connection with the white substance.

The nuclei of the grey substance were mostly very coarsely granular, the nucleoli especially had increased in size and looked as if split up into a number of coarse granules. More especially in the carmine-stained specimens we often observed larger spaces, identical with the periganglionic space, either empty or holding extremely delicate granules. These spaces, so-called vacuoles, very probably had formed by an accumulation of a serous exudation around the nuclei, by which either a certain amount of the surrounding grey substance was pushed in a peripheral direction, or a certain amount of living matter destroyed. The fine granules within the above spaces, consequently, were either coagulated albumen or remnants of the former reticulum of living matter.

New formation of nuclei in the inflamed grey substance is a very common occurrence. Within the spaces just described we sometimes saw one large and two or three small nuclei, which, being in contact with their flattened surfaces, looking towards each other, allow of the conclusion that they had originated by a process of splitting or division of the original single nucleus.

New formation of nuclei, doubtless, takes place independently of former nuclei in the grey substance. I have seen repeatedly clusters of protoplasm near the wall of the abscess, with irregular outlines and holding a large number of oblong nuclei. In this manner bodies originated which were first described as existing in the medullary tissue of bone, and were called myelo-plaxes by Robin of Paris, giant-cells by R. Virchow of Berlin, and myeloid cells by English authors. Such multi-nuclear protoplasmic bodies are by no means exclusively found in the medulla of bone, but are very commonly observed in almost every variety of inflamed tissue, including tubercle. They are evidently produced by the confluence of protoplasmic bodies (emigrated colorless corpuscles, Ziegler), or by the formation of protoplasmic territories previous to their splitting up into inflammatory elements.

The ganglionic elements within the inflamed brain tissue exhibit a series of changes of great interest. Nearest to the abscess a number of ganglionic elements had swelled and been transformed into almost homogeneous, indistinctly granular bodies, still characterized by the presence of offshoots and a deep carmine stain. No doubt, the swelling of these elements is due to an inundation with exudation, which leads to a stretching and breaking apart of the reticulum of living matter therein.

The capillaries of regions where such swelled ganglionic elements are numerous, are considerably dilated, their endothelial coat is partly thinned, partly thickened, by endogenous new growth, and their perivascular sheath enormously widened. In this space I have seen faint granules and pale granular protoplasmic bodies of the size of colorless blood corpuscles, indicating that immigration of such corpuscles had really taken place.

In other portions of the grey substance a marked proliferation of the ganglionic elements can be observed. There are bodies with enlarged and beaded nucleoli, bodies with two or three isolated nucleoli, bodies with two or three coarsely granular nuclei, sprung from a division of the original nucleus, as is proved by the presence of facets, where the nuclei lay against one another. (See Fig. 4, *a*, *b*, *c*.) Many ganglionic elements are transformed into coarsely granular, nearly homogeneous lumps and split into smaller lumps, varying in number from 2 to 7 or 8. (See Fig. 4, *d*.) The clusters of protoplasmic bodies are grouped together in such a way as to retain the general shape of the ganglionic element—considerably enlarged. The offshoots of these elements are in many instances still recognizable as being either enlarged and coarsely granular or broken apart into rows of protoplasmic bodies, mainly shining and homogeneous. (See Fig. 4, *c*.)

As to the origin of medullary elements within the ganglionic bodies, I can state positively that they have originated by a process of endogenous growth from the protoplasm of the ganglionic elements themselves. First, the living matter was increased, hence we explain the coarsely granular and homogeneous looks of such an element; next, marks of division had formed by the splitting up of living matter into angular lumps, closely packed together so as to flatten each other, and separated by a thin layer of fluid, which everywhere was traversed by delicate conical offshoots, uninterruptedly connecting all newly-formed lumps with each other. Some of these lumps, apparently, had further advanced in development than others; while some looked still shining and homogeneous, others were already coarsely granular and presented a marked formation of a nucleus and a nucleolus. Again, all these formations, granules, nucleolus and enclosing shells are united by delicate threads, thus representing the advanced stage of development of living matter, the so-called protoplasm.

Lastly, the whole ganglionic element and its offshoots had broken apart into medullary or indifferent elements, which, so long as they remain united to one another by delicate threads of living matter, represent an indifferent, medullary or inflammatory tissue, identical with that arisen from the grey and white substance of the brain. If, on the contrary, the uniting offshoots be torn, the isolated medullary elements will produce pus corpuscles, and an accumulation of such corpuscles gives rise to what is called an abscess. In the pus taken from the abscess of the brain under consideration, besides pus corpuscles, a large number of protoplasmic bodies were found suspended in the fluid, in size considerably exceeding that of ordinary pus corpuscles. These large bodies exhibited all stages of endogenous formations and proliferations of living matter, sufficiently indicating their origin from the ganglionic elements of the grey substance of the brain.

The literature on the subject of my studies is extremely sterile. No exact observations, at least to my knowledge, have as yet been made on acute encephalitis and suppuration of the brain substance. Only one point has so far been called attention to, and this is the proliferation of the ganglionic elements of the grey substance. Theodore Meynert (*Vierteljahrschrift für Psychiatrie*, 1867) first noticed a proliferation of the nucleoli and nuclei of ganglion elements. E. Fleischl (*Med. Jahrbücher*, 1872) found a division of ganglionic elements, though not in a strictly inflammatory process, but in a brain involved in the formation of a tumor. A. R. Robinson, of New York City ("Über die entzündlichen Veränderungen der Ganglionzellen des Sympathicus," *Med. Jahrbücher*, 1873), produced inflammation in the ganglia of the sympathetic nerve around the aorta of the frog, and observed a division of the ganglionic elements from the formation of a furrow on the surface to the complete division into small particles. The division may involve only a part of a ganglionic body, the rest remaining normal, or it may invade the whole. Analogous transformations were also observed in the elongations of the ganglion cells.

Andrea Cecchirelli, of Florence ("Ein Beitrag zur Kenntniss der entzündlichen Veränderungen des Gehirnes," *Med. Jahrbücher*, 1874), produced traumatic lesions in the large hemispheres of the brain of a chicken and of rabbits. He saw enlarged and granular ganglion-cells within the inflammatory focus, and came to the conclusion that the nuclei had increased in number and that the whole ganglion-cell, by division, had been transformed into smaller elements.

The results of my own observations can be summed up in the following points:

First. The grey substance of the brain, by the inflammatory process, is transformed into inflammatory or medullary elements, in the production of which the nuclei and ganglionic bodies also share. Non-medullated nerve-fibres, through an increase of living matter in the axis cylinders, are likewise transformed into medullary elements. The same results are produced in inflammation of the white substance of the brain, after the dissolution of the myeline.

Secondly. The medullary elements, sprung from the grey or the white substance of the brain, are transformed into connective tissue, either myxomatous or fibrous, and thus the wall of an abscess in the brain is the result of the reduction of the brain tissue first into medullary corpuscles, next into myxomatous, and lastly into fibrous connective tissue.

Thirdly. Medullary elements, irrespective of which particular nerve-element they had originated, when broken apart, constitute pus corpuscles, and therefore the contents of an abscess of the brain. In the fluid of the abscess clusters of protoplasmic bodies are seen, proving a transformation of ganglionic elements into pus corpuscles by a process of endogenous new formation and subsequent division of living matter. All the stages of this process are observable within the ganglionic elements of the inflamed grey substance itself.

Fourthly. The endothelia of the blood-vessels become enlarged, coarsely granular and proliferating in the process of inflammation of the brain tissue. New blood-vessels are formed in the wall of the abscess. A consolidation of the blood-vessels, on the contrary, and a breaking up of their endothelia into medullary elements, afterwards pus corpuscles, takes place whenever the tissue is destroyed by suppuration. Pus is mainly a product of the inflamed tissue itself, and not of emigration of colorless blood corpuscles.

EXPLANATION OF FIGURES.

Fig. 1. Transverse section through the wall of an abscess of the brain; *a*, layer of fibrous connective tissue with scanty blood-vessels bounding the abscess; *b*, *b*, layer of myxomatous connective tissue with capillary blood-vessels *c*, *c*; *f*, *f*, white substance of the brain with numerous large blood-vessels. Magnified ×200.

Fig. 2. Same as Fig. 1. *a*, layer of fibrous connective tissue in the condition of recent transformation of medullary elements into fibrous basis substance; *d*, *d*, nests of medullary elements, apparently produced by the proliferation of the endothelia of former blood-vessels. Some of the nests hold a still recognizable, though compressed, calibre in their centres. *b*, myxomatous portion of the wall of the abscess, built up by a wide reticulum of fibrous connective tissue, in the meshes of which, *e*, *e*, numerous medullary elements are imbedded, either in a delicate fibrous reticulum, or in a light, homogeneous basis substance. Magnified ×500.

Fig. 3. Axis cylinders taken from the boundary between the grey and white substance, with marked inflammatory changes; *a*, circumscribed enlargement of the axis cylinder; *b*, rosary-like; *c*, club-like enlargement of the axis cylinder; *d*, *d*, medullary elements arisen from the breaking apart of the axis cylinder; *e*, nucleus of the grey substance in proliferation; *f*, the reticulum of the grey matter with considerably enlarged points of intersection—the future medullary elements; *g*, vacuole. Magnified ×1,200 (immersion lens).

Fig. 4. Inflammatory changes of the ganglionic nerve-elements of the grey substance of the brain; *a*, coarse granules, new nuclei in the body of the ganglionic element; *b*, splitting of a ganglionic element on its peripheral portion into medullary elements; *c*, the whole body split into large, nearly homogeneous lumps; *d*, the whole body and also its offshoot (*e*) split into numerous medullary elements, all in connection with each other by means of delicate threads; *f*, periganglionic space; *g*, grey substance of brain traversed by axis cylinders with considerable inflammatory changes, viz.: formation of indifferent or medullary elements. Magnified ×600.

Fig. 1

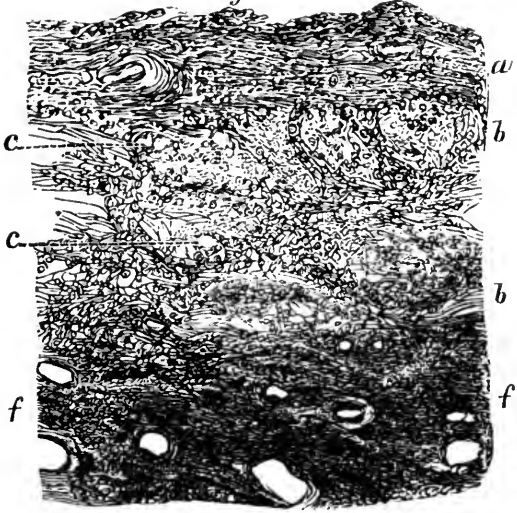


Fig 3.

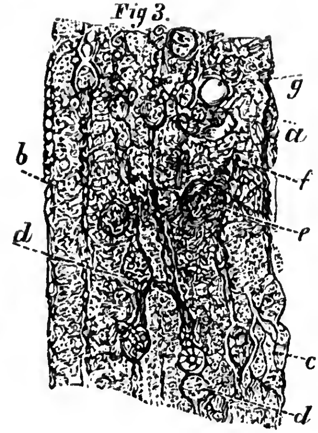


Fig 2

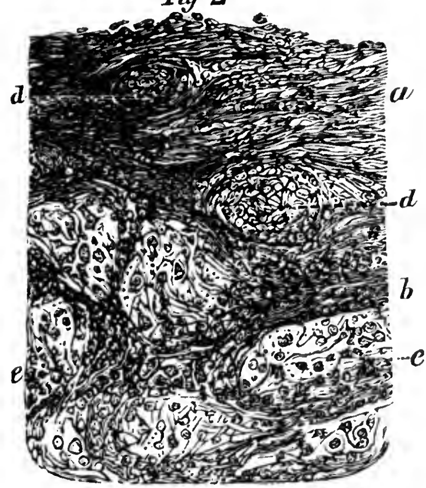
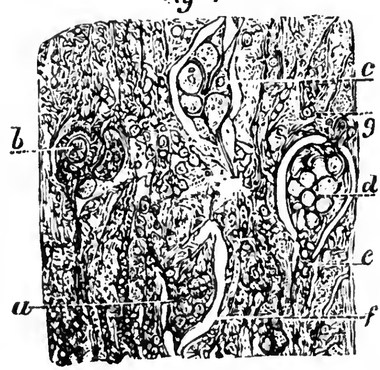


Fig 4



ART. II.—MICROSCOPIC STUDIES ON THE CENTRAL NERVOUS SYSTEM OF REPTILES AND BATRACHIANS.

BY JOHN J. MASON, M. D.

ARTICLE II.—DIAMETERS OF THE NUCLEI OF NERVE CELLS IN THE SPINAL CORD. RANA; EMYS FLORIDANA; TESTUDO POLYPHEMUS.

AS early as 1875, while studying the histology of the frog's spinal cord, with special reference to the effect produced by poisons, I was often impressed by what appeared to be an inequality between the size of the nerve-cells in the brachial and those of the crural enlargement. This difference was most striking in longitudinal sections, where a long column of cells was under observation. They appeared to be larger in the crural than in the brachial region. The idea of ascertaining by actual measurement whether the inequality of size were real or apparent, was not then entertained, because it seemed to me that measurements of the body of the cell must be unsatisfactory, owing to the great and constant diversity in its form and in the number, size, and length of its prolongations or processes. Later I was led to measure the nuclei, and last winter published in the January number of this journal the fact that there is a considerable difference in the frog between the two enlargements of the spinal cord, as to the diameters of the cell-nuclei.

Neither Reissner, Stieda, nor any other anatomist, had, up to this time, given in their writings comparative measurements of nuclei taken from these two regions of the cord. Whatever shapes the cell-body may assume, or whatever may be the nature of its substance, the nucleus in these animals presents itself to us always as a sharply-defined, persistent anatomical element, easily prepared for microscopical examination. Readily colored by carmine, in both fresh and hardened specimens, it is especially well adapted for measurement, and its prominence as an object in the microscopic field seems constantly to invite our efforts to determine more about its real nature and function. The writer does not claim to have accomplished much in this direction. The facts, however, which he has brought to light have been established with so much care and precision that he feels warranted in formulating the following law, which he predicts will be found to hold true in all vertebrate animals, viz.:

The nuclei of the cells in the inferior (anterior) horns, in the two enlargements of the spinal cord, have average diameters which are proportional to the muscular power of the corresponding extremities.

The observations which seem to justify the above law are briefly the following:

In the frog, which uses almost exclusively its posterior extremities for locomotion, on land and in water, I find that the average diameters (for Rana halecina) of the cell-nuclei of the crural enlargement exceed, by about $\frac{1}{400}$ of a millimetre, the average diameters (long and short) of the cell-nuclei of the brachial enlargement. The average size of the former stands to that of the latter very nearly in the arithmetical ratio of 7 to 6 divisions of the micrometer eye-piece used with Nachet's objective, No. 5.

In the gopher of Florida, testudo polyphemus (Holbrook), which lives exclusively on land, and digs deep excavations in the earth with its anterior extremities, the latter become quite powerful, and attain a development more than double that of the posterior limbs. The average diameters of the cell-nuclei in the spinal cord of this animal I have found to have a reverse arrangement as to size from that noticed in the frog. The average size of the brachial nuclei stands to that of the crural nuclei in the arithmetical ratio of about 7.5 to 7.

In other words, there was a difference in the diameters of about $\frac{1}{800}$ of a millimetre, the nuclei of the cells of the anterior or brachial enlargement being larger than those of the posterior or crural enlargement.

Again, in the so-called terrapin of the St. John's river, Florida, Emys Floridana (Holbrook), which uses the posterior with much greater effect than the anterior extremities in swimming, and which has correspondingly large hind legs, the arrangement of nuclei as to size is reversed in accordance with the law. The difference in the average diameters I here found to be less than in the nuclei of the gopher; but, whereas in the latter animal the brachial nuclei were found to be larger than the crural nuclei, in the emys the nuclei from the crural enlargement were the larger.

I have also measured these nuclei in the spinal cord of alligators; red-headed lizards, Scincus erythrocephalus (Holbrook); horned toads, Phrynosoma cornutum; and the chameleons of the South, Anolius Carolinensis, without being able to detect constant differences in average diameters between these elements from the two enlargements. Only in the frog and the two species of chelonia referred to, have I found a marked disparity between the brachial and the crural nuclei. This equality of the nuclei in lizards seems, therefore, confirmatory of the law which I hope to have established, for of all the animals above enumerated, frogs and turtles present the greatest inequality in the extremities as to size and especially as to power.

In the alligator and lizards, while the posterior are considerably larger than the anterior extremities, the difference, if there be any, in the power which can be exerted by the two sets of limbs in running or climbing, is inconsiderable when compared with the marked contrast in their functions to be observed in the frog, gopher and emys.

The diameters of the nuclei of the nerve-cells vary in different individuals of the same species, in accordance with the age of the animal. Thus, in a very small but well-developed and active specimen of Rana halecina, I found the average diameters of inferior horn groups from all parts of the cord to be less than those in another specimen of this species, about three times as large. The crural nuclei, however, were found to be larger than the brachial nuclei in both animals. In a young gopher, which had not yet used its anterior limbs for burrowing, the nuclei in general were smaller than those of a full-grown animal, while I could discover no difference in size between the brachial and crural nuclei. It might seem fair to infer, therefore, that the nucleus of a motor cell grows with the muscular substance which it is supposed to innervate. If farther research confirm this inference, a conclusive reason will be furnished for the now common division of nerve-cells into motor and sensitive; for if the nuclei of a definite cell-group are found to increase in size along with the development of muscular power in the related extremities, and to have no such connection with the function of sensation, such nuclei may certainly be regarded as belonging to the motor apparatus.

A word as to the manner of making permanent preparations for counting and measuring nuclei. During the past winter I have tried the method recommended by Stieda * for hardening the brains and cords of small animals, and have found it to be superior to any other that I have yet met with. In transparent carmine-colored sections the nuclei are shown with remarkable distinctness, and can be measured with great ease and accuracy. My custom has been to make an unbroken series of transverse cuts through both the enlargements; mount all the sections, and carefully label all the slides so that all the preparations from the same individual may be kept together by themselves. Longitudinal sections are particularly well adapted for showing a large number of nuclei in the same field.

It is always desirable to measure fresh nuclei when possible. This I have done in the frog and alligator, confirming what was observed in sections. Great care must be taken here to avoid compressing the nucleus between the cover and slide, and for this purpose it is always better to use bits of softened wax to support the cover under its four corners.

When the sections are mounted and the Canada balsam has become sufficiently hard the slide is placed under the No. 5 objective (better to have a movable stage) with micrometer eye-piece † and the group of large cells in one of the inferior horns is readily found. The nuclei of these cells are then

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* See this journal for January, 1880.

† Vid. Robin—*Traité du Microscope*, p. 208.

counted, and the eye made familiar with their relative position in the field, in order to avoid measuring the same nucleus twice. The measurements as taken are noted down for this horn, and then the horn of the other side of the section is brought into the field, and so with each section on the slide.* The process is somewhat laborious, but by properly dividing the work it may be gone through with without much fatigue. After all the measurements that are desired are taken, they are added together and the sum is divided by the number of nuclei measured. This gives the average diameter.

EXAMPLE.

MEASUREMENTS OF NUCLEI FROM THE SPINAL CORD OF TESTUDO POLYPHEMUS NO. 1. MAY 15TH, 16TH AND 17TH, 1880.

No. of Nuclei.			Sum of Diameters.	Average Diameters.
224	Brachial	Long Diameters,	1544	6.89
		Short Diameters,	1319	5.87
220	Crural	Long Diameters,	1448	6.58
		Short Diameters,	1198	5.44

The above diameters are in divisions of the micrometer eye-piece with Nachet No. 5—7 divisions being equal to .0175 mm.

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* It is often possible to mount as many as twelve sections on the same slide.

ART. III.—CASE OF NOCTURNAL ROTARY SPASM.*

BY M. PUTNAM-JACOBI.

THE case of rotatory spasm I have asked permission to describe to the Society, exists in a boy of three years of age, remarkably chubby, and presenting the appearance of the most perfect health. Since his birth, he has never had any illness except a mild attack of scarlatina, which occurred six months after the first development of the present affection. This began at the age of 18 months—thus 18 months ago. The mother then noticed, that after the child had been asleep for a couple of hours, he would turn over on his right side, drawing the right arm above his head, and applying the left hand over the left ear. Once in this position, he would begin to oscillate his head on the pillow from right to left, in a perfecly rhythmical manner. The oscillation would be maintained for about half an hour, and then the child slept quietly again. From the time this phenomenon was first observed, no night passed without its occurrence; but for the first six months, the rotary movements were not very rapid—did not last very long—and thus did not attract any great attention. They were ascribed to a morbid habit of no especial significance. During the last year, however—thus ever since the attack of scarlatina—the oscillation has increased in rapidity, in duration, and even in extent. At first exclusively confined to the head, the rotation has successively involved the shoulders and the trunk. At first confined to half an hour, it now habitually lasts several hours, and even the whole night.

It is noticed that if after the paroxysm had begun at nine and lasted an hour, the child was awakened, he would sleep quietly until midnight, but that then the movement would recommence and become most violent between five and six in the morning. After that he would fall into a very heavy

* Read before the New York Neurological Society.

sleep, and instead of awakening early, as usual with children of this age, the boy would sleep till 7½ or 8.

Change of locality would generally diminish the violence of the nocturnal movements for a few nights. But they would then regain their original intensity; often the thumping of the crib as the child rolled from side to side would make a noise sufficient to keep awake the mother or nurse in an adjoining room.

In the morning following a night thus agitated, the child would seem to be in nowise fatigued, and certainly retained no recollection of his nocturnal gyrations. He never could be induced to repeat them voluntarily, though he had become impressed with the solicitude they excited, and would often threaten to "shake his head," in order to tease his mother. He would even, when requested, lie down in the position in which the paroxysm habitually occurred, on the right side, with the right arm above the head, and the left hand applied to the left ear. But in this position, while awake, no attack occurred; although the invariableness with which the attack during sleep was preceded by the assumption of this position, suggested some connection between it and the rotatory spasm.

In view of such a possible connection, on the first occasion on which I witnessed the phenomenon, I turned the child on the left side. The movements immediately ceased, and on that occasion—a nap taken in the day-time—did not return. The mother reported that this manœuvre had often been tried, and always with the effect of temporarily checking the rotation. The child resisted the turning with considerable force, and, as soon as left to himself, turned over on his right side, and recommenced his oscillations.

It was noticed that the paroxysms rarely occurred when the child slept in the day-time, or if they did, they were of very moderate severity. But this fact seemed dependent on the other, that the rotations only took place during a very sound sleep, and after this had lasted about two hours.

On the first occasion on which I saw the child, however, he had been brought from some little distance in the country, was very tired, and readily went to sleep at noon. The rotations of the head began in half an hour.

Starting from the attitude of repose on the right side, the head was thrown to the left and a little upwards, with a slight jerk, so that the face looked upwards and to the left, the occiput downwards and to the right. It was then immediately restored to its former position, so that the face worked downwards and to the right, the occiput upwards and to the left. These positions were alternated seventy-two times in a minute, and were rhythmically regular. The movement from right to left, which seemed the initial movement, was always jerking, the movement of restitution, from left to right, was not. Accompanying the oscillations of the head, were twitchings of the eyelids, and apparently oscillations of the eyeballs.

The first half of the oscillation was necessarily effected by sudden, brief contraction of the right sterno-cleido-mastoid, together with the clavicular portion of the right trapezius, and probably also of the splenius. (Duchenne, pp. 2, 714, 715.) The second half of the oscillation, or the movement of restitution, necessitated similar contractions on the part of the homologous muscles on the left side. Faradization (after Duchenne's method) of the right sterno-cleido-mastoid muscle of a healthy woman lying on the back, rotated the head upwards and to the left with a jerking motion, in a manner entirely resembling the first half of the oscillation in our case.

During this oscillation, the forehead of the child was slightly contracted, and a very slight shade of distress seemed to be impressed on the child's features. The pulse was 87, soft and regular. The temperature of the left parietal region, alone accessible with the patient in position, was 94.5. (94.44 G.) After watching the oscillation for fifteen minutes and observing no change, I turned the child carefully on the left side. All movements immediately ceased, both of head and eyelids, and the child continued to sleep tranquilly. The mother attributed this result, unusual in her experience, to the unusual degree of fatigue caused by the journey.

Immediately after turning the child on the left side, I noticed a considerable change in the pulse. It increased in fullness and strength, and in frequency to 115. In five minutes it had fallen to 99 and became much softer. In ten minutes it had returned to the original rate of 87.

While the child lay on the left side, the parietal temperature of the right side was measured, and found to be 93. (93.59 G.) The temperature of the occipital region was 95. (91.94 right, G.) Thus this portion of the head was .3.06 higher than the average temperature for the occiput as given by Dr. Gray.

After about fifteen minutes the child was turned over again on the right side, but the oscillation did not return. No change was noticed in the pulse, such as had been observed after turning the child in the opposite direction: it remained soft, and at 87 beats in a minute.

A few weeks later I had an opportunity of observing a nocturnal paroxysm. This began punctually at 9, the child having fallen asleep at 7. At first the rotation was confined to the head, and resembled that already described. But a little later, after some interruption, the movement changed. With the left hand over the left ear, the child began rotating the entire upper half of his body, softly, rhythmically, about seventy times a minute. The head moved with the shoulders and trunk: the lower limbs remained quiescent. A little later in the evening, this rotation was accompanied by a crooning cry, also rhythmical.

The child had the air of rocking himself to sleep to his own lullaby.

This cry was a feature in the case that had only recently been added. It reminded me of one that I once heard uttered by a child during the clonic period of an eclamptic convulsion. The child was suffering from intermittent fever, and very often had convulsions at the time of the chill. Whenever these convulsions were severe, the automatic inarticulate crying would begin; and gradually shape itself into a tune which was always the same, namely, "Pop goes the Weasel." The inarticulate crooning of the child whose case we are now describing, was modulated into no definite melody. But, like the above, it seemed to depend upon a succession of clonic contractions of the constrictors of the glottis, analogous to the contractions affecting the other muscles.

During this nocturnal attack the face of the child became very much flushed, as had not been the case during the first two hours of sleep. The mother reported that this flushing was a constant accompaniment of the rotation, though it had not existed during the mild attack I witnessed in the day-time.

The temperature at the occiput was 96¾—thus still higher than had been observed on the previous occasion.

In the day-time, careful examination of the child, especially in regard to motor incoherences or ataxia, or to any disturbance of the special senses, yielded completely negative results. The expression and gestures were vivacious and intelligent. The articulation, however, was more defective than usual for children of three years old. Until the age of two and a half, its speech was said to have been completely unintelligible.

The head of the child presented no marked abnormality of shape. The forehead, however, was projecting, and the palate much arched.

The inquiries in regard to the faculty of equilibration and to the sense of hearing, were especially suggested by the resemblance which the rotatory movements of the child bore to those which, in animals, follow unilateral section of a lateral peduncle of the cerebellum, or of the horizontal branch of the semicircular canals. Such mutilation is apt to be followed, not only by rotations of the head, but also by rotations of the entire trunk, and are accompanied by oscillations of the eye-balls. Clinically speaking, there can be no doubt that the morbid condition belongs to the group of choreiform affections, of which the Salaam convulsion or Spasmus Nutans, and the Saltatory convulsion, are the types.

In the spasmus nutans, both sterno-cleido and mastoid muscles are affected, and hence results a nodding movement of the head. "But when," observes Eulenburg, "there is unilateral clonic convulsion of the same muscles, the movements are rotatory. The point of the chin is turned towards the sound side; the occiput is drawn down; the ear and mastoid process approached to the clavicle of the affected side."

As already noticed, this movement can be exactly imitated on a healthy person who is lying down, when one sterno-cleido mastoid is intermittently faradized. Eulenburg further notices that these clonic spasms are often not isolated, but are accompanied by contractions of the muscles innervated by the facial, trigeminus, and oculo-motor nerves. The movements are sometimes very slow, sometimes as rapid as 100 a minute.

Erb describes a rotation of the chin from one side to the other, occasioned by alternate spasm of both sterno-cleido mastoids. He asserts that the bowing movement caused by an exactly synchronous action of the same muscles, is much less frequently observed.

Soltmann, in Gerhardt's new encyclopædia, also describes two forms of "spinal accessory convulsion." It consists, he says, in a double or rhythmically alternating contraction of the antagonists, whereby the head is now turned from one side to the other, or else the chin is alternately depressed or elevated.

In 1850 Dr. Willshire read a paper on the Eclampsia Nutans, or Salaam convulsion, in which he stated that there were only four well authenticated and detailed cases on record, those namely described by Dr. Newnham in 1839. Of these cases, three children died and one recovered. The latter was sixteen months old when she began to have attacks of "head nodding" three times a day. The paroxysms rapidly increased in number and severity, and the convulsive movement extended to the trunk, which was forcibly bowed, sometimes as often as 140 times a minute. The paroxysm seemed to occasion considerable suffering, and was followed by exhaustion and drowsiness. After three months, the child lost the ability to crawl she had previously acquired. A month later, the attacks began to come on during sleep, from which the child would awaken with a violent scream, and in a spasm of the whole body, the head being first thrown back and then bowed violently to the feet, which were also drawn upwards. Six months from the beginning of the attacks, the child fell into a comatose sleep which lasted some hours, and from this date improvement commenced. The clonic convulsions ceased altogether, but the intellectual development of the child was arrested, so that at three years she was no more advanced than at two.

In Dr. Newnham's other cases the children became hemi- or paraplegic, and completely idiotic.

In Dr. Willshire's case the child was only six months old when the bowing movements of the head began. These were repeated fifty times a minute, and were so extensive that the head was made to touch the knees. These paroxysms always occurred after sleep, and were severe in proportion to the intensity of the sleep. They never occurred during sleep. Occasionally they were replaced by general epileptiform convulsions. This case recovered under a treatment of purgatives, blisters behind the ears, iodide of potassium and quinine.

Dr. Bidwell's case, reported in 1852, terminated as unfavorably as did the three cases of Dr. Newnham. The nodding movements began at the age of six months, occurring three to four times a day, being at first repeated only a few times in the course of a minute or two. At the age of a year, the frequency and intensity of the paroxysms had increased, consisting of thirty or forty convulsive movements in rapid succession. By this time it became evident that the mental development was very much retarded, if not wholly arrested. The slight nod of the original paroxysm increased to the true oriental "salaam," in which the head was suddenly drawn quite down to the floor, often bruising the forehead and lips. Later, epileptic convulsions occurred, and at the end of second year the child was hopelessly idiotic and epileptic. She died at the age of twenty-six months. No autopsy recorded.

In 1850 Dr. Faber reports a case, in a child of three years, whose health had begun to suffer only three months before coming under observation. The nodding paroxysms came on suddenly, after much complaint of headache and drowsiness, and were accompanied by strabismus. The nodding paroxysms merged into epilepsy, and the child became idiotic.

In a second case observed by Faber, the patient, a child of six years, was severely frightened by falling down a well. After that he seemed to droop; his sleep was restless, and he frequently cried out in it. One day, having been scolded by his father, he began to nod his head violently, while at the same time the face was distorted. The nodding movements occurred about eighty times a minute; the paroxysm lasted three or four minutes and returned several times a day. At its close the child was evidently much fatigued. A condition of stupidity supervened, analogous to that occurring in chorea.

Ultimately, however, the child improved under the administration of iron.

In 1867 Dr. Morgan published in the *Lancet* a case of *rotatory cramp* of the head, observed in a man thirty-eight years old. Since childhood he had suffered from headache and from a choreatic affection of the right arm, which prevented him from writing. A rotatory cramp of the head developed after exposure to cold. While in bed, or while sitting or standing, this was very slight, but so soon as patient began to walk, the chin was convulsively drawn to the shoulder, the head inclined to the opposite side, while severe pain was felt both in the neck and also in the occiput. The occipital tuberosity was painful on pressure. Dr. Morgan considered that the convulsive rotation was principally effected by the left sterno-cleido-mastoid and right trapezius muscle, and cut the left spinal accessory nerve, paralyzing the trapezius and sterno-mastoid on the left side. After the operation, although the trapezius, with the splénius and complexus still remained affected, the patient was able to walk without a convulsion, if he took the precaution to hold the clavicular fibres of the trapezius between his fingers.

In 1868 Henoch described cases of spasmus nutans, not limited to the head, but involving the entire upper part of the body. In one case the nodding convulsion alternated with lateral movements of the head from right to left. Nystagmus often coëxisted. One of Henoch's cases was ameliorated in fourteen days. The other terminated, suddenly, in death.

The latest recorded cases that I have been able to find are by Kropff, reported in 1877, in an inaugural dissertation. The first was in a consumptive woman, attacked by the convulsion during the puerperal state. The convulsion was accompanied by pains in the region of the left occipital and the frontal nerves, and consisted in nodding of the head seventy or eighty times a minute. At the same time the head was turned a little to one side. Voluntary movements were possible, and the clonic contractions could be passively overcome. The morbid condition was cured by tonic treatment and by iron.

The second case was in a man, in whom the head was thrown first directly backwards, then forwards. The spasm lasted only a second, but was repeated twenty or thirty times a minute. It was succeeded by a tonic spasm of the constrictors of the glottis, so that the breathing was arrested for a few seconds; then by clonic spasm of the pectoral and deltoid muscles, causing involuntary movements of one arm. From these cases it is evident that the spasmus nutans and the spasmodic affections allied to it may be either purely functional disorders, or else symptomatic of organic cerebral disease, as in the earlier cases described by Newnham, Willshire and Bidwell. As far as can be at present ascertained, the case I have described belongs to the first category. But it differs from them, and from all of which I can find a record, in two important particulars. 1st. The rotatory paroxysms occur in the recumbent position and during sleep; while in the other cases, recumbency has quieted, and sleep arrested the paroxysms. 2d. The rotatory spasm in our case exists only so long as the body is maintained in a certain position.

Is it possible to draw any diagnostic inference from these two facts?

The occurrence of the paroxysm during profound sleep, its intensity during the early morning, and the profound sleep by which it is followed, the flushing of the face and the inarticulate cry accompanying the rotatory spasm, suggests many analogies with epilepsy, which, in the absence of organic lesion, might justify us in classing the affection as an epileptiform rather than as a choreiform neurosis. For the occurrence or non-occurrence of morbid symptoms during sleep, is well known to be one of the most striking points of contrast between the symptomatology of epilepsy and of chorea.

It may be mentioned in this connection, that the only medicine which has in any way seemed to control the paroxysm, is bromide of potassium. This even when given in small doses. On last seeing the child, he was ordered a mixture of bromide and chloral: ten grains of bromide and five of chloral twice a day—twenty grains of bromide and five of chloral at night. For ten days after taking this medicine the child slept without rotation. Then a plentiful crop of acne developed, and the mother interrupted the medicine. The paroxysms returned. The medicine was repeated, but this time its effect was much less marked. The paroxysms were not interrupted, but they were diminished in intensity—did not begin until twelve or one o'clock—on many nights were omitted. This diminution persisted even after the medicine was interrupted.

The second peculiarity in our case which distinguished it from the general type of the spasmus nutans, was the peculiar position of the body, which seemed to be a necessary condition for the occurrence of the spasm. The forcible turning over to the right side, the curving of the body, with the convexity to the left, the bending downwards of the head, offered a close resemblance to the forced attitude assumed by animals after lesions of certain parts of the brain. Section of one lateral peduncle of the cerebellum, or unilateral section of the medulla, carried down as far as the level of the tuberculum acusticum, will each be followed by an assumption of this peculiar attitude.

The convex curving of the body may be directed towards the wounded or the sound side.

It is said to have been first observed by Magendie after the unilateral section of the medulla. But, as is well known, Magendie, and many other observers after him, from Serres and Flourens to Ferrier, have been able to produce, by section of a lateral peduncle of the cerebellum, rotatory movements of the head and trunk, which succeeded to this fixed attitude, and were directed from the healthy to the wounded side. The rotary movements observed in our case resemble these in every respect, even in the fact that they are directed from the side towards which the body is concave, towards the side at which it is convex, thus the presumably morbid side.

Such rotary movements are known also to follow section of the horizontal branch of the semicircular canals on one side, as I have myself had an opportunity to observe in pigeons. But were lesions in these two localities alone capable of producing forced rhythmical oscillations, the data from experiment would fail to explain all the circumstances of our case. For in it, the movements began with a simple lateral jerking of the head, such as may be produced by faradic irritation of the sterno-cleido-mastoid muscle, and seemed therefore to depend exclusively on irritation of the spinal accessory nerve.

At this stage of the affection, it constituted a typical "clonic accessorius convulsion." And the proximate seat of the irritation must have been in the nucleus of the 11th nerve, situated in the medulla. Now Magendie who has first described the rotary movements and the fixed position determined by unilateral section of the medulla, has established that the latter lesion will also determine movements of rotation of the head and trunk around the longitudinal axis of the body. Recently Curschmann has asserted that section of the peduncle of the cerebellum never determines the movements, but only the forced attitude, if the section be made at a certain distance from the medulla, and infers that the peduncular lesion is only effective in virtue of a secondary influence upon the medulla. With this view Eckhard entirely agrees.

However this may be, there is no question that unilateral lesion of the medulla will be followed by this peculiar phenomenon, and it is unnecessary, in the absence of personal experience, to adduce more authorities in proof of this.

Clinically, the forced lateral position, and even the rotary movements have been observed in cases of demonstrated cerebellar lesion, but only when this involved the processus vermiformis. (Nothnagel.)* According to Nothnagel, these symptoms have not yet been observed in connection with lesion of any other part of the brain; not therefore with disease of the medulla. He admits, however, that they may occur in epileptic and hysterical conditions, and that the transitory assumption of a forced lateral position not unfrequently marks the onset of an epileptic attack.

Under these circumstances the phenomenon would be referred to medullary disease, though of a so-called functional character.

If now we suppose an irritation of the nucleus of the right spinal accessory nerve as the starting-point of the morbid process, we may, from the clinical history, infer that this irri-

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* The rolling of the head in acute hydrocephalus bears some resemblance to the rotary movements we are describing. But it might perhaps be possible to demonstrate that this symptom only occurred when, by distension of the aqueductus Sylvii, fluid had passed from the lateral to the fourth ventricle, and was exerting pressure on the medulla.

tation has gradually extended upwards along the right half of the medulla. By the time it reached the nucleus of the acoustic nerve, a territory would have become involved whose lesion gives rise to complete rotations of the head and also of the trunk. Irritation of the floor of the 4th ventricle is moreover powerful in the production of nystagmus. This symptom, and that of increased oscillations, would then complicate the original affection, as we have seen that they did.

Further extension of the irritation would reach the upper extremity of the calamus scriptorius and the region lying between it and the corpora quadrigemina, which is considered to contain the principal vaso-motor centre; hence the flushing of the face and acceleration of the pulse which began to coincide with the paroxysm. Whether the irritation was extended to the cerebellum, and whether during the paroxysm hyperæmia really existed there and occasioned a rise of temperature perceptible at the occiput, we should perhaps hesitate to affirm, but it seems not improbable. There is only one symptom which could possibly indicate an original coöperation of the cerebellum, in the place of the secondary participation we have supposed. I mean the defective articulation. But it is difficult to be certain that this is really a morbid condition.

The observations on temperature were made previous to the publication of Dr. Amidon's essay, and on that account the lateral frontal region of the head was not examined in respect to temperature. It would certainly be most interesting to ascertain whether automatic muscular contraction occurring in muscles during a prolonged clonic convulsion, would be followed by the same alterations of cranial temperature as voluntary contraction of the same muscles, as has been shown by Dr. Amidon to do.

The crooning cry, which has been the latest addition to the symptomatology, must evidently be referred to clonic spasm of the inferior laryngeal nerve, derived from the spinal accessory filaments associated with the pneumogastric.

In the absence of all other symptoms than those which have been described, and from the transitory and intermittent nature of the forced position and the rotary movements, we can hardly suppose an organic lesion to exist. We should rather infer a neurosis of an epileptiform nature, which, in its constant progress, is liable at any time to invade the pons, and occasion an outbreak of true epileptic convulsions. Such a stamp would explain the peculiarity of occurrence during sleep; period of repose for choreiform affections, and with them for the ordinary spasmus nutans.

I should be very happy if any member of the Society may pursue further than I have been able to do, the analysis of this case.

ART. IV.—THE TRANSFER OF SENSATIONS.*

BY PROF. ROBERTS BARTHOLOW, M. D., LL.D.

IT would seem to be a labor of supererogation to recall to the attention of this body those recent observations which have had for their object the decision of the question in respect to the route of communication between the sensory tracts on the two sides. Nevertheless, to properly introduce the subject, I must state the results which have been accomplished by the mode of experimentation which I have myself pursued, and briefly indicate the present condition of physiological knowledge on the particular point involved in my inquiry.

Brown-Séquard, as everybody knows, demonstrated the decussation of the sensory fibres to occur along the cord at numerous, if not innumerable points. It is true, he has since modified his opinions somewhat as to the exact seat of the decussation. That the grey substance of the cord is the channel of conduction of sensory impressions seems abundantly established by the recent experiments of Schiff (*Wiener med. Wochenschrift*, No. 43, 1879). By division of the white matter sensation was not impaired, but when the grey matter

*Read before the American Neurological Association at the annual meeting, June 16, 1880.

was entirely destroyed, sensation was permanently lost. We must, therefore, hold that the grey matter is the medium of communication between the sensory fibres of the two sides of the body. Various attempts have been made to determine how far consentaneous action in respect to sensory and other impressions may exist between the two sides. The problem to be solved is—Are the two sides so intimately connected by commissural fibres, that an impression made at a certain point in one member is accompanied by a corresponding reaction in the other member? These experiments have been extended to include the sensory impressions of touch, temperature, and pain. Rumpf was one of the first, I believe, to undertake these particular investigations (*Berliner klinische Wochenschrift*, 1879, No. 36). He applied metal plates, mustard, and hot sponges to one side, and then studied the alterations of sensibility occurring in the symmetrical region of the other side. He found that alterations of sensibility produced by irritation causes a simultaneous alteration on the opposite side. Eulenburg read a paper before the Sixth International Medical Congress, at Amsterdam, on the "Transfer of Sensibility," which appeared by abstract in the *British Medical Journal* for Sept. 27, 1879. His experiments were performed on medical students, and had for their object to prove that agents which increase or lessen the sensibility of the skin of either half of the body, cause a consecutive increase or lessening of the sensibility of the corresponding spot of the other half of the body. Faradic stimulation of one side increased the distance apart at which the compass points were perceived on the other side. This effect was ascertained to be not constant. There are oscillations—elevations followed by depressions of the space perceptions, and migrations of the effect from one point to another. When a part was frozen with ether spray, the corresponding point on the other side experienced an evident increase of sensibility.

My own experiments were inspired by an observation made two years ago. In practicing hypodermatic injections into the painful points in the thigh in a case of sciatica, my patient, who happened to be a very intelligent and discerning man, called my attention to pains felt in the arm of the same side, simultaneously with the pain at the point of puncture. Not every injection produced this result, but those made into places where nerve filaments of some size were impinged on. The patient always referred the secondary pain to the corresponding position on the upper member of the same side and never on the other side. In some studies on my own person, I employed an ordinary sewing needle of large size to develop the initial pain by puncture of a nerve filament, and ice wrapped in oil silk to produce the local lowering of the temperature. To ascertain the variations of temperature, I applied the surface thermometer of Hawksley, which is so enclosed that pressure does not affect the mercurial column as it does in the instrument invented by Seguin. I soon learned that some "experiments of control" were necessary. Rumpf hints at variations not due to experiments, and I found that the state of sensibility and the temperature of the different parts involved in the series of experiments were not uniform. Especially must we exercise caution in drawing conclusions from thermometric observations made under the usual conditions. When one hand is immersed in cold water, as Brown-Séquard long ago showed, the temperature of the other hand falls, but the difference is slight and may easily be confounded with the normal variations produced by causes not now understood. I find that the fall of temperature produced by the refrigeration of a member affects the corresponding region on the same side, as on the opposite side. When a large part of the anterior surface of the thigh is artificially cooled, the temperature of the anterior face of the arm falls, and to as great an extent as the opposite side in symmetrical positions. This declination of temperature is not greater than one-half degree, according to my observations.

Repeating Brown-Séquard's experiments, I find that artificial cooling of one hand depresses the temperature of the other scarcely a half degree. The method of proceeding is as follows: First, the temperature of the hand at rest is carefully measured by placing two surface thermometers in position and confining them with a cravat to insure equal pressure. Then the thermometers are removed, read, the index readjusted, and are again applied in the same manner. Without changing position or affecting in any way the condition of the hand to which the thermometers are applied, the other hand is immersed in running water, temperature 65° F. Two thermometers are employed that one may be a check on the other. I am thus minute in describing these trivial details because the results are concerned with such a narrow margin of difference of temperature. I have not ascertained, as I had hoped, whether, when a part is refrigerated, all parts having the same anatomical relation to the spinal centre experience a decline in temperature; but it is probable that such is the case.

The experiments which I have made indicate that the transfer of painful sensations is limited to the same side. Pain of considerable severity must be produced to develop the secondary pain, and in certain positions only can it be done. When the filaments of certain nerves in the thigh are irritated, a response is elicited in the nerves of the arm in the same relative position. Thus, irritation of the external cutaneous of the thigh caused pain in the cutaneous branch of the musculo-spiral in the arm—of the middle cutaneous of the thigh, pain in the circumflex of the arm—of the internal cutaneous of the thigh, pain in the nerve of Wrisberg. The secondary pain is acute and nearly instantaneous. It is not prolonged, but acute and severe pain, which is necessary to develop the secondary pain. If the secondary pain is not felt on the instant, it will not occur at all. There is no difference between the sides in regard to the production of a secondary pain from a primary irritation. In no instance was pain referred across the spinal cord to a symmetrical position on the other side. I have not pushed my inquiry beyond the region indicated. The process of investigation is painful, and hence one naturally shrinks from its performance.

Are the two sets of facts which I have presented contradictory? I do not think so. The lowering of temperature on symmetrical points on the same and on the opposite sides is probably due, as I have suggested, to the symmetrical arrangement of the vaso-motor fibres accompanying the nerves of animal life from the common centre in the cord. The secondary pain, produced by the irritation of a nerve on the same side, is a phenomenon which may be compared to the irradiation of pain in the neuralgias. There are other facts to show that the communication of painful impressions is more immediate along the same side than across, and that such impressions are transferred to the other side only when they have acquired great intensity. The first proof of this statement is pathological. When myelitis occurs above the dorso-lumbar enlargement of the cord, on tickling the bottom of the foot, the muscles of the corresponding leg are thrown into jactitation, and those of the other leg only after continued and prolonged titillation. The next proof is a matter of experiment. If the spinal cord of a pigeon be divided by a clean cut above the dorso-lumbar enlargement, and sufficient time allowed for the subsidence of the effects due to the injury, the conditions of the experiment are complete. Now on pinching a toe of the pigeon, the limb pinched will be thrown into active jactitations, and afterwards the other limb.

ART. V.—THE ARCHITECTURE AND MECHANISM OF THE BRAIN.

BY EDWARD C. SPITZKA.

CHAPTER II.

THE HIGHER GANGLIA OF THE MID- AND HIND-BRAIN.

Treating of the optic and post-optic lobes, and the cerebellum.

IN the preceding chapter I have discussed the morphology of the, physiologically speaking, lowest cerebral centres. Not one of the grey masses described thus far, if imagined dissected out by itself, could constitute a sufficient basis for any act which would merit the designation of cerebration. Nay, all of them in the aggregate and in their combination through the associating tracts uniting them in functional union, would constitute but a very simple nervous mechanism, whose highest aspiration might be the production of co-ordinated reflex acts, such as the respiratory and deglutitory movements.(1)

If we imagined the cranial nerve nuclei and their uniting strands, as well as the peripheral nerves, separated from all connections with the higher centres, and in the light of what experimentation has taught us, analyze the phenomena resulting from their isolated functional activity, we will be struck by the uniformity of the latter. The same peripheral irritation will provoke the same reaction(2) with such regularity that this feature has given to the word automatic one of its collaterally acquired significations.

If the simplicity of function manifested by the cranial nerve nuclei was in perfect harmony with their simplicity in structure, those, physiologically speaking, higher centres which are developed in the same two lower encephalic segments, whose ventricular grey constitutes the aforesaid nerve nuclei, may be expected to show a higher structure; and so we find it.

As I have had occasion to state in the introductory chapter, what we properly term the higher ganglia, are in reality but specialized, and topographically more or less perfectly separated segments of the central tubular grey. The ganglia thus developed in the hind-brain and mid-brain are four in number, in their order from behind forwards. I term them (*a*) the cerebellum, (*b*) the post-optic lobes, (*c*) the inter-optic lobes, and (*d*) the optic lobes. Of these I omit from consideration the third named, in this essay, as, though represented in the human brai ,[3] it is so evidently a defunct and reliquary centre in the latter, that it merits nothing beyond an excluding notice.

§ 96. The relations of these ganglia in the adult human brain are so much complicated by fascicular connections with still higher centres, that it is almost impossible to recognize the true homology of the ganglia of the mid- and hind-brain in them.

For example, taking the case of the cerebellum, if we examine its relations to the fourth ventricle in the adult human brain, we will find that it constitutes a dorsal covering of nearly the entire fourth ventricle, while its peduncles form the latter's side walls. The inference would appear to follow as a just one, that the cerebellum represented the dorsal grey of at least two-thirds of that segment of the medullary tube containing the fourth ventricle. Nothing could be more incorrect, for the true embryonal relations have been much altered in the highly developed mammalian brain. The peduncles are secondary additions to the primitive architecture of the cerebellum, and the large mass of the vermis and hemispheres constitutes a secondary hypertrophy of what was originally a very insignificant segment of the dorsal portion of the central tubular grey. The typical and "ancestral" grey of the cerebellum is represented in the so-called *lingula cerebelli* topping the entrance to aqueduct of Sylvius, and the primitive cerebellar peduncles are represented in a small amount of white matter found on the sides of the aqueduct entrance, and scattered and crowded away in man by the *processus e cerebelli ad cerebrum.*

To derive the true homology of these structures I must again refer to the development of the encephalon in the embryo, and to the analogous relations found in lower vertebrates.

§ 97. In most reptiles the architecture of the mid- and hind-brain closely corresponds to that found in the same segments of the mammalian embryo. Such differences as are apparent consist merely in the greater acuteness of the angles of incurvation found in the encephalon of the mammalian embryo. (Fig. 9.)

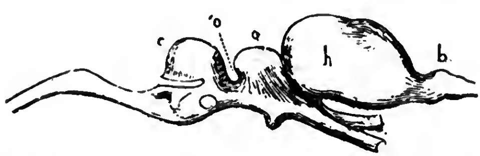


Fig. 8. Lateral view of encephalon of *Thallassochelys conana* (loggerhead turtle), olfactory tracts and hypophysis not represented. h, right cerebral hemisphere; o, right optic lobe, connected below with optic tract; ò, region of post-optic ganglion; c, cerebellum; i, infundibulum; b, olfactory lobe; x$\frac{2}{3}$.

As the most prominent feature of the mid-brain of reptiles we recognize two symmetrical spherical masses, which each constitute as it were a button-like terminus to the optic tract of the same side. They usurp the entire dorsal portion of the mid-brain, in fact they exclusively constitute the mid-brain, as far as the direct derivation from that embryonic structure is concerned. They are known in comparative anatomy as the optic lobes, and found represented in all the craniote vertebrata, constituting, as I shall show, the fundamental terminus of the optic tract, and represented by the anterior pair of the corpora quadrigemina in man and the mammalia. I propose to term them the true optic lobes. (Fig. 8, *o*.)

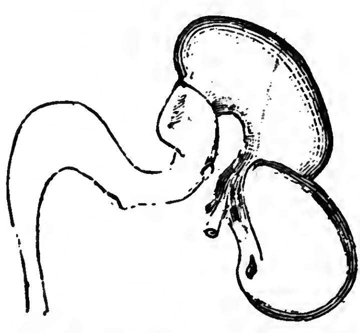


Fig. 9. Lateral view of encephalon of a canine embryo, showing the valvular projection of the cerebellum and the prominence of the mesencephalon.

§ 98. On first sight, a transverse section through the region of the OPTIC LOBES of man exhibits a very different appearance from that presented by a similar preparation taken from a reptile. On closer analysis we find, however, that all the parts present in the human optic ganglion are present also in the reptilian, and that the study of the latter offers an important elucidation of those features of the human optic ganglion which are by themselves difficult to understand. In fact, for the reason that the peduncular tracts and intercalar ganglia are reduced to a minimum in such animals as the turtle, we may consider the latter's mesencephalon as a natural dissection out of the human optic lobes.

Fig. 10.

Transverse section through optic lobes of yellow spotted turtle (*Nannemys guttata*). A, B, o, o′, o″, o‴, D, e, F, layers and fibre masses described in text. K, posterior longitudinal fasciculus; G. fibres derived from optic tract; V, cells of the mesencephalic nucleus of the fifth pair, corresponding to the more peripheral and evenly distributed cells on the margin of the central tubular grey of figure; I, disappearing inter-optic ganglion.

§ 99. The fundamental constituents of the mid-brain, as visible on a transverse section of a reptile's brain (Fig. 10), are from within outwards, first, the aqueduct of Sylvius, which in these animals attains the dimensions of a ventricular cavity; lining this, the ependyma, immediately followed by a subependymal tissue, differing from that of the human brain in being purely fibrillar [4] (Fig. 10, A). On this follows a layer of pyramidal nerve cells, arranged in a beautiful series; the elements are small, and have long apex processes. (B.)

These closely crowded, small pyramidal cells are not unlike the cells of the cerebral cortex in the same animal, and cannot be readily identified in man. The equivalent cells appear to be scattered throughout the area of the central tubular grey.

§ 100. If the degree of differentiation to which a cell group attains, and the extensity of its fibrillar connections with other cell groups and with nerve tracts is to constitute a test of its functional importance, then in reptiles we must admit that the deep cortical layer just described constitutes an important centre, but further than this general surmise I am unable to go at present.

It is the two other layers, the one composed of either pyramidal or fusiform cells lying parallel with their long axes to the arched fibres (Fig. 10, D), and the other composed of a gelatinous nerve substance (F) with imbedded round and smaller elements, that will engage our attention. The gelatinous mass lies imbedded as it were in the fibres of the optic tract. These fibres can never be traced beyond the gelatinous mass; then, also, they diminish in number as we approach the convexity of the optic lobes, from all of which we are justified in assuming that this, the most superficial layer of the optic lobe cortex, is the *first central recipient of the visual impressions.* In the fact of its gelatinous structure, we find another support of the view that as a rule the gelatinous nerve substance is related to sensory peripheries, as we have had occasion to note when dealing with the sensory nuclei of the trigeminus nerve.

§ 101. From the gelatinous or *superficial cortical layer,* fibrillæ radiate inwards, and while many of them can be traced to the layer of closely packed pyramids (B), others of this series (e) can be traced to and among the cells of the *deep cortical layer* (D).

The cells of this last layer are spindle-shaped, and their long axes, instead of being vertical to the aqueduct contour, as in the layer B, are parallel to the surface of the mesencephalon, and it can be readily seen that they are forced into this position by being imbedded in a layer of nerve fibres having the same direction.

As we pass from the dorsal to the ventral region, we find that the fibres increase in amount and accumulate on the inner side of the layer of spindle-shaped cells. They thus constitute a *deep white layer* of the mesencephalon, just as the layer e represents a *superficial white layer.*

On tracing the fibres of the deep white layer (o, o′), we perceive that while one portion (o′′) enters the nucleus of the oculo-motor nerve (h) and builds up the mass of the posterior longitudinal fasciculus, another portion (o′′′) crosses the median line and enters the posterior longitudinal fasciculus of the opposite side or becomes lost in the reticular field.

If we leave out of sight for a moment the purely physiological features of nerve currents, and starting with the simple basis that a sensory impression is normally always centripetal, and that a nerve oscillation once taking place in a tract must, if it travels, travel in one direction, we shall have in the reptilian brain, and this will also partly apply to the human, the following course prescribed for the transmission of the retinal impression: (1) Retina, (2) optic nerve and tract, (3) superficial grey of optic lobe, (4) radiatory fibres from 3 to 5, (5) deep grey of optic lobe, (6) deep white matter of optic lobe, (7) oculo-motor nucleus, posterior longitudinal fasciculus, and an unknown destination.

The function of the retina is to receive visual impressions; the function of the muscles innervated from the oculo-motor and other nuclei, which are in connection with the posterior longitudinal fasciculus, is to move the eyeball, and to move the head upon the neck, that is to follow the retinal impress.

§ 102. Now, since we have a connection passing from the retinal to the muscular periphery, and this connection is interrupted in its course by ganglionic matter, we are justified in assuming that in this ganglionic matter the translation of the sensory impression to a motor impulse must take place. There are three such interruptions : the first is the gelatinous cortex F, the second that of spindle-shaped and pyramidal cells of the deep grey matter (D), and the third are the nuclei of the muscles mentioned. The question arises, at which one does the translation occur ?

If this question were merely one of surmise, it would lead us to suggest the intermediate of the three serial interrupting masses as the locality in question, for it holds the anatomical balance, as it were, between the central termination of the sensory tract (G) and the origin of the motor nerves.

If we study the comparative degree of development of this layer (D), we will be led to a similar inference. Comparing the optic lobe of a reptile with a mammal, we will find that this deep cortical substance is nearly equally well developed in both, while the superficial grey, so well developed in reptiles, is atrophic in the mammalia. The latter fact is due to the depreciation of the optic lobes as receptive centres in higher animals. On the other hand, in the mole both the superficial and the deep layers are atrophic. Both the retinal receptions and the ocular movements are practically absent in this animal. We see, therefore, that through the animal range this layer keeps step with the development of the oculo-motor coördinations.[5]

Tracing the fascicular connections, we find strong confirmatory proof in the existence of a strand of fibres uniting the deep cortical grey and the oculo-motor nuclei, known as the posterior longitudinal fasciculus.

Studying the histological structure, we shall find that among the cells of this layer are many that have the typical shape of what are ordinarily termed motor cells, while such cells are absent in the superficial layer.

We have thus a number of reasons for considering the superficial grey as a projection field for retinal impressions, the deep grey as a co-ordinating field which elaborates the motor innervations to which the nerve nuclei are subject, in obedience to the impressions first received in the superficial grey and the nerve nuclei as the inferior deputies of that deep grey. The deep grey would occupy the position of a controlling centre with reference to the oculo-motor movements, just as the cerebral hemispheres occupy an analogous position with regard to the hypoglossal and facial nuclei for example.

§ 103. Except that there are far more complicated factors engaged in the elaboration of the speech enunciations, an analogy can be readily established between these and the oculo-motor coördinations. The organ of hearing, with its projection on the cerebral cortex, constitutes an analogue to the retina and the superficial grey of the optic lobes. The nerve tracts connecting the auditory field of the cortex with the motor coördinating centres of the tongue, lips and larynx, correspond to the radiatory fibres of the layer *e*; the corona radiata, internal capsule, and anterior pyramidal tract, offer a still more striking analogy with the posterior longitudinal fasciculus, and, like the latter, terminate in nerve nuclei.

§ 104. The oculo-motor nuclei, with the controlling deep grey of the optic lobes and the projecting tract of the posterior longitudinal fasciculus, are found already well developed in the lowest vertebrates, and where all other tracts of higher animals and derived from higher centres are absent, the posterior longitudinal fasciculus is a marked feature of every transverse section of the mid- and hind-brain, showing how fundamental its importance is in the range of vertebrate animals. Probably no coördination of a cerebral origin is of such primitive importance as that of the two visual globes, and it is in accord with what I announced in the introductory chapter, that the centres and tracts subservient to this coördination should be early developed in the embryo, well developed in the lower vertebrates and exhibiting a fair constancy in development in all vertebrates.

§ 105. After this preliminary sketch we are prepared to study the architecture of the optic lobes of man.

It must be borne in mind that the anterior pair of the so-called corpora quadrigemina alone is related to the retinal and oculo-motor innervations,(6) and that it alone has connections with the optic tract, and exhibits the cortical structure,(7) which is the characteristic feature of the optic lobes with all those vertebrates whose visual periphery is well developed.

In a transverse section, made through the upper origin of the third pair, the optic lobes are exposed in their best development. (Fig. 11.) We have in such a section all the component parts of the optic lobes of reptiles represented.

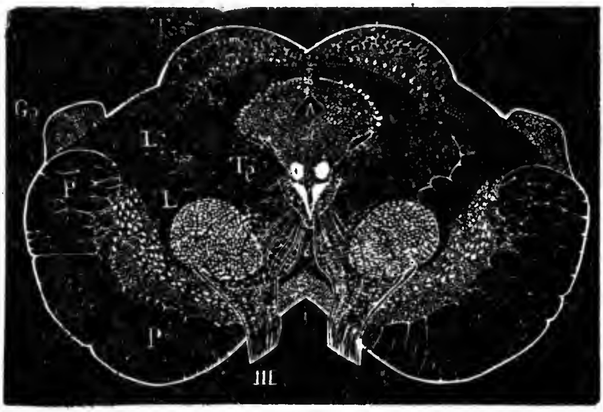


Fig. 11.* Transverse section (Meynert-Stilling plane) through human isthmus at altitude of third pair. T. ant., anterior tubercles of corpora quadrigemina or optic lobes proper; s, superficial cortex of same; d, g, deep cortical grey of same; m, sagittal nerve bundles, running forwards from this plane; A, aqueduct of Sylvius and, surrounding it, the kite-shaped central tubular grey (§ 62) at whose upper arched contour the round cells of the fifth nerve (§ 94), at the lower apex the oculo-motor nuclei are found (§ 90); X, the descending trigeminal root; III, the oculo-motor roots; T, the *nucleus tegmenti;* G, S, ganglion of Soemmering; P, P′, *Pes pedunculi;* h, "fountain decussation;" i, *ganglion interpedunculare.*

The superficial cortex (F in Figure 10) is seen here (S), though so atrophic that its dimensions had to be exaggerated in the diagram, in order to show its relations. The superficial white matter (*e* of Figure 10) is also represented in the field (*m*), though a foreign element is introduced in the shape of a sagittal set of fibres running forwards to the thalamus. The deep cortex is finely developed, as well as the deep fibres

* In this and similar diagrams the topographical proportions are retained. Ganglionic substance is represented by dotted areas, cells groups, by larger dots, and compact nuclear masses, as open spaces. Fibres running in the plane of the section are represented by lines, the nerve bundles divided in the section by black fields marked by white contours.

originating from it, which, as in the reptile, are lost either in the oculo-motor nucleus, the posterior longitudinal fasciculus, reticular field, or undergo a fountain-like decussation described by Meynert and Forel, and proposed by Forel to be named the tegmental decussation of Meynert.

If the immense cerebral fibre masses of the pes pedunculi, the thalamic fasciculi and the intercalar ganglia of Soemmering, and the red nucleus of the tegmentum were taken out of this field, it would require but insignificant further modifications to constitute it a faithful reproduction of the corresponding field in the reptilia. Since I have shown the optic lobe to be a rather complex body composed of several distinct though related structures, each of these will merit a separate (8) description.

§ 106. THE SUPERFICIAL GREY of the OPTIC LOBES decreases in mass and in development as we pass from the lower mammals upward in the scale, until, in man and the apes, it has become entirely atrophic. In all these animals except the last mentioned, it is found to constitute a sort of cap, covering the convexity of the anterior pair of the corpora quadrigemina, and is composed of a finely molecular, and sometimes laminated basis substance, containing numerous multipolar cells. These are, as a rule, of small dimensions; their bodies are roundish, and the processes attenuated. The fact that this superficial grey is well developed in lower animals, and atrophic in man and the apes, accounts for the noteworthy difference observed in the color of the anterior pair of the corpora quadrigemina in the two groups.(9) In the rabbit and dog while the posterior pair is white on its surface, as in the human being, the anterior is grey; in man this pair is also white.

§ 107. Underneath the first grey layer follows a layer of white substance, the SUPERFICIAL MEDULLARY LAYER. This in man is mingled with scattered cells, and consists of several sets of fibres. The most massive consists of sagittal fasciculi which run forward to the thalamus. Others come directly from the optic tract and enter the superficial cortex described. Still others, and these are few in number in the human brain, run in a radiating manner towards the deep grey layer. It is this layer which, in man and the apes, gives the white color to the surface of the anterior pair, owing to the attenuation of the covering grey.

§ 108. The DEEP GREY of the OPTIC LOBES is the most important constituent of those ganglia in man. Laterally it passes insensibly into the scattered grey of the tegmentum, but this fusion is to be regarded as an accidental one, and is due to a common embryonic origin. Its cellular elements are thickly crowded, and while the majority are of a smaller category, there are some pyramidal nerve cells in it arranged in a fairly regular series, of large size, and resembling the large pyramids of the cerebral cortex, which are ordinarily termed "motor."

§ 109. Underneath the last grey layer, and between it and the central tubular grey, we find a fasciculus running in the plane of the section, and constituting a DEEP WHITE LAYER. Its fibres sweep around under and parallel to the grey matter from which they appear to originate, and while a fair proportion of them go, as in reptiles, to the oculo-motor nuclei and the posterior longitudinal fasciculus (§ 101), a large number pass directly into the tegmental region, constituting part of a large condensed fibre mass which becomes longitudinal and constitutes the superior lemniscus.

§ 110. The SUPERIOR LEMNISCUS contains fibres of probably many different origins; it interests us in this chapter only in so far as it contains a portion of the fibres of the deep white layer, and conducts them to lower levels of the encephalon. It may readily be supposed that the latter follow the course of the entire bundle. The superior lemniscus, after passing down at the lateral part of the isthmus, comes to lie dorsally over the pons varolii, occupying here the middle division of what we shall study later on as the lemniscus layer of the tegmentum.

This mass is continued down into the medulla oblongata, and there takes part in the pineal decussation through which its fibres pass into the posterior columns of the spinal cord. These fibres, therefore, in part, constitute a connection between the sensory tracts of the spinal region and the optic lobes.[(10)]

§ 111. Many of the fibres of the deep medullary layer enter, as I have said, the POSTERIOR LONGITUDINAL FASCICULUS (p, Fig. 11), that remarkable nerve bundle referred to in the first chapter in connection with the nuclei of the eyeball muscles.

Originally there can be little doubt that the posterior longitudinal fasciculus developed as a commissural system, corresponding to what I have termed (§ 32) the longitudinal associating system of the central tubular grey, for its morphological continuation in the spinal cord, the column of Türk, is of this character. To a slight extent it maintains this character in adult life, and the view of Deiters, Flechsig and Forel is thus, in part at least, confirmed.

The latter author admits that the fasciculus cannot be traced beyond the altitude of the posterior commissure, and that in its full development it is only found in levels falling below the middle altitude of the anterior tubercles of the corpora quadrigemina. Now, if a fasciculus is seen to receive fibres from a given source, and positively known to receive no fibres from any other source, we are justified in declaring its main origin to be from the ascertained source. And if observations on other animals built on the same general plan as man, and in whom the relations are clearer, that source is confirmed, we may consider that source an established fact.

Following this line of argument, I do not hesitate to state that the posterior longitudinal fasciculus originates in the deep grey of the optic lobes, and gives off fibres to the trochlearis and common abducens facial nuclei, and to no other nerve nuclei below the level of the latter, until the cervical spinal cord is reached, where, decussating in the anterior commissure, it appears to be lost in the nuclei of the cervical muscles. Irritation of this tract in reptiles, whose posterior longitudinal fasciculus lies finely sculptured on either side of the median groove of the fourth ventricle,(11) confirms a relation of this bundle to the movements of the head and neck, as far as these movements are in an automatic relation to the visual perceptions.

§ 112. We have thus confirmed for man what we have established for the clearer case of the reptilia. We have seen that a centripetal tract from the retina abuts in the superficial grey of the optic lobes, a presumably sensory centre, that thence connections pass to a presumably motor co-ordinating centre, the deep grey, and that from the latter a system of fibres is developed which places the nuclei of the ocular muscles, the orbicularis palpebrarum, and the muscles moving the head on the neck under the subjection of the retinal impressions.

Anatomy furnishes us with nothing further in explanation of the ocular co-ordinations; it only presents us with the uncertain observation that the optic lobes of opposite sides appear to be connected through a commissural system in the superficial white layer, and that an interchange of fibres between the posterior longitudinal fasciculi of opposite sides takes place. But enough is known to justify us in regarding these latter fasciculi as oculo-motor tracts. The physiological deductions will find their place in the appropriate chapter.

The question may have arisen in the mind of the reader, why the superficial grey should be atrophic in man, whose visual sense is well developed as compared with that of lower animals. This fact will find its explanation in a following chapter. I will simply say for the present that as the thalamic and cerebral projection of the retina gains in extent, that in the optic lobes diminishes, and probably no more extensive projection of the retina takes place in the human optic lobes than is necessary for the coördinating purpose. In the lower animals they were both coördinating, registrating, and receiving centres; higher ganglia usurp the latter functions in man. This view is borne out by the fact that in the mole, whose retinal and oculo-motor innervations are almost *nil*, the superficial cortex and superficial white matter are absent, and the deep grey atrophic, while the higher visual centres, as in other insectivora, are undeterminable.

As it is not my object at present to discuss the optic tract as a whole, I shall defer the consideration of the destiny of those fibres, which go elsewhere than to the optic lobes, to the following chapters.

As far as we have gone, we can see in the optic lobes of man nothing further than a controlling centre of those movements which are subject to the retinal impressions, and this view is borne out by pathological experience, for isolated lesion of the anterior pair, or both pairs of the corpora quadrigemina, fails to produce blindness, unless a morbid influence or change extends to the optic tracts.

The diagram on the following page exhibits the frame within which the coördinating mechanism in question takes place. I omit for many reasons to duplicate the centres and tracts as they are duplicated in nature, and will ask the reader for the present to consider the retinas, the optic lobes, fasciculi, nuclei, nerves and muscles of opposite sides to be fused in the median line.

§ 113. The POST-OPTIC LOBES OR GANGLIA comprise a symmetrical pair of compact ganglia, which in the human being have the shape of biconvex lenses on transverse section, and which are covered by medullary substance in all animals. They are composed of a molecular basis substance, enclosing cells not unlike in shape to those of the nucleus vagi; they are round and multipolar, with slender processes, but much larger than those of the superficial grey of the optic lobes.

A striking fact is the uniformity of this ganglion in the animal series; it is well marked (although this has been denied) in reptiles (Fig. 12, O 2), and attains a remarkable development in some of the mammalia. (Fig. 13, P 2.)

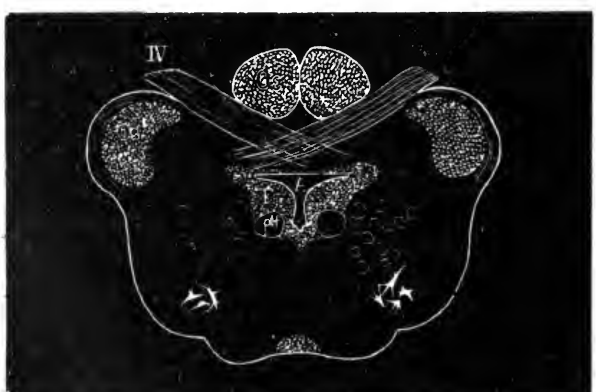
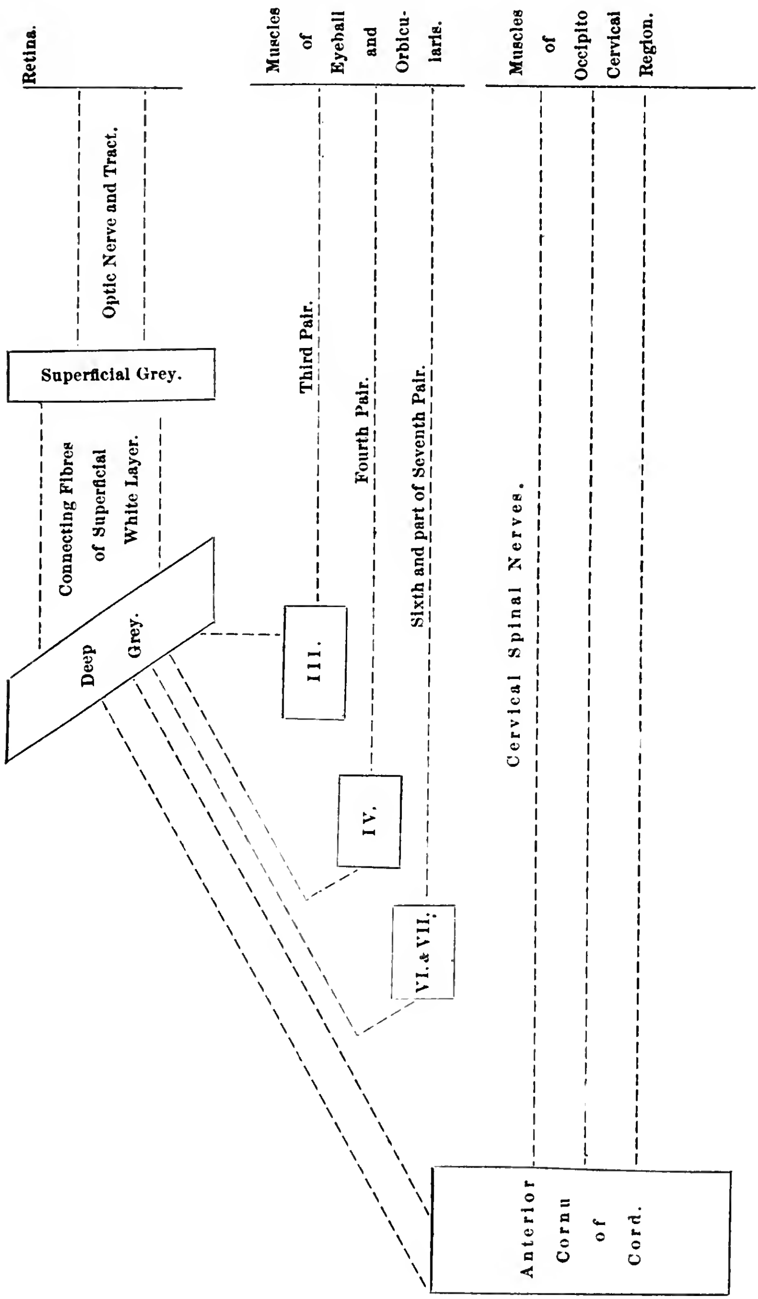


Fig. 12. O 2, Post-optic Ganglion; O 3, Inter-optic Ganglion; IV, Trochlearis nerve and decussation; p. l. f., Posterior longitudinal fasciculus; T, Trochlearis nucleus. After a transverse section from the *Iguana.*


Retina.
Optic Nerve and Tract.
Superficial Grey.
Connecting Fibres of Superficial White Layer.
Deep Grey.
Muscles of Eyeball and Orbicularis.
Third Pair.
Fourth Pair.
Sixth and part of Seventh Pair.
III.
IV.
VI. & VII.
Muscles of Occipito Cervical Region.
Cervical Spinal Nerves.
Anterior Cornu of Cord.

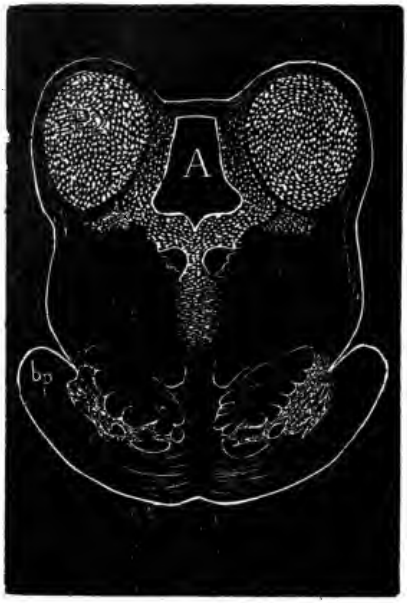
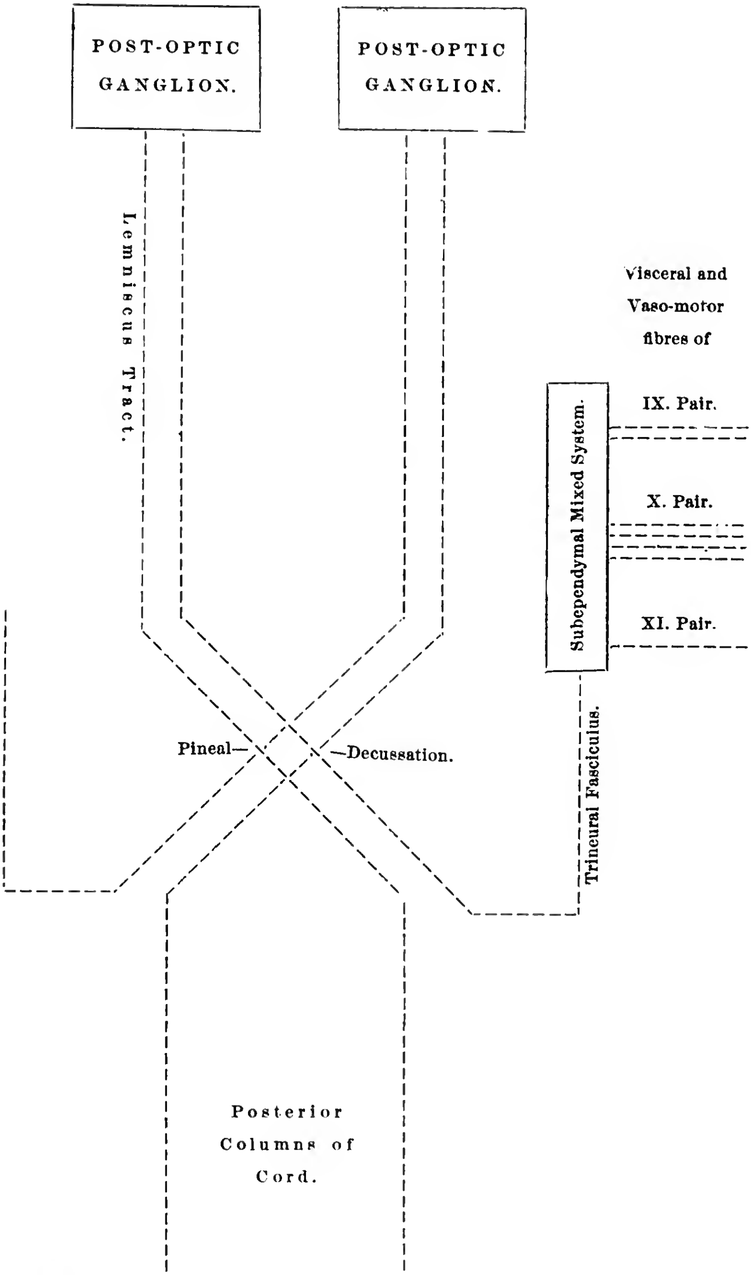


Fig. 13. Corresponding section from lioness. P 2, Post-optic Ganglion; A, Aqueduct; b. p., Brachium Pontis.

I am not able to derive any deduction from the comparative development of this ganglion in different animals.[12] On the whole it is larger compared with the tegmental area in the mammalia, if contrasted with the sauropsida, and in the latter as contrasted with the amphibia, in which group it is not closely defined.

§ 114. From the dorsal contour of each post-optic ganglion numerous fibres collect, which ultimately contribute a distinct fasciculus, the INFERIOR LEMNISCUS. This latter bundle takes a similar course to that one described for the superior lemniscus, but runs more laterally. It also decussates in the "pineal decussation," but in a different altitude apparently. While most of the crossed fibres of this altitude pass into the posterior columns of the cord, a not inconsiderable portion forms after crossing a distinct fasciculus, which I have described as the Trineural Fasciculus in the first chapter. While I can only venture to predicate this connection as a *surmise* (based, however, upon a study of embryonic development and of a complete series of transverse sections from adult brains), the view which I am thence constrained to adopt, that through the inferior lemniscus the post-optic ganglia are brought into some relation with the visceral and vasomotor innervations, is much strengthened by some anatomical and physiological facts.[13]

This relation, as far as it can be surmised, would be as follows:


POST-OPTIC
GANGLION.
POST-OPTIC
GANGLION.
Lemniscus Tract.
Visceral and
Vaso-motor
fibres of
IX. Pair.
X. Pair.
XI. Pair.
Subependymal Mixed System.
Pineal—
—Decussation.
Trineural Fasciculus.
Posterior
Columns of
Cord.

The third important ganglion whose morphological consideration should fall within this chapter I have announced in the heading merely for the purpose of formal enumeration. The study of the CEREBELLUM is necessarily so closely interwoven with that of the higher centres of the fore-brain, with which it is in fascicular connection, and its relations to the lower centres which it enjoys are so obscure unless the cerebellum be considered an intercalar depot for final cerebral transmission, that, although an originally independent segment of the embryonic nervous system, it cannot be satisfactorily studied except in the light of an intercalar nerve-mass. So that I shall defer the description of the cerebellar architecture to the fourth chapter.

What we know of this ganglion in the lower animals is so unsatisfactory that it is difficult to even hazard a conjecture as to what its original functional rôle was. I am inclined to consider it as a homologue of the gelatinous nucleus of the fifth pair,(14) and as in a primitive relation with that nerve; that subsequently the auditory nerve entered into connection with it, and that, increasing in dimensions with its increasing neural connections, it attained the high development found in the human cerebellum, through the spinal and cerebral tracts that are detached into its medullary substance.

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(1) And even here we would not be able to exclude a functional participation of the reticular ganglion.

(2) The apparent contradiction existing between this assertion, and the results of Pflüger's experiments on the spinal centres of the frog, will be explained in the chapter on the mechanism of the cerebral centres.

(3) It is represented by a deeply stained sub-ependymal area of the central tubular grey of the aqueduct. In the Iguana it attains the dignity of a distinct pair of lobes which, situated in front of the trochlearis nerve origin, might be mistaken for the homologues of the posterior pair of the corpora quadrigemina, which is also very clearly marked in the Iguana, lie further to one side, and on a somewhat posterior plane, though the posterior end of the former and the anterior end of the latter fall in the same transverse section.

(4) This formation of conducting substance is analogous to the manner in which white substance is developed on the inside of the grey substance in the cerebral hemispheres. If this is to be considered a higher feature in a morphological sense, the fact would be in perfect harmony with the relatively higher and more independent position of the mesencephalon in reptiles as compared with mammals, in which class it has lost much of its importance.

(5) And with the derived posterior longitudinal fasciculus, which is much reduced in the mole and the crepuscular bats.

(6) How erroneous ideas of the brain architecture must become, if sight is lost of the embryological and comparative anatomical facts related thereto, is nowhere as markedly illustrated as in the case of the ganglia named.

In the human and mammalian brain there is found in front of the cerebellum and behind the thalami, a rounded quadrangular elevation, presenting a demarcation into four tubercles. For the older anatomists who were guided in their nomenclature less by the deep structural relations than by the plastic contours of tissues, these latter constituted so many subdivisions of one common ganglion, and they termed them the *corpora quadrigemina*. Then when a portion of the *optic tract* was traced to these bodies by naked-eye observation, their functional position as visual centres seemed well established. Comparative anatomy, equally ignoring the subtler connections of the different parts, identified the corpora quadrigemina of the mammalia with the *optic lobes* of birds, reptiles and amphibians. Inasmuch as four tubercles constitute the corpora quadrigemina of mammals, and two constitute the optic lobes of the sauropsida and ichthyopsida, the *dictum* has been and is promulgated, that one of the great dividing lines between the mammalia and all the other vertebrate classes is, that in the former the mesencephalon divides into four, in the latter only into two segments. Then followed the embryologist, and taught that in the mammalian embryo the originally single mesencephalon was divided into two halves, as in reptiles, by a median sulcus, and that finally, by a crucial furrow, these were re-subdivided so that four tubercles resulted.

This is the current view as entertained by zootomists and neuro-anatomists. Though all the points involved in this special subject are fundamental, and the almost unanimous voice of scientists is in favor of that current view, I am able confidently and categorically to pronounce it erroneous in each and every particular!

1. It is incorrect to say that the anterior and posterior pairs of the corpora quadrigemina are analogous in structure.

2. It is incorrect to say that the optic nerve has relations to both pairs.

3. It is incorrect to say that in the sauropsida the four tubercles of the mammalia are represented by two optic lobes.

4. It is incorrect to say that the mesencephalon of the mammalian embryo divides first into two lateral halves, and that these are each subdivided in turn by a transverse fissure.

On the contrary, the ganglia of the anterior and posterior pairs are distinct from each other in structure, in derivation and in their relations; only the anterior pair has relations to the optic nerve; only the anterior pair corresponds to the optic lobes of reptiles, and only the anterior pair is derived from the mesencephalon of the embryo.

In the common reptiles, such as the chelonia and crocodilia, the cerebral architecture of the adult animal closely corresponds to that observed in the embryonic mammal. The cerebellum (Fig. 8, *c*) is a valvular cropping out of the grey matter covering the posterior entrance to what in these animals corresponds to the Sylvian aqueduct, then in front of the cerebellum follows a short, deeply situated area ('*o*), succeeded by two symmetrical globular ganglia (*o*) which simulate, as it were, button-like terminations of the optic tracts, and in fact microscopic examination demonstrates that in amphibians the entire, and in true reptiles almost the entire, optic tracts terminate in these ganglia, which are therefore properly known as the OPTIC GANGLIA.

In studying such a brain in a series of transverse sections, beginning at the medulla oblongata, in order that we may be able to identify in the more complicated grey masses of the cerebellar and mesencephalic regions the homologies existing with the simpler grey masses of lower altitudes, we find that the cerebellum is an hypertrophy of that embryonic grey matter which corresponds to the dorsal or posterior commissure of the spinal grey. We also discover that concealed in the region intervening between the cerebellum and the optic lobes there are two symmetrical and lensiform grey masses which correspond to the *caput gelatinosum* of the posterior cornu of the spinal grey (Fig. 9 D). *These bodies are structurally similar to and have the same fascicular relations as the posterior pair of the corpora quadrigemina of man and the mammalia.*

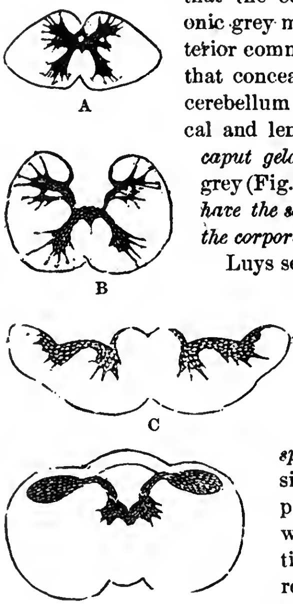

Fig. 14. Transverse sections through the brain of *Thallassochelys mydas* (green turtle); A, through the junction of the cord and medulla; B, through lower apex of fourth ventricle; C, through auditory nerve root; D, through post-optic ganglion, corresponding to the altitude indicated by ó in Fig. 8.

Luys seems to have had a correct view of the relation of the anterior pair to the optic lobes in birds, for he states that the optic lobes of birds correspond to the anterior pair of the corpora quadrigemina, *plus* the corpus geniculatum externum of mammals (*Recherches sur le Systéme nerveux cérébro-spinal*). But this homology could not be considered established until that of the posterior pair had been rendered clear. That Forel, to whom we owe much with regard to this question, entirely misconceived the comparative relations, is shown by his statement (*Untersuchungen, etc.*) that a study of the ornithorynchus brain would probably throw light on this question. I have shown that the reptilian brain explains it. (A new homologization of the Corp. Quadrig.) I would state provisionally and in passing that unless the optic lobes, the post-optic and inter-optic lobes are carefully distinguished, that we can never expect to clear up the homologies of the brains of fishes. Much of the confusion arising in the course of the Gegenbaur-Stieda controversy, would have been avoided if the brain of the sauropsida had been properly studied and utilized as a key to the comprehension of the more bizarre though lower brain of the ichthyopsida.

(7). The arrangement of the different layers of the optic lobes in reptiles, strongly suggest the similar arrangement of certain of the retinal layers, at least on superficial observation.

(8) To Forel (*Unters. über die Haubenregion*) belongs the credit of having first clearly differentiated these different constituents.

(9) In no animal have I seen the grey color of the anterior pair so well marked, and the extent of the ganglionic expanse superficially so neatly demarcated as in the hippopotamus. In the dog, which in cerebral development reaches nearer to that of the Simians than does that of the rabbit, the grey color is less distinct; in man Forel states that a slight yellowish tinge is noticeable in the anterior pair, as an indication of the atrophic cortex.

(10) The possibility that some of the fibres of this fasciculi pass directly into the lateral column, though to my mind a remote one, is not to be entirely excluded. As far as I can judge from the obscure description of Flechsig, which labors under the additional disadvantage of being ambiguous, his results derived from the embryo, agree with those I obtained from a study of the adult brain. Such a connection accepted, it would perhaps tend to explain the participation of the retina in many spinal disorders. How often is not a chronic or acute myelitis, or posterior spinal sclerosis, ushered in or accompanied by temporary diplopia, amblyopia, or by optic nerve atrophy? How frequent it is for the symptoms of spinal irritation to be accompanied by visual disturbances. It is now generally accepted that some of the most severe prodromal symptoms of organic spinal disease are not accompanied by palpable structural change, and, perhaps the diplopic and amblyopic disturbances may be due to the distant transmission of an irritative influence through the lemniscus (a most probably centripetal tract), from the seat of disease, the posterior spinal columns.

Temporary diplopia is the most constant of all the symptoms ushering in the spinal affections mentioned, particularly posterior spinal sclerosis. And in every case observed by myself, and in almost every case which has made any impression on myself in perusing the literature of the latter disease, I have found that diplopia preceded amblyopia where the latter occurred. This would harmonize with the fact that any irritative influence traveling up the lemniscus tract would first encounter the coördinating centre of the eyeball movements (deep grey of optic lobes), and only by extension further on, the superficial or visual grey and through the opto-thalamic tract, perhaps higher visual centres.

(11) Whence anatomists have erroneously confounded it with the eminentia teres of mammals. The reason why it is so palpable at the ventricular floor in reptiles is that the motor nuclei are feebly prominent and fail to mask it, therefore, as they do in the mammalia.

(12) I would however note its relative reduction in size as compared with the anterior pair in the fruit-bat (Pteropus fuliginosus). Is this perhaps related to the relative reduction of the visceral masses and cavities in this animal?

(13) Notably by the experiments of Ott, published in the Journal of Nervous and Mental Disease, and by the histological correspondence between the post-optic ganglia and the nucleus vagi.

(14) Probably the post-optic ganglia had a similar relation originally, in obedience to the law of segmental harmony. Even in the adult, Forel considers a relation with the fifth nerve as not impossible.

ART. VI.—CONTRIBUTION TO THE STUDY OF MENTAL AND NERVOUS DISEASES, WITH CASES ILLUSTRATIVE OF TREATMENT.

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I. DIPSÔMANIA.

IN patients admitted to Sunnyside Retreat with Dipsomania, the affection is considered and treated as a distinct form of neurosis. These patients give way to the impulse and uncontrollable desire for alcoholic stimulants generally in solitude and periodically. Their disease unfits them to carry on any occupation continuously. They do not drink as does the ordinary drunkard, for pleasure, or with companions, neither do they drink whenever they have an opportunity, as an ordinary drunkard does. The dipsomaniac, I think, often truly wishes to refrain from drinking, and drinks in obedience to the blind, ungovernable impulse which he can neither understand nor control. In the intervals between the paroxysms when there is no craving, the dipsomaniac often dislikes liquor exceedingly, and will not touch it. This neurosis, for as we say above, we regard dipsomania as a distinct form of nervous disease, closely related to insanity, depends upon, or is the result of, an ill-balanced and defective state of the whole nervous system, in which there is a constitutional tendency to disease of the nervous system, which, in the cases under consideration, takes the form of dipsomania. The pathology of the production of dipsomania, in common with most other nervous diseases, consists, primarily, in an interference with the proper nutrition of the cerebral tissues of the fœtus, so that even during embryonic life, the brain of the infant undergoes pathological changes, which induce deficient moral power, mental weakness, and, as before remarked, a predisposition to the acquisition of all forms of nervous disease. The family history of patients who have been under my care has revealed insanity, habitual drunkenness, general paralysis, strumous diathesis, and dipsomania, in fathers, mothers, brothers, and sisters. In but very few cases do I find a good family history, and they are so few that I think I am warranted in calling cases of dipsomania with a good family history decidedly exceptional. Although confirmed dipsomaniacs are, as a rule, sterile, their offspring, if the marriage proves fruitful, by reason of the interference with the proper nutrition of the cerebral tissues of the fœtus during embryo life, induces a defective organization, prone to take on diseased action. These children are often affected with epileptiform convulsions, and as they grow older the morbific force which may lie dormant in the system, may manifest itself in one of the different phases of the neuroses, such as insanity, epilepsy, chorea, or dipsomania, the latter being, I think, the most frequent. Next in frequency comes, I think, epilepsy.

We find in dipsomania a peculiar type of premature mental decay and nervous exhaustion manifested. In patients admitted here with this disease, the general symptoms indicative of exhausted nervous power are observable, viz.: general debility of the body, inability to walk even short distances without fatigue, general feeling of languor, unwillingness to make any active exertion, great tendency to sweat, more especially at night, but also induced during the day by the slightest exertion, and often an unsteady gait. I have found these patients exceedingly prone to neuralgia. The explanation of this is probably due to the fact that there exists in such cases a worn, irritable, hyper-sensitive condition of the sensory nerve-cells of the central sensory tract, which is the sole seat of true nervous sensibility. The central nervous system is affected, beyond all doubt, by excessive drinking, and the degeneration thus produced I regard as a powerful predisposer of neuralgia of the inveterate type. Aside from the direct influence impressed on the nerve-centres, I think that this irritable and hyper-sensitive condition of the central sensory tract is often induced by visceral irritative disease of the stomach, kidneys, or liver, so frequently existing in dipsomaniacs, which almost necessarily affects the sensory nerves which ramify in these organs, and from these diseased nerves a more or less steady stream of irritative and wearing nervous impressions is transmitted, practically without cessation, to certain parts of the sensory tract to which the sensory nerves from any given part may go, and, as a result, sooner or later the central sensory nerve-cells are brought into that degree of nutritional disturbance which is the fundamental factor in neuralgia. The real seat of these severe neuralgias, from which so many dipsomaniacs suffer, is rarely, if ever, in the peripheral nerves of the affected region, but in the central nervous apparatus. The heart's action is weak, often irregular, accompanied by palpitation, and not unfrequently with symptoms of indigestion. There is indecision of character and often an utter inability to fix the mind on any one subject, or to follow up a train of thought consecutively. There is a loss of tone in character, blunting of moral perceptions, and a general impairment of all the mental faculties. The ideas are spontaneous, not well under the power of control, and any exertion requiring continuous mental effort is often impossible. The treatment of dipsomania is of a varied character. The endeavor is to provide constantly easy and pleasant occupation of the mind, avoiding equally lazy inaction or violent excitement. There is a worn, irritable condition of the nervous system, an unstable condition as regards its nutrition, its solidity, and its perfection of structure, which makes our task no light matter. The stimulus is withdrawn invariably from the first, and in combating the nerve-exhausting tendencies which are present in a marked degres in such cases, it is necessary to supply the greatest possible amount of nutritive material to the brain and nervous system to repair the existing nutritive lesion. We must quiet all abnormal nervous excitability, keep our patients calm and tranquil, and make them sleep. An even temperature of the body is maintained, and care paid to the condition of the excretory functions of the skin, kidneys, and bowels. If there is headache and drowsiness, such diuretics as the liq ammoniæ acetat. with sp. nitric ether are indicated. Indian hemp is also a valuable adjunct in doses of $\frac{1}{4}$ gr. of the extract as required. Free exposure, without fatigue, to the fresh air cannot too strongly be insisted upon. One of the most valuable of remedial agents is phosphorus, which we prescribe in cod-liver oil in doses from $\frac{1}{100}$ to $\frac{1}{12}$ of a grain after meals. The cod-liver oil is one of the best nutritive remedies, as fat must be applied to the nutrition of the nervous system if this is to be maintained in its organic integrity. The general effects of phosphorus are those of a stimulant, but it possesses a special power over the exhausted nervous system. It is perhaps evanescent in its effects, but is never followed by a stage of depression which is noticeable. It should never be ordered upon an empty stomach. Quinine and strychnine are also very valuable as nerve tonics, and I also have used with very good results Dr. Hammond's pill of phosphide of zinc and ext. nux vomica. When there is persistent insomnia, I am accustomed to rely on the use of prolonged warm baths given at bed-time, conjoined, when necessary, with monobromide of camphor or gelsemium ($\frac{1}{8}$ gr. pill) with sodium and chloral. Either of these are admirable cerebral sedatives.

I come finally to speak of the remedial agent which, in my opinion, far surpasses all others in its permanent effects, and which is comparatively little used. I refer to the judicious use of the constant and induced currents of electricity. The essential difference in the action exerted upon the nervous system by the use of electricity, and that produced by drugs very often prescribed, is as follows: many of the remedies commonly employed in the treatment of nervous diseases and in dipsomania, for the purpose of restoring lost nerve force, are *nerve stimulants*, and not nerve tonics in the proper sense of the term. Electricity is a remedial agent which furnishes us with the means of modifying the nutritive condition of parts deeply situated, and of modifying the circulation to a greater extent, I think, than by any known agent. By the judicious employment of the constant and induced currents, we have it in our power to hasten the processes of nerve growth and repair, and thereby indirectly hasten the acquisition of nerve power. The use of electricity does not, I think, act by contributing anything directly to the growth or repair of nerve tissue. Its action, it would seem most probable, is to stimulate and quicken these processes on which the material and functional integrity of the nervous system depends. The action of electricity is always followed in my practice by an increase of strength and nerve force, and the results gained are gradual and permanent, while the use of nerve stimulants has always seemed to me to primarily excite the nerve activities proper, and *not* the nutritive processes upon which the acquisition of power depends. The deceptive results obtained from the use of nerve stimulants depends upon the excitation of nerve activities and the resultant expenditure of nerve power, which is followed by a period of exhaustion varying in degree and duration. The careful and judicious employment of electricity has always led, in my hands, to an increase of nervous energy, while the employment of nerve stimulants has appeared to me to lead, in many instances, ultimately to a waste and diminution of nervous energy. In cases of dipsomania, we have, as I have already remarked, abnormal nervous excitability, conjoined with cerebral exhaustion, and the two indications which are urgent are, primarily, for increased rapidity and effectiveness as regards the process of nerve nutrition, and, secondarily, to secure freedom from excitement, and diminution of nerve activity, and thereby to check the waste of nerve structure and of power. These indications we can fulfill by the judicious use of electricity and nerve tonics more certainly than by any other means, there being no other such combined sedative, restorative and refreshant to the central nervous system, and we can thus successfully meet all the indications in cases of cerebral exhaustion and threatened mental disease, except that of affording direct nutriment to the brain, which, as I have stated, I endeavor to obtain by rest, cod-liver oil, phosphorus, etc. The use of electricity seems to supply to the system, in cases of inebriety, the stimulus which has been withdrawn; as my patients have repeatedly told me that, while under treatment, they experienced little, if any, of the terrible feelings produced by its withdrawal under ordinary circumstances. I have seen this so often that I advance it as a scientific fact, and not as an untested theory. I have had cases of years' standing who have assured me that the application of electricity has been of more service to them than any thing they had previously tried. I have generally employed both currents, the constant and the induced, using the negative electrode at the lower end of the spine or at the pit of the stomach, while I apply the positive pole to the head, cervical sympathetic, the cilio-spinal centre, or region over or on each side of the seventh cervical vertebra, and up and down the spine, making a séance of fifteen or twenty minutes daily, and in some cases twice a day.

Case 1. A gentleman aged 34 years, resident of New York City, admitted as a patient suffering from dipsomania. Father died of general paralysis; mother healthy; uncle died of phthisis. Upon admission was very weak and anæmic, and much exhausted from excitement and loss of rest. For three years had been a paroxysmal drinker. About once in two or three months would get uneasy and restless, and soon an uncontrollable impulse to drink would take complete possession of him, and at such times he never stopped short of actual intoxication. He had slept but little for some nights. The first night he was put on a mixture of bromide of sodium and ammonium, and a 4-gr. capsule of mono-bromide of camphor was also given; slept poorly. Next day beef tea and the bromide with ext. cannabis indica in $\frac{1}{4}$-gr. doses until patient was quiet. General faradization was employed at once, and phosphide zinc and strychnine used in pill. After five or six séances there was no craving for liquor, and the patient was relieved entirely of the terrible nervous prostration which had invariably attacked him during previous attempts to withdraw his liquor. He was given *no liquor at all* after his admission to Sunnyside. Was given phosphide of zinc, strychnia, the bromide and mono-bromide of camphor to control sleeplessness, and general faradization once a day for about twenty minutes. At the end of the second month central galvanization was employed, and at the expiration of six months our patient, who had formerly occupied a high and honorable position in the business community, was restored to his business relations and to his friends, perfectly restored to mental and physical health. It is now three years since his discharge, and since that time he has enjoyed perfect health and has had no further desire to indulge in alcohol.

Case 2. Gen.——, aged 40; family history good. Was admitted suffering fom dipsomania. Was much broken down mentally and physically. There was marked nervous exhaustion, general debility, and irregular action of the heart, accompanied by palpitation and dyspepsia. Had slept but little for a week and was much exhausted. For some years had been drinking periodically at periods varying from a few weeks to a month or two. In the intervals manifested a decided distaste for liquor, and would not touch it. There was a worn, irritable condition of the nervous system, and the patient seemed on the verge of an attack of acute mania. Was given a warm bath with cold to the head, lasting for half an hour, and put to bed, a dose of bromide of sodium and chloral, in combination with $\frac{1}{8}$ gr. of gelsemium being administered. The next day small doses of beef tea were administered every fifteen minutes. The following night the same treatment was followed as upon the first night of admission, with the effect of giving the patient the first quiet and restful night he had passed for weeks. Milk and beef tea formed the diet for the next two days, and the patient then put on a full nourishing diet, as the digestive organs had resumed their functions. Alcoholic stimulus was withdrawn entirely from the commencement of treatment. General faradization, strychnia, phosphorus and cod-liver were daily used, the effect of the electricity being to obviate any disagreeable feelings or sufferings consequent upon the withdrawal of liquor. Under this treatment the patient steadily improved; the symptoms of nervous exhaustion disappeared, the mental faculties improved, and there was no craving for liquor up to the time of the patient's discharge; nor has there been since that time, about two years having elapsed. These are typical cases of dipsomania, taken from our case book, and fairly represent the class of cases we are constantly treating. These cases, as we before remarked, drink generally in solitude and periodically, the attacks being preceded by a general sense of uneasiness, listlessness and depression. They are admitted with shattered constitutions and broken down nervous systems, which require to be built up and restored. Their digestive powers are weakened, the appetite is impaired, the muscular system is enfeebled, and the generative function often decayed. The indications for treatment in all these cases is to place the patient under the most favorable hygienic influences, provide for him cheerful, tranquil and pleasant surroundings, repress cerebral excitement, procure sleep, and give plenty of good nourishing food and an abundance of fresh air, exercise and amusement. By the use of these means we have had the pleasure of restoring many patients to their homes and to society permanently cured.

II. THE OPIUM HABIT.

Although inebriation by opium is not known to the people or to the medical profession as alcoholic excess is, this ruinous propensity seems gradually to be infecting large numbers of both the upper and the lower classes, as a substitute for, or being taken in connection with, alcohol. In my experience, pain is generally pleaded as an apology for indulgence in opium; but my experience also convinces me that the opium is taken to produce agreeable, soothing, stimulating, elevating, or exquisitely pleasant sensations. I have tried to analyze the psychical operation of the drug by long and close conversations with my patients. The intense sensibility resulting from the use of opium seems to be entirely subjective, depending upon the abnormal condition of consciousness. Many ladies take it, I fancy, to enhance the pleasures of society, while others resort to it to relieve the nervous prostration resulting from fashionable dissipation. I have observed the gravest physical and moral consequences supervene on its long continuance; even insanity itself, as I shall state hereafter in the latter part of this paper. From what I know of this habit, I am satisfied that many persons, and particularly many ladies, take opium in pretty large doses for years in their own families without the slightest suspicion being excited. The ladies of to-day may possibly be but following or reviving a very ancient custom, for Diodorus says the women of Thebes were acquainted with an herb which, from its properties, leads us to suspect that it was the poppy. We have no direct evidence, however, that it was used for more than a sleeping draught. Latullus and Tibullus speak of this plant, while Homer speaks of the poppy as among the familiar garden flowers. Pliny also understood its virtues, and Livy speaks of it as being in the gardens of Tarquinius Superbus, which shows that it was known to the Romans at least five centuries before the Christian era. Hippocrates was also well acquainted with its virtues. The Nepenthes of the Odyssey and the ancient cordials probably contained opium and also Indian hemp, which imparted the intoxicating and exhilarating inspirations to such beverages. Opium was used medicinally by the Greek physicians centuries before the Christian era, and Dioscorides and others describe the mode in which it was obtained from the capsules of the plant. In 1228 we find the use of opium mentioned by the physician to Pope Nicholas IV. It was sent afterwards, with camphor, etc., as a present to royal personages; and in 1516 it had become an article of commerce. In a letter to the king of Portugal by Pyres, it is described as in great demand among the rich and noble people in Egypt and Cambay, where the consumption was limited only by the price. Its use as a luxury was communicated by the Arabs (who have also been the greatest users of hashish) and Persians to the other Eastern nations, and the rapid recourse to some form of opium was contemporaneous with the spread of Islamism. From being known in China as a medicinal substance in the ninth century, it has lately become a means of sensual indulgence, and constitutes a distinct and lucrative department of trade. About 3,000,000 Chinese smoke opium, and 94,000 out of 9,000,000 natives of Java smoke opium. The emperor of China, seeing doubtless the inevitable ruin of his empire if this is continued, has issued a proclamation forbidding the further cultivation of the poppy in the Chinese empire. In the island of Singapore, 15,000 out of a population of 70,000 are similarly addicted. It is recorded that, calculating the consumption of 299 smokers in Singapore, each smoker consumed what was equivalent to 50 grains of crude opium per day. When used to excess, it is said that 116 grains have been consumed in this manner, One hundred pounds has been stated to be the monthly supply for the opium inebriates of the island. The opium traffic with China is so immense that as far back as 1854 the Chinese paid the East India Company for opium alone a sum exceeding in valuation the total exports of their teas and silks together. The effect of opium is invariably, although in different degrees, agreeable, soothing, stimulating, and elevating, culminating, as opium smokers describe, in perfect bliss and complete oblivion. This state, however, is soon succeeded by languor, lassitude, loathing of food, aching of the limbs, gloom, and indefinable wretchedness; and these sensations are only relieved by increased indulgence, which gradually results in a complete demoralization of the moral as well as the physical nature. In China the opium used for smoking purposes is prepared with the greatest care from the crude gum, thus obtaining an extract or "Tschandiè" which is about 54 per cent. of the original gum, and which yields more pronounced exhilarant and sedative properties, with a corresponding reduction of the narcotic element. In the region of the Bosphorus there is used a confection of the lozenge form, and these lozenges are sold publicly. At Cairo a conserve is sold, which, in addition to opium, contains hyoscyamus; while in India, the same confection contains Indian hemp or nux vomica. In Turkey, the natives add to the gum opium ten per cent. of mercury to intensify the stimulation. Morphine contains the sedative property of opium, but the narcotic power is lessened, and it is therefore much used by ladies, especially in England. Laudanum in China is limited to the higher classes, while with us it is used by the lower classes, to whom druggists are in the habit of selling a diluted laudanum for the purposes of drink. In China opium is universally smoked; while in Persia the lozenges before alluded to are swallowed. In smoking the opium the lungs are inflated as much as possible, and after retaining the smoke for some time—practice making perfect—the fumes are exhaled through the nostrils. In this way a single whiff penetrates throughout the air cells of the lungs, and after a length of time, extending from a few minutes up to two hours in old habitués, the coveted influence is obtained, and lasts from three to five hours, as the case may be. From the dens of the opium shops in the cities, where the lowest classes congregate, to the boudoirs of the rich with the gilded opium pipe, the same intoxicating bliss is sought for, and the same curse of destruction of mental and physical health brands alike the rich and the beggar. From the time when the indescribably entrancing repose following the use of opium occurs, may generally be dated the bondage to the drug, which eventuates in ruined health, prostrated business, and blasted hopes. The action of opium suspends and permanently enfeebles volition and conscience. Whether this is due to its agency upon cerebral structure—that is, whether it is imbibed by the nervous tissues and creates by such imbibition changes incompatible with pain, for instance, or whether by its action on the brain the will directs the attention of its influence to structural or moral suffering as the case may be—is a very difficult problem for psychologists. It would seem that the suspension and enfeeblement of the moral faculties produced by opium, while the intellectual faculties remain unimpaired, should depend rather upon a relation between opium and sensibility and consciousness, than upon the relation which it has to cerebral substance. One very disagreeable symptom which my patients complain of is a general hyperæsthesia; and the painful nervous susceptibility often becomes so acute that even a jar from a footstep becomes unendurable; while the neuralgic twinges that result from opium shoot along the nerves, until the unhappy sufferers, body and mind alike, are shattered from the prolonged torture. When a man has once yielded himself up to the mastery of this appetite, the soul becomes contaminated, the moral sense becomes obliterated, and all the finer susceptibilities and nobler aspirations decline and fade away; the aim in life becomes erratic and purposeless, and the habitué, if he has children—for the use of opium is provocative of sterility—has the misery of seeing his children inherit the physical expression of general enervation and the mental aspect of dullness and idiocy. These children with their feeble, broken-down constitutions, inevitably fill, as they grow up, our prisons, almshouses, and asylums. Opium is sometimes resorted to by literary men for the transient exaltation of the imaginative faculty, but the intellectual fire, which is regularly fed as it flags with stimulants and narcotics, will ere long die out, never to be relighted. Voluntary renunciation of opium by one who has become addicted to its use is unknown to the profession. Opium habitués make many well-intentioned resolves toward reform, but they are invariably frustrated by a revival of the appetite, and a relapse follows. Opium is taken generally to stimulate the mind, to soothe irritability, to induce placidity, pleasurable feelings, to restore the strength and activity enfeebled by previous indulgence, and to render the partaker himself capable of discharging his duties and occupations by imparting an artificial and temporary health, which at once deceives the victim and baffles the keenest scrutiny. A wan and withered man or woman, with an unsteady and ill-balanced gait, bent figure, tremulous hand, having lost control of the muscles, features pale and haggard, eyes sunken and lustreless, the patient would appear to the ordinary observer as a man or woman tottering on the verge of life. Administer to the patient his ordinary dose of a solution of morphine, and observe the result. The transformation to a non-professional observer is something miraculous. The gait is firmer and more assured, the muscular system is restrung, the face has grown in roundness and fullness and is flushed as in health, and the conversation is brilliant and fascinating. In one of our patients, who was a fine musician, opium had undoubtedly been relied on to intensify and render more brilliant her execution on the piano, and also to enable her to sing with more passion and abandon, as after these efforts she would become a different person, generally retiring from the company in the parlor as she felt the effect of the opium wearing off. A gentleman who applied for treatment arrived early in the evening, and apparently hardly able to walk, said, "Doctor, I can't meet the gentlemen until you give me a hypodermic." This being administered, he lay down on the lounge in my private office for a short time, possibly fifteen minutes, and came out with a totally different appearance from that which he presented when he came in. His ideas were brilliant and under control, his conversational energies improved, and he played some most excellent games of billiards. By the time for retiring, however, his rejuvenescence had faded away into his former spectral appearance. Opium is resorted to among our higher classes to blunt care, to dry the tears of grief, to calm the tremors of the terror-stricken, and lull clamorous consciences to the coveted rest. In addition to this, the wear and tear of our hurried life, and the nervous exhaustion and prostration so common among fashionable women, are temporarily relieved by this habit. One fashionable lady, who became a patient of mine, used hypodermic injections, the pretext being to allay the pains of neuralgia. The origin of the habit in this case was the use of the hypodermics by a physician for neuralgia, but as he was a busy practitioner and objected to being called up at night, he very thoughtlessly told this lady to get herself a hypodermic syringe, and showed her how to use it himself. The craving for the morphia soon became morbid, and upon her admittance as a patient here, I could count *hundreds* of wounds on the arms and thighs produced by the hypodermic needles.

These opium habituès are severe sufferers. When a patient awakes to a consciousness of his real position, it is pitiable in the extreme to know that this state can only be mitigated by new and perhaps increased indulgence. There is probably no more terrible suffering than the complete exhaustion, prostration of mind and body, feeling of sinking, and the pains in the limbs, principally in the calves of the legs, from which these patients suffer. The control over the muscles is lost, and epilepsy, paralysis, and an unsteady, ill-balanced gait, are all frequent symptoms of this terrible disease. Such patients have a full consciousness of their position, but are powerless to emancipate themselves from the opium habit. Their miseries and anguish are extreme, but in spite of all effort they find themselves forced back again into the habit. It is this class of cases that apply to us for medical aid and treatment, and there are certainly no cases of any disease which more require to be lifted out from the depths of their suffering, and are in greater necessity of careful nursing, consideration, and attention. It is a matter of clinical experience here that the opium will yield to proper treatment, and can be thoroughly eradicated if the patient will put himself under the necessary control and desires a cure himself. Upon admission, the ordinary dose of opium is reduced considerably, and from the point thus fixed a slow reductionary course of treatment is adopted, while the nervous system is kept quiet by sedatives. By this plan of treatment, suffering and nervous prostration is practically obviated. The opium being entirely dropped, which it usually is in from ten to twelve days after the admission of the patient, he is given warm baths and sedatives to obviate the sleeplessness which often appears at this time, while to stimulate and invigorate the central nervous system the daily use of electricity, in the form of general faradization, with a tonic mixture containing quinine, strychnia, phosphorus, and tinct. gentian, and cold sponge baths, soon build up the nervous system, and the patient in one month from the time of his admission presents a most gratifying appearance. He has grown apparently about twenty years younger, and his eyes and complexion have resumed their natural appearance. Upon their admission patients generally appear about twice their actual age, by reason of their shattered constitution and enfeebled muscular system. Patients gain, on an average, from 15 to 25 lbs. within six weeks of their admission, and very often are able to leave Sunnyside and return to their business in that length of time. The length of time required for a cure depends, I think, upon the patient's own temperament and constitution, so that from my experience I should find it very difficult to lay down a definite rule as to the average time required to cure a case of opium habit. In the person of a German, a gentleman of quiet and phlegmatic disposition, a rapid and complete cure was effected in one month, and although he had been addicted to the use of opium for two years, he denied that he experienced any suffering from its withdrawal, and with the exception of two sleepless nights he experienced no inconvenience as a result of treatment. Upon his discharge I congratulated him on his speedy cure, telling him that I wished all my patients were Germans. Another similar case occurred in the person of a physician, 47 years of age, who, as a result of a fracture of the radius and dislocation of the ulna, had commenced the use of morphia hypodermically, and upon his recovery found that the craving for morphia had taken complete possession of him, and that he was powerless to resist it. He came to me immediately, and placed himself under my care. This was six months after the occurrence of the fracture. He was taking eighty minims of Majendie's solution daily, hypodermically. He was pale, emaciated, and his mental faculties were enfeebled, and he was very much afraid of being left alone in the dark at night. I at once reduced him to 40 minims daily, commencing treatment with a mercurial cathartic, followed by salines. As the morphine was gradually reduced in quantity, the sedatives were increased, adding tinct. cannabis indica at night when there was any sleeplessness. In ten days the morphia was discontinued, and the electricity and tonic treatment commenced, and at the expiration my friend had gained 23 pounds of flesh, had not the slightest craving for morphia, and returned to his professional labors perfectly well. I hear from him occasionally, and he has had not the slightest desire for morphia. I have treated several physicians with the most pleasing results, as with one exception they all coöperated with me in my efforts for a speedy cure. In the majority of cases of professional men, I find that the use of opium was commenced to relieve pain, and that subsequently, having used it for weeks or months, the patient found himself utterly unable to do without it. In several instances I have found that patients were also addicted to the use of chloral, and these are more difficult cures to treat. The excessive use of chloral hydrate produces a peculiar condition of weakness and irritability of the vaso-motor system, interference with the functions of the liver, enfeeblement of the mental functions and of the moral sense, great restlessness and sleeplessness, neuralgic pains, unsteady and wandering gait, irregular and feeble action of the heart, and decided tendency to paralysis of the lower extremities. The anæsthetic effects of chloral in its influence on the nervous system are to be attributed to chloroform, and to the alkaline formiates that develop simultaneously as the chloral decomposes, contributing to the anæsthesia by their vaso-dilator action, carrying the chloroform more rapidly and in greater quantity to the nervous centres and terminations of peripheral nerves.

Art. VII.—PERSISTENCE THROUGH LIFE OF THE SOMATIC ELEMENTS.

By John Stuart Woodside, M. D.

PHYSICIANS, and physiologists in general, have so long taught that our bodies are continually undergoing a species of physiological decay, transformation and renewal, that even the laity have come to consider it as an established fact that not a single particle of matter which now enters into the composition of their frames existed there "seven years" ago.

Such expressions as "disintegration of the tissues," "molecular transformation," "tissue metamorphosis," "destructive assimilation," are constantly before our eyes in our text-books and medical periodicals, and the medical mind has become so saturated and imbued with the teaching herein indicated, that the propounding of antagonistic opinions will be sneered at as a rank heresy, and the holder of such immediately diagnosed as in a profound state of confirmed dementia. That it may not be thought that I am exaggerating the present teaching of physiologists on this matter, I quote from Flint, Jr., the following: "In the organism of animals every part is continually undergoing what may be called physiological decay; the organic nitrogenized principles are constantly being transformed into effete matter. This process of molecular change is a necessary and inevitable condition of life."

Dalton gives an approximate idea of the rapidity with which these changes take place in the following words: "The total quantity of material introduced and discharged within a given time, forms a measure of the rapidity with which the internal changes of nutrition and metamorphosis go on in the animal system. Rather more than five per cent. of the entire bodily weight is absorbed and discharged daily by the healthy adult human subject; and, for a man having the average weight of 65 kilogrammes, a quantity of material equal to the weight of the whole body thus passes through the system in the course of twenty days." Plainly put, this means, that in about every twenty days the integral composition of our whole cellular organism undergoes radical, vital, and structural changes of a substitutionary character!

Metaphysicians, particularly those who have a leaning toward biblical teachings, support their philosophical theories of mind as a distinct entity independent of matter by data drawn from this evanescent theory of nutrition. For example: "No man in his senses doubts that he is the same individual that he was ten or twenty years ago. But the sameness or identity of which we are conscious is entirely in the mind, for the body is subject to continual decay and change. Now this alternate waste and repair—this constant influx and efflux of material particles—this total change of our bodily substance—is utterly inconsistent with the conviction of Personal Identity except upon the supposition that mind, which has this conviction, is altogether different and distinct from matter. All anatomists agree that the whole structure of the brain is repeatedly renewed in the course of life, there being no particle of the same organ in manhood which had existed in youth. Yet an image impressed on the sensorium in early life is often recalled in age, after the whole material tablet on which it was engraved was removed. This would seem to indicate that memory is a function connected with something beyond the boundary of matter." The materialist cannot confute such reasoning by saying that in the process of cell substitution the older ones have the power of transmitting all the impressions which they had received to their successors; also, of collecting and recording all the impressions of their own day and generation, and transmitting these with the accumulation of their ancestors to their descendants; and that the third generation of cells could perform the same function and filial duties for their parents and grandparents. The absurdity is palpable. No stronger proof can be adduced than the phenomena of memory of the persistence throughout life of the cellular elements once they have attained a certain development; and that their integral basic structure *does not* undergo molecular disintegration and consequent transformation with the substitution of new tissue. Impressions made on the infantile brain are not retained until the growth and elaboration of that most highly organized protoplasm of which the ganglionic cells consists, has arrived at the state of perfection which enables it to receive, transmit or record, impressions conducted to it. Once arrived at that state of maturity, molecular changes may and do occur continually, but not of a disintegrating character. This will be explained further on.

If theologians want an argument to substantiate and explain the length of Methuselah's life, and such ilk, they might search far before finding a stronger one than the destructive assimilation theory. Were it so that a man's whole cellular structure undergoes complete renovation and is reorganized at short intervals with a new physical basis of life, he would live much longer than he now does, and retain the vigor of his adult life until cut down by some accidental occurrence in the shape of injury or disease, which would interfere with the normal continuance of his vital processes. That senile condition which we so much honor and revere, and which has lately received so much scientific consideration at the hands of Sir William Gull and Dr. Sutton of London, would be impossible. How is it possible for the normal senile degenerations of the tissues which Gull and Sutton so ably describe, to take place, if they are continually being removed and replaced by fresh, healthy tissue?

A fact familiar to all, and which, as far as I know, no effort toward its explanation has been attempted, is the persistence of tattoo marks in all the perfection of their first production, throughout a long life. India ink tattooed into the cells of the cutis vera in childhood remains in its primitive perfection till the death of the individual. Is this compatible with a complete molecular change of the cells thus impregnated? Can it be explained by saying that the original cells have the power of transmitting to their successors these impressions absolutely without loss? For if there was even an infinitesimal loss at each change, the changes, according to present teaching, are so frequent and so thorough, that the marks in an old man would be at least much diminished in size, which is contrary to fact. But the supporter of our corporeal evanescence will at once say—this impregnation of the cells with a coloring matter constitutes an abnormality, it interferes with their molecular processes, acts perhaps as a preservative, and is excuse enough for their remaining persistent. Such an apology is preposterous, for if such were the case, they would constitute a foreign body, their disintegration would immediately begin, and their removal be hastened.

Undoubtedly one structure of the body does continually change and give place to new elements, and from its inherent character and position was meant to do so: I refer to the epithelial coatings. On the surfaces of the body exposed to friction, in the glandular organs where work is to be performed and change is necessary, epithelial elements are situated. Nowhere in the body where change is necessary for the due production of the animal functions is any other type of cell to be found. But even the mode of death of epithelial cells is not molecular—it is *en masse.* Each group of cells have their allotted term of existence, and when this has expired and their duties in the economy have been performed, they die and are cast off as a fish casts its scales—*in toto.* It is only in their destruction in the production of the secretions, such as milk, etc., that the character of their death simulates the molecular. I will only add further in this connection—and this has a direct bearing on what was said in regard to senility and the prolongation of life—that the epithelial cells of the old man are as fresh, healthy, and normal looking, and as functionally competent, as those of the robust youth of fifteen, provided the matrix from which they originate has not been injured or disorganized by disease.

Tyson summarizes the most advanced theories of cell nutrition in the following words: "The pabulum comes to the cell from the periphery, being strained through the formed material, and the new germinal matter takes its place in or near the centre of the original mass, constituting a new centre of germinal matter, which may be the nucleus if no other circumscribed centre be present, or the nucleolus if it be deposited within such a centre. Other new centres may again take position within these, and assume the position of nucleus to the original nucleolus, which now becomes the nucleus, an older centre of germinal matter, while the original nucleus has probably been converted into the second constituent of the cell—the formed material." A great deal too much stress has been laid on the importance of the nucleus and nucleolus as the chief factors in the elaboration of the cells function. The formed material, or, as Tyson calls it, the "non-germinal matter," "is as important and essential to the functions of the economy as the germinal matter. It is, in fact, the portion of the cell in which alone function resides, since it is to the formed material of the muscle cell that we owe the power of contractility—to the formed material of the nervous element that we are indebted for neurility, etc." (Tyson.) "The endogenous mode of cell formation is not that by which tissues regenerate themselves. This is usually effected by simple division." (Green's *Pathology and Morbid Anatomy.*)

What I consider a more correct and rational mode of cell nutrition is this: the nutritive fluid comes in contact with every part of the cell by a process of elective osmosis, giving renewed vigor and life to the somatic unit, and is then extruded and passes on in a more or less denutritionized condition constituting the physiological detritus of the animal organism, which by previous misapprehension has been falsely considered the decayed remains of the living tissues. We may refer to a vital diagram for an imperfect illustration of this. The nutritive procedure in the protozoal forms of life—in animals consisting of a single cell—may be beautifully demonstrated after the plan pursued by Ehrenberg in his researches on the Infusoria. An amœba, for example, is fed with indigo or carmine in a fine state of division. "A piece of this colored food may be seen to approach the animalcule, when, at once it extends toward the particle two of its pseudopodia; with these it encloses the little mass of nutriment, the pseudopodia melt into one another at their extremities, and finally the morsel is seen to be deposited, or rather engulphed, within the body of the creature. Whilst thus retained the nutritive portion of the food will be extracted by some process analogous to digestion, and the effete or indigestible portion cast out, by a simple reversion of the process by which it was taken in." (Andrew Wilson.) It is argued, that for molecular motion to be disengaged there must be decomposition; that in the production of every functional act, an equivalent amount of organized tissue is used up, and goes to add to the general mass of excrementitious substance. Herein is the mistake. The decomposition does not take place in the integral structure of the cell, but in the nutritious pabulum which at the time being exists in it, by a process which may be easiest described as an elective catalytic action. It is this nutritious pabulum which constitutes the characteristic excrementitious substances, after it has been acted on by the cells, and which varies according to the character of the cells with which it comes in contact; for example, cholesterine in the nervous system, creatin in the muscular. A great part, of course, which has not been affected by the chemico-vital action of the cells, and is still in a condition for subserving the purposes of nutrition, is returned by the lymphatic system to again reënter the circulation. The cell has the power of generating from this decomposition which takes place *within* its substance—but not *of* its substance—the function peculiar to it, whether it be the elaboration of a drop of bile, or the recording on memory's page of a newly arrived fact. This theory does not do away with the established views of atomic and molecular motion as the cause of animal heat. It admits of a cyclosis of the protoplasmic molecules within the cell, for in the absence of motion there is no life. Herbert Spencer comes near my idea when he talks of "molecular changes that are not destructive and are probably isomeric."

"Much as there is here of hypothesis, the indirect evidence makes it probable that if this is not the true interpretation, the true interpretation is analogous to it." (Spencer.) A good theory is better than a bad fact.

ART. VIII. — THE PSYCHOSES OF SECONDARY FEVER OF SYPHILIS.

BEING A REPORT OF FOUR CASES OBSERVED AT THE N. Y. CITY ASYLUM FOR INSANE, WARD'S ISLAND.*

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IN dealing with the subject of Psychiatry, too much care cannot be taken to avoid adding to the already extended list of psychoses. Were these really symptom groups no objection could exist to their number, but most of them consist of a name and nothing else. This condition has arisen from the rather singular relation there is between the profession and the subject of psychiatry, which seems to be a field that every physician claims the right to enter, and to speak *ex cathedra* on its problems. This has led to many evils in the province of forensic psychiatry, where a physician whose reading on insanity is very limited, whose experience is still less, and who has never been taught the fundamental data of the subject, proclaims in open court *his* opinion, and contradicts a psychiatrist who has made the subject a study of years. Not unfrequently does it happen that a general practitioner, who would shrink from giving an expert opinion on ophthalmology, a surgeon who would avoid an expert opinion on an obscure chest affection, a gynæcologist who would refrain from expressing an expert opinion on an abstruse point in dermatology, rush to the court to give a decided opinion on a man's testamentary capacity, one of the most difficult problems in psychiatry. Great as this evil is, another produced in the same way is scarcely less; that to which we owe the rather stupid divisions of insanity which appear in the literary pro-

*Read before the County Medical Society of New York, June 28th, 1880, in outline.

ductions of these dilettante psychiatrists when they write on the subject.

Perhaps the most amusing instance of this is to be found in the *Psychological Journal*, July, 1872, where a writer, taking the form characterized by Esquirol as "a species of monomania where the patient believes himself to be God," and called by him in accordance with his rather bizarre formulæ, Theomania, describes under it a case of hereditary chronic mania, in which the specific delusion is *not* present.

This system of naming insanity after one specific delusion having been abandoned by the psychiatrist, the dilettante takes up the system of etiological classification, and describes cases monotonously alike, except that one was produced by this cause, another by that, or where the simple coëxistence of two diseases is the only evidence of cause and effect.

Any new form should therefore be exposed to keen criticism, and clearly demarcated before being given forth to the world.

In this paper it is not my intention to describe any new psychosis, nor to lend support to any of the preëxisting forms, but simply to trace the influence of a single etiological factor in the production of insanity, both from the standpoint of my own observation and from that of cases reported by others.

I shall, therefore, give first a short *resumé* of existing opinions on the etiological influence of secondary syphilis in the production of insanity, and the symptoms produced by it.

Wille, in the *Allgemeine Zeitschrift für psychisch-gerichtliche Medicin*, Band XVIII., Heft 4 and 5, has made what is perhaps the most logical and thorough analysis of syphilitic psychoses, and lays down three general rules concerning these; that in the present position of cerebral syphilis the following psychoses can be distinguished:

1st. Irritative psychoses based upon cerebral anæmia, following syphilitic infection even from its very commencement.

2d. Simple inflammatory psychoses, due to meningitis and inflammatory softening of the cerebral substance.

3d. Neoplastic psychoses, proceeding from cerebral and meningeal gummata.

Griesinger (quoted by the same author) claims that "when acute mental disease affects patients during the secondary stage of syphilis, it will be chiefly those whose brain is organically affected, who have previously presented symptoms of abnormal cerebral activity, or in whose families nervous diseases have frequently appeared."

Wille claims that it is settled that mental symptoms may appear two months, or even two weeks, after infection, certainly with the first appearance of the secondary symptoms.

Hildenbrand, in his "Syphilis dans ses rapports avec alienation mental," entertains similar opinions.

Leubuscher was perhaps the first to describe and establish the existence of mental symptoms during and due to the secondary period of syphilis; prior to the appearance of his article only the tertiary stage was regarded as capable of producing mental symptoms.

Berthier, in the *Union Médicale*, May, 1865, has mentioned several acute forms of insanity as due to the secondary period of syphilis.

Fournier describes several types of mental symptoms as occurring in the secondary period of syphilis, varying from a partial dementia to a cataleptoid condition.

Mickle, in the *British and Foreign Medico-Chirurgical Review*, Vol. LVIII., 1876, has observed several cases occurring during the secondary period of syphilis, but does not consider the relation between the cause (secondary syphilis) and the effect (insanity) at all clear, though in the few real cases reported he regards the effect produced by the syphilitic virus as similar to that of dram-drinking.

Clouston, in the Morrisonian Lectures for 1873, *Journal of Mental Science*, volume XXI., agrees to a great extent with Wille (op. cit.), and makes this psychosis the second of his varieties of psychoses due to syphilis.

Cadell, in the *Journal of Mental Science*, January, 1874, has given a brief narration of a single case, which I here condense:

"A gentleman, aged 48, contracted a chancre in January, 1870. A squamous syphilide made its appearance in April, and was accompanied with marked mental excitement and extreme restlessness, which reached its height during August and September, almost amounting to delirium. The patient took little rest in bed, but drove and rode about recklessly at night. Toward the end of October the excitement began to diminish, and in December nothing remained of it, the syphilide having meanwhile disappeared.

"In April, 1871, the hair of the head, eyebrows, and beard began to fall out. This was accompanied with increasing despondency, which caused the patient to threaten suicide in July. After which 'paralysis of energy' manifested itself, the patient refusing to leave his bed. From October, 1871, to January, 1872, the patient scarcely left the house; but soon after, his bodily health improving, he began to improve mentally, and by June, 1873, was fully recovered."

The fact that secondary syphilis may give rise to acute mental diseases is acknowledged by the leading authorities who have written on the subject. Now, this being admitted as a cause, what symptoms does it give rise to?

Wille (op. cit.) says: "The first abnormal symptoms are psychical disorders and hypochondriacal fears, which generally show themselves as syphilophobia, or have a more general hypochondriacal or melancholic tinge."

Albers (*Syphilitische Gehirnkrankheiten*) gives syphilitic hypochondria as the first stage of this type of mental disease.

Leidesdorf also mentions this hypochondria; but considers it as arising in a purely psychical manner.

Leubuscher claims that hypochondria is the most frequent type of mental disease produced by syphilis.

Engelsted also mentions it as a symptom of secondary syphilis.

Gros describes this form, as also does Lancereaux.

Bucknill and Tuke (*Psychological Medicine*) agree substantially with Wille.

The general symptoms given by authorities are therefore either of a hypochondriacal or of a melancholic type. Before proceeding to further discuss the symptomatology, I shall give my own case, as furnishing the best means for comparison.

Case I. E. J. S., Canadian, 35, tailor, periodic drinker. Criminal antecedents and criminal parentage. A sister and an aunt are prostitutes; one brother is idiotic and one is a professional burglar. Four weeks before admission had contracted the initial lesion, which healed up without any treatment. Two weeks before admission was very morose and irritable, felt chilly sensations all over the body, and was very languid. Six days before admission was attacked by a very violent fever, and on the following day complained of insects crawling beneath his flesh and burning him, of men being at the window with guns to shoot him, and was at the same time markedly terrified and depressed. On admission the patient had a temperature of 40.5° C., was markedly agitated, always in motion, and had an expression of extreme terror. The patient was ordered ℞ ext. fl. conium, ext. fl. hyoscyamus, hydrate of chloral 2.00, quinia sulph. .30, tid.; but for two days no effect was produced either on the mental excitement or the fever. On the third day the history already given was obtained, and the attendant was ordered to rub two grammes of mercurial ointment into the armpits, clefts of the thighs, and arms, the other treatment being continued. The following night the patient slept relatively comfortable, his temperature falling to 38.3° C. He was less agitated, but retained his delusions, and was very little inclined to remain alone. For two days this treatment was continued, the temperature and mental condition of the patient remaining the same. On the third day after this a roseolaceous eruption made its appearance on his forehead and neck. This was at first simply roseola, but in twenty-four hours became pustular, and gradually melted down into dark brown crusts, flattened and depressed, which, when removed, showed a greyish film bathed in pus underneath. The attendant, soon after the appearance of the pustules, neglected to continue the rubbing in of the mercurial ointment, whereupon the patient's temperature rose to 39.7° C., and he became violently excited, rushing wildly from one end of the room to the other, saying that he was about to be shot, that spiders were eating his brain; his countenance expressed extreme terror, and he was always in motion. As a means of restraint, and at the same time of securing treatment, a sheet was smeared with mercurial ointment, the patient was wrapped in this, and then confined in a camisole. The day following his temperature fell to 37.7° C., and, though retaining his delusions, was much more at ease and less agitated than he had been since admission. The treatment was continued for three weeks; the mental disturbance became less and less marked. The eruption began to cicatrize in places, and finally healed up, leaving thin red lines radiating from a centre. His delusions and hallucinations grew less and less vivid, until finally they seemed to him dreams of an unpleasant character through which he had passed. He still retained some gruffness and irascibility, but this was evidently natural to him and not due to insanity of manner, as an incautious observer might suppose. He remained in the asylum a month after the total disappearance of the mental symptoms, when, all symptoms of insanity having disappeared, he was discharged. A year subsequent to this, when last seen, was still in good health.

Case II. J. N., American, baker, 25 years of age, moderate drinker. A brother died insane and a sister is now an inmate of an asylum. On admission is very much agitated and has well marked hallucinations of sight and hearing; sees spiders crawling over him, and guns protruded from holes in the wall to shoot him. Hears wolves and lions howling and roaring at him; keeps always in motion, can by dint of a great effort control himself and give a relatively rational answer to some questions. After recovery, he gave the following history: Four weeks before admission he had contracted the initial lesion of syphilis, and about the beginning of the fourth week thereafter had a distinct chill succeeded by a high fever. Believing this to be malaria, but feeling unaccountably depressed, he took ten grains of quinine and went on a visit to Central Park. While there he became so frightened at the howling of the wolves that his companion was obliged to draw him away to avoid attracting attention; this scene was repeated before the lions' cage. He was not afraid of the animals but of the noise made by them. He went home, becoming exceedingly delirious in the course of the day, crying out about the wolves and lions. In two days it was obvious that asylum treatment was necessary, and he was sent to Ward's Island.

On admission he had a temperature of 40° C., was fairly nourished, rather loquacious, which loquacity was at times broken in upon by his hallucinations. He was ordered quinia sulph. .30, ext. fl. conium 2.00, ext. fl. hyoscyamus 2.00, three times a day, with two grammes of chloral hydrate at night, with but little effect on the fever and none on the mental excitement. On the morning of the fourth day a roseolaceous eruption made its appearance on his forehead around the roots of the hair. The patient was ordered a mercurial ointment inunction applied as before on a sheet, the other treatment remaining the same with the exception of the quinine. In the course of twenty-four hours the patient's temperature fell to 37.7° C., he was much quieter, but retained his hallucinations and delusions. The following day a similar eruption made its appearance on the arms and trunk, which gradually formed flat pustules from twenty-five to forty millimetres square. These became covered with greenish-brown crusts, which when removed showed a greyish red ulceration beneath and were surrounded with a copper-colored areola. The delusions and hallucinations continued but with less vividness for the next two weeks, and by the time of the total disappearance of the eruption at the beginning of the third week, disappeared also, leaving the patient in a dazed condition (the "paralysis of energy" of the Germans). He remained relatively stationary for about two weeks, then gradually brightened up, and was discharged, totally recovered, four months after admission.

A year and a half after, he was in excellent physical and mental health and looked much younger than he did when admitted to the asylum.

Case III. J. B., 42, American, printer, periodic drinker. Patient has two brothers insane, and his grandfather and brother's son died insane; presents marked asymmetry of face and skull. On admission is very incoherent and extremely terrified at something; rushes wildly across the room; at times remains quiet, listening intently, then starts up suddenly, exclaiming: "Murder! look! they are playing the battery on me!" He frequently brushes himself and then stamps on the floor. Asked why he does this, says, "Scorpions, spiders, biting me, biting me." Always has an expression of terror on his face. He is much run down and has a temperature of 40.5° C. The lungs, heart and other organs are normal; the remains of a recent chancre are noticeable on his penis. Ordered mercurial innunction and egg nog. No other treatment. Two days after admission the patient has quieted down; is less terrified, still very incoherent; his temperature has fallen to 37.5° C. He was arrested in a dance house, where he had been for two weeks previous, and it has been ascertained that he belongs to Massachusetts.

Four days after admission a roseola has made its appearance on his forehead. Just previous to this his temperature rose to 39.3° C. but has fallen to 37.8° C. He was very much agitated during the rise of temperature, brushing his clothing repeatedly. He has been recognized by a friend visiting a patient in the same ward, who gives the family history above mentioned, and says that the patient has been insane for a number of years, but is now worse than he ever saw him. Treatment continues. One week after admission the patient was sent, with two other more intelligent patients (just admitted) from a Massachusetts asylum, to be dropped in New York, each of them being given a small sum of money. Ten days after admission patient is markedly quiet; no evidence of hallucinations; is still very incoherent; roseola is fading. Twenty days after, no hallucinations; is evidently an old case of chronic mania, passing into dementia; was three years an inmate of the asylum in Massachusetts, and always noted for his good humor. Treatment suspended, patient having now no fever. A year after, still quietly incoherent; has been recognized by a workhouse woman as an old crazy man who went into the dance house where she was employed and had intercourse with one of the inmates under treatment for venereal disease.

Case IV. Jno. McG., 75, mason, periodic drinker, Irish, was admitted to the New York City insane asylum with a history of having been for a year previous very restless, getting up during the night and searching for people long dead, as his father and mother, wandering off during the day to look for his mother and sisters, most of whom died in his infancy. Has a good memory of far-off events, but is markedly oblivious of the fact that he has been married and has children, some of whom are fifty years old. He went out into the street dressed in his daughter's drawers, with her frock on as a shawl; this and similar performances caused such a scandal that home treatment was abandoned and he was brought to the asylum. On admission he was a typical case of the insanity of senescence, and was sent to one of the quiet wards. At the time of his admission, workhouse women were employed in the wards by order of the commissioners as assistants to the attendants. About a week after admission three ulcers were noticed on the patient's penis, one of which was clearly the initial lesion of syphilis, while the others were simple venereal ulcers. On admission the patient was perfectly healthy; it was, therefore, obvious that the ulcers had been contracted in the asylum. The workhouse women of the ward being examined, one of them was found diseased in a similar way. Nothing unusual was noticed about the patient till three weeks after, he having been meanwhile under the usual treatment for his venereal disease. Three weeks after the patient became very violent, tore his clothing to get at the mice gnawing his bones, and said that the "hearts of steel" were after him, and he heard them cry, "shoot, shoot him," and saw their guns pointed at him. His temperature at this time was 41.1° C. In the course of the next week a roseola appeared on his forehead, the mental symptoms just mentioned persisted, and the patient was put under chloral, hyoscyamus and conium in two gramme doses, with quinine to reduce the fever; none of these had any effect. On the appearance of the roseola it was determined to place the patient under mercurials. A sheet well smeared in mercurial ointment was wrapped round him, and he was placed in a camisole. In six days the fever fell to 36.9° C., the hallucinations disappeared, but his old restlessness returned, and in an attempt to get out of bed he bruised his penis, causing an ulcer, which became phagedenic. It was cauterized, while under ether, but he did not rally markedly after the operation, dying in the course of the next two days.

All these cases bear out Griesinger's dictum in relation to the influence of heredity and previous mental abnormalities. Two of them having families predisposed to nervous disease, for the criminal type is, it is needless to say, an evidence of mental abnormality; the third combined preexisting mental abnormality and heredity, while the fourth, whose family history was not obtained, had the preëxisting mental state abnormal. Their symptoms do not agree with those laid down by Leubuscher, Albers, Englested and Gros, in that in none was there to be found any evidence of hypochondria nor specially of the symptom syphilophobia; but after all, are these to be considered symptoms of syphilitic forms of insanity alone? Leidesdorf has suggested that these latter symptoms may arise in a purely psychical manner. I am fully of his opinion, and would account for the syphilophobia by the existence of a conscientiousness in the patient, who, conscious of his delinquencies, has probably lied about the manner in which he became infected, the lie becoming in his morbid condition part of himself, and being remembered, not as a lie, but as a means of accounting for the existence of syphilis in himself, the false nature of which, as time passes, is more and more lost sight of, and forms an easy transition to belief in the certainty of becoming infected in a similar way, and to a dread of the same. The hypochondria evidently arises from the indefinite malaise that secondary syphilis produces, and, in my opinion, is an intensification of a preëxisting tendency in this direction.

Wille, while giving the hypochondriac symptom, also admits of a melancholic form which he clearly places among his first division of the psychoses.

Cadell's case, while lasting much longer than mine, exhibits many similar features, the marked restlessness, etc.

Mickle's suggestion that acute forms due to secondary syphilis resemble those produced by alcohol, is certainly in accordance with the cases I have given, and it is not impossible that a suspicion may arise that these cases were due to alcohol, but I can safely claim that no such influence was to be found in the last case, and the history leaves as little doubt in the others. What the basis of the hallucinations was it is easy to determine as regards the idea of the insects, mice, etc., which were, it is evident, due to *osteoscopic pains*, producing first the sensation of heat or pain, which, by a very easy transition, led to hallucinations by its misinterpretation. Goethe was able to produce hallucinations at will, and there appears to me little doubt that the intense concentration of patients on their sensations can give rise to hallucinations in a similar way, altnough not voluntarily, which, from the morbid mental condition, are accepted as true. The appearance of the hallucination about the roaring of the lions, etc., in the second case, is a very interesting instance of the influence of extraneous sounds on a morbid condition. The patient suffering under mental depression takes a large dose of quinine; his aural sensibility, already intense, is increased by the quinine, which, of course, produces its usual tinnitus. While laboring under this condition he is subject to very intense noises, the roaring, etc., which naturally make a profound impression on his sensorium. And the quinine treatment being continued, its effects are very naturally misinterpreted into the delusive hallucination of roaring, etc. The fact that the syphilis complicated an old case of chronic mania and insanity of senescence is valuable as showing that various forms of insanity may complicate each other. The influence of mercury both on the fever and on the mental condition was very strikingly shown in the first, where, after a marked subsidence, both increased on the treatment being carelessly omitted. One of the features of Cadell's case is markedly noticeable in Case II., namely the "paralysis of energy," lasting much less time than in his case, however. The sudden appearance of marked delusions, varying in type from those proper to the form of insanity, strikes one very forcibly in Case IV., where rather intellectual delusions suddenly appear among the feeble delusions of senescence. Although it is hardly relevant, it may be somewhat interesting to note, that both cases III. and IV. owed their syphilis to the superstition prevalent among the vulgar, that a person afflicted with venereal disease can cure it by infecting a lunatic or child with it. From the cases given can the inference be drawn that syphilis gives rise to peculiar forms of insanity? I think not; that it gives rise to peculiar individual symptoms there can be no doubt, but that these are sufficiently distinct, numerous, and related to form a separate symptom group, I agree with Mickle in considering "not proven." The symptoms in my four cases are clearly due to the syphilitic fever, and it is evident that they approximate in nature to the psychical symptoms produced by alcohol, stramonium, essential fevers, etc. No conclusions can be drawn as to what age renders a man liable to be attacked by these psychical symptoms, since the first case was aged 35, the second 25, the third 42, and the fourth 75, middle life, manhood, and old age being approximately represented. As to sex I can say nothing, all my cases were men. Race is equally indeterminate, three being Anglo-Saxons and one a Celt. Three were single and one married, so no conclusions are to be drawn from the civil condition, except of course the natural probability, that the single man will be more likely to contract venereal disease. The mercurial inunction treatment yielded so good results that I think no other indicated mechanical restraint for surgical reasons would seem to be allowable. Should the patient be sent to an asylum? If his means permit home treatment, this question can safely be answered in the negative, since the treatment he is likely, as a rule, to receive there will not be individual, and besides, the stigma attached to being in an asylum should be considered. From all the facts it seems to me that the following conclusions can safely be drawn:

First—That the secondary fever has, agreeable to the opinions of Leubuscher, Albers, Cadell, and Wille, given rise to mental symptoms in these four cases.

Second—That the symptoms are analogous to those produced by alcohol, narcotics, and essential fevers.

Third—That Mickle's opinion about the non-necessity of making a separate symptom group for the syphilitic psychoses is justified by these cases as far as they go.

Fourth—That mercurial inunction yields the best results, but that mechanical restraint will be found necessary for its proper application.

Fifth—That asylum treatment is not advisable if it can be avoided.

Sixth—That aside from confirming Griesinger as to the predisposing influences, no light is to be drawn from these cases as to who is, or is not, liable to insanity from this cause

Finally—I would express my opinion, based only on analogy, that, like all cases of pure mania, or melancholia, no brain changes are likely to be found, post-mortem, in patients dying with these mental symptoms.

Art. IX. — CONTRIBUTIONS TO ENCEPHALIC ANATOMY.

By E. C. Spitzka.

PART VIII.

The Brain of the Iguana.

HAVING, through a piece of good fortune, come into the possession of a living iguana, and thence obtained the brain and cord in a perfectly fresh condition, I was enabled to make a study for the first time of the remarkable brain of this saurian.

As regards the exterior of the encephalon, it presents nothing very different from that of any other higher reptile. On a lateral view, however, it exhibits a much acuter basilar incurvation, approximating to the bird's brain in this respect. As in birds, also, the optic nerves leave the skull directly on emerging from the chiasm. It is remarked also that the optic lobes are far larger than in any reptile or bird thus far examined by anatomists, in fact, excluding the case of the finny tribes, it may be said that the iguana possesses the largest optic lobes in the animal kingdom. They are as massive in their grey and white tissues, and nearly as voluminous as the cerebral hemispheres.

The olfactory lobes and bulbs offer nothing special for consideration.

On a transverse section through the cerebral hemispheres, I am able to identify the component parts of the cornu ammonis of the mammalia. It appears that the medial thin wall of the cerebral vesicle corresponds, with its layer of closely packed pyramidal nerve cells, to the *stratum corporum nervorum arctorum* of Kuppfer, and it is indeed separated from the cortical layer of the convexity, which I believe to correspond, as far as the thin part extends, to the *sigma* of the cornu. At the lower end of the thin-walled vesicle, there where a transition of nerve fibres from the *stratum corporum nervorum arctorum* (?) takes place, to the thalamus, and which therefore corresponds to the fornix, there is an accumulation of molecular nerve substance, projecting outwards into the ventricular cavity. This may represent one of the thalamic tubercles; I regard it as much more probable, however, that it corresponds to the body of the so-called fascia dentata.

Now, in sections exhibiting the above features, I find also another which is highly important, in so far as it tends to overthrow another one of the *dicta* on whose strength the sauropsidean and mammalian brains are distinguished. Immediately underneath the median longitudinal fissure, but *over* the third ventricle, there passes a fasciculus of white fibres, uniting the two hemispheres, and particularly that portion of each which corresponds to the cornu ammonis. This is unquestionably the corpus callosum, whose first appearance in the embryo and the lower mammalia we know to be intimately associated with the development of the cornu ammonis.

But it is when we reach the mesencephalon and the region posterior to it, that we discover the most remarkable features of this brain.

As in some other saurians, the cerebellum, instead of being curved backward and constituting a cap over a part of the lateral ventricle, as in the alligator and chelonia, is bent forward, and bound to the posterior face of the optic lobes by the arachnoid filaments. On separating and drawing it backwards, thus making it correspond artificially in position with the cerebellum of the alligator, we find that between the optic lobes and the cerebellum there are two pairs of tubercles.

One of these pairs, which I have found as a concealed mass in turtles, and as a very distinct elevation in the alligator, ophidia and pseudopus, I was familiar with, and I had no hesitation in describing it as the post-optic ganglia corresponding to the posterior pair of the corpora quadrigemina. The other was at first new to me, but after a careful comparative study I found that it was nothing but an unusually large, and therefore more prominent representative of a ganglionic mass which I have noticed in fair development in the turtle, and which is even represented in an atrophic condition with the mammalia. As the pair of tubercles in the iguana lies intermediate to the optic and post-optic lobes, I propose for it the name of inter-optic lobes.

On a dorsal view these different parts lie about as follows: In front are the massive optic lobes touching each other broadly on the middle line, so that their posterior margins form a continuous semi-lunar curve, convex behind. Behind each optic lobe, and bulging out somewhat, laterally, we have the smaller but distinct post-optic lobes, which fail to come in contact in the median line, so that a shallow groove would separate them, if it were not filled out by another structure, now to be described.

If we imagine the median furrow separating the optic lobes prolonged between the post-optic lobes, and crowd two little pea-shaped eminences on each side of this imaginary median line, so that the latter are bounded in front by the optic lobes, on the outside by the post-optic lobes, and behind by the cerebellum, we will have the precise situation of the inter-optic lobes. These eminences are not so remarkable for their absolute size (their surface extent being only half that of the post-optic lobes and one-ninth of that of the optic lobes) as for the distinctness of their demarcation. I have obtained sections through their posterior third, in which these bodies are shown to be absolutely free.

Other sections further forward show that these ganglia crop out of a specialized division of the central tubular grey of the aqueduct, and that the visible eminences do not represent the true extent of the ganglia.

The trochlearis nerves arise behind the inter-optic lobes, and passing forwards and downwards, lie in the furrow between the optic and post-optic lobes, as in other reptiles. It is well known that in the mammalia they pass down behind the post-optic lobes. I look on this as an incidental and insignificant variation.

The remainder of the isthmus shows nothing especially noteworthy. The remarkable size of the oculo-motor nuclei, and the gigantic dimensions of their almost star-like multipolar nerve-cells, merits mention, as well as the fact that in this animal the nuclei of the third and fourth pairs constitute a common cell mass, unlike the relation in the mammalia, and that the third and fourth pairs arise almost in the same plane, the third from the ventral, the fourth from the dorsal extensions of the common nucleus.

I would call attention to the fact that the average dimensions of the cell nuclei of the auditory nerve nucleus equal those of the motor nuclei of the medulla and cord, and exceed some of them, and that the same statement applies to the cells as a whole. I make this statement in view of the recent communication of Dr. Mason before the American Neurological Association, though I do not claim to make it on the same basis of careful and extensive micrometric observations that his communication was based on, but on a general impression derived from repeated examinations which I think are sufficient to determine palpable differences.

I desire the present lines to be looked on as a preliminary communication, and trust to be able before long to submit a more exhaustive and illustrated record of this interesting and suggestive piece of cerebral anatomy to the reader.

American Neurological Association.

SIXTH ANNUAL MEETING.

FIRST DAY'S PROCEEDINGS: Reports of officers.—Amendment to the Constitution.—Dr. Hammond on myxœdema, with special reference to its cerebral and nervous symptoms. —Presentation of specimens of swollen axis cylinder of myelitis, by Dr. Webber.—Dr. Mason on the diameter of nerve cell nuclei in the spinal cord.—Dr. Bartholow on transfer of sensations.—Discussion on Bromides.—Dr. Gray on the use of quinine in combination with nerve sedatives.—Dr. Webber, medicinal use of water.—Dr. Putnam, stretching of the facial nerve and sphygmographic tests.

SECOND DAY'S PROCEEDINGS: Report of Council.—Election of members.—Dr. Beard, experiments with the Jumpers of Maine.—Dr. Gibney, pachymeningitis spinalis.—Dr. Hammond, thalamic epilepsy.—Dr. Ott, bromide of ethyl as an anæsthetic, and exhibition of Woroschiloff's instrument.

THIRD DAY'S PROCEEDINGS: Report of the Council.—Miscellaneous business.—Dr. Hammond, Jr., Jacksonian epilepsy, with cases.—Dr. Putnam, report of a case of acute muscular atrophy without lesion of the cord; also paper on numbness.—Dr. Birdsell, remarkable tumor of the encephalon.—Resolutions presented by Dr. Gray.—Dr. Spitzka, hysterical case.—Dr. Gray, diagnostic significance of a dilated and mobile pupil in epilepsy, with discussion.—Papers read by title.

The American Neurological Association convened at the Academy of Medicine, in New York City, June 16, 1880, and was called to order at 2:30 P. M., by the President, Dr. F. T. Miles, of Baltimore.

Present: Drs. Miles, Hammond, Van Bibber, Bartholow, Webber, Putnam, Beard, Jewell, Spitzka, Mason, Gibney, Gray, Seguin.

As the minutes of the preceding annual meeting had been printed and distributed among the members of the Association, on motion, their reading was dispensed with.

REPORTS.

Dr. E. C. Seguin, Recording Secretary and Treasurer of the Association, made his annual report, which was accepted.

NOMINATIONS FOR MEMBERSHIP.

Dr. Grahame M. Hammond, of New York, proposed by Dr. Seguin; seconded by Dr. Jewell.

Dr. Isaac Ott, of Easton, Pa., proposed by Dr. Putnam; seconded by Dr. Seguin.

Dr. W. R. Birdsell, of New York, proposed by Dr. Seguin; seconded by Dr. Jewell.

The President appointed the following committee to report on the nominations: Drs. Jewell, Putnam, Mason, Van Bibber and Gibney, with instructions to report on the following day.

Dr. E. C. Seguin submitted the following Amendment to the Constitution:

Article I. In addition to active members there shall be a class of honorary members not to exceed twelve in number, and a class of corresponding members not to exceed twenty in number. Honorary members shall be nominated in writing by six active members, reported upon by the Council, and elected only by unanimous vote of the members present at the meeting following the one at which the nomination is made. Corresponding members shall be nominated in writing by two active members of the Association, reported upon by the Council, and elected by a majority of the members present at the meeting next following the nomination.

Next followed the reading of a paper by Dr. William A. Hammond, of New York, entitled,

MYXŒDEMA, WITH SPECIAL REFERENCE TO ITS CEREBRAL AND NERVOUS SYMPTOMS.

The first account of this very remarkable disease was given by Sir William Gull in 1873, but he did not enter into a consideration of its morbid anatomy and pathology. Subsequently, a very thorough paper upon the subject was published by Dr. Ord, which together with one or two other papers constituted all of the literature upon this disease.

Myxœdema was a disease which had for its patho-anatomical feature the deposit of a mucoid substance in various parts of the body, especially in the skin, or a degeneration and proliferation of the connective tissue; probably both these conditions co-existed in some tissues. The tissues were elastic and not boggy as in ordinary œdema, though the resulting appearance was very much the same. The face resembled the appearance resulting from the toxic effect of arsenic The fingers were clubbed at their extremities. The temperature was always below normal. The disease, thus far, had occurred in adult women. The cerebral and nervous symptoms appeared to be very decided.

Dr. Hammond gave a detailed account of the case which had come under his observation, both as to the general appearance of the patient and the symptoms presented. Among the latter he enumerated, diminished sensibility of the skin, pain in the head, sensation of numbness in the face, lips, ends of fingers, tongue, arms and legs, staggering gait, sluggish and indistinct articulation, together with more or less derangement of all the organs of special sense. There were frequent hallucinations of sight and hearing. Her appetite was bad, bowels constipated and her urine contained an excess of urates.

Dr. Hammond was of the opinion that the mental symptoms were the result of primary brain disease; probably to the deposit of the mucoid tissue around the cells of the nervous centres. He considered, however, that both central and peripheral disturbances were necessary to give rise to the phenomena of myxœdema.

REMARKS UPON DR. HAMMOND'S PAPER.

Dr. Jewell inquired if the patient complained of anything prior to a year ago, if there was any hereditary tendency in the case, and if Dr. Hammond had any idea as to the cause of the disorder.

Dr. Hammond stated that all that was noticed prior to a year ago were mental hallucinations, that there was no hereditary tendency, and that he had no idea of the cause and did not think it possible to have from the study of one case.

Dr. Miles inquired if the swelling was always general?

Dr. Hammond replied that it was, and the feeling given to the finger was like that of pressing upon India rubber.

Dr. Jewell asked what were the microscopic findings in Dr. Ord's case?

Dr. Hammond said that the microscope revealed mainly cells and fibres, and that Dr. Ord was uncertain whether these products were the result of degeneration, or the formation of new tissue.

SWOLLEN AXIS CYLINDER IN MYELITIS: SPECIMENS.

Dr. S. G. Webber, of Boston, presented some specimens to be looked at under the microscope. The patient had been exposed to a sleet or rain while riding a distance of twenty-five miles, and reached home weakened and very much chilled. The following day he began to experience a feeling of numbness in his feet and legs, and in the course of two or three days was brought into the city hospital of Boston. When he entered his temperature was elevated, but it soon sank to normal. Sensation was impaired in both legs and part of the body. Later he lost all power in his legs. Thirteen days after the beginning of the attack the patient died. The specimens presented showed very well the enlarged axis-cylinders. There were the other appearances of myelitis in the dorsal region, and nearly the whole length of the spinal cord was softened so that sections could not be made. A longitudinal section under the microscope showed the different forms of the axis cylinders, some being spherical and some fusiform. As many as eleven or twelve enlargements had been observed upon one axis cylinder. The medullary sheath seemed to have disappeared, and where much swelling existed, there was no appearance of myelin whatever. In transverse sections all exposed axis cylinders appeared in groups. In one specimen, around the group of swollen cells there were normal cells. In addition to these swollen axis cylinders there were all the appearances of myelitis. Enlarged axis cylinders had frequently been seen, but were never so well marked as in the specimens exhibited, except in acute cases. Sometimes these enlargements occurred in chronic cases, but never in so marked a degree. It was thought they had been best seen in cases artificially produced.

REMARKS.

Dr. Miles inquired as to the condition of the grey matter.

Dr. Webber replied that the grey matter was more or less affected.

Dr. Jewell expressed a desire that the class of cases under consideration should be fully discussed. Of acute or more or less acute cases of a similar kind he had seen quite a number within the last year or two. Several cases of acute myelitis which he had seen within the past few months were produced much in the same way. One, a gentleman who spent his winter in Florida, and was on his way back north, while in Washington, encountered a storm and became thoroughly chilled. On the following morning he found himself unable to put on his pants without stumbling, and there was numbness. He could not walk well. He had some fever. He got into a sleeping car and came home. When Dr. Jewell first saw the patient he was unable to roll over in bed, and could not raise his arms or grasp the hand with sufficient strength to make it felt. Motor paresis was general, and paræsthesias were widely extended. The point which Dr. Jewell wished to emphasize was, that this man had been treated with large doses of ergot, under the idea that the blood-vessels would be contracted and thus relieve the patient. Instead of this, however, he got worse. Dr. Jewell placed him upon large doses of strychnine, and increased the amount almost up to toxic doses. The man had improved so that now he could walk. Absolute physical rest was essential in the treatment of these cases.

Dr. Jewell recalled another case more exaggerated than the above. A gentleman came some distance to see him. He was weak and walked with a stick. Dr. Jewell immediately ordered him to bed, where he remained some five or six weeks. He became thoroughly paretic, but afterwards got better and returned to his home with directions not to move about. Being a superintendent of schools which were about to close, he walked up-stairs to review the classes, and in so doing violated the directions which had been given him. He was at present in one of the worst conditions in which a man could well be. The flexors of his legs were contracted so that the legs were brought up against the thigh and the thighs against the abdomen. The arms were also drawn up tightly. There was no prospect of his getting well, so far as could be seen. But the doctor believed that the patient would have recovered if he had kept quiet. Dr. Jewell had had other cases. One case was now well, in Brooklyn. This patient could not even wink or move in any way. He was placed upon very large doses of strychnine, at last one-tenth of a grain three or four times a day, and absolute quiet enjoined. Every time the patient received callers or was excited he was worse. Dr. Jewell considered it absolutely necessary that these patients should be *kept perfectly quiet, and not allowed to exert themselves in the least*, if possible not even to think. If these directions were ignored, it had been his experience that the patients made slow recoveries or died. Massage might be used in a mild way, but large doses of strychnine and absolute quietude were more potent agents.

Dr. Beard agreed with Dr. Jewell as to treatment. He kept his patients in bed until heartily sick and tired of such treatment. He remembered one case which occurred in hospital practice. The patient had lain in the gutter over night, and came into the hospital within one to three days afterwards. There was partial suppression of urine. The patient was not only kept quiet, but on account of the renal symptoms was given a sweat, which seemed to relieve him. In his case there was a peculiar numbness and loss of power, found in cases of myelitis, but these disappeared in the course of a week and he was essentially well.

Dr. Hammond thought all of the members present would agree with Dr. Jewell in regard to the efficacy of rest in the treatment of these cases. Dr. Jewell's remarks in reference to the use of strychnine, he confessed, shocked him. He did not see how anybody could keep quiet who was taking one-tenth of a grain of strychnine four times a day. It struck him as a very dangerous practice. In the treatment of his cases he had enjoined quietude, and the drugs which he had used had been such as to lead to opposite results than would be obtained by the use of strychnine.

Dr. Gray thought there could be no doubt that rest, both physical and mental, was one of the best means of treatment that could be employed. A point which had interested him was, when to stop rest. In the early treatment of myelitis it was undoubtedly a benefit, but he had seen cases where he believed it had been carried too far. In regard to the effect of strychnine in these cases, he thought it difficult to determine, for the reason that enough of these cases had not been studied to know whether they usually lasted six days or six months; so that if there was any improvement it was assigned to the effects of the drug. Dr. Gray had not used strychnine on account of entertaining the same view as Dr. Hammond. In some cases he had seen excellent results during the administration of iodide of potassium, but he had not been able to state that this was the result of the drug.

Dr. Seguin remarked that he was very much interested in the anatomical aspect of the case. He referred to a patient who had come under his notice, and in whom complete paralysis developed within ten or twelve hours after the first symptom. Microscopical examination showed destructive changes rather than swelling; a great many of the ganglion cells had undergone vacuole formation. Very few cases of acute myelitis had been thoroughly studied post-mortem. Most cases were sub-acute, and it was his belief that at the present time we were approaching a classification of acute myelitis into two forms: one an active or parenchymatous, and another where the connective tissue is primarily affected and in which we find those areas of disintegration. He thought it would turn out that all of us had been prescribing rest in these cases for several years, yet he would hardly go as far as Dr. Jewell in asserting the influence of rest upon the course of the disease. He had been led by observation to believe that there was a fatality in the changes which had taken place in the early stages of myelitis. He did not believe that any amount of strychnine, ergot, or iodide of potassium would cure destructive myelitis. In regard to strychnine, he believed that Dr. Jewell had not given us the symptom which enabled us to judge of the treatment; and, in particular, the muscular reactions to faradism. If his cases were those in which the anterior horn was involved, it was not surprising that no muscular contractions occurred under strychnine. A few of these cases of affection of the anterior horns got well spontaneously.

Dr. Putnam thought that in speaking thus of strychnine we were using as a basis nothing more than physiological experiments. He believed it was recognized that poisons acted very differently upon diseased nervous centres from what they did upon normal tissue. Inasmuch as the arguments were deductive, it should be borne in mind, that one-tenth of a grain of strychnine upon a nervous centre which was disorganized would have a different effect than it would have upon the same centre if it were in a normal condition.

Dr. Hammond remarked that in his earlier days he had given such doses of strychnine as Dr. Jewell spoke of, but in every case the symptoms were exaggerated. He had never seen a case of myelitis which was not aggravated by the administration of strychnine.

Dr. Jewell explained the points he had made. He did not claim anything new in regard to rest, but he wished to emphasize the statement that the utmost possible pains should be taken to keep the patient not only in bed, but absolutely quiet. He could not be mistaken as to the good effects of rest. As to the use of strychnine, he said, that two of the attending physicians upon cases he was called to see in consultation, were a little horror-struck with his suggestion to give strychnine. In one case, there was first an exposure, then a chill, and in forty-eight hours afterwards paralysis developed; then fever, which passed away after a time and the temperature even fell below the normal. The patient had been given large doses of ergot and iodide of potassium, the latter for good reasons. Strychnine, he knew, acted well in these cases when the fever had abated and the temperature was not above normal. He had commenced in six cases with one-thirtieth of a grain and rapidly ran up to, in one case, one-tenth of a grain three or four times a day. In his cases there was not that entire loss of electro-muscular excitability found in cases of acute disease and degeneration of the anterior horns. His last patient had been under electric treatment for a long time. Whenever the strychnine was discontinued the patient grew worse, but improved when its administration was resumed.

Dr. Jewell did not pretend to explain this action of strychnine, but simply announced it as a matter a little contrary to what was usually expected.

Dr. Hammond suggested that the effect produced might be due to the administration of a larger dose than usual: different or opposite effects were produced by the same drug by varying the size of the dose.

Dr. Webber inquired of Dr. Jewell whether, in this case the arms or legs were paralyzed first, and how long it was after the origin of the disease before the paralysis developed?

Dr. Jewell replied that it began in the legs, and in most cases he thought it traveled up the cord. The paralysis was worst about six weeks after the beginning of the disease. In most of Dr. Jewell's cases the face was involved either upon one or both sides, so that the individual could only move the face muscles to a very limited degree. His Brooklyn patient was unable to voluntarily move any of his muscles: the sphincters were entirely relaxed, the bladder had to be emptied by a catheter, and his breathing was almost wholly thoracic.

Dr. Bartholow inquired if the patient had been taking iodide of potassium along with the strychnine?

Dr. Jewell said he was kept upon pretty large doses of iodide of potassium, but made no start towards recovery until he began the use of strychnine. That the point insisted upon by him was contrary to the ordinary teaching, he knew very well, but he knew the other thing likewise, that these cases had improved upon strychnine. Iodide of potassium had been given with no apparent improvement. He could conceive of changes in the spinal cord in which the action of strychnine would be very different from what we were accustomed to suppose, the blood-vessels being actually stimulated so as to diminish in size: possibly their muscular coat being stimulated through the related nerves.

Dr. Putnam asked if the physiological symptoms due to strychnine were obtained?

Dr. Jewell stated, that in the case where he used one-tenth of a grain three times a day the physiological effects of strychnine were not produced, but they were produced in other cases where a smaller dose was administered.

Dr. Webber thought he should give Dr. Jewell's plan of treatment a trial as soon as he returned home. What Dr. Jewell said about the action of strychnine upon blood-vessels, after the acute stage has passed, reminded him that strychnine was good in certain conditions of relaxation of the bowels. He agreed with Dr. Seguin in regard to the pathological changes in the cord. He believed it was two years ago when he called the attention of the Association to the fact, that there was an acute parenchymatous myelitis, and an acute interstitial myelitis: the specimens presented were of the former variety, in which the irritative process was rather more marked than usual.

Dr. Bartholow inquired first as to the character of the cases mentioned by Dr. Jewell. He thought they were syphilitic, and upon that theory we could account for the rapid improvement under the iodide of potassium and the beneficial influence of strychnine. If it was a fact that syphilitic products were removed by the iodide of potassium, and he believed it was, then the tissues needed the subsequent stimulus of strychnine. He believed, however, that strychnine could only aggravate in acute myelitis. It had been long ago shown, that strychnine increased the size of the blood-vessels of the cord, and that vessels which were not previously observable, were, under its influence, brought into view. This being the case, of course acute myelitis would be made worse by the administration of strychnine.

Dr. Jewell remarked that he should not think of giving strychnine in cases of acute myelitis as long as febrile symptoms remained. The point he wished to make was, that after the case had progressed to a certain extent, we might begin the use of strychnine, and that, too, much earlier than was ordinarily supposed possible; this might be done in cases looked upon as hopeless, and in those cases where most physicians gave the bromides and the fluid extract of ergot under the idea that they would bring about contraction of the blood-vessels. If the acute stage had passed and there was no softening, then the stimulation of the strychnine was obtained; if there was softening the strychnine would do no harm. In reply to Dr. Bartholow, Dr. Jewell stated that he had made very particular inquiries as to the existence or non-existence of syphilis in his cases, and that in none of them could he get a syphilitic history.

Dr. Hammond inquired when the acute period was considered passed?

Dr. Jewell said it was passed when there were no longer any outward febrile symptoms.

Dr. Miles asked for the first symptom of improvement, whether it was to be found in the condition of the sphincters, or in the movements of the patient?

Dr. Jewell thought both improved together.

Dr. Miles remarked, that he had a remarkable case of paralysis of a year-and-a-half standing in which the improvement was first noticed in the sphincters.

Dr. Beard asked if iodide of potassium and strychnine were given together, as a fact?

Dr. Jewell stated that they were, but that improvement did not begin to take place until strychnine was administered.

Dr. Hammond thought it was impossible to determine that.

Dr. Beard remarked that he understood Dr. Jewell to make three claims : first, after the febrile symptoms passed away, he began the use of strychnine : thus he used it while there was still congestion of the cord ; second, whether strychnine might not prove good after the secondary effect of iodide of potassium had been obtained. With his increased experience he had found, that in those patients who said they could not take iron or quinine, it was possible to administer both without bad effect. after the patients had taken sedatives. As to the production of different effects by varying the size of the dose, he considered this a truism. The opposite effects produced by large and small doses was well illustrated by the action of arsenic upon the stomach.

There being no further discussion, Dr. J. J. Mason, of Newport, R. I., proceeded to read his paper entitled,

MICROSCOPICAL STUDIES ON THE CENTRAL NERVOUS SYSTEM OF REPTILES AND BATRACHIANS. DIAMETERS OF THE NUCLEI OF THE NERVE CELLS IN THE SPINAL CORD.

As early as 1875 the author had observed an inequality between the size of the nerve cells in the brachial, and those of the crural enlargement in frogs. More extended subsequent observations with reference to this particular point enabled him now to formulate the following law, which he predicted would be found to hold true in all vertebrate animals:

"The nuclei of the cells in the inferior (anterior) horns, in the two enlargements of the spinal cord, have average diameters which are proportional to the muscular power of the corresponding extremities."

He also found that the diameters of the nuclei of the nerve cells vary in different individuals of the same species in accordance with the age of the animal. From this he thought it fair to infer, that the nucleus of a motor cell grows with the muscular substance which it is supposed to innervate.

Details of the manner of making permanent preparations for counting and measuring nuclei were given.

REMARKS UPON DR. MASON'S PAPER.

Dr. Miles inquired if the nucleus bore any definite proportion to the size of the cell?

Dr. Mason had not found it so, for it was very difficult to determine the size of the cell.

Dr. Spitzka remarked that it had long been known, that cells in different parts of the cord varied in size. He had previously stated, that wherever he found a certain group of cells having a certain shape rising and sinking in a certain group of animals, then he had no hesitancy in referring to that group of cells a motor function. He hardly thought, that in all cases the nuclei bore a definite proportion to the size of the cell. He thought there were conditions of development and nutrition which we must yet study. There was a current error that large and multipolar cells were essentially motor. He did not believe that any fixed relation could be established between the cells and the muscles to which they were distributed.

Dr. Hammond inquired if reflex excitability was not greater in the posterior group of cells than in the anterior?

Dr. Mason thought not.

Dr. Hammond took exceptions to this. He declared that reflex excitability was greater in the sole of the foot than in the palm of the hand. As to the frog, he was well satisfied that there was an excess of excitability in the hind-legs over that in the fore-legs.

Dr. Mason remarked, that as far as sensation went it had nothing to do with the subject of the paper. He was now engaged in making measurements of the cranial nuclei, or cells of origin. He presented photographs showing the difference in the size of the auditory nuclei and those of the trigeminal or fifth pair.

Dr. Putnam thought that before any general law was laid down, the function of the different muscles should be taken into account. In regard to enlarged sensitive nerve cells, he said that he had found the olfactory nerve fibre of the deer enlarged.

There being no further discussion, Dr. Roberts Bartholow, of Philadelphia, read a paper entitled,

THE TRANSFER OF SENSATIONS.

Only such historical references were made as were necessary to show what had been accomplished by the mode of experimentation pursued by the author, and the present state of physiological knowledge on the particular point involved in the present inquiry. Brown-Séquard had demonstrated the decussation of the sensory fibres all along the spinal cord. That the grey substance of the cord was the channel of conduction of sensory impressions, seemed abundantly established by the recent experiments of Schiff. The grey matter, then, was the medium of communication between the sensory fibres of the two sides. The problem to be solved was, are the two sides so intimately connected that an impression made at a certain point in one member is accompanied by a corresponding impression in the same place in the other member? Eulenburg had attempted to work out this problem in some experiments upon medical students, which were directed to show that agents which increase or lessen the sensibility of the skin of either half of the body causes a consecutive increase or lessening of the sensibility of the corresponding spot of the other half of the body. Rumpf, previous to the experiments of Eulenburg, had found that alterations of sensibility, produced by irritation, caused a simultaneous alteration on the opposite side. Two years ago Dr. Bartholow, while practicing hypodermic injections into the painful points in a case of sciatica, had his attention called to the fact that his patient felt pain in the arm of the same side simultaneous with the pain at the point of puncture. Not every injection produced these results, but they occurred whenever the injections were made in those situations where nerve filaments of some size were apt to be impinged on. The patient always referred the pain to the corresponding position on the upper member of the same side, and never on the other side. Further investigation was now resolved upon, and to this end an ordinary sewing needle of large size was used to develop the initial pain, and ice wrapped in oil-silk to produce the local lowering of temperature. The temperature of the corresponding parts under observation was determined by Hawksley's surface thermometer. It was found that the fall of temperature, produced by the refrigerations of a member, affected the corresponding region of the same member as on the opposite side, and that these deviations of temperature were never greater than one-half of a degree. The explanation was to be sought for in the connection of the vaso-motor system with the spinal. It had not been ascertained, though it was thought probable, that, when a part was refrigerated, the parts having the same anatomical relation would experience a decline in temperature. The experiments which were submitted indicated that the transfer of painful sensations was limited to the same side. Pain of considerable severity, though not prolonged, must be caused to develop secondary pain. Induced pain could be developed only in certain positions. Were the two sets of facts contradictory? Dr. Bartholow thought not. The lowering of temperature on symmetrical points of the same and opposite sides was probably due, as already suggested, to the symmetrical arrangement of the vaso-motor fibres accompanying the nerves of animal life from the common centre in the cord. The secondary pain produced by the irritation of a nerve on the same side was a phenomenon which might be compared to the irradiation of pain in neuralgias.

REMARKS UPON DR. BARTHOLOW'S PAPER.

Dr. Putnam remarked that Dr. Bartholow's interesting paper called to mind some experiments he performed upon the frog, in which he irritated one foot of that animal and caused the blood-vessels in the other foot to contract. This peculiarity was perhaps better shown in the ears of a rabbit. Ice applied to one ear will cause a temporary rise of temperature in the other.

Dr. Beard stated that he had noticed phenomena of that kind in cases where patients had an irritable spinal cord, in the application of the faradic current. When it was applied to the right leg its effects were also observed on the corresponding side of the left leg; this, however, was not often observed. He remembered one case which could not bear any electricity whatever, no matter how mild. He had always regarded this condition pathological rather than physiological.

Dr. Jewell said that he recalled a case that was interesting in this connection. The gentleman was hemiplegic in regard to sensibility and mobility. If anything hot was applied to his skin he would have no feeling upon that side. If a severe cut was made with a knife, he experienced no pain; but if he was pinched he would have pain. But, when the skin of the foot was pinched, he would have pain at the knee and elbow. By just drawing the fingers over the ends of the hairs upon his leg, however, he could not only feel, but localize the contact. This condition continued until his death.

Dr. Spitzka remarked that he supposed for some time to come such observations as these would be considered curious; they were certainly interesting; such, for instance, as pain under the shoulder blade in hepatic trouble.

Dr. Miles stated that whenever he had an accumulation of wind in his stomach he experienced a pain in his wrist. These phenomena might be of some service in the application of blisters.

Dr. Spitzka referred to the coughing caused by the tickling of the auditory canal.

First Day—Evening Meeting.

The Association was called to order by President Miles, at 8:30 P. M.

Present: Drs. Miles, Gray, Cross, Mason, Kinnicutt, Putnam, Van Bibber, Bartholow, Webber, Jewell, Spitzka, Seguin, Hammond, and Beard.

The first paper was by Dr. Landon Carter Gray, of Brooklyn, on

THE USE OF QUININE WITH THE NERVOUS SEDATIVES.

He maintained that quinine, when given with the bromides, belladonna, and hyoscyamine, lessened the depression that these drugs usually produced, while it *actually increased* the effect of these medicines over the diseases for which they were given, as epilepsy, mania, etc.; whilst the conjoined use of quinine with nervous sedatives was not new, this curious fact had not hitherto been observed. Dr. Gray also directed attention to caution in the use of the bromides in asthenic individuals, and that benefit was generally to be expected from their administration to asthenic individuals only.

REMARKS UPON DR. GRAY'S PAPER.

Dr. Jewell remarked that wherever there was nervous or muscular weakness in epileptic patients, he was accustomed to use strychnine, and found it exceedingly beneficial in combating the depressing effects of a prolonged course of bromides. He had found that it did not increase the reflex irritability and thus render the patient more liable to fits. He had already had much favorable experience with quinine in this relation.

Dr. Webber mentioned a case which he had seen in consultation, where there was the most profound depression in consequence of the use of the bromides. He was accustomed to combine iron with the bromides in order to counteract their depressing effect, and found it to work very well.

Dr. Bartholow spoke of the factors entering into the depression produced by the bromides. As a rule the bromides, he said, were not so efficient in weak and anæmic patients as in others unless they were combined with tonics. Chloral, he thought, would be of service in certain cases: its effect upon the brain was directly opposite to that of the bromides, causing hyperæmia rather than anæmia.

Dr. Spitzka inquired what Dr. Gray understood by puerperal mania?

Dr. Gray said that he understood puerperal mania to be the mania following confinement. He wished to be understood as saying that the action of quinine with nervous sedatives was to deepen their hold upon the disease for which they were given.

Dr. Seguin remarked that it might be interesting to quote Brown-Séquard in this connection, who, when he was with him, often impressed him with the danger of giving quinine in epilepsy. Dr. Brown-Séquard believed that quinine was liable to precipitate the attack; he was in the habit of giving strychnine. Dr. Seguin had given quinine in some cases without any apparent aggravation. The point brought out by Dr. Gray, he said, struck him as worth working up; it was quite different from giving tonics in anæmia.

Dr. Miles expressed the opinion that there was no danger from bromization. He had never found any permanent effect from the use of the bromides, nevertheless he considered it a good plan to administer tonics in connection with them.

Dr. Spitzka, in referring to the influence of these drugs upon insanity, said that a case of puerperal mania could hardly constitute a test case. He considered one very fortunate in having a case so mild as to be relieved by the second dose of any sedative. He thought the combination of the bromides with chloral was older than was usually supposed. He knew they had been used in connection with hyoscyamus in our city hospital since 1874. He referred to a case which he now had under observation. Brown-Séquard when in this country had treated the patient for epilepsy. The patient had taken Brown-Séquard's mixture, and for fourteen months was entirely free from epileptic attacks. He used to take a spoonful of bromide of potassium dissolved in water, three times a day. He bought his bromide by the pound at a wholesale store. Dr Spitzka had a boy under observation whose epileptic convulsions were controlled by the bromide of potassium, but he developed a murderous tendency; there was no acne. He alluded to another case in which ten to fifteen minims of the fluid extract of conium in connection with the fluid extract of ergot was administered. The patient had a vision of a man with a dark cloak over his face just before she had an explosion; it came out in distinct outline. He gave the above combination and she was free from epileptic convulsions for eighteen months. After this she went out from under observation. She returned, and a second time he found that ergot and conium failed, and he had recourse to bromide of potassium, which relieved. The family then removed. The grandparents, father, aunts and uncles of this patient were epileptic. From the history of this case he came to the conclusion that the bromide did good only in emergencies. In a case of motor excitement, he would say that hyoscyamus could not be as efficacious as conium. He did not understand how any of the true narcotics could be suspended and quinine substituted unless there had been a period of natural repose.

Dr. Gray remarked, that it was not because he thought the treatment alluded to was the best that he used it, but because he wanted to experiment. As to his unfortunate case of puerperal mania, he did not think he said it was cured by two doses of medicine. He simply stated that he gave hyoscyamine for some time, and brought the patient fully under its influence; he hesitated to increase the dose and thought he would give quinine, and the second dose was followed by marked improvement. The patient had been getting worse for several weeks, so unless we concluded that the effects were due to the medicine we might as well shut up our drug shops.

Dr. Hammond thought that every atom of quinine added to a dose of bromide, lessens the effect of the bromide upon the patient. He did not know of a single combination that was beneficial to the patient except the combination of Fowler's solution with bromide to prevent acne. He thought that every atom of quinine given in combination with bromide was injurious to the patient. Whenever the bromides produced an injurious effect, the best way to mitigate that was to lessen the amount. He thought the bromides should never be given unless the patient was under the physician's observation. He had had four cases of death resulting from the administration of the bromides. He had come to the conclusion, that unless bromization was produced the patient could not be cured. He now had a little girl under treatment, six years of age, who had taken over fifteen grains of the bromide of potassium three times a day for a month. He had found in this case that the combination of the bromide of zinc with the bromide of sodium worked well; she had had no spasms for the past two days, when previously she had been having several in a day. As regards the combination of iron with the bromides, he thought it did harm in all cases of epilepsy. Strychnine was beneficial in some cases but not in the ordinary cases. He had frequently combined quinine and the bromide of potassium to lessen the head symptoms of the quinine.

Dr. Spitzka said he had never regularly given over fifteen grains of the bromide three times a day. He thought the bromide of sodium was stronger than the bromide of potassium; that was to say, you got more bromine in the bromide of sodium. Not for five years had he prescribed the bromide of potassium; he gave bromide of sodium.

Dr. Seguin stated that he had found iron, a stimulant theoretically indicated, to work well in his practice. He said that one of the chief actions of strychnine was to increase arterial tension, hence its efficacy in bromism, one of whose chief elements was weakening of the heart and the lowering of arterial tension.

Dr. Hammond said he had seen the best results from the use of bromide of sodium in a certain quantity of water: every dose should be taken in half a tumbler of water. He thought one of the most unfavorable effects of the bromides was upon the tonsils and mouth. This could be prevented by diluting the bromides. The effect of the bromide is well marked in cases of nervous prurigo when administered externally by brushing over the parts with a solution.

Dr. Spitzka said there could be no doubt as to the antagonism between tonics and the bromides. A great deal of the effect of the bromides was shown in quieting peripheral impressions: strychnine was certainly antagonistic. As regards quinine, he thought it was quite clear that it reduced the action of the bromides.

Dr. Seguin suggested that in following out the long observed rule of thoroughly diluting the bromides, Vichy water be used instead of the ordinary water; it covered the taste somewhat. For his poor patients he was in the habit of directing a pinch of soda to be put into the water.

Dr. Mason inquired of Dr. Hammond if there was any other cause of death besides the bromides, in the cases referred to.

Dr. Hammond replied that all died with symptoms of pneumonia, but he believed they would not have died when they did had it not been for the bromides. He had at least a hundred cases in which death would have taken place in another day if the bromides had been given longer

There being no further discussion, Dr. S. G. Webber, of Boston, read a paper upon

WATER AS A PROPHYLACTIC AND A REMEDY.

Many people had a notion that it was injurious to drink at meals, but a moderate quantity of fluid taken at meal-time was rather beneficial than otherwise. A large class of patients were affected with symptoms of an indefinite character, a vague unrest showing itself by discomfort or even pain, sometimes in one place, sometimes in another; they were usually subject to constipation, often had an unhealthy hue of the skin; they were frequently classed as hypochondriacal or hysterical; there was no well-defined disease. It had long been his custom to inquire of patients thus affected as to the amount of drink they took and how much urine they passed. He often found the amount of drink much below the average; there was a tendency to dryness of the skin; the urine was scanty, high-colored, and strongly acid, sometimes depositing a sediment. Under the use of an increased amount of water the perspiration was increased, the urine became more natural, and the unpleasant symptoms diminished or disappeared.

The waste of the tissue changes in the system must pass into the blood, and could only leave the system in a state of solution. During comparatively good health the amount of blood was maintained at nearly the same figure, and only as much water would be parted with through the skin, lungs, and kidneys as could be restored from other sources. If too little was ingested, the perspiration would be slight, the elimination of urine would be diminished, and the excretion of waste material would be lessened. The blood would be continually saturated, or nearly so, with the results of disassimilation; the removal of the waste of tissue changes was not accomplished with sufficient regularity, and the tissues became clogged with used up material, and nutrition was interfered with. The balance each day against health was very slight, but after a time there was such an accumulation that unpleasant symptoms were developed. If the person continued to eat heartily, either the surplus food passed off by the intestines or was deposited in the shape of fat, the nitrogenized portions assisting to load the urine with urea and the urates. Let such a person drink a large amount, and the blood having a sufficient supply of water, more urine would be secreted. the loss made good to the blood by absorption, and a larger amount of waste products would be taken up to be eliminated; more urea, phosphoric and sulphuric acids passed off by the urine, which was increased in amount, and there was more disintegration of the tissues. This last was made up by new material, so nutrition was increased. The doctor had found that neurasthenic patients did not drink enough. Was it an American peculiarity to ingest too little fluid? The doctor thought it was. It was not to be expected that in all of these cases the simple increase of the fluids injected would cure our patients. Too frequently the tissues had been so long illy nourished that that simple plan of treatment was not sufficient. The time to work the greatest cures with water was before the disease had begun.

REMARKS UPON DR. WEBBER'S PAPER.

Dr. Beard remarked that he was very much interested in Dr. Webber's paper. In his work upon neurasthenia he had spoken of the symptom of thirst as a prominent one. His attention was first called to it by a well-known physician who spoke of his deficient thirst. He then began to question his patients, and found it to be one of the interesting symptoms of neurasthenia, and occurred not infrequently. He had been prescribing Summit water; two or three patients had gotten well under its use, he was sure it had done good. He was not making scientific experiments, but so far as he could judge the water did great good. He had substituted other kinds of water in some of his cases. He not only used water freely with the bromides, but with other medicines. He used the bromides alternately with tonics and a free supply of water; the plan was very satisfactory; he got what he wanted in the system, namely, water. He had found that the urine was full of oxalates, albumen and casts. These were apparently driven out by the water. Water, as water, was beneficial. It was excellent to keep the bowels relaxed. Sometimes patients objected to drinking so much water, but they soon became accustomed to it, and would take it in large quantities.

Dr. Webber said that patients who drank no more than a pint or twenty ounces of water per day, had told him that they were not thirsty, and were surprised when he told them to drink more water. They did so, and in the course of a week were drinking three pints a day; they also began to experience thirst in the course of a week. He thought that it was the popular medical writers who were to blame for the scanty ingestion of water in many instances.

SPHYGMOGRAPHIC TESTS.

Dr. James J. Putnam, of Boston, made brief mention of some experiments he had made in connection with Dr. Bowditch, in testing Pond's sphygmograph. He had substituted a spring for the weight usually used, and found the instrument to work better.

Dr. Putnam then read a short paper on

STRETCHING THE FACIAL NERVE FOR SPASM.

He read the history of a case where the nerve was stretched somewhat slightly, but three days afterwards began to show loss of reaction from the electric current. He thought sufficient directions as to the indications for the performance of the operation had not been given. From experiments upon dogs he had made up his mind that stretching of a nerve by means of a hook was the best plan; and secondly, that it was best to let the patient come partly out from under the influence of the ether, and then pull just enough to cause a slight immediate effect, with the full expectation that no further bad effect would be produced.

Owing to the lateness of the hour the Association adjourned.

TUESDAY, JUNE 17TH—AFTERNOON SESSION.

The Association was called to order at 2.30 P. M. by the President, Dr. Miles.

Present: Drs. Miles, Beard, Gibney, Spitzka, Ott, Hammond, Van Bibber, Mason, Webber, Shaw, Kinnicutt, Putnam, Jewell, Seguin, Gray, and G. M. Hammond.

REPORT OF THE COMMITTEE ON NOMINATIONS.

Dr. Jewell presented the report of the Nominating Committee, which was as follows : President, Dr. Roberts Bartholow, of Philadelphia; Vice-President, Dr. John C. Shaw, of Brooklyn; Secretary and Treasurer, Dr. E. C. Seguin, of New York; Councillors, Dr. S. G. Webber, of Boston, and Dr. Frank P. Kinnicutt, of New York.

Upon motion, the Secretary was directed to cast the vote of the Association; it was aye, and the above-named gentlemen were duly elected.

The council reported favorably upon the candidacy of Drs. G. M. Hammond, of New York, and Isaac Ott, of Easton, Pa.; elected.

The first paper of the afternoon was by Dr. George M. Beard, of New York, entitled,

EXPERIMENTS WITH THE "JUMPERS," OR "JUMPING FRENCHMEN" OF MAINE.

Dr. Beard remarked, that two years before he had made a verbal statement upon this subject to the Association, but at that time had not seen any case and derived his facts from conversation and correspondence with those who had requested him to scientifically investigate the subject. In this month of June he had visited Moosehead Lake and found the Jumpers and experimented with them, taking care to eliminate the six sources of error that complicate all experiments with living human beings. He found that what had been claimed was true and more than true. One of the jumpers while sitting in his chair with a knife in his hand was told to throw it, and he threw it quickly, so that it stuck in a beam opposite; at the same time he repeated the order to throw it, with cry or utterance of alarm resembling that of hysteria or epilepsy. He also threw away his pipe when filling it with tobacco when he was slapped upon the shoulder. Two jumpers standing near each other were told to strike, and they struck each other very forcibly. One jumper when standing by a window, was suddenly commanded by a person on the other side of the window, to jump, and he jumped straight up half a foot from the floor, repeating the order. When the commands are uttered in a quick loud voice the jumper repeats the order. When told to strike, he strikes, when told to throw it, he throws it, whatever he has in his hands. Dr. Beard tried this power of repetition with the first part of the first line of Virgil's Æneid and the first part of the first line of Homer's Iliad, and out-of-the-way words in the English language, with which the jumper could not be familiar, and he repeated or echoed the sound of the word as it came to him, in a quick, sharp voice, at the same time he jumped, or struck, or threw, or raised his shoulders, or made some other violent muscular motion. They could not help repeating the word or sound that came from the person that ordered them any more than they could help striking, dropping, throwing, jumping, or starting; all of these phenomena were indeed but parts of the general condition known as, jumping. It was not necessary that the sound should come from a human being: any sudden or unexpected noise, as the explosion of a gun or pistol, the falling of a window, or the slamming of a door, provided it be unexpected and loud enough, would cause these jumpers to exhibit some one or all of these phenomena. One of these jumpers came very near cutting his throat while shaving on hearing a door slam. They had been known to strike their fists against a red-hot stove; they had been known to jump into the fire and into water; they could not help striking their best friend, if near them, when ordered. The noise of a steam-whistle was especially obnoxious to them. One of these jumpers when taking some bromide of sodium in a tumbler, was told to throw it, and he dashed the tumbler upon the floor. It was dangerous to startle them in any way when they had an axe or knife in their hand. All of the jumpers agree that it tires them to be jumped and they dread it, but they were constantly annoyed by their companions.

This disease was analogous to the mental or psychical hysteria, the so-called servant-girl hysteria which was so often observed during the epidemics of the middle ages. It was a trancoidal condition: a temporary trance induced by reflex irritation, and the emotion of fear. In a certain sense we were all jumpers; an alarm of fire in a crowded building would have the same effect upon very many of us, producing trance with convulsive movements. An approximative analogue to these phenomena of "jerks," as they were called, was to be found in certain religious revivals, and the "holy rollers," those who under religious excitement rolled upon the floor, as observed in northern New Hampshire. In two respects this phenomenon of jumping was different from any analogue here given: *First*, the temporariness and momentariness of the phenomenon : it was all over in a second, and then the man was ready to be jumped again. In the mesmeric trance, which was a very good analogue of this condition, the entranced subject remained in that condition a long while, or at the will of the operator. Simply pointing with the finger at one of these jumpers, if done quickly and decidedly, would have the same effect as striking him : some persons were mesmerized in the same way. *Second*, it differed from the analogues in the persistence of the liability. The religious jerkers and holy rollers were victims of a condition that passed away after a time, while the jumper's liability to jump was a life-long condition from which they never recovered. One thing was certain, that these jumpers were not nervous: the phenomenon was not a symptom of neurasthenia, and in this it agreed with the servant-girl hysteria epidemic of the middle ages, with the jerkers and with the phenomenon of the "holy rollers." Psychologically, these jumpers were modest, quiet, retiring, deficient in power of self-assertion and push. They were not half French so far as Dr. Beard could learn, and in this respect he had been misinformed. They were strong and capable of doing hard physical work, and some of them could read and write and were as intelligent as the class to which they belonged. Jumping was hereditary and ran in families: there were fifteen cases in four families. Women were rarely jumpers; young children four or five years of age might begin to jump: two such children were in one family. The disease was epidemic and restricted mostly to the northern part of New Hampshire, Maine, and Canada, although cases had been reported among the Malays upon the other side of the globe. This disease was probably an evolution of tickling: the habit of tickling each other in the woods.

In regard to prognosis Dr. Beard said, once a jumper, always a jumper. Dr. Beard tried bromization in one case without any very great effect. Psychologically this subject was of the highest conceivable interest in its relation to trance, the involuntary life, the departments of science that are now exciting the attention of the ablest neurologists in the world. Dr. Beard claimed that his theory of trance, as explained in his work upon that subject, explained this phenomenon of jumping. The most incredible fact connected with the whole subject was not the existence of the phenomena above described, but that they had not been previously observed by science.

REMARKS UPON DR. BEARD'S PAPER.

Dr. Gray inquired if there were any evidences of hysteria in the cases referred to.

Dr. Beard replied, not the slightest.

Dr. Jewell remarked that he had been greatly interested in the paper, and he hoped Dr. Beard would pursue the "jumpers." He thought the subject was worthy of study as this class of cases was confined to a certain locality, and the peculiarities of the individuals were hereditary.

The next paper was by Dr. V. P. Gibney, of New York, entitled,

CERVICAL PACHYMENINGITIS.

The paper consisted of the detailed histories of three cases occurring in children. First, a girl, aged seven years, an incomplete history of whose case was given at the meeting of the Association in 1878, was taken with post-cervical pains in the winter of 1876. She had attacks of torticollis, from which she was two or three months recovering, and was treated for vertebral caries in the spring of 1872. She got entirely well to all appearances in the summer of 1876. The symptoms recurred in February, 1878; radiating pains and stiffness of neck, and later infiltration of the soft parts being the most prominent features. In April of the same year cervical paraplegia came on, and this was followed by paraplegia, all within a week. Under full doses of ergot and iodide of potassium she made a prompt recovery from this; went from under treatment and relapsed again in less than a fortnight. She lay at home almost entirely helpless as to her head and extremities for nearly eighteen months, with very little rectal or vesical disturbance at any time. There was at no time any bony deformity of the spine; there was, however, nearly all the while, and especially during the exacerbation, spinal tenderness more or less marked, and on this Dr. Gibney laid great stress in excluding caries of the vertebræ.

The patient made a complete recovery from all paralysis, and eight or ten months had elapsed, during which period no relapse occurred.

Second. A girl aged four years came under treatment November 24, 1878, the first symptoms dating from March, 1878. Then a stiff neck came on, acutely, like that from cold; pain and tenderness in the cervical region and throughout the occiput. These pains were relieved only by opiates, and the symptoms continued with greater or less severity until November, when loss of power was added. This began in the left arm, the right arm soon following, and then the left leg. The paralysis was gradual. The faradic responses were preserved and the atrophy was at no time very marked. The torticollis was a prominent sign, yet this was easily relieved by the use of a head-spring attached to the body brace. There was no spinal deformity and no pain on concussion; no fullness of the pharynx. Never at any time was there any febrile disturbance that was significant. The paraplegia lasted about ten months, and at times there was constipation and incontinence of urine. The reflexes were always very marked: at one time being wonderfully exaggerated. The recovery was complete, and nearly a year had elapsed since the cure was established. The treatment consisted of ergot and iodide of potassium, and the use of apparatus with the occasional employment of faradism.

Third. A boy, aged ten a half years, an abstract of whose case, at that time incomplete, was published in the *Medical Record*, Jan. 4th, 1879, page 20. He gave the usual history, and at the time of the publication just alluded to was in bed paralyzed in superior and inferior extremities. As a full account of his initiatory symptoms was given in the *Record*, along with those of the second stage, they were not repeated. It suffices to say he made a complete recovery from the cervical paraplegia and a recovery from the paraplegia in all the muscles save those of the flexors of the thigh, right side. The incontinence of urine preceded retention, and constipation was very marked. This case developed a descending optic neuritis in the wake of his paraplegia, and he recovered from this affection. Later still he developed a vesical calculus, removed per urethram. The three cases illustrated admirably the progress of cervical pachymeningitis through its different stages, and the disassociation from any bone lesion of the vertebræ was well shown by the diagnostic points adduced and by the final results.

REMARKS ON DR. GIBNEY'S PAPER.

Dr. Putnam asked for more symptoms which would enable one to differentiate between pachymeningitis cervicalis and Pott's disease. He wished to know whether it was always possible to distinguish between the two, especially when there was no deformity.

Dr. Gibney said it was impossible to make a differential diagnosis at one examination. As a rule, you did not get spinal tenderness in Pott's disease, whereas this was present in pachymeningitis. If you had paroxysms of torticollis, you might be sure that the case was not one of Pott's disease. The paraplegia was alike in the two diseases, but there were very few cases of cervical paraplegia in Pott's disease. You could examine the posterior wall of the pharynx in most cases very well, and thus satisfy yourself in regard to the existence of bone disease.

There being no further discussion, Dr. William A. Hammond, of New York, proceeded to read his paper upon

THALAMIC EPILEPSY.

Whilst cases of the form of epilepsy which the doctor was about to describe had doubtless not been very uncommon, it happened that they had not hitherto received special attention. Dr. Hughlings Jackson had specified six varieties of epilepsy as including all known forms, but had not made loss of consciousness an epileptic feature. Dr. Hammond was convinced that there was no true epilepsy without loss of consciousness.

This was an essential phenomenon without which there was no epilepsy. The other symptoms were the characteristic features by means of which differentiations were made. The cases under consideration were marked by unconsciousness, but the other symptoms were of such a character as to exclude them from any one of the categories mentioned by Dr. Jackson. A description was given of the cases upon which the views advanced in this paper were founded. That the optic thalamus was the centre for perception as the cortex was for intellection was, to say the least, exceedingly probable. Every sense had then two stages in its full action: something was observed, that was one stage; it was more or less thoroughly understood, and that was the other stage. An illustrative experiment upon a pigeon was given. The intrinsic starting-point of every sensorial impression was an organ of sense, such as the eye, the ear, or the terminal ramifications of the olfactory nerves. The starting-point of an erroneous or false sensorial impression, illusion, or hallucination, might be either the organ of sense concerned therein or the sensory ganglion of the optic thalamus. It could only elaborate the impressions which reached it from the sensory ganglion, and these were either true or false, real or unreal, according as they came originally from the ganglion or were transmitted through it from an organ of sense receiving real impressions from without, and according as the cortex was in a normal or abnormal condition, would the ideas or beliefs which it formed from those transmitted impressions be normal or abnormal. All therefore that the cortex did was to take cognizance of present or former sensorial impressions which it receives or has received from the optic thalamus, and to form ideas from them. In the cases which form the basis of the paper there were hallucinations without intellectual derangement. In these cases it was believed that the disease was confined entirely or nearly so to the optic thalami; nearly so, because the loss of consciousness which ensued showed that there was that necessary cortical disturbance without which there could be, in his opinion, no true epilepsy.

Again, an additional argument against the involvement of the cortex was found in the fact that there were no muscular spasms in either of the cases cited. Muscular spasms were, of course, not epilepsy, but muscular spasms combined with unconsciousness made a true epileptic paroxysm. From what had been said in the paper, it was thought that the following conclusions were fairly deducible: First, that there was a form of epilepsy, the phenomena of which were simply hallucinations and loss of consciousness; second, that the morbid anatomical basis of this type was located in the optic thalamus.

REMARKS ON DR. HAMMOND'S PAPER.

Dr. Miles remarked that he could not agree that the optic thalamus was the centre of sensation. The opinion was held by high authority that it was rather at the head of the higher and more complex reflex actions. He confessed that Dr. Hammond's theory as stated in his paper was a taking one.

Dr. Jewell said that he had been greatly interested, especially with the first part of Dr. Hammond's paper. As to the pathology, he was obliged to differ very decidedly from Dr. Hammond. In regard to the seat of visual perception, he did not agree that it was located in the thalamus. He did not regard the thalamus as the seat of consciousness. The seat of perception was in the cortex of the brain. He had no doubt that the optic thalamus was intimately connected with the sense of sight. It has a reflex relation in the visual apparatus, but the seat of perception is in the cortex of the brain. If, therefore, he should find some interesting cases troubled in visual perception he would generally place the lesion in the cortex of the brain and not in the thalamus opticus. The experiment cited by Dr. Hammond, of removing the cerebrum of a pigeon, after which the animal would follow a strong light apparently with its eyes, he did not think conclusive. He suggested that in a pigeon the optic thalamus might have a higher function than in man, but it appeared to him the phenomenon in the pigeon indicated only a highly elaborated reflex. Dr. Jewell agreed with the President that the optic thalamus was not the seat of perception. He thought that Dr. Hammond was right in saying that sense perceptions came solely through sense organs, with one possible exception, and that was when their substrata were inherited; that is to say, there may be a sense mechanism gradually developed in the cortex, until at last the substrata were really transmitted, so that individuals might have a revival of sense impressions which they had never personally experienced.

Dr. Webber thought there was a third ground to take, that it was possible certain states of the optic thalamus might excite hallucinations, or that the cortex alone might excite them, and hence the vision seen. He thought it was impossible while the patient was alive to determine upon what the cause depended, whether upon the one or the other, and that the cases related by Dr. Hammond might be placed in either of these categories. He thought that the experiments of irritating motor centres failed in establishing the cause of epilepsy. He would take exception to the restrictions made by Dr. Hammond in the definition of epilepsy. According to Dr. Hammond, a patient did not have epilepsy until loss of consciousness ensued.

Dr. Gray expressed an interest in the cases related by Dr. Hammond. He had one or two cases of that class which had puzzled him somewhat. In regard to the pathology of the disease, he differed from Dr. Hammond, nor would he fall into the arms of Dr. Jewell. That the optic thalamus, and this alone, could be the seat of epilepsy, seemed to him an unwarrantable view, though it might be so. We all know that the nervous system is made up of white and grey matter, and that the grey matter is the essential part. If you take a sensitive nerve having its origin in the spinal cord, it was upon the grey matter that its function depended. By irritating such a nerve the sensation was referred to the periphery, and the same thing would obtain if the grey matter was irritated; that is, you would still get the sensation referred to the periphery. It was upon the nuclei of the grey matter that the nerves of special function depended. It was reasonable to presume that irritation anywhere between the periphery of a nerve of special sensation and the grey matter where it takes its origin, would give rise to a sensation. As to whether there was perception from any irritation confined to the region below the cortex, that was a question which could be answered in the negative and in the affirmative; that was to say, there was conscious and unconscious sensation. If the head of a frog was cut off, and the body thrown into the water, the animal would swim. If the same reasoning was applied to Dr. Hammond's cases, it was quite probable that any irritation anywhere between the terminal distribution of the optic nerve and its origin would give rise to hallucinations of sight, and any irritation either in the cortex or strands connecting the cortex with the basal ganglion would give rise to that sensation.

Dr. Hammond remarked that what was true of the brain of the pigeon was also true of that of man. There was one point that was lost sight of in the argument, and that was whether those cases were real cases of epilepsy or not. In answer to Dr. Gray, he said there were certain cases of hallucination where the patients died, and the lesion found was located in the optic thalamus. There was not a single case on record where a lesion of the optic thalamus was found after death in which there were not hallucinations of sight.

Dr. Putnam remarked, that in speaking of Hughlings Jackson, it was only fair to state that he recognized cases where consciousness was lost as cases of epilepsy, and he tried to point out these cases were consciousness was not lost and to show the connection between them. With regard to the signification of autopsies, it seemed to him that no very great value could be as yet attached to them, for not many cases with visual derangement had been recorded in which lesions had been found. It was well known that physiological experiments on the lower animals had given rise to the belief that the visual centre was located in the cortex of the brain.

Dr. Isaac Ott, of Easton, Pennsylvania, next read a paper upon

THE BROMIDE OF ETHYL AS AN ANÆSTHETIC.

That the bromide of ethyl had a rapid and powerful action on the nervous system, was evident from its quick anæsthetic effect. That it also had some very disagreeable and violent action on the central nervous system, was in some rare cases true. He thought it could be stated that ethyl in rare cases could produce epileptiform phenomena. Bromide of ethyl in man had been proven to arrest the action of the heart, the pulse at first disappearing and then the breathing. Usually, however, during anæsthesia it increased the pulse and arterial tension. Its effect upon the respiration in man was first to increase it and then decrease it. Its effect upon the stomach and bowels was in some cases very decided, when used as an anæsthetic. When administered by the stomach it did not appear to produce vomiting. As an anæsthetic he said it would seem to give excellent results when only pushed to the extent of elevating the pulse and arterial tension. But the moment it depressed the tension and the pulse, then in some cases dangerous symptoms might intervene.

Dr. Ott gave an exhibition of the instrument of Woroschiloff, and explained its working. The instrument was for the purpose of making definite sections of the spinal cord in living animals.

Owing to the late hour the association adjourned.

Friday, June 18—Afternoon Session.

The association was called to order at 2.45 p. m., by President Miles.

Present: Drs. Miles, Shaw, Kinnicutt, Gray, Van Bibber, G. M. Hammond, W. A. Hammond, Mason, Cross, Jewell, Beard and Seguin.

The secretary read the minutes of the preceding meeting, which were approved.

The council reported favorably upon the name of Dr. W. R. Birdsell of New York; unanimously elected.

Dr. Gray presented resolutions relative to the death of Dr. E. R. Hun; adopted.

Dr. Gray presented some extended resolutions on asylums. Upon motion of Dr. Hammond these resolutions were not acted upon until later in the day.

The first paper of the afternoon was read by Dr. G. M. Hammond, entitled

CONTRIBUTION TO JACKSONIAN EPILEPSY.

The paper consisted of a history of three cases of so-called Jacksonian epilepsy. Attention was called to the fact that Dr. Jackson did not consider loss of consciousness to be an essential element of an epileptic paroxysm, and that he had described a variety of the disease consisting of sensory and motor disturbances, but in which consciousness remained unimpaired. Dr. Hammond regarded this disorder as being epileptoid and not true epilepsy, and in fact had no tendency to pass into true epilepsy. One of the cases referred to was that of a man aged forty, who had for ten years suffered from epileptiform attacks induced by reflex irritation of the peripheral nerves of the right side of the body, just below the axillary space. It was only necessary to rub the hand over this region of the skin to induce an attack, and frequently even the friction of the clothing induced a like result. The paroxysm consisted of an aura of pain over the spermatic cord, of a tonic contraction of the spinal thoracic and abdominal muscles on the right side, throwing the body into a condition of pleurosthotonus; the face was congested and expressive of pain, but there was no loss of consciousness. Before treatment he had from twenty to thirty attacks a day, but under the continued use of the bromides the attacks gradually ceased, until he was even unable to cause one by strong friction over the epileptic zone. This patient was exhibited to the association.

The second case was that of a Hungarian aged forty-two, who, three years ago, fell in the street, probably from an epileptic attack. He remained perfectly well after this for about a year, when he had a similar attack, accompanied by tonic rigidity of the muscles of the neck, sometimes on one side, sometimes on the other, and again in the posterior region. There were two kinds of auræ: one, in which he saw bright lights of all colors accompanied by a sensation of distress in the epigastrium; the other, in which the left ear became "fiery hot." The epileptic zone was seated in the scalp, and the slightest touch on this portion of the head was sufficient to cause an attack, and even approaching him with the hand as if about to touch his head was productive of a like result. He was treated with the bromides for some time without any amelioration in his symptoms. This case was also exhibited to the association.

The third case, Mr. D., aged twenty-eight, suffered from convulsions and "nervous attacks," as he called them. The convulsions did not differ from ordinary epileptic attacks, and only occurred once in two or three weeks. The "nervous attacks," of which he had a great many every day, consisted of a sensation of numbness in the right arm, which appeared to begin in the index finger, quickly followed by muscular contraction of the flexors of the hand, wrist and fore-arm. There was no loss of consciousness in any of these attacks, but there was a sensation experienced as if a piece of ice had been drawn through the brain. Under the use of the bromide the attacks gradually ceased.

REMARKS UPON DR. G. M. HAMMOND'S PAPER.

Dr. Gray inquired of Dr. Hammond, Sr., if he had ever seen any other such cases as the second alluded to in the paper?

Dr. Hammond replied that he had never seen any case so exaggerated as this, nor one where the zone was so extensive. He thought in those attacks which came on from peripheral irritation, that the patients did not lose consciousness, and it was this one point why he thought such cases were not epilepsy. In the case presented the patient could see and think when at the height of the paroxysm. He thought the case was something between hysteria and epilepsy, but it was not hystero-epilepsy; there were no hallucinations. After the patient had had one or two attacks the mere pointing of the finger at his head was sufficient to cause a seizure.

Dr. Miles recalled a case which occurred in his practice some years ago. A boy from the country, weak in health, had a hacking cough. When he began to cough, if it was continued, he twisted himself over, cut several regular steps, and then fell down.

Dr. Hammond, Sr., remarked that on the Sunday following he proposed to anæsthetize the patient, shave his head and cauterize it.

Dr. Miles suggested that the patient be allowed to come out from under the influence of chloroform somewhat, and to deaden sensation by the ether spray, and then cauterize the surface.

Dr. Kinnicutt said he had seen and examined a case similar to the one presented by Dr. Hammond. It was found that the slightest touch of the zone in the scalp produced a paroxysm, which consisted of an elevation of the arms and the muscles of the trunk, but not of the lower extremities; this was usually accompanied by one cry as the arms went up. The hair could not be brushed without this occurring. Various plans of treatment were tried. The bromides were thought to be of value in this case, and it was recorded as a case showing how often hysteria and epilepsy grade one into the other. The patient had all the symptoms found in the case presented by Dr. Hammond, with the addition of hallucinations. He had one other case where the convulsions were still more marked, the peripheral zone being situated upon one side of the face. The spasms were the most exaggerated that he had ever seen. The patient did not lose consciousness, however.

Dr. Gray remarked that Charcot mentioned a case similar to those under consideration under the name of laryngeal vertigo. This name Dr. Gray considered a misnomer. He had had an instance of this in his clinic. The man had served in the war and was hit by a ball upon the forehead. Immediately after this, a cough which he had had for several months, when it occurred, would bring on an attack of unconsciousness. He went into the hospital but received no treatment. He went out, and fifteen years passed, and then he came to Dr. Gray's clinic, complaining of a recurrence of these spells. The chest was examined but nothing wrong was found. His friend, Dr. French, examined the larynx, but nothing abnormal was seen except follicular pharyngitis. The pharynx was treated locally with bromide and in a short time these attacks passed off. Dr. Gray thought the cases mentioned by him belonged to the same class as those mentioned in Dr. Hammond's paper. In all the cases recorded as laryngeal vertigo nothing abnormal was found in the larynx, but it was in the pharynx where pathological changes had taken place. This statement held true in all cases except one.

Dr. Jewell remarked that he had seen several cases in which there was a sensitive area. He wished to speak of the term epilepsy. He apprehended that a great deal of the difficulty which arose in discussions upon this subject was such as was experienced in the present one. A great deal of the difficulty lay in the meaning attached to the term. He could hardly use the term as Hughlings Jackson did. An epilepsy for him included necessarily two things: loss of consciousness followed or usually followed by more or less convulsive muscular action. There might be other symptoms, but these were the most characteristic. Other attacks resembling these he would call epileptiform and not epileptic attacks. He would strictly confine the term epilepsy, to the full orbed attack, as above described, especially for medico-legal purposes, and thus avoid confusion. He thought we ought to be very careful in the use of the term epilepsy. He was not disturbed at the pathology of the disease but at its nomenclature. He thought he understood what Dr. Jackson meant by the word epilepsy from a scientific point of view, and he admired the thoroughness and character of his work, but Dr. Jackson's classification would give rise to confusion.

Dr. Beard said that he had seen some of these cases with Dr. Jackson some ten or eleven years ago. Since then he had given a great deal of thought to the subject, and for a number of years had considered it wrong to expect that the disease would be sharply defined. Not only did we have cases of convulsion without loss of consciousness, but we had loss of consciousness without convulsions, and both had been called epilepsy. He believed that epilepsy must have, as Dr. Jewell had stated, loss of consciousness and convulsive movements. The patient presented by Dr. Hammond was not a case of epilepsy. He would say, incidentally, that he had seen a number of cases of hay fever brought on in the same way from peripheral irritation, as the combing of the hair.

Dr. Hammond, Sr., thought if Dr. Jewell included in his definition sensory disturbances as well as motor, he would have the best definition possible. This change would read, an abnormal sensory or motor disturbance attended with unconsciousness, is epilepsy. Dr. Hammond did not regard the case presented by his son as one of epilepsy, but Jacksonian epilepsy.

Dr. Gray said, as bearing upon the subject of the unconsciousness of true epilepsy, in which we were all agreed, there were between the attacks spells of vertigo, but without spasm and without loss of consciousness: there were no motor twitchings unattended by loss of consciousness.

Dr. Putnam thought it was fair to Dr. Jackson to remember that the definition given by him was intended for scientific classification only, and that he as well as any one else would agree with Dr. Hammond and Dr. Jewell in speaking of epilepsy; he thought Dr. Jackson did not speak of epilepsy but of epilepsies. He did not think that he had ever formulated a clinical law or done anything different from what Dr. Hammond would lay down: his efforts had been directed to a scientific analysis.

Dr. Miles remarked that we ought to be very careful in regard to the point of unconsciousness. He thought that care should also be exercised in the use of the word epilepsy in the presence of patients and friends, as it might lead to unnecessary alarm on their part.

There being no further discussion, Dr. James J. Putnam, of Boston, reported a case of

ACUTE MUSCULAR ATROPHY WITHOUT LESION OF THE CORD.

The patient was more than fifty years of age, and upon entering the Massachusetts Hospital, had complained for a fortnight only. It was supposed that she drank. She had complained for about two weeks of severe pain in the toes, extending up the legs and in the trunk, of a pain having a burning and lanceolating character. Upon examination it was found that there was diminution of the sensibility of the legs below the knee. The loss of motion in the leg was more marked in the muscles supplied by the peroneal nerve. She had loss of power in her arm. The galvanic reaction was better than the faradic reaction. The case went on from bad to worse. It was worthy of notice that the motions of the hands and feet were more affected than at the larger joints, as the hips and shoulders. The pain continued and the patient became delirious, and finally died with a temperature of 107°. The urine contained more or less casts and albumen. The autopsy was made by the pathologist of the hospital. Dr. Putnam was not informed of this until the following day, when he removed the spinal cord and found it softened to such an extent that it was difficult to get good sections. Pieces of the tibialis anticus muscle and the peroneal nerve were removed but afterwards lost. The spinal cord was examined with great care, and no lesion whatever could be found except that the nerve cells were granular, and there was a slight degeneration in one of the lateral columns; also a few cells that appeared to be small vacuoles; nothing could be found to account for the symptoms. There were no foci of inflammation. There was a very considerable thickening of the small arteries of the cord, which the doctor had associated in his mind with Bright's disease. In the brain there were several points of softening which involved the posterior portion of the internal capsules. The doctor believed the case to be one of disseminated neuritis. The anterior nerve root was examined and no evidence of disease found. The pain, loss of electrical reaction, and rapid muscular wasting, were the prominent features of the case.

There being no discussion Dr. Putnam proceeded to read a paper on

NUMBNESS OF THE HAND.

Within the past few years there had come under his notice, a large number of cases such as he had not remembered to have seen described anywhere in detail, though they were often the subjects of brief reference. Differing in minor respects, these cases presented as a common symptom disturbance of the subjective sensibility of the skin, giving rise to what was properly known as numbness recurring periodically, coming on especially at night or very early in the morning, and affecting one or both hands, either alone or in company with the arm, the legs, or, rarely, the whole body. This numbness was very often excessively intense, so as to amount to severe pain, sometimes being associated with pain of a more or less neuralgic character, especially in the arms. In some cases simply letting the arms lie out of bed or shaking them about for some moments would drive the numbness away, in others it could only be done by prolonged rubbing. Most of the patients were women in middle life, and many of them were debilitated. A few marked cases were in strong healthy men. Of thirty-one patients, twenty-eight were women, three men. None of these patients were below twenty years of age, and only six over fifty. In most cases one hand was worse than the other. Dr. Putnam thought that the symptoms were due to changes in the vascular supply of the peripheral nerves themselves, a contraction or dilatation or both alternately of the vasa nervorum. In treatment he had used galvanism, phosphorus, strychnia, bromides, cannabis indica, nitrite of amyl and a few other remedies.

REMARKS ON DR. PUTNAM'S PAPER.

Dr. Jewell asked Dr. Putnam's opinion in regard to the fact that there was no lesion in the spinal cord, but still atrophy.

Dr. Putnam thought his case was one of disseminated neuritis, as described by Leyden.

Dr. Miles remarked that in 1876 he published the history of a case in the *Baltimore Medical Journal*, where the extremest atrophy existed, but there was no absolute paralysis, the loss of power being due to loss of muscular substance. He remembered that he could all but span the leg above the knee. He thought it impossible at first to excite contraction of the muscles, but the application of electricity was continued, and complete recovery took place.

Dr. Jewell inquired what Dr. Putnam's opinion is in regard to atrophies arising, as Friedreich had thought, without any disease whatever of the nervous system.

Dr. Putnam remarked that he did not claim to be an authority, but he could not help respecting the philosophic suggestion of Leyden, which was that we might have the disease of primary myopathic origin.

Dr. Jewell said that he had seen one or two cases during the past year that he had not been able to *demonstrate* as being myopathic, but he thought one of them must have been so. The whole history of the case was of such character as to lead him to think that it was purely a local disease of the muscles; that is, it began in the muscles without any reference to the motor nerves—he did not say independently of the vaso-motor nerve. He thought one would have to call into account in explanation of these cases some disorder of action of the vaso-motor nerves as one of the earliest features of the case. But his present opinion was, that the motor nerve had nothing to do in this case primarily. He felt very sure that in this case the disease began in the muscles first. It was the only case he had ever seen in which he felt certain that the disease began in the muscle itself, and finally involved the motor nerves, thus constituting a case of ascending neuritis, and followed by atrophy.

Dr. Hammond remarked that he had seen several of these cases, but he had never seen them lead to any bad results. One case, a young lady over seventeen years of age, had symmetrical contraction, accompanied by numbness. She recovered under the galvanic current, as all of his cases had recovered.

Dr. Putnam remarked that recently a well-known German had published a series of cases where numbness had occurred in the legs.

Dr. Miles remarked that he had a case now in which the numbness was confined entirely to the hand. The points of the compass could not be distinguished at three-fifths of an inch apart. There was no pallor, but rather the contrary. At times the fingers flushed up, but this was relieved by the galvanic current, which also improved tactile sensation.

Dr. Seguin stated that he had seen a series of such cases, he had seen them ever since he became specially interested in nervous diseases, both in private practice and at the college clinic. Most were cases of numbness in the hands and fore-arm; to a certain extent in the arms. He thought that the affection was bilateral in all of his cases. In none of his cases were there any evidences of organic disease, no anæsthesia, no paralysis. In all of his cases the only pathological condition was numbness, which in some instances was very decided. He did not remember any cases presenting the appearance of *digiti mortui*. The numbness described was like that described by those patients having chronic myelitis. As regards treatment, he was obliged to confess that it had been unsuccessful. He had treated his patients by cupping, blistering, mild irritants, and had given a great variety of remedies, as well as having used the two currents. On the whole, he thought the only benefit he had obtained from treatment was by a general tonic course; as a palliative treatment, he had had good success with applications of hot water to the hands. This treatment in many of the cases, and also in another class of cases with organic disease, had given a great deal of relief, causing a cessation of the numbness for several hours. In regard to the pathology, he was in utter ignorance; he was indisposed to the vaso-motor theory; he rather thought there was some slight change in the posterior columns of the cord. He had been reënforced in this view by an autopsy, which showed that true numbness without anæsthesia might be the expression of an organic change. He referred to a case of abnormal tabes which was under his observation two or three years, and in which the numbness of the legs and hands was the only symptom. The patient went from under his care in the spring of 1878, and he did not again see him for several months. In the fall he was summoned to see the patient, and found him confined in bed, fatally ill with progressive anæmia; he died from asthenia in a few days. Dr. Seguin learned that the numbness had continued. Upon persistent cross-examination, he learned that the patient had had a pain which could be spoken of as a fulgurating pain, and during the last week of life he had severe, sharp, agonizing pain in one heel. Upon examination of the spinal cord, Dr. Seguin found typical sclerosis of the posterior columns of the cord. He was not disposed to look upon the symptom of numbness as necessarily vaso-motor, except in cases of *digiti mortui*, or in cases of hyperæmia; he would not admit the vaso-motor theory.

Dr. Jewell wished to make a remark that he made a very wide difference between this *digiti mortui* spoken of and numbness that was accompanied by any such condition. In cases of *digiti mortui*, there was some little numbness, but the other class of cases had more or less persistent numbness, without any vaso-motor trouble whatever, and occurring more frequently in women than in men, and worse in the latter part of the day, if the patients did not lie upon their back. His hypothesis, which had been satisfactory to him in the treatment, was that these were cases of spinal exhaustion, and with that a state of the local circulation in the cord where there is possibly passive congestion, giving rise to pressure upon the surrounding nerve elements from dilatation of the blood-vessels. The numbness was an expression of the wearing out process, and of the gradual increased passive dilatation of the blood-vessels, which sometimes was worse and at other times better, according as the numbness was more or less diffuse. Such cases he had always, or nearly always, been able to cure, if he could put the patient at rest as regards the arm, and use the descending current. Rest was exceedingly important; just as necessary as in the treatment of Basedow's disease. Such was his hypothesis of the pathology of the disease.

Dr. Putnam remarked that in certainly five or six of his patients there were distinct vaso-motor disturbances in the fingers; also that two of the patients were apparently in perfect health. It seemed to him difficult to suppose that the disease was due to any particular condition of the medulla oblongata; the disturbance was, of course, connected with the central circulation.

Dr. Hammond thought Dr. Jewell's theory would not account for Dr. Putnam's facts or his own facts. He did not see how the muscles could be affected with numbness in consequence of muscular action. He had performed experiments that refuted that idea. He had divided the tissues of the leg of a rabbit, with the exception of the sciatic nerve; then galvanized the muscles below, and obtained evidences of sensation; there was no anæsthesia. His own theory as to why washerwomen were so subject to numbness of the hands, was that those members were placed in hot and cold water alternately. In the case of the rabbits experimented upon, although the animal could not withdraw the limb, it would shriek with pain upon the application of a stimulus.

Dr. Jewell said that not even a majority of cases spoken of by him were washerwomen. He supposed that through that zone of the cord the circulatory disturbances might spread from one region to others, and that from the way the attacks came on we must have some sort of shifting cause;

effects told something as respects the nature of their cause, and he knew of nothing that would produce this coming and going of sensibility, unless it was a disturbance of the circulation. He did not suppose that motor disturbances were the cause of the numbness, but rather circulatory disturbances. He offered this explanation simply as an hypothesis. He thought, with Dr. Putnam, that there were various ways of explaining these cases. Sometimes one had to go way up into the cortex of the brain itself, or to the fibres that extend from it downward to the medulla oblongata and cord, or the cord itself, or may be in the course of the nerve trunk, or, as Dr. Hammond had said, some local anæsthesia as happens in washerwomen; it might be any one of these, but he was speaking of a certain class of cases where you have bilateral anæsthesia, which comes and goes, and is connected, as he believed, with circulatory disorder in the cord.

Dr. Hammond said that the condition spoken of by Dr. Jewell was an entirely different thing from that referred to by himself. There was such a thing as exhaustion of the cord, but you did not have the condition of hyperæmia in exhaustion of the cord, nor did you have numbness. In Writer's Paralysis you had exhaustion of certain segments of the spinal cord, but you did not have numbness.

Dr. Seguin inquired if the symptoms in the cases were usually changeable.

Dr. Putnam replied that they were, and the changes occurred almost daily.

Dr. Seguin remarked that in the cases he referred to, the condition was constant.

The discussion of Dr. Putnam's paper having closed, Dr. W. R. Birdsall, of New York, reported a case of

REMARKABLE TUMOR OF THE ENCEPHALON.

A female, aged twenty, was in perfect health until July, 1879, when she commenced to have headache, usually occipital, but sometimes frontal, preceded by stiffness in the back of the neck, and which persisted almost without interval until her death, about nine months later. There was a severe chill and fever during the first few days; occasional febrile attacks later;

nausea at times; complete amenorrhœa and constipation; in November, numbness and weakness in the left foot, formication and weakness to a less extent in the left hand. In December, her mother observed that her mouth was drawn to the left side, also that she was becoming exophthalmic. Diplopia was first observed about this time, and tinnitus aurium in the left ear. Atrophy of the left half of the tongue had existed since childhood. There was no dysphagia. An examination in January, 1880, exhibited complete facial paralysis; paresis of the right sixth nerve; slight weakness in the left hand; some athetoid movements; weakness of the left lower extremity; hemiplegic walk; tendon-reflex exalted; double optic neuritis. Later her vision failed completely; she had frequent attacks of vomiting, ceasing before her death; difficulty in articulation two weeks before and again on the day of her death, when speech was unintelligible, and saliva dribbled from the mouth. A convulsive movement of the left arm occurred at death.

A fibro-sarcoma was found enveloped by the pia mater in the parietal region, measuring 7.5 c. m. in its antero-posterior direction, 7 c. m. transversely, and 4.5 c. m. in depth. The convolutions forming the walls of the cavity in which the tumor was deposited, consisted of the upper half of the ascending frontal convolution, the upper two-thirds of the ascending parietal convolution, all of the superior parietal lobule, and part of the inferior parietal lobule They were displaced downward and outward, the precuneus inwards, it being flattened as thin as bristol-board. There were no changes except the flattening due to pressure. A growth of a similar nature, the size of a filbert, was found attached to the left auditory and facial nerves in contact with the inferior surface of the cerebellum. The latter nerve being easily stripped off, the former spread out upon the growth, some fibres penetrating it, but showing no evidence of degeneration. Degeneration of the optic nerves was traced beyond the commissure and the optic papillæ were swollen.

Another sharply defined sarcoma was found extending from the lower third of the fourth ventricle to just below the calamus scriptorius, nearly round, and directly in the median line;

involving in the thickest part one-half the area of a transverse section, the medulla not being much larger than normal. The microscopical appearances of the surrounding tissues exhibited remarkable preservation. They had been gently crowded aside, slight changes were found, such as thickening of the walls of vessels and increase in lymphoid elements near the tumor. The nuclei and roots of the cranial nerves were all normal, except the left hypoglossal nucleus, where the large motor cells were atrophied and few in number. There was no ascending or descending degeneration.

That part of the cortex which had been rendered thin by pressure (the upper part of the ascending parietal) corresponds to the motor centre for the lower extremity. The centre for the upper extremity escaped with less damage, and we find less paresis in the hand than in the lower extremity. The motor centres for the facial muscles are situated too far externally to be affected by pressure to a great extent. As the paresis was never very decided the opinion is not unwarranted that it was due to pressure on the regions described, interfering with nutrition sufficiently to produce impairment of function. There is no satisfactory way of accounting for the paralysis of the sixth and seventh nerves on the opposite side by the lesions found, unless by direct pressure from the large tumor upon the nerves, a doubtful probability. The atrophy of the tongue and of the hypoglossal nucleus harmonized, as there is no evidence that the latter was of recent origin. The attacks of dysphagia and inarticulate speech, the accumulation of saliva, and the disturbances of temperature might be expected from the pressure of a tumor in the medulla, a neighborhood where so many hypothetical centres, salivary, vaso-motor, etc., are supposed to exist. It is a remarkable feature of the case that the functional and structural changes were so slight. The tinnitus aurium is of interest in connection with the tumor of the auditory nerve. The optic nerve atrophy was to be expected from the ophthalmoscopic appearances.

The case was illustrated by a complete set of microscopical preparations and drawings.

REMARKS ON DR. BIRDSALL'S PAPER.

Dr. Seguin said that he had seen the case several times, and delivered a clinical lecture upon it. The patient presented a partial left hemiplegia of the leg chiefly, but she had right facial paralysis and exquisitely marked choked discs. The diagnosis made before the class was that she had a cerebral tumor. Dr. Seguin ventured to locate the tumor, and made diagrams upon the black-board, placing it in the anterior halt of the pons varolii upon the right side. He was overjoyed at the opportunity of solving the problem, but exceedingly surprised at the result. The result of the examination, so far as his diagnosis was concerned, was that there was no lesion in the pons. The puzzling thing to his mind was the finding ot an enormous tumor in the medulla oblongata. As regards the tongue, he used the utmost energy to force the patient into the statement that the atrophy was recent, but she stated that it had existed from childhood. If he had not received this reply, he would have been led to the diagnosis of multiple tumor. Her facial paralysis was of the kind common in hemiplegia, not Bell's palsy.

Upon motion of Dr. Hammond, it was directed that the Association proceed to the consideration of Dr. Gray's resolutions before the reading of papers at the evening session.

The Secretary said he had received the following letter from Dr. Hammond which he read:

New York, June 18, 1880.

To the Secretary of the American Neurological Association:

Dear Sir:—I hereby offer to the American Neurological Association the sum of five hundred dollars, to be awarded by a committee of the Association, at the meeting in 1882, to the author of the best essay that may be written on *The Functions of the Optic Thalamus.*

I desire this prize shall be open to neurologists in all parts of the world, under such conditions as the committee may determine upon. Should no essay be deemed worthy of receiving it, I will continue the offer till the session of 1883.

I also request that the committee may be appointed by the President at the present session of the Association, and I should like to be allowed to confer with the committee before the final announcement of this offer in regard to certain points of inquiry.

Yours sincerely,

WM. A. HAMMOND.

Upon motion, the Association adjourned.

THIRD DAY—EVENING MEETING.

The Association was called to order at 8:30 P. M. by President Miles.

Present — Drs. Miles, Spitzka, Putnam, Cross, Birdsall, Hammond, Gray, Seguin, Kinnicutt.

In accordance with the motion of Dr. Hammond, the Secretary proceeded to read the resolutions of Dr. Gray on Asylums, giving the members of the Association an opportunity to pass judgment upon the successive sections thereof.

Whereas, In 1876 and 1877 a series of papers were published by an eminent alienist, Dr. H. B. Wilbur, himself at the head of a State institution, and the defects of our American asylum system clearly demonstrated; and

Whereas, In the winter of 1878–1879 attention was called to these and other deficiencies in several articles written by Dr. E. C. Spitzka; and

Whereas, In 1878 and 1879 a petition was gotten up by the New York Neurological Society to the Legislature of the State of New York, praying for an investigation into the management of the asylums within the State, and signed by numerous gentlemen of high station in medicine and in other walks of life; and

Whereas, These papers and this petition have been given wide publication, both in the lay and in the medical press, and have elicited wide-spread interest and comment; and

Whereas, Mass meetings were held in the cities of Boston and New York in this matter of asylum reform, at which many of the foremost citizens of the two commonwealths, whose names are authoritative in matters pertaining to social progress, gave strong utterance to their belief in the necessity of improvement in the treatment of the insane; and

Whereas, A bill was introduced into the Legislature of the State of New York during the session that has just expired, providing for the formation of a State Board of Lunacy, which was to be a component part of the State Board of Charities; and

Whereas, A committee of the Senate of the State of New York has been appointed, to take into consideration this matter of asylum reform within the State; and

Whereas, In deference to the public sentiment, a Board of Visiting Physicians has been organized at the Asylum for the Insane at Poughkeepsie; and

Whereas, The Commissioners of Charities and Corrections of the City of New York have lately seen fit to dismiss the superintendent of one of the asylums under their care, upon charges of official mismanagement, to which their attention was first directed by individuals not holding official position; and

Whereas, It is a matter of record that the Commissioner in Lunacy of the State of New York has been derelict in the duties of his office, it being also a matter of common notoriety that this gentleman, although he is an author of high repute in medical jurisprudence, has no claims as a clinical alienist; and

Whereas, There has been no adequate reply, except by vituperation, evasion, and allegations of interested motives, to the direct and substantiated charges that have been brought in these divers ways; to wit, of the insufficient education, not only as alienists, but also as general practitioners, of the assistants and superintendents within the asylums; of the scanty pathological and clinical investigation that has been done; of the insufficient number of assistants; of the over-crowding of patients; of the lack of occupation of patients; of the scarcity of instruments that are necessities to the expert; and

Whereas, This action of legislative bodies, of high officials, and the Poughkeepsie Asylum, these mass meetings, the favorable verdict of the press and of the public, have not been brought about by any of that political influence upon the part of the movers in the cause of asylum reform, which is so largely possessed by the superintendents and their friends, and which has been freely used to defeat any measures looking to investigation and improvement; and

Whereas, The only national society of professed alienists in this country is the American Association of Superintendents, from which all are excluded who are not superintendents of asylums, no matter how excellent alienists they may be:

Now, therefore, at the annual meeting of 1880, of the American Neurological Association, be it

Resolved, That it is the sense of the Association that the science and art of psychiatry in America is far below the standard at which it should be maintained by the existing knowledge upon the subject, and at which it is, in a large measure, maintained in Great Britain and upon the Continent of Europe; and be it

Resolved, That the charges that have been brought, by the sundry methods aforesaid, against the present system of asylum management, have been sustained by evidence as valid as that which is daily determining great questions of state and of life and death in our courts of law; and be it

Resolved, That it is the sense of the Association that a distinction should no longer be made between the alienist and the neurologist, between the specialist who treats those diseases of the brain whose presence is indicated by mental derangement, and the specialist who treats those diseases of the brain whose presence is indicated by paralysis of motion and sensation, as well as other diseases of the nervous system; but that it should be recognizsd that the neurologist is one who is an expert in all diseases of the brain, the spinal cord, their membranes, and the peripheral nerves, whether those diseases eventuate in insanity or not; and be it

Resolved, That hospitals for the insane should, where it is feasible, have boards of visiting physicians, as do general hospitals; and be it

Resolved, That the assistants in insane asylums should be versed in the modern researches in regard to the nervous system, and should, where it is possible, be selected by a competitive examination; and be it

Resolved, That the proportion of attendants and assistant physicians to the number of patients should approximate to the ratio which is observed in well managed general hospitals; and be it

Resolved, That some system of employment of patients should be had in insane asylums, such as that which exists in Great Britain ; and be it

Resolved, That there should be a strict State or Governmental supervision of asylums, non-political, by acknowledged alienists, such as that of Great Britain ; and be it

Resolved, That the liberty of insane patients should be much more considered and respected by superintendents of asylums, and by our magistrates; such respect leading to the abolition of almost all restraint in asylums, and to the removal of signs of prison life from wards or institutions containing the harmless insane.

These resolutions, together with the preamble, were adopted by the Association.

Dr. Hammond moved that an additional resolution be added, to the effect that they should be printed and sent to the American and European medical journals.

Dr. Gray gave notice of the following amendment to Article IV. of the Constitution.

To read that: "They be nominated by the Society at the first day of the Annual Session," instead of: "They shall be nominated by a committee on nomination of five members appointed by the President on the first day of the Annual Session."

Dr. E. C. Spitzka read his paper entitled "The Homologies of the Mesencephalon in the Vertebrate Series, with the Description of a New Mesencephalic Ganglion," by title only.

Dr. Spitzka then made a verbal statement in regard to a hysterical case. The patient, a young Cuban lady, first came under his notice about fourteen months ago at the North-Eastern Dispensary. She had remarkable dyspnœic movements. She was at some time aphonic; could speak in a whisper. She was under treatment for acute miliary tuberculosis, the diagnosis having been made by an eminent auscultator. Two weeks afterward he saw her at the dispensary again, at which time he made a physical examination, and found no rational or physical signs of tuberculosis. Shortly afterward he called upon the patient with Dr. Maguire, and made a thorough examination. The doctor had obtained a full history; it was to the effect that for the past two years in this city she had been suffering from dyspnœa. All sorts of diagnoses had been made of heart and lung lesions, as well as hysteria; she did have hysterical symptoms. They also had found tender points, which Dr. Spitzka ascertained were limited to the epigastrium. She also had what is usually called vicarious menstrual vomiting of large quantities of blood from the stomach, without menstrual flow. Dr. Spitzka made a diagnosis, excluding thoracic complaints, but still thought she might be hysterical, and that all these symptoms, as well as aphony, were due to gastric ulcers. She not only had pain after eating, but always at the same point, and aggravated with every deep inspiratory movement. The patient was treated by rectal alimentation, in order to give the stomach a rest. Subsequently a careful course of dieting was prescribed. The aphonia disappeared; the peculiar inspiratory movements ceased. After this had taken place she had a violent tonic spasm, the grand spasm of Charcot, but she recovered in a short time. The patient was placed on large doses of bismuth. She had divergent squint of the right eye; also violent pains in the shoulder joint. The stomach had regained about its normal condition, but the patient would not take care of herself; she was now in a hysterical state.

The point which Dr. Spitzka wished to bring out was that he thought there could be little doubt as to the origin of the blood, which was not hæmoptysis but hæmatemesis. In the course of the treatment, and without informing the patient of the cause of the trouble, it was found that whenever treatment was suspended she became worse, but she was finally entirely relieved.

There being no discussion upon Dr. Spitzka's communication, Dr. F. T. Miles, of Baltimore, read the title of his paper, which consisted of the histories of two cases of idiopathic ulnar neuritis, marked by extreme pain in one, and lack of pain in the other, both presenting the symptoms of anæsthesia, paralysis and muscular atrophy with degeneration reaction; recovery.

Dr. Landon Carter Gray, of Brooklyn, then proceeded to read his paper on

THE DIAGNOSTIC SIGNIFICANCE OF A DILATED AND MOBILE PUPIL IN EPILEPSY.

He had frequently been uncertain as to whether the convulsive seizures of a patient were epileptic or epileptiform. In most cases the physician had to rely upon the testimony of friends of the patient as to the character of the attack, in order to make a diagnosis. Such testimony was in many instances unsatisfactory. The history might be good and yet the physician be in doubt as to whether he had a case of true functional epilepsy, or one in which the symptoms were produced by persistent organic lesions. A symptom which would determine this was a dilated and mobile pupil. He had examined seven epileptics in his own practice, twelve at the Flatbush Lunatic Asylum, and, thanks to Dr. Daly, thirty at the Flatbush Hospital for Incurables, making forty-nine in all. In all but four of these cases the pupil had the characteristic symptoms which he had described. He was not sure that these four cases were really exceptions. One of these was blind in one eye, from advanced keratitis. The mobility and dilatation was usually in proportion to the inveteracy and violence of the disease, although not always so. He desired to have it distinctly understood that his observations applied only to cases of true functional epilepsy. By means of this symptom he had been enabled to make a diagnosis in several instances where the history was uncertain, or he knew nothing of it. He was, therefore, almost willing to affirm that this symptom was pathognomonic, and he submitted it to the criticism of the profession, in the hope that it might prove of as extended and certain application as he anticipated.

REMARKS UPON DR. GRAY'S PAPER.

Dr. Spitzka inquired whether Dr. Gray referred to the condition during the interval.

Dr. Gray answered that he meant the habitual condition of the pupils.

Dr. Spitzka remarked that in more than half of the epileptics the cry was not present, and in a large proportion the deep sleep was absent. While he attached great importance to the dilated pupil, he had found cases where it was absent, those cases occurring late in life, in which there is a peculiar pupil, something like that of general paralytics. While a dilated pupil was a good general sign in some cases, it might be contracted in the interval. He had found a relation between the frequency of the convulsions and the dilatation of the pupil.

Dr. Gray remarked that he had been investigating this subject for upwards of a year. He would take exception to the statement that there was a large number of epileptics in whom the deep sleep was not found.

Dr. Hammond thought that depended upon the number of attacks the patients had. If they had had a number of attacks, thirty to fifty, the stupor became lost; whereas, in the earlier attacks, the stupor was profound.

Dr. Cross remarked that about three years ago he read a paper upon "The Ophthalmoscopic Appearances of the Retina in Epilepsy." Although he had not made a note of the condition of the pupil, he remembered that in a large number of the cases there was dilatation of the pupil. He did not say there was no exception to the rule, but this was his recollection.

Dr. Gray remarked that his point was, that the pupils were dilated and mobile. He examined his patients in an ordinarily well-lighted room, then turning the patient gradually around to look into the dark room, he had noticed the extent of the dilatation; in ordinary bright light there was slight dilatation; the dilatation was very quick, almost instantaneous, and returned in the same way.

Dr. Hammond said that he had not noticed the point that Dr. Gray insisted upon, but would in the future. He thought there was no doubt about the dilatation of the pupils. There was a point which he wished to mention in regard to epilepsy. Dr. Kowalewski had promulgated the assertion that epileptics after their attacks lose in weight, sometimes as much as twelve pounds. It struck him as almost impossible. The variation ranged from one pound up to twelve. Recently he had subjected six epileptics to weighing, who went on the scales in five minutes after the attack, and not in one case was there any loss of weight.

Dr. Seguin spoke in reference to Dr. Spitzka's objection to

Dr. Gray's argument. He would suggest, in explanation of the fact, that in those cases of epilepsy occurring late in life and having a small pupil, there was, after a certain age, myosis, which, he thought, destroyed the value of the exception.

Dr. Spitzka said that there was nothing new in the statement that dilatation of the pupil was a symptom of epilepsy; it was so old he would not dare to quote authority. He said if he saw a single case of true epilepsy in a young person under thirty years of age, in which this symptom was not found, it would make such an impression upon him that a hundred cases would not change his opinion. He thought he had a case which might convince Dr. Gray that, while the symptom was important, there were a few cases whose nature might be of doubtful pathology, and in which this symptom might not be found. He wished to call attention to the fact that there was a certain group of epileptics of alcoholic habit which had a tendency to dementia, that in these cases you would find the true epileptic condition, and with it not only the normal pupil, but a more than normally contracted pupil.

Dr. Gray was sure that none of his cases belonged to that class.

Dr. Birdsall wished to ask if Dr. Gray claimed anything more for the symptom referred to than a diagnostic symptom. It seemed to him that the symptom in other allied affections should be studied to make it of much value. If there were a few exceptions, as had been claimed by some, he could not see how it could be of much value in a diagnosis. Some cases of hysteria presented the same feature; also, some young patients having myelitis and who had practiced masturbation, would sometimes present in a marked degree the same symptom, not only dilatation, but mobility of the pupil, and just in these cases we required careful diagnostic points to separate them.

Dr. Gray remarked that there was no one symptom in the whole range of medicine that was pathognomonic. The symptom referred to was simply a piece of evidence, which, being put with other pieces of evidence, went to make up the diagnosis.

Dr. Spitzka asked for Dr. Kiernan's observation upon cases of alcoholic epilepsy.

Dr. Kiernan, on the invitation of the President, remarked that in these cases he must confess he had noticed the symptom of a largely dilated and mobile pupil. With regard to the question of forms of insanity associated with masturbation, he said the same symptom was present, so he thought that the symptom was of little value in making a diagnosis.

Dr. Gray asked if the pupil was always mobile?

Dr. Kiernan said that it was mobile in many cases. In one case the pupil was widely dilated, but immobile.

Dr. Gray inquired of Dr. Kiernan, in what percentage of cases of epilepsy or masturbation he had found a dilated and mobile pupil.

Dr. Kiernan replied that he had found this symptom in about twenty per cent. of the cases of masturbation, epilepsy and pubescent insanity.

Dr. Kinnicutt remarked that within the past two weeks he had seen two cases of melancholia in children, where the etiological factor was supposed to be masturbation, and in both cases the pupils were largely dilated and mobile. Within the last two years he had seen at least seven or eight cases of melancholia in children with supposed masturbation as a factor of causation, in which the pupils were dilated and mobile.

Dr. Kiernan remarked that it might be interesting to note that certain superintendents of asylums placed great stress upon the symptom of dilatation of the pupil and mobility of the same, as a symptom of masturbation.

There being no further discussion, upon motion, Dr. H. D. Schmidt's paper on "The Structure of the Sympathetic Ganglionic Bodies," was read by title. He had previously stated that these (ganglionic bodies) were especially distinguished from those of the spinal marrow and brain by being enclosed in a membraniform capsule with which they were, in a certain measure, connected. From the body enclosed within the capsule, a number of larger and smaller processes arose, consisting, like those proceeding from the ganglionic bodies of the spinal marrow and brain, of finely granular fibrillæ.

In selecting a sympathetic ganglionic body of the *gangliated cords* of man as a type, we observed from two to four *larger processes*, directly after arising from the body, piercing the capsule and disappearing at a distance of $\frac{6}{100}$ mm. or more in the form of naked axis cylinders among the neighboring bundles of sympathetic nerve fibres. The smaller processes arising from the body were more numerous than those just mentioned. The capsule of the sympathetic ganglionic bodies represented a *complicated membraniform* nervous structure derived from and connected with the body it enveloped. Scattered over the inner as well as outer surface of the capsule, a considerable number of round or oval nuclei were observed. He had never been able to satisfactorily determine the destination of those axis cylinders arising from the processes piercing the capsule.

His recent investigations into the structure of these ganglionic bodies had taught him that the above statements, made six years ago, were correct. The proper method of making these investigations was described in detail. He still recognized the sympathetic ganglia as individual nervous centres or organs, destined to perform an individual function, though they stood to a certain degree in some relation with the cerebrum. He confined himself in the present paper to the probable mode of the function of the sympathetic nervous system, as it appeared to him at present. In the normal condition the nervous functions of those organs depending upon this system were performed through the sole influence of the sympathetic ganglia; and chiefly related to the rhythmical or peristaltic movements of the involuntary muscular elements of these organs. For a number of years he had nourished the idea that the inhibitory function of the pneumogastric and splanchnic nerves, as well as the rhythmical and peristaltic movements of the involuntary muscular element, might stand in some relationship with the ganglionic structure of the sympathetic ganglia. The contractions of the muscular layers of the alimentary canal being much slower and less definite than those of voluntary muscles, might also, to some extent, depend upon the intricate plexiform arrangement of the structure of ganglia and upon the absence of the medullary covering of the fibres. A portion of the medullary fibres might represent the sensory element of the ganglia, while the rest carried the nervous stimuli going to and coming from the brain.

Dr. Schmidt also forwarded a report of a "Case of Tumor of the Pia Mater at the Base of the Brain," which was read by title.

The paper of Dr. J. S. Lombard, now residing in Leamington, England, was read by title. The paper consisted of some experimental researches on some points relating to the temperature of the head.

The paper of Dr. H. M. Bannister, of Chicago, containing a report of a case of "Periencephalitis and Meningitis, with Remarks," was read by title.

The following committee was appointed to decide in regard to the merits of the papers presented for the Hammond prize: Drs. Miles, Seguin, and Jewell.

Upon motion of Dr. Seguin, it was decided that the Association meet for the next Annual Session in New York City upon the regularly appointed day.

The Association then adjourned.

The following corrections came to hand too late to be made in their proper place: On page 482 Dr. Hammond's remarks should read in favor of bromide of sodium, and Dr. Spitzka's statement following, on page 483, should read that he has *not* prescribed bromide of sodium for five years, and that he prefers bromide of potassium.

Reviews and Bibliographical Notices.

I.—CALDERWOOD: MIND AND BRAIN.

THE RELATIONS OF MIND AND BRAIN. By Henry Calderwood, LL.D., Professor of Moral Philosophy in the University of Edinburgh. London, Macmillan & Co., 1879; pages, 455. Chicago, Jansen, McClurg & Co.

This is one of numerous attempts in modern times to work out a physiological psychology. In France such movements may almost be said to have begun with the writings of Cabanis. In Germany, an impulse in this direction was given chiefly by Herbart and his disciples, and in Great Britain by Hartley and his numerous followers.

The book, the title of which appears at the head of this notice, is by a professed psychologist and moralist, more or less widely known by various writings, chiefly perhaps by his work entitled the "Philosophy of the Infinite." In his later years, it would seem, the author has set himself to the task of removing from himself the reproach which is directed against "introspective" psychologists, so-called, as a body, that they neglect physiology. From the literary references contained in the foot notes, especially in the anatomical and physiological parts of the volume, it is quite evident that the author's knowledge of the anatomy and physiology of the nervous system, as represented in the best works on the subject, is very limited and wholly second-hand. For example, on page 25 is a reference to certain researches of Betz of Kiew, and apparently the title of a work in the German is given, the citations being from page 578 of the same. The reader is left to suppose that Betz has produced a large work on the "Anatomischer Nachweis zwier Gehirncentren," when the facts are, that the above is part of a title of a short paper published in 1874 in the *Centralblatt f. d. med. Wissenschaften*, at Berlin. The author seems to have depended on Professors Turner and McKendrick, of the Medical Department of the University of Edinburgh, for his anatomical and physiological data. The illustrations are borrowed chiefly from the work on anatomy of Professor Turner and from Dr. Ferrier's book.

The first chapter is devoted to the "Relations of Philosophy and Science." It opens with the following statement: "Philosophy and science are so related as to constitute a unity. The one is concerned with the facts and problems of rational life, the other with the facts and problems of material existence, animate and inanimate. They are at one in seeking a rational explanation of facts. They adopt the same method, depending upon observation, analysis, classification, reasoning."

We cannot agree to this as an adequate statement of the case. It may be admitted as true, that "Philosophy and science are so related as to constitute a unity." But it is not true that the one is exclusively, or even chiefly, concerned "with the *facts* and problems of *rational life*," while the other, in the same way and to the same degree, is concerned "with the *facts* and problems of *material existence*, animate and inanimate," as we are apparently told by the author.

Science is concerned with *facts* or *phenomena* and their relations, whether of "rational life" or of "material existence." Philosophy is concerned with the *causes* of the facts or phenomena, or with a rational explanation of their coming to pass, whether in the domain of "rational life" or of "material existence." There is a science of the one as well as of the other. Facts, no matter from what source, no matter what their kind, are the material of science. There is or may be a science of mind as well as a science of matter. The facts being given and duly grouped, according to their relations in space and time, by science, it is the aim and office of philosophy *to explain them*, and it is hence chiefly concerned with *causes*. The definitions above given of the respective spheres of science and philosophy clash, and indicate a want of clearness in conception of the subject in hand at the outset, which does not promise well for the subsequent course of the discussion. For according to this author, there is no science of "rational life," since this is the province of philosophy, and there can be no philosophy of "material existence," for this is the province of science. And yet "they adopt the same method." But we would not insist at too great length on the seeming confusion of definitions which are met with in the first lines of the book.

Professor Calderwood, early in his book, examines the objections of Comte, Maudsley, and others, as to the unreliability of consciousness. But the discussion is brief and in some measure inadequate. We will not in this place go into an examination of this subject again, since that was done at length in a former volume of this journal, in a review of the last edition of Dr. Maudsley's *Physiology of the Mind.*

"In proceeding to deal with this problem," (that is, the relation of brain to mind,) the author says: "I prefer to approach it by the path which physical science has opened. Granting that the brain is the organ of the mind ('das seelenorgan,' as Rudolph Wagner has named it), the problem may be stated thus: Given a physiology of brain and nerve, to ascertain whether this constitutes a philosophy of the phenomena commonly recognized as 'mental phenomena.' These phenomena may be summarized under the three words, Thought, Emotion, Volition, taking all these terms in their commonly received meanings. I shall attempt first a summary of the results of anatomical and physiological research, and after consider how far these results carry us in the interpretation of the facts of our own life." (P. 9.)

The account of the structure and modes of action of the nervous system is, on the whole, good, but brief, and deficient in many things which are necessary to be considered in a case like the present. A fair summary of the researches of Dr. Ferrier and others, taken chiefly from Dr. Ferrier's work on the *Functions of the Brain* is given. But for so small a book as this, and for the real purpose of the author, the summary given of these researches is too lengthy. After a fair discussion of the results of "anatomical and physiological" study, as regards mental action, speaking comprehensively, the author says: "I have endeavored to present in detail the evidence as to structure and function of brain and nerve, and there does not seem to be any portion of that evidence pointing to the conclusion that to the sensory and motor functions there fail to be added intellectual functions. There is still, indeed, a wide region of inquiry before us, but it opens to view as new territory; and at this stage it seems our only possible conclusion that anatomical and physiological investigations as to brain and nerve, so far as they have yet been carried, afford no explanation of our most ordinary intellectual exercises." (P. 210.)

This statement is in great measure true. But we cannot accept it without qualification. In our judgment it is not true that "no explanation of our most ordinary intellectual exercises" can be given from the standpoint afforded by anatomy and physiology. That no *full* explanation of such phenomena can be given on the basis of our present knowledge is true. But in the case of memory, or of association, not to speak of other forms of mental activity, it must be admitted that no explanation worthy of the name can be made if the data of anatomy and physiology are left out. But this question is one largely of definitions, and could not be satisfactorily discussed within narrow limits. But in subsequent chapters Dr. Calderwood argues with much force against the final adequacy of the attempts to explain mental phenomena by a consideration of the structure and known modes of action of the nervous system. With the general results of his discussion we heartily agree, while dissenting at various points from particular statements made during the progress of the work.

In the latter part of the work we have, discussed in a plain and vigorous manner, "Experience as connected with Motor Activity," "Retentiveness of Acquisition Memory," "Use of Speech," "Action and Reaction of Body and Mind," "Weariness, Sleep, and Unconsciousness," "Brain Disorders," "The Higher Forms of Mental Activity," and finally a "Summary of Intellectual Results."

The conclusion of the whole matter is, that there is something beside nerve and nerve action in the sense in which these terms are ordinarily understood, for the author declares that "mind cannot be explained under the conditions applicable to matter. The immateriality of the rational nature is clearly implied in the forms of activity which are peculiar to it." (P. 447.)

The style of the work is simple, and is quite evidently written by a psychologist or metaphysician, rather than a physiologist. While the author's writings escape the vagueness of Bain's works on psychological subjects and the tediousness of Spencer, yet they lack the clearness and precision of Mill, the graphic character of Maudsley, and the scientific completeness of Wundt, as shown in the *Physiologischen Psychologie* of the latter.

II.—KANE: MORPHIA HYPODERMICALLY.

THE HYPODERMIC INJECTION OF MORPHIA: ITS HISTORY, ADVANTAGES AND DANGERS. (Based on the experience of 360 Physicians.) By H. H. Kane, M.D., New York. New York, Charles L. Bermingham & Co. 1880.

This is a clinical study of the advantages and disadvantages of the employment of a mode of medication that for various reasons has come very largely into favor of late years, but which is in some respects, perhaps, especially liable to abuse or over use. The author was incited to its production, as he states in his preface, by reading a paper in the *Chicago Medical Journal and Examiner* for May, 1878, by Dr. E. F Ingals, of this city, who was his predecessor in this line of inquiry. It was his intention, at first, to give the results of his investigation in a few journal articles, but the subject grew upon him so that, with all attention to the avoidance of undue prolixity, the present volume has made its appearance instead.

The author's mode of investigation was by sending out circulars containing a series of questions relative to experience with morphia injections, and having the same published in the leading medical journals. In this way he was able to command a large audience, and the fruits are comprised in the testimonies of nearly three hundred and eighty physicians, mostly American, but including also some representatives from Great Britain, Ireland, France, and the British colonies. This testimony he has classified and discussed with considerable ability and fairness, and has produced, on the whole, a very valuable contribution to therapeutics. It is somewhat novel in its plan, and for this reason alone, to say nothing of others, it will be likely to receive the attention that it ought to command from the importance of its subject.

The substance of the first two chapters, which treat of the advantages of localizing the injections and certain of the accidents that may follow a want of care on the part of the operator, is summed up by the author himself, and we cannot do better than to reproduce his conclusions. They are:

1st. "That localization of the injection is not necessary, and sometimes mischievous, save in certain cases—*i.e.*, burning neuralgia ; cases of sciatica and zoster, and in all cases of long standing in which the sheath or trunk of the nerve has become altered ; rheumatic troubles and chronic neuralgias where there is much inflammatory thickening and adhesion, and in mental diseases.

2d. "That rapidity of absorption varies in different individuals and in the same individual at different times, and with the place where the injection is made, that from the back being the slowest.

3d. "That hypodermic injections blunt tactile and pain sensibility sufficiently to admit of the performance of minor surgical operations without the use of an anæsthetic.

4th. "That abscess and inflammation are *comparatively* rare occurrences.

5th. "That too acid solutions, unclean syringes, rusty or dirty needles, Magendie's solution that has stood for some time, especially in warm weather, improper modes of injecting, and unhealthy conditions of the system, are liable to cause abscess or inflammation.

6th. "That the sulphate of morphia is the best salt to use, being readily soluble in plain water.

7th. "That no solution should be used that is not protected by salicylic acid, carbolic acid, or some such drug; the Keyes solution being about the best.

8th. "That carrying powders and dissolving at the bed-side is an excellent plan.

9th. "That deep injections are worthy of trial.

10th. "That serious inflammation, erysipelas, gangrene, and pyæmia may follow the puncture.

11th. "That abscesses so formed are often very slow to heal.

12th. "That needles should be *thoroughly* cleansed after using on syphilitic or carcinomatous patients, and patients ill with contagious or infectious disease.

13th. "That small cystic and fibroid tumors may result from the inflammation."

The Keyes solution referred to above is of the same strength as Magendie's solution, with a grain of salicylic acid to each two ounces of the mixture. We have given these conclusions in full because they seem eminently reasonable, and the precautions they include should be certainly attended to by every physician using the instrument.

The remaining portion of the book, comprising five-sixths of its bulk, takes up the subjects of idiosyncrasy, narcotism, the various accidents that may follow this method, the morphia habit, etc. It would seem from the returns to the doctor's inquiries that there is a great range in the dose employed by physicians, some beginning with as little as $\frac{1}{30}$ grain, while others use as much as $\frac{1}{2}$ to 2 grains at the first injection. The last figure seems rather imprudent, and we should almost discredit it as an unintentional mistake in figures, were not a physician's own words as to nearly as extreme a practice given in full in the latter part of the volume. We agree with Dr. Kane in deeming this physician extremely fortunate in having escaped the accidents that happen to very much more cautious practitioners, and which form the subject-matter of over one hundred pages in the book. The author has collected the accounts, more or less detailed, of thirty-six cases of death attributed to the hypodermic injection of morphia. These are discussed very fairly, it appears to us, and while they indicate the need of caution in its employment, they are not at all conclusive against it as some alarmists would have us think. It is very doubtful, indeed, in our opinion whether as much danger is to be apprehended from overdoses of opium given in this way, as there is from its administration by the mouth, which as a rule is left in the patient's or nurse's hands.

Dr. Kane gives the details of a few experiments to demonstrate the effects of suppression of the renal excretion on the action of morphia. He found that with ligature of the ureters or artificially excited inflammation death rapidly followed the injection of a dose of morphia which, under other circumstances, would have been or would easily be rendered harmless. They are of interest, but, as he admits, the investigation was hardly carried far enough in his hands to be conclusive.

The chapters on the treatment of morphia narcosis, the convulsivant action of morphia, and morphia and atropia, are worth reading. The author advises the carrying of solutions or powders of strychnia, atropia, and caffeine in proper quantity to be used in cases of emergency, together with a small tourniquet to prevent the entrance of the drug into the general circulation. As regards the combination of atropia with the morphia, he seems inclined to think it is overdone in practice, and that its advantages are not as positively proven as is believed by some. Yet he thinks that the combination is more effectively anodyne than morphia alone, and a less quantity of the latter is thus effective, and in the next chapter, on the Morphia Habit, he advises its employment when morphia is to be given for any length of time, as lessening the danger of contracting the habit. On the whole, the advantages of the combination, even on his showing, are more apparent than its disadvantages.

The concluding chapter sums up the general results of the discussion of the subject. We have indicated already some of the principal points made, that are reiterated here. The author is laboriously cautious and impartial, and his book is well worth the attention of the profession as a special study of a very important method in therapeutics. We can conscientiously recommend it to our readers.

SHORTER NOTICES.

I. COMMON MIND-TROUBLES, AND THE SECRET OF A CLEAR HEAD. By J. Mortimer Granville, M. D., M. R. C. S. Edited with additions by an American. Philadelphia, D. G. Brinton, 1880; 185 pages.

II. THE VENEREAL DISEASES, INCLUDING STRICTURE OF THE MALE URETHRA. By E. L. Keyes, A. M., M. D. New York, Wm. Wood & Co., 1880. Chicago, W. T. Keener.

III. A HAND-BOOK OF PHYSICAL DIAGNOSIS, COMPRISING THE THROAT, THORAX, AND ABDOMEN. By Dr. Paul Guttman. Translated from the Third German Edition by Alex. Napier, M. D. With a colored plate and eighty-nine fine wood engravings. New York, Wm. Wood & Co., 1880. Chicago, W. T. Keener.

IV. A TREATISE ON FOREIGN BODIES IN SURGICAL PRACTICE. By Alfred Poulet, M. D. Vols. I. and II. New York, Wm. Wood & Co., 1880. Chicago, W. T. Keener.

V. OPHTHALMIC AND OTIC CONTRIBUTIONS. By Daniel B. St. John Roosa, M. D., and Edward T. Ely, M. D. New York, G. P. Putnam's Sons, 1880. Chicago, Jansen, McClurg & Co.

VI. A PRACTICAL TREATISE ON SEA-SICKNESS. ITS SYMPTOMS, NATURE AND TREATMENT. By Geo. M. Beard, A. M., M. D. New York, E. B. Treat, 1880. Chicago, Jansen, McClurg & Co.

I. This is a series of papers intended for popular reading, not especially scientific, but sensible throughout, and pleasantly written. The author is an English physician of some reputation in the department of mental medicine, and the plan of this little volume was to offer some general counsels to the public in regard to the hygiene of the mind and the relief of common mental disturbances that if let alone are not infrequently precursors of more serious mental derangement. It is a treatise on self-help in the slighter intellectual and emotional ailments to which nearly all of us are liable. Dr. Mortimer Granville is, as the American editor remarks, "a firm believer in the power of the will to overcome most of these troubles, if it is properly directed in their very beginning." With this prepossession he has produced this volume, which has passed its fifth thousand in Great Britain and is now offered to the American reader. The titles of the chapters, "Failings," "Defects of Memory," "Confusion of Thought," "Low Spirits," "Tempers, Good and Bad," "Habit," etc., etc., will sufficiently show the scope of the work. The American editor has added two chapters, one on "Mental Languor and Listlessness," and one on "Morbid Fear," which are as good as any in the volume. It is a safe and serviceable book to put in the hands of any one.

II. Dr. Keyes has in this volume presented the profession with a concise and readable treatise on venereal diseases, strongly tinged, it is true, with his own personal and peculiar views on certain subjects but not perhaps any the less valuable on this account. It is well and clearly written, copiously illustrated, and deserves and will doubtless obtain an extensive circulation with the others of Wood's cheap series of medical publications, of which it is the first for the present year. It is to be regretted, in a certain point of view, that these volumes are not to be obtained separately, though we think there is no one in the profession but would do well to obtain the whole series, judging from those that have already appeared.

III. This, the second volume of Wood's Library of Standard Authors for 1880, is a valuable addition to the medical literature of our language. The fact that it has passed through three editions in its original tongue, and has been translated into at least six European languages before its appearance in an English dress, is sufficient evidence of the appreciation it has received abroad and which it must necessarily have deserved. Its scope is not coëxtensive with its subject, for it does not include all descriptions of physical diagnosis; but in this respect it is not singular, for we know of no single work that does. As a manual for the physical examination of the respiratory, circulatory and abdominal organs, it is very good, as far as we have been able to examine it. The translation appears to be well done, and many engravings that could hardly have been included in the European editions are given.

IV. As stated in the author's preface, this work "has no analogue in our classical literature; it collects in book form and discusses the facts that had heretofore only been accessible as scattered throughout the medical literature of the world." These two volumes will therefore scarcely fail to be of service. They will probably be the standard treatise on this subject for many years.

V. This volume consists of a series of papers that have already appeared in various medical periodicals, but which are here, for the sake of giving them a wider and different circulation, collected in book form. All are more or less notable in the specialties of ophthalmology and otology, and several are of more general interest. Among these are those on poisoning by cinchona, by Dr. Roosa, and on the effects of tobacco, by Dr. Ely. The latter found, in an investigation of over one hundred workers in tobacco factories, no such evidence of damage to the nervous system or to sight as might be inferred from previous opinions on the subject. He concludes that tobacco has of itself only slight effects, if any, on the vision, and that working in tobacco factories is as healthy as most other sedentary occupations; and that while in certain susceptible cases, or when combined with other noxious influences, it may have deleterious effects, constant contact with it, as with other poisons, may beget a tolerance sufficient to contradict all theory. Its reported effect on the reproductive power, however, seems confirmed, or at least supported by other statements in this paper, as it was noted by Drs. Tracy and Emerson that the ratio of children of cigar-makers was exceedingly low. The book is very handsomely gotten up, as is usually the case with works issued by its publishers.

VI. Dr. Beard has added one to the two or three little tracts already existing on sea sickness by Nelken, Barker and others. The important feature of his monograph is his treatment, which he claims has been amply tested by experience. It consists of simply mild brominization, begun before incurring any risk of the disorder, and is preventive, therefore, as much as or more than it is curative. In addition to this he has seen benefit from atropine given hypodermically, from citrate of caffeine and cannabis indica in relieving the headache, and from hydrate of chloral. We are not aware that these remedies are absolutely novel in this disorder, some of them certainly are not; but on the whole Dr. Beard is entitled to the thanks of the traveling public, if his treatment is generally as successful as it has been in his hands. The little monograph ought to have a large sale, considering the importance of its subject and the number of people necessarily exposed.

Editorial Department.

AT the Cooper Institute meeting in behalf of the insane, last December, among other resolutions one was adopted recommending the organization of a National Association for the protection of the insane. The permanent committee appointed at that meeting took the matter in hand, and on May 10th issued a circular announcing that, by the invitation of Gen. Brinkerhoff, President of the Conference of Charities and Correction, those interested in this matter would meet with the Conference at its session in Cleveland, in June, and that a place would be reserved on the programme for them. At the said meeting the organization was formed, a constitution and by-laws adopted, and several papers of value were read by Drs. Shaw, Seguin, Beard, and others. The following are stated to be the Society's methods for attaining the end expressed in its name, "The National Association for the Protection of the Insane and the Prevention of Insanity:"

"First. By the encouragement of special and thorough clinical and pathological observations by the medical profession generally, as well as those connected with asylums.

"Second. By enlightening public sentiment as to the nature of the malady, the importance of early treatment, improved methods of management and treatment at home and abroad.

"Third. By recommending an enlightened State policy, which, while neglecting no one of its insane population, shall so administer relief and protection as not to lay unnecessary or undue burdens upon the tax-payers.

"Fourth. By holding public meetings wherever needed, to stimulate legislation that will secure effic ent State supervision of all public institutions for the care of the insane, as a mutual safeguard for the protection of society—the patients, as well as those who have them in charge.

"Fifth. To further the perfection of laws relating to the treatment of the insane, and their rights while patients in the asylum.

"Sixth. By efforts to allay the public distrust in relation to the management of insane asylums, by placing them on the same footing as that of our hospitals, both in the matter of freer communication with the outside world, and the privilege of a consulting medical staff of general practitioners."

Any person may become a member of the Association by the annual payment of five dollars. The officers elected at the meeting were Dr. H. B. Wilbur, of New York, President; Dr. Nathan Allen, of Massachusetts, Vice-President; Miss A. A. Chevallier, of Massachusetts, Secretary; Dr. George M. Beard, of New York, Treasurer, and a council of fourteen, including some of the best-known physicians and philanthropists in the country.

On motion of Dr. Seguin, of New York, the Association adjourned to meet again in New York, in the last week in September, for the purpose of perfecting its organization.

B. F. LAUTENBACH.

In closing the columns of the present number of the Journal, the painful news arrives that Dr. Lautenbach is no more among the living. His name is, no doubt, familiar to most of our readers, both from his direct contributions as well as from frequent references to his work in the Periscope. From an editorial in the *Philadelphia Medical Times*, we have just learned that he died recently, in his 26th year, having returned from Switzerland on account of his failing health. We deplore in his loss not merely the sincere personal friend, but fully as much the energetic, zealous investigator. Dr. Lautenbach had enjoyed fine opportunities in preparing himself for his career. He commenced the study of medicine only after acquiring a thorough scientific education; if we remember correctly, he was indeed connected for a time with the chair of Geology in the University of Pennsylvania. After graduation, he displayed at once his taste for original research, and soon abandoned the idea of practicing medicine. Ever since our more intimate acquaintance we have cherished the hope to see his name paraded as one of the foremost in the ranks of American physiologists. He bid fair to fulfill this hope. He had been the assistant of Prof. Schiff for a time, until his return to his home in Philadelphia in 1877. But, after all, he found the European abode more attractive, and soon retraced his steps to Geneva, where he has staid since as assistant in the physiological laboratory. While there he made good use of his time. A long list of articles in various physiological publications is the best token of his diligence, while the high merit of his researches needs no comment.

But all hopes were in vain. That dire scourge, phthisis, counted him also among its victims. But, while his life has been short, it has not been spent uselessly. His name will be remembered kindly by all who believe in the search after truth. H. GRADLE.

THE late meeting at New York of the American Neurological Association was one of much interest. The period given to its work was busily occupied in the reading of papers above the average in interest, and to suggestive discussions. But we would refer the reader to the admirable report of the proceedings published in the present number. It is quite evident that there is room for the society, and that it has made good its title to a place among the really working medical associations in our land.

We would call special attention to the letter of Dr. Hammond to the society, offering a prize of five hundred dollars for the best essay, which is the outcome of original work, on the functions of the optic thalamus; and also to the resolutions adopted by the society in reference to the care of the insane in the United States.

The next meeting is to be held in the city of New York, and we earnestly hope it may be well attended.

Periscope.

a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

Vascular Supply of the Spinal Cord.—Dr. James Ross, in *Brain*, Vol. III., No. 1, maps out the distribution of blood-vessels of the cord from a series of fortunate sections:

The anterior median artery divides into two main trunks, each entering the grey anterior horns; each trunk subdivides into three branches, the anterior branch of which curves forward and is distributed to the anterior and internal portion of the grey substance, the median goes to the lateral portion of the anterior horn, while the posterior goes to the posterior horn. The central artery gives off also three branches, going to the anterior, lateral and posterior grey matter. The posterior spinal artery divides into a variable number of branches distributed to the posterior horns. In addition to the vessels described a large number pass from the pia mater into the substance of the cord, and some are very large. Two of these run by the anterior roots of the nerves. The internal anterior root artery joins the anterior branches of the first subdivision of the artery of the anterior median fissure and of the central artery The external anterior root artery divides into two branches in the grey substance.

Other more or less constant vessels are found as follows:

One passing from the lateral aspect of the cord dividing into two branches, one of which passes in front and the other behind the postero-lateral group of cells, and this vessel may be called the median lateral artery.

An internal posterior artery runs from the pia mater, passes between the columns of Goll and the posterior root zone, and after passing through about two-thirds of the depth of the posterior column it curves outward to reach the posterior grey horn.

A posterior commissure artery winds backward along the internal edge of the posterior horn. In all inflammatory diseases the tissues in the vicinity of the vessels will be more liable than the remote portion to be inundated by effusion; hence, the lines of the distinction of the vessels may be said to form lines of least resistance to disease. C.

Corpora Quadrigemina.—Dr. Spitzka, in the *Medical Record* for March 13, 1880, gives some new features in the anatomy of the corpora quadrigemina. He says the older anatomists, observing the similarity in external appearance between the anterior and posterior pairs of the corpora quadrigemina, naturally considered all the four tubercles to be analogous in their structure and relations, and therefore also in their physiology. In reptiles there is but one pair, and they believed that lateral fissure of these constituted the only difference. Spitzka says that Meynert and Huguenin are wrong in attributing similar functions to both sets. Adamuk believed both to be concerned in the coördination of the ocular muscles. Spitzka found the corpora in an anaconda and studied the matter up with the result of showing that only the anterior tubercles are derived from the mesencephalon; that the posterior pair is a secondary and foreign addition derived from the hind-brain; that the current description of the segmentation of the corpora quadrigemina is incorrect, inasmuch as there are not first one, then two and finally four bodies, but first one, two, three, and then four, the posterior pair being last to divide.

The conclusions reached are,

1st, That the anterior and posterior pair are not analogous ganglia.

2d, That each pair has a different embryonic origin.

3d, That the posterior pair is different in structure and relations from the anterior.

4th, That only the anterior pair is related to the retinal and oculo-motor innervation.

5th, That the optic lobes of reptiles are homologous with the anterior pair of man alone.

The posterior pair of man is represented in most reptiles by a concealed lentiform ganglion, and in some pythons by a distinct posterior pair of tubercles.

The relation of the posterior pair to the retina and ocular muscles being excluded, the question arises, What functional importance does it or may it have? It is highly probable that these ganglia may have some important relation to tactile sensation, for the following reasons:

1st, Their structure is that of sensory ganglia. 2d, Their embryonic origin is from the same mass which lower down becomes developed into the gelatinous sensory nuclei of the trigeminus. 3d, The fasciculus connected with these ganglia (inferior lemniscus) can be clearly traced to the posterior column of the cord through a beautiful decussation which lies in front of the pyramidal crossing. 4th, The posterior pair is hypertrophic in animals with defective vision, and in such animals it is known that the sense of touch vicariates for that of sight. C.

The Relative Quantities of Grey and White Substance in the Brain, has been determined by Dr. B. Danilewsky (*Centralblatt*, No. 14, 1880), by means of their specific gravity. He ascertains this with the picrometer, using in the first place carefully isolated pieces of either substance and hereupon determining the specific gravity of the entire brain he calculates the percentage of the two tissues. He claims for his method an accuracy which we cannot admit. It is true the presence of vessels and connective tissue gives rise to but a very slight error, but his figures for the specific weight of the isolated grey and white matter vary within such large limits, that any accurate calculation seems to us an illusion. As a result he states, that in the human species the grey substance of the cortex equals about 33 per cent., while the grey matter of the basal ganglia constitutes 6 per cent. of the entire cerebrum. In the dog 50 per cent of the cerebrum is composed of grey matter. Assuming the depth of the convolutions to be 2.5 millimetres in man, a fair average, he figures their total extent, by means of the specific gravity, to be equal to about 1,600 square centimetres, a result agreeing with that of Baillarger, but smaller than R. Wagner's measurements.

While thus distrusting the author's method for anthropological purposes, we must admit, with him, that it appears promising as far as pathology is concerned. He found, for instance, that the grey substance of the anterior parietal convolution exceeded the other grey matter in specific gravity in a case of death during an epileptic attack.

THE TOPOGRAPHY OF THE NERVE FIBRES IN THE TRUNK OF THE OPTIC NERVE.—Anatomy alone does not seem competent to decide the position in the trunk of the optic nerve of a set of fibres supplying any given part of the retina, especially the important centre, the macula lutea. We must rely mainly on post-mortems, in cases of partial atrophy, for this information. Such an instance was fortunately observed by Samuelsohn (*Centralblatt*, No. 23, 1880). The patient had suffered for three years previous to his death from an absolute central scotoma involving only the macula. The cause was a retro-bulbar neuritis with atrophy of the temporal part of the papilla. The autopsy showed partial atrophy of the optic nerve, extending backwards no further than the optic foramen. The bundle of atrophied fibres occupied the very centre of the trunk at the optic foramen, but gained the temporal side before reaching the eyeball. At the point of entrance of the nerve into the eyeball, the degenerated fasciculus appeared wedge-shaped, with the base reaching to the periphery of the optic trunk on the temporal side. *This is hence the course of the fibres ending in the centre of the retina.* In conformity with the importance of the macula in vision, the fibres supplying it *constitute nearly one-half the bulk of the entire optic nerve.*

THE EXCITABILITY OF SENSORY NERVES AT BIRTH.—As a supplement to previous researches in which Dr. Soltmann had tested the irritability of motor nerves in new-born animals and found it low as compared with the adult state, the same author examined also the sensory nerves. (*Jahrb. f. Kinderheilk.*, N. F. XIV., p. 308—abstr. in *Schmidt's Jahrb.*, No. 3, Vol. 185). He employed the method of Bezold, in which changes of blood-pressure are the indicator of the sensitiveness. The manometer is connected with the curarized animal, and the least electric current is sought which, when applied to the central end of the sciatic nerve, can raise the blood-pressure.

The author thus found, that in the new-born animal a much stronger stimulus is necessary than in the adult dog. Indeed he observed occasionally sinking instead of a rise of blood-pressure, showing the superiority of the vaso-dilator nerves at this age. The excitability of the sensory nerves rises gradually until it gains its normal height at the age of about ten to twelve weeks (in the dog).

These researches show the fallacy of assuming an augmented reflex excitability in the infant. The liability to spasms occurring at a somewhat more advanced period depends really on the tardiness in the development of the inhibitory nervous apparatus.

THE RESPIRATORY CENTRE.—Dr. A. Christiani, *Centralbl. f. d. med. Wissensch.*, April 10, describes the position of the respiratory centre as determined by his own researches. He had previously communicated, in March, to the Berlin Physiological Society, the fact that excitations of the optic and acoustic nerves influenced respiration in an opposite sense to the trigeminus, being inspiratory excitants rather than expiratory. In the further course of his investigations he located the respiratory centre in the third ventricle, on its floor, internally to the thalamus and near to the corpus quadrigeminus. This centre, irritation of which, either mechanical, electrical, or through the sensory nerves, produces deepened inspiration and retarded breathing, is rather limited in extent, as irritations a few millimeters laterally to the third ventricle are without effect. If the thalamus and the floor of the ventricle are removed entirely from the brain, and the outermost anterior layer of the forward corpus quadrigeminus is continuously destroyed, the respiratory effects of electrical irritation of the more central lying region ceases, or there occurs a corresponding expiratory modification of the respiration. This latter also occurs under certain circumstances from irritation of the lateral portions of the corpora quadrigemina. The experiments were generally performed on rabbits; further details are promised in Dubois-Reymond's *Archiv.*

THE SEMICIRCULAR CANALS.—The following are the conclusions of a very lengthy paper, by C. Spamer, in *Pflüger's Archiv*, XXI. Hft., which embody the results of a careful, critical and experimental investigation of the subject of the physiology of the semicircular canals.

1. There is no question but that the membranous arches of the inner ear and their ampullæ are of great importance for the security of movements.

2. They have, in all probability, nothing to do with the sense of hearing. It is better, therefore, as Flourens has already suggested, that the eighth cranial nerve, which so manifestly ends peripherally in such functionally different fibres, should not be called merely by the one-sided designation of "nervus acusticus," but rather the "nervus vestibulo-cochlearis," or if one is not shocked by the formation of a term not exactly classical Latin, by the name, designating its function, of "nervus acustico-equilibricus."

3. There is nothing to justify us in considering the semicircular canals as the central organs for equilibrium. Experiments have hitherto afforded nothing contradictory of the view rendered so probable by numerous researches and clinical observations, that the cerebellum is this central organ.

4. On the other hand, anatomical as well as experimental and pathological facts support the view that these canals are a peripheral mechanism, a "sensory organ" (Goltz) for the equilibrium sense, or the "static sense" (Breuer), and for the coördination of movements.

5. But these canals cannot be regarded as the only sensory organs for the sense of equilibrium and the coördination of movements dependent thereupon, since complete destruction of all the canals in man does not abolish the power of coördinated motion or equilibrium, and the experimental destruction of the same in the lower animals only gives, though not immediately, the highest observable degree of uncertainty of movement (although sometimes the ability to perform movements is permanently impaired, as observed by Flourens and Goltz).

6. An altogether satisfactory and unobjectionable explanation of the way in which the said sensory irritations are produced in the canals by their primary incitants, is not at present practicable.

7. Much more important motor disorders than those from mere excision of the canals may be produced by mechanical, thermic, chemical, or electrical irritation. An altogether unirritating ablation is moreover impossible. Also when the ampullæ are extracted there must necessarily be irritative conditions set up in the nerve. The most striking motor disturbances set up after operations in these canals must be considered as the results of irritation.

8. But sometimes there are present, after destruction of the canals, phenomena that cannot be considered as direct consequences of the operation (*Ausfallserscheinungen*). Among these we may include the uncertainty of movement that appears after the disappearance of the manifest irritation phenomena and before the appearance of the secondary inflammation or degeneration.

9. The deviation of the head that is observed after simple irritative operations, sometimes instantaneously, but constantly (with moderately severe unilateral operations) after the course of a few days, and then in frequent and much longer attacks, is also an evidence of an irritation, but one of a region as yet unknown, which must be sought for more centrally than the canals. During or immediately after simple excision of the canals, this deviation is never observed. If it appears a few days after the operation (usually five or six) then it is only in paroxysms usually or exclusively aroused by excitation of the animal. In the intermediate period they can move the head freely in any direction and can run any way, but there is considerable uncertainty and embarrassment, or even suppression of the powers of flying The deviation of the head is certainly not the cause of the other motor disturbances that follow injuries of the canals.

10. There is much in favor of the view that a subjective vertigo is connected with or causes the convulsive movements, evidently increased or only produced through psychic excitations (such as head deviation, *manége* movements, etc.).

11. Galvanic irritation of one of the two superficial canals (by means of insulated wire) produced in most experiments falling and turning toward the side determined by the current direction and varying with it; opening

of the current was always followed by a new movement toward the same side as before.

12. This last fact shows a difference between these movements and those produced by transverse currents through the occiput. In the latter, the movement after the current opening is always in the opposite direction to that after the closing.

13. In the first case it is to be considered probable that we have a result of the action of the current on the semicircular canals.

14. From the movements produced by transverse galvanization through the head, it appears that the current has no action in this case on the semicircular canals, or, if any, a very subordinate one. This is indicated by the difference in the reaction mentioned above under 12, and also by the circumstance that the movements are notably present after destruction of all the canals.

Excitability in Transverse Direction.—In one of our recent numbers we abstracted some researches by Tschirjew, according to which a nerve *can* really be stimulated by a current passing through in an accurately transverse direction. This statement is now positively contradicted by Albrecht and Meyer, on the basis of experiments made in the laboratory of Prof. Hermann. (*Pflüger's Archiv*, Vol. 21, H. 10 and 12) The principle of their methods consisted in immersing the nerve in a salt solution, through which a current, either induced or constant, is sent in a given direction. On altering the position of the nerve the current passes through it either exactly, transversely, or obliquely. The more nearly parallel the nerve with the direction of the current, the greater will be its excitability, while, if the current enters the nerve only in an exactly transverse direction, no stimulation whatever occurs.

In the same article Dr. Ginffrè adds, that he has examined the muscle by a similar arrangement and obtained the same result. On account of the imperfect parallelism of the muscular fibres it is, however, more difficult to demonstrate the want of excitability in the transverse direction.

Vaso-motor Innervation and Circulation of the Liver and Abdominal Organs.—At a session of the Societé de Biologie, Mar. 15, M. Lafont read a communication, of which the following is the *resumé*, as given in the *Bull. Gén. de Thérapeutique*, Apr. 15.

1. There exist vaso-dilator nerves of the liver and the abdominal organs, which pass from the cord through the first three pairs of dorsal nerves.

2. The hyperglycemia and glycosuria following the faradic excitation of the central ends of the vagi in the dog, of the depressor nerves in the rabbit, and of the sensory nerves in general, are the results of an impression carried by these different nerves to the symmetrical vaso-dilator centres on both sides of the medulla, whence arise the dilator nerves that follow the cord as far as the first pair of dorsal nerves, from which point, as far as, it may be, the third dorsal pair, they pass out to join the sympathetic and the splanchnics.

3. Severing the two or three first dorsal pairs suppresses the effect of excitation of the vagi and depressor nerves and of puncture of the floor of the fourth ventricle, on the abdominal circulation.

Qualitative Analysis of Cutaneous Sensibility.—In order to answer the question whether we have more than one kind of cutaneous sensibility, Dr. Max Bruch undertook a series of experiments, the general results of which are briefly reported in the *Centralbl. f. Nervenheilk.* for last March. We know that any cutaneous irritation, such as stroking or rubbing, cold, heat, etc, has its influence on the sensibility of the skin. Now, if all qualities of cutaneous sensibility are always brought out by the same agency in the same way, and this is the case with several reagents, then it is highly probable that they are identical and conducted by the same nerves. But if all the kinds of cutaneous sensibility are not influenced alike by all excitations; if, for example, stroking of the skin diminishes the irritability of the pressure sense, while, on the other hand, it increases the sensibility to temperature, then it appears evident that the feelings of pressure and temperature are not served by the same nervous apparatus, or, if so, that its irritability can be at once heightened and diminished at the same time. In this manner a qualitative test of cutaneous sensibility can be made. Dr. Bruch found that stroking the skin (*massage en effleurage*) reduced the sensibility for locality and pressure and increased that for pain. This last he has measured by a special "baralgesimeter" of his own device. Long continued exposure to high temperature (water of 41°–45° C. or 96°–113° F.) reduces the excitability of the temperature sense, while the sensibility to painful impressions from temperature is increased. Hence it appears that the nervous apparatus for tact and pain are not the same.

By a short exposure to temperature of 92°–96° F. the sensibility for locality and pressure is increased, while that for temperature is decreased, thus showing that the muscular sense and that for temperature are not identical. He is still engaged in his experiments and expects to publish further results.

Among other recently published articles on the Anatomy and Physiology of the Nervous System, we may mention the following:

Poole, on the Relations of Nerve and Muscle, *N. Y. Med. Record*, May 8 and 15.—Ott, Path of the Sensory Fibres in the Spinal Cord—The Path of the Sensory and Inhibitory Fibres in the Pons Varolii, *Detroit Lancet*, May. —Southworth, Does there exist a Nervous as well as Vascular Connection between the Mother and the Fœtus in Utero? *Ibid.*—Ott, Paralysis and Anæsthesia, *N. Y. Med. Jour.*, May.—Dexter, The Anatomical Reasons for Dextral Preference in Man, *Ann. of Anat. and Surg. Soc.*, Brooklyn, Apr.—Smith, The Cause of Sleep, *Boston Med. and Surg. Jour.*, May 5.—Engelmann, Ueber die Discontinuität des Axencylinders und den fibrillaren Bau der Nervenfasern, *Pflüger's Archiv*, xxii., 1 & 2.—Deecke, The Structure of the Vessels of the Nervous Centres in Health, etc., *Am. Jour. of Insanity*, Apr.—Reinhard, Die Eigenwärme in der allgemeine progressive Paralyse der Irren, *Arch. f. Psych.*, x., 2.—MONAKOW, Zur pathologischen Anatomie der Bleilähmung und der saturnine Encephalopathie, *Ibid.*—TAKACZ, Untersuchungen ueber die Verspätung der Empfindungsleitung, *Ibid.*—RACINE, Ein Fall von acuter (primärer) spontaner Rückenmarkserweichung, *Ibid.*

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b.—PATHOLOGY OF THE NERVOUS SYSTEM AND PATHOLOGICAL ANATOMY.

HEAD SYMPTOMS WITH TRANSITORY PARALYSIS IN CHILDREN, FOLLOWED BY PERMANENT DEAFNESS.—Dr. A. Seeligmüller, *Centralbl. f. Nervenheilkunde*, March, gives an account of two cases of children, aged 3 and 4 years respectively, who were suddenly seized with high fever, delirium, headache, etc., and who, after the subsidence of the more acute symptoms, were found more or less paraplegic and deaf. The motor symptoms in one case were as follows: The child could move his limbs in all directions with considerable force, the faradic and sensory reactions were apparently normal, but he could neither walk nor stand. The patellar reflex was lacking, but tickling the sole of the foot produced the usual contractions. Sensibility was apparently normal; nothing abnormal in the spinal cord, except an apparent sensitiveness of the dorsal vertebræ. In a few months power of the limbs was completely restored, but deafness was persistent and complete. The other case, when seen a month after the first attack, could walk with support, but was unsteady, stood with his limbs wide apart, though it had not the appearance of vertigo, and his gait was about the same with the eyes closed or open. Electric reaction, reflexes, and sensation were normal; the bodily functions all right. A few days later the motor symptoms had much improved. The deafness was complete.

Similar histories have been given by Voltolini, Toynbee, and Von Tröltsch. The latter author had attributed it to a localized lesion in the fourth ventricle, but Seeligmüller rejects this explanation, since in both of his cases he found no sugar in the urine, and there was no increase in its quantity. The exact pathology of the condition cannot be determined until a fatal case affords an autopsy, an event that has not as yet occurred.

THE NERVOUS SYMPTOMS OF DYSPEPSIA.—At the session of the Societé de Biologie, April 3, M. Leven offered a communication, of which the following abstract is reported in the *Gaz. des Hopitaux*, No. 40:

Physiological experiment has demonstrated that relations exist between the brain and stomach. Lesions in the thalami, the crura, the upper part of the cord, or section of the trigeminus within the cranium, are sufficient to cause certain disorders of the stomach. Schiff rightly concludes that this cerebral influence is transmitted *via* the pneumogastrics.

M. Leven has been able to clinically observe the action of dyspepsia on the cord and brain. The nervous disorders due to dyspepsia are of two kinds: Disorders of sensibility and vaso-motor troubles.

1. The disorders of sensibility are exhibited in the anterior branches of the cervical, dorso-lumbar, and sacral nerves, and may be observed in any part whatever of their track as neuralgic points, painful on pressure, in the neck, trunk, or sacral region. The sensitive nerves of the muscles, articulations, and of the skin, become painful. Pain may easily be aroused by taking up the muscle, moving the joint, or handling or pinching the skin. Similar phenomena are exhibited in the head, hyperæsthesia of the skin, exaggerated sensibility of the frontal and occipital muscles, foci of pain along the cervical nerves, emanating from the posterior part of the skull and the frontal nerves on its anterior half, and tinnitus of the left ear, etc.

These symptoms always are first observed on the left side, to which they may remain limited; in other cases they may extend along both sides of the spinal column, occupying the whole trunk from front to rear, the neck and skull on both sides. Localized first in the superior members, it extends to the lower parts of the body, retaining its characters as myalgia, neuralgia, arthralgia, and dermalgia.

2. The vaso-motor troubles are not less of interest. The thermometer applied to the left side of the thorax, the neck, or the skull, shows five, six, or eight-tenths of a degree less elevation than when placed at corresponding points on the right side.

What is the origin of these symptoms? By pressing over the great prominence of the stomach, we find the left portion of the solar plexus is irritated by an old dyspepsia, and very painful on pressure. There are patients who suffer for hours from attacks of pain, making them cry out; it is at the level of the two last dorsal or the first lumbar vertebræ, in the intervertebral spaces, and external to the transverse apophyses, that these pains appear in a very limited space; then they pass upward along the vertebral column, and may occupy all the intervertebral spaces, but may limit themselves to the neck or lumbar regions of the left side.

If we seek the explanation of these facts, we recognize that to the semilunar ganglion, through its branches sent to the cord, is due the excitation. This irritation of the cord produces no associated motor reaction, but reveals itself in disorders of sensibility and vaso-motor innervation. The irritation does not limit itself to the cord; it is transmitted to the brain, it may be directly, by the vaso-motor disturbances, and it produces that which we know as hypochondria. This is characterized by phenomena of sensibility, sadness, morbid fears, and lack of ability to persevere. Hypochondria never gets beyond these symptoms; the hypochondriac never goes so far as to commit suicide; he does nothing more than lament his condition. The cerebral state is the product of dyspepsia; it appears and disappears with it.

The solar plexus, called by the ancients the abdominal brain, may therefore react on the whole nervous system, brain, cord, and sympathetic. Thus the dyspeptic hypochondriac may be troubled with morbid symptoms in any part of his body.

Gout a Neurosis.—Dr. Dyce Duckworth closes a rather lengthy article in the April number of *Brain*, arguing for the neurotic theory of gout, with the following conclusions which sum up the principal points he offers:

1. I contend that the diseased conditions which are recognized as of unequivocal gouty nature, are primarily dependent upon a functional disorder of a definite tract of the nervous system, and that, thus, gout is a primary neurosis.

2. That there is much in the nature of the malady itself, and much evidence forthcoming by way of analogy, to warrant the conjecture that the portion of the nervous system specially involved is situate in some part of the medulla oblongata, where, possibly, may be placed a trophic centre for the joints.

3. That the gouty neurosis may, like others, be acquired, intensified, and transmitted; also, that it may be modified variously, and commingled with various neuroses; that it may suffer metamorphic transformation, or be altogether repressed.

4. That this diathetic neurosis imposes its type upon the affected individual in definite nutritional modes, affecting the assimilating and excreting powers, exhibiting marked peculiarities in nervous impressibility, and determining, in more or less degree, a physiognomy of the gouty.

5. That a large part of the phenomena known as gouty are due to perverted relations of uric acid and sodium salts in the economy, resulting from the morbid peculiarities mentioned under the last head. Thus, there is excess of urate of soda in the blood before and during gouty explosive manifestations, and there is determination (by nervous influence, in all probability) either of this salt to the affected part (Garrod), or there is a too frequent formation of it at these inflammatory points, whence it is deposited locally and also set free into the circulation (Ord).

The renal excretory power for uric acid appears to be temporarily inhibited as part of the process of gouty paroxysm. This measure of renal inadequacy would appear to prevail in varying degree as a part of the specific neurosal disorder. In chronic gout, when structural disease has occurred, either tubal, with deposition of urate of soda, or interstitial, with shrinkage of the organs, the renal inadequacy may admit of more mechanical explanation.

6. That in primary, or inherited gout, the toxæmia is dependent upon the gouty neurosis; is the outcome, in whatever degree, of it, and is, therefore, a secondary manifestation.

7. That in what I term secondary or acquired gout, the toxæmia is directly induced by such habits as overload the digestive and excretory organs, and constantly prevent secondary disposal of nutritional elements of food; that if, together with such toxæmia, distinctly depressing and exhausting agencies affecting the nervous system come into operation, the special neurotic manifestations of the gouty diathesis will occur, and be impressed more or less deeply upon the individual and his offspring.

8. That this theory of gout, better than any other, correlates all the known factors concerned in the production of the varied symptoms of the malady; and while it displaces its humoral pathology from the pre-eminence it has so long occupied, it takes full cognizance of it, and seeks to place it in a clearer relation to the phenomena of the disease.

9. That if it be desirable to refer various maladies to their distinct place

in pathology, without reference merely to their chemistry, histology, or neurology, the affection known as gout may perhaps most correctly be relegated, along with some others, to a class of diseases which may be termed neuro-humoral.

10. An argument is adduced from the *juvantia* afforded by colchicum, in favor of the theory which has been set forth.

Phimosis as a Cause of Nervous Symptoms.—At the meeting of the Section on the Practice of Medicine of the American Medical Association, at New York, June 1st (rep. in *N. Y. Med. Record*), Dr. Geo. M. Beard read a paper on phimosis as a cause of nervous symptoms, and gave the results of operative treatment in several of his cases. He stated that Lallemand had first brought this subject to professional notice, and to this author also belonged the credit of having organized this department of surgery and neurology. Dr. Beard then reviewed the literature of the subject, and finally formulated his conclusions as follows:

First—There were a large number of neurasthenic symptoms in addition to those previously referred to by writers. These might be caused or aggravated by phimosis, or the presence of this condition might interfere with their cure. Adherent or redundant prepuce might act in the same way. Among other symptoms Dr. Beard mentioned:

1, Morbid fears of various kinds, as fear of society, of places (topophobia), of being alone (monophobia), etc.; 2, dilated pupils and congestion of the conjunctivæ; 3, causeless and persistent flushing; 4, sweating of the hands; 5, palpitation and cardiac oppression; 6, twitchings of muscles—the so-called fibrillary contractions; 7, lumbar and dorsal pain and tenderness; 8, general or local itching; 9, great hyperæsthesia of the urethra; 10, irritable prostate; 11, relaxed scrotum; 12, frequent and difficult micturition.

Second—There might be a good deal of phimosis, and the prepuce might be both redundant and adherent from birth, without exciting any nervous symptoms that could be traced to these conditions. In at least one-half of the healthy adults there was either phimosis or redundancy of the prepuce, with or without adherence.

Third—When the nervous system had become depleted of its force, then this local irritation from phimosis or allied conditions might become the excitant or aggravant of nervous symptoms.

Fourth—The great points in the operation of circumcision in these cases were thoroughness and care of details.

Fifth—Immediate or startling results were not to be expected.

Sixth—Long confinement after operations of this kind was not always necessary.

Seventh—Keeping back the prepuce and stretching it was sufficient in some cases.

Eighth—It was not well to depend exclusively upon the operation for the cure of the symptoms that were connected with phimosis. Accessory and supplementary treatment might be needed.

This was the same as that employed for general neurasthenia, as described in the author's work on the subject.

Illustrative cases were then cited. Out of eighty cases of general and sexual neurasthenia, thirty-one cases, or over one-third, had either phimosis or adherent and redundant prepuce.

In studying this subject in a Russian bath establishment, it was found that at least one-half of the patrons had either phimosis or redundant prepuce.

LOCOMOTOR ATAXIA.—Prof. Berger, of Breslau, gives, in the *Centralbl. f. Nervenheilkunde*, for March, notices of two new points in the clinical history of tabes that have come under his own observation. The first has been noticed by him for many years, and consists in a peculiar condition of the cutaneous sensibility. In a number of ataxics in whom the disorder was regularly progressive and had reached the so-called paraplegic condition, there was found to be a perfect restoration of the general tact sensibility of the skin, which had before been impaired according to the usual course of the disease. At the same time the muscular sense was still affected, thus affording an additional proof of the independence of these two senses. The second peculiarity was observed in only a single case. A man, 46 years of age, who had the symptoms of pronounced locomotor ataxia, commencing ten years previously with fulgurant pains, cutaneous hyperalgesia, and local reflex contractions; then since six years, partial diplopia, vesical weakness, anæsthesia of the urethra and anus and incontinence of fæces. Some sexual weakness, numbness of legs and feet, and since four years marked ataxia, and on examination total anosmia was found, and complete absence of patellar and Achilles tendon-reflexes. He was put on nitrate of silver and hydrotherapy. A very remarkable improvement occurred under this treatment, considering the time the disorder had already existed and the fact that it was not syphilitic; but the most remarkable feature was the restoration of the patellar tendon-reflex. On the left leg, in which the other symptoms, and especially the anæsthesia, had nearly disappeared, this reflex was so marked that a very light percussion through the clothes promptly called it forth. On the right it was less noticeable. The return of this reflex, with the general improvement in this case, is interesting and suggestive. Dr. Berger seems to have had rare good luck with this patient, and it would be of interest to know the condition of the tendon-reflex in such other favorable cases as may occur or have occurred.

THE EFFECTS OF LIGHTNING passing through the body have been studied by Prof. Nothnagel in his usual thorough manner. In his experiments on rabbits he employed the discharge of a Leyden jar of 0.42 square metre metallic surface, which arrangement furnished a convenient and correct substitute for lightning. An insulated wire passed from the surface of the jar to the subcutaneous tissue of the rabbit, while another one connected the button during the discharge. In order to obtain positive success the author found it best to send from two to four successive discharges through the animal each time. The sensibility was tested with a couple of platinum needles connected with a DuBois coil, and introduced underneath the skin. The current was enforced until pain was manifested.

The result of experiments in which the discharge passed from the toes through the hind leg was only anæsthesia of the foot, without disturbance of motility. At the moment of the spark the muscles contracted, and a few seconds later the animal shrieked. The direction of the current was found indifferent. The anæsthesia was strangely limited, stopping exactly at the lower condyle of the tibia. In the fore-leg, similarly, the anæsthesia, when produced here, included only the phalanges and carpus. This peculiar limitation could be explained on physical grounds. Of all tissues skin and bones are the poorest conductors, while muscles rank amongst the best. Hence the largest portion of the current will pass through the muscles, whenever they constitute a part of the conducting mass. A sufficient density of the current to produce anæsthesia can hence be attained only in those parts where the diameter of the conductor is least and where no muscular tissue exists, as the foot or tail. Stronger discharges, hence, than those Nothnagel could command would be necessary to generalize the anæsthesia.

The anæsthesia disappeared within one to two hours after the experiment. It was sometimes followed by slight hyperæsthesia. The rapid vanishing proves that it is not due to any coarse anatomical lesion. In some few experiments, when very intense discharges were employed, there occurred also some paresis of the hind legs, of about the same duration. Even though the paresis may not be marked, the author found by direct test a diminution of the faradic excitability of the motor nerve.

The experimental work was undertaken with the intention of explaining the following clinical case:

A man had been struck by lightning during the year 1873. Unconscious during the night, he recovered fully in the morning, but could not use his right hand, which remained cool and insensible. He was treated electrically, probably with the induced current, for some ten weeks without change, until suddenly sensibility returned within two days. Last October the hand again became paralyzed quite suddenly. He entered the clinic the present January. The right hand was found pale and cool. There existed considerable atrophy of the inter-ossei muscles and of the musculature of the little finger and thumb. The movements of the wrist are impaired and the fingers are almost completely paralyzed. Tested electrically, the reaction is the same on both sides, with the exception of the muscles of the hand. The electro-muscular sensibility is also lacking entirely. The hand is completely anæsthetic, the insensibility ending abruptly in a circular line including the star-like processes.

Five days' treatment with galvanic and faradic currents proved useless. Hereupon the large horseshoe magnet was pressed against the back of the hand, for the sake of experiment. Within forty-five minutes the patient felt a feeling of formication. In five and a half hours the surface covered by the magnet had recovered its sensibility, which spread still further on removing the magnet. The following day the sensibility was even more complete and the motility returning. For a few days the magnet was applied for several hours daily, resulting in a complete cure within less than two weeks. The atrophy likewise had noticeably diminished. At no time was the transfer of sensibility observed.

Anæsthesia of the Digestive Tracts in Lypemania.—Dr. H. Mabille, adjunct physician to the asylum of Ville-Evrard, concludes the second part of his paper entitled "Clinical Study on Some Points in Lypemania," which gained him the *Annales Médico-Psychologiques* prize for 1879, in the April number of the *Annales*. It treats of the loss of sensibility of the digestive canal in certain melancholic cases, discusses their mechanism and treatment, gives illustrative cases, and sums up in the following conclusions:

1. Apart from peripheral anæsthesia there is frequently in the lypemaniacs, principally among the class of sitiophobes, partial or total sensory paralysis of the digestive canal, which it is possible to determine up to a certain point.
2. This paralysis appears to be consecutive to the refusal of food.
3. Nervous exhaustion from emptiness and the sudden distension of the stomach by alimentary substances seem to be the principal causes.
4. This condition of anæsthesia prevents assimilation, diminishes the patient's strength, and may allow the general feeling of hunger to persist, despite the ingestion of sufficient food to preserve life, this, with anæmia, aggravating the patient's delirious condition.
5. These accidents may be prevented by practicing catheterism early on the patient's refusal of food and the slow ingestion of alimentary substances into the stomach.
6. Tincture of nux vomica will relieve the constipation, and when the anæsthesia is established, pepsin, nervous excitants, and electricity will overcome it in a majority of cases.

The Conjugate Deviation of the Head and Eyes.—The following are the conclusions of a lengthy article by Dr. L. Landouzy in the *Progrès Médical*, 1879, Nos. 36, 37, 41, 42, 43, 46, 48, and 49:

The parallel study of the conjugate deviation of the head and eyes, made in patients in whom it occurs, associated with convulsions, and in those in whom it accompanies paralysis, permits us,

1st. To form a correct idea of the symptom, observed either by itself or in its relations with all the other symptoms due to cerebral lesions.

2d. To show that the first of these classes (epileptic hemiplegics) look toward their convulsed members and from the side of the lesion, and

3d. To show that in the second class of patients (paralytics) the version is toward the injured side of the brain, and away from the paralyzed members.

4th. To penetrate the pathology of the symptom, since the conjugate deviation appears to be due,

a. In the convulsed patients, to a functional excitation which has the same relation to the conjugate deviation as it has to the convulsion of the face and limbs.

b. In the paralytics to suppression of functions of muscles producing alike the deviation and the facial paralysis.

c. In patients passing successively into opposite conditions of deviation, from functional excitations which are followed by functional exhaustion.

5th. To furnish a new theory for this conjugate deviation.

6th. To apply to it the same pathology as to convulsive or paralytic disorders of the face or members, *i. e.*, to substitute for the notion of excitation at a distance (Prevost) the idea of a direct personal action implying the existence of encephalic centres for the oculo-cephalic rotatory function.

7th. To next explain the deviation in these convulsive cases, by an incitation, which, produced *loco dolenti*, causes conjugate rotation on the opposite side, to explain the deviation of the paralytics, by the suppression of motor functions, *loco dolenti*, whence rotation in the contrary sense by the isolated play of the functions of the sound hemisphere set in action and unopposed.

8th. To completely assimilate the deviations, convulsive or paralytic, to convulsive or paralytic disorders of the face and limbs.

9th. To search next for the motor centres for the conjugate deviation, as in cases of epilepsy and facial hemiplegia, since in this condition they will be the rotatory centres.

10th. To be guided by experimental research and human pathological anatomy, to use, in short, those observations in which the manner of beginning, the grouping, succession and association of symptoms are so well specified as to prove for the oculo-cephalic rotators in man, a seat confined to the foot of the lower parietal lobule.

11th. To admit, as starting from this centre, convulsivant or paralytic influences which form the modalities of this deviation.

12th. To trace as far as to the pons the routes of the rotatory impulses, since the lesions extended from the cortex of the upper pons reveal themselves by a symptomatic equation identical in lesions of like quality.

13th. To infer that in their intra-cerebral track the relative position of the rotatory nervous tracts ought to remain the same as upon the cortex, since in capsular ganglionic and peduncular lesions and in those of the cerebrum ovale, the conjugate deviation appears joined to the ordinary hemiplegic phenomena, as it is in-cortical lesions.

14th. To infer that to be contiguous upon the cortex, as in their cerebral tract, the rotatory tracts preserve their individuality and independence, since ocular deviation and cephalic rotation may appear isolated.

15th. To be sure that deviation of the head is caused by the intermediary of two nervo-muscular structures.

a. Flexion and rotation of the head on the side of the contracted muscles, splenius, rectus posticus, major and minor, and great oblique innervated by the cervical plexus.

b. Slight flexion and forced rotation of the head on the side opposite to the contracted muscles, by the play of the trapezius and sterno-cleido mastoid innervated by some of the cervical nerves and the external branch of the spinal.

c. Sterno-mastoidal rotation of the head (customary in conjugate deviation of the head and eyes) is accomplished in such a manner that it is opposed to the sterno-mastoid which produces it; so that it results in the convulsed person from a contraction of the mastoid on the side not convulsed; among paralytics from the contraction of the mastoid on the side paralyzed.

16th. To be sure that in these cases the rotation of the head shows the action, not of the cervical nerves, but of the spinal.

17th. To be sure, in conclusion, that in these cases the spinal is convulsed or paralyzed on the side on which the cerebral lesions occur.

18th. To be sure that the conjugate deviation of the eyes is caused by the play of the rectus externus on one side combined with the play of the rectus internus on the other side; muscles set in action by the sixth pair of nerves.

19th. To be sure that convulsions and paralyses of the sixth nerve are on the side opposite the cerebral lesions.

20th. To then utilize the cephalic and ocular deviations to search out the cerebral connections of the eleventh, the sixth, and certain cervical pairs of nerves.

21st. To utilize the conjugate deviation as a means of fine dissection to track out the cerebral connections of the sixth and eleventh pairs, as we have been able to use facial epilepsies and hemiplegias for the inferior facial nerve.

22d. To use the rotation of the head for the recognition of an intra-cerebral track and *personal* connections to the external branch of the spinal, distinct from the track and relations of the internal branch.

23d. To conclude from the *inverse* modalities of the cortico-peduncular and bulbo-protuberantial conjugate deviation, that, at a certain point in the isthmus, the direction of the eleventh pair ought to change, since the cephalic rotation is reversed according as the lesion is cortico-peduncular or meso-cephalic.

24th. To presume from the syndromes of symptoms and the lesions that produce them, that the course of the eleventh pair may be at once direct and crossed; direct as far as the upper portion of the pons, crossed in its middle portion, and finally direct again at its entrance into the bulbar nuclei.

25th. Thus to be able to trace out the connections of the sixth and eleventh pair from the cortex to the medulla.

26th. To then understand the how and the why of the changes produced in these symptoms of conjugate deviation of cerebral, pontine, or bulbar origin.

27th. To prove the necessity of introducing into the symptomatology of conjugate deviation a nerve-element, that of *quality* of the lesion, since to this quality is attached, in part, the form of the deviation, as a lesion of different quality would give, for an identical location, a different symptomatic result; thus, a *cerebral* lesion of irritative quality would produce a convergent deviation to the convulsed limbs, while a lesion of the same quality, but situated in the pons, would cause the deviation to be divergent from the convulsed members, and inversely a paralytic cerebral lesion produces a deviation away from the paralyzed limbs, and a paralytic pontine lesion one toward the same (formula of Desnos).

28th. To make sure that, with the combined ideas of locality and quality, we are in a position to understand and to interpret all the forms of conjugate deviation, that is to say to apprehend their semiotic value.

29th. To see that to obtain a notion of the locality of the lesion it will suffice to observe the deviation less by itself than in its relations with all the symptoms that accompany it.

30th. To understand how the deviation,

a. Is only symptomatically one of the letters of the cerebral alphabet, by means of which are formed the infinite varieties of clinical syndromes.

b. That as it may result from lesions anywhere between the cortex and the medulla, its semiotic value is connected with an infinite number of anatomo-pathological combinations, and consequently it can only furnish the elements of a regional diagnosis when combined with other pathological phenomena, therefore it is incorrect to seek in the conjugate deviation a pontine equation; that for the anatomical connections of the eleventh and sixth pairs it follows that the conjugate deviation, viewed by itself alone, signifies only an encephalic lesion, and that, observed in connection with other symptoms, it serves to diagnosticate at once *the seat and the quality of the lesion.*

31st. To understand how this double semiotic value of this conjugate deviation is completely embodied in the following *formula*, which I propose, since completing the laws of Vulpian, Prevost, and Desnos, it meets all the known conditions of the oculo-cephalic deviation:

A. "A patient who turns the head and eyes toward his convulsed members has an irritative hemispheric (cortico-peduncular) lesion;

B. "A patient who turns away his head and eyes from his paralyzed members has a paralytic hemispheric lesion;

C. "A patient who turns his head and eyes towards his paralyzed members has a paralytic protuberantial lesion;

D. "A patient who turns his head and eyes away from his convulsed limbs has an irritative protuberantial lesion;

E. "A patient who turns his eyes alone toward his paralyzed limbs has a paralytic lesion in the middle or lower portion of the pons (lesion involving the sixth, and not the eleventh pair of nerves)."

32d. To perceive that if we substitute a new theory for that proposed by MM. Vulpian and Prevost, the law that the latter has formulated in his remarkable thesis, for the semiology of the conjugate deviation, remains absolutely true as regards paralytic cases; that this law *is not liable to exceptions* if we complete and supplement the eleventh conclusion of M. Prevost,

1. By the terms *paralyses.*
2. By our formulas A and D, taking account of the double forms of the conjugate deviation presented by patients affected with convulsions from hemispheric or pontine lesions.

33d. To understand, finally, why, if the preceding semiological, anatomical and physiological deductions are correct, we may say that the minute analysis of the symptom of conjugate deviation has served for the recognition of the *strategic route* by which pass through the brain the majority of incitations to the sixth and eleventh pairs, since, as the clinic teaches us, the conjugate deviations of the head and eyes of cerebral origin are, by themselves alone, much more common than all those from the meso-cephalon and medulla united.

Epileptic Insanity.—In an interesting paper on "Some Not Generally Known Forms of Mental Alienation Related to Insanity," in the *St. Louis Clinical Record* for March, Dr. E. C. Spitzka discusses the various forms of insanity related to epilepsy, and the classifications of the same of Falret and Samt, of which he gives an outline. After noticing the division by Samt of these cases into simple post-epileptic stupor, post-epileptic conditions of fear or fright, and post-epileptic maniacal moria, he says, "under the head of chronic protracted epileptic insanity he describes many cases which are evidently related to the post-epileptic forms. On the other hand, I have observed some cases in which gradually increasing verbigeration, delirium of a religious tinge, or maniacal attacks with or without intervals of stupor, confusion and automatism, preceded the outbreak of a convulsion or its equivalent. Just as the forms characterized in Samt's classification were designated post-epileptic, these latter, noticed by myself, and which are far from infrequent, deserve being designated as *prodromal* or *pre-epileptic.* If the chronological relation of the mental disturbance be made a principle of classification, then I think much confusion could be avoided by adopting the following:

1. "The epileptic psychical *equivalent*, which replaces the convulsive attack.

2. "The acute post-epileptic insanity which almost immediately follows the convulsive attack (including the ordinary post-convulsive stupor as a part of the attack), or the psychical equivalent of such convulsive attack.

3. "The pre-epileptic insanity which precedes the outbreak of a convulsive attack or its equivalent, and increases up to the moment when the paroxysm explodes.

4. "The purely intervallary epileptic insanity, which neither immediately following nor preceding a paroxysm, occurs in the interval between such. It is possible that all such cases are, after all, equivalents of imperfect convulsions, but as long as the relation cannot be clearly established it is well to provide a category for the reception of such doubtful cases.

"It is possible for all these four to occur together, and in addition there is very apt to be a background of chronic protracted epileptic dementia to complicate the picture. It is only when epilepsy is recent that the above forms are found in an unmixed state; as the disease progresses we are very apt to find that the post-epileptic *grand mal intellectual* of Falret and Samt is in intimate association with a 'replacing' attack of violence. Such cases, lasting with their correlated stupor, delirium and confusion for entire weeks, figure as 'epileptic mania' in our asylum records, although *moria*-like symptoms and genuine exaltation be entirely out of the question!"

The paper then gives the account of two cases, interesting as well in a medico-legal as a pathological point of view, and concludes with a discussion of the subject of the civil capacity of epileptics. Dr. Spitzka points out that it is not so much the occasional attacks of epileptic mania or hallucinations that are likely to invalidate the testamentary capacity of an epileptic, as the general mental depreciation, defects of memory, and loss of independency of will, and the lack of proper appreciation of acts, which are often the result of long continuance of the disease. The article is a very instructive and valuable one.

The Condition of the Pupil in General Paresis.—The following is the abstract of a recent *brochure* by M. Doutrebente, as given in *La France Médicale*, of May 5:

There is, for the movements of the ocular globes, an excito motor centre in the inferior parietal lobe, but some experiments have proved to M. Doutrebente that the electric excitation of this portion of the cortical motor zone causes no modification of the pupillary orifice, whilst the eye and eyelids are aroused to tumultuous movements.

Every one knows that the great sympathetic is the dilator of the pupil, and consequently the antagonist of the motor oculi. M. Francois Franck has recently shown the existence of a sympathetic nerve twig leaving the superior cervical ganglion and passing through the foramen lacerum posterior to join the Gasserian ganglion after having sent a branch to the external motor oculi.

In case of pupillary inequality, the dilated orifice is affected with predominant functional troubles. M. Doutrebente thinks that the grand sympathetic under the influence of a congestive or sclerosed condition is responsible for the pupillary inequality in general paralysis. When there is an exaggerated contraction there is, according to him, a chronic irritation of the real origins of the motor oculi communis.

As regards the clinical side of the subject, there was observed in ninety-five per cent. of cases of general paralysis either pupillary inequality, exaggerated contraction, or abnormal dilatation. As a special point, M. Doutrebente found with other observers, that the left pupil was more dilated than the right in two-thirds of all the cases.

In ninety-five general paralytics observed between the tenth and fifteenth of March, 1878, at the asylum of Ville-Evrard, only nine, or 9.7 per cent. had never presented any pupillary abnormality. In the ninety-five examined, there were seventy cases of pupillary inequality, twelve cases of contraction to a millimetre and less, four cases of abnormally dilated pupils to the width of five to nine millimetres, and nine in a normal condition. Of these nine cases, five were found to have been wrongly diagnosed as general paralytics, therefore only in four were the pupils really normal.

Of these ninety paralytics observed by M. Doutrebente, three were affected with cataract, two with exophthalmia, and only one with blepharoptosis with mydriasis on the left side.

Purpura a Neurosis.— Dr. J. Magee Finney, *Brit. Med. Jour.*, May 29, after reporting two cases of purpura hemorrhagica and discussing the pathology of the disease, says:

"My own view as to the pathology of purpura is that the nervous system is primarily at fault, and that, through the influence of the vaso-motor system, the blood and the capillaries are secondarily affected. The following reasons occur to me as justifying such a conclusion:

1. "The majority of the cases of purpura present a history pointing to some nerve waste, such as over-exercise, fatigue, and mental emotion.

2. "The prominent symptom at the onset of the disease, long prior to the occurrence of cutaneous hemorrhages, throughout its course, and for some time after the cessation of all bleeding, is that of exhaustion, muscular weakness, and fatigue; and this holds good, whether or not the attack be accompanied with pyrexia.

3. "The analogy which exists in the acknowledged influence of the sympathetic nerve over cutaneous eruptions, such as erythema and herpes, and the altered pigmentation in pregnancy, leucoderma, and Addison's disease.

4. "The symmetry of the eruption; the rapid manner in which purpura at times makes its appearance; and the still more remarkable way in which further hemorrhages are abruptly arrested while the patient is exposed to the same circumstances, hygienic and dietetic, and while the constitution of the blood, it must be acknowledged, can hardly have undergone any alteration.

5. "The close connection between disease of the cerebro-spinal centres and purpura, such as was manifested in that malignant purpuric fever, (Stokes), or cerebro-spinal fever, which, as an epidemic, visited Dublin in 1868–9, the fell influence of which still clings round our patients, and complicating nearly every disease of a febrile type, renders prognosis most difficult and treatment too often futile."

Plumbism.—The following are the results of an investigation into the toxic effects of lead, by M. Delaunay, as reported to the Soc. de Biologie, May 9, and published in the *Gaz. des Hopitaux*. As will be seen he takes up separately each modifying accident as well as each action of the metal:

Race.—"The inferior races are less affected by lead than are the superior ones. Thus, according to M. Dutrouleau, the black races are exempt from lead colic.

Sex.—"Women, says Tanquerel des Planches, are much less subject to the accidents from lead than men. This agrees with a special predisposition of their organism. M. Malassez has observed that, all other things being equal, the red globules are more numerous in the woman poisoned with lead than in the man under the same conditions.

Age.—"According to Tanquerel des Planches, the age of forty years is the one most subject to the accidents of plumbism.

Constitution.—"Plumbism affects the strong more than the weak. We never meet with the symptoms of lead poisoning among consumptives. A person is affected by lead because he is strong and is not phthisical for the same reason, and *vice versa*. Hence the antagonism observed between plumbism and phthisis.

Side of body.—"In right-handed persons lead affects the right side of the body and the left hemisphere more severely than, and before, it affects the left side and the right hemisphere.

Organs of body.—"In adults lead affects the organs of animal life more severely than, and before, it affects those of organic life. According to Empis and Robinet 'the metal has an elective affinity for the brain and collects in it in great quantity.'

Functions.—"The character of the food, excitants, alcohol, etc., the dependent situation of the affected organs that normally increases its nutrition, all aggravate the accidents of plumbism. Menstruation on the other hand, by lowering nutrition diminishes them or makes them to disappear.

"Lead affects the organs in proportion to their functional activity, and first affects those that are most active. Thus it strikes the organs of vegetative life in the infant (Tanquerel des Planches) and those of animal life in the adult. Lead colic is specially felt after a meal, and seems proportional to the richness of the diet and the functional activity of the digestive organs. Lead first affects the superior members in workmen who use their hands, the legs in those who use their feet, the larynx in singers, etc.

"In the various occupations subject to plumbism, the muscles that are most employed are the ones most severely poisoned. If lead paralyzes the extensors in house painters, it is because in this occupation the extensors are used incomparably more than the flexors. In fact when they use vertical strokes, the motion that raises the brush charged with paint and weighing two kilogrammes; is much more fatiguing than the reverse motion which is favored by the weight of the tool. The paralysis of the extensors is observed, therefore, in workmen who employ these muscles, like house painters, compositors, who lift type, etc., but not in those who do not employ them, such as makers of white lead, carriage painters, etc. In carriage painters, indeed, it is the horizontal motions (such as they employ in their work) that are rendered impossible by the paralysis, while in house painters the vertical motions are affected.

"Lead has not, therefore, as it has been claimed, the special power to paralyze the extensors. Moreover, extensor paralysis is produced in other forms of metallic poisoning (mercuric, cupric) always in a ratio with the greater exercise of the extensor muscles.

"Lead affects individuals not only according to their functional activity, but also in proportion to their development. Thus it renders the infants ot lead poisoned individuals, that are not destroyed by it during fœtal life, idiotic or epileptic. By the same reason we see how it retards the cicatrization of wounds.

Surroundings.—"All the surroundings that increase nutrition aggravate he saturnine accidents. Thus act night, winter, cold climates.

Diseases.—"Plumbism is aggravated by certain diseased conditions, such as traumatisms and the phlegmasias in which the intensity of nutrition is augmented. The acute or chronic inflammation of an organ, by attracting the blood thither, predisposes to the manifestations of saturnism. A violent contusion arouses lead colic.

"On the other hand the effects of lead are diminished in diseases that lower nutrition, such as phthisis, etc.

Conclusion.—"Lead affects especially the best nourished individuals (superior races, males, adults, etc.), and being aided by all circumstances that augment the nutrition, acts in direct ratio to the nutrition.

"The blood being intoxicated, poisons instead of nourishes, and affects the various organs in proportion to their nutrition, affecting those most that normally it best nourishes, and those least that normally receive the least nutrition."

INTERMITTENT SUPRAORBITAL NEURALGIA.—In the *Centralblatt f. Nervenheilk.* (No. 11, 1880), Dr. Seeligmüller, of Halle, reports a dozen cases of this affection, with a treatment of decided efficacy. In all instances the attacks commenced daily with remarkable punctuality. They lasted generally two to three hours, rarely longer. The pain was intense. There existed, moreover, tenderness of the supraorbital nerve and hyperæsthesia of the skin of the forehead.

The patients varied in age between the twentieth and fortieth year. The author reminds us in this connection, that according to Henle, the frontal sinus does not exist until the second year of life and continues to develop even after maturity. As regards sex the disease involved mainly males. With two exceptions the patients were residents of Halle, a city entirely free from malarial influence. Moreover, quinine had been previously taken by some of the sufferers in large doses but without relief. The malarial nature of the affection must hence be denied.

Dr. Seeligmüller agrees with Horner (who has lately published many cases) in attributing the pain to a catarrh of the frontal sinus. His reasons he states as follows: In most cases nasal catarrh had been or was still present. The passage of air through the nose was obstructed and with the removal of the pain, the nostrils became again pervious. Moreover the effect of the treatment confirmed this view. *The use of the nasal douche proved successful in every instance.* Usually less than three days sufficed for the complete cure. The fluid employed was the ordinary solution of salt, or simply warm milk. It was used in the evening and again an hour before the expected attack. Wherever the nostrils were found occluded a sufficient pressure was used to force the fluid through. The author attributes the relief to the mechanical emptying of the frontal sinus of the retained secretions. He makes no attempt to explain the astonishing regularity in the time of the attacks.

THE PARALYSES OF PHTHISIS.—M. Beringier, former *interne* of the Paris hospitals, has lately published a *brochure* on certain forms of paralysis met with in advanced phthisis, which is thus noticed in *La France Médicale*, No. 36, May 5:

There exist, in chronic pulmonary phthisis, says M. Beringier, more or less extensive paralyses, having various cerebral lesions as their cause. These paralyses generally supervene at an advanced stage of the disease.

They appear in three different ways: they are sometimes preceded by an apoplectic attack; at other times they appear suddenly, but are not attended with any loss of consciousness; frequently they develop slowly and progressively.

They nearly always take on the characters of cortical paralysis; they may be accompanied with convulsions, contractures, or certain transient disorders of sensibility. The paralysis may be either hemiplegic, monoplegic, or irregular. As hemiplegia it is often incomplete. When only one member is affected it is nearly always the superior. Aphasia is not infrequent.

The lesions met with are: 1. Localized tuberculous meningo-encephalitis; 2. Foci of superficial or deep softening due to thrombosis by alteration of the vascular walls or to an embolism.

When they are superficial, these lesions occupy by preference the motor zone of the convolutions. These paralyses must be distinguished from those due to final tuberculous meningitis. Frequently they simulate the beginning of a cerebral hemorrhage. They must not be confounded with motor disorders of peripheral origin. Their prognosis is always grave; they hasten the death of the patient.

Sexual Neurasthenia.—Dr. George M. Beard, in a note on sexual neurasthenia, *Detroit Lancet*, April, after giving accounts of a number of cases, concludes as follows:

1. Sexual neurasthenia is a disease of great and increasing frequency and importance, and though closely involved, as a cause or effect, with general neurasthenia, is yet sufficiently individual and distinct to entitle it to the most prominent position among the sub-varieties of the nervously exhausted state. The chief, but not the only exciting cause, is sexual excess, in the natural or unnatural way, especially when begun in early life, prolonged and teasing continence with mental excitation and *sudden* changes in sexual habits may act as causes. Widowers are liable to be affected.

2. The diagnosis is made, not so much by any one symptom as by groups of symptoms considered in their relation to each other. These symptoms are connected in part with the reproductive organs, in part with the general nervous system. There is frequently, though not always, true spermatorrhœa—flowing away of spermatozoa in the urine—and there may or may not be involuntary emissions by day or by night.

3. Cases of this kind are variously diagnosticated, as cerebral congestion, as cerebral anæmia, as cerebral hyperæmia, as spinal congestion, as spinal irritation, as hysteria, as hypochondria, as melancholia, as mania in its different forms, as oxaluria, as dyspepsia, as catarrh of the stomach, as biliousness, as reflexes from the eyes, as incipient "softening of the brain," as imagination, according to the different views of different practitioners.

4. The treatment should be both general and local, and should be carried out with resolution and with especial adaptation to the needs of each case. Neither local nor general treatment should be used to the exclusion of the other, as they supplement each other; but if but one be employed, it should be the general treatment.

Under the two methods combined, simultaneously or in alternation, the causes of sexual exhaustion can be relieved, and many, if not the majority, can in time be substantially cured.

The following are the titles of some of the recently published papers on the Pathology of the Nervous System and Mind, and Pathological Anatomy:

Folsom, Cases of Insanity and Fanaticism, *Bost. Med. and Surg. Jour.*, Mar. 18.—Channing, The Study of Psychological Medicine, *Ibid.*, Apr. 1.—Crothers, Cerebral Trance, or Loss of Consciousness and Memory in Inebriety, *Quart. Jour. of Inebriety*, Jan., 1880.—Fisher, Insane Drunkards—Their Medico-Legal Relations, *Ibid.*—Arnold, Chronic Tobacco Inebriety, *Ibid.* — Hill, Nervous and Neuralgic Affections Symptomatic of Defect of the Eye, *Med. & Surg. Reporter*, Apr. 3. — Cattani, The Localization of Lesions in the Tempora-Sphenoidal Lobe of the Brain, *Gaz. degli Ospitali*, March 15.—Angear, Consumption a Nerve Disease, *St. Louis Med. and Surg. Jour.*, Apr. 5.—Mulhall, Hysterical Cough, *Ibid.*—Whittaker, Facial Paralysis, *Cin. Lancet and Clinic*, May 22.—Davy, St. Vitus' Dance and Kindred Affections, *Ibid.*—Ball, De là Folie Circulaire, *La France Méd.*, Nos. 32 and 33.—Spitzka, On the Scientific Necessity for a Clinical Demarcation of the Various Forms of Insanity, *The Med. Gazette*, May 15.—Gray, L. C., A Case of Paralysis of the Four Extremities and the Muscles of the Trunk Due to Myelitis of the Anterior Cornua of the Spinal Cord, *Proc. Med. Soc. Co. Kings*, May, 1880.—Beard, Nervous Diseases connected with the Male Genital Function, *N. Y. Med. Record*, May 8.—Eger, Beitrag zur Pathologie des Morbus Basedowi, *Deutsche med. Wochenschr.*, No. 13, Mar. 27.—Cassels, Report of a Fatal Case of "Gunshot" Wound of the Head, *Canada Med. Rec.*, May.—Wilkins, Case of Spinal Apoplexy, *Ibid.*—Helm, Spinal Meningitis, *Cincinnati Lancet and Clinic*, June 5.—Mitchell, Clinical Notes on Duchenne's Disease, *Phil. Med. Times*, May 22.—Beates, Insanity of Lactation, *Med. & Surg. Rep.*, May 15.—Lagardelle, The Diagnosis of *Manie Grave*, *Jour. de Med. de Bordeaux*, Apr. 24.—Beach, On Cases of Athetosis, *Brit. Med. Jour.*, June 12.—Bradford, Two Cases of Paralytic Affections in Children, with Remarks, *N. Y. Med. Jour.*, July.—Mattison, A Remarkable Case of Chloral and Chloroform Inebriety, *Proc. Med. Soc. Co. of Kings*, July.—De Watteville, On Facial Paralysis from Cold, with Special Reference to its Prognosis, *Practitioner*, May.—San Martin, Paralisis Agitante, *Cronica Med. Quirurg. de la Habana*, May.—Sayre, On Some Disorders Dependent upon Genital Irritation, *Med. News and Abstract*, June.—Beverly Robinson, On Various Forms of Functional Cardiac Disturbances, *N. Y. Med. Rec.*, June 26.—Hayden, Certain Varieties of Cardiac Neurosis, *Brit. Med. Jour.*, June 5.—Galvagni, Sugli Spasmi Ritmici Localizzati, *Rivista Clinica di Bologna*, Jan.—Arnold, Insanity Occurring in the Puerperal State, *Maryland Med. Jour.*, June 15.—Mendel, Ueber Anfälle von Einschlafen, *Deutsche med. Wochenschr.*, May 15.—Cattani, Due Casi di Lesione Cerebellare, *Gazetta degli Ospitali*, Apr. 30.—Bareggi, Casa di Emorragia Sottoaracnoidea della probabile Durata di circa un Anno con sordita completa di Lesione corticale e morte per Emorragia cerebrale, *Ibid.*, May 15.—Mauriac, Contribution á l'etude de la Syphilis Cerebrale, *Jour de Médecine de Bordeaux*, Feb. 28.

c.—THERAPEUTICS OF THE NERVOUS SYSTEM AND MIND.

Alcohol and Thermogenesis.—We give below the conclusions of a paper on the physiological action of alcohol in its relations to animal heat by Dr. W. Bevan Lewis, published in the *Journal of Mental Science* for April of the present year. The animals experimented upon were chiefly rabbits, which were weighed, observed with a calorimeter, and then put under the influence of dilute alcohol introduced into the stomach. The results were as follows:

1. A primary check to heat formation most marked and protracted when *small doses* of alcohol have been given.

2. A pronounced fall in body temperature most marked during the first quarter of an hour, and therefore coincident with the primary check to thermogenesis. (1.)

3. A greatly increased heat formation varying directly with the strength of the dose administered.

4. This increased heat product is manifested over a more prolonged period after larger doses of alcohol.

5. This increase in the heat product is gradually augmented from time to time, until the heat climax is reached, a period usually coincident with the registry of the lowest bodily temperature.

6. The heat climax is more protracted or postponed, and also greatest in degree with the stronger doses of alcohol.

7. The greatest loss of heat units from the temperature occurring, as before stated, during the first interval, subsequent intervals are marked by a still progressive loss, which, however, becomes less towards the period of heat climax, when a restitution of the *norma* of temperature begins.

8. With *small* doses of alcohol this restitution of body temperature is usually sudden, or comparatively rapid in operation; after *large* doses the return to the *norma* of temperature is spread over a longer period, being extremely tardy when very large doses have been administered.

9. These observations are directly in antagonism to the views already quoted (of H. C. Wood.—Ed.), that "*Alcohol in very large doses lowers temperature by directly checking tissue metamorphosis.*"

10. The above considerations appear to justify the conclusion that the *characteristic* action of alcohol is that of greatly increasing the heat product, while dispersion of the fresh formed heat is facilitated by peripheral vaso-motor paresis, and that it is only in very small doses that we get a temporary lowering of heat formation.

11. The action of chloral as affecting thermogenesis being similar to that of alcohol, we obtain by their combination a most powerful vaso-motor depressant, and one which should be used with great caution.

Pressure in Neuralgia of the Testis.—Dr. W. A. Hammond, *St. Louis Courier of Medicine*, May, gives an account of two cases of obstinate and extremely painful neuralgia of the testis, which he relieved completely and permanently by applying pressure to the spermatic nerve. The application was not excessively painful when made with sufficient force, and was continued in one case for four hours, during which the patient had the first undisturbed nap since the disease was fully established. Some temporary numbness followed the pressure, but nothing serious. To be efficient the pressure must be sufficient to destroy the axis-cylinders of the nerves. If less than this the pain will be aggravated.

Whether the operation causes atrophy of the testicle is not certain, but Dr. Hammond thinks that if the spermatic nerve is irreparably damaged it would occur. In cases where only one testicle is involved this is not of much consequence. But if both are affected the case is different, and other considerations may require attention. But in any event the operation, according to present experience, is a less serious one than castration, which has been recommended in these cases, and the probability of relief, without causing atrophy by irreparable injury to the nerve, is also to be considered. Dr. Hammond thinks that in time it is generally restored to perfect integrity.

Nitrous Oxide Gas.—Dr. A. McLane Hamilton, in the ***Maryland Medical Journal***, May 1st, recommends the inhalation of nitrous oxide gas in melancholia, anæmic headache, paroxysmal neuralgia, both facial and sciatic, certain cases of insomnia, dependent on overwork and general prostration, some forms of functional heart trouble, such as those connected with hypochondriasis, and the palpitations of chlorotic girls suffering from head troubles and ovarian irregularities, and also for the general functional disturbances following excess in tobacco or other stimulants, such as alcohol or opium. It is of course contra-indicated in cases in which the trouble depends upon cerebra' hyperæmia, in excitable hysterical cases, and in cases of organic heart trouble. In epilepsy he has not tried it, but thinks it may be good. Among other effects of the use of nitrous oxide is a marked increase in sexual power, which had been noted as much as thirty years ago by Ziegler. Dr. Hamilton has noticed this repeatedly. The susceptibility of patients to the effects of the gas was very different. In many as much as four gallons was required. Other patients exhibited curious motor symptoms, such as jactitations, twitchings of lips, etc., while no other evidences of intoxication were present. In only a few cases were there any unpleasant symptoms following the administration, caution being of course used in the selection of cases. Once or twice there was transient nausea, and in one patient who complained of sciatica there was some possibility that an attack of pain followed the administration.

Salicylate of Soda.—Dr. Francesco Gatti, *Gazetta degli Ospitali*, Feb. 29, reports a case of articular rheumatism to which was given eight grams of salicylate of soda in ten doses, one to be taken every hour by the mouth. A peculiar consequence of this medication in this case was a complete amaurosis, lasting about ten hours, with mydriasis; the latter disappearing more gradually than the former. At the same time no reaction characteristic of the presence of salicylate was met with in examination of the urine. Ophthalmoscopic examination showed no anatomical basis for the visual disorder. Though diminution of the visual power had been previously noted, this case of complete amaurosis adds another to the series of apparently formidable accidents that have been at times observed from the use of this drug, but which, like those of quinine, are not often really dangerous. The discussion of the case in the article is quite full.

Drugs in Epilepsy.—In the twenty-eighth annual report of the Derby County Lunatic Asylum, which has just been published, Dr. Murray Lindsay records the results obtained from the administration of certain drugs—sumbul, bromide of potassium, zinc, arsenic, nitrite of amyl, and nitro-glycerine—to a group of confirmed epileptics. The trials made of these drugs have not been sufficiently numerous nor long-continued to warrant any definite conclusions, but they have certainly afforded some interesting and suggestive results, and must encourage to further experiment. As might have been anticipated, Dr. Murray Lindsay has found that bromide of potassium is the remedy from which benefit is most surely and generally derived in chronic epileptics, and by which the frequency and severity of the fits is most certainly diminished. But, while according to this remedy the first place in the *rôle* of medicines useful in epilepsy, he assigns positions of subordinate but still material usefulness to nitrite of amyl and nitro-glycerine. The latter drug has not before been tried in epilepsy, and much interest therefore attaches to the provisional conclusion of Dr. Murray Lindsay and his colleague, Dr. Thompson, respecting it, that, while in some cases it decidedly aggravated the malady and increased the number of fits, in other cases—those in which there was marked anæmia—it conferred benefit and diminished the frequency and severity of the seizures. It was administered in doses of from one to ten minims of a one per cent. solution, and was pushed in some cases until its physiological effects—quickening of the pulse and throbbing of the arteries—were established. Even when taken continuously for three months, it had no ill effects upon the general health. Nitrite of amyl is, Dr. Murray Lindsay thinks, most useful when bromide of potassium fails to act. From sumbul, arsenic, and zinc he obtained no appreciable effects.—*Brit. Med. Journal*, June 12.

Tobacco.—Dr. E. T. Ely, *N. Y. Med. Journal*, April, gives the results of an examination of over one hundred workers in a tobacco manufactory. The principal object of the examination was to ascertain the effect, if there is any, of tobacco on the eyesight; but inquiries were directed also to the general condition and health of each individual whose vision was tested. The results were chiefly negative as far as indicating any actual disastrous consequences due to the occupation, and his impression derived from this and other experiences is, that tobacco has a comparatively slight influence in impairing the vision, and that working in it is about as healthy as other sedentary occupations, but that there might be persons especially subject to its noxious influences; and that especially when combined with other similar ones, the vision as well as the general health may be impaired by it. He also concludes that constant contact with this, as with other potent poisons, may beget a tolerance sufficient to contradict all theory. This fact being true to a certain extent, of course impairs the value of his observations on the tobacco workers, who had nearly all been some years in the business, and may be supposed to have acquired this tolerance. Indeed, there is no evidence that this accustomation is universally possible, and that there is not a sort of natural selection taking place in this employment, and that these persons were not the most insusceptible naturally to the effects of tobacco.

Morphia in Grave's Disease.—Dr. Robert Park, of Glasgow, Scotland, *Practitioner*, March, tells of a case of exophthalmic goitre to which he was called, and found the patient, a woman aged 36, suffering intensely from turbulent cardiac action, with systolic basal murmur, pulse 160, œdema of lower extremities, goitre, like a large melon, pronounced exophthalmus, and very distressing orthopnœa, she having been unable to lie down or be moved for six days and nights. The distress was so urgent, and other measures failing. he determined to give an injection of morphia, at the request of the patient and her friends, having first, however, warned them of the possible peril from this treatment. The solution used was of the strength of one-sixth grain per minim, and after he had injected one minim, and finding no relief after five minutes, he injected another, and continued to do this every five minutes (the syringe being *in situ* all the time) till, in all, twelve minims, or two grains, had been injected. The operation thus continued over an hour, and it was not till near the end of this time that any calmative effect was observed, and even then the pupils were still to some degree abnormally dilated. At the end of another hour, however, the patient had fallen into a quiet slumber, from which she could be easily aroused, and which lasted altogether only eight hours. At the next visit she was much better, and the same treatment of frequent hypodermic injections of one to two grains each time was kept up for a considerable time by himself and his successor in the case, and twelve months afterwards the patient was reported as "well and going about."

We do not advise this treatment, though it appears to have been successful in this case, which is remarkable on account of the tolerance of the dose in a patient not previously accustomed to it. The author does not give sufficient particulars to show just why such large doses of morphia were indicated.

Thalictrum Macrocarpum.—At the session of the Societé de Biologie, Paris, March 13 (rep. in *Le Progrès Médical*), M. Bochefontaine gave the results of the studies of M. Doassans and himself on the physiological action of the root of thalictrum macrocarpum (*Ranunculacœa*). A first series of experiments on frogs and dogs indicated the local effects of irritation, paralytic benumbing of the central nervous system, retardation or even arrest of the heart, and considerable emesis; and in addition to these, diminution of the motor excitability and contractility of the muscular system. Each time that the dose of the extract caused paralytic resolution, the animals succumbed.

The roots and their extracts were analyzed at the laboratory of Professor Wurtz by MM. Doassans and Hauriot, who isolated macrocarpine. and by MM. Doassans and Mourrut, at Prof. Vulpian's laboratory, where they obtained thalictrine. Macrocarpine is not toxic; it possesses some of the reactions of berberine. Thalictrine, on the other hand, is very active, and has the chemical constitution of the alkaloids. It produced the same physiological effects as the extract of the root, and in these seems to closely resemble aconitine.

Bromide of Ethyl.—In the *Detroit Lancet* for April, Dr. Isaac Ott publishes some experimental investigations of his own on the physiological action of the new anæsthetic, the bromide of ethyl. The experiments were performed upon frogs and rabbits, with DuBois's coil for irritating and Ludwig's electrodes. He found that the action was not a paralysant one on the motor nerves, but that the drug possessed the power to lower somewhat the irritability of striated muscle. No reaction followed irritation of the sensory nerves in the ethylized animal, but Ott concludes that these are not directly affected, but that the paralysis is purely spinal. In his study of the reflex action, he employed Tuerck's method of suspending the frog by a wire holder with its foot immersed in a solution slightly acidulated with sulphuric acid, which was immediatly washed off. The cerebrum was always removed In these experiments it appeared that ethyl depressed reflex activity as much with the higher inhibitory centres removed as with them in full action. This depression was not the result of weakened circulatory action, for the heart pulse was still frequent and active. The bromide of ethyl first slightly increases, then decreases the pulse-rate in frogs. In warm-blooded animals (rabbits) it was found to increase the pulse-rate and the arterial tension, the former through stimulation either of the accelerator nerves or the cardiac ganglia, most probably the latter, or the cardiac muscle itself, and the arterial tension seems due to stimulation either of the spinal vaso-motor centres or the peripheral vaso-motor system. The rate of respiration was decidedly reduced by the drug, while its depth was increased. This effect is due, the author holds, to an action on the central ganglia, and he thinks that the danger on the side of this function from the ethyl is quite small as compared with ether. It more nearly resembles nitrous oxide, and has advantages over it in the lesser arterial tension it produces, which is less likely to be followed by cerebral trouble. The proximate cause of the anæsthesia, he holds, is a chemical action on the grey matter of the nervous system. Asphyxia plays no part in its production. Comparing it with other anæsthetics in use, he concludes as follows:

1. "Chloroform increases the pulse, then slows it by a cardio-inhibitory stimulation; ether increases the pulse, nitrous oxide also increases it by paralysis of cardio-inhibitory apparatus, whilst bromide of ethyl increases the pulse by an action on the heart itself.

2. "Chloroform reduces the blood-pressure by paralysis of the main vaso-motor centre and cardiac debility; ether greatly increases it and keeps it increased; and nitrous oxide also increases it. Bromide of ethyl increases it either by a stimulation of the spinal or peripheral vaso-motor system.

3. "Chloroform increases and then decreases respiration; nitrous oxide reduces it. Bromide of ethyl decreases it by a central action."

BROMOHYDRATE OF CONIA.—The following are the conclusions of a memoir on the physiological action of the bromohydrate of conine, by J. L. Prevost, in the *Archives de Physiologie Normale et Pathologique*, Jan., Febr., 1880. The experiments on which they are based are detailed; the subjects were fowls, pigeons, frogs, cats, rabbits, etc.

1. The paralysis produced by the bromohydrate of conine is the result of the paralysis of the motor nerves, which also lose their excitability.

2. When we interrupt the circulation in the hind quarters of a frog, sparing the nerves of the part at the same time, and then introduce a dose of .015 to .02 (= ¼ to ⅓ grain) of bromohydrate of conine under the skin of the back, the nerves of the hind limbs remain excitable, and they react to excitations made upon the fore limbs in front of the ligature, these fore limbs themselves being paralyzed by the poison.

3. This experiment is made more striking by strychnizing the frog; we can then observe the effects of both drugs simultaneously on the same animal.

4. The pneumogastric is poisoned before the other nerves and regains its excitability more promptly upon the elimination of the poison.

5. The urinary, salivary and lachrymal secretions are excited by the bromohydrate of quinine.

6. I have been able to demonstrate experimentally the passage of bromohydrate of quinine in the urine. The urine of a cat poisoned by bromohydrate of conine, evaporated to the consistency of syrup, and injected under the skin of several frogs, produced in these animals the characteristic symptoms of poisoning by the drug.

7. The glandular nerves retain their excitability and provoke their secretions when the pneumogastrics and nerves of the striated muscles have lost their excitability under the influence of bromohydrate of quinine. Electrical excitation of the cervical sympathetic and the tympanico-lingual nerves produced a flow of saliva. The excitation of the peripheral end of the nerves of the limb produced perspiration in the sole of the paw when electrization of the nerve produced no motor reaction.

8. In warm-blooded animals poisoned by the drug and submitted to artificial respiration, the heart offers great resistance and is the last organ to succumb. It continues to pulsate longer than a normal heart after cessation of artificial respiration, or when separated from the body.

In rabbits and cats, direct electrization of the heart by a strong induction current does not produce paralysis when the poisoning has been carried to the extent of complete loss of the excitability of the sciatic. This experiment failed in a cock. When in rabbits the excitability of the sciatic is not altogether destroyed, electrization of the heart has succeeded in producing its paralysis, but repeated attempts have been required to produce this effect.

9. It is very doubtful whether the nervous centres are directly affected by bromohydrate of conine; the convulsions observed in warm-blooded animals in the last stage of poisoning are due to asphyxia resulting from the paralysis of the mechanical agents of respiration. These convulsions may be avoided by means of artificial respiration.

10. The muscular contractility is not affected by bromohydrate of conine.

Oxalate of Cerium.—Dr. Hobart Cheeseman, in a paper read before the Medical Society of the County of New York, *N. Y. Med. Record*, June 12, reports favorably on the use of oxalate of cerium to allay cough. It was for several months tried on a daily average of twenty-five patients in St. Luke's Hospital, suffering from phthisis in all stages of the disease. The oxalate was generally given as dry powder on the tongue, on an empty stomach, and the usual beginning dose was five grains, at bed-time or immediately on waking in the morning. As high as twenty grains at a dose was given in a few cases. Eight cases are given in detail, and in conclu-son he gives a *resumé* of the cases reported to the N. Y. Therapeutical Society, with the conclusions adopted by its committee. The latter are as follows:

1. Cerium oxalate may be given safely in doses of ten grains or more three times a day, for many days in succession.

2. The only symptom noted from such doses is a slight dryness of the mouth for the first few days.

3. It is probably more efficient when taken dry upon the tongue.

4. Its effects are not fully apparent until it has been taken two or three days and continued about the same length of time after its use is suspended.

5. For chronic cough it is best taken on an empty stomach early in the morning and at bed-time, with other doses during the day, if required; the initial dose for an adult being five grains.

6. It is in the majority of cases an efficient cough medicine, at least for a considerable time, and it is very valuable as an alternate with other drugs used for that purpose.

7. It does not disturb the stomach as do opiates and most other cough remedies, but on the contrary it tends to relieve nausea and to improve digestion.

8. The different preparations on the market are not of equal value, and when success is not obtained with one, another should be substituted.

Piscidia Erythrina, a New Narcotic.—Dr. Isaac Ott reports in the *Detroit Lancet* for June the results of an experimental study of the physiological action of the root bark of the Jamaica dogwood (piscidia erythrina). As the active principle has not yet been extracted, his experiments were made with an infusion obtained by extracting the alcohol from the fluid extract, by adding to an ounce of it an equal quantity of water, and then evaporating the whole down to about five drachms. Therefore, the preparation included many organic principles besides the active principle of the plant, but therapeutically the results were quite applicable. The fluid extract employed was reddish in color, like wine, and had an odor strongly resembling laudanum.

Besides the experiments on rabbits and frogs to determine the effects on the sensory nerves, the spinal and reflex action, the circulation, Dr. Ott administered to himself doses of the fluid extract sufficient to produce the effects of the drug, and noted his own symptoms. He found that it lacked the power of producing the pleasurable intoxication produced by opium, but was also devoid of the disagreeable after-effects of the latter. The sleep produced by piscidia resembles that due to a large dose of bromide of potassium. He sums up his own results as follows:

"It is evident from the preceding experiments that in piscidia we have a drug capable of producing death by arrest of the respiratory apparatus. Frogs seldom recover from a moderate dose of the drug. The following conclusions may be drawn:

1. "It is a narcotic to frogs, rabbits, and men.
2. "It does not affect the irritability of the motor nerves.
3. "It does not attack the peripheral ends of the sensory nerves.
4. "It reduces reflex action by a stimulant action on the centres of Setschenow.
5. "That it produces a tetanoid state by a stimulant action on the spinal cord, and not by a paralysis of Setschenow's centres.
6. "It dilates the pupil, which dilatation passes into a state of contraction upon the supervention of asphyxia.
7. "It is a salivator.
8. "It increases the secretion of the skin.
9. "It reduces the frequency of the pulse.
10. "It increases arterial tension by stimulation of the monarchical vaso-motor centre.
11. "This increase of pressure is soon succeeded by a fall, due to a weakening of the heart itself.

"If the action of piscidia is compared with that of chloral, it is found that the former has no dangerous action on the heart like the latter, nor such an energetic action like the latter upon the respiratory apparatus.

"Compared with atropia, piscidia, unlike the former, does not paralyze the motor nerves; it does not paralyze the chorda tympani; it does not arrest the sudoral secretion; it does not paralyze the pneumogastrics, and does not elevate greatly the arterial tension, but, like it, dilates the pupil. Compared with morphia, like it, it produces sleep, heightened excitability, spinal convulsions, general paralysis and stimulation of the main vaso-motor centre; unlike it, it dilates the pupil. In the use of the drug I would like to add the caution that its surface is pleasure and its depth death."

Bromide of Ethyl.—Dr. Isaac Ott, *Detroit Lancet*, June, ends an account of an experimental investigation (experiments performed on rabbits and with graphic apparatus) with the following conclusions:

1. Bromide of ethyl, by either inhalation or subcutaneous use, kills by a toxic action on the centres of respiration.

2. That the decrease of force and frequency of the heart contribute to the paralysis of the respiratory centres.

3. That injections of ethyl into the jugular toward the heart kill by cardiac arrest, probably due to an action on the cardiac muscles.

4. Bromide of ethyl in toxic doses depresses momentarily the frequency of the heart, followed by a subsequent permanent rise to normal rate.

5. Bromide of ethyl in toxic doses depresses the actual tension steadily, due in major part to the depressant action of the drug upon the heart, and in minor part to a partial loss of tone of either the spinal vaso-motor centres or the peripheral vaso-motor system.

6. The inhibitory power of the pneumogastric is not paralyzed.

The following are some of the articles recently published on the Therapeutics of the Nervous System and Mind:

MARION-SIMS, The Bromide of Ethyl as an Anæsthetic, *N. Y. Med. Record*, April 3.—DAVIS, Hints upon the Treatment of Paralysis in Early Life, *Boston Med. and Surg. Jour.*, March 25.—HALDEMAN, If Veratrum Viride is a Sure Antidote for Opium Poisoning in the Acute Form, may it not be in the Chronic? *Cin. Lancet and Clinic*, May 22.—FOWLER, The Surgical Treatment of Facial Neuralgia, *Ann. Anat. and Surg. Soc.*, May.—TERRILLON, De l'Anæsthesie générale par le Bromure d' Ethyle, *Bull. Gen. de Thérap.*, April 30.—BRAMWELL, Nerve Stretching as a Remedy for Sciatica, *Brit. Med. Jour.*, June 19.—JONES, The Physiological Action of Atropia as Demonstrated by Experiment, *N. O. Med. and Surg. Jour.*. June.—BERNABEI, Azione dell' Atropina sul Cuore Umano, *Rivista Clinica di Bologna*, February and March.—GRAY, Hyoscyamia in Insanity, *American Journal of Insanity*, April.—LINDSAY, The Protection Bed and its Uses, *Ibid.*

BOOKS, ETC., RECEIVED.

Handbuch der Physiologie. Herausgegeben von Dr. L. Hermann. Dritter Band: Physiologie der Sinnesorgane. Erster Theil: Physiologie des Gesichtssinns. Von A. Fick, W. Kühne, u. E. Hering. Leipzig, 1879. Zweiter Theil: Gehör. Von V. Hensen. Geschmack, Geruch. Von M. v. Vintschgau. Tastsinn und Gemeingefühle. Von O. Funke. Temperatursinn. Von E. Hering. Leipzig, 1880.

Fünfter Band, Erster Theil: Physiologie der Absonderungsvorgänge. Chemie der Verdauungssäfte u. Verdauung. Von R. Heidenhain, B. Luchsinger u. R. Maly. Leipzig, 1880.

Pathologie Clinique du Grand Sympathique. Étude baseé sur l'Anatomie et la Physiologie. Par le Dr. A. Trumet de Fontarce. Avec Planches intercalée dans le texte. Paris, 1880.

L'Hydrotherapie aux Bains de Champel (Pres Genéve). Par le Docteur Paul Glatz. Premiere Partie. Genéve, 1879.

De l'Influence de la Faradization Localisée sur l'Anæsthésie de Causes Diverses. Par A. Vulpian. Paris, 1880.

Sonnenstich und Hitzschlag. Als Monographie bearbeitet von Dr. G. H. Jacubasch. Berlin, 1879.

Lecons sur la Physiologie et l'Anatomie comparée de l'Homme et des Animaux, faites a la Faculté des Sciences de Paris. Par H. Milne-Edwards. Tome Quatorziéme et Dernier, Premiere Partie: Fonctions de Relation (suite). Paris, 1880.

Dictionnaire Encyclopédique des Sciences Medicales. Directeur, A. Dechambre. Premiere Serie: A–E. Tome XXV., Premiere Partie: Cystospores—Dalmas. Tome XXIV., Seconde Partie: Cuivre—Cystopus.

Troisiéme Serie Q–Z. Tome Huitieme, Premiere Partie: Scl—Scr.

A New Study of Cerebral Cortical Localization, The Effect of Willed Muscular Movements on the Temperature of the Head. The Essay to which was awarded the Prize of the Alumni Association of the College of Physicians and Surgeons, New York, March 12, 1880. By R. W. Amidon, A. M., M. D. (Reprinted from the Archives of Medicine.) New York, G. P. Putnam's Sons, 1880.

Twelfth Annual Report of the Inspector of Asylums, Prisons and Public Charities for the Province of Ontario, for the year ending September 30, 1879. Toronto, 1880.

The Annual Report of the Royal Edinburgh Asylum for the Insane, for the year 1879. Morningside, 1880.

The Conditions of the Unipolar Stimulation in Physiology and Therapeutics. By A. De Watteville. (Reprint from "Brain," Part IX.)

Ein schwere Fall von Prosopospasmus mit ungewöhnlichen Verlaufe. Von Prof. A. Eulenburg. (Separat-Abdruck aus dem Centralblatt für Nervenheilkunde, etc. 1880. No. 7.)

The American Medical College Association. Fourth Annual Meeting held at New York City, May 31st and June 1st, 1880. Detroit, 1880.

The Future Influence of the Johns Hopkins Hospital on the Medical Profession of Baltimore. By John Van Bibber, M. D. Baltimore, 1879.

The Abuses of Medical Charities. By M. P. Hatfield, M. D., and Roswell Park, M. D. (Reprinted from the Chicago Medical Gazette, March, 5, 1880.)

The Relations of Communities and States during Epidemics. An Address by Hon. J. B. Eustis, New Orleans, March 19, 1880.

The Coincidence of Optic Neuritis and Subacute Transverse Myelitis. By E. C. Seguin, M. D., New York. (Reprinted from the Journal of Nervous and Mental Disease, April, 1880.)

A Case of Intra-Ovarian Pregnancy with a Post-Mortem Examination. By Talbot Jones, M. D. (Reprinted from the American Journal of Medical Sciences.) Philadelphia, 1880.

The Brain in Health and Disease. By Edward C. Mann, M. D. (Reprinted from Virginia Medical Monthly for May, 1880.)

Ovarian Tumors. At What Stage of the Disease is it the Proper Time to Operate? By Edward Borck, M. D. St. Louis, 1880. (Reprinted from Cincinnati Obstetric Gazette, March, 1880.)

By the Same Author: Compound Dislocation of the Wrist. (Reprinted from the Transactions of the St. Louis Medical Society, February 28, 1880.)

By the Same Author: Diseases of the Maxillary Sinus. (Reprinted from the Indiana Medical Reporter. Evansville, Indiana, April, 1880.)

Can the American Medical Association afford to discriminate between Medical Men as is now done by its Code of Ethics? By C. R. Parke, M. D. (Reprinted from St. Louis Medical and Surgical Journal, April 20, 1880.)

On Coccygodynia. By Edward W Jenks, Chicago, 1880. (Reprinted from the Medical Record of New York, April 17, 1880.)

By the Same Author: The Treatment of Puerperal Septicemia by Intra-Uterine Injections. (Reprinted from Volume IX., Gynecological Transactions, 1880.)

A Reply to Criticisms on "The Problems of Insanity. With Remarks on the Gosling Case." By George M. Beard, A. M., M. D. (Delivered before the New York Medico-Legal Society, April 16, 1880.)

On the Relations of the Medical Profession to the Trade Interests of the Materia Medica, and a Note on Pepsin. By Edward R. Squibb, M. D., of Brooklyn. (Reprinted from "The Proceedings of the Medical Society of the County of Kings," May, 1880.)

The Embryogeny of the Sympathetic Nervous System. By W. R. Birdsall, M. D., New York. (Reprinted from Archives of Medicine, April, 1879.)

The Prospective advantages of Baltimore as a Medical Centre. By John Van Bibber, M. D. (Reprinted from The Maryland Medical Journal for April, 1880.) Baltimore, 1880.

Observations on the Insane Asylums of California and Nevada. By W. R. Birdsall, M. D. (Reprinted from the Archives of Medicine, June, 1880.) New York, 1880.

On Fluid Extracts as Proposed for the Coming Pharmacopœia. (Reprinted from Therapeutic Gazette, April 15, 1880.) Detroit, 1880.

Microscopic Studies on the Central Nervous System of Reptiles and Batrachians. The Spinal Cord of the Frog, Rana Pipiens, Rana Halecina. Article I. By John J. Mason, M. D. (Reprinted from the Journal of Nervous and Mental Disease, Jan., 1880.)

Researches on Hearing through the Medium of the Teeeth and Cranial Bones. By Charles Hermon Thomas, M. D. (Reprinted from the Philadelphia Medical Times, February 28, 1880.

The Association of Ideas. By William James. (Reprinted from the Popular Science Monthly, March, 1880.)

THE FOLLOWING FOREIGN PERIODICALS HAVE BEEN RECEIVED SINCE OUR LAST ISSUE.

Allgemeine Zeitschrift fuer Psychiatrie und Psychisch. Gerichtl. Medicin.
Annales Médico-Psychologiques.
Archiv fuer Anatomie und Physiologie.
Archiv fuer Path. Anatomie, Physiologie, und fuer Klin. Medicin.
Archiv fuer die Gesammte Physiologie der Menschen und Thiere.
Archiv f. Psychiatrie u. Nervenkrankheiten.
Archivio Italiano per le Malatie Nervose.
Brain.
British Medical Journal.
Bulletin Générale de Thérapeutique.
Centralblatt f. d. Med.Wissenschaften.
Centralblatt f. d. Nervenheilk., Psychiatrie, etc.
Cronica Med. Quirurg. de la Habana.
Dublin Journal of Medical Science.
Deutsche Medicinische Wochenschrift.
Deutsches Archiv f. Geschichte der Medicin.
Edinburgh Medical Journal.
Gazetta Medica de Roma.
Gazette des Hopitaux.
Glasgow Medical Journal.
Gazette degli Ospitali.
Gazetta Medicalle de Strassbourg.
Hygeia.
Hospitals Tidende.
Journal de Médicine et de Chirurgie Pratiques.
Journal of Mental Science.
Journal of Physiology.
Journal de Medecine de Bordeaux.
Journal of Psych. Medicine.
La France Médicale.
Lancet.
Le Progrès Medical.
Lo Sperimentale.
L'Union Medicale.
Mind.
Nordiskt Medicinskt Arkiv.
Norsk Magazin for Lagensvidenskabens.
Practitioner.
Psychiatrisches Centralblatt.
Rivista Clinica di Bologna.
Rivista Sperimentale di Freniatria e de Medicina Legale.
Revue Medicale du Nord-Est.
Revue Mensuelle de Medicine et de Chirurgie.

Schmidt's Jahrbuecher der In- und Auslandischen Gesammten Medicin.
St. Petersburger Med. Wochenschrift.
The Practitioner.
Upsala Lakarefornings Forehandlinger.
Vierteljahrschrift f. d. Praktische Heilkunde.

The following domestic exchanges have been received:

Alienist and Neurologist.
American Journal of Insanity.
American Journal of Medical Sciences.
American Journal of Obstetrics.
American Journal of Pharmacy.
American Practitioner.
Annals of the Anatomical and Surgical Society.
Archives of Comp. Med. and Surgery.
Archives of Dermatology.
Atlanta Medical and Surgical Journal.
Boston Medical and Surgical Journal.
Buffalo Medical Journal.
Bulletin National Board of Health.
Canada Medical Record.
Canadian Journal of Medical Sciences.
Chicago Medical Gazette.
Chicago Medical Journal and Examiner.
Cincinnati Lancet and Clinic.
Clinical News.
College and Clinical Record.
Detroit Lancet.
Gaillard's Medical Journal.
Hospital Gazette.
Independent Practitioner.
Indiana Medical Reporter.
Index Medicus.
Maryland Medical Journal.
Medical Annals.
Medical Brief.
Medical Herald.
Medical News and Abstract.
Medical Record.
Medical and Surgical Reporter.
Michigan Medical News.
Monthly Review.
Nashville Journal of Medicine.
Neurological Contributions.
New Orleans Medical and Surgical Journal.
New Remedies.
New York Medical Journal.

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Original Articles.

Art. I.—PLAN OF THE CEREBRO-SPINAL NERVOUS SYSTEM.*

By S. V. Clevenger, M. D., Chicago.

WE accept the motions of protoplasm as evidence of life, and yet ungrouped elementary atoms are subject to the play of physical forces which become known as modes of motion: sound, heat, light, electricity, etc., through the changes in place of atoms and molecules.

Inasmuch as sensations have for their ultimate expression motion in the living organism, cause and effect exchange places in the recognition that forces are manifest to us as sensation only in the molecular movements caused by forces. These molecular movements impress us as sensations which, of necessity, must be translated into some form or forms of motion.

Sensibility and motility, then, are sequentially convertible

* Read before the Boston meeting of the American Association for the Advancement of Science, August 29th, 1880.

terms, and we find it none the less true in the most complex than in the simplest forms of life.

There are certain fundamental considerations which should stand in axiomatic relation to all biological inquiries.

1st. Sensibility and motility are merely afferent and efferent terms to express the effects of force upon matter and matter upon force.

2d. In life a primary object of motion is for procurement of food.

3d. Growth depends upon proper nutrition (ingestion).

4th. Multiplication (as fission) proceeds from growth.

5th. Food is any material, gaseous, liquid or solid, which tends toward nutrition of the body.

6th. "Development is a process of differentiation by which the primitively similar parts of the living body become more and more unlike one another." (Von Baer.)

7th. "Higher sensory organs are special elaborations with one special function capable of response to stimuli of one special kind. They are developed from the lower kind of sensory organs, and often times still possess the essential structure of that lower kind." (Gegenbaur.)

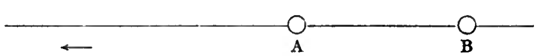
As illustrative of undifferentiated faculties it may be mentioned that by the Gregarinæ food is taken in by endosmotic processes at the surface. Any place in the protoplasm can act as a digestive cavity by enveloping and absorbing nutritive matter.

It is the simpler view, entertained by some (in opposition to the delamination precedence theory), that the form which preceded the gastrula was a one-layered vesicle which, by invagination, produced the endoderm from the ectoderm. While the ectoderm was undifferentiated, all parts of the cell were assimilative. In the gastrula stage the endoderm acquired specific ingestive faculties. Differentiation of the purely ingestive proceeds thus from the intestine, while the ectoderm remained in contact with the more variable conditions of the environment, and developed the greatest qualitative sensory and motor organs. The entire nervous organization, in its earliest condition, answers to that portion which, in vertebrata, presides over the vermicular motions of the intestines, and the correlated respiratory and circulatory structures,—the sympathetic nervous system. This, therefore, we may entitle the First System. As soon as the enteron is created, by folding in of the ectoderm, qualitative development of this First System is restricted to such functions as are more clearly nutritive, as, when the blood vascular system is differentiated from the mesoderm, the vaso-motor nerves are derived from or added to the sympathetic, and exactly in the ratio of development of the viscera so does the First System differentiation proceed.

In high forms of invertebrata, but more pronounced in vertebrata, the viscera, and consequently the First System of nerves, occupy an inferior position, properly termed ventral, while as a broad rule the upper surface of the animal comes most in contact with varying molecular motions of the outer world. Hence, we may say that it comes to be a law, that from the dorsal to the ventral parts of the animal, ingoing impressions proceed, and, of necessity, progressive development must occur, by superimposition upon the ventral system. Then :

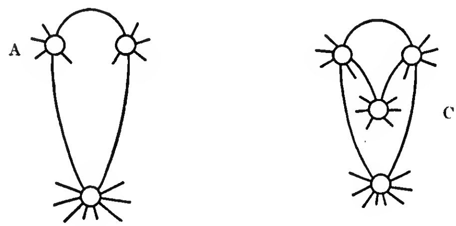
I. *Qualitative differentiation of the nervous organization proceeds dorsally, with a tendency toward the head end.*

The first appearance of a Second System, equivalent to the spinal cord (segments coalesced) of vertebrata, is indicated in ganglionic enlargements upon the afferent nerves of the First System, thus : A = First System centre; B = Second System foreshadowed.



This is apparent in the Oyster, whose anterior ganglia (A) are placed upon the fibres leading to the principal ganglion of the body. (In a typical embryonic, not phylogenetic sense, for the oyster is a degraded Lamellibranch.)

This appears to be a specialization of the tactile sense, with reference to its uses anteriorly in food discrimination and ingestion, involving ciliary prehension, and control of the valves. In Pecten further quantitative development of a Second System produces the pedal ganglion (C), also related to the touch sense.



The cilia of Protozoa subserve ingestive as well as locomotor purposes, and show the relationship of ingestive and general motions, and that the locomotor ability is often derived from the prehensile ingestive. In the free Rotifer this is quite apparent.

As the segments increase the sub-œsophageal ganglia multiply; the first set of ganglia become relatively ventral and preside over nutrition, while the second set, relatively dorsal, indicate progressive differentiation, as control of a pedal extremity or some special organ related externally. At the same time this dorsal ganglion is connected always with the ventral system. Fusion of these segmental ganglia with each other, or with ganglia of other systems, produce confusing appearances. This fusion of systems is most clearly seen in vertebrata.

The vibrating molecules which produce the undifferentiated impressions upon lower protozoa may be considered as causing purely tactile excitation. Just as the waves that dash the primitive animal about differ from the ripples that bring it food, only in degree, so the differences between impressions must be regarded. All sensation being related to molecular motions, and all special sense organs being derived from indifferent primaries, so we must regard it as a law:

II. *All senses are primarily tactile and differ from each other only in degree.*

Otocysts in their simplest form are connected directly with nerves, as are the pigment granules which eventually develop into eyes. Prof. Alf. M. Mayer shows that the fibres of the antennæ of the male mosquito vibrate sympathetically to the notes of the female mosquito, and that the vibrations of the insect's antennæ may teach it the direction of sounds (thus allying this sense to the so-called "space sense" of the human labyrinth). Prof. Mayer also announced that the terminal auditory nerve-fibres vibrate half as often in a given time as the membrane of the tympanum and the ossicles.

In these instances there is a direct derivation of an auditory from the special tactile which, in turn, was evolved from the general tactile sense and does not seem to be lost even in man, as a property of sensory nerves.

A heat sense system of nerves developed from pigment terminals, by further elaboration could become ocelli and finally eyes.

A special series of nerves for heat appreciation would have necessarily *a general distribution throughout the body*, to viscera as well as to more external peripheries.

Nervous tissue appears at the same time as muscular, and affords a better path or course of less resistance for the molecular vibrations from without. The muscular is a definitely located expression of what previously belonged to all parts of the animal, contractile ability or motility for assimilative purposes.

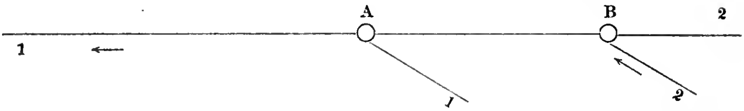
This assimilative faculty is essentially prehensile, and in the word prehension we may grasp the idea of a differentiation of such faculties as respiration, locomotion, deglutition, etc.

Carrying the comparison from Protozoa to Man, all that Man does or may hope to do has for its basis the single fundamental, though widely differentiated faculty of prehension.

Jaws and arms are prehensile, clearly. Ribs are prehensile in the sense that they assist in prehension of oxygen (food) for the lungs, morphologically and less physically in Man, while in Ophidia the ribs are locomotory prehensile, direct.

Legs are prehensile directly in quadrumana, and in Man in carrying him over ground in search of food.

As mentioned, the next step in development of the nervous system is when the ingoing general impressions become specialized and a secondary ganglion appears upon a sensory strand of the primary, which signifies that from among the general impressions some one sense, as sight, is being specialized. This is outwardly evidenced by formation of ocelli or eyes (Leech), which require a special projection.



(1 A 1—First system. 2 B 2—Second system from retina to musculus choanoides, as in Reptilia, and homologous or accompanying oculo-motor innervations in other forms. B to A becoming the motor projection to the first system from the second or inter-systemic commissural.) Here is an evidence of a sensory of the first becoming a motor nerve of the second. An afferent becoming an efferent though as between systems still afferent to the first system but efferent from the second.

By quantitative increase multiple eyes may form (Leech) and these become united into bilateral organs (pyramidal fusion in Crayfish).

The likeness between the chain of ganglia in the Leech and the spinal cord of vertebrata has led many comparative anatomists astray in homologizing. A nearly similar chain of ganglia obtains in vertebrata but situated ventrally from the vertebral column. This chain is a first system. The head ganglion, only, of the Leech, as in most invertebrata can be compared to a spinal. In Insecta and Myriapoda the superimposed secondary becomes more evident. An "unpaired system" runs in the median line between and connected with the paired or primary system, typifying the more definite appearance of the medullary grey and its commissures below or back of the head.

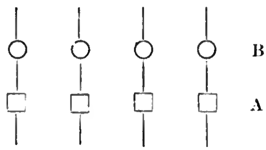
Todd and Bowman (pages 611 and 614, Vol. III.) use the following words, which indicate an early recognition of the anatomical fact without their having seen its connection or full import:

"In the Bee, the cerebral ('secondary') ganglion is very large; from its anterior portion is given off two nerves which pass forward to the base of the antennæ and have their origin well marked by a distinct ganglionic enlargement!"

Todd dwells upon the importance of recognizing this distinct ganglionary enlargement and repeats, "The sensory nerves have ganglionic enlargements in the Bee."

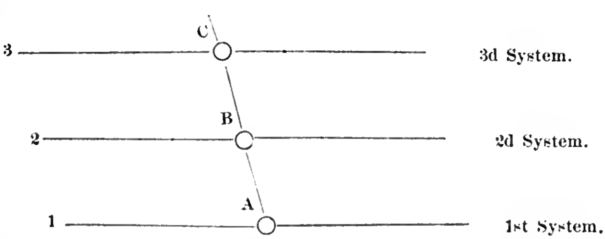
(This appearance of a third system is rare in invertebrata, though the Crab and Pterotrachea also may prove to be its possessors.)

The ganglionic swellings which on the sensory nerves of the Bee distinguished it from most Arthropoda and in fact all invertebrata, in vertebrate types from Cyclostomes upward become more markedly developed.



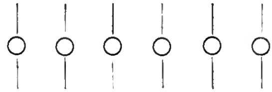
A—Secondary ganglionic segments. B—Third system (intervertebral) ganglia. Spitzka believes that the intervertebral ganglia and central nervous axis constitute a morphological unit, and to this I agree with the added consideration that the unification may be both embryological and phylogenetic, and still in accomplished development be as distinct physiologically as they are anatomically separate.

The identical procession of development of first into second and second into third systems may be seen in this diagram.

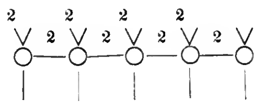


While both the first and second systems possess recognized afferent and efferent fibres, before being able to comprehend the relationships between systems or the process of projection formation we must consider whether some fundamental law does not underlie these series of relations which will better account for their creation.

The typical segment is an animal whose nerve centre lies midway between an afferent and efferent strand, thus: ⦶. A series of such segments if ununited present this appearance;



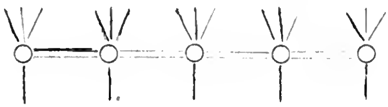
These segments could be correlated by a second fibre 2, which instead of passing between peripheries as in the instance of non-union, unite the segmental ganglia by making another ganglion its motor projection, thus:



Carpenter (*Principles of Comparative Physiology*, p. 642) expresses this view: "When different organs are so far specialized as to be confined to distinct portions of the system, and each part consequently becomes possessed of a different structure and is appropriated to a separate function, this repetition of parts in the nervous system no longer exists; its individual portions assume special and distinct offices, and they are brought into much closer relationship to one another by means of commissures or connecting fibres, which form a large part of the nervous system of the higher animals It is evident that between the most simple and the most complex forms of this system there must be a number of intermediate gradations, each of them having a relation with the general form of the body, its structure and economy, and the specialization of its distinct functions. This will be found, on careful examination, to be the case; and yet, with the diversity of its parts as great as exists in the conformation of other organs, its essential character will be found to be the same throughout."

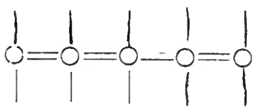
Segmental union, thus, is accomplished through efferent nerves no longer penetrating to primary organs, but passing to nerve centres of other segments, for the purpose of producing coördinated movements, and consequently to exert an inhibitory effect thereupon.

At this stage the so-called afferent commissure alone is established, but the same law of unification of segments in the construction of an individual from its component colonial members will also confer upon it an efferent commissural system.



While this is intended to represent the visceral nervous system of invertebrata, the same rule will apply in the union of vertebral ganglia segments in higher forms, beginning in such invertebrata as possess more than one secondary system ganglia (some Arthropoda).

Ganglionary fusions occur in parasitic insects and other forms, but this is secondary and does not interfere with the general application. By omitting the afferent part of the fibres that form the commissures the segmental union may be expressed thus, and confusion avoided:

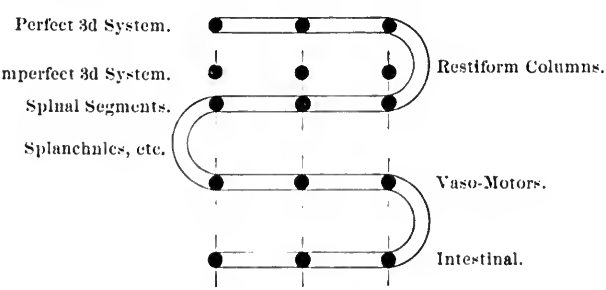


It may be stated, then, that

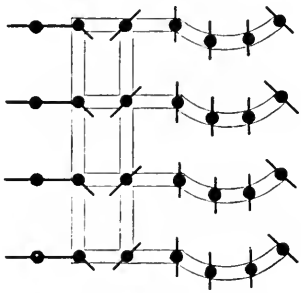
III. *Repetition of parts of a system, up to a certain point, ceases; and these parts become commissurally united before another system is perfected.*

These may be schematically expressed in diagrams which show the higher ganglionic series to be commissurally connected with the lower; each higher segment presiding over a lower system series and the commissures between forming apparently, direct projection systems.

This scheme would explain why the splanchnics have no inhibitory control over intestines (Ludwig and Haffter), such control really pertaining to higher projections (Ott).



Each spinal ganglion segment presiding over a similar series would be thus represented:



While each and every ganglion preserves its primary projection functions, the commissures inter-relate the systems and are themselves projection fibres.

The third system in this diagram is incomplete in not being commissurally connected, hence it is but a ganglionic (intervertebral) swelling upon the secondary spinal afferent nerves, and attains its complete functional character within the cranium only.

In Trigla adriatica the brain and dorsum of the cord are marked by a double chain of well-developed tubercles on the secondary nerves just as they enter the cord. These ganglionic enlargements are exact reproductions of the cerebellar and cerebral enlargements, *en chatelaine.* These intervertebral ganglia constitute the third system, the difference between the spinal ganglia and those above being that the latter are commissurally united to one another, and in higher vertebrata fused longitudinally.

("Osseous fishes, as Dactylopterus, the small ganglionic risings upon the dorsal region of the myelon receive nerves of sensation from the free soft rays of the pectorals, and the homologous ganglia are more marked in other Gurnards [Triglæ], which have from three to five, sometimes six pairs, *e. g.*, in Trigla adriatica. Similar myelonal cervical ganglia are present also in Polynemus. Although many fishes (Bream, Dorsk) show a slight enlargement at each junction of the nerve roots with the myelon, the anatomical student will look in vain in the recent eel or lump-fish for that ganglionic structure of the myelon which the descriptions of Cuvier might lead him to expect."—Owen, p. 271, Vol. I.)

The vermis of the cerebellum is probably a mere commissure compounded of different segmental heights, for the transverse striations are pronounced in birds and some reptiles.

According to Owen the cerebellum (vermis) retains its embryonic form of a simple commissural bridge or fold in the parasitic suctorial Cyclostomes and sturgeon, and in the almost finless Lepidosiren, while the cerebellum (still vermis, because centrally placed) is highly developed in the sharks. In the saw fish it even rests upon the "cerebrum."

The first well-marked posterior ganglionary mass which in higher vertebrata becomes a portion of the cerebellum is the vagus tubercle, placed posterior to and below the "cerebellum" of the fox shark. It might be safe to assume that subsequently this tubercle (third system ganglion) forms the flocculus or pneumogastric lobule of the cerebellum.

The Gasserian ganglion (unmistakably an intervertebral), where non-existent, must form a portion of the cerebellum.

The cerebellum then appears to be formed from fused hypertrophied intervertebral ganglia.

Stilling regarded the law of isolated conduction as inapplicable to the cerebellar lobes, owing to the very great commissural (fused) union which occurs there. Thus a coördinating function between cranial nerves on the one hand (the cerebellum acting as connected intervertebral ganglia for many cranial nerve fibres), and the general spinal system on the other, must follow in such vertebrata as are governed mainly by cerebellar supervision, while in higher forms it is brought directly into relation with the cerebrum itself.

Above this the cephalic intervertebral ganglia developed in some animals, atrophic or rudimentary in others, appears to be the posterior and anterior tubercula bigemina, epiphisis cerebri, eminentia mammillaria, olfactory lobes, cerebrum, which latter is itself composed of several lobes or ganglia, some of which, as the anterior, are undeveloped in most vertebrata and even in many mammals.

The posterior bigeminal lobe appears to be a third system ganglion related to special tactile sense (see Spitzka, *N. Y.*, *Medical Record*, March 13, 1880), while the optic lobes (anterior bigeminal) are third systems for the optic nerves. The primitive optic fibres were related to the grey matter above the chiasma, and even in man retain some primary thalamic connections. It is affirmed that there are cerebellar connections, but Spitzka doubts this.

The epiphisis cerebri (pineal gland), bilobed in the fœtus and devoid of sabulous matter in forms below man, attains quite a large size in some animals (Meleagris gallapavo, p. 260 *Huxley's Vertebrates*). It may with the mammillary eminence indicate a sense between sight and olfaction.

The mammillary eminences can be third systems, their positions and cinereal envelope weighing nothing against the idea, for the Teliost cerebrum itself drops to a comparably defective structure and inferior position.

These eminences are very large in monotremes, marsupials, and the horse. They stand related to the fornix, which in turn is connected to the olfactory lobe.

The olfactory lobe (another third system ganglion) appears to have been derived from a place lying in front of the mammillary eminences, according to Luys' sections, but Meynert is doubtless more correct in attaching the olfactory primitively to the optic thalamus.

The olfactory lobes, of more importance in some vertebrates than the cerebrum, in man became strangled, so to speak, by the preponderance of higher third systems.

("The olfactory lobe bore such important relations to the life history of early vertebrates that we are not surprised to find the *cerebral hemispheres* developing at first as mere appendages of the olfactory lobes."—Spitzka, "Architecture and Mechanism of the Brain," p. 37.)

The lobes of the cerebrum are related to the corpus striatum, which seems to be a part of the medullary grey second system, though formed after the hypophisis cerebri had become atrophic as the end of the spinal cord.

The hypophisis ended in the sella turcica and the corpus striatum (caudate nucleus) and subsequently lenticular nucleus developed in the scale of intelligence (Meynert).

In Teliost fishes the optic lobe (third system) occupies the place of the cerebrum of mammals in point of mass development, and the inference is natural that this optic lobe contains the highest centres related to the psychic life of this division of vertebrates; the cerebrum proper being an undeveloped tubercle in front of the mammillary eminence with the infundibulum between them (Todd, p. 619, Vol. III).

In Amphioxus we have the culmination of the secondary ganglionic type with the foreshadowing, seemingly, of the tertiary, in the black pigmentary formation in the dorsal portion of the notochord. This vertebrate, so far from being anomalous, explains by its rudimentary organization what appears later in the Cyclostomi or above. Its second pair of nerves runs from the dorsal segmental nerves to the head end ganglion, thence to the ventral segmental nerves, typifying the medulla oblongata control over lower centres, without the intervention of a cerebellar or any other third system.

The optic ganglion (secondary) of the crab (Carcinus mænas) topographically precedes the antennal, from which may be inferred that the posterior bigeminal (tertiary) is related, as Spitzka claims, to the special tactile (fifth pair) sense.

The slight development of the superior ganglia in Brachiopoda is correlated with higher sensory organs, and Gegenbaur, p. 310, notices that the nerves for the arms are probably given off from the *ventral ganglia*, a condition which I suspect is more common than usually thought to be the case, due to the want of differentiation between alimentary and locomotor parts so far, at least, as central innervation is concerned. "In the Mollusca the visceral ganglia are not only of importance, as forming a part of the general nervous system, but they may also fuse with the cerebral ganglia, owing to the gradual shortening of their commissures. New and primitively peripherally placed parts are thereby added on to these central organs, and it becomes a matter of doubt whether or no these ganglia, which formerly belonged to the visceral nervous system should still be regarded as belonging to it."—Gegenbaur, p. 344.

The development of the nervous system appears to have proceeded as follows:

PRIMARY.

Intestinal—Circulatory and visceral, cardiac.

SECONDARY.

Respiratory—Special tactile locomotory, auditory, optic, or optic and next auditory.

Antennal special tactile from which auditory in some (olfactory not certain in invertebrata, possibly in cephalopoda. *In vertebrata originates highest secondary and tertiary*).

The progression of faculties intermingle and a branch sense appears often to develop indifferently from one or other trunk, as while respiratory may give rise to the tactile for locomotion, and audition follows upon this, the antennal for gustatory purposes may originate the auditory, while locomotor tactile may be developed separately.

NERVOUS ORGANIZATION OF INVERTEBRATA.

1. *Protozoa.*—Not perceptibly differentiated.
2. *Cœlenterata.*—Rudimentary primary.

3. *Vermes.* 4. *Echinodermata.*	Secondary appears and becomes highly developed. Often fused with primary.
5. *Arthropoda.*	Secondary well developed. In insecta the primary quantitatively developed. Tertiary pronounced in bee.

6. *Brachiopoda.*—Degraded secondary.

7. *Mollusca.*	Resemble Vermes. Secondary feeble lamellibranchiata. Secondary well formed in gastropoda.
8. *Tunicata.*	Secondary well defined (extending by commissures dorsally (?) Copelata). First appearance of extended secondary in invertebrata. Anterior ganglia vesicularly developed.

Gegenbaur (p. 501) justifies this view of the central nervous system of vertebrata being homologous with the superior central ganglia of invertebrata "in an exceedingly high state of development."

The dorsal position of the central nervous system can be well made out in Tunicata. It proceeds from ectodermal differentiation.

An anterior larger mass divides into three consecutive (secondary) lobes, produced by unequal thickening of the walls of the central tube.

The anterior mass is in connection with the origin of the visual organs in Ascidiæ, Salpæ and Copelata.

A median dorsal nerve cord appears in ascidian larvæ, which prolongation Gegenbaur, p. 396, regards as noteworthy as being the only *dorsal* prolongation in invertebrata, and thus a medullary secondary central system appears stretching the length of the animal.

EMBRYOLOGICAL CONSIDERATIONS.

Notwithstanding the feeble development of the cerebral ganglia in most Mollusca the homology of these ganglia with the cerebral ganglia of Vermes and of Arthropoda has been clearly made out. There exist in Arthropoda and Mollusca cerebral (secondary) ganglia connected with nerves of special sense and visceral (primary) ganglia innervating, in Mollusca, the heart, branchial apparatus and generative organs, comparable to the "stomato-gastric nervous system" of Arthropoda.

The ventral chain of ganglia, so obvious in Crustacea and Insecta, partakes of primary or secondary characteristics, or both, depending upon the position of the metamera and the degree of development they have undergone. With concrescence of the anterior metamera into a more or less extended cephalothorax the anterior ganglionic masses are fused, as in Stomapoda, where a portion of this ventral chain innervates the anterior buccal and prehensile feet, while the six smaller ganglia of the abdomen still correspond to the segments and have more apparent primary than secondary significance. In Arachnida where nerves are given off to the enteron from both the cerebral and ventral ganglia an appearance is presented of the vertebrate pneumogastric projection.

Recent embryological observations, as set forth by Balfour (*Comparative Embryology*, Vol. I., 1880) from monographs of Kowalevsky, Kleinenberg, Fol, Lankester and others, distinctly show that where the nervous system has been made out at all, as a rule it proceeds from epiblastic thickening and differentiation. There are many remarkable exceptions to this, however, and no particular class seems exempt from such deviations. The supra-œsophageal or cephalic ganglia arise from the head epiblast and the ventral cords from the ventral epiblast, but in Platyelminthes the cephalic originates from the prostomial mesoblast, and in Mollusca especially the epiblast does not afford the nervous origination. Fol thinks the pedal ganglion comes from the mesoblast of the foot, which Bobretzky denies. Lankester states that in Cephalopoda the various ganglia originate in mesoblastic tissue, each ganglion separately, and subsequently commissural cords unite them. The claim is made that the epiblast in Mollusca and Chætopoda always affords the supra-œsophageal.

Attention is called to the statements of Claus and Dohrn, that in Nauplius the second pair of antennæ is innervated from a sub-œsophageal ganglion.

The crustacean "mesoblast appears to be formed of cells budded off from the anterior wall of the archenteron (Astacus) or from its lateral walls generally (Palæmon). They make their first appearance soon after the invagination of the hypoblast has commenced" (Balfour, p. 427).

The ventral nerve cord of the crustacea develops as a thickening of the epiblast along the median ventral line; the differentiation of which commences in front and extends backwards. The ventral cord is at first unsegmented. The supra-œsophageal ganglia originate as thickenings of the epiblast of the procephalic lobes. The ventral cord divides by constrictions into as many ganglia as there are pairs of appendages or segments. The commissural tissue soon becomes continuous through the length of the ventral cord and is also prolonged into the supra-œsophageal ganglia. The commissural tissue also gives rise to the transverse commissures which unite the two halves of the individual ganglia. The ganglia, usually, if not always, at first appear to correspond in number with the segments, and the smaller number so often present in the adult is due to the coalescence of originally distinct ganglia" (op. cit., p. 434).

While the epiblast, as a rule, supplies the main nervous organization and is the protective and sensory layer, and the hypoblast is essentially the digestive and secretory layer, the nerves answering to the sympathetic, as the visceral, may develop from the epiblast. But as the mesoblast is only found in fully developed conditions above Cœlenterata and originates the vascular and excretory system, it follows that a vaso-motor system can only appear subsequent to the intestinal innervation, and hence must proceed from the mesoblast as an intermediate between the secondary and primary nervous systems, though more closely related to the primary.

The junction between the two parts of the nervous system (supra-œsophageal and ventral) takes place comparatively late in Chætopoda, and in Insecta "the præ-oral portion of the nervous system consists entirely of supra-œsophageal ganglia which remain disconnected on the dorsal side till quite the close of embryonic life" (op. cit., p. 322). In Arachnída the abdominal ganglia fuse into two continuous cords united by commissures to previous ganglia, and the supra-œsophageal forms independently of ventral cords.

According to Kleinenberg (*Quarterly Journal of Microscopic Science*, Vol. XIX., 1879, "The Development of the Earthworm, Lumbricus Trapezoides"), a subsequent pair of prolongations *runs backward from the supra-œsophageal ganglia to meet the ventral cord.* This appears to represent a higher ganglionic series projecting afferent and efferent nerves, other than commissural, into a lower series as a periphery, which we shall see is evidently the case in vertebrate cerebro-spinal development.

THE FIRST SYSTEM

Arises from intestinal innervation, the ganglion of which affords in invertebrata locomotor nervous control. The respiratory, digestive, and excretory functions, as in larva of dragon fly and fish Cobites, being performed, not only by the same sets of nerves, but the same organs (*vide* Darwin's *Origin of Species*, p. 170). We have seen locomotion to proceed as an accidental accompaniment of respiration (Branchipus), and the sub-œsophageal ganglion innervating the second pair of antennæ in Nauplius (*vide supra*).

The vaso-motor division of the first system is added when the mesoblast appears and the vascular is differentiated. The concentration of the fibres and ganglia of this system in certain areas, as solar plexus, renders any attempt at systematic classification of strands, etc., futile, but by studying the arrangement of the sympathetic system backward from the præ-vertebral ganglia, the warrant for the scheme I have adopted is more apparent. The præ-vertebral are united by longitudinal commissures, precisely as is the ventral chain of ganglia in Arthropoda; often as in the cervical region these ganglia coalesce to form larger nerve centres, precisely as in cephalo-thoracic formation from metamera, or as in the Leech; one ganglion may in the adult represent three of the embryonic segmental ganglia.

No matter how exalted the function or position pertaining to a ganglion *in any system*, it does not lose its identity as a simple centre from which afferent and efferent fibres proceed. The præ-vertebral chain presides directly as centres over the immediate vascular area with which it lies in contact, with its more or less obscure peripheral projections, while the commissural system binding it to the visceral plexuses lengthen and broaden out into such great fasciculi as the splanchnic and cardiac nerves.

SECOND SYSTEM GANGLIA.

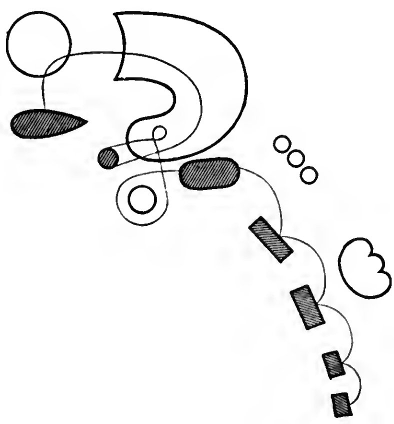
By quantitative caudad development of the cerebral ganglia homologies of invertebrata, as supra-œsophageal, optic, auditory, pedal, or tactile, commissurally connected by afferent fibres posteriorly (columns of Goll and Burdach), and by efferent fibres anteriorly (columns of Türck and anterior fundamental tract), a view is obtained of the primitive spinal cord segments ununited. Spitzka records that the planes of junction of the original segments may be still made out by the poorness in cellular elements of such areas under microscopic examination, while the centres of the spinal ganglia are determinable by their richness in these elements. Longitudinal fusion and consequent shortening of this chain forms the central tubular grey of the spinal cord.

The "medullary white" of Flechsig first appears in the columns of Burdach, in the fœtus of 25 c. m. Spitzka says it also appears in the processus cerebello ad cerebrum. This is reasonable, for the processus cerebello ad cerebrum is a continuation of the columns of Goll and Burdach, as will appear later in this description.

The second system ganglia consist of:

1. All the coalesced segments which form the spinal cord.
2. The medulla oblongata grey.
3. The grey masses in the pons Varolii.
4. The optic thalami and soft commissure.
5. The tuber cinereum.
6. The (doubtful) olfactory ganglion of Luys.
7. The caudate and lenticular nuclei of the corpora striata.

The hypophisis cerebri being the atrophied end of the cord, needs no numerical consideration.



SECOND SYSTEM COMMISSURAL AFFERENT POSTERIOR LONGITUDINAL FIBRES.

1. Spinal ganglia united by columns of Goll and Burdach.
2. Spinal and medulla oblongata by part of restiform columns.

3. Medulla oblongata segments by fibres of reticular field.

4. Medulla oblongata, grey of pons and optic thalamus by processus cerebello ad cerebrum and habenulæ to Luys' anterior centre of optic thalamus.

5. Optic thalamus to tuber cinereum.

Luys, pl. XXI., 18 : "*Fibres réunnisant le centre anterieur à la substance grise du tubercule mammillaire* (*faisceau de Vicq d' Azyr*)."

6. Tuber cinereum to olfactory ganglion.

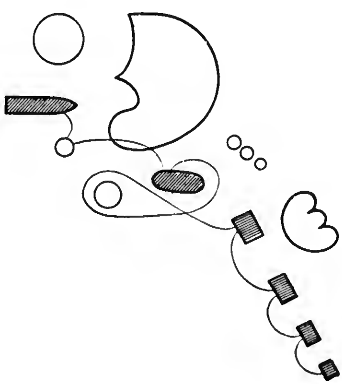
Anterior pillars of fornix, through fornix to olfactory ganglion, through "*corps godronné.*"—Luys, pl. XXI., 8-20-7-16.

7. Olfactory ganglion to corpus striatum.

Luys, pl. XXI., 23 : "*Substance grise du corps godronné en continuité en* 21, 21′ *avec les tractus de Lancisi, qui se perdent après avoir parcoura toute l' étendue du corps calleux, dans le sens antéro postérieur, dans la substance grise accumulée au niveau de la partie inférieure de la cloison, la où les fibres olfactives internes vieunent se distribuer en* 17 (*comparez avec pl. XV., fig.* 1, (6) *et pl. XX VIII., fig.* 2).

The longitudinal fibres of the gyrus fornicatus generally and tractus Lancisi fall in this division.

Gratiolet's surcingle addition to the caudate nucleus (see *Brain*, July, 1880) would connect Luys' olfactory ganglion with the caudate nucleus, but Meynert's proposed optic thalamus, secondary origin, for the olfactory afferent nerves, seems most reasonable.



SECOND SYSTEM COMMISSURAL EFFERENT ANTERIOR LONGITUDINAL FIBRES.

1. Corpus striatum to olfactory ganglion fibres near and in anterior commissure.—Luys, pl. XXVI. (Omission of the olfactory ganglion, and regarding an anterior portion of the optic thalamus as a secondary olfactory, simplifies the scheme and accords better with Meynert's views.)

2. Olfactory ganglion to tuber cinereum.

Luys, pl. XXVI., 11, 12, 10: Tænia semicircularis or stria cornea (Meynert). Luys, pl. XV., 10: From olfactory ganglion to anterior centre optic thalamus. Also, pl. II., 18, 18′

3. Tuber cinereum to optic thalamus fibres of crus.

4. Optic thalamus to pons and medulla fibres through pons Varolii.

5. Medulla oblongata segments.

Luys, pl. XV., 14, 14′: "*Fibres les plus internes et les plus supérieures des faisceaux spinaux antérieurs* (*fibres entrecroiseés*).

6. Medulla and spinal segments.

Internal anterior columns, spinal cord.

7. Spinal segments.

Columns of Türck and anterior fundamental tract.

SECOND SYSTEM TRANSVERSE COMMISSURES.

1. Transverse fibres near central canal spinal grey.
2. Fibres of the reticular field, medulla oblongata.
3. Posterior commissure of optic thalami.
4. Part of anterior commissure, corpora striata.

Transverse fusion of cord and pons grey and the soft commissure of the optic thalami are equivalent to commissural union.

SECOND SYSTEM PROJECTIONS.

We have thus far considered only the central tubular ganglia and their commissures. In passing to the enumeration of the afferent and efferent nerves, it will save repetition to include mention of the third system ganglia, which in vertebrata above Pharyngobranchii develop upon the sensory nerves near their junction with the spinal cord. The second system projections may be thus most conveniently considered with the

THIRD SYSTEM GANGLIA.

Turning again to the Amphioxus, we find that the second system ganglia, or spinal cord, give off afferent and efferent nerves dorsally and ventrally, *without intervertebral ganglia, cerebellum, or anything resembling a cerebrum.* The "second pair" of nerves of the head end, instead of passing ventrally and dorsally, as do those of the lower segments, run backward or caudally; those which run from the tail to the head along the dorsum are afferent, while those projected backward along the ventral portion of the body are efferent.

These sets of nerves resemble strikingly in many particulars the pneumogastric nerves *and the lateral columns of the spinal cord* of higher vertebrata. Confer ganglionic swellings upon all these afferent spinal nerves of the Amphioxus, proportioning their sizes to the nerve bundle sizes, and an appearance is presented like that which obtains in Trigla adriatica, a series of dorsal (intervertebral) ganglia from tail to head forming intervertebral ganglia, cerebellum, optic lobe (so-called cerebrum) and the higher series differ from the lower only in point of mass.

The crura cerebri and tegmental fibres thus become efferent and afferent nerves from the higher homologues of the central tubular grey; the corpora striata and optic thalamus, and these fibres with part of the restiform column project at different levels *from and to the spinal grey as peripheries* along the antero- and postero-lateral columns of the cord. But this does not comprise *all* of the projection series from these parts for the cerebro-spinal nerves have their primary projections as well.

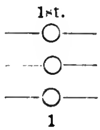
PROJECTIONS SECOND SYSTEM AND THIRD SYSTEM GANGLIA.

EFFERENT NERVES.	SECOND SYSTEM GANGLIA.		THIRD SYSTEM GANGLIA.	AFFERENT NERVES.
Crura cerebri.	Lenticular Nucleus.	Corona Radiata.	Frontal Lobe.	External & Internal Capsule.
Crura cerebri.	Caudate Nucleus.	Corona Radiata.	Occipital and Temporal Lobes.	Internal Capsule.
Rudimentary.	Tuber Cinereum.		Corpus Mammillarius	Rudimentary.

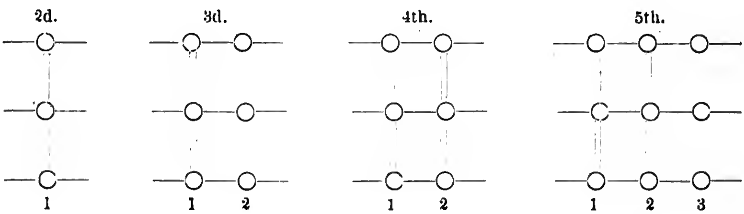
Fibres 7th Pair.	Optic Thalamus.	Olfactory Lobe.	Ethmoidal Distribution.
Rudimentary.	Optic Thalamus.	Pineal Gland.	Rudimentary.
3d Pair.	Optic Thalamus.	Optic Lobe.	Retina.
5th Pair.	Optic Thalamus.	Posterior Tubercula Bigemina.	5th Pair.
4th Pair.	Pons Grey.	Cerebellum.	Fibres 2d Pair(?)
5th Pair.	Medulla.	Gasserian.	5th Pair.
5th Pair.	Medulla.	Cerebellum.	5th Pair.
6th Pair.	Medulla.	Cerebellum.	Cyon—Labyrinth.
7th Pair.	Medulla.	Cerebellum.	Labyrinth.
7th Pair.	Medulla.	Petrosal.	9th Pair.
7th Pair.	Medulla.	Cerebellum.	9th Pair.
Restiform Columns, 10th and 11th Pairs.	Medulla.	Cerebellum.	Restiform Columns & 10th Pr.
10th and 11th Pairs.	Medulla.	Flocculus.	10th Pair.
12th Pair.	Medulla.	Olive. (Henle.)	9th Pair.
Spinal.	Spinal Grey.	Intervertebral Ganglion.	Spinal.

THIRD SYSTEM COMMISSURES.

Carpenter's law finds its highest realization in the cerebellar fusion; but in the cerebral connections it becomes masked, and only by referring to the first part of this paper can we be enabled to clearly see our way through the labyrinth. Let the first system ununited by commissures be the *first stage*, where each segment acts for itself.

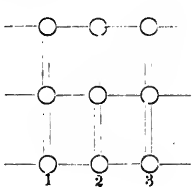


The successive steps are: Second stage segments of ventral system united commissurally; third stage, second system appears, etc.

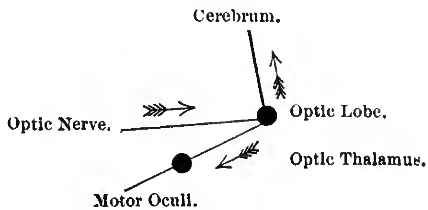


The fifth stage being the appearance of the intervertebral third system ununited commissurally.

When the cerebellum is formed, this occurs by fusion of higher third system ganglia. The sixth stage then is



Now, while the optic lobe predominates in fishes, any third system commissural strands from the cerebellum can go no higher than this optic lobe; but when other lobes, as the cerebral, develop, there must arise a system of commissural projections equivalent to those connecting the second system ganglia, and exactly like the motor efferent projections, passing to lower third systems. These projections can be regarded as efferent nerves from the lower third systems projected into higher lobes, thus, as the corpora geniculata, external and internal:



"The internal corpus geniculata is a fasciculus of the corona radiata arising in the ganglion of the inferior corpus quadrigeminum. It develops with and is connected to the tegmentum.

"Both geniculate bodies are connected to occipital and temporal lobes."—(Meynert, pp. 409, 438.)

If these fibres pass from the optic lobe to the gyrus angularis in the cerebrum, the effects of lesions there are explained. The visual impression being afferently projected there excites the sensation of vision in a higher centre, and brings it into coördinate relations with other centres, as auditory, just below gyrus angularis (projected from cerebellum), olfactory, being also projected to cerebrum, temporal lobe. The arcuate fibres form the longitudinal series between lobes, and upon reaching the frontal region, are projected backward and downward, to exert an inhibitory effect upon posterior cerebral centres before descending through crus. The anterior lobe being the remoter from direct lower connections, paralysis does not follow injury to its extremity; while the middle frontal, being related directly to the crus, paralysis ensues quickly upon injury thereto.

As far as seem evident, the third system commissures are as follows:

AFFERENT.

1. Fibres from posterior column of spinal cord entering restiform column, passing to olivary body, thus beginning the connection between longitudinal commissural for second sys-

tem and those for the third. This transition may occur in the medulla oblongata, and form a portion of the arcuate fibres.

2. Fibres of the restiform column from the olive to the cerebellum.

3. Fibres of the lemniscus tract (which also has lateral projection fibres like the restiform, and seems analogous to it).

4. Pons fibres and tegmental fibres.

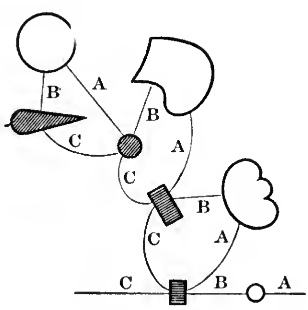
5. "External fasciculus of crus, which passes into the decussation of the pyramids into posterior column of cord."—(Meynert, p. 409.)

6. Arcuate fibres of cerebrum.

EFFERENT.

1. Arcuate fibres of cerebrum.
2. Fibres of crus and tegmentum.
3. Posterior longitudinal fasciculus.
4. Column of Türck and anterior fundamental column, as transition fibres commissural between second and third systems.

PLAN OF THE CEREBRO-SPINAL PROJECTIONS.



First Plane.

A. Sensory nerve to intervertebral ganglion.
B. Thence to spinal cord.
C. Motor nerve.

Second Plane.

A. Restiform column.
B. Brachium Pontis.
C. Antero-lateral columns of cord.

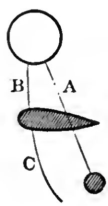
Third Plane.

A. Tegmentum.
B. Corona radiata.
C. Crus.

Fourth Plane.

A. Internal capsule.
B. Corona radiata.
C. Crus.

The fourth plane undergoes additional complication by the fibres of A (internal capsule) passing through the corpus striatum, thus:



The PLANES must be renumbered in accordance with the view that the tubercula quadrigemina, olfactory lobe, etc., are third systems:

1. There will be thirty-one segments of the first plane, consisting of all the spinal segments and their appendages below the medulla.
2. The cerebellum and medulla, olive, ganglion Gasser, etc.
3. The posterior tubercula quadrigemina and motor nuclei.
4. The optic lobes and their motor nuclei.
5. The epiphises and their motor nuclei.
6. The mammillary eminences and tuber cinereum.
7. The olfactory lobes and ganglia.
8. The occipital and temporal lobes and caudate process.
9. The præ-rolandic lobe and corpus striatum.
10. The frontal lobe proper and lenticular nucleus.

The afferent fibres A of the planes may then be classed in:

First plane: Sensory nerves to intervertebral ganglia.

Second plane: Restiform columns and cranial nerves.

Third plane: Longitudinal fibres of pons Varolii and cranial nerves.

Fourth plane: The optic nerves and fibres from basal optic ganglion and optic thalamus to optic lobes.

Fifth plane: Rudimentary.

Sixth plane: Rudimentary.

Seventh plane: Ethmoidal nerves.

Eighth plane: Corona radiata and internal capsule.

Ninth plane: Internal capsule.

Tenth plane: External and internal capsule.

B—Afferent fibres, from third to second systems:

First plane: Fibres between intervertebral ganglia and cord.

Second plane: Cranial nerves and fibres from cerebellum to medulla.

Third plane: Fifth pair and fibres from posterior tubercula bigemina to nuclei.

Fourth plane: Fibres from optic lobes to oculo-motor and lower nuclei.

Fifth plane: Rudimentary.

Sixth plane: Rudimentary.

Seventh plane: Fibres from olfactory lobe to optic thalaamus (Meynert), olfactory ganglion (Luys).

Eighth plane: Corona radiata.

Ninth plane: Corona radiata.

Tenth plane: Corona radiata and fibres from frontal lobe to lenticular nucleus.

C—Efferent fibres from second systems to periphery:

First plane: All motor spinal nerves.

Second plane: All motor cranial nerves and restiform columns to the antero-lateral columns cord.

Third plane: Seventh pair fibres and antero-lateral columns spinal cord.

Fourth plane: Posterior part of tegmentum and antero-lateral columns cord (predominate in fishes).

Fifth plane: Rudimentary.

Sixth plane: Rudimentary.

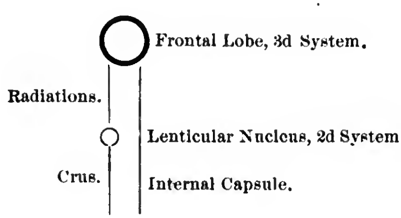
Seventh plane: Fibres from olfactory ganglion to optic thalamus, medulla, etc. (?)

Eighth plane: Tegmentum and crus to medulla and spinal cord.

Ninth plane: Crus.

Tenth plane: Fibres from lenticular nucleus to corpus striatum and crus.

Meynert (p. 416) shows the relations existing between the frontal lobe and lenticular nucleus, which, interpreted by our present scheme presents the frontal lobe as a Third System, with its internal capsular part as the afferent nerve, the radiations from the convex surface of the lenticular nucleus to the insula and frontal lobe, as the second part of the afferent system. The crus from the nucleus forms the efferent system of nerves. Thus:



Flechsig claims that the entire mass of the pyramidal fibres of pes pedunculi terminate in the præ- and post-central gyri. Spitzka says a large portion terminates thus, undoubtedly, but not the whole.

It goes to show how the upper lobes acquire a motor supremacy.

"Meynert asserts that the efferent fibres of a large portion of the nucleus lenticularis run inwards as the fourth stratum of the ansa peduncularis to become the most internal fibres of the pes pedunculi; these same fibres are supposed on very strong grounds to place the cranial nerve nuclei under the control of the higher centres. We judge the latter from the course of the raphe fibres and the greater thickness of the raphe in those regions where the hypoglossal facial and motor trigeminal are found."—Spitzka, J. N. AND M. D., Jan., 1879.

THIRD SYSTEM—TRANSVERSE COMMISSURES.

1. Vermis.
2. Transverse fibres between tubercula quadrigemina in some mammals.

3. Fusion of epiphises cerebri.

4. Transverse fibres, tuber cinereum connecting the corpora mammillaria.

5. Part of anterior commissure.

6. Corpus callosum.

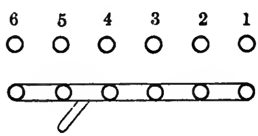
(Transverse fibres of pons Varolii intentionally omitted.)

MORPHOLOGY OF THE THIRD SYSTEM LOBES.

The position of the cerebellum and its recognizable phylogenetic changes may be easily traced through the vertebrata generally, but the lobes superior to it undergo a variety of distortions and changes of position for the solution of which we must resort to schematic views.

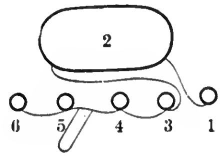
Given, a series of tubercles which shall from behind forward represent the lobes of the brain, as follows :

1. Posterior pair of tubercula quadrigemina.
2. Anterior pair of tubercula quadrigemina.
3. Epiphisis cerebri.
4. Mammillary eminence.
5. Olfactory lobe.
6. Cerebrum.

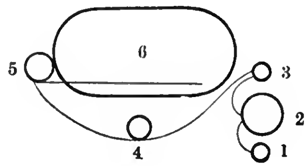


The grey secondary of each being united by commissures, the afferent and efferent. The first of these commissures it will be most convenient to follow through the developmental gyrations as apparently connecting the under surface of each lobe, but in reality connecting the secondary segments pertaining to each, as optic thalamus, tuber cinereum, olfactory ganglion and corpus striatum.

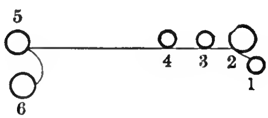
1 is connected to 2 and 3 by the upper end of the brachium conjunctivum, 3 to 4 by prolonged habenulæ, 4 to 5 by fornix, 5 to 6 by hippocampal fibres, tractus Lancisi and gyrus fornicatus (the latter principally). In the case of a fish with optic lobe (2) developed covering the other tubercles, the course of the commissures and relative mass appearance would be thus:



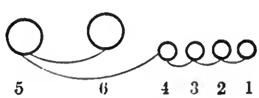
Bird, as pigeon, with cerebrum developed covering 1 to 5, the optic lobe being pressed to one side.



The following appears to be the arrangement of the brain of the fox shark, with lobes equally developed. I think the main mass must be the optic thalamus, with the quadrigeminal bodies fused on its surface (this latter feature not represented here).

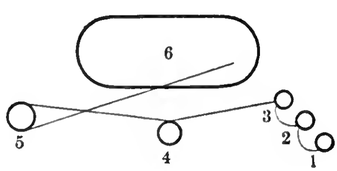


This form appears in mammal with large olfactory lobe and cerebrum.

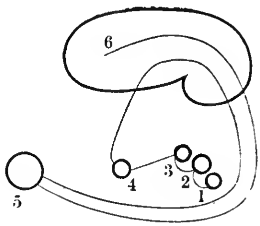


EVOLUTION OF THE AFFERENT LONGITUDINAL COMMISSURES, FISSURE OF SYLVIUS AND TEMPORAL LOBE.

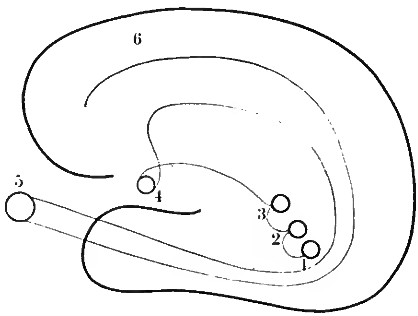
This condition is presented by an unconvoluted brain such as the beaver's, which is but faintly fissured.



An illustration of the gradual appearance of the Sylvian fissure with the hippocampal formation, is attempted below:



The last cut represents the Sylvian fissure formed as in man, with the accompanying fascicular distortions:



The growth of the frontal lobe in proportion to the intelligence of the primate individual augments this creation of temporal. Many of the longitudinal sulci of the quadrumana fold over and under with this advancement of the occipital into temporal, and the parieto-occipital fissure on the median face of the cerebral hemisphere is doubtless created directly by this bend, and the calcarine may also owe its origin to this change. A variety of causes combine, however, in fissure formation, aside from those mentioned.

Olive.—Schroeder van der Kolk tried to bring the olivary nucleus in relation to the hypoglossal nerves as coördinators of the tongue, and Spitzka sees new reasons why this investigation should be renewed. The latter, as do Deiters and Meynert, regards it as an internuncial station of the restiform columns and cerebellum.

This would bring the olive into the third system, and the hypoglossal being a motor nerve, in the main, its proper nucleus should not appear in the olive, but its sensory nerves, if any, should alone do so. The olive is often correspondingly atrophied with the opposite cerebellar lobe. Deiters and Meynert claim that the olives stand in connection with the opposite cerebellar hemispheres through the restiform decussation (columns of Burdach). The parrot's olive is highly developed. "The superior olive in the trapezium is entirely different, the inferior being the olive *par excellence*, and development is opposite. When nucleus of trapezium is large the olive is small, and *vice versa*." (Spitzka.)

OPTIC LOBES.—In reptiles they exhibit a true cortical structure, and the cortical lamina is covered by white substance.

The outer consists of fibres entering the optic tracts; the inner of projection fibres which run parallel with contour of Sylvian Aqueduct, and in part decussate beneath its floor. This is the homologue of Forel's fountain-like tegmental decussation.

The innermost fibres of this mass pass into the oculo-motor nucleus of the same and of the opposite side, still others which fail to decussate leave their original direction and become longitudinal, constituting the post-longitudinal fasciculus, which in no animal can be traced farther than the posterior commissure.

Flechsig and Forel consider this fasciculus as a connecting band of the oculo-motor nuclei and the spinal grey substance. *It can certainly be traced with great clearness into the column of Türck, especially in lower animals.* It sends a distinct branch to the trochlearis nucleus and the abducens is entered by a similar nucleus. (Spitzka.)

In reptiles the (anterior pair of man) optic lobes are covered outside by expansion of optic nerves. Inside are layers of cells (described by Spitzka), the central tubular grey containing in inferior part the nucleus of origin of the oculo-motor nerves.

From this the post-longitudinal fasciculus continues with columns of Türck, terminating *directly and by anterior commissures in nuclei of origin of cervical nerves.*

It would then constitute a band of union between the visual impressions and the movements of the nucleus controlling the eyeball and rotation of the head and neck. It is the part by virtue of the existence of which the pigeon, deprived of its cerebrum, follows a candle light with its eyes and head.

The primitive eye vescicle is the first of the organs to appear in embryo, corresponding with its appearance in Invertebrata phylogenetically.

Spitzka accounts for the atrophy of the superficial grey in the optic lobes of man, whose visual sense is well developed, by stating that as the thalamic and cerebral projection of the retina gains in extent, that in the optic lobes diminishes, and probably no more extensive projection of the retina takes place in the human optic lobes than is necessary for the coördinating purpose. In the lower animals they are both coördinating, registering and receiving centres; higher ganglia usurp the latter function in man. This view is borne out by the fact that in the mole, whose retinal and oculo-motor innervations are almost *nil*, the superficial cortex and superficial white matter are absent and the deep grey atrophic, while the higher visual centres, as in other insectivora, are indeterminable.

"In Teliost fishes the optic lobes occupy the place of the cerebral, the latter being an undeveloped tubercle in front of the mammillary eminence, with the infundibulum passing between them." (Todd, Vol. III., p. 619.) If we are to regard the import of a centre as determinable by its preponderance in mass over its fellow centres, then we must consider the optic lobe as a centre of higher importance in the fish than in mammals, and as vicarating more or less the cerebral functions of the latter. (I am indebted for this expression of my own views to an eminent comparative anatomist. We found our differences of opinion reconciled in these words.)

Posterior Tubercula Bigemina appears to be in relation to the fifth pair, and does not connect with anterior (Forel and Spitzka). Forel claims they are separate from anterior pair, though here we have an excellent example of subsequent fusion of systems where the two pairs are indeterminable and an evidence of the origin of the optic sense from the special tactile. Considering the fifth and seventh pairs as the primitive cranial nerves, amplification or refinement of tactile sense would differentiate the optic, auditory, gustatory and olfactory senses. As a rule, says Spitzka, the higher the animal range the more distinctly do the posterior tubercles become demarcated and developed. Lesion of posterior pair does not affect vision and only the anterior pair is related to retinal and oculo-motor innervations, the optic lobes alone of reptiles are analogous to anterior pair of man. The posterior pair is hypertrophic in animals with defective vision (the blind have touch sense augmented). Bats and moles rely upon touch sense.

Convolutions in any animal usually signify that the brain is growing faster than the skull.

Something analogous to the fissure of Sylvius appears in the optic lobes of fishes, due to the same cause that produces this fissure in the cerebrum. The olfactory lobe of the cod is convoluted or crenated.

The cerebral hemispheres do not extend over cerebellum in marsupials, or any other animal having a larger brain case than brain. An overlap can occur when cerebral growth, generally anteriorly, presses the cerebrum backward, or when the small relative size of the skull compels the brain to pass backward and downward.

This relatively defective development is also accompanied with lesser development of trapezium or Pons Varolii.

Concerning the development of these centres and their connections, Spitzka ("Architecture of Brain") has thus excellently expressed it:

"We have found one striking feature in the elaboration of the projecting tracts, namely that, in higher developments, the fasciculi show a tendency to emancipate themselves from the interruptions offered by intermediate ganglionic categories; in short, that the tendency is to establish a direct communication between the cortex and the central tubular grey matter. It is the same tendency which led to the development of the longitudinal tracts of the cord, thus establishing a readier association than the circuitous route furnished by the fibrillary net-work of the grey substance.

"The course of this development is determined by two physiological laws; the first is, that, the greater the distance traversed, the longer will the impression take to travel to its destination; the second is, that every ganglionic element to be traversed delays the transmission of the nerve current.

"Thus it is that the first ganglia preponderate over all the others as a *Brain.* And thus it is that the brain shows such complex relations in contrast with the relative uniformity found throughout the spinal cord.

"But it was not only the *ganglia* of olfaction, smell, taste, mastication, respiration and circulation that underwent such an increase in dimensions; superior as they were in functional importance to all the other ganglia, and exerting therefore a control over these others, it followed that the *associating tracts* joining the cerebral and spinal centres predominated over the associating tracts joining the spinal centres to their fellows.

"We have here a fundamental law of the cerebral mechanism: *The highest functions do not reside in any special centre, but in the functional union of several centres through associating tracts.*"

FORNIX.—A concentrated projection system from the cornu ammonis grey to the superior tubercle of the optic thalamus. The fornix is drawn under the corpus callosum and forward by movements of the temporal lobe in its formation from the occipital by pressure backwards of the growing frontal lobe.

The mammillary eminences remaining stationary, the anterior pillars of the fornix fibres pull the posterior edge of the corpus callosum downward and forward. Wundt says the corpus callosum unites the fornix primitively. Spitzka has found traces of the callosal fibres in brains where they were not supposed to exist, the tendency being to create transverse union between symmetrical lobes at an early stage.

INSULA.—While the hypoglossal fibres, etc., are united to the Island of Reil or its homologue, the anterior brain must guide it as it does other parts, commissurally through arcuate system. Hence the island and lenticular nucleus need not develop *pari passu.* The island is a lobe by itself, and is fused with the postero-frontal lobe, while the lenticular nucleus is the corpus striatum equivalent for the frontal region. As the frontal lobe develops it crowds the occipital backward, downward, and then forward, forming the temporal, which tends to lessen relatively in size to frontal brain preponderence, and necessarily the Sulcus Rolando is pressed farther back in the scale of intelligence, while the cranium *tends* to adapt itself to this change by the creation of a higher forehead. Changes in brain shape being readily effected as compared to skull modifications, several generations of tendencies in the latter direction may be required to render the effect of education thus visible, while the brain itself may undergo extensive alteration in the individual.

The hippocampal fornix fibres are twisted as the temporal passes forward and the upper cerebral mass weighs down upon the temporal, producing partial rotation of the latter.

Ontogenetic seldom repeats phylogenetic development, and this is why in the embryo we have the direct appearance of the Sylvian fissure without much of this folding-in process, though some of it is evident. Meynert (p. 379) says that when the elevation of the lenticular nucleus is low the fissure of Sylvius is reduced to a mere slit, Corpus Striatum.—In Echidna appears to be only the caudate process; in bats and rodents forms greatest part of hemispheres; appears large in monkeys, owing to small size of cerebrum. Appears in twelfth week in fœtus. United by small anterior commissure in Sauropsida. The lenticular nucleus preponderates in man more than the caudate nucleus, "the latter being continuous with what is in man an atrophied portion of the hemispheres, the olfactory lobes." (Meynert, p. 421.) This recognizes two points of origin for the olfactory lobe: one from the optic thalamus and the other from the caudate nucleus. This may have occurred and subsequent fusion into one lobe have taken place.

Corpus Callosum.—Absent in fishes, reptiles, birds, and monotremes; rudimentary in marsupials; broadest of all in man. All transverse commissures such as the corpus callosum can be considered only as of secondary origin and importance. I have observed a broad band of transverse fibres, resembling the corpus callosum, stretched between the tubercula quadrigemina in other animals—as the calf, in which it is quite distinct.

Hippocampus Major lies behind the corpus striatum in Echidna. Meynert calls it a defective structure, due to its passing out of use in man. Relatively larger in lower animals. Its rolled appearance is produced by rotation of temporal lobes in passing backward, downward and forward.

Vaso-Motor Centres.—Budge and Waller fix the sympathetic control of the iris in the cilio-spinal centre in the lower cervical cord.

Claude Bernard places vaso-motor centres for vessels of head in the cord between sixth cervical and fourth dorsal vertebræ; genito-spinal centre, both dorsal to lower end of cord (Budge and Schiff), near which the ano-spinal fixed by M. Masius of Liege (See Jewell, Vol. I., p. 116, Journal of Nervous and Mental Disease).

Luys and Jewell suppose that there is a continuous column of such centres—vaso-motor centres for whole body in medulla (Schiff, Salkowsky, Ludwig, Thiry). Tscheschichin fixes it at junction of point of medulla and pons. Brown-Sequard extends vaso-motor tract to cerebellum and brain proper. Kronecker, at Leipsic, confines it to floor of fourth ventricle (Vulpian, *Rev. Scient.*, '74, No. 35).

I regard vaso-motor control as inherent in every segment of all three systems. Primarily, the sympathetic projects the vaso-motor system; through this passes fibres to the dorsum, which causes the intestines and blood-vessels to be under the direct influence of external impressions. The secondary system interposes and thus inhibits and distributes sensations to a variety of points other than vaso-motor. So, thus, each and all would be correct in their views, and Brown-Sequard has given it the clearest expression. The propinquity of systems to the vaso-motor is in direct ratio of influence exerted upon vaso-motors.

See also Spitzka, "Architecture of Brain, Mixed System."

The forced hypnotism of animals and sleep in general may be accounted for as a withdrawal of vaso-motor cerebral control. Now, if the second and third systems be relieved from such excitation, as is usually experienced during waking hours, both these systems would, in a great measure, abandon their inhibitory control of the primary system, and the hypnotized would be reduced to the lowest state of animation, with occasional interruptions from inner or outer stimulation, inducing dreams, restlessness, etc.

NUCLEI OF MEDULLA.—Gegenbaur (p. 520) shows that the whole vagus must be regarded as a complex of a large number of nerves which are homologous with spinal nerves. Darwin's view of the consolidation of segments to form higher series is quite compatible with the tenor of this paper as well as with the special point just referred to. "Natural selection accounts for it. In the vertebrata we see a series of internal vertebræ bearing certain processes and appendages; in the articulata we see the body divided into a series of segments bearing external appendages, and in flowering plants we see a series of successive spiral whorls of leaves. An indefinite repetition (as Owen has observed) of all low or little modified forms *Therefore we may readily believe that the unknown progenitor of the vertebrata possessed many vertebræ,* the unknown progenitor of the articulata many segments, etc., and as the whole amount of modification will have been effected by slight successive steps, we need not wonder at discovering in such parts or organs a certain degree of fundamental resemblance retained by the strong principle of inheritance." (*Origin of Species,* p. 380.) Compare this with the fact that the Amphioxus possesses from fifty to sixty notochordal segments, and we may conceive that just as the sacrum preserves a certain resemblance to the vertebræ composing it, so the cerebellum in its laminated and lobulated appearance indicates its origin from the intervertebral ganglia which preceded it, and from which it has been formed.

There would be nothing in this to explain rhythmic respirations unless we consider the *somewhat,* not wholly, regular intervals of respiration from the standpoint of food ingestion (oxygen being a food). Most animals are compelled to eat when they can obtain food, and there can be nothing rhythmical about eating, but oxygen being always present as a rule, regular inhalations would follow and become impressed upon the nervous system in about the same manner as habitually regular three meals daily to the man whose habits in this respect are regular, become eventually a physiological necessity, and a meal missed would exert as comparable disturbance as a respiration missed. The only difference between the two as to rhythm becomes a question of time—respiration being simply at shorter intervals than food taking, and both are muscular involuntary acts from the pharynx downward. So also the vermicular pulsations of the arteries become rhythmical owing to the constant presence of an exciting cause for rhythmicality.

Nothing could be more natural than that the abducens nucleus should be primitively connected with an auditory nerve, for sounds reaching an ear from one side could thus reflexly draw the eye to that side.

The abducens, then, is part of the auditory reflex united commissurally to the oculo-motor and trochlearis by columns of Türck.

The primitive labyrinthine vesicle is second in appearing in the embryo, the eye appearing first.

(Dr. Spitzka convinced me that he has a prior claim to the auditory reflex suggestion made above, as he published his views on this point several years ago. The point I consider a good one, and I am pleased to know that Dr. S. and I arrived at this conclusion from different points of view and in different connections.)

The auditory being derived from the pedal in Lamellibranchiata and Scaphopoda would account for respiratory and auditory nuclei in medulla oblongata. The respiratory and locomotor functions are identical in peripheral expression in Branchipus.

The antennary origin is directly in front of the optic in the Cockroach, according to Huxley, p. 357, and this either implies crossed nerve fibres or that the antennal sense of the Cockroach is different from that in Crustacea.

The fact that in the Teleostei the facial nerve enters into connection with the trigeminal, and in many sharks is fused with it, would indicate that the trigeminal is the sensory part largely of the seventh pair. Gegenbaur thinks, however, that this union was effected during their ontogenetic development, and in Urodela and above, these pairs being distinct suggests the idea that if we are to consider the trigeminal and facial as distinct the sensory part of the latter has been utterly or nearly lost in mammalia. Subsequent increase of commissural connections in the brain has given this nerve a wider range of reflex action than that merely afforded by the trigeminal, *as witness the facial muscular play under emotional or intellectual excitation.*

RÉSUMÉ.

1. *The primitive sense is tactile and all senses have proceeded from its differentiation.* For illustrative purposes let us consider energy as divided into molecular vibrations, from one ethereal pulsation in an eternity, to an infinite number of vibrations in one second. In such an undulatory series we may see, as a small division of it, all forces from sound to gravitation represented. While the protozoön may be visibly affected by every such undulation the homogeneity of its composition prevents any differential response; for instance, the tremor of a musical note, heat, light, electricity, alike produce contractions or expansions (motions) of its mass. In a higher form of life nerve tissue appears, which conveys only certain vibrations and rejects all others. Take one undulation in a second as the capacity of this nerve fibre. It is a tactile nerve. When a nerve-fibre conveys more rapid undulations differentiation begins. Sixteen to forty thousand per second begin and end the auditory vibrations. Quicker vibrations to four hundred and fifty billion per second we may view as heat appreciation, thence to eight hundred billion from red to violet light, above this fluorescent undulations, "chemical energy,"

electricity, to infinity. We may thus mathematically conceive an auditory sense derived from the general tactile or a special touch sense (like that of the fifth pair of nerves). An optic sense would arise from this same tactile, and we have seen it thus differentiated embryologically.

2. *Qualitative differentiation of the nervous organization proceeds dorsally, with a tendency toward the head end.* That portion of the animal which stands in most direct relation to the changing molecular movements of the environment develops the highest sensory and motor nerve-centres and projections.

3. *Repetition of parts of a system, up to a certain point ceases; and these parts become commissurally united before another system is perfected.*

The sympathetic nervous system, consisting of the intestinal and vascular or vaso-motor nerves, develops first. Schenck and Birdsall (*Archives of Medicine*, vol. I., No. 2) on the Embryogeny of the Sympathetic, consider this system as composed of masses originating in the central nervous system. This is a truth from one standpoint, and that a very narrow one. Blending the results of comparative embryology and anatomy, the sympathetic precedes the creation of other systems.

The second system to appear phylogenetically is the spinal, equivalent in the invertebrates to their "cerebral" ganglia.

The third system is the intervertebral, the swellings upon the posterior roots of the spinal nerves.

4. *The cerebellum is formed from fused hypertrophied intervertebral ganglia.*

Many sensory cranial nerves pass through this organ and by the fusion of these originally separate centres co-ordination occurs necessarily.

Excessive development on the one hand, or want of development on the other, places all the ganglionary tubercles and lobes of the encephalon in the third system category. Thus *the præfrontal lobe of the cerebrum, the occipital and temporal lobes, the olivary body, the olfactory lobe, the mammillary eminence, the epiphisis cerebri, the tubercula bigemina, the petrosal and Gasserian ganglia were originally intervertebral* *ganglia*, and still maintain resemblance to these ganglia in many particulars.

5. *The præ-frontal lobe is the last intervertebral ganglion to develop.* It grows larger in the scale of intelligence and presses the occipital (see the brains of monotremes and marsupials) backward, downward and forward, thus forming the temporal (or what has been erroneously termed the middle) lobe.

6. The cerebro-spinal nerves, in some cases, preserve their original projections from and to muscles, but these nerves may also have not only a distribution to the viscera, as has the pneumogastric, but may also project into and from *other system-centres.* The lateral columns of the spinal cord, the tegmentum and crura cerebri in their main mass may thus be regarded as cerebro-spinal nerves of the highest series, having lower system-centres for peripheries. The præ-frontal lobes thus exert an inhibitory control over the highest centres, because such centres are peripheries for the nerves of these foremost ganglia.

ART. II.—CONTRIBUTIONS TO NERVOUS AND MENTAL PATHOLOGY.

BY EDWARD C. SPITZKA, M. D.

VI.—RACE AND INSANITY.

THERE is one question related to the etiological problems involved in the study of insanity, regarding which the information furnished in the hand-books is meagre and vague, and yet which from an anthropological, if not from other points of view, is an extremely interesting one.

Several years ago, while engaged in a series of investigations on the somatic etiology of insanity, I drew this question within the range of my studies; and as the New York City Asylum for the Insane, at which, without holding any official position, I was, through the kindness of a friend, collecting some material for clinical and pathological investigation, offered an excellent field for the study of the relations of race to insanity, I set about utilizing this opportunity.

Dr. Kiernan, at that time an *interne* at the institution named, at a great sacrifice of time and with a readiness that I must gratefully acknowledge, set on foot an enumeration intended to show the relation, first, of races to insanity in general, and then of each race to each particular form of insanity. The Doctor was the better able to furnish me with a reliable and exhaustive summary, as the statistical labors of the institution were at that time, and had been for some years, mainly, if not exclusively, in his hands, and his knowledge of the languages enabled him to track out what would in other hands have probably proved very problematical nativities. I need not add that an analysis of hundreds of cases, from a clinical point of view, carried on single handed, was alone an immense labor.

At the time when I had proposed to utilize the statistics, these were not in such shape or sufficiently perfect to permit me to draw any conclusions from them. Several factors had not been sufficiently differentiated to permit of that comparison and contrast which is a basis of all inferences to be drawn from statistical tables. I also felt individual doubts on many points that I now feel more confident concerning. In short, I did not incorporate the work in the essay which circumstances forced me to complete at that time. Dr. Kiernan, however, continued independently to extend the tables, followed the suggestions made, incorporated the new admissions, and found that at the date of his leaving the asylum it comprised the racial statistics of over two thousand lunatics. The fact that a larger number of individuals was comprised in the enumeration alone permitted of a fairer comparison, and a more thorough classification rendered these tables of greater value than they possessed when first submitted. Dr. Kiernan has once more placed these tables at my disposal, and I shall proceed to lay the same before the reader, with such comments as I am able to make, either as the result of my own observations on these very cases, on others occurring in a similar population, or finally as following naturally from the figures themselves.

The county of New York being the great receiving depot of the emigration, a comparison of the insane ratio of different races might seem faulty, as the fact that not only the lame, halt and blind are sent here by certain liberal communities on the other side of the Atlantic, but in addition the criminals and the lunatics are despatched to furnish a quota to that percentage of these classes which is of foreign birth. But this source of error is practically eliminated by the fact that the insane arriving in this way are provided for in a separate and distinct institution, the State Asylum for insane emigrants on Ward's Island, which is under the supervision of the State Commissioners of Emigration. Unless cured or dying in the meantime, these patients are drafted off to the county asylums after having been in this country *five years*, and by that time their number has been so much diminished through various channels, death, discharge, and removal by relatives, that it does not play any appreciable part in the statistics of the county institutions. It must be recollected that the overwhelming majority of these cases represents the legitimately

TABLE A.

Form of Insanity.	Anglo-Americans.	English.	Scotch.	Anglo-Saxon Race. Total.	German-American.	German.	Dutch.	Germanic Race. Total.	Norse.	Swedes.	Danes.	Scandinavian Race. Total.	Teutonic Family Total.	Irish-American.	Irish.	Welsh.	Celtic Family Total.	Portuguese.	Spanish.	Italian.	French.	Latin Family Total.	Bohemian.	Polish.	Russian.	Sclavonic Family Total.	Hebrew.	Kurd.	Shemitic Family Total.	Chinese.	Hungarian.	Mongolian Family Total.	Negro Family Total.	Grand Total.
Paralytic Insanities	61	10	7	78	22	30	3	55	1	6	4	11	144	41	35	5	81		1	4	6	11	4	1	1	6	21		21	2	1	3	18	284
Hebephrenia and Insanity of masturbation	25	3	1	29	10	9	1	20		2		2	51	14	4	2	20		1	1	1	3	1	1		2	27		27		1	1	8	112
Katatonia	14	1		15	6	4		10					25	11	3		14			1		1	1			1	2		2				3	46
Circular Alienation	14	1	1	16	9	1	1	11					27	9	6		15		1		1	2	1		1	2	3		3				1	50
Senile Alienation	11	3	1	15	4	11		15		1		1	31	10	21		31			2		2	1			1	7		7				10	82
Epileptic Alienation	12	5	1	18	9	12	1	22		1		1	41	20	15		35						1			1	14		14				10	101
Acute Mania	40	14	5	59	24	30		54	1	1	1	3	116	50	46		96						4			4	23		23				21	260
Periodical Mania	18	5	1	24	9	10	1	20					44	11	9		20		1		2	3					4		4				6	77
Melancholia	40	8	3	51	33	70	2	105	6	4	2	12	168	50	20	4	74		6	5	12	23	3			3	20		20				13	301
Mixed Group	100	15	7	122	64	61		125	6	5	4	15	262	115	117	3	235	1	3	7	13	24	2		1	3	51	1	52				74	650
Terminal Dementia	103	20	2	125	23	30	2	55					180	20	56	2	78						4			4	32		32				40	334
Total of each Nationality Insane,	438	85	29	552	213	268	11	492	14	20	11	45	1,089	351	332	16	699	1	13	20	35	69	22	2	3	27	204	1	205	2	2	4	204	2,297

insane emigration, that is, of individuals who have become insane shortly before or during the voyage or on their arrival, or who accompanied their respective families, and that the number despatched surreptitiously is necessarily a small one, as, first, only comparatively docile patients can be transferred across the Atlantic so unceremoniously; secondly, a number are turned back on the way; and finally, that the aggregate of the insane filtering through to us from this source is counterbalanced by the insane left in European asylums and alms-houses by families emigrating to America. Those so remaining should strictly count as a part of the insane percentage of the population emigrating. The subjoined table (A) shows at a glance the number of the insane appertaining to each race, whether of foreign or native birth, the number pertaining to each form of insanity, and the total of patients suffering from each form of alienation.

All the patients were of one sex, the male. The population insane here given, includes the patients living in the asylum at the end of the year 1874, and the new admissions of the years 1875, 1876, 1877, and a portion of those admitted in 1878.

It will be perceived that some of the nationalities, such as the Scotch, Norwegians, Swedes, Danes, Welsh, as well as the nations belonging to the Latin, Sclavonic and Mongolian families, are represented in too small numbers to permit of any conclusions being drawn as to the ratio they bear to the corresponding sane population. I have left them in the table however, in order to exhibit the part they play in our large insane community. Subtracting the total of Hebrews from the grand total, for the reason that there is no clue at present obtainable as to how many members of this race were of foreign, and how many of domestic birth, and the determination of this point having been unaccountably neglected at the time the tables were compiled, we will find that of 2093 insane whose nativity is known, 887 were of foreign birth, and 1206 were born in the United States.

Leaving out of the question for the moment what proportion these respective figures bear to the entire number of inhabitants of the County, and considering merely the percentage contributed to each total by patients suffering from special forms of insanity, we will find that each form maintains about the same ratio both among the insane of foreign and those of native birth.

TABLE B.

FORM OF INSANITY.	No. and Percentage of Foreign Births.		No. and Percentage of Native Births.		No. and Percentage of unascertained Births (Hebrew).		Total No. and Percentage.	
Progressive Paresis	121	$.13\frac{64}{100}$	142	$.11\frac{77}{100}$	21	$.10\frac{29}{100}$	284	$.12\frac{36}{100}$
Hebephrenia and Insanity of Masturbation	28	$.03\frac{15}{100}$	57	$.04\frac{72}{100}$	27	$.13\frac{23}{100}$	112	$.04\frac{85}{100}$
Katatonia	10	$.01\frac{12}{100}$	34	$.02\frac{81}{100}$	2	$.00\frac{98}{100}$	46	$.02\frac{00}{100}$
Circular Alienation	14	$.01\frac{57}{100}$	33	$.02\frac{78}{100}$	3	$.01\frac{47}{100}$	50	$.02\frac{17}{100}$
Senile Alienation	40	$.04\frac{50}{100}$	35	$.02\frac{90}{100}$	7	$.03\frac{43}{100}$	82	$.03\frac{56}{100}$
Epileptic Alienation	36	$.04\frac{5}{100}$	51	$.04\frac{22}{100}$	14	$.06\frac{86}{101}$	101	$.04\frac{39}{100}$
Acute Mania	102	$.11\frac{49}{100}$	135	$.11\frac{18}{100}$	23	$.11\frac{27}{100}$	260	$.11\frac{31}{100}$
Periodical Mania	29	$.03\frac{26}{100}$	44	$.03\frac{64}{100}$	4	$.01\frac{91}{100}$	77	$.03\frac{35}{100}$
Melancholia	145	$.16\frac{34}{100}$	136	$.11\frac{27}{100}$	20	$.09\frac{80}{100}$	301	$.13\frac{10}{100}$
Mixed Group	246	$.27\frac{78}{100}$	353	$.29\frac{27}{100}$	51	$.24\frac{99}{100}$	650	$.28\frac{29}{100}$
Terminal Dementia	116	$.12\frac{85}{100}$	186	$.15\frac{45}{100}$	32	$.15\frac{68}{100}$	334	$.14\frac{44}{100}$
TOTAL	887	1.00	1206	1.00	204	1.00	2297	1.00

The most startling difference is noticeable in the case of acute Melancholia, in which form the foreign born population vastly exceeds the native. The natural inference follows, that the great disparity here manifested must be due to some of the causes connected with emigration, and, indeed in my experience with a number of cases of Melancholia among the Germans, I have found that Nostalgia, isolation from society (no new associations having been formed, when those once existing at home had been broken), and the deeper dejection and depression naturally following reverses in those so situated as contrasted with the condition of those who under similar reverses, would have friends and relatives to fall back on, were fertile and common factors in the production of this mental disorder. The third column of the table having been added only for the purpose of filling what would otherwise appear a gap, will not be commented on now; the lessons to be learned from it will be expatiated on, when we come to consider the relations of the individual nationalities and races. The object of table B is to show what rôle emigration as a single factor exercises on the existence and predisposition to special forms of insanity. We are justified in announcing as a

FIRST CONCLUSION.

That melancholia (true lypemania) is considerably more frequent among the foreign born than among the native insane population. For every hundred insane of the former there are sixteen melancholiacs, while for the same number of the latter there are but eleven such.

As we proceed it will be found that this proposition will require some modification, inasmuch as it does not apply equally to the native and foreign born members of each individual race. The fact of emigration does not appear to be as important a factor as the predisposing element which seems to be due to race-character itself!

The merely ascertaining what proportion of each race in the population is insane is not as important in my mind as the determination of the preponderance of special forms of insanity in certain races. Still as the well known influence of heredity has an important bearing on the amount of the insane in a given community, it will be well to throw a glance at this part of the subject. Unfortunately there are many grounds for suspecting the government census to be unreliable. The sort of individuals appointed to take a census are pretty certain to put down every foreigner whose language they can not understand as a German, and every non-Catholic as a Protestant. The first column in the table exhibits the number of sane persons of each race and nativity in every 10,000 of the sane population, according to the census of 1875. The second column exhibits the proportion of the insane of each race and nativity as calculated by myself from Dr. Kiernan's figures, on a basis of 10,000 as the insane population.

TABLE C.

Race and Nativity.	Sane out of a general population of 10,000.	Insane out of an asylum population of 10,000.
Anglo-Americans	2,074	1,906
English	149	370
Scotch	147	126
TOTAL ANGLO-SAXON	2,370	2,402
German-American	1,582	927
Native German	1,604	1,166
Dutch	11	47
TOTAL TEUTONIC	3,197	2,140
Irish-American	1,830	1,528
Native Irish	1,911	1,445
Welsh	31	69
TOTAL CELTIC	3,772	3,042
SHEMITIC, according to a computation of a gentleman connected with the Hebrew charities.	750	888

Inasmuch as the census takes no account of the Shemitic race, and the vast majority of that race have either come from or through Germany to this country, and as there is further evidence inherent to the census report, showing that even the Jews from Poland and Austria have been added to the German column, the asylum statistics and those of the census do not correspond. In order to make them tally, the Shemitic insane should be added to the Teutonic, thus bringing the latter up to 3,028 instead of 2,140.

It must be recollected here that the first column includes both sexes and all ages, while the second includes the male insane alone. This materially invalidates the drawing of conclusions from table C, for the current female insane population is vastly in excess of the male. As far as I can gather it is to-day in the proportion of 14 insane females to 10 insane males.

If the figures given in the first column are reliable, the order of frequency of insanity in the four principal civilized races represented is as follows: Jews, Anglo-Saxons, Germanic, Celts.

I believe this to be the true order, and if we take into account that far more native Americans and Jews are cared for in private and state asylums than Germans and Irish,

TABLE D.

SHOWING THE PERCENTAGE OF THE MALE INSANE OF EACH NATIONALITY SUFFERING FROM SPECIAL FORMS OF ALIENATION.

Form of Insanity.	Anglo-Americans.	English.	Anglo-Saxons as a Whole (Including Scotch).	German-Americans.	Germans.	Germanic People as a Whole (Including Dutch).	Scandinavian People as a Whole	Irish-Americans.	Irish.	Celts as a Whole (Including Welsh).	Spaniards.	Italians.	French.	Latins as a Whole.	Sclavonic People as a Whole.	Hebrews.	Negroes.	Whole Asylum Population.
Paralytic Insanities	$.13\frac{92}{100}$	$.11\frac{70}{100}$	$.13\frac{29}{100}$	$.10\frac{32}{100}$	$.11\frac{20}{100}$	$.11\frac{13}{100}$	$.24\frac{40}{100}$	$.11\frac{68}{100}$	$.10\frac{54}{100}$	$.11\frac{58}{100}$	$.07\frac{69}{100}$	.20	$.17\frac{17}{100}$	$.15\frac{94}{100}$	$.22\frac{22}{100}$	$.10\frac{29}{100}$	$.08\frac{82}{100}$	$.12\frac{36}{100}$
Hebephrenia and Insanity of masturbation	$.05\frac{72}{100}$	$.03\frac{52}{100}$	$.05\frac{25}{100}$	$.04\frac{69}{100}$	$.03\frac{41}{100}$	$.04\frac{6}{100}$	$.04\frac{44}{100}$	$.03\frac{98}{100}$	$.01\frac{20}{100}$	$.02\frac{86}{100}$	$.07\frac{69}{100}$	.05	$.02\frac{85}{100}$	$.04\frac{34}{100}$	$.07\frac{40}{100}$	$.13\frac{23}{100}$	$.03\frac{86}{100}$	$.04\frac{87}{100}$
Katatonia	$.03\frac{19}{100}$	$.01\frac{17}{100}$	$.02\frac{71}{100}$	$.02\frac{81}{100}$	$.01\frac{40}{100}$	$.02\frac{3}{100}$	----	$.03\frac{13}{100}$	$.00\frac{90}{100}$	.02	----	.05	----	$.01\frac{44}{100}$	$.03\frac{70}{100}$	$.00\frac{98}{100}$	$.01\frac{47}{100}$	.02
Circular Alienation	$.03\frac{19}{100}$	$.01\frac{17}{100}$	$.02\frac{89}{100}$	$.04\frac{22}{100}$	$.00\frac{87}{100}$	$.02\frac{23}{100}$	----	$.02\frac{58}{100}$	$.01\frac{80}{100}$	$.02\frac{14}{100}$	$.07\frac{69}{100}$	----	$.02\frac{85}{100}$	$.02\frac{89}{100}$	$.07\frac{40}{100}$	$.01\frac{47}{100}$	$.00\frac{19}{100}$	$.02\frac{17}{000}$
Senile Alienation	$.02\frac{51}{100}$	$.03\frac{52}{100}$	$.02\frac{71}{100}$	$.01\frac{87}{100}$	$.04\frac{10}{100}$	$.03\frac{4}{100}$	$.02\frac{22}{100}$	$.02\frac{85}{100}$	$.06\frac{30}{100}$	$.04\frac{43}{100}$	----	.10	----	$.02\frac{89}{100}$	$.03\frac{70}{100}$	$.03\frac{43}{100}$	$.04\frac{90}{100}$	$.03\frac{56}{100}$
Epileptic Alienation	$.02\frac{74}{100}$	$.05\frac{88}{100}$	$.03\frac{26}{100}$	$.04\frac{32}{100}$	$.04\frac{49}{100}$	$.04\frac{46}{100}$	$.02\frac{22}{100}$	$.05\frac{76}{100}$	$.04\frac{51}{100}$	.05	----	----	----	----	$.03\frac{70}{100}$	$.06\frac{86}{100}$	$.04\frac{90}{100}$	$.04\frac{39}{100}$
Acute Mania	$.09\frac{13}{100}$	$.16\frac{47}{100}$	$.10\frac{68}{100}$	$.11\frac{26}{100}$	$.11\frac{19}{100}$	$.10\frac{97}{100}$	$.06\frac{66}{100}$	$.14\frac{21}{100}$	$.13\frac{85}{100}$	$.13\frac{73}{100}$	----	----	----	----	$.14\frac{81}{100}$	$.11\frac{27}{100}$	$.10\frac{29}{100}$	$.11\frac{31}{100}$
Recurrent and Periodical Mania	$.04\frac{10}{100}$	$.05\frac{88}{100}$	$.04\frac{34}{100}$	$.04\frac{32}{101}$	$.03\frac{73}{100}$	$.04\frac{6}{100}$	----	$.03\frac{13}{100}$	$.02\frac{71}{100}$	$.02\frac{86}{100}$	$.07\frac{69}{100}$	----	$.05\frac{70}{100}$	$.04\frac{34}{100}$	----	$.01\frac{91}{100}$	$.02\frac{94}{100}$	$.03\frac{35}{100}$
Acute Melancholia	$.09\frac{13}{100}$	$.09\frac{41}{100}$	$.09\frac{83}{100}$	$.15\frac{54}{100}$	$.26\frac{11}{100}$	$.21\frac{84}{100}$	$.26\frac{66}{100}$	$.14\frac{24}{100}$	$.06\frac{2}{100}$	$.10\frac{58}{100}$	$.46\frac{15}{100}$	.25	$.34\frac{28}{100}$	$.33\frac{33}{100}$	$.11\frac{11}{100}$	$.09\frac{80}{100}$	$.06\frac{37}{100}$	$.13\frac{10}{100}$
Mixed Group	$.22\frac{82}{100}$	$.17\frac{63}{100}$	$.22\frac{7}{100}$	$.30\frac{3}{100}$	$.22\frac{75}{100}$	$.25\frac{40}{100}$	$.33\frac{33}{100}$	$.32\frac{75}{100}$	$35\frac{21}{100}$	$.33\frac{61}{100}$	$.23\frac{7}{100}$	.35	$.37\frac{5}{100}$	$.34\frac{77}{100}$	$.11\frac{10}{100}$	$.24\frac{99}{100}$	$.36\frac{26}{100}$	$.28\frac{29}{100}$
Terminal Dementia	$.23\frac{51}{100}$	$.23\frac{52}{100}$	$.22\frac{64}{100}$	$.10\frac{79}{100}$	$.11\frac{19}{100}$	$.11\frac{13}{100}$	----	$.05\frac{69}{100}$	$16\frac{86}{100}$	$.11\frac{15}{100}$	----	----	----	----	$.14\frac{81}{100}$	$.15\frac{68}{100}$	$.19\frac{60}{100}$	$.14\frac{40}{100}$
Error	$.00\frac{6}{100}$	$.00\frac{12}{100}$	$.00\frac{12}{100}$	$.00\frac{2}{100}$	.00	$.00\frac{15}{100}$	$.00\frac{7}{100}$	$.00\frac{6}{100}$	$.00\frac{10}{100}$	$.00\frac{7}{100}$	$.00\frac{2}{100}$	.00	$.00\frac{5}{100}$	$.00\frac{6}{100}$	$.00\frac{5}{100}$	$.00\frac{4}{100}$	$.00\frac{10}{100}$	$.00\frac{20}{100}$

whose insane chiefly drift into county asylums, the figures will speak only the more strongly in favor of the series as given.

Turning to the more interesting inquiry as to the preponderance of given forms of insanity in each race, we will be able to draw far more reliable inferences (table D). Before proceeding to analyze the results, it may be well to say a few words in regard to the nomenclature of the various forms of insanity adopted. At the time the tables were first compiled the histories of the patients were, with few exceptions, so imperfect as to permit of hardly any subtler clinical demarcation without a repeated examination of the patient. I recollect well how, in turning over the records, I lighted on a few histories taken by Dr. Kellogg, the first superintendent of the asylum, which were models of scholarly psychological observation and clinical analysis, but these stood forth from the rest of the volume like an oasis in a barren desert.

The vast majority of the histories read somewhat, as to length and definiteness, like the following, recently discovered in the annals of a kindred institution, the King's County Asylum. In that case the history of the patient's *mental* condition covered *four lines* of the record only. In fact, it was about half as long as the record of the patient's mental state made by the committing physicians on their certificates after a single fifteen minutes' examination: "His mental faculties have become impaired, is suspicious of those around him, and will sit passively, when of a sudden he becomes very violent, shrieking in all directions and yelling."

As a type of the kind of classification adopted at the Ward's Island asylum, I select one from its report of 1876:

1. Mania, acute.
2. " chronic.
3. " recurrent.
4. Melancholia, acute.
5. " chronic.
6. Dementia, primary.
7. " secondary.
8. Amentia (!) idiocy.
9. " imbecile.
10. General paresis.

Since a patient excited for a brief period is classed as an acute maniac by the gentlemen who have adopted this classification, one who is excited at intervals as a recurrent maniac, one excited for a long period as a chronic maniac, one who is depressed a short time an acute melancholiac, for a long time a chronic melancholiac, and so on, I may be permitted to object to a classification which every asylum attendant is as well qualified to discriminate in as the medical superintendent, on account of its being layman-like and unscientific in the highest degree. There is no provision in the table for the epileptic insane, of whom there were one hundred and one in the asylum within a period of less than four years! None for the alcoholic insane, or for those suffering from insanity of masturbation, not to speak of the more recently established groups of primary and secondary vesania, katatonia, hebephrenia, impulsive insanity, and so on! Even general paralysis of the insane was not perfectly recognized at the time I first visited the institution, and many cases of this disease I found classed as chronic mania, though Dr. Kiernan subsequently assigned them to their proper category.

Under these circumstances the asylum classification was discarded as misleading and imperfect, and I have been compelled to alter the tables, even as they were presented to me, for another reason. Originally what I have enumerated as the "Mixed Group" was submitted under the two heads of "Chronic Mania" and "Chronic Melancholia." One need but turn to the "clinical lectures" * emanating from this institution to find that the most infantile notions as to the signification and correlation of symptoms have given rise to it. In short, that under the head of chronic mania are confusedly mixed up cases of dipsomania, moral insanity, impulsive insanity, primary vesania of the megalomaniacal variety, erotomania, and so on, together with the secondary vesanias, with a confusion of ideas (rarely of a more extreme kind than

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* In the *Medical Record*, vol. 16, No. 21, p. 482, is related a magnificently typical case of megalomaniacal primary vesania, with combined delusions of grandeur and persecution, as a characteristic case of melancholia!!! Similar instances of clinical skill are crowded in the same series of articles. Here is the proper field for asylum reform from a medical pointof view!

that prevailing in the classification). In like manner "Chronic Melancholia" contains cases of primary vesania of the most intellectual type, with delusions of grandeur and persecution, together with cases of terminal dementia and associated depression. What could be more condemnable than to classify the "stupidité" of the French, the "*angedonnerte melancholie*" or "stupiditaet" of the Germans, as a subdivision of "dementia" with the qualifying adjective "primary"?

I was compelled for these reasons to erect a "mixed group" for the accommodation of certain primary and secondary vesanias that at this date it is impossible to classify. Dr. Kiernan had already, before submitting the tables to me, placed "primary dementia" where it belonged, with acute melancholia. As there was a doubt in regard to some cases observed prior to 1876, cases having been arbitrarily assigned to either group, the two have been combined under the latter name.

As a similar confusion existed at the same period with regard to hebephrenia (insanity of pubescence, not in the sense of Skae, but of Bucknill and Tuke) and insanity of masturbation, and as there appear to be many features in common between the two, these have also been combined.

I am well aware how much these groupings, rendered necessary as they are, damage the value of the tables, but believe that, notwithstanding this, some interesting deductions can be drawn from them. It is but proper to add that the gentleman who assisted me in this labor has the same views on this head.

With regard to the paralytic insanities, it is to be regretted that the luetic, alcoholic, and other forms have not been held apart; notwithstanding the fact that during the last five years the writing of papers on this disease has become a hobby at the institution in question, the different forms and their relation to specific etiological factors are almost ignored. It is remarked that just as insanity in general seems to be most frequent with nationalities represented by the smallest figures in the general population, such as the Dutch, Scandinavians, Welsh, Latins, and Sclavonic peoples, so general paralysis reaches its highest percentage among the insane of these nations. Of one hundred insane the

Scandinavians	have	24	paralytic	insane.
Dutch	"	27	"	"
Scotch	"	24	"	"
Welsh	"	31	"	"
Latins	"	16	"	"
Sclaves	"	22	"	"

It is true that the numbers are small, but it must be more than a coincidence that *all* nations representing a small fraction of the general population have a vastly higher percentage of paretics than those constituting the bulk of the population. The average of the entire asylum population, paretic is $12\frac{86}{100}$; excluding the Scandinavians, Dutch, Scotch, Welsh, Latins, and Sclaves, it is $11\frac{48}{100}$. The least of the figures of the nationalities named rises five per cent. over this, the greatest sixteen per cent.!

I attribute this excess to the fact that the wandering professions, agents, sailors, firemen of steamers (exposed to caloric), are more numerous, proportionately, among the races sending the smaller quotas to the emigration, on the one hand; on the other, to the greater mental strain thrown on those who have to make their way, isolated from the more congenial surroundings in which other nationalities find themselves. But the most important factor lies, doubtless, in the fact that one of the premonitory symptoms of the disease, the *mania errabunda*, causes the predisposed among various nations to find their way to this shore.

These figures, therefore, do not represent the true part that these nationalities play in the quota furnished to the paralytic insanities. But they illustrate the influence of a symptom of the disease itself. That among the nationalities of small representation the Spaniards should rank lowest is in accordance with the observation that the paralytic insanities are rarer in the warm countries, such as the Antilles and Mexico, whence the members of this race living in the asylum were chiefly derived, than in the cold climates. At bottom this is also a psychological cause.

The order of frequency with which the paralytic insanities appear among the insane of each of the five races present in a sufficient number to warrant deduction, is as follows:

1. Anglo-Saxons, $.13\frac{29}{100}$ in 100
2. Celts, $.11\frac{58}{100}$ " "
3. Germanic, $.11\frac{18}{100}$ " "
4. Hebrews, $.10\frac{29}{100}$ " "
5. Negroes, $.08\frac{82}{100}$ " "

The Anglo-Saxon, or the race of the greatest speculative business tendencies, of a high, if not the highest, intellectual development among the races inhabiting the United States, has the highest proportion paretic! That mere business labor is not the most fertile cause of the disease is evident from the fact that the Hebrew race, equally as active, and equally, if not more successful in the mercantile world, occupies one of the lowest places in the list. That intellectual exertion of every kind is not *per se* a cause is shown by the lesser percentage among the Germanic races, who have always stood foremost in abstract and speculative science. Either the high proportion is directly due to race, or indirectly to some tendency of the race. England and America are the countries of the most feverish and active civilization, of great facilities for travel, of large manufacturing and mercantile establishments, of hurry, bustle, and restlessness, and all these features seem to be implanted in the race. The German still retains in this land the phlegm, as it is miscalled, of his forefathers; the Celt preserves, as a rule, those qualities for which he was noted in his native land, of taking things easier than the Saxon; and the Negro is practically indifferent and lethargic to those matters which call for the interest and action of the higher races. The question of the relation of sexual excess to the paralytic insanities, as a primary cause, disposed of as it has been by high authority, is decided contrarily, also, by these figures. No one will claim that the Anglo-Saxon is more libidinous or less competent to endure the indulgence in that tendency than the other races. If any reflection could be cast on any race in this respect, it would be the one which actually shows the least percentage of paretic individuals, the Negro. That individuals of the latter race at all become paretic, I attribute to the fact that such members of it as compete with the higher races in vocations requiring a certain degree of mental exertion do so with an inferior brain, and consequently break down in the contest for existence. It is for a similar reason that more paretics are found among females engaged in vocations once the sole field of the male than among housewives.

The natural deduction which follows from all these reflections and the figures may be incorporated in our

SECOND PROPOSITION.

That paralytic insanity is more frequent among races of a high than a low cerebral organization, most frequent among those whose civilization induces a restless mental activity, and that sexual excess has no essential bearing on the production of these diseases.

It is but proper to state, and this I do merely on the strength of an impression derived from a large number of cases, that syphilis plays about the same rôle in the causation of paralytic forms of insanity in all the races named, excepting the Negro, with whom it is in excess. This latter observation is in accordance with that of the physicians of a negro hospital in this city, who find syphilis to be quite universal among the mongrel negro population of this city.

The comparative immunity of the Hebrews I attribute to the fact, that with all the similarity in its surroundings and mental organization to the other higher races, the excitement incident to business transactions and the generally active life of the nineteenth century fails to act upon a people who for centuries have been trained for such an epoch. The place of the Hebrew for ages has been in the great cities and business marts; his occupation, traffic; and his children, and children's children have easily and naturally followed the extension of the mercantile sphere in the world's activity, unlike the descendants of those who have been artisans and farmers, and have been thrown into the turmoil and routine of business with a brain unprepared by hereditary influence. So strong is the influence of heredity in this respect that I have not infrequently noticed, in examining the relatives of Hebrews who have become insane, that often times with imbecility, weakmindedness and actual vesania, there was a considerable degree of business shrewdness, more than many a perfectly sane Caucasian would manifest. I have seen a microcephalic young man of this race whose mental faculties were generally not as well developed as those of an average child of nine, who attended regularly and punctually to his father's business, was universally considered a fair business man, and as far as a capability for routine business and getting the best end of a bargain was concerned, could compare favorably with the average clerk.

There is a lunatic Hebrew in the asylum (whose statistics I am giving) to-day who entertains the delusion, very stupidly expressed at that, that he is General Grant, who at the times when I have seen him was engaged in exchanging presents made by relatives with other patients, and but for the restraint imposed upon such transactions would infallibly have accumulated all their property in his own possession, without resorting to anything outside of what the world considers legitimate business strategy. I need not refer to another paretic of the same race, recently pronounced sane by a jury, who accumulated a fortune of $80,000 in a few years, during part of which period he had been thrice incarcerated in British and American asylums while suffering from acute exacerbations of this disease.

As far as my observation extends, the cases of paralytic insanity occurring among Hebrews more frequently exhibit the action of an hereditary influence than do the corresponding cases occurring in other nationalities. This is in harmony with our later conclusion, that in general the factor of heredity is very potent among these people.

It is in accordance with the well known experience regarding hereditary cases of paresis, that more long-lived cases, and longer periods of remission, should be found among Hebrews than among other races.

A second observation which follows from these figures is that the Irish are not, as some superintendents of Irish asylums have claimed, immune to this disease. When placed under the same social conditions as other races, they show the same or about the same proportion of paretics, ten and a half per cent. for those born in Ireland, eleven and six-tenths per-cent. for those born in this country. This slight difference of one per cent. may be accidental, but I think that the fact that those born in this country are more apt to compete in higher walks of active life than those born in Ireland, may have some influence here.

THIRD PROPOSITION.

The Celtic race is not immune to the paralytic insanities; when placed under the same conditions as other races, it is as subject to the disease as the Teutonic peoples.

By those who like Dr. Ashe, of Ireland, claim that paralytic insanity is due to an excessive assimilation of phosphates with the food, and that the by him alleged immunity of the Irish was due to the fact that their diet contained very few phosphates, this proposition may be construed as being favorable to their very weak theory. It is needless for any writer of to-day to state that paralytic insanity is due to factors very remote from the chemical composition of the food! When we bear in mind that among the coast population of Ireland we have a fish diet prevalent, and also that in districts of Saxony in which paralytic insanity is quite common, a potato diet is even more exclusively adhered to than in Ireland, the inutility of further discussion of this question will appear evident.

It is noteworthy that the slight disparity (about one per cent.) found to exist between the native born and the American born Germans in the frequency of this disease is in a contrary sense. This is, however, an apparent discrepancy only; on excluding the cases of acute melancholia in both groups it disappears.

Mendel, in his recent work on progressive paralysis of the insane, gives as the percentage of paretics treated in the aggregate asylums of Germany during the years 1877 and 1878, 10.5 and 11.3 respectively. These figures are very nearly the same as those I have given as the proportions of Germans and German-Americans paretic in the New York County Asylum. Mendel's figures here quoted refer, as mine do, only to the male population.

Regarding the second category, hebephrenia and insanity of masturbation, it is remarked that while the other races show a low percentage, the Hebrews have one nearly three times as great as the highest ratio of other races.

1. Hebrews, $.13\frac{23}{100}$.
2. Anglo-Saxons, $.05\frac{25}{100}$.
3. Germanic, $.04\frac{44}{100}$.
4. Negro, $.03\frac{86}{100}$.
5. Celt, $.02\frac{86}{100}$.

It would be very erroneous to infer from this table the extent to which masturbation is practiced among the youth of different nations. In a community like this one it is probably equally disseminated among all branches. But we are justified in inferring the extent to which this habit acting upon the hereditarily predisposed mental organization, produces insanity. I should say from my recollection that the high Hebrew proportion was rather due to hebephrenia than to insanity of masturbation. The former disease I think may be looked on as an arrest or perversion of mental development occurring at puberty, analogous on the one hand to arrest of development in the infantile period, on the other to those cases of paralytic dementia which simulate a pre-senile decay. It is an hereditary affection. It is a legitimate conclusion to say that the frequency of these two forms, having the common feature of recurring at or about puberty, has a direct proportion to heredity. The Hebrew occupies a somewhat isolated position in this respect, as with that race heredity is much increased by factors not acting among other races to the same extent. Although the mischievous character of the habit of intermarrying is now generally recognized, and agitated against by the eminent men of that race, its evil effects have been too deeply ingrafted to be speedily eradicated.

Epileptic alienation stands nearly even among the different races:

Hebrews,	$.06\frac{36}{100}$.
Celt,	.05.
Negro,	$.04\frac{90}{100}$.
Germanic,	$.04\frac{46}{100}$.
Anglo-Saxon,	$.03\frac{26}{100}$.

The figures are too small to permit of conclusions.

The disparity between Anglo-Americans and English in regard to acute mania, *over seven per cent.*, is not in favor of those who in this country advocate the necessity of more restraint than is admitted in England, on the strength of the alleged fact that violent cases of insanity are more frequent here than there. The same applies to that most dangerous form of epileptic alienation, which is represented by a percentage doubly higher for the English than for the native Americans.

If any inference were to be drawn as to the curability of insanity from the frequency with which terminal dementia sets in, in different races, the insane of the Germanic and Celtic race would seem to stand a better chance of recovery from the acuter vesanias than the Anglo-Saxon and Negro, while the Hebrew occupies an intermediate position. The order of frequency is as follows:

1. Anglo-Saxons, $.22\frac{64}{100}$.
2. Negroes, $.19\frac{60}{100}$.
3. Hebrews, $.15\frac{68}{100}$.
4. Celt, $.11\frac{15}{100}$.
5. Germanic, $.11\frac{13}{100}$.

I believe that the figures are sufficiently large for this inference, and the correspondence between the Anglo-American and English percentage is so close as to materially strengthen it.

It would appear that the Celtic race had improved in this respect by emigration; while there is a close correspondence among the individual branches of each other race, the American Celt has eleven per cent. less of terminal dements than the foreign born Celt.

The most important deductions are to be drawn from the figures denoting the proportion of acute melancholiacs. Here the order of frequency is as follows:

Germanic, $.21\frac{34}{100}$.
Celt, $.10\frac{58}{100}$.
English, $.09\frac{83}{100}$.
Hebrew, $.09\frac{80}{100}$.
Negro, $.06\frac{37}{100}$.

The frequency of melancholia is greater among the emigrated than among the American-born German, which is in accord with our opening proposition.

Native-born Germans, $.26\frac{11}{100}$.
German Americans, $.14\frac{54}{100}$.

As I have observed the insane in private practice, I should be inclined to say that the Germanic peoples, as contrasted with other peoples, are constitutionally inclined to acute melancholia, of an emotional form and comparatively curable, with less tendency to actual delusion than is generally manifested. This observation is in accord with the lesser frequency with which terminal dementia occurs with them.

A remarkable exception to the general rule governing the frequency with which melancholia occurs in emigrated peoples, and with which the figures of all the columns denoting the melancholiacs of other foreign births are in harmony, is constituted by the Irish. While the Irish-American has nearly as high a proportion as the German American ($.14\frac{34}{100}$ and $.15\frac{54}{100}$), the native Irish have not quite half that proportion ($.06\frac{2}{100}$). Whether the great improvement in his material surroundings, contrasting so favorably with what he has to endure at home, may not have counteracted the ordinary depressing influences of somatic and psychical life with the Celt, is the question that arises. If this is accepted as the solution of the problem, the increase of melancholia among his descendants must be referred to the fact that the wave of prosperity having reached a fixed level with the latter, that the depressing influences are again able to exert their influence.

In concluding, I would say that I am perfectly well aware of many sources of error existing in every study of this kind. In order to present the subject in the most unimpeachable manner, I should have obtained the number of the insane from this county who were inhabitants of the State asylum at Poughkeepsie, the asylum for insane criminals, as well as the various private institutions in this as well as Long Island and Connecticut, during the same period that these 2,297 male insane were tabulated in the county asylum.

The reasons why I have not done so, or been able to do so, must be obvious to every one who has been an attentive reader of the JOURNAL OF NERVOUS AND MENTAL DISEASE for the past three years, as well as of the asylum reports.

Imperfect as the tables are, and crude as the conclusions necessarily must be, I present them for the purpose of eliciting such comment and correction as they call for. And if they have done nothing else, I trust they have shown what an important field of study has been neglected by the physicians of our asylums, and notably by the Commissioner in Lunacy of the State of New York.

There is a special provision in the law of the State to the effect that that officer is to collect such statistics and other data regarding the insane of this State as may be of interest.

What inquiry could have been more easily made, what figures would have proven more interesting, than such as would show the influence of race, of emigration, of sex, and of social conditions on the production of different forms of insanity? Unfortunately, here, as in all other branches of the science of psychiatry, it seems not only that all suggestions must come from without, but also that before they can be adopted by those who hold the opportunities for investigation in a monopolizing grasp, the adamantine wall of indifference and incompetency will have to be penetrated.

So far as the tables herewith presented permit of an answer to the question, as to the influence race has on insanity, the following may be stated :

On the whole, the different forms of insanity occur in nearly the same proportions in the Anglo-Saxon, Teutonic, Celtic, and Hebrew races; paralytic insanity is most common among Anglo-Saxons and least common among Negroes; melancholia is most common among the Germanic peoples; the tendency to terminal dementia is greater in the Anglo-Saxon than in the German or Celt; and the forms dependent upon hereditary taint are most common among Hebrews. With this it is in accord, that since the termination in dementia and the influence of heredity are the factors which chiefly cause an accumulation of the insane population, that the Hebrew and the Anglo-Saxon should have the highest proportions insane of their respective populations.

Art. III.—CONTRIBUTIONS TO PSYCHIATRY.

By James G. Kiernan, M. D.

I.

MANIA TRANSITORIA.

THAT there should be transitory mental affections would not surprise any one accustomed to think philosophically, especially when it is remembered that among the ordinary physical diseases there are many of this nature. A temporary diarrhœa, nay even (the nearest to a mental affection) a transitory cerebral congestion, are known and admitted by all; it is also generally admitted that these affections may occur without apparent prodromata, and disappear without leaving apparent sequelæ in persons healthy previous and subsequent to the attack. However, apply these conditions to mental affections, and claim that a transitory mania is a psychosis that might have been expected *a priori*, and numerous disclaimers quickly appear. This condition of things arises from the important medico-legal relations that this psychosis has, and more especially from the fact that, as a plea for non-responsibility, it has been much abused. In forensic psychiatry, from causes alluded to elsewhere, all sorts of extravagant opinions are made use of to force various mental conditions, morbid or not, into the procrustean bed of the psychosis that fits the particular case. No psychosis has been more abused in this particular than mania transitoria, for under this category physicians claiming to be psychiatrical experts have placed conditions varying from the primary vesania of the Germans to morbid impulse, depravity, nay even fits of anger. From such procedures much confusion has occurred as to what this psychosis is, and its very existence, as already hinted, has been denied. Waiving, for the present, examination of the reasons why such denial has been made, the positive clinical evidence naturally

(1) "Psychoses of Secondary Fever of Syphilis," Journal of Nervous and Mental Disease, July, 1880.

presents itself for examination. As I have based this paper, not so much on *a priori* reasoning as on the personal clinical experience of two cases, the examination of the conclusions of acknowledged authorities should precede, as it will serve to elucidate them. Von Krafft-Ebing,[2] who has written most clearly and convincingly of any of the authorities on this subject, claims that mania transitoria is a psychosis characterized by sudden invasion and cessation in a person of excitable temperament, attended by amnesia and followed by slumber. Starck,[3] Pick,[4] Essenbeck[5] and L. Meyer,[6] who have also made clinical investigations of the subject, agree substantially with Von Krafft-Ebing. Devergie[7] finds it to be a psychosis without apparent cause or prodromata, breaking out suddenly and ceasing with a crime. Bellard[8] concludes that it is a mental disease of a sudden and temporary character, which carries the patient to automatic acts not foreseen. Bell[9] has stated that it is a mental disease suddenly coming on and as suddenly passing away in a hitherto sane individual. Griesinger,[10] Ray[11] and Maudsley[12] consider it a brief explosive attack of acute mania. Marc,[13] Henke[14] and Cazauvielh[15] consider it an instantaneous, temporary, fleeting form of insanity. Castelnau[16] says it is an instantaneous, temporary, fleeting mania; a mental disorder which bursts out suddenly and ceases with a crime. Bucknill and Tuke,[17] while holding the question *sub judice*, say it is a mental disease paroxysmal in

(2) *Allgemeine Zeitschrift für Psychiatrie*, 1868. *Lehre von der Mania Transitoria*, *Irrenfreund*, 1871.

(3) *Irrenfreund*, 1871.

(4) *Prager Med. Wochenschrift*, p. 411, IV., 1879.

(5) *Memorabilien Heilbron*, XIV., 1879.

(6) *Ueber Mania Transitoria.*

(7) *Annales d'hygiene publique*, XLV., 1851.

(8) *Les Aliénés devant les Courts d'Assise.*

(9) *Trial of Rogers*, p. 157.

(10) *Pathologie und Therapie der Psychischen Krankheiten*, p. 123.

(11) *Medical Jurisprudence of Insanity.*

(12) *Pathology of Mind*, 1880.

(13) *De La Folie, etc.*, II., 511.

(14) *Abhandl. Gerichtl. Medicin.*

(15) *Monomanie homicide.*

(16) *Annales d'hygiene publique*, XI., 1857.

(17) *Psychological Medicine.*

character, of brief duration and sudden cessation. Clark,[18] Jarvis[19] and Woodward[20] consider it an instantaneous, temporary abeyance of judgment and reason, transient in character, occurring in individuals hitherto sane. Calmeil[21] and Tardieu[22] agree substantially with Castelnau. The case given by Rush[23] presents similar symptoms to those of Woodward, as do some of the cases of homicidal monomania cited by Esquirol[24]. Otto and Hoffbauer agree with Ray, as do some of the cases cited by Pritchard.[25] From the cases and conclusions of these authorities it is clear that mania transitoria is a psychosis made up of the essential features of maniacal excitement, brevity of duration and sudden invasion, together with a non-essential feature of violence, occurring in an individual hitherto and subsequently sane. My own two cases are as follows:

Case I. A. B., American, clerk, abstinent, aged 24, single, father epileptic, grandfather died of apoplexy, was admitted to asylum with a history of having been an inmate of the penitentiary for six months preceding his admission, and had been apparently well, mentally and physically, until the evening before admission, when he made a sudden, violent, unprovoked and indiscriminate attack on the keepers and convicts, at the supper table. Soon after this he was transferred to a cell and continued acutely maniacal for two hours, at length falling into a slumber which lasted an hour and a half. In the course of the next fourteen hours he was transferred to the asylum. On admission was slow, but perfectly coherent and rational, in speech. Gave a full, true account of all that happened that day up to the supper time, when the last thing he recollected was getting up to get some salt, but remembered no more till he found himself in the cell four hours after. He had been at work in the quarries all day and had felt over-

(18) *Journal of Insanity*, 1869.
(19) *Journal of Insanity*, vol. 28.
(20) *Journal of Insanity*, vol. 28.
(21) *Annales Médico-Psychologiques*, vol. 29.
(22) *Annales Médico-Psychologiques*, p. 413, 1872.
(23) *Medical Enquiries and Observations.*
(24) *Maladies Mentales*, tome II.
(25) *Treatise on Insanity.*

come by heat at night. His face and hands were somewhat turgid, but in two hours this condition had vanished. He strongly objected to being considered insane, but despite his remonstrances he was retained for a month when, no new phenomena appearing and the patient being perfectly sane, he was, at his urgent and repeated request, returned to the penitentiary to serve out his term, being discharged from the asylum as a case of acute mania from epilepsy, the superintendent basing this diagnosis on the single explosive act of violence. A year and a half, when last heard from, had no returns of the acute mania, nor any epileptic attacks.

Case II. C. M., twenty-three, single, dressmaker, Scotch-Irish, abstinent, maternal ancestors all liable to "rush of blood to the head," from which the great-grandfather, grandfather and granduncle died. I saw this patient accidentally while called by her brother, an employé of the asylum, to attend the mother, who was suffering from the premonitory symptoms of cerebral congestion. The daughter had been watching her mother very faithfully for two nights, and was much worn out. She had a quarrel an hour before my arrival, with her betrothed, after which she went up-stairs to work at a dress which had occupied her for two days previous, but which she found had been placed near the fire, and two live coals had fallen on it. She burst into a violent rage, tore the dress to pieces, and then attempted to smash the furniture. She was secured by her sister, but continued violently excited for the next hour, at which time I saw her. She was then in a condition of acute mania; said I was so dark I must be the devil; and made two attacks on me. Other than this she did not display any evidence of delusions or hallucinations, but was very destructive, and required constant watching. I ordered her to be wet packed in a sheet, and an enema given her. In the course of half an hour she fell into a deep sleep, on awaking from which, two hours after, she was perfectly herself, but had no recollection of anything subsequent to her discovery of the dress being spoiled. She was very much ashamed of the language addressed to me, having been told of it by her sister rather injudiciously She had been previously a very good tempered girl, and had never before given vent to such a violent fit of anger. Just previous to falling asleep her hands became very turgid, but by the time she awoke this condition of things had disappeared.

Here are two cases, both of which are undoubtedly genuine; in neither can there be said to be anything to indicate epilepsy other than the violence and the turgid condition of the hands, but since the latter is found also in melancholia, and the dementia secondary to hebephrenia, no stress can be laid on that. These two cases agree in the requirements already laid down of a case of mania transitoria. They display, however, evidence of causation of predisposing nature, heredity, and of an exciting character, violent emotion, physical exhaustion and insolation, but all these are admitted as causes by all the authorities cited, even Devergie, who lays stress on the fact that the causes are not at first apparent, but insists that they are always present. The first case resembles, in some respects, the one cited by Le Grand du Saulle, and placed by him under epileptic mania, although, as he says, he could not undertake to *prove* its epileptic nature. As before stated, I regard the attempts at violence as a non-essential part, though a frequent concomitant of the disease. The fact that the disease often ceases with a crime simply arises from the disease having then reached its acme. This psychosis is, in my opinion, very rare. I have had the opportunity of examining twenty-two hundred and ninety-seven cases of insanity in the New York city asylum, and nine hundred and twenty-three in other institutions and private practice, and have seen but two cases. As far as these two observations go they fully corroborate Von Krafft-Ebing. Having dealt with the disease as observed, clinically, it now becomes necessary to consider certain objections to its existence. Ordronaux[26] claims that in mania transitoria nature departs from her laws, since there are no prodromata or sequelæ, a cavil that is fully answered already. He objects also to the fact that most of the cases observed are of foreign origin, a nativistic argument that answers itself. He claims that superintendents seeing thousands of cases have yet to see a single case of mania transitoria. A little might be said here as to the clinical skill of these superintend-

(26) *Journal of Insanity*, vol. 29, p. 333 *et seq.*

ents, since one of those cited recently assured a general paretic's friends that he would recover in three months; but the cavil is sufficiently answered by my experience already given. In reply to the rest of his objections, I cannot do better than quote the criticism on his article by Achille Foville pére[27]:

"Here is a fantastic interpretation which we could scarcely have expected, and which is *hardly* calculated to rank as a *scientific* production.[28] Other than this, it is not to scientific procedures that the author has recourse, to combat the existence of moral insanity and mania transitoria; it is only by the aid of appeals thoroughly permeated with religious sentimentality, and drawn from the domain of literature. that the author declares moral insanity and mania transitoria false, absurd, ridiculous, and above all, unworthy of being received by the courts. To enable the reader to judge of the extra scientific method adopted by the author, we give the conclusion of his article: 'Lastly, we object to both (mania transitoria and moral insanity) because it is an attempt to set back the clock of the century, and to revert to supernaturalism and superstition in medicine. It is an attempt to curtain the windows (*sic*)[29] of that science whose religious duty it is to cast light and not mysticism around disease—to treat it not as a personal devil entirely to be exorcised by *philters* and mummery, but rather as the perversion of a natural state struggling to regain its equilibrium.' Many physicians will be astonished to learn that, according to Dr. Ordronaux, they are deceived in believing themselves in the pathway of modern progress and scientific advance, when in reality they are returning to the Dark Ages. But will the rhetoric of their American colleague induce them to retrace their footsteps?"

Wharton and Stillé's[30] objections are much more logical. They claim—

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(27) *Annales Médico-Psychologiques*, 1874.

(28) Alluding to his statement that the existence of moral insanity was due to Pinel's benevolent attempt to account for the executions of the first French Revolution.

(29) Dr. Foville's interpolation.

(30) *Medical Jurisprudence*, vol. I., p. 719

First. That the majority of French and German alienists have not accepted this psychosis, but cite only Liman,[31] "who says transient attacks of mania may occur in the sane, but no distinctive *species of mania*, as mania transitoria, so-called," which is granting all that is required, since the chief difference between ordinary acute mania and mania transitoria is the *transient* nature of the latter; Friedrich[32] and Schurmayer,[33] who admit the possibility of the existence of mania transitoria, but declare it difficult of recognition, and Le Grand du Saulle,[34] whose statements are seriously modified by the case already reported from him. In view of the fact that so few authorities are cited, and those few not decidedly opposed to mania transitoria, it must be admitted that Wharton and Stillé's statements are not very well borne out by the facts.

Second. That many of the cases of Dr. Jarvis[35] are imperfectly reported, and are certainly in the right as regards many of them, as Dr. Jarvis has thrown together cases of morbid impulse, epileptic insanity and simple anger, but certain of his cases are mania transitoria, and the reasoning of Wharton and Stillé fails to explain them away; for instance, for a sober woman to stab her husband for asking for his supper on his return from work, is certainly a very peculiar act, assuming she was sane, as we are required to do by Wharton and Stillé's analysis of this case.

Third. That to recognize this psychosis would be to open the door to barbarism, which strongly reminds one of Ordronaux's rhodomontade; science[36] endeavors to ascertain the truth, no matter what the consequence. If mania transitoria exists, it must be recognized by forensic psychiatry, no matter what the consequences be; these can be guarded against afterwards. There can be no special pleading in science.

In the fourth place they object that the principle of the law that a man sane before an act and sane after it must be sane during it, is a principle of common sense. This can scarcely

(31) Casper's *Gerichtlichen Medicin.*

(32) *Handbuch der Gerichtlichen Psychologie.*

(33) *Gerichtlichen Medicin*, § 522.

(34) *Médicine Legale.*

(35) Op cit. They appear to consider him *the* authority on this subject.

(36) See note.

be called a principle of the law, since the law recognizes that an epileptic may be sane before a certain specified act and sane after it, yet the act be an insane one; it is best not to dogmatize about common sense.

Cook[37] claims that all well authenticated cases of mania transitoria are cases of *cerebral* epilepsy. You cannot prove the epilepsy: you can the mania, and it is transient; and is it not as easy to accept the theory of transitory mania as it is to go wandering off in the woods after a far-fetched, forced explanation? From the cases already referred to, of Calmeil, Castelnau, Tardieu, Le Grand du Saulle, Esquirol, Marc, Cazauvielh, Henke, Otto, Hoffbauer, Krafft-Ebing, Griesinger, Pick, Essenbeck, Maudsley, Pritchard, Ray, Rush, Bell, Woodward, Jarvis, Clark and myself, the following conclusions clearly follow:

1. That there is such a psychosis as mania transitoria.
2. That it is an ordinary form of acute mania characterized by the brevity and explosive character of the violence.
3. That it occurs in individuals sane before and subsequent to the attack, rarely relapses, and seldom lasts more than six hours.
4. That there are no apparent prodromata and no apparent sequelæ, except the turgid hands and slumber can be called such.
5. That the predisposing causes are heredity and an excitable temperament.
6. That the exciting causes may be alcoholic excess, insolation, physical exhaustion, violent emotion, and mental strain.
7. That the patient is apt to commit violence during the attack, of which he retains no after remembrance.
8. That the disease tends of itself to recovery.
9. That the disease is analogous to the epileptic replacing psychoses.
10. That the plea of transitory mania has been much abused in criminal cases, and that many cases are placed under it of a different kind from the psychosis itself.

Note.—Dr. Bannister, I find, has used a similar argument against a like cavil in regard to moral insanity.—Journal of Nervous and Mental Disease, 1877.

(37) *Phila. Med. and Surg. Reporter*, vol. II., 531, 1873.

II.

FOLIE A DEUX OR FOLIE COMMUNIQUÉE.

This psychosis, or more properly, mental condition, has received much attention at the hands of the French and German psychiatrists. The English have not made many contributions to the subject, and the only American one is that of Seguin[38]; his cases, as Hack Tuke[39] remarks, are rather cases of acute insanity arising in sisters than *folie a deux.* Falret and Laségue[40] have made a very philosophical study of this condition, and have arrived at the following conclusions:

1. That in ordinary conditions mental contagion does not proceed from an insane person either to a sane or to another insane individual.

2. That contagion is only possible in exceptional instances.

3. That these are divisible into two great classes.

a—In *folie a deux* one of the patients is an active, the other a passive recipient. The active agent creates the delusions and imposes them on the other, who receives and submits easily to his influence; but in time the delusions as accepted by the passive patient react on the other, and are, in a modified condition, accepted and proclaimed by both as true.

b—For the same intellectual delusions to occur in two individuals, they must have been subject to the same influences and lived a long time together.

4. All cases observed have presented the same symptoms, and have only developed under circumstances such as those described.

5. This form of insanity is more common among women than men.

6. The patients may be related, but more frequently are not.

7. The chief point in treatment is the separation of the active individual from the other.

8. The passive individual usually recovers first.

9. Delusions may be communicated from a second to a third, and so on to several individuals, but this rarely happens.

(38) *Archives of Medicine*, 1879.

(39) *Journal of Mental Science*, Jan., 1880.

(40) *Annales Médico Psychologiques*, tome XVIII., p. 321, *et seq.*

While my own experience to a great extent corroborates these conclusions, still there is sufficient difference to render an account of the cases I have to report of interest to the readers of the JOURNAL.

Folie a deux, or more properly the communication of an insane intellectual conception from one mind to another, is very frequently noticed among the general paretics. This observation was first made by myself, and communicated to Dr. A. E. Macdonald,[41] who made use of it in his monograph on "General Paresis" and his subsequent lectures on that subject.[42] In every ward of an insane asylum containing general paretics will be found three or four who bear in their delusions traces of delusions of other patients, while nearly all the paretics accept the delusions of the other paretics as true. One general paretic in Ward's Island was going to secure an immense increase of capital by marrying his daughter to a fellow paretic. Two ex-commission merchants formed a copartnership to the extent of several billion dollars. A gambler based his delusions on the delusions of his companions, having won the wealth they boasted of from them. This condition of things arises, as Spitzka[43] has pointed out, from the paretic's loss of his proper self-consciousness. This mental condition is, as already stated, very closely analogous to the psychological phenomena of *folie a deux.* Considering the latter in its widest possible sense, cases are to be found among those already insane, and I shall consider these before passing to the cases of the affection in its limited sense. The relations between the insane patients are identical with those described by Falret.

Cases I–VI. A Presbyterian clergyman, liberal education, American, 40 years old, abstinent, married, strong hereditary taint, was admitted to the asylum at intervals from 1872 to 1873, and discharged during periods of paralucidity, the contrast between which and the periods when his mental disease was well marked were extreme. In the paralucid period he

(41) *Journal of Insanity*, April, 1877.

(42) *Medical Record*, Jan., 1879.

(43) JOURNAL OF NERVOUS AND MENTAL DISEASE, "Pathological Psychology of Progressive Paresis," April, 1877.

was polite, unassuming, unobtrusive, and a pleasant companion; in the other conditions he was inquisitive, familiar, obtrusive, given to very loud talking, and had marked insanity of manner. His correspondences then displayed all the peculiar punctuation and emphasis common to the chronic insane, together with a great superabundance of adjectives and a marked attempt at frequent alliteration. In 1874, he came on a visit to the asylum, filled with ideas of ameliorating the condition of the patients, and, above all, of improving their intellectual capacity by means of a lecture on the Holy Land. He was then clearly in his insane period, and displayed his restlessness, obtrusiveness, and peculiarities common to him at that time. But the interest of the case lay in the companions by whom he was accompanied, all of whom were permeated with ideas of a delusive character, based on the improvement of the insane and the conversion of them into useful members of society, of almost the same character as the ideas of the minister. The first case was a general paretic, one of those wandering cases who come to the front when any popular uprising happens. This individual had been to Cuba, and had claimed to have a colonel's commission in the Cuban republican army. Somewhere he had met the minister, who obtained an ascendancy over him, and his mind was thoroughly permeated with the schemes of that gentleman. He attempted to ameliorate the condition of the insane by purchasing five dollars' worth of red and blue lead pencils, and distributing them among the patients and attendants. The second member of the group was a case of chronic mania with imbecility, who was very religious, and full of the ideas of serving God by ameliorating the condition of the insane. The third individual was a case of hebephrenia, who mingled in his conversation religion, regrets at his having been addicted to masturbation and the delusive ideas already alluded to. The fourth case was a similar form of insanity to the minister, but shading into dementia and thoroughly dominated by the ideas of his companions. The fifth member of the group was an epileptic, slightly demented, but swayed by the same dominant ideas. When again a patient the minister displayed great power of collecting similar groups.

Cases VII., VIII. These were two young men, one a case of chronic intellectual mania with some hereditary predisposition, who was the greater part of the time quiet and a good worker, though occasionally violent; always, whether quiet or violent, manifesting the one delusion that he was God. He contracted a great friendship with a case of hebephrenia in the same ward. In the course of an examination it was developed that the hebephreniac recognized his companion's godhead; that he believed himself, and was believed by the chronic maniac, to be an angel.

Case IX. was an imbecile who worked near the two last mentioned, and although not admitted to fellowship with them still kept intimate enough with them to imbibe part of their ideas. On one occasion having overcome the chronic maniac in a quarrel, he called himself thereafter the great god who had conquered the little god.

Cases X., XI. Two instances of chronic intellectual mania (the primary vesania of the Germans), who lived a long while together in the asylum, coming gradually to accept each other's delusions, one calling himself God the Father, the other God the Son, and follow each other around.

Cases XII., XIII. These were brother and sister, aged twenty-two and twenty, belonging to an old Knickerbocker family, but reduced since 1873, and compelled to resort to manual labor for a livelihood. There was a strong hereditary tendency. The girl first began to manifest delusions of persecution, and later, as the boy was much in her society, identical delusions developed in him; both were transferred to the city asylums, and both recovered; the boy the first: the girl, who was by far the ablest of the two, later. The form of insanity in both cases was melancholia, and in the boy's would only have amounted to simple depression were it not for the intellectual delusions he received from the girl, and which, as latterly displayed by her, showed traces of a masculine mind.

While it is clear that the majority of the cases are not, strictly speaking, *folie a deux*, still they are very closely related, the two last belonging clearly to that category. From the psychological resemblance between the condition of the previous cases and the two last cited, it seems clear that while cases of *folie a deux* may arise *de novo*, cases of a similar kind are to be found among those already insane, the same evidence of an active agent and a passive recipient being present in both classes. The last case pretty fully corroborates the conclusions of Falret and Lasègue, already cited. From the cases of *folie a deux* and the analogous condition found among the insane, I should be inclined to draw the following conclusions :

1. That *folie a deux*, considered in its wider relations as affecting the insane, is not exceptionally rare.

2. That the same conditions obtain among the insane as among the sane, the active agent being usually an intellectual chronic maniac, the passive recipient an insane patient whose mind is enfeebled ; the case being here more properly a *folie communiquée* than, strictly speaking, a *folie a deux*, the mental influence showing a tendency to spread beyond the first two.

3. That the general conclusions of Falret and Lasègue are corroborated by the cases given.

Finally, that segregation of the insane in immense numbers tends to develop in them insane ideas caught up from their companions, and therefore to diminish their chances of recovery.

III.

THE USE OF ERGOT IN THE TREATMENT OF THE CONVULSIONS OF GENERAL PARESIS.

Perhaps the most serious complications of this psychosis are the epileptiform and apoplectiform convulsions, which occur during its progress; serious not only from their, at times, fatal character, but also from the disagreeable consequences of the trophic changes they at times induce. Any agent that will tend to lessen their frequency will increase, therefore, the paretic's existence and certainly diminish his suffering. Among the numerous remedies that have been mentioned as useful in the treatment of General Paresis is Ergot. My use of this remedy for this particular complication dates back to the year 1874, when at the suggestion of Dr. E. C. Spitzka I began its use. As he has already given his reasons for the use of this remedy[44] I shall confine myself to its action on the convulsions. In dealing with these I have endeavored to approach them from an etiological standpoint as regards the psychosis of which they are a complication. To be sure very many will have to be registered, etiology unknown, but for the others, the *actual* carefully ascertained cause has been given, not the *assigned* one usually employed. There is nothing in the whole subject of Psychiatry so absurd as the custom that obtains, particularly in the United States, of accepting the cause assigned by the relatives, which is nine hundred and ninety-nine times out of a thousand either the effect or the premonitory symptom of the on-coming insanity or, almost equally often, the product of the vigorous imagination of a relative. In the cases given the cause has been definitely traced by careful and patient enquiry. While speaking of causes I would like to express my opinion that the *great cause* of general paresis is *undue emotional*[45] disturbance. At some future time I may give my reasons for this opinion, but at present the matter is hardly pertinent to the present subject of inquiry. I have arranged the cases in tables which are, it seems to me, self-explanatory, adopting as a classification of the convulsions that of Newcombe.[46] I may premise some cavils by saying that such specific treatment as the etiology suggested was adopted before and kept up during the exhibition of ergot. The reason that six months' treatment only was reported was that administrative conveniences did not permit of the exact record of a longer period. The preparation of ergot used was the fluid extract of Squibb, in doses of eight grammes gradually increased to sixteen. Hypodermic injections of ergotin were at times used, but as a rule not yielding any better results than the fluid extract, they were abandoned, as the hypodermic system of medication should be used as unfrequently as possible in general paresis, because of the

(44) JOURNAL OF NERVOUS AND MENTAL DISEASE, Vol. VII., "Progressive Paresis."

(45) I find since writing the above that Austin has expressed a similar opinion.

(46) "Convulsions of General Paresis," *West Riding Reports*, vol. V.

ease with which traumatic causes produce decided changes in the skin. There are some differences between my results in these cases and those of Newcombe; the first being that the period between the apoplectiform convulsions was longer in my cases than in his, which may result either from the relatively fewer cases examined, or from the greater tendency to apoplexy of the English; at the same time the interval between the epileptiform convulsions is decidedly shorter, which unquestionably results from the fact that the worst cases were chosen for treatment. Newcombe's classification is as follows:

1*a*. Convulsions, with hemiplegia.
1*b*. Convulsions, without hemiplegia.
2. Convulsions affecting both sides.
3. Convulsions affecting right and left sides alternately.

CLASS I. UNILATERAL CONVULSIONS.

SUB-CLASS A, WITH HEMIPLEGIA.

Table 1, showing the results of treatment, with the number of convulsions, three months preceding, and six months succeeding treatment.

APOPLECTIFORM.

	3 Mos. Before.		3 Mos. After.		6 Mos. After.	
Cause.	No.	Length.	No.	Length.	No.	Length
1 Syphilis	3	3 hrs.	1	1 hour.	1	¼ hr.
2 Unknown	4	2½ "	1	1 "	1	½ "
3 Insolation	4	2 "	1	2 "	1	½ "
4 Rheumatism	3	3 "	1	¼ "	0	0 "
		Average.		Average.		Average.
Total	14	3⅜ hrs.	4	1 1-16	3	⅜ hr.

EPILEPTIFORM.

	3 Mos. Before.		3 Mos. After.		6 Mos. After.	
Cause.	No.	Length.	No.	Length.	No.	Length.
1 Traumatic	18	½ hour.	3	1-6 hour	2	1-6 hr.
2 Unknown	14	1 "	1	½ "	0	0
3 Traumatic	18	1 "	2	½ "	1	¼ hr.
4 Unknown	16	¼ "	3	1-6 "	1	1-6 "
5 Insolation	10	½ "	2	1-6 "	1	1-12 "
6 Unknown	12	¼ "	6	1-6 "	1	1-6 "
7 Lead poisoning	18	½ "	2	½ "	1	¼ "
		Average.		Average.		Average.
	106	4-7 hr.	19	13-42	7	13-84 hr.

Table 2, showing the termination of the cases and time subsequent to treatment, and from the beginning of the diseases.

APOPLECTIFORM.

Termination.	After Treatment.	From Beginning.
1 Died of diarrhœa	2 years.	4 years.
2 " " phthisis	2 "	3 "

Termination.	After Treatment.	From Beginning.
3 Died of maniacal exhaustion.............	1¼ "	3 "
4 Discharged improved, still alive..........	2 "	4 "
	Average. 1⅞ year.	Average. 3½ years.

EPILEPTIFORM.

Termination.	After Treatment.	From Beginning.
1 Died of cerebral abscess.................	2 years	3 years.
2 Discharged, lost sight of	1 "	2 "
3 Died of apoplexy	2 "	4 "
4 " " "	1½ "	3 "
5 " " diarrhœa	3 "	5 "
6 Discharged, lost sight of	3 "	4 "
7 Discharged, lost sight of	2 "	4 "
	Average. 2 1-14 yrs.	Average. 3 4-7 yrs.

SUBDIVISION B, WITHOUT HEMIPLEGIA.

Table 3, similar to Table 1.

APOPLECTIFORM.

Cause.	3 Mos. Before. No.	Length.	3 Mos. After. No.	Length.	6 Mos. After. No.	Length.
1 Unknown	4	1 hr.	1	½ hr.	1	1-6 hr.

EPILEPTIFORM.

Cause.	3 Mos. Before. No	Length.	3 Mos. After. No.	Length.	6 Mos. After. No.	Length.
1 Unknown	16	¼ hr.	3	¼ hr.	1	¼ hr.
2 Syphilis	6	¼ "	0	0 "	0	0
3 Unknown....................	18	¼ "	3	¼ "	2	¼ hr.
4 Traumatic	14	¼ "	3	¼ "	1	¼ "
5 Developed from chronic mania	18	½ "	5	½ "	3	½ "
6 " " " "	8	½ "	6	¼ "	2	¼ "
7 Syphilis	8	¼ "	3	¼ "	1	¼ "
8 Traumatic	18	½ "	10	½ "	1	¼ "
9 Otorrhœa	8	½ "	1	¼ "	died.	
	114	Average. 13-36	40	Average. 5-18	11	Average. 2-9

Table 4, similar to Table 2.

APOPLECTIFORM.

Termination.	After Treatment.	From Beginning.
1 Died in a convulsion................	2 years	3 years

EPILEPTIFORM.

Termination	After Treatment	From Beginning.
1 Discharged improved, lost sight of......	2 years.	4 years.
2 Still alive, discharged apparently well..	6 "	10 "
3 Died of diarrhœa.......................	1 "	3 "
4 " " phthisis.........................	2 "	4 "
5 " in a convulsion	1 "	2 "
6 " " "	1 "	2 "
7 Still alive	5 "	7 "
8 Died of exhaustion	3 "	5
9 " " "	3-12 "	11-12 "
	Average. 2 19-48.	4 1-9 yrs.

CLASS II. BOTH SIDES AFFECTED.

Table 5, similar to Table I.

APOPLECTIFORM.

Cause.	3 Mos. Before. No.	3 Mos. Before. Length.	3 Mos. After. No.	3 Mos. After. Length.	6 Mos. After. No.	6 Mos. After. Length.
1 Unknown	3	3 hrs.	1	2 hrs.	1	1 hr.
2 "	3	8 "	2	3 "	1	2 "
3 Developed from chronic mania	3	3 "	1	2 "	1	$\frac{1}{2}$ "
	9	$4\frac{2}{3}$ hrs.	4	$2\frac{1}{3}$ hrs.	3	1 1-16 hr.

EPILEPTIFORM.

Cause.	3 Mos. Before. No.	3 Mos. Before. Length.	3 Mos. After. No.	3 Mos. After. Length.	6 Mos. After. No.	6 Mos. After. Length.
1 Unknown	16	1 hr.	4	1 hr.	1	$\frac{3}{4}$ hr.
2 Syphilis	18	1 "	6	1 "	3	$\frac{1}{4}$ "
3 Insolation	15	$\frac{1}{2}$ "	4	$\frac{1}{4}$ "	1	$\frac{1}{4}$ "
4 Unknown	18	3 "	3	1 "	1	1-6 "
5 Traumatic	15	2 "	8	1 "	2	$\frac{1}{2}$ "
		Average.		Average.		Average.
	82	$1\frac{1}{2}$ hr.	25	9-20 hr.	8	17-60 hr.

Table 6, similar to Table 2.

APOPLECTIFORM.

Termination.	After Treatment.	From Beginning.
1 Died of phthisis	2 years.	3 years.
2 " in a convulsion	2 "	3 "
3 " " "	1 "	2 "
	$1\frac{2}{3}$ yr.	$2\frac{2}{3}$ yrs.

EPILEPTIFORM.

Termination.	After Treatment.	From Beginning.
1 Died of apoplexy	2 years.	4 years.
2 " "	2 "	3 "
3 " exhaustion	2 "	$3\frac{1}{2}$ "
4 Discharged, lost sight of	3 "	4 "
5 Died of exhaustion	3 "	4 "
	Average.	Average.
	2 2-5 yrs.	3 7-10 yrs.

CLASS III. EACH SIDE ALTERNATELY AFFECTED.

Table 7, similar to Table 1.

APOPLECTIFORM.

Cause.	3 Mos. Before. No.	3 Mos. Before. Length.	3 Mos. After. No.	3 Mos. After. Length.	6 Mos. After. No.	6 Mos. After. Length.
1 Syphilis	6	3 hours.	1	$2\frac{1}{4}$ hours.	0	0

EPILEPTIFORM.

Cause.	3 Mos. Before No.	3 Mos. Before Length.	3 Mos. After, No.	3 Mos. After, Length.	6 Mos. After. No.	6 Mos. After. Length.
1 Mental strain	18	2 hours.	10	2 hours.	8	1 hour.
2 Unknown	16	5 "	4	1 "	2	1 "
3 Developed after chronic mania	7	2 "	3	1 "	0	0
		Average.		Average.		Average.
	41	3 hrs.	17	$1\frac{1}{3}$ hrs.	4	$\frac{2}{3}$ hr.

Table 8, similar to Table 2.

APOPLECTIFORM.

Termination.	After Treatment.	From Beginning.
1 Died of apoplexy	4 years	6 years

EPILEPTIFORM.

Termination.	After Treatment.	From Beginning.
1 Died of diarrhœa	2 years	3 years
2 " "	2 "	4 "
3 Discharged apparently well, still alive	3 "	4 "
	Average. 2⅓ yrs.	Average. 3⅔ yrs.

SUMMARY, SHOWING THE RESULTS BY CAUSES.

APOPLECTIFORM. Causes.	3 Months before Treatment. No. of cases.	3 Months before Treatment. No. of convulsions.	3 Months before Treatment. Average length of convulsions.	3 Months after Treatment. No. of convulsions.	3 Months after Treatment. Average length of convulsions.	6 Months after Treatment. No. of convulsions.	6 Months after Treatment. Average length of convulsions.	6 Months after Treatment. Died.	6 Months after Treatment. Discharged improved.	Average. Discharged recovered.	Average. Length of disease after treatment.	Average. Total length of disease.
Developed after chronic mania	1	3	3 hrs	1	2 yrs	1	½ hr	1			1 yr.	2 yrs
Insolation	1	4	2	1	2	1	⅓				1½	3
Rheumatism	1	3	3	1	¼	0	0	0	1*		3	4
Syphilis	2	9	3	2	1¾	1	½	2			2	5
Unknown	4	14	3⅝	5	1⅝	4	11-12	4			2	3
Total	9	33		10		7		8	1		19-10	3 2-5

EPILEPTIFORM. Causes.	3 Months before Treatment. No. of cases.	3 Months before Treatment. No. of convulsions.	3 Months before Treatment. Average length of convulsions.	3 Months after Treatment. No. of convulsions.	3 Months after Treatment. Average length of convulsions.	6 Months after Treatment. No. of convulsions.	6 Months after Treatment. Average length of convulsions.	6 Months after Treatment. Died.	6 Months after Treatment. Discharged improved.	Average. Discharged recovered.	Average. Length of disease after treatment.	Average. Total length of disease.
Developed after chronic mania	3	33	1 hr.	14	7-12	5	¼ h.	2		1	1½ y.	2⅔ y.
Insolation	2	25	½	6	5-24	2	1-6	2			2½	4¼
Lead poisoning	1	18	½	2	½	1	¼		1		2	4
Mental strain	1	18	2	10	2	3	1	1			2	3
Otorrhœa	1	8	½	1	¼	Died		1			3-12	11-12
Syphilis	3	22	5-6	9	5-12	4	1-6	1	1	1	4⅛	6⅔
Traumatic	5	83	49-60	26	29-60	7	13-30	5			2 4-5	4
Unknown	8	116	1⅜	27	24-60	9	14-60	4	4		1⅞	3 5-8
Total	24	323		95		31		16	6	2	Av. 2⅛	Av. 3⅔ y.

* Was not discharged; still in the asylum.

Taking these tables in detail, we find that there are eleven cases of the first class, subdivision A; of these, four cases had apoplectiform convulsions and seven epileptiform. That the four apoplectic cases had fourteen convulsions in the three months preceding treatment, of an average duration of three and three-eighths hours. That during the first three months of treatment they had but four convulsions of one and one-sixteenth hour's average duration, which fell to three at the end of six months of three-eighths of an hour's duration. Turning to the question of termination, we find that one case died of phthisis, one of diarrhœa, one of maniacal exhaustion, and one is still alive, the average duration of life being one and seven-eighths year after treatment, three and a half years after beginning of disease. From these facts it follows, first, that ergot has diminished the number of apoplectiform attacks, decreased their duration, and increased the average expectancy of life in this class of cases. Examining now the epileptiform attacks, we find that seven cases had one hundred and six convulsions in the three months preceding treatment, of an average duration of four-sevenths of an hour, which fell to nineteen in the first three months of treatment of an average duration of thirteen-forty-seconds of an hour, and to seven in the second three months, of an average duration of thirteen-eighty-fourths of an hour; that average duration of life was two and a quarter years after treatment and three and four-sevenths years from the beginning of the disease. From these facts it follows that ergot exerts a much more decided influence both on the number and duration of the epileptiform convulsions than on the apoplectiform; that its influence on the duration of life is not as marked as in the case of the apoplectiform convulsions; still the average duration, considering the fact that three of the cases have been discharged and lost sight of, is somewhat over the average duration of the disease. In class I., subdivision B, we find out of ten cases but one case of apoplectiform convulsions, which had four convulsions during the three months preceding treatment, of an hour's duration, falling to one convulsion in the first three months of treatment, of half an hour's duration, and one of one-sixth hour's duration in the second three months of treatment. The patient died in a convulsion two years after treatment, three after the beginning of the disease. The effects of the remedy on the duration and number of convulsions are marked, but nothing can be said as to its effects on life. The cases of epileptiform convulsions were nine in number, who had one hundred and fourteen convulsions of an average duration of thirteen-thirty-sixths of an hour in the three months preceding treatment, falling to forty of ten-thirty-sixths hour's duration during the next three months of treatment, and during the following three months to eleven of eight-thirty-sixths hour's duration, one patient not having any convulsions during treatment and one dying at the end of the first three months' treatment; the average duration of life being two years and four months after treatment and four years and three months after the beginning of the disease, so the same effect is produced on the duration and frequency of the convulsions, while life is apparently lengthened.

In class II. there were eight cases, of which three were apoplectiform, having nine convulsions of an average duration of four and two-thirds hours during the three months preceding treatment, and four convulsions of two and a third hours' duration during the first three months of treatment, falling to three of one and a sixth hour's duration during the last three months of treatment; the average duration of life being one and two-thirds year after treatment, and two and two-thirds years after beginning of disease. It is obvious, therefore, that while the remedy has affected the disease, it did so much less than in class I. Of the cases of epileptiform convulsions, there were five having eighty-two convulsions of an average duration of an hour and a half during the three months preceding treatment, falling to twenty-five convulsions of an average duration of nine-twentieths of an hour in the first three months of treatment, and to eight of seventeen minutes' duration in the second three months; the average duration of life being two and two-fifths years after treatment, and three from the beginning of the disease. The same condition of things, it is evident, holds good here as in the apoplectiform convulsions.

In class III. there were four cases, of which one was apoplectiform, having six convulsions of an average duration of three hours and a half in the three months previous to treatment, one of two and a half hours in the second half of the first three months of treatment, and none in the second three months of treatment, the patient dying of apoplexy four years after treatment and six after the beginning of the disease. Here it is evident that the influence of ergot was marked, both as regards diminution in number and decrease of duration of the convulsions, as also increase in the duration of life. There were three epileptiform cases which had forty-one convulsions of an average duration of three hours in the three months preceding treatment, falling to seventeen of one and a third hour's duration during the first quarter of treatment, and four of two-thirds of an hour duration during the second quarter; the average duration of life being two and a third years after treatment and three and two-thirds years after the beginning of the disease, one of the patients being still alive. The same influence of ergot is visible here as in the apoplectiform cases. From all this it is evident that ergot exerts a direct influence on the convulsions of general paresis. The following facts are in addition to be observed: First, that of the thirty-three two were discharged apparently recovered, both are still alive, one is pursuing his profession as a physician, the other as a mason; six were discharged improved, and five lost sight of; one still alive; one is still alive in the seventh year of the disease in the asylum; and twenty-four are dead, of whom five died in a convulsion, five of apoplexy, four of exhaustion from general paresis, three of phthisis, five of diarrhœa, one of cerebral abscess, and one of maniacal exhaustion. Of those dying of apoplexy, one died four years after treatment, three two years, and one a year and a half. Of those dying of convulsions, two died two years after treatment and three a year after. Of those dying of exhaustion from general paresis, two died three years after treatment, one two years after treatment, and one three months after. Of those dying of diarrhœa, one died three years after treatment, three two years after, and one one year after. One patient died two years after treatment, of cerebral abscess, and one a year and a half after treatment, of maniacal exhaustion. Of two patients who apparently recovered, one was of syphilitic origin; the other entered the asylum as a case of acute melancholia with frenzy, passed into a condition of chronic mania, and from that into general paresis. From all the facts given I think the following conclusions can be drawn:

1. That ergot exerts a decided influence over the convulsions of general paresis.
2. That this influence is, as a rule, more marked in the apoplectiform convulsions.
3. That the first, third and second classes of Newcombe are, in the order named, amenable to treatment by this means.

ART. IV.—A CASE OF ACUTE DIFFUSE MYELITIS.

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AND

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THIS case occurred in a patient suffering from Progressive Paresis of the Insane as a complication, and in some respects is of such rare occurrence that it is now published.

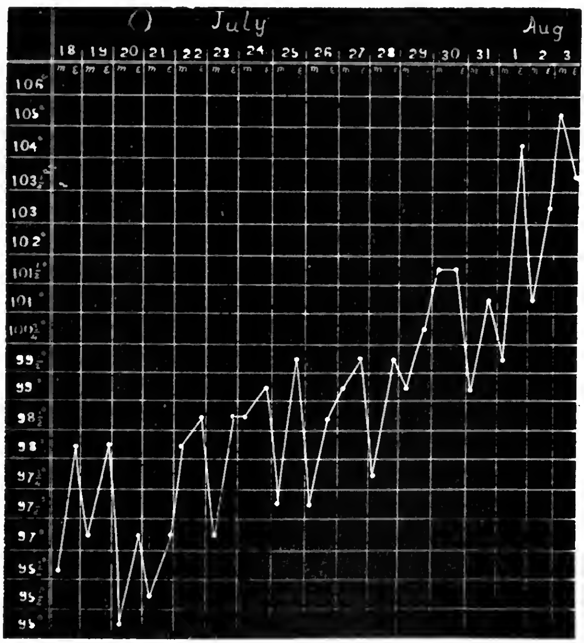
The terms which are adopted to designate the various pathological conditions of the spinal cord are usually confusing to the general reader, therefore we will define what is understood by acute diffuse myelitis; and further on will state why we have so entitled this case.

We adopt the classification of Professors Vulpian and Charcot because we believe it to be the most comprehensive and simple; if we use the word myelitis without committing ourselves at this time to the question as to whether some of these conditions are inflammatory or not—then we have diffuse myelitis—that is, where the lesion is distributed about the spinal cord, in patches of greater or lesser thickness and extent, without any regard to the course of the bundles of fibres, or to the physiologically distinct areas of the white or grey substance, all may alike be involved in the disease; this condition may be acute, sub-acute, or chronic.

2d.—We have lesions which are strictly confined to certain systems of fibres, such as the lateral columns or posterior columns, where the lesion will extend the whole length of these bundles; be strictly confined to them and not interfere with the adjacent bundles, or lesions which are strictly confined to certain parts of the grey matter, such as the anterior horns (acute spinal paralysis of adults, infantile spinal paralysis, progressive muscular atrophy) these lesions may also be acute, sub-acute, or chronic; to these the word systematic is applied. What has been said has entirely to do with the location of the lesion and has nothing to do with the nature of the lesion or the tissue involved; to this last we apply the terms parenchymatous myelitis, when the lesion affects primarily and mainly the nerve elements, and interstitial myelitis when the neuroglia is primarily affected.

C. F., male, Germany, age 32, brewer, admitted May 13, 1879. When twenty-four years old had fracture of left leg, and there is now some shortening; was much exposed during the Franco-Prussian war, and had typhoid fever; has no insane relations; been a moderate drinker; it is stated that for some weeks past he has manifested a disposition to wander away from home and go from place to place in an aimless manner; is in good physical condition; sleeps and eats well; sits quietly with an anxious expression of countenance; has slight thickness in speaking; converses reluctantly; says he is worth one hundred thousand million dollars and quantities of diamonds; memory defective, says this is New Year's day; is irritable and at times pugnacious; he becomes quite stupid; walks up and down and will not converse or answer questions; pupils regular, but on expansion all the fibres do not do so with the same rapidity; has no tremor of tongue or facial muscles (?); in June begins to be dirty, soils himself, is stupid, tears up his clothes and bedding, strikes his head against the side of his room; thinks that people are around continually, striking him, and in this belief he will often strike anyone who is near him (this idea is probably caused by lancinating pains or sensory abnormalities of some kind); tendon-reflex slightly increased; will not speak; refuses to eat, and has to be fed with the tube for two days. On July 22d, in the evening, is noticed to have suddenly become paralyzed in right fore-arm and hand, followed by paralysis of right lower extremity, and the next day by paralysis of left extremities; left upper extremity was drawn upward and shoulder muscles slightly rigid, but this passed off the next day, all the other extremities flaccid; muscles react to faradism; bed sores appear and go on rapidly, and patient dies apparently of exhaustion, on August 4th, in the morning. A diagnosis of myelitis of the anterior horns having been made to account for the rapid paralysis; unfortunately from unavoidable neglect the brain was spoiled during the hot weather; the spinal cord, pons and medulla hardened and preserved properly. A good deal of chronic inflammation of the meninges of cord and numerous small whitish hard plates distributed about it; nothing special observed on section in the fresh state.

Temperature Curve.



Microscopic examination: The distribution of the lesion after hardening could be made out from the light grey appearance of the diseased patches; on section and staining with carmine these patches were all stained sharply with the color; sections through the middle of the pons showed no lesion; through the middle of the olivary bodies there is seen a sclerotic patch in the very centre of the medulla involving the raphe and extending for some distance on both sides, involving both olivary bodies at their internal edges. (See fig. 1.) Sections

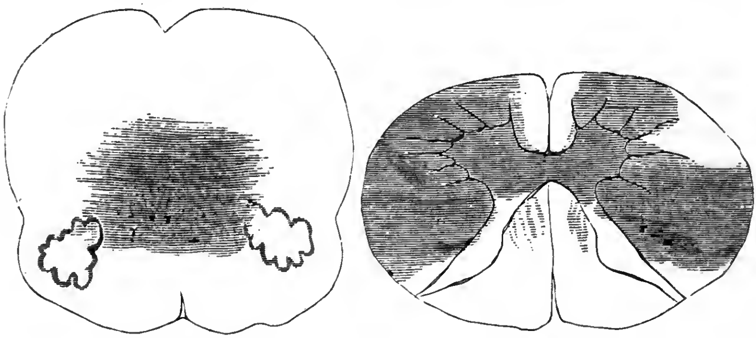


Fig. 1. Fig. 2.

from this down to the lower part of cervical enlargement showed secondary degeneration of both lateral columns; at the lower part of cervical enlargement the cord appeared to be swollen, and the sections through it showed quite a diffuseness of the lesion; the anterior and lateral columns on both sides involved as well as both anterior horns. (Fig 2.) This was present for about one quarter of an inch of the cord, then it disappeared leaving the secondary degeneration of the lateral columns, which became lighter as it passed down. The lesion in the white matter consists in a thickening in the neuroglia bundles running between the nerve fibres, these are infiltrated with an apparently semi-solid material which is tinted lightly by the carmine; there is some increase in the size of the neuroglia cells, they are more distinct and in some places show processes of great length; the majority of nerve tubes between them appear healthy but many are atrophied; there is lesion of both anterior horns throughout the cord, consisting in atrophy and pigmentation of the ganglion cells; a very large quantity of cells are to be seen, but very few normal; from six to ten cells in each section have the swelled appearance which Prof. Charcot has described; their nuclei and processes are absent and the carmine stains them less sharply than the normal cells; quite a number of cells have vacuoles, but these are found mostly in the cervical region.

The diagnosis of acute spinal paralysis which was made is correct as far as the symptomatology and pathological appearances of the anterior horns is concerned; but the case has been published as acute diffuse myelitis based upon the entire pathological appearances.

Acute spinal paralysis coming on as a complication in progressive paresis is exceedingly rare. We know of no case recorded, and Voisin* does not mention it as a complication. This is not a typical case of acute spinal paralysis of the adult, but was probably due to extension of the lesions in the white matter to the anterior horns, and this makes the case of double interest, for there is no case recorded as far as we know, where acute spinal paralysis (acute myelitis of the anterior horns) came on by extension of a primary lesion to the anterior horns; this extension does occur, but then it is chronic myelitis of the anterior horns that we have.

The course and symptomatology, the vacuolation and swelled state of the ganglion cells all go to show that it was an acute process; the muscular reaction to the faradic current is explicable from the fact that the faradic reaction is only lost several days after the onset of the paralysis; here it was tested the day after the paresis appeared.

No explanation can be given as to why these diffuse lesions are present, especially the one in the centre of the medulla, unless they be part of a general inflammatory condition of the neuroglia throughout the cerebro-spinal axis.

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* A. Voisin, *Paralysie Générale des Aliénés.*

ART. V.—CONTRIBUTIONS TO ENCEPHALIC ANATOMY.

BY E. C. SPITZKA, M. D., NEW YORK.

PART IX.

The objects and methods of a study of the Ichthyopsidean brain.

THE inquiries of a pupil, as well as of a fellow investigator residing at a distance from myself, having led me to commit some hints on the above subjects to paper, I have, thinking that these possibly might become of value to some one or other reader of the JOURNAL OF NERVOUS AND MENTAL DISEASE, submitted them to the editors of this quarterly.

Inasmuch as Huxley's class of the Ichthyopsida contains the lowest of the living vertebrate forms, it would appear one of the most important undertakings for the cerebral anatomist to determine the structural relations of the brain, spinal cord and principal nerves in that class. In fact, *a priori*, the student might conclude that the anatomy of a simple brain like that of the fish would represent a sort of rough and rudimentary sketch of the fundamental features of the higher mammalian brain, and that for this reason alone, its study would be essential to the human anatomist.

Nothing could be more erroneous!

Any one familiar with the visceral and osteological anatomy of the fish tribes will bear me out in the statement, that however convenient it may be to pigeon-hole the Amphibia, Elasmobranchi, Teliosts, Ganoids, Dipnoi, and Marsipobranchi in one great class, on the strength of the formal common character, that they have no amnion at the embryonic period, and always have gills at some time of or throughout life,* that there are

* These are the only constant characters, separating them from other groups, and it is even doubtful whether we are justified in denying the existence of the morphological representative of the amnion in all the anamnia.

actually more fundamental diversities between the different primary groups of this class, than between at least one group of this class and the Sauropsida.

As it would be difficult to find an archetype of the vertebral skeleton in any ichthyopsidean, so it is a task requiring far more discrimination and careful study than is generally devoted to this subject to determine the cerebro-spinal archetype in any member of this group, aside from the protean amphibians. For there are greater differences between the architecture of a shark's and a pike's, a herring's and a sturgeon's, an electric eel's and a lamprey's, than between an amphibian and a mammalian brain. While the differences between the brain of a frog and of a man can almost all be referred to quantitative variations in the relative proportions of similar and homologous parts, the differences between the brains of the other animals named are of a qualitative character. It actually becomes a question whether a homology between the parts ot an amphibian and of a shark's brain can be established.

Notwithstanding the difficulties enshrouding this subject, both writers on human and on comparative cerebral anatomy, skim over the subject with a remarkable *nonchalance.* The latest compilation on the human brain * neglects any mention of the fact that the cerebral lobes of fishes are commonly solid, informs the student that there are symmetrical halves in these animals constituting a cerebellum, and repeats the statements of as old an author as Cuvier without the slightest reference to the recent controversy on the homology of the fish's brain, in which Gegenbaur, Fritsch, Stieda and Maclay have taken part.

The text book on Zoology used at most of our colleges, Packard's work, on passing through the ordeal of criticism at the hands of Wilder, is shorn of nearly every statement it makes regarding the fish's brain, since scarcely a reliable one is contained in the volume.

The question of the true homology of the fish's brain being still *sub judice,* the human cerebral anatomist can only lose time, and writers on the human brain only confuse their students by devoting attention to this problematical subject.

* "The Brain as an Organ of the Mind," by H. Charlton Bastian. 1880.

It is a legitimate field of study for the zootomist alone, and in its morphological respects the subject bids fair to prove rich in surprising and suggestive results, which, when once established on the basis of observation, may be utilized by the human anatomist and physiologist in generalization.

The questions to be determined will appear from the following, their answer is as yet a desideratum.

1st. A careful surface study of the brain of at least one representative of each great group should be made. Careful and enlarged representations of each such brain as projected in the five cardinal views, namely, the dorsal, ventral, lateral, anterior and posterior should be drawn, and the brains preserved for reference, in the manner to be detailed.

2d. A median section of each such brain should be made and delineated, in order to expose the axis contours of the ventricular cavities.

3d. A longitudinal section nearly parallel with the former, running from the anterior prolongation of the olfactory bulb through the middle of *each* cerebral and optic lobe, and striking the lateral convoluted mass of the medulla oblongata, could be made from the same brain, as a supplement to the elucidation of the internal contours.

4th. One horizontal dissection exposing the ventricular floors, from above, and another exposing the ventricular roofs from below, will still further clear up these relations.

5th. A series of transverse sections, taken perpendicularly to the peduncular axis, will be essential to a comprehension of the relations of the ventricles and deeper parts for each altitude. The sections should be taken at distances of from one to three millimetres apart, according to the size of the brain, then preserved in separate bottles and labeled in numerical order.

All these preparations should be made from brains hardened in absolute alcohol, and the dissections should be made after the brain has been kept thus for one month, if the working season is in summer, and one or two weeks or even a few days, if the season is winter.

My plan, when engaged in this and similar work, has been to expose the cranial cavity by cutting away the surrounding parts with a strong knife until the brain level is reached. This requires very little practice. Then the lateral walls are broken away with a forceps, or cut away with the same knife, and the student may then clear up the tracks of the cranial nerves for a short distance. The brain is not to be removed from the skull base, but left in contact with it, a smooth round head of a needle may be employed to break up the arachnoid attachments there, and facilitate the penetration of alcohol to the basilar parts, but this is all that should be done. The brain must be immersed in alcohol, with the base of the skull in connection therewith, at least by means of the emerging nerve roots, else the topography may become disturbed.

The membranes (excepting the dura of the convexity) should not be touched, for it is desirable to trace their connections with plexiform structures penetrating the fissures and cavities of the encephalon, as these may be of service in explaining certain homologies.

Alcohol is selected as the preserving fluid for the reason that it does not render the specimens too brittle for coarse dissection, which the chromic salts do, nor distorts the contours as does glycerine.

The transverse sections can be made in a microtome, moving the piston the distance of the thickness of the required section, before each section is cut. Previous to each cutting, the imbedding matrix should be removed to a little below the level of the section. All other sections can be made without a microtome, it being well, however, to fix the brain in a wax or paraffine layer, poured on a glass plate. Adherent particles of the material thus used can be subsequently removed with turpentine, when the specimen is prepared for permanent preservation. It is needless to add that all sections and dissections can be done a hundredfold better under the surface of a fluid like alcohol or water, than by simply wetting the knife with these fluids, as text-books direct.

All the work so far mentioned is only preparatory however. It is merely destined to furnish on the one hand a topographical guide to the more important work which is to follow, on the other to supplement the ascertained relations of ganglionic masses and fascicular tracts by a plastic conception of the encephalic segments which contain them. The work which is to follow is far more tedious, but also far more important, its methods are those employed in studying the microscopic anatomy of embryos.

For the purposes of microscopic anatomy the brains of smaller species are as preferable, as those of the larger species are desirable for the coarse anatomy. The brain of a sturgeon twelve inches long, will show all the microscopical details as well, and be easier of manipulation than that of one of twelve feet long. The latter's had best be devoted to naked eye study.

If the weather is cold, the animal perfectly fresh, and the specimen can be kept in a temperature near the freezing point (it should never reach or drop below the latter,) the brain can be immediately transferred to a solution of chromic acid of a light sherry color. In my experience this tint, tested in a two ounce graduate, is a far more reliable gauge than any weighing by so many grains to so many ounces, that is ordinarily recommended. After staying a week in this solution, it is transferred to one of bichromate of potash, having the same color. Here it remains, care being taken to have always at least one hundred times as much fluid volume as specimen volume, until the desired degree of hardness is attained. The latter is hard to describe in words, but an adequate conception can be best conveyed by saying that the specimen should be unyielding to pressure, and yet not altogether inelastic. The membranes will now separate readily, and the specimen first washed in water, is transferred to a neutral (long stood, and repeatedly filtered and mouldless) carmine solution, so concentrated as to appear black in a depth of six inches. Here the specimen is left for from one to three weeks, according to the size of the brain. Then it is again washed, put in water containing two per cent. of glacial acetic acid for twenty-four hours, washed again, transferred to proof spirit for a day, then finally to absolute alcohol, until such time as the observer is ready to make his sections.

When this time arrives (and it is best not to defer it over a month) the brain stained and hardened as it is, is transferred to clove oil, which penetrates and drives out the alcohol in a few days. The translucency of the specimen is a sign that this has been accomplished. It is then taken off, the superfluous clove oil drained from the surface, and imbedded in a microtome with paraffine. The superfluous matrix being removed with each section, the cutting is done with turpentine, and each section, stained and transparent, can be transferred to its appropriate slide and mounted, so that the order in which each section belongs is preserved. This is an important advantage.

If the weather is warm, the brain should be submitted to absolute alcohol for a day before entire removal from the skull, then put in a mixture of methyl-alcohol and bichromate of potash, of a muddy beer color (thirty grains of the salt to the ounce of alcohol) for a week and subsequently for a variable time according as the specimen will harden, to simple Müller's fluid. The staining, cutting and mounting can be done exactly as in the former case.

Specimens prepared by the first method of hardening will furnish better results for the medulla, those hardened with the second will yield more complete specimens of the higher ganglia. It is a well-known fact that fluids that will harden the medulla oblongata well will sometimes fail to render the cerebrum and mesencephalon fit for cutting.

Of course the most important series of sections will be one taken transversely to the peduncular axis. This should be made first, therefore, and studied in conjunction with the delineations made from the coarse specimens. Now the student having familiarized himself with the precise topography and extent of every ganglion, cortical expanse and fibre mass, is ready to proceed to more complicated inquiries, that is to study the *relations* of fibre masses. How he may proceed where a fasciculus does not run in a straight plane, I have indicated in a previous contribution to this journal.*

It is needless to say that in addition to these methods, which may be called systemic ones, inasmuch as they are calculated to reveal homologies and relations, that all other methods of hardening and staining may be used to study the

* Part I. of this series, JOURNAL OF NERVOUS AND MENTAL DISEASE, 1877, p. 668.

finer and finest histology. They are of less importance, however, both to the zootomist and neurologist than is generally supposed.

Now a word as to the objects of such an inquiry, for unless the investigator has a definite point in view, and a provisional notion of the subject he intends to develop, his work will be barren of result, save he stumble on some revelation accidentally.

a. The close relation between the cerebral lobes and the olfactory lobes of fishes may, if studied in all the groups, particularly the lampreys, lead to the establishment of a homology with the so-called cerebral lobes of the higher invertebrates.

b. The fact, which we have every reason to suspect to be a fact, that the cerebral lobes of fishes are the true homologues of the cerebral hemispheres of the mammalia, sauropsida and amphibia, requires to be definitely established. Prof. Burt G. Wilder questions this homology, on the ground that the cerebral lobes of bony fishes are solid, and contain no ventricles. That so acute an observer, one to whom we owe so much in the line of correction of gross errors which have found their way into standard text books, could lean his objection on such a doubtful basis, shows how catholic must become the principles, if I may so term them, of cerebral anatomy. The embryological development of the fish's brain presents features which no other vertebrate brain exhibits in the course of development, namely, the entire central nervous axis is apparently solid. In truth it is hollow, but the cavity is a mere slit, the walls of which are in contact, and when the cerebral lobes become solid they do so by the fusion of these walls and the obliteration of the slit. The ventricle is therefore not an essential feature of the cerebral hemisphere, and as if to prove this fact beyond a doubt, we find that among animals as nearly related as sharks, some have true ventricles in these lobes communicating with the third ventricle, while others have them as solid as the bony fish.

c. The derivation of the olfactory bulb, a structure often and unwarrantably confounded with the olfactory lobe, can be best studied in fishes.

d. The same applies to the cerebral epiphysis and hypophysis, still known by the improper titles of pineal and pituitary glands.

e. The relations of the peculiar *lobi inferiores* to the optic nerve, and the asserted homology of the *corpora candicantea* require confirmation.

f. The question of the homology of the cerebellum and optic lobes, which is in a very unsettled state to-day, is yet unanswered. Wilder, in his paper on the brain of the *Chimæra*, has exposed the fallacious interpretations which most authors have made in this regard. His essay will prove valuable to those engaged in this inquiry. Possibly the discovery by myself of the entire distinctness of the post-optic and the hitherto unknown inter-optic lobes in reptiles, from the optic lobes proper, may assist in unraveling the true relations.

g. Since among fishes we find many examples of remarkable development of the periphery, I need but instance the rostrum of spatularia, the great lateral expansions of the skate, the asymmetry of the flounder, the rudimentary eyes of amblyopsis, the marsupium of the hippocampus, and the immense jaw of the angler, an inquiry dealing with the relations of nerve centres to the projected peripheries may be expected to furnish many suggestive facts bearing on the projection doctrine.

All through these lines it will be seen that as in every other branch of morphology a study of embryonic development is an essential to a proper knowledge of the fish's brain. A brief consideration of the methods to be employed in this field of the study will not be out of place.

Spawn can be obtained living from our fish hatching depots, whose superintendents will be found very obliging towards those requiring material for scientific study. The different stages of development, extending to beyond the period when the young fry escapes, can be obtained by permitting the ova to develop under the eye of the observer in a hatching trough.

The ova of bony fishes are dropped into a solution of chromic acid, or Müller's fluid; better a few specimens are taken out each day and dropped each into differently strong solutions of the former and into the latter. I know of no standard strength that will yield uniform results, and have while working in this field in Vienna lost thousands of ova by following the routine directions.

From the chromic acid and Müller's solutions the spawn is transferred to alcohol in from two to twelve days, the younger the germ the less time should it be exposed to chromic acid. After having been in alcohol a week it is transferred to a sherry wine colored solution of bichromate of potash for a period sufficient to harden it.

With a cataract needle the investigator will then cut a trench around the embryo, cutting through the vitelline membrane, which fixes the embryo to the vitellus, and then lift it away and remove it from the latter, which, brittle and crumby, cannot be cut. The staining in a solution of carmine, as described for adult brains in this paper, will require from one to four days, according to the size of the embryo. Of each stage three series of sections are necessary, one transverse, one horizontal, and a third, the most important, sagittal, that is parallel to the median plane.

All these minutiæ, however wearisome they will prove, are necessary, and he who has thus with his scalpel, reagents and razor, constructed an open volume of natural specimens, will find himself richly rewarded by the richness in detail, the manifold character of the morphologies, and the suggestive character of the relations exposed.

The material for such a study can be obtained in a fresh state from no one locality. The student residing in New York will have to take a vacation trip to the Mississippi; he living in Chicago a corresponding trip to the Atlantic coast.

In the West he will find the great lake catfish, the lake sturgeon, the Amia calva, the gar-pike, and the remarkable spatularia, the brains of all of which should be studied. Possibly he may obtain the fresh water lamprey (Hylomyzon), but one brain which he should not neglect is that of the blind fish of the Kentucky caves, whose examination is destined to clear up somewhat the true relations of the *lobi inferiores* and the optic lobes. On the Atlantic coast all the bony fish, obtainable in the fresh waters of the West, besides a rich variety of salt water forms, also the lamprey, the shark and ray are obtainable. A trip to the Bermudas or the Florida coast, occupying about two weeks, will increase the student's *repertoire* with a host of tropical and sub-tropical genera.

For purposes of reference I can recommend the following recent monographs relating to this subject:

Wilder. "The brain of Chimæra." *Silliman's Journal*, 1876.

Rohon. "Das Centralorgan des Nervensystems der Selachier." *Denkschriften der Math-Naturwissensch. Classe der Wiener Akademie*, XXXVIII.

Stieda. *Zeitschrift fuer wissensch. Zoologie*, 1868, 1873.

Valentin. "Beitraege zur Anatomie des Zitteraales." Neuchatel, 1851.

Reissner. "Beitraege zur Kenntniss von Baû des Ruckenmarkes von *Petromyzon fluviatilis*. *Arch. f. Anat. u. Phys.*, 1860.

Reichenheim. "Beitraege zur Kenntniss des elektrischen Centralorgan von Torpedo." *Arch. f. Anat. u. Phys.*, 1873.

Micklucho-Maclay, v. "Beitraege zur vergl. Neurologie der Wirbelthiere. Das Gehirn der Selachier." Leipzig, 1870.

Gegenbaur. "Kopfnerven von Hexanchus." *Jenaische Zeitschrift*, 1871.

Gegenbaur. "Untersuchungen zur vergl. Anat. der Wirbelthiere." Leipzig, 1872.

Fritsch. "Monatsbericht der Konigl. Akad. der Wissenschaften." Berlin, 1875. (This deals with the brains of the Teliosts.)

Fritsch. "Bau des Fischgehirnes." Berlin, 1878.

Viault. "Recherches histologiques sur la structure des centres nerveux des Plagiostomes." *Archives de Zoologie expérimentale de Lacaze-Duthiers.* Tome V., 1876.

Goette. "Die Entwicklung der Unke." (For comparative purposes, as it is the most complete embryological account of the amphibian brain.)

Oellacher. "Beitrag zur Entwicklungsgeschichte der Knochenfische." Leipzig, 1872. *Zeitschrift fuer w. Zoologie*, XXII., XXIV.

Michalcovics. "Entwicklung des Gehirnanhangs." *Centralblatt.* No. 20. 1874.

Michalcovics. "Entwicklung der Zirbel." *Ibid.* No. 16.

1874. (For comparative purposes regarding the epiphysis and hypophysis cerebri.)

The older works of Stannius, Owen and Cuvier, as well as most of the text-books now in use will prove of little avail, and the investigator will economize time and labor by ignoring them altogether. Huxley's comparative anatomy of vertebrates contains the best of the brief accounts, and is very suggestive in its homology of the cranial nerves. The more recent volumes of the different Archives and Proceedings of Societies will also be found to contain a great deal not referred to in the list of the literary references above given. Notably important among these, both in description and methods, are the articles of Calberla on the lamprey.

Art. VI.—A CASE OF ACUTE MYELITIS WITH INTERESTING MICROSCOPICAL CHANGES.

By S. G. Webber, M. D., Boston.

E. F., æt. thirty-four years, farmer, entered the Boston City Hospital, November 8, 1879. He had used liquors for fifteen years in small quantities, but, he said, never to excess. There was no history of syphilis. November 3d he drove twenty-five miles in the rain and snow, getting his legs wet; he felt chilly on the road. During the day, November 5th, he worked in a barn cellar; he worked hard and was heated. In the evening he worked in a cold milk-house, on his hands and knees. He felt quite chilly while at work, and more so on leaving off. In the night he walked to the water-closet and then found he could not pass his water. On the morning of the 6th he rose, dressed and sat by the stove. In half an hour he found that his legs were feeling stiff and weak; he required help to get to his bed. The feet were numb, pricking as if pins were stuck into them. There was no pain except from a full bladder, which was relieved by catheterization; no sense of constriction. The numbness began at about the crest of the ilium; the legs when tested proved to be less sensitive than normal. There was no reflex action on tickling the soles of the feet; tendon-reflex was absent. There was entire loss of voluntary motion in both legs. There was no spasmodic action. The temperature on admission was high, 104°, but in three or four days it descended to 101°, and subsequently to the normal. The pulse followed nearly the same course. The anæsthesia crept upwards, breathing became abdominal, and November 18th he died, thirteen days after the beginning of the disease.

Autopsy by Dr. Cutler. *Cord:* From a short distance below brachial enlargement the cord had an irregular, lobulated surface. On section just below the cervical enlargement there was a considerable amount of hemorrhage into the grey substance. The difference of color between the healthy grey substance and that where the hemorrhage occurred was obscured by the hemorrhage, but it seemed to be decidedly less grey. Below, the lateral columns were quite grey, softened, and in them were some small hemorrhages. The boundary between the grey and white substance was difficult to make out. The cord below was extensively diseased, the most marked changes, however, being in the few inches below the cervical enlargement. Other organs healthy.

After hardening in bichromate potassa it was found that the middle of the dorsal region was so much diseased that it did not harden well, and sections could not be cut, excepting that for a short distance in this region the posterior columns were less changed and gave good sections. Above and below the region of greatest disease the cord was less affected and hardened well, and in both cervical and lumbar enlargement there was little or no change from the normal.

The boundaries of the diseased tract were most favorable for studying the changes.

Vessels. The smaller vessels were much more prominent than in health, by reason of the thickening of their walls, which being strongly tinted by carmine, rendered the vessels easily visible. Many of the vessels were also evidently dilated, some being very much larger than any found in the same locality in other cords examined for comparison. These changes in the vessels were most strongly marked in the grey substance, especially in the posterior and central parts, and were not confined to the portion of the cord most diseased, but occurred in regions above and below which were nearly healthy. In the more diseased parts there was a moderate increase of the nuclei in the adventitia around some of the larger vessels. Around some of the vessels there was an exudation, small in extent.

Neuroglia. The interstitial tissue was but little changed unless certain cells to be mentioned later belonged to it. The fibrous septa between the nerve-fibres was as a rule not thickened. In some places it seemed, however, to be a little affected. The spider cells were generally not increased in prominence, in size, nor in numbers. Yet occasionally limited areas were noticed where there was apparently a slight increase in the depth to which the carmine tinted them. This affection of the interstitial tissue was of very limited extent, and where the change of structure was much marked it was absent. Of course, in the portion most affected the interstitial tissues had broken down as well as the proper nervous structures.

In most sections many small round cells with well-defined walls, granular contents and small nuclei, were seen. These cells were but feebly tinted by carmine; were grouped together, often in groups of four or six. In one section which was accidentally crushed these cells could be seen with more ease than in an uninjured section; these cells seemed to escape easily from the meshes in which they had been held, and were to be found free in the interstices of the crushed section.

Nerve-fibres. The most interesting change was the enlargement of the axis cylinders. (Figs. 1, 3, 4.) Many of these were enlarged to eight or ten times the normal diameter, more were less hypertrophied, being from two to four or five times the normal size. The enlargement took almost all varieties of form. On transverse section (Fig. 1), of course, all were round or oval, but on longitudinal section it could be seen that most were spherical (Fig. 4, b, c); many were fusiform (Fig. 3); some were varicose (Fig. 4, a). The spherical enlargements looked much like a round cell with two processes opposite each other, but without nucleus. The axis was suddenly dilated without previously undergoing any change. In the fusiform variety the axis was often moderately enlarged for a long distance before dilating into the widest portion; other axes did not show this preliminary enlargement. Only a few axes showed a varicose condition; they were not among those which were most enlarged, but rather the medium sized. In one case eleven dilatations could be counted, one immediately adjoining another, with only a short interval of narrow axis cylinder between, resembling a string of beads.

These altered axis cylinders were sometimes decidedly granular, sometimes homogeneous in their contents. They were stained in all degrees by carmine, some only faintly, some strongly.

The medullary sheath of the undilated fibres could be recognized with reasonable distinctness; those axes which were most hypertrophied seemed to have lost the medullary sheath. Polarized light is one of the best means to use to recognize the myeline sheath, and with that none could be seen around the largest axes. Those which were only moder-erately dilated sometimes showed a remains of the medullary sheath.

Many of the axis cylinders which had undergone the greatest dilatation contained cavities, so-called vacuoles (Fig. 3, b); these varied in size from minute points scarcely perceptible to large cavities occupying nearly the whole diameter of the axis; often there were several cavities near each other. Perhaps these would indicate that the contents of the axis cylinder was undergoing softening and changing into a fluid which would not take up carmine, and so the whole axis would soon disappear. Another way in which the axis disappeared is probably by breaking up into segments before becoming entirely fluid.

The enlarged axis cylinders were found on the boundaries of the most diseased portions, seeming to form a transition between the comparatively healthy fibres and the regions where the fibres had entirely disappeared. They were scattered irregularly over the boundary of the greatest disease, appearing in groups of greater or less extent, but nearly entirely around the diseased tracts there were axis cylinders somewhat enlarged, not perhaps greatly so. Sometimes a group of enlarged axes would be seen in the midst of an otherwise comparatively healthy region, as in the anterior columns, showing a focus of commencing disease.

After the morbid changes had advanced more, the space filled by the nerve-fibres was left either empty of all structure, filled only with granular and fatty débris, or filled with what resembled coagulated myeline. Probably some of the nerve-fibres lost their axis cylinders by direct atrophy, without their passing through the stage of hypertrophy; in such case, probably, the myeline underwent the usual changes of segmentation, coagulation and disintegration.

Grey substance. The *nuclei* of the neuroglia seemed to be slightly increased in numbers, but not to any great extent: the fibres of the neuroglia were about normal. The *axis cylinders* were not materially changed in size; none could be seen which were extremely hypertrophied, or even moderately increased in size; their number was rather less than normal.

The *nerve-cells* showed the most marked change; this consisted, I. In a more coarsely granular appearance, a disappearance of nuclei, a shortening of processes and a diminution in size, with more frequent shrinking away from the neighboring tissues, leaving a space between the cell and the surrounding neuroglia. (Fig. 5.) II. Another variety of change was, the contents became much more finely granular and homogeneous; the walls of the cell were well filled; the nucleus was eccentric; instead of being near the centre of the cell it was pushed to one side, even causing a bulging of the cell wall. (Fig. 7.) III. Occasionally so-called vacuoles are found in the cells. (Fig. 6.) The first variety of altered cells imbibed the carmine readily and were dark colored, the second were less deeply tinted. The distribution of these altered cells was irregular, some sections showed the changes only in one cornu or in both anterior cornua; in other sections these were less affected than the vesicular columns of Clarke. In many places the cells seemed fewer than normal.

Clinically, this case is a typical one of acute myelitis running a rapid course and ending quickly in death. The initial rise of temperature with subsequent fall, when the destruction of the cord had advanced considerably, is interesting and characteristic. Sensation was first affected, it being some hours before the patient noticed weakness of the legs, numbness and tingling being the first abnormal sensation. There was no pain, no aching in the back, no tenderness there. Pain in uncomplicated myelitis is rare; abnormal sensation in the limbs, referred dysæsthesia is not rare. Spasms and involuntary action of the muscles were also absent. When spasm is present there is more likely to be an implication of the membranes. The case is characterized clinically by the few symptoms present: referred dysæsthesia, anæsthesia, paralysis of motion, these gradually extending upwards until respiration ceased.

The etiology is also of interest. There can be no doubt that the exposure of the legs to the cold storm and then to the cold floor in the barn cellar and milk-house was the cause of the disease. In a large proportion of cases of spinal disease, exposure of feet and legs is a chief cause of their occurrence.

The microscopic appearances found in this case include nearly all the changes found in acute parenchymatous myelitis, and are even more interesting than the clinical features of the case. The nervous structures are almost exclusively affected, the changes in the interstitial tissue being very slight, and evidently secondary in character.

The enlargement of the axis cylinders is the most interesting change in this case. This enlargement was more extensive and greater than is usually seen. This change is found in locomotor ataxia, in central grey degeneration, in progressive paralysis (Obermeyer), and in chronic myelitis (Lange) as well as in acute myelitis. I have seen enlarged axis cylinders in an ordinary case of sclerosis in patches and in chronic myelitis; but in no case is the enlargement to be compared with that which is found in acute myelitis.

The change may be found in a very short time after the beginning of the disease. Roth (*Virch. Arch.*, LV., 1872, p. 197) says it has been noticed within seventeen hours. Charcot (*Arch. de Phys.*, IV., 1871, p. 93) reports a case of a soldier with cord completely divided in the dorsal region, who died about twenty-four hours after, where were found round and oval islets in various parts of the lateral and posterior columns, in the area of which all the axis cylinders were enlarged.

The descriptions by others of this change is so nearly like what was seen in the present case that it is scarcely necessary to repeat them. Joffroy (*Mem. de la Soc. de Biol.*, 1873, p. 77) experimented on dogs by exciting myelitis artificially, and found, after death, enlarged axis cylinders in various parts of the white columns; their diameter was four or five times the normal. Joffroy thinks the swelling ends in destruction of the axis cylinder, and that generally in that case the disintegration attacks the surrounding connective tissue.

Roth says that most authors consider the change to be passive in character, but he looks upon it as active. Joffroy believes it is the result of an irritative process, a sort of parenchymatous inflammation. He does not believe it takes part in secondary ascending and descending degenerations. I think this view of the process, that it is the result of an irritative process, is the correct one. In my case the locality of the enlarged axis cylinders, on the border line between tissue comparatively healthy and that most diseased, shows that this enlargement is one of the earlier processes in the inflammation. The presence in the midst of comparatively healthy fibres, as in one section in the anterior columns, with few if any other changes, would point to the same conclusion.

The final disintegration of these axis cylinders, I believe, occurs through their breaking up, but before this it seems probable that their composition changes somewhat, at least many become granular, and are tinted by carmine less readily. These changes can be seen in varying degrees of intensity. Finally, spaces which probably at one time contained enlarged axes are seen filled with granular débris, and on sections cleared up with oil of cloves, many cell-like bodies are seen which have no nucleus and are grouped together to the number of three to six. Hayem (*Arch. de Phys.*, 1874, p. 603) says that some of the swollen axes, completely detached and very granular, seem to form a species of granular corpuscles, and these large granular corpuscles, he says, are most numerous around these altered axes.

The cell-like bodies above mentioned are referred to and figured by Leyden, who considers that they are related to the ordinary granular corpuscles. They have also been referred to the lymphatics arising from a proliferation of the epithelium. It seems to me this latter view is less probable, and unless the bodies seen by me are different from those to which Leyden refers, he has figured the nucleus as a more constant element than it is. The bodies seen in the present case in other respects resembled those described by Leyden, and seemed to be the products of changes in the nerve-fibres, bearing some relation to the bodies resembling granular corpuscles which result from disintegration of nerve-fibres.

The changes in the nerve-cells resulting in coarse granulation with atrophy are such as are frequently found in cases of destruction of the nerve-cells.

The formation of cavities or vacuoles in the cells is a rarer change. Leyden describes it at length. (*Klinik der Rücken-*

markskrankheiten.) Hayem mentions it in connection with a vitreous change. Kahler and Pick ("Ueber Vacuolenbildung in den Ganglionzellen des Rückenmarkes." *Vierteljahrsch. f. d. prakt. Heilk.*, CXLII., 1879, p. 5) report a case where this change was very general. Dr. R. T. Edes ("A Case of Anterior Spinal Paralysis with Formation of Vacuoles in the Ganglion Cells of the Spinal Cord." *Boston Med. and Surg. Jour.*, July 24, 1879, p. 105) reports a very interesting case where this change was quite general in certain regions of the cord. In the two cases last referred to the change was much more marked than in the present case, where such cells were seen only exceptionally. Taken in connection with the vacuole occurring in the axis cylinders, and the fact that many cells were atrophied, and that in some regions the cells seemed to be fewer than normal, we may regard the formation of vacuoles as one mode in which the nervous tissues degenerate and finally disappear.

The apparently swollen cells (Fig. 7), where the protoplasm has undergone the changes described above, and the nucleus is pushed to one side, is described by Leyden. (*Klinik.*) Charcot (*Arch. de Phys.*, t. II., 1869, p. 291) also mentions this change. It is not very uncommon; the nucleus is not always persistent. (Magnan, *Comptes Rendus de la Soc. de Biol.*, 1869, p. 113.)

EXPLANATION OF FIGURES.

1. Transverse section, enlarged axis cylinders, some greatly enlarged.

2. Transverse section from same region of cord as No. 1, at higher level, where there was little or no disease.

3. Longitudinal section, group of fusiform enlargements of axis cylinders: (*a*) without cavities, (*b*) with cavities or vacuoles, (*c*) an axis cylinder moderately enlarged for a distance before bulging out much larger. Near centre of figure is a vessel.

4. Shows different varieties of enlargement: (*a*) varicose, medullary sheath persisting around a part of the fibre, (*b*) two enlargements united by a short stretch of normal axis, (*c*) globular enlargements.

5. Atrophied and altered nerve cells from anterior cornu shrunken away from surrounding tissue; one shows a faint nucleus.

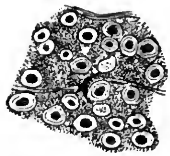
8. Normal cell from same region of healthy cord.

6. Cell with vacuoles.

7. A dilated cell with nucleus pushed to one side by the increased and altered protoplasm. All granular character is lost in the protoplasm.

Figures 1, 2, 3, 4, magnified about 180 diam.; 5, 6, 7, 8, about 250 diam.

1



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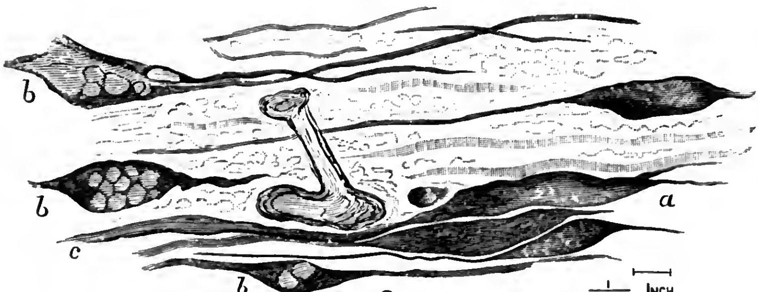

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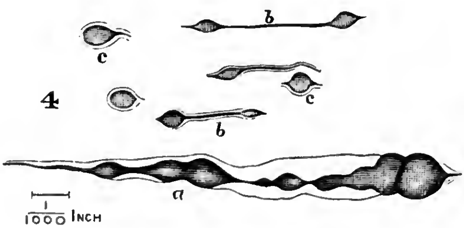

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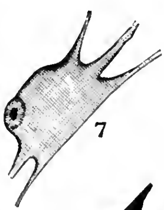

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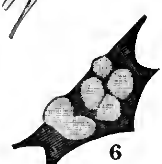

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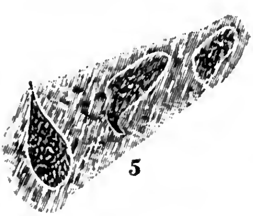

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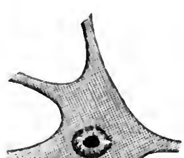

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ART. VII.—A CASE OF MENINGO-ENCEPHALITIS WITH PECULIAR SYMPTOMS. REMARKS ON THE PATHOLOGICAL SIGNIFICANCE OF THE PACCHIONIAN BODIES.

BY H. M. BANNISTER, M. D.

THE following case, imperfect as it is in many respects, is offered on account of its peculiar history and a certain suggestiveness it appears to me to possess. I had no opportunity of examining the patient, and only casually met him once during the four weeks he was under treatment, not being aware then that he was even ill, nor suspecting it from his appearance. But I have taken pains to obtain from his physician and from his family all the particulars that could be obtained in regard to his illness and its symptoms, as well as its antecedents, and the family history as regards hereditary or constitutional disease. I had, moreover, some personal knowledge myself of the patient, having been acquainted with him for many years, and had repeatedly met him during the few months preceding his death.

J. D. K., American, aged 28, dairyman, married, well built as to physique, with no heredity of disease, always healthy previously, and perfectly correct in habits and morals, called in his physician, Dr. Poole, on the 2d of February, 1880. He had for a year or more been working very hard at his business, which required him to keep early and late hours, and generally, it is probable, overtaxed his strength. He had also undertaken to carry some responsibilities that subjected him to some mental worry. Some weeks before, he had had an accidental fall on his left side and was, it is said, insensible for a time and feverish for some days afterward, though it is not stated that his head was bruised or even struck. He had also felt a little out of health and had been losing weight for some months, but had not considered himself ill and had kept at work as hard as ever. Beyond these particulars, there is no reliable record of any early symptoms or antecedents of his illness, On the evening before calling the doctor, while visiting at his father's house, he found himself suddenly unable to talk, and was much alarmed. When seen the next morning, he was unable to talk except slowly and with difficulty, pronouncing each word by itself with considerable pauses in his articulation, and appeared to have to exert himself to remember the words he wanted to use. This, however, was not a permanent condition of speech, and it seemed, in part at least, to be due to the excitement of seeing the physician; he afterward spoke with more ease and freedom. He said he did not feel well, but mentioned no special symptoms; he had no fever that was noticeable (though the temperature was not taken with the thermometer at any time during his illness) nor any marked acceleration of pulse, no paralysis of motion or sensation, no convulsive movements or tremors; his appetite was said to be fair and his bowels regular. He was, however, very emotional and depressed in spirits; partly, at least, on account of the alarm at his loss of speech. Dr. Poole put him on a general tonic course of treatment and saw him again in a couple of days, when he was still in much the same condition, but less emotionally disturbed and rather cheerful. No marked change occurred in his condition for a number of days; he slept well, was up and about and even attended to business to some extent, but still did not feel well, and was quite emotional and often affected in his speech. On the 12th of February Dr. C. L. Rutter saw him in company with Dr. Poole, and at this visit a new symptom was noticed for the first time. The excitement of seeing a stranger, apparently, produced, in addition to the temporary aphasic symptoms brought on by any excitement or disturbance, a clonic facial convulsion, involving, according to Dr. Rutter's observation at the time, only the muscles of the eyelids, the mouth and the chin on the right side, and those of the eyelids on the left. The mouth was slightly drawn to the right and the eyes turned in the same direction. There was no other muscular movement, and consciousness was unimpaired. In other respects, the condition was the same as on the previous visits.

From this time on these facial convulsions appeared upon the least irritation or excitement with the difficulty in speech.

The patient's general condition continued about the same; his appetite was fair, bowels regular, urine normal, he had no noticeable fever, his pulse was sometimes down to eighty, but was usually rapid and often one hundred, his mind was clear and he was up and about every day, but did not feel inclined or able to attend to business. As a rule, he was better in the morning; had no difficulty in talking in the earlier part of the day, but became worse in all respects as it advanced. The facial spasms never occurred during sleep, and seemed when they did occur to be modified by mental states, turning of the thought or attention, etc., though uncontrollable by the will. But they were never completely suppressed in any such way. There was at no time any disorder of intelligence detected, nor was pain complained of, except, at times, some slight frontal headache. This, however, was not a frequent symptom, either at this stage of the disorder or later.

Dr. N. S. Davis saw the patient with Dr. Poole on the 22d of February. He was then pale and had a rather saddened or anxious expression of countenance; there was no marked fever or heat of skin, but the pulse was over one hundred. The facial convulsions involved all, or nearly all, of the muscles on the right side of the face, and were also observed in the neck; on the right, the eyelids alone were affected. At their close, he was unable to speak at all for a few seconds, and then talked correctly and rationally, but very slowly and hesitatingly. The pupils were normal. Examination of the thorax revealed no disease, and the bodily organs generally appeared healthy.

I have no details of the treatment at this time, but a number of remedies were tried—the bromides for the head symptoms, quinine on account of the apparent periodic recurrence or aggravation of the symptoms in the latter part of the day, and some other drugs to modify the spasms, but none seemed to have any very decided effect. No very notable change occurred, but he seemed to be gradually growing weaker and kept more closely to his room. On the 27th and 28th his wife thought him a little better, that there was less general nervousness and that the facial convulsions had diminished, but this did not appear to be the case to his physician. On the morning of the 29th, at 7.30 o'clock, before he had dressed, he was suddenly seized with a severe general convulsion of the right side, later becoming general over his whole body and lasting several minutes. This was followed by a short period of unconsciousness, and, after an interval of an hour and a half or two hours, by another series of general convulsions. After the first of these attacks he complained of pain in the back and side and of headache, and the second attack was immediately preceded by nausea and vomiting. Just after the second attack he was seen by Drs. Davis and Poole. He was conscious and rational, but had scarcely strength enough to converse. There was a constant slight twitching of the muscles of the upper lip on the right side, the pupils were contracted, the pulse about one hundred and ten, soft and weak, respiratory movements feeble, countenance dejected. This interval free from convulsions lasted during the visit, but very soon after he was seized with another, and then, after a still shorter interval, with another, so that as the day advanced the intervals of quiet averaged scarcely fifteen minutes. This state of affairs continued during the day and succeeding night, the patient becoming constantly weaker and the convulsions, consequently, less violent. It is very doubtful whether, after the first two or three attacks, there was any return to consciousness. Nothing seemed to abate the convulsions, and death occurred from exhaustion a little before 10 o'clock on the morning of March 1st.

By permission of the friends, the cranium was allowed to be opened, and the post-mortem was made, twenty-four hours after death, by Dr. C. L. Rutter in the presence of Drs. Poole, Webster, Bragdon, and the writer. The body was quite emaciated, rigor mortis at this time fully set in. The skull was symmetrical, of medium thickness, or perhaps a little thinner than usual. Upon opening it, the dura was found for the most part natural in color, but in spots, here and there, slightly congested. It was adherent to the cranium anteriorly along the median line, as well as to the membranes below, so that it had to be cut with a knife in one or two places in extracting the brain. Very little fluid was found in the skull, not over two ounces as estimated. This may have been due, in part, to the fact that the body had been laid on an inclined plane, with the head considerably higher than the feet. The sinuses were almost empty of fluid blood. On taking out the brain it was found well developed, symmetrical, and with no abnormalities in the principal convolutions or sulci. The pia was very much congested over the convexity of the whole left hemisphere and over the posterior portion of the right, somewhat less so over the anterior right hemisphere, except along the median fissure. Along the median fissure in both hemispheres, anteriorly, it amounted to very decided meningitis as it appeared to naked-eye observation, more intense, however, though perhaps more recent, on the left than on the right side. Portions of the pia and of the brain substance tore away with the dura mater in extracting the brain. This was most noticeable on the right side, while the brightest inflammatory appearance was on the left side, just at the upper extremity of the sulcus of Rolando. In all other parts of the brain the pia separated easily from the convolutions; here there were strong adhesions which tore away on the right hemisphere, and could not, therefore, be measured; on the left they were mostly cut with a knife, thus enabling an accurate estimate of their position and area. The principal adhesion thus cut was about one-third of an inch anterior to the upper extremity of the sulcus of Rolando, and extended forward from this point about three-quarters of an inch. Its greatest width was anteriorly where it bordered on the longitudinal fissure, and was nearly three-eighths of an inch. Half an inch anterior to this was another strong adhesion, nearly circular in shape and one-third of an inch in diameter. Directly over the upper extremity of the sulcus of Rolando there was probably another adhesion, as a small portion of the membranes tore away, exposing the brain substance, and perhaps slightly involving it. On the right side the adhesions, as indicated by the tearing of the membranes, were situated more anteriorly than on the left, and all over the superior frontal gyrus or lobule. On both sides of the great longitudinal fissure, and for three inches or more anterior to the sulcus of Rolando, were numerous minute bodies, which I took to be the Pacchionian granulations, very unusually developed in so young a person as the one whose brain we were examining. They were so numerous, in fact, that they gave a sort of ragged appearance to the membranes along the median fissure. Posterior to the sulcus of Rolando they were very scarce, and at only one point was there any considerable collection of them. This was on the internal face of the right hemisphere, on both sides of the occipital fissure, nearly or quite three-quarters of an inch from its top. At no other point were they observed farther than five-eighths of an inch from the inner and upper border of the hemispheres.

The veins of the pia were generally injected; this was rather noticeably the case over the convolutions of the insula on both sides. Sections of the brain revealed no gross lesion in the centrum ovale or the basal ganglia; the puncto vasculosa were only moderately plain; the ventricles were empty and pale; the choroid plexus was moderately full of dark blood; there was an appearance of congestion and dilatation of the vessels of the pons, as it showed numerous dark points on section. The medulla revealed nothing abnormal, the cerebellum was considerably congested and rather softer perhaps than normal, as it tore readily on handling. It presented, however, no localized lesion that could be detected. On the basal surface the meningitis was less marked than on the convexity of the brain.

The abdominal and thoracic organs were not examined as their disease was not diagnosed during life. It is not probable that there was any serious visceral trouble, but I now regret that this was not done, as even negative findings in these parts would have added somewhat to the completeness of the case.

Portions of the brain, including the regions along the median fissure on both hemispheres, which were the localities of the adhesions and greatest inflammation, portions of the occipital lobes, the insula on the left side, portions of the basal ganglia, the pons and the medulla, were removed and placed in a two to two and a half per cent. solution of bichromate of potash for hardening. Some portions did not harden satisfactorily and others afforded only negative results in a pathological point of view. But the following appearances were noted by Dr. F. W. Mercer, who made the sections and the microscopic examination. Marked thickening of the membranes generally, but especially along the median fissure, and exudative processes, proliferation of nuclei, etc., were well advanced. The granulations on the arachnoid were plainly connective tissue, there were no evidences of tubercle, and their character as the true Pacchionian granulations could not be questioned. Sections made through the region of the adhesions on the right side showed the cells of the upper cortical layer apparently less numerous than in health, but individually normal and well contoured. There were around them and crowding them a great number of free lymphoid cells, which were abundant down to the third or fourth cortical layer. The cells of the lower layers apparently enlarged. The coats of the blood-vessels were thickened, without, however, diminishing their internal calibre, and the vessels themselves distended with debris of blood and nucleated bodies, which were especially dense at the bifurcations. The perivascular spaces were prominent. The same appearances were very much less marked in the cortex on the left side of the median fissure and were not observed to any extent in other portions of the hemispheres.

Sections in the pons showed on both sides the arterioles enlarged, tortuous and varicose in appearance, and filled with nuclei, granular matter and debris of blood. External to the vessels there were collections of granular cells clinging to the vascular walls. There was also an appearance of an excess of granular matter generally in the structure of the pons, collected in insular masses. Besides these there were numerous minute hemorrhages or extravasations, apparently not very recent, as they had the yellow granular appearances of old hemorrhages. The cell elements of the pons appeared unaltered.

Nothing specially abnormal was found in the medulla or other parts examined. The slides were also examined by Dr. Lester Curtis, who agreed with Dr. Mercer in his findings.

The interest of this case, as it seems to me, is in the comparatively negative character of the symptoms up to within two weeks of its termination, and the absolute lack of any clinical features, so far as known, to correspond with some of the lesions found on the post-mortem. There is a history of slight ill health without any marked symptoms except progressive loss of weight, existing for several months prior to any break-down or recognition of his condition by the patient himself, and this agrees with the post-mortem findings and the microscopic examinations, which indicated apparently that the morbid processes had been in operation for a considerable period of time. The symptoms observed during life pointed rather strongly to a cortical lesion situated in the neighborhood of the region in the left hemisphere where the most active meningitis was found at the autopsy,—the anterior central or Rolandic convolution,—but the more advanced encephalitis in the right hemisphere, the generalized meningitis and the marked disorganization in the pons seem to have given rise to no symptoms other than general *malaise*, emaciation and emotional disturbances,—at least not before the last thirty hours of the patient's life. The closest questioning of those who observed him during his last illness brought out no other facts in this regard than I have given above.

The cause of the trouble is not very apparent, unless we attribute it to over-work and worry, neither of which were complained of by the patient himself. There is no history of excess of any kind, though this was carefully inquired after; his habits and morals were good, and his character had always been excellent. And, as stated in the beginning, he came of a healthy family and had always been considered a fairly robust and healthy person.

The remarkable development of the Pacchionian granulations along the median fissure anteriorly appears to me decidedly noteworthy. None of those present at the autopsy had ever seen them so numerous in so limited a space, and Dr. Mercer, who made the microscopic sections, said the same for himself. I do not know how often they may seem in like abundance, but our combined experience in post-mortems in which the brain was at least partially examined included over two hundred cases. Some recent writers, such as Axel

Key* and Fr. Fischer† have claimed, in opposition to the opinion perhaps more generally held that they are pathological products, that these granulations are normal growths, and that they serve as a means of communication between the sub-arachnoid and sub-dural lymph-spaces, their spongy structure readily permitting the transudation of the fluid lymph. But whether they are normal or abnormal, or whether or not they serve this special function, there is no question but that their abundance in the present case was altogether unusual, and I believe pathological. If they are not physiological structures—and it does not necessarily follow that they are such because they are useful, they may be merely compensatory—but are due to some accident or pathological condition, or even if they are normal when developed in due and proper proportion, it is easy to see how their excess might be pathological, and even irritating and mischievous. In the present case such a possibility was very strongly suggested in my mind by the appearances. The close adhesions of the membranes both to the brain substance and the dura and cranium, the vivid inflammation and the actual cortical disorganization, all coinciding in location with the excessive development of these bodies, appeared to indicate a very close, if not a direct causal relation between them, in one way or the other, and I am inclined to believe that the granulations antedated the other conditions. It is well known that they can and often do produce adhesions, and the fact that these bodies, originating in the arachnoid, penetrate the dura mater and even erode the firm bony structures of the skull, is not in favor of their harmlessness. If, as L. Meyer‡ has claimed, they are due to injuries received by the delicate arachnoid membrane from shocks or movements due to sudden and violent fluctuations in the blood supply of the brain, then their presence in such abundance in this case would point to very serious and frequent disturbances of the intra-cranial circulation extending over a considerable period of time, of which we have no clinical history. But this is consistent with the history of the case as we

* *Nordiskt Med. Arkiv*, XI., I. and II.

† *Arch. f. Mikr. Anat.*, XVI., p. 362. *Cbl.*, 1880. No. 7.

‡ *Virchow's Arch.*, XIX., 172 and 288.

know it, the disorder was more or less latent during its whole course.

I can find very little said as to the usual frequency of these formations in the human subject. Though Key states that they are met with in children and in the lower animals, it is certain that they are very little developed in extreme youth, and that as a rule they are met with in greater abundance as age advances. They are very seldom mentioned in accounts of autopsies, and I can learn nothing directly as to their frequency in inflammatory diseases of the brain or its membranes. Ludwig Meyer, however, incidentally remarks that of thirty subjects in whom he found them in special abundance, over two-thirds were general paralytics. In the insane they are sometimes met with in unusual abundance and prematurely, but I have not heard of any special significance having been attached to them in these cases; it has perhaps been supposed that they were comparatively unimportant in a pathological point of view and mere secondary products to the general condition causing the insanity. The query suggests itself to me, may it not be that circulatory disturbances from any cause, sometimes, through the production of these bodies in the manner described by Ludwig Meyer, produce irritation enough to give rise to meningitis or even encephalitis, and may not this be the mode of origin of some cases of general paralysis? This is not offered as an opinion, but merely as a suggestion called forth by the case described, to be taken only for whatever it may seem to be worth. The clinical importance of these bodies certainly appears to have been underrated, and altogether too little note is taken of them. It is not improbable that, as has been suggested by Cornil and Ranvier,* they are sometimes mistaken for miliary tubercles in autopsies of the brain, and an entirely false diagnosis may possibly have been sometimes made in this way. It is not difficult to conceive how the adhesions these bodies produce may, by this irritation and disturbance of the normal relations to which they give rise, cause very decided symptoms, such as headache and even localized inflammation, in certain cases where they are unusu-

* "Pathological Histology," Am. Transl., p. 367.

ally abundant. They sometimes undergo calcification, and some importance has been attributed to this fact by Meyer, who thinks that they may have their share in producing the ossification sometimes met with along the walls of the cerebral sinuses.

It is not possible of course to account for the alterations in the pons in any such way as we have suggested for the general meningitis. They may have had themselves a still earlier causal relation to the whole trouble for all that is known. The apparent age of the lesions found here, and the total lack of symptoms during life that could be in any way referred to them, has been already noted, and is one of the peculiar features of this rather anomalous case. There are other points that are suggestive, but they could be discussed more intelligently had we fuller clinical data. Imperfect as it is, the case appears to me of interest as illustrating the possible latency for considerable periods of time of very serious and extensive cerebral lesions.

Reviews and Bibliographical Notices.

I.—KRAFFT-EBING: HAND-BOOK OF PSYCHIATRY.

LEHRBUCH DER PSYCHIATRIE, AUF KLINISCHER GRUNDLAGE, FUER PRAKTISCHE AERZTE UND STUDIRENDE. Von Dr. E. v. Krafft-Ebing, K.K.A.O. Professor der Psychiatrie an der Universitaet Graz, Director der Steiermarkischen Landes-irrenanstalt, etc., etc., etc. Stuttgart: Verlag von Enke, 1879. (In three volumes.)

Meynert in his papers on the scope and methods of psychiatrical studies remarks with some sarcasm, that most of the recent hand-books published in Germany, and dealing with mental diseases, are substantially plagiarisms on Griesinger. To a great extent this is true! However much excellent work has been done by German specialists in the line of monographs and contributions to the periodical literature, it seems that the authors of systematic works have belonged to the compiling species of writers rather than to the class of original investigators and thinkers.

In the work before us we herald a new departure; it is the result of labors carried on for many years by one of the most eminent of the new school of German alienists. It is fully up to the times, and embodies all the advances made in the field within past years. Few men are as well qualified for the task as Prof. Krafft-Ebing, its author; for many years the medical director of one of the best Austrian asylums, a teacher of clinical psychiatry in one of the universities, and the leader among German medical jurisconsults, he is enabled to grasp the subject of Insanity from different points of view, and to deal with it in a manner satisfactory to the many classes of readers who are apt to seek for information in a text-book on Insanity.

While the practical issues are thus dealt with in an almost unexceptionably able manner, we regret to note that the anatomical and physiological remarks exhibit a haziness of conception and an imperfection in detail that we are painfully surprised at. We can only wish that Prof. Krafft-Ebing had either omitted this portion from his work altogether, or else, like Leidesdorf, entrusted the writing of it to some one who had mastered the subject. We will return to this matter at the close of the review, for although a subsidiary one, yet it is but proper that the short-comings even in the less practical fields should be pointed out.

Of the three volumes comprising the work, the first deals with the general pathology and therapeutics of Insanity, the second with the pathology and therapeutics of the special forms, and the third contains histories of over one hundred and fifty typical cases of insanity, intended to serve as illustrations to the different chapters of the first two volumes.

The opening volume consists of twelve chapters. The first, headed "The Organ of the Psychical Functions," and the second, headed "Insanity a Cerebral Disease," we will defer the discussion of, as just indicated. The third is an historical sketch of the development of Psychiatry as a Science, and contains nothing essentially new; this is of course in the nature of that subject.

The following chapter, entitled "The Analogies of Insanity," embodies the fundamental propositions of modern mental science and places insanity where it belongs, as a symptom of disordered states of the brain. The author insists that all the laws of nerve excitability, of reflex transmission, of vicarating functions, of irradiation and conduction, as well as of exhaustion and the centrifugal projection of excitation of nerve centres, apply to the phenomena of insanity as they do to the tangibly accessible and experimentally induced phenomena of the nervous system.

Assuming this as true, and we can only agree with the author that everything is in favor of and nothing against his assumption, though we could have wished that he had either not at all introduced the question of reflex transmission, or at least expounded it more clearly, he goes on to state that we must be justified in transferring some of the terms of nerve physiology to the phenomena of insanity. Thus he claims that it is proper to speak of psychical hyperæsthesia and anæsthesia, of psychical spasm and paralysis, of diminished and increased resistance in the conductors, of increased and diminished reflex excitability. We can again take exception only to the latter clause. It is a common phrase in the writings of the modern French and German alienists, but we have yet to see a single essential phenomenon of insanity which can be interpreted on the basis of an altered reflex state, using the word of course in a properly limited sense, not as the pupils of the Brown-Séquard school do, so as to mean anything and everything in nerve physiology. The mischief that the loose and vague use of this term has wrought and is still perpetrating in the minds of students is simply incalculable, and unfortunately recognized by but few writers of text-books.

As a corollary to the important and unimpeachable proposition that disease is life under abnormal conditions, and that mental disease and mental health are not essentially antitheses, and stating that a lunatic can do and say what a sane man does and says, he adds that the distinguishing criterion between the actions and sayings of the former and of the latter is to be sought for not in the quality of the psychical acts, but in their mode of production.

Here the author either intended to say something entirely different from what his words signify, and in that case he has used the German language very loosely, or he has given vent to an extremely thoughtless and paradoxical absurdity. We know nothing of either the healthy or the diseased mental mechanism except by inference, and however much our inferences may be based on correct and extensive observation and a sound use of logic, they cannot rise to the dignity of absolute facts. Why, we judge the nature of the hypothetical mind mechanism from the very character of the mental acts themselves! And to say as our author does, that we are to draw the line between sane and insane acts not by their difference in quality or character, but their difference in origin, is arguing in a very wide circle, to say the least. It is true he dulls the edge of this criticism in the next sentence by citing as an example of what he intends to convey, that a man who becomes depressed in consequence of a loss of friends or property, will not be considered insane, while one who becomes depressed in consequence of a trivial or inadequate cause is considered so to be.

But the clinician will instantly recognize in the character of the depression, whether it is within the limits of health or of disease, and where he is exceptionally in doubt, he will usually find that the legitimate causes of normal depression are more or less mingled with those of the pathological state. The fact remains, and should have been insisted on by so sharp a clinical observer as Prof. Krafft-Ebing, that a typical sadness and a typical melancholia are distinct, but on the next page he actually compares a normal individual suffering from a painful emotion with another suffering from melancholia, and asserts that there is no apparent difference, that both have surrendered themselves to their painful ideas, that both are unable to interest themselves for anything outside the circle constituted by the latter, that both neglect their business affairs, suffer in sleep and appetite, and that with both the bowels become sluggish. The second statement does not apply to both cases equally, for example, a man depressed in consequence of the loss of his wife will, if anything, have his affection for the children increased at the time, while a melancholiac is unable and feels his inability to call up his natural affections. There is not only a decided difference in the intensity of the depression, but the accompanying phenomena also separate the two affections. A man in the deepest agony of grief, or one rising to receive his sentence of death or states prison, will years afterward recollect every minute circumstance attending the occurrence calling for his emotion, while the melancholiac has but a shadowed memory of what took place around him during the melancholiac period.

At the foot of the same page the author in fact contradicts himself, for he states that while consolation of friends, diversions, etc., will draw the sane man out of his depression, they will, if anything, make the lunatic worse, and that attempts to demonstrate the fallacy of his delusion may quiet the latter momentarily, but that the next moment he will develop another! If this is not establishing a criterion on the strength of the "quality" of the insane words and actions, then we are ourselves at fault!

A similar careless statement is made on the next page, where the author states that the source of the insane patient's feelings and conceptions is a cerebral disease, that it is, in other words, organic and not psychological. If he added to "psychologically"—based on correctly registered impressions from the outer world—we could take no exception to the statement, but in view of the fact that without the qualifying clause he involves himself in a *contradictio in adjectio* we must insist on its faultiness.

A very suggestive paragraph in this chapter is the one in which the author develops the relation between the pseudo-genius and the chronic lunatic. It is correctly stated that this class may vary from the true genius to the fool, a fact contradicted by most modern writers, though it has the high authority of Morel in its favour.

We are in doubt whether the statement that pleasant dreams are as rare in health as pleasant deliria are rare with the insane is correct in its first premise. Equally do we question whether the sequel that deliria of an agreeable character are essentially associated with conditions of cerebral degeneration and exhaustion, just as pleasant dreams are associated with states of physical and mental prostration, is accurate in its last clause. In our experience the dreams of exhaustion, and those portending grave pathological states based on exhaustion, are uniformly of a frightful and horrible character, and what physician would not rather see the expansive deliria in a fever patient than frightful or muttering ones?

Prof. Krafft-Ebing is more fortunate in establishing an analogy between the first stages of alcoholic intoxication and the acute vesanias, while he compares the last stages with the terminal and paralytic dementias.

The fourth chapter deals with the elementary disturbances of the cerebral functions in Insanity. These are classed in three divisions, those involving: I. Processes in the emotional sphere. II. Processes in the sphere of the conceptions, comprising the reason, memory and phantasy. III. Processes in the psycho-motor sphere, the impulses and the will.

This is a very practical and convenient classification. But Krafft-Ebing assigns to it nothing beyond a formal signification, and takes the strong ground that it is not a classification of insanity, a position we strongly endorse. He states: "This division has only a didactic signification. It does not involve the error of the old metaphysical psychology, which assumed a triad of individual and isolated mental functions and thereby led to the gravest errors (monomanias, partial insanities)."

With this condemnation of the older views regarding monomanias and partial vesanias, it must not be supposed that our author relegates the clinical forms once designated by such terms to oblivion, on the contrary, as we shall see, he reanimates them with the additional support that a more thorough clinical study furnishes for the forms so classically described by Esquirol.

He insists that there is no insanity affecting one faculty of the mind *per se*, but that all mental factors are to be regarded by the psychologist as constituting an organic whole, the *Ego*, and that the different insanities constitute more or less profound disturbances of this *Ego*.

The emotional disturbances he classifies as the qualitative and formal. The former are typified in the two extremes of the morbidly depressed and the morbidly exalted states, while the formal disturbances comprise the states of abnormal excitability and abnormal absence of emotion.

The elementary disturbance of the conceptional sphere are also divided into two groups; the first consist of those involving the extrinsic character, such as the duration, association, intensity and reproduction of conceptions; the second comprises the falsification of conceptions, or in other words, insane delusions.

The corresponding disturbances of the motor and the, from it inseparable (?) will spheres, he classifies as: I. Anomalies of the propensities for food, the extremes being polyphagism, bulimism, the appetites of dipsomaniacs, and on the other hand the sitophobia or refusal of food of melancholiacs, the religiously insane, and certain lunatics with fixed hypochondriacal ideas. A related group of disturbances is constituted by the *pica* of neurotic subjects and pregnant women. II. Anomalies of the sexual propensities. Here he ranges the diminution of the propensity, as observed in the hypochondriac and melancholiac, the idiot, the paretic in the last stages, and other insanities associated with spinal disease. This latter arrangement we regard as forced and foreign to the question of the morbid propensities. The pathological exaggeration of the sexual propensity he finds in all insanities associated with excitation, and he points out very happily the great analogy existing between the increased morbid sexual appetite and the insanities associated with religious tendencies. As remarkable as this relation may seem to some, and however much it may strike many into incredulity on first sight, yet we can assert with tolerable confidence that no two classes of conceptions are as intimately related in the mental life of the insane as the erotic and the religious inclinations and conceptions. The *perverted* sexual appetites form a sub-group with our author and are found as a symptom chiefly of hereditary and degenerative cerebral states.

III. The impulsive act, sufficiently well known to the English reader under the name of morbid impulses, such as those designated pyromania, true dipsomania, kleptomania, etc.

Under the head of psycho-motor disturbances, the motor excitement of the maniacal, the "psychical reflex acts" of melancholiacs (a gross misnomer, the author refers to the *raptus melancholicus* and the so-called active melancholia), the rhythmical acts of the imbecile and demented, the tetany of certain forms of depression, the catalepsy of melancholia attonita (katatonia of Kahlbaum and Kiernan), disturbances of the will power and of the "free will" are enumerated. The latter discrimination will to many seem strange; we can interpret the author's intent best by saying that under the anomalies of the "will power" he means quantitative disturbances, that is states whose extremes are constituted by a diminished will power, as in dementia and melancholia, and an excessive liberation of this power as in acute mania; while by disturbances of the "free will" he intends to convey the conception of those qualitatively morbid states in which the self-determining power of the will (if we dare use that term) is disturbed or perverted by states of imperfect consciousness, transitory abolition of self-consciousness, or delusions and hallucinations.

He adds a fourth great class to the principal groups we have enumerated, entitled, "The Elementary Disturbances of Consciousness;" such are the states analogous to the abstracted conditions of the mind found within normal limits, the dazed states of senile and paralytic dementias, the strange loss of the recollections of a given period of years observed in some of the insane, conditions of altered consciousness, double consciousness, epileptic states, ecstasy and somnambulism.

Under a fifth group he considers the disturbances of speech in the insane, a series of disturbances which, in our opinion, should have been assigned to a sub-group of the psycho-motor disturbances, at least in part. And under the sixth and last group, entitled the psycho-sensorial anomalies, he enumerates hallucinations, illusions and the sensorial deliria, all of which could have been properly considered under the heading of disturbances of the conceptional sphere. For insane hallucinations and illusions are conceptional as well as sensorial disturbances, as we will demonstrate on another occasion.

Reviewing this classification as a whole, and bearing in mind the exceptions advanced in the shape of the running comments, it is a very sound one, and furnishes the student with a fair view of the phenomena of insanity considered as individual phenomena.

The sixth chapter deals with the epiphenomena of insanity, the anomalies of the somatic sphere, which, either as the basis of hallucinations, delusions and illusions, or of insane acts, acquire considerable importance from a therapeutical as well as a semeiological point of view. They are classified A, as sensory disturbances, such as anæsthesias and hyperæsthesias, under which head falls the prominent symptom of the *dysphrenia neuralgica*, a remarkable and thus far but imperfectly known form of alienation; B, Motor disturbances; D, Vaso-motor anomalies, as cerebral anæmia, hyperæmia, venous stasis and œdema of the cortex, changes in the arterial tension and changes in the cardiac innervation, provoking the "præcordial fright" of certain melancholiacs; E. Trophic disturbances. Here he enumerates, besides the herpes and rhagades of melancholiacs and dements, abnormal pigmentation and the peculiar relations of progressive paresis to traumatism and decubitus, also the degenerative states of the teeth, ears, cranial contour, hypospadias, deformities of the extremities, uterus bicornis, microrchidism, hermaphroditism, etc. This we hold to be highly incorrect, inasmuch as these states are but teratological defects of the periphery associated with the analogous cerebral defect, and no further related to it than that both have the common basis, a fault in the embryological development.

In an appendix to this chapter he considers the anomalies of the vital functions, the animal heat, the pulse, digestion, assimilation, respiration, general nutrition and sleep. The interesting observation is made that even in acute mania with high motor excitement, the cardiac movements are either only very slightly increased or even slower than the normal rate, owing probably to abnormal irritation of the vagus centres.

The interesting subject of the Etiology of insanity is considered in the seventh chapter. The author opens this subject with a discussion of the various sources of error which the investigator should avoid. For example he states that the mere fact that there are more females than males in asylums does not prove that females are more liable to insanity, for as the patients of that sex show a lesser mortality than the male insane they accumulate as it were in larger numbers. After calling attention to other sources of error with which we presume the reader to be familiar, he closes the remarks introducing this subject with the following words, which are of interest as showing the position of German alienists in regard to a very important speculative question.

"The accessory exciting causes are commonly distinguished as *physical* and *moral*, a discrimination which has a value only in so far as it permits of a patent classification, and is justifiable only under the proviso that it recognizes, that moral causes must ultimately act through physical channels, either that such moral causes necessitate an organic predisposition, in order to exercise their influence as shocks to the nervous system, or that the nutritive disturbance of the brain which is at the root of the insanity is produced by them, sometimes directly, through an influence exercised on the cerebral vaso-motors, at others through the indirect channel of a general disturbance of nutrition."

It will not be necessary within the limits of this review to go over a mere list of the causes, which our readers can find detailed in the majority of text-books, especially as the more debatable and interesting features of causation are repeated in the second volume, and will be referred to when we reach the consideration of that part of the work. But as Prof. Krafft-Ebing speaks of the modern vices in this chapter and the question of the influence of alcohol on insanity is one so generally discussed in England and America to-day, we may be permitted to quote his opinion. It has the greater value as it proceeds from one living in a community in which the *pro* and *contra* temperance fanaticisms are entirely unknown! Speaking of the influence of alcoholic abuse on the increase of insanity he says:

"It is true that our ancestors probably consumed quantitatively more spirituous liquors than the present generation, but what they drank was wine, and this besides of a low percentage of alcohol. To-day, alcohol in concentrated and other forms, the industries are able to furnish at a very low price to the lower classes.

"But the kind of alcohol thus offered the latter is of the very worst kind, containing fusel oil, one of the most deleteriously acting substances in its influence on the central nervous system."

A few lines further on follows a short statement which those who herald themselves as the discoverers of Neurasthenia and "American Nervousness" may read with some profit; it is a consolation to know that the condition referred to is recognized in Europe as a common one, and is not, as some writers without either facts or logic at their disposal would probably for the sake of a sensation lead the public to believe, exclusively or preëminently American.

"These injurious influences (overstrain of the brain and excessive use of stimulants) manifest themselves at first in a great increase of the neuropathic constitution in modern society, which has too many *nerves* but not enough *nerve.* This constitution furnishes the most important predisposition not alone to insanity, but also to all other possible neuroses. It is either acquired through improper regimen of the individual, or inherited from an ancestry which has been guilty of improper modes of life."

In speaking of the influence of puberty, he disposes of that clinical form described as Hebephrenia by Kahlbaum-Hecker, although we consider that this well-marked and distinct affection would have merited a separate consideration in the second volume, with the other groups of insanity.

In assigning to the military career an influence in the development of insanity, he adds in a foot note (p. 150) that of 26 officers and military officials received at his asylum, *all* were suffering from progressive paresis. He neglects to mention in explanation, a cause which we have known him and other Austrian alienists to assign, namely the excessive indulgence in so-called "Virginia segars," (a form of the weed which favors the direct absorption of nicotin) among the Austrian army officers. In other armies such a high percentage of paretics is unknown; we believe the French has the next highest proportion of this class of the insane.

In dealing with the subject of heredity the writer states that the transmutations are countless and that this proves all insanities to be members of a common family. In this he echoes the conclusions of Le Grand du Saulle, who utterly failed to comprehend the great common feature of the hereditary insanities insisted on by Morel, and which distinguishes this group from other forms. If a father suffers from systematized mania, and his son exhibits hypochondriacal delusions with a tinge of imbecility, while the grandchild is an idiot without issue, we have not, as Le Grand du Saulle and Krafft-Ebing suppose, a transmutation of forms, but a consistent intensification of one form in one direction, making only a vaster stride with each step in the descending line to the extinction of the family!

The statement (p. 157) that the not infrequent coëxistence of idiocy, insanity and genius in the same family stock is probably due to the possession by its members of a common delicate nervous organization, which on the one hand may under favorable circumstances, rise to a high development, on the other under unfavorable circumstances lead to psychical degenerations, is certainly faulty or at least applies to but a minority of cases. Our explanation of this coëxistence, and we have devoted some attention to this particular subject, is that in all these cases an anatomical aberration is to be sought for, and that the very intricate character of the anatomical mechanism which is the basis of a high degree of mental complexity, is the basis when the associations are faulty of the degenerations in other members of the family. This is in accordance with the well established law that higher forms are more apt to exhibit variations in different directions, that is, to a still higher, to conservative and to retrograde development, than lower forms. And it is for this reason that excluding the cases produced by overstrain, constitutional diseases, habits and vicious indulgences, the classes of moderate intellectual development furnish a lesser quota to the hereditary neuroses and insanities than those of high development. It is also to be noted that among those of high development, there are two sub-groups, the one in which cortical development is in advance of that of the brain mass as a whole, where the peduncular tracts are small, the base of the skull narrow and the whole physical organization shows an absence of vigor, and the other in which with as high a degree of cortical development we have a perfect harmony in the basilar parts and the body as a whole. It is the former group that furnishes the quota to nervous and mental aberration, not the latter.

Page 159 the author asserts, that the interesting question, whether there is such a thing as an hereditary insanity as a clinical form must remain an open one, though answered affirmatively by Morel. We find it difficult to understand how a writer, standing as firmly on the somatic basis of insanity as Krafft-Ebing, could give any other than a decided answer to this question, and in fact he incorporates the hereditary element in the classifications given in the second volume, so that unconsciously perhaps he answers it with Morel.

We are glad to find an experience of our own, partly confirmed in Krafft-Ebing's statement (p. 163) that where a predisposition is absent the association with the insane in a scientific or humane capacity has scarcely ever a bad effect on mental health. But he strongly warns those exhibiting the slightest predisposition from following the vocations of either an alienist, physician or asylum attendant. It is well known that a remarkably large proportion of asylum superintendents have broken down in their mental health. An actual predisposition was not discovered to have existed in these cases. It is rather found in those unable or unwilling to rise to the level of scientists, and limited to routine duties by choice or necessity ; hence the unintelligent daily contact with the insane must perhaps in combination with the overstrain of a not too active intellect, be accused as the cause of their alienation. The pursuit of a scientific object is one of the best prophylactics against insanity, and it is for this reason that the mental health of the continental alienists contrasts so favorably with those of a certain other country.

We have observed however, in cases where a predisposition could be excluded, among faithful asylum attendants of inferior mental calibre, the insidious development of a state of progressive mental enfeeblement, which could not be described better than by the phrase "an early dotage," and this state we unhesitatingly attribute to the daily contact for years of a mind of feeble resisting power with the insane. A physician of some experience with the insane but of somewhat radical views, informed us that he did not consider that any person should act in the capacity of an asylum attendant for a longer period than five years, for this reason.

On page 167 the writer speaks of insolation and exposure to caloric influences as producing acute delirium, and progressive dementia with irritability and intercurrent attacks of anxious excitement ; he says nothing of paralytic dementia in this connection. Five such cases have come under our own observation where this disease occurred in stokers and firemen.

The statement that the vertiginous form of epilepsy is more injurious to mental health than the convulsive, is not at all established as the unquestionable fact as which our author advances it. The argument drawn from it, that the circulatory disturbance being less in the former than in the latter variety, cannot therefore be accused of being the cause of the complicating mental derangements of epilepsy, therefore falls to the ground, if it be not, as we think, faulty for other reasons. In speaking of the effects of masturbation, the author makes a very remarkable parallel which we give here, *verbatim*, for what it is worth. "Etiologically onanism is much more important (than excessive natural venery) if for no other reason than because it is generally practiced at a much earlier age, and frequently coincides with the neuropathic constitution. To this must be added the fact that onanism is an inadequate, unphysiological irritation of the central nervous system, as compared with the performance of the natural act. The latter involves a rather automatic and reflex act, but onanism a more voluntary and forced one, in other words the expenditure of more nerve force. It is in an analogous manner that voluntary acts, such as the simulation of maniacal furor and epilepsy, cause exhaustion and prostration much earlier than do spontaneous ones." While physicians at large will concede part of this proposition, certain of the clauses will to many appear unwarrantable and far-fetched.

In the last five chapters of the volume the subjects of the duration, mortality, prognosis, general diagnosis and therapeutics of insanity are succinctly dealt with. One omission which this work shares with others, and which particularly the non-asylum physician will appreciate, is that there are no directions given as to how patients are to be transported to an asylum when it becomes necessary to commit them to one. We can assure the reader that a greater responsibility is thrown on the committing physician, and more fertility and quickness in scientific resources called for from him, than is exhibited by the vast majority of our asylum physicians. The recommendation published in those remarkable evolutions of the superintendents' fancies, the annual reports, that patients must always be told by the physician when they are to be taken to an asylum, makes one almost wish that a few members of the Asylum Association (we will grant them the numerical odds) would get into one room with a paretic in the furious excitement of the first stages, or an epileptic raving in the intervallary or post-epileptic explosions, and try their own recommendation! It is on these various points that the practitioner will seek information in such a work as the present one, and that they are not considered will by many be appreciated as a serious defect.

Due stress is laid on the psychical treatment, that is, what English alienists speak of as "moral treatment."

The second volume, devoted to the special pathology and therapeutics, contains the author's classification of insanity. As this is, in our opinion, with all the imperfections that might be urged against it, unqualifiedly the best classification we have found in any one work, we abstract it as a whole, for the benefit of the reader. Where the English terminology of mental science is unfortunately devoid of terms equivalent to the German terms of the original work, we give them in the author's language, and enclose in brackets such explanation as may render them intelligible to those not familiar with German.

The fundamental classification of the true vesanias is into the psycho-neuroses and the psychical degenerative states; to this he adds as equivalent groups, the cerebral diseases associated with predominating psychical symptoms, and the conditions of arrested cerebral development:

THE PSYCHO-NEUROSES.

I. *Primary curable forms.*

A. MELANCHOLIA.
1. Melancholia passiva.
2. Melancholia attonita.

B. MANIA.
1. Simple maniacal excitement.
2. "Tobsucht" (*High maniacal exaltation with great motor excitement and often with furor.*)

C. "STUPIDITAET" (*Primary Dementia*).

II. *Secondary incurable conditions of psychical weakness.*

A. "SECUNDAERE VERRUECKTHEIT" (Chronic mania with a loss of power of creating systematic delusions, found as a sequel of uncured primary forms).

B. TERMINAL DEMENTIA.
1. Dementia with excitement and confusion.
2. Apathetic Dementia.

THE PSYCHICAL DEGENERATIVE STATES.

A. CONSTITUTIONAL AFFECTIVE INSANITY (*Folie raissonnante*).

B. MORAL INSANITY.

C. "PRIMAERE VERRUECKTHEIT." (Comprising most Monomanias in the sense of Esquirol, *Folie systematisée* of some French authors and perhaps best known as systematized insanity).
1. With delusions.
   a. of persecution.
   b. megalomania.
      a. m. religiosa.
      b. m. erotica.
2. With "Zwangsvorstellungen" (Imperative conceptions).

D. EPILEPTIC INSANITY.
1. The psychical degenerations of Epileptics (ordinarily known as ep. dementia).
2. The transitory epileptic psychical disturbances. (Preceding, following or replacing convulsions.)
   a. Epileptic stupor.
   b. "Dammerzustaende" (States of imperfect and dazed consciousness).
      a. With fright. (Falret's *petit mal intellectual.*)
      b. With frightful deliria and hallucinations. (Falret's *grand mal intellectual.*)
      c. With religiously expansive deliria.
      d. Dreamy stupor.
      e. Dreamy stupor with moria-like excitement.
3. The epileptic psychoses. (Insanities which simulate in their duration and to some extent in character the ordinary psychoses, but have an epileptic basis and certain semeiological peculiarities.)

E. HYSTERICAL INSANITY.
1. Transitory forms.
   a. With fright.
   b. Hystero-epileptic deliria.
   c. Ecstatic visionary forms.
   d. Moria-like conditions.
2. Chronic forms.
   a. Hystero-melancholia.
   b. Hystero-mania.
   c. Degenerative states with hysterical basis.

F. HYPOCHONDRIACAL INSANITY.
G. PERIODICAL INSANITY.
  I. *Of idiopathic origin.*
    1. *In the guise of a Psycho-neurosis.*
      a. Mania periodica.
      b. Dipsomania.
      c. Melancholia periodica.
      d. Circular insanity.
    2. In the guise of Delirium.
  II. *Of sympathetic origin.*
    a. Periodical Insanity of Menstruation.

THE CEREBRAL DISEASES WITH PREDOMINATING PSYCHICAL SYMPTOMS.

A. DEMENTIA PARALYTICA (Progressive Paresis).
B. CEREBRAL SYPHILIS.
C. CHRONIC ALCOHOLISM AND ITS COMPLICATIONS.
  1. *Delirium tremens.*
  2. *Pathological intoxications* (*Mania a potu*).
  3. Hallucinatory conditions.
  4. The alcoholic psychoses.
    a. Mania gravis potatorum
    b. Alcoholic melancholia.
    c. Alcoholic insanity with delusions of persecution.
    d. Alcoholic paralysis.
  5. Alcoholic epilepsy.
D. SENILE DEMENTIA.
E. ACUTE DELIRIUM (Congestive Mania, Typho Mania, *manie grave* of authors).

THE PSYCHICAL STATES OF ARRESTED DEVELOPMENT, IDIOCY AND CRETINISM.

The following modifications would, in our opinion, bring this classification much more in accord with the principles now adopted in clinical medicine, than it is as here detailed, with all its acknowledged good features.

Melancholia attonita should stand separate from the melancholias under the name devised by Kahlbaum, of katatonia, for it is a cyclical form and has its own peculiar association of motor and mental disorders. The same will apply to circular insanity, which should also be held distinct from the periodical vesanias till we shall know something more definite about its relations in this regard.

Hypochondriacal insanity unquestionably should be ranged with the other systematized manias. Nothing is gained by separating megalomania into a religious and erotic megalomania, for quite aside from the fact that the word erotic is ambiguous, these two forms do not exhaust the list by any means, and all of them have their fundamental characters in common.

The classification of the epileptic forms is taken almost bodily from Samt, and is the most accurate one we have yet seen. But we are not sure that Prof. Krafft-Ebing has interpreted the forms of Falret accurately.

Logically, the mental states due to arrest of development should at least follow the degenerative psychoses. We would go further than this even and range them in a sub-group under the latter head, for there is an unbroken chain running from the most intellectual forms of systematized mania to the most abject idiocy and even microcephaly. And when this truth is once recognized we shall after all have only fallen back on Morel. It seems to have been dimly appreciated by our author, for the idea must have been uppermost in his mind when he made the happy distinction between the psycho-neuroses, or vesanias attacking an intact brain, and the degenerative psychical states which affect the brain injured by hereditary or acquired vices of conformation or nutrition. He makes the former parallel to a parasitic affection, as it were, the latter to a constitutional one. When there is an hereditary predisposition in a patient suffering from a psycho-neurosis our author considers it as latent.

The first chapter in this volume is an essay on classification, and in many features reminds one of the corresponding remarks of Voisin, though more attention is paid by Krafft-Ebing to the somatic signs than by the French alienist.

In the succeeding chapters the different forms of insanity are considered in a truly classical manner. Each chapter is an essay by itself. The various facts are admirably brought together, and a vein of logic runs through each description, which we could only wish had been made as manifest in the first volume. This part of the author's work must have been in his mind for years, and been subjected to all the polishing that only well matured ideas exhibit. Indeed, those who are familiar with his works on criminal psychology and the admirable "Uebersicht ueber Fortschritte in der forensischen Psychiatrie fuer dass Decennium 1865–1875" would have anticipated Prof. Krafft-Ebing to excel in this part of his work.

It is refreshing to read such statements as these (speaking of melancholia, p. 27): "The strait-jacket furnishes no guarantee against suicide." Speaking of acute mania, p. 34, he says: "Opium and morphine, so useful in many periodical cases, here have no favorable influence, they rather increase the excitement;" p. 44: "With high maniacal excitement, associated with indications of cerebral anæmia, brandy, beer and wine are the best calmatives and soporifics." This is one of the most valuable and important therapeutical hints; it contrasts curiously with the statement of one of our superintendents, made before a now sufficiently notorious legislative committee, that patients with cerebral anæmia were placed in the crib in his asylum, and the pompous pride with which one of his colleagues pointed to the fact that he had diminished the amount of stimulants used at his institution since placed in charge.

Not a word is said in favor of inebriate asylums; for the true dipsomaniac Krafft-Ebing holds that an asylum detention of years, in combination with morphine, used on the same principles as in periodic insanity, alone holds forth prospects of an amelioration or efficient prophylaxis!

Amyl nitrite is not recommended for any other cases of epilepsy than where an aura permits of its use in time to prevent an attack. The author suspects that this remedy has the worst effects in other cases. This agrees with the physiological knowledge we have of the drug, yet it is used indiscriminately in our asylums, not only in the *status epilepticus*, but in an analogous state seen in the last stages of paralytic dementia. As regards forced feeding, the author believes that the advantages and dangers are evenly balanced between the methods employed *per orem* and *per nasum*. In case of incipient paralysis of the laryngeal and pharyngeal muscles, the nasal passages are the preferable road, as the tube does not interfere with the laryngeal aperture as readily as with the other method.

The treatment of fixed ideas by means of intimidation, which was successfully practised by Leuret, is not rejected by Krafft-Ebing as it is by certain extremists; he regards it as a species of mental discipline.

Prof. Krafft-Ebing is not an absolute non-restraint man; he insists that restraint is grossly abused, but at the same time believes that the camisole (which is the most severe appliance he mentions), indestructible clothing and gloves are often invaluable. These, he adds, should never be employed except under medical supervision.

It may be of interest to those who are afraid of large doses of the bromides to know that the author recommends doses as high as 160 grains (10,00) in cases of high maniacal excitement ("tobsucht").

The volume of case-accounts, which closes the work, is one of great practical value. Those delicate shades of difference observed in individual cases can alone be shown in the manner adopted by the writer.

The cases are classed under the clinical form to which they appertain, and the author has endeavored as much as possible to apportion the different instances in equal ratio among the sexes and the different social states. He has also, when possible, furnished accounts of autopsies. As exhibiting the thorough manner in which he thus illustrates the different forms, we will enumerate the headings of the observations coming under the head of melancholia passiva (simple melancholia): 1. Melancholia passiva on the basis of chronic intestinal catarrh; 2. Ditto, with predominating psychical anæsthesia, disturbed visceral sensations, and thereon based hypochondriacal tinge; 3. Ditto, with interesting description of disease symptoms by the patient himself; 4. Ditto, with demonomaniac ideas and *raptus melancholicus;* 5. Ditto, in the puerperal state; 6. Melancholia syphilidophobica in a luetic patient; 7. Melancholia religiosa; 8. Melancholia agitans, affected favorably by opium; 9. Melancholia passiva after mental over-exertion; 10. Melancholia passiva based on chronic gastro-enteritis; 11. Melancholia with præcordial fear predominating; 12. Melancholia with *raptus* in the course of acute gastro-duodenal catarrh; 13. Chronic melancholia passiva with *raptus;* 14. Melancholia passiva terminating in mental enfeeblement.

One great omission in this series is the absence of cases of insanity of masturbation and of hebephrenia; possibly this is owing to a lack of material, but its absence will be felt by all who recognize the importance of a recognition of these well-demarcated forms. The two observations (61 and 62) of masturbators are not, and are not given as cases of insanity of masturbation, but appertain to the hypochondriacal group, as all masturbators who have not begun the habit early in life or practised it to a great extent at the age of puberty and shortly after, do.

The style of the writer is felicitous, the descriptions pragmatical and clear; there is, as regards the literary character of the work, but a single short-coming. Prof. Krafft-Ebing, like Meynert and other of the leading German and Austrian alienists, repeatedly speaks of a "gemuethliche Reizbarkeit." The ordinary vernacular sense of the first word, an adjective, expresses a congenial, good-humored quality, but it appears that these writers have modeled the adjective after the noun "Gemueth," and given it an entirely different signification, that of *emotional.* The student to whom the language is foreign, as well as the native German, will, on first sight, be puzzled by the "gemuethliche Reizbarkeit," a sort of incongruity: a good-humored irritability (though there is such a thing), and it is only after some judicious guessing that he arrives at the meaning of the writers, which is: emotional irritability. Now, we suggest as a way out of the dilemma, and as admitting of no ambiguity, that the clear and not to be misunderstood phrase "Gemuethsreizbarkeit" be adopted, instead of the one quoted, thus leaving to the adjective its limited vernacular signification. It is, of course, a trivial matter, but it is just the trivial matters that often annoy and perplex the student most!

Having given the reader an idea, to the best of our ability, of the practical contents of the work, we will, pursuant to our opening intimation, enumerate the imperfections of the two opening chapters of the first volume.

We question, for example, whether, as stated by the Professor, all peripheral sensations associated with the emotions are due to excentric sensations transmitted by the vagus and sympathetic nerves of a strictly encephalic origin. The majority are so, undoubtedly, but some of them are only indirectly so produced and referable to primarily vaso-motor influences, acting directly and locally on the organic sensations.

It is not correct that the spinal cord only serves the purpose of a conductor and a mediator of the simple reflexes, if the words "simple reflex" be used in a properly limited sense. Speaking of the medulla oblongata, he puts this segment of the nervous system in a far higher plane than the cord, asserting that it does not only subserve conducting and reflex functions, but is also a centre for sensory nerves, the seat of important automatic centres of respiration and circulation. Now, just so far as the medulla oblongata is a sensory centre of a low kind, the cord merits the same position, and the automatism of the former is but of a slightly higher grade than that of which the cord is capable.

On the same page it is stated that the entire psychical existence is built up from sensory impressions, elaborated into sensory perceptions, which ultimately fuse together (it would certainly be better to describe them as becoming correlated and associated), and individualize themselves separately from their original source as ideas, judgments and conceptions. There is no mention whatever of the motor side of the intellect here!

Page 5, the elephant is stated to have relatively the smallest brain weight of all animals, and on the next page the mesocephalon is parenthetically stated to comprise the corpora quadrigemina and the *thalamus*. An abortive attempt to exhibit one of Meynert's chief theorems has led to the remarkable statement that the tegmental fibres depend on the corpora quadrigemina in their development, while it is an elementary fact that their chief mass is derived from the thalamus and sub-thalamic region.

The view announced on the seventh page, that the intact portions of a diseased brain vicarate for the affected areas by means of the associating tracts, is entirely chimerical.

Wherever the author touches on the subject of comparative cerebral anatomy he commits solecisms; thus the rodentia and bats are stated to have no other fissures than the Sylvian. They have no such fissure, but they have many of them, even the opossum got a *fissura calloso-marginalis*, continuous, if we mistake not, with the homologue of the *fissura collateralis*. The short description of the human sulci is so brief and ambiguous that it had as well have been omitted.

It is not correct to assert that the gyri of the idiotic brain represent an arrest at the embryonic stage. No idiotic brain ever exhibits the unmixed embryonic character, there are always some teratological features present in addition.

On the same page in his last line he uses the word "Vorderhirn" instead of "Vorderlappen." The former means the aggregate cerebral hemispheres and the thalamus, the latter the frontal lobe alone. This error is repeated on the following page.

The second chapter opens with the assertion that insanity is a cerebral disease. It is true that in the German vernacular the word "Krankheit" is used more loosely than our word disease, but it would have been more correct, nevertheless, to say that insanity is a symptom-complex, indicating a disordered state of the brain.

But all these minor short-comings cannot detract from the great value of the work as a whole. It is a monument of patience, diligence and skill; it is eminently practical, and its perusal cannot fail to profit every worker in the field of nervous and mental diseases, who will turn to it of course not to obtain information in anatomy and physiology, but in the diagnosis and treatment of the most mysterious affections of the nervous system.

In how high esteem our author holds the accessory sciences, and how thoroughly he is imbued with the idea that insanity is but a branch of general neuro-pathology, let the concluding lines of his second introductory chapter attest:

"From all these facts follows the practically important dictum, that all the methods of observation and treatment of the so-called diseases of the mind must be the same as those applied to other cerebral diseases, and that only he can intelligently recognize and treat them who has the various diagnostic aids at his disposal, and possesses special knowledge of the physiology and pathology of the entire nervous system."

E. C. SPITZKA.

II.—DOWSE: NEURALGIA: ITS NATURE AND CURATIVE TREATMENT.

Neuralgia: Its Nature and Curative Treatment. (The Brain and Diseases of the Nervous System, vol. II.) By Thomas Stretch Dowse, M. D. G. P. Putnam's Sons, 182 Fifth Avenue. New York, 1880. Pages, 198.

In his preface the author says: "If the reader expects to find in the following pages any vague or speculative theories relative to the pathology of neuralgia, he will be greatly mistaken."

This statement will be found true, for the book does not contain a theory of neuralgia of any kind worthy of the name. If the author regards theories or rational explanations of important groups of morbid phenomena, such as are observed in neuralgias, as impossible or useless, or necessarily "vague or speculative," he is sadly in error. If, however, he means to be understood as simply declining for the present to offer a theory or explanation of the phenomena of neuralgia, then he should be permitted quietly to have his own way. But, in any case, it seems strange a writer should either lay so little stress upon having and giving a sensible theory, or should allow himself so little time and space as to render such a course impracticable when he sets himself down deliberately to write a book on such a subject. For our own part we do not hesitate to condemn, whether in medical practice or medical writings, the irrational haste to get at "practical" results which so often involves the neglect of thoughtful rational theory. If we may be permitted to judge from what little is contained in this work, our author falls under this condemnation.

Dr. Dowse seems to be proceeding in an original, even a curious fashion, in preparing a work "On the Brain and Diseases of the Nervous System." First we have a monograph hastily written on "Syphilis of the Brain," next the present essay on Neuralgia, then a little monograph on neurasthenia, etc., and what next may appear can only be known by waiting, since there does not seem to be the slightest organic connection between the parts of his work which have thus far appeared.

The views of Dr. Dowse on the nature of neuralgia may perhaps be found outlined in the "introduction" of nine pages. To this we will briefly direct the attention of our readers.

Dr. Dowse says: "The term neuralgia is here employed to denote a *diseased condition of the blood or tissues* of the body, and a condition which causes a more or less definite and localized affection of the nerves." Or again: "Neuralgia * * * * is, in the majority of cases, due to a disordered action or a diseased condition of the nerve centres." If the author is determined to avoid "vague and speculative theories" he has not been able to avoid "vague and speculative" definitions. We must decline an attempt to analyze generalizations, the limits and contents of which are so uncertain. If the author had given a little more attention to theory, or, in other words, to careful analytical reflection and generalization upon the facts of neuralgia, his definitions would have been better.

Dr. Dowse refers to Benedik and Eulenburg [Benedikt and Eulenberg] as holding to the opinion that neuralgias are always dependent on inflammatory processes. But, we feel sure, after pretty close acquaintance with their writings, that both authors would repudiate such an opinion unless it were much qualified.

We now come to the practical part of the book. Dr. Dowse regards true neuralgias as generally curable, those of the arm being more curable than those of the leg and face. In this part, 69 cases are detailed, which gives it altogether the aspect of a collection of brief clinical reports. This portion of the book is prefaced by a few judicious general observations on treatment. But even here, as elsewhere, the author is not happy in his modes of expression We can most heartily commend the emphatic remarks made by the author on the "avoidance of fatigue" in the treatment of neuralgia. In an astonishing number of instances Dr. Dowse speaks of "curing" neuralgias. In some of them it is hard from the account given to see the causal connection between the action of the remedy and the disappearance of the disorder. Take the following case: "I *cured* a severe case of neuralgia of the fifth nerve in a gentleman by compelling him to give up his claret and drink copiously of draught stout, which he at first declared to be an impossibility. He, however, had an attack of gout, which readily yielded to treatment, and from that time his neuralgia entirely left him." (Case I., page 18.) Here the reader will notice that the patient gave up claret for stout and soon had an attack of gout with his neuralgia. The doctor began on the gout, which gave way to treatment, and the neuralgia went with it. Now, how can it be said the stout *cured* the neuralgia? Is it not more probable that the neuralgia was a manifestation of the gouty diathesis, and that the treatment, whatever it was, which relieved the gout also relieved the neuralgia? We only cite this case to show how loosely the author reasons.

The book, hastily and loosely written as it is, contains very many useful therapeutic hints and practical observations, which are evidently the outcome of a wide experience. The author is evidently a busy, outspoken, practical, rather than a scientific physician. In his general remarks on the use of therapeutic agents in neuralgia, the author lays much stress on the external use of chloral hydrate. He says: "I believe that I was the first physician in this country to bring prominently before the profession the value of hydrate of chloral when applied externally for the relief of pain; and if properly and carefully applied after the manner which I direct, its value cannot be over-estimated; and, strange to say, many cases of severe nerve-pain which the hydrate of chloral failed to relieve when given internally, soon subsided when this drug was applied externally. The strength of the solution is usually 1 oz. of the chloral hydrate to 16 oz. of water. My mode of applying it (a great deal, of course, depending upon the surface over which it has to be applied), is as follows:

"Take three layers of lint, which must be fully saturated with the solution of the hydrate of chloral, previously made hot. Place these immediately upon the painful part, and upon them place three or four folds of flannel which has been previously soaked in very hot water and wrung out; and then upon the whole place a piece of india-rubber sheeting. It is necessary to bind these firmly to the part affected, and they may remain in position for six or eight hours. When they are removed the part ought to be painted with collodion or dusted with starch, and then covered with cotton wool."

Dr. Dowse lays great stress on the use of opium in neuralgias. He prefers the watery extract to any other form, and makes the following remarks concerning its use, which, though they are not novel, have practical value:

"From my experience concerning the administration of morphia, I have come to this conclusion, namely, that its action differs materially from that of opium. When I administer morphia internally it is with the object of inducing profound sleep, and I give the largest dose which I think my patient can bear ($\frac{1}{2}$ gr. to 1 gr.) which I order to be taken in the form of pills, one every two, three, or four hours. The action of the two drugs is dissimilar. The first effect of the morphia is marvelous. A few minutes are sometimes sufficient to calm the most agonizing pain, but the pain unfortunately generally returns as the effects of the narcotic wear off. With opium given in small doses at intervals we have a soothing power induced, which, as I have just stated, is so essential to produce rest and allay irritability." We can heartily commend these remarks on the use of opium in painful affections, chief among which are neuralgias. It is our opinion that the profession has much even yet to learn concerning the moderate persistent use of opium in such affections. But we cannot endorse the author in his recommendation of such large doses of opium or its salts until, by repeated trials, the degree of tolerance of the drug by a patient has been carefully established. We desire at this point to give an emphatic caution.

The author says far too little concerning the use of *aconitia* in tri-facial neuralgias. We have used the latter, Duquesnel's aconitia, solely, and have found it of *very* great value. We begin its internal use with the $\frac{1}{200}$ of a grain, and steadily increase the dose until we have unmistakably procured its physiological effects.

Dr. Dowse seems to have had success by means of the local external use of aconitia and veratria combined (veratria, grs., xii.; aconitine, grs., i., dissolved in spirits and spread over a square foot of emplastrum resinæ). A piece of this prepared plaster is applied to the painful part with most excellent results according to the author. In respect to the use of gelseminum, the author says: "I certainly do not know of any other remedy which acts so promptly in relieving those neuralgias which are commonly called tooth-aches and face-aches. There are some practitioners who state that 15 drops is a full dose, but I never give less than 20 or 30 drops of the tincture, and repeat the dose every hour until the pain is relieved. It must be understood that the effect of this drug in painful nervous affections, is not confined to the tri-facial nerve, although its action upon this nerve is certainly specific. I have found it of value in intercostal and mammary neuralgias, and other superficial cutaneous neuralgias of no great severity. In the lightning pains of locomotor ataxia it is of value, but the dose must be increased by degrees."

His estimate of phosphorus in neuralgias is far from being enthusiastic. The author's experience has been much the same as our own with this drug. If given in doses large enough to be useful it is likely to irritate the mucous membrane of the stomach, producing coated tongue, loss of appetite, gastric tenderness, eructations of gas, etc.

Croton chloral has, upon the whole, disappointed the author. He uses it often in small, frequently repeated doses. Hydrate of chloral associated with morphia (40 grains chloral hydrate to $\frac{1}{4}$ gr. morphia) is highly recommended to alleviate in a severe attack of neuralgia. But greater caution in using these remedies should be observed than the author anywhere gives. Chloride of ammonium in 40 grain doses, frequently repeated, has produced very favorable results in the hands of Dr. Dowse "in facial, lumbar and abdominal neuralgias, especially when of catarrhal, rheumatic or gouty origin." Iodide of potassium is highly spoken of, more especially when there is a "clear history of gout or syphilis."

The author gives a very short and inadequate account of extract of Indian hemp. There is no more valuable remedy in those forms of neuralgia of the head which pass under the name of hemicrania or migraine. Of its persistent use in large doses for the relief of such neuralgias we cannot speak too highly after a rather large experience. But, as Dr. Dowse says, great care must be taken in selecting the drug. The majority of its preparations found in the market are either of uncertain strength or worthless. To this fact more than anything else must be ascribed the ill success with it which is so often reported.

Very much depends, in the successful treatment of neuralgias, not alone on a just notion of their nature, but on a judicious and tactful use of remedies. Dr. Dowse's practical observations are valuable though not novel.

The remainder of the work is occupied in giving an account of various forms of neuralgia, which are generally brief, and present nothing worthy of special mention after what has been said of the author's therapeutics. Upon the whole we fail to see any place this work is to fill, which had not been already better done by works already in existence, and quite as accessible to English readers as is this little hastily written memoir.

III.—HERMANN: PHYSIOLOGY.

Handbuch der Physiologie. Herausgegeben von Dr. L. Hermann.

Since our notice of the first two volumes of this work, (January, 1880,) several new parts have appeared. The third volume comprising the organs of the special senses is now complete. The dioptrics of the eye and the perception of light and colors are presented by Prof. A. Fick, while Hering has taken up the sense of space and the movements of the eyeball. Both parts are well written and quite exhaustive, but they do not at all please when compared with Aubert's physiological optics written some four years ago as a part of Graefe and Saemisch's (German) handbook of ophthalmology. The comparison is just since both works have the same scope. Aubert's compilation though smaller in bulk, is fully as exhaustive and contains its information in an easily digestible form. The present work, however, suffers from too technical a style, which without increasing its value as a book of reference, is apt to deter even the more advanced student from reading it as a book of information. The language employed by Hering especially is exceedingly difficult to follow.

A part calling for special notice is the chapter by Kühne on the chemistry of the retina, which fills about one hundred pages. It is the first complete account of the discoveries made mainly by Boll and by Kühne on the existence of pigments sensitive to light. Within the last two years, however, this subject has been but little advanced. Abstracts of most of the points have fully appeared in this journal from time to time.

The treatise on the sense of hearing deserves in every way the epithet excellent. Its author, Prof. Hensen, of Kiel, evidently feels at home just as much in the mathematical portion as he does in the morphological and experimental results. In both of the latter directions his own researches form no unimportant part of the book. On the whole it is the only complete description of the physiology of the ear to be found in any language. A short appendix treats of the observations made on the semicircular canals. Although quite complete in the presentation of the facts the author has not dwelt on the topic with any show of favor. He evidently distrusts both the experimental results and the post-mortem accounts of Menière's disease and considered it premature to theorize.

The following chapter treats of the sense of taste by Professor von Vintschgau, who has written likewise the chapter on smell. Both of these parts are well written and exhaustive; it seems to us almost unnecessarily exhaustive in the older literature. The author shows how incomplete our knowledge really is on these topics. He sifts with much diligence the experimental evidence as to which of the cranial nerves really serve for the transmission of taste impressions. From an almost overwhelming array of confusing statements, he makes out that it is at least fully established, that the glosso-pharyngeal supplies the posterior part of the tongue. A valuable proof of this view has recently been furnished by his own experiments, according to which, division of this nerve is followed by degeneration of the taste-buds. As regards the anterior two-thirds of the tongue, he concludes likewise, that it is also supplied by the glosso-pharyngeal nerve,the fibres of which enter the plexus tympanicus through the tympanic nerve, and thence reach the lingual nerve. The view that the chorda tympani is the nerve of taste, he does not consider fully supported.

The following chapter treats of the sense of touch and the internal sensations. It was commenced by the late Prof. Funke, but after his death completed by Latschenberger. Any one accustomed to Funke's style can readily recognize the author by his tendency to philosophical speculation. While hence, the contents of the chapter correspond fully to the plan of the book, the style is sometimes so diffuse as to render it difficult to find what one seeks. It is therefore quite difficult to make the reader acquainted with Funke's views. Moreover, he contents himself frequently with stating the arguments on both sides of a question without trying to decide. Thus he admits that the sensations of touch, temperature, pain, etc., can be interfered with separately in disease, although the results of vivisection are less distinct. But he leaves it undecided whether there exist separate peripheral nerve-fibres for separate sensations, or whether the analysis of these sensations occurs only in the spinal cord. An unnecessary amount of space is sacrificed to the discussion of Fechner's psycho-physical law. In the pages devoted to the muscular sense, the author ranks this of course as a separate sense, but the sifting of the evidence is more or less left to the reader.

The last part of the third volume is concluded by Prof. Hering with a separate chapter on the sense of temperature. We find in it views peculiar to the author, that are not promulgated in ordinary text-books. He insists in the first place that the sensation of temperature is dependent on the existence of a peripheral organ. For warmth and cold applied to a nerve-fibre may irritate it, but do not give the impression of a change of temperature. What the peripheral organs are, anatomy has not yet decided. The author states that the *thermal organs* in the skin are in repose when the temperature of the skin has adapted itself to the temperature of the surrounding medium. This repose he calls the thermal zero. By the time a given part of the skin has adapted itself as regards its own temperature, to the warmth of the surrounding medium, we experience neither heat nor cold in that part. The absolute temperature of the skin, the thermal organs of which are at the physiological zero, may vary, however, according to the temperature of the surrounding medium. But the zero cannot be attained if the temperature exceeds certain limits in either direction. The zero having once been attained, all thermometric changes in that part of the skin are now felt as heat or cold. A sensation of heat can be produced by increasing the temperature of the skin by augmentation of the heat supply from the inside—hyperæmia, or from the outside by a medium warmer than the skin, or, on the other hand, by checking the loss of heat either by surrounding it with non-conductors, or by augmenting the temperature of the medium above the point to which the skin was originally adapted, though the medium may still be cooler than the skin itself. The same considerations apply conversely to the sensations of cold. After quoting the various observations which have been made on the sense of temperature, Hering sketches finally, the outlines of a theory which is based on the same unproven premises as his theory of color-perception. According to it, the nerve conduction varies not merely quantitatively but is capable of a plus or minus state. These two opposite states of nerve-conduction he refers to assimilation and dissimilation of nerve-substance, and tries to explain with the aid of this assumption how a single nerve-fibre can conduct the impression of cold as well as of heat.

The first half of the fourth volume begins with the chemistry of the blood and the physics of the circulation, by A. Rollet.

These chapters are written in a rather encyclopædic, though not unpleasant style. As regards their thoroughness and presentation of facts no objections can be raised. Unlike some other parts of the treatise, the methods are also sufficiently described. But a peculiarity of the author which we do not sanction is the predominance he accords in his description to phenomena of a relatively less important mechanical order, at the expense of the more significant physiological processes. Thus the discussion on the import of the secondary waves of the sphygmogram is very minute, while the processes occurring in the capillaries are stated in a short and almost dry manner. Those phenomena which constitute the border between physiology and pathology, like diapedesis and transudation, are scarcely touched upon.

Next in order we find the innervation of the circulatory organs, by H. Aubert, a pleasantly written and thorough chapter. It begins with the intrinsic nervous system of the heart. As regards the systole, he concludes from the experimental evidence that it is a single contraction and not a muscular tetanus, although its duration is about ten times that of the single contraction of other striated muscles. He does not admit that a distinct tetanus of the cardiac muscle has ever been produced, but fails to notice the most recent publications of Ranvier, who showed that a cardiac tetanus is possible with a certain mode of electric excitation. In the next place, the conditions are considered under which the excised heart continues to beat. The researches of Gaule (abstracted in the JOURNAL) are detailed, but it seems to us their importance is not sufficiently pointed out. As regards the cardiac rhythm, the author attributes this to the conduction of impulses through the muscular cells themselves. In fact, he claims that the muscular fibres of the heart possess the power of conductility ordinarily the attribute of nerves. After discussing the various phenomena in which the ganglia play a part, he attributes to them the following rôles: 1.—that the nervous substance has a greater excitability than the heart muscle; 2.—that it conducts the exciting impulse less rapidly than the muscular tissue; and 3.—that the nervous substance serves as a bridge of conduction from the sinus to the auricle and from the auricle to the ventricle. Hereupon the author describes very detailedly the extra-cardiac nerves without producing any new statements.

The innervation of the vessels is commenced with a description of the methods of studying the action of the vaso-motor nerves. After considering vaso-motor nerves from a general aspect he undertakes a topography of the vaso-motor system, detailing the nature of the fibres found in the various nerve-trunks. This arrangement is somewhat new, and seems to us the best systematic description which has so far appeared. It is followed by the consideration of the various vascular reflexes and of the vaso-motor centres. The treatise ends with the full rèsumè of our imperfect knowledge as regards the innervation of capillaries and veins.

The fifth volume begins with the physiology of secretion, by R. Heidenhain. This is in all respects the most meritorious part of the book. It contains but little which is absolutely new, but a good deal, especially of the author's own researches, which has not found its way into text-books. The style is elegant throughout, and the entire treatise is fresh with an air of suggestiveness that we miss unfortunately in many of the contributions to Hermann's hand-book. The reader is impressed with the idea that the author feels at home in his subject, and that he never permits the enthusiasm he displays to influence his sound judgment.

Heidenhain pays more attention to histology than any of the other contributors to Hermann's work. But he does this in the interest of the structural changes occurring in glands during activity. He begins with the salivary secretion. Doing full justice here to Pflüger's claim as to the termination of nerve-fibres in the gland cells, he admits, however, that neither any other histologist, nor he himself, have ever been able to corroborate Pflüger's statements. It is only in the *Blatta orientalis* that Kupfer has really seen nerves end in gland cells. Entering hereupon in a most interesting manner into the details of the act of secretion, he develops finally his theory of secretory and trophic nerve-fibres with which the readers of this journal are familiar. The changes in the appearance of gland cells during secretion are presented with a thoroughness that promises to render Heidenhain's views a permanent and valuable acquisition in this field.

The secretions of the stomach are taken up with a minuteness not equaled in the literature on the stomach. But even where the author cannot quite escape the reproach of diffuseness, he is never wearisome. The innervation of the gastric glands is critically considered, but Heidenhain cannot find any positive statements of perfectly trustworthy nature. His own numerous experiments as to the influence of the stomach nerves upon the secretion were altogether negative. A similar uncertainty, if not ignorance, must be admitted as regards the innervation of the intestinal glands.

The present knowledge of the influence of the nervous system on the pancreas the author presents in about the following statements, which we reproduce in an abstract: 1.—After section of all (?) pancreatic nerves the secretion can still continue, even in an exaggerated manner. 2.—The secretion can be started and augmented by electric irritation of the medulla oblongata. 3. But still this secretion continues though diminished in quantity after division between the cord and the medulla. 4.—The existence of true secretory fibres in the pancreatic nerves has not yet been demonstrated. It is more likely that the innervation resembles that of the heart, viz., intrinsic conditions determining the secretion, while probably *accelerating* nerves can influence it. 5.—In all probability there exist also inhibitory fibres for the pancreas. The secretion can stop suddenly from nervous influence, for instance, during vomiting. 6.—Atropin checks the flow of pancreatic juice, at least in dogs, while pilocarpin in large doses can augment it (according to the author's experiments). The remaining considerations as regards the pancreatic physiology are fully up to the general value of the volume.

In the same exhaustive manner the formation of bile is discussed. The secretion of the liver is not influenced according to known researches through any other channel than the vaso-motor nerves The secretion of urine is taken up with more than mere encyclopædic thoroughness. The author makes this the occasion to expose some views of fundamental importance. He dissents totally from the universally adopted filtration theory of Ludwig and returns to Bowman's views, which he modifies, however. On the strength of his researches on the excretion of pigments, as well as from data in comparative physiology, he insists that the solid constituents of the urine are excreted by the cells lining the tubuli contorti, while the water is furnished by the glomeruli. But he does not accept the view that this elimination of water in the Malpighian tufts is a simple physical process, but claims that it is due to the activity of the epithelium of the glomerulus, and that it is not the blood-pressure, but the velocity of the blood-current which determines the rapidity of secretion. The arguments he advances in favor of this are of a convincing nature. The influence of the nervous system on the kidney has not been made the subject of personal researches by the author. The effects of section and irritation of the splanchnic nerve he attributes entirely to its vaso-motor fibres. He admits that Bernard and Eckhard have shown that polyuria can be produced by irritation of parts in the medulla and cerebellum, but he does not grant that true secretory fibres for the kidney have ever been demonstrated.

The secretion of milk is another chapter that cannot fail to please on account of its exceptional thoroughness. It contains moreover much information coming from the author's laboratory, not yet accessible in literature. As regards the rôle of the nervous system in lactation the author admits our complete ignorance, since Eckhard's experiments were wholly negative, while Röhrig's results he does not consider conclusive. In review of Heidenhain's contribution, we can only repeat that on the subject of secretion no similar treatise has yet appeared, and that in general the work is unsurpassed as a model of thoroughness and of ingenious research guided by critical judgment.

Luchsinger details in the next chapter the process of perspiration. The main interest centres in the influence of the nervous system on the sweat glands. The recent researches on this topic have almost all been noticed in this journal. While this chapter is inferior to Heidenhain's part in elegance of style and suggestiveness, it is still an excellent presentation. Not one of the least merits of the description is the fact that Luchsinger is himself the author of the bulk of the experiments. The same author has furnished an interesting and novel paragraph on the galvanic currents of glands. As a pupil of Hermann he does not admit the existence of any constant current in either the uninjured muscle or gland during repose. But during activity the galvanometer shows the establishment of a regular and constant current. In the case of sweat glands, where it can be shown most positively, its direction is inward towards the gland. This secretion current is, according to Hermann, the cause of the galvanometric deviation observed on deriving from both (human) arms, while one is being contracted. On the skin of the frog similar observations were made. It seems however, that two currents arise in that locality on irritating the glands. The inward current is produced in glands of alkaline secretion, while the secretion of an acid juice furnishes a current having an outward direction. These currents as well as the visible secretions are checked by atropin.

The first part of the fifth volume contains also the chemistry of digestion by R. Maly. This chapter is quite thorough though somewhat encyclopædic in style; although the methods are usually described, the author is still rather arbitrary in his judgment at times. An unwarrantable assumption it appears to us that Maly refuses to quote original memoirs in periodic literature, and refers only to the yearly abstracts in Canstatt's and other retrospects, and last, but not least, in his own "Jahresbericht f. Thierchemie." It seems also autocratic that he should refuse to bring the subject to a later date than the year 1878.

H. G.

IV.—FABRE: NERVOUS DISORDERS.

LES RELATIONS PATHOGENIQUES DES TROUBLES NERVEUX, ou les Troubles nerveux etudiés dans leurs Rapports Réciproques de cause a effet avec les autres Phenomenes Morbides, par le Dr. Augustin Fabre. Leçons recueillies par le Dr. Audibert. Paris, 1880. (*The Pathogenic Relations of Nervous Disorders.*)

We cannot introduce this work better to the readers of the JOURNAL than by quoting the author's preface. He says: "My object in publishing this volume is not so much to meet a want in medical literature as to call attention to it. A complement is needed to the remarkable works on diseases of the nervous system that have recently appeared. They have studied with care the diseases themselves, but they have too much neglected the consideration of nervous affections in their relations with other disorders, especially with visceral lesions; reciprocal relalations in which we see in one case the nervous disorder affect the viscus, and in another the visceral trouble react on the nervous system. Thus considered, nervous pathology is vastly extended; it is not a mere fraction, it is even the half of all pathology.

"Considering nervous derangements successively as effects and as causes of morbid phenomena, I pass in review, in the two parts of this work, on the one hand, the nervous troubles consecutive to visceral affections, and on the other, the morbid conditions due primarily to disorders in the nervous system. Many of the questions discussed in the second part have already received masterly treatment by MM. Professors Charcot and Vulpian, but the greater portion of those that form the subject of the first part have been only touched upon in medical literature. It seemed to me desirable to call the careful attention of competent men to these important scientific, as well as practical, subjects. To solve these problems, it is necessary to commence by stating them. The solutions I offer here are, many of them, only provisional; they are presented to call out more definite and final answers. I only trace a sketch: those who come after me will complete the picture.

"Medicine has need of researches in this direction; it is necessary to fix the relationship of morbid processes. Many of the phenomena occurring in a disease are only its indirect results, dependent upon its original manifestations. The practitioner is too often placed in the presence of an assemblage of morbid symptoms, unable to distinguish the primary and the secondary phenomena, and is practically in a situation analogous to that of an astronomer who, in a group of stars, puts a planet into the same category with its satellites. We cannot, therefore, I repeat, endeavor too strongly to trace out the sequences and relations of morbid phenomena, and this is the task I have here attempted. * * * The questions opened in this memoir are entirely in the domain of clinical medicine. Ranking below the great problems that require the aid of philosophy, and being, for the most part, outside of the domain of those whose solution calls in the physico-chemical sciences, they are undoubtedly explainable by physiological laws, but the observation of the phenomena of disease throws upon them still more light than does experimentation with animals. Clinical observation, therefore, is our guide in this field of pathogeny."

The principal justification of a notice of a book in a foreign language like the present one, is to give our readers some idea of those portions of its contents that are really contributions to medical science, or to call attention to such as are suggestive in special directions. If the author's introduction given above is correct in its statements, there should be much, at least in the first part of his book, that is one or the other of these two things. It will, of course, be impossible to give anything like a full abstract of all of even this part of the work, and a mere enumeration of some of the titles must suffice.

The form adopted by the author is that of lectures, in part clinical, which in substance, at least, were actually given before his students at Marseilles. The first section takes up the discussion of the nervous troubles consecutive to abdominal affections, and opens with a case of sudden death from nervous shock in biliary lithiasis. After an exhaustive exclusion of all other complications, which is in itself an instructive lecture, he reviews all the possibilities and observed accidents on the side of the nervous system in this condition, the usual sensory disturbances, the reflex paraplegias and paresis noticed by Trousseau, convulsions, hemi-epilepsy, mental derangement (hypochondria, irascibility), vomiting, dyspepsia, pulmonary congestions, syncopes, etc. The patient died in collapse, and the autopsy revealed some hepatic cirrhosis, but the cause of death was plainly the nervous shock due to the passage of biliary calculi.

In the second chapter the consideration of the subjects of collapse and shock naturally follows, and in connection with these is placed the typhoid state, an opposed condition in one sense, but owning the derangement of the same nervous apparatus, the vaso-motor or great sympathetic, for its causes. Around these two conditions, collapse and the typhoid state, revolve the important general nervous phenomena of abdominal affections.

The third chapter treats of the pathogenic influence of the abdominal viscera on those of the thorax through the intermediation of the nervous system. In the lung we meet with congestions and inflammations due to reflex influences from gastric, hepatic, renal, or genito-urinary affections, besides various sensory and functional troubles, such as the irritative cough accompanying certain derangements of abdominal organs, and which in its various manifestations is so clinically familiar to every practitioner. On the side of the heart we find various affections of this organ, connected with derangements of the stomach, uterus, liver, kidneys, etc. These may lead to perceptible organic changes; thus the author calls attention to a cardiac dilatation met with in connection with dyspepsia and gastric troubles, due, probably, to reflex atony, characterized by lowering of the apex, extension of the dullness transversely, and more pronounced second sound. This, he thinks, is not uncommon, though it has not been noticed by previous writers, and before it is admitted in any case, care must be taken to avoid deception due to a dilated and tympanitic stomach exaggerating the heart sounds. The effects of the uterus on the heart are still more prominent than those of the stomach, though he mentions no organic change thus produced. To a still greater degree is the heart affected by the liver and kidneys, through the nervous system, apart from the toxic and mechanical effects of the disorders of these organs upon the circulation. M. Fabre mentions under this head the organic cardiac alterations noticed by Gangolphe and himself in hepatic disorders, consisting of mitral insufficiency, due either to an atonic dilatation or to myocarditis, according as the disordered innervation or the toxic action of the original disease was the cause; also that observed by Potain, of dilatation of the right heart in the same relations, which he considers is undoubtedly due to disordered innervation, either of the heart itself or the vaso-motor apparatus of the lungs. The cardiac disorders of nephritis are also noticed. M. Fabre rejects the explanations of Traube and Hodgson, referring the dilatation of the left ventricle frequently met with in renal affections to mechanical obstruction of the circulation in the kidneys, or to disseminated arteritis, and adopts Potain's theory, that it is due to reflex nervous action on the capillaries, thus placing it directly in the category of the results of nervous sympathetic derangement.

The fourth chapter takes up the mutual action of the abdominal viscera upon each other through the nervous system. The uterus is the disturbing factor in the abdomen *par excellence*, and some of the nervous phenomena to which it gives rise in other organs are sufficiently familiar to every one. The stomach is its especial point of attack, but its pathological influence is on other organs, the liver, the kidneys and the bladder. But besides these, there are nervous complications on the part of various organs in affections of the stomach, the bowels, the liver and the kidneys, some of them obscure or little known; others more or less familiar to every practitioner. All these are noticed, but to give even an abstract of what the author says on the mutual pathological relations of the stomach, liver, kidneys, etc., would exceed the allotted space in this review.

The fifth chapter discusses the troubles of sensibility and motility connected with affections of the abdominal organs, and among these we may include those of intellection and emotion, as in hysteria, and hypochondria, depending on genital disturbances.

The second section of the first part is devoted to the description of the nervous disorders consecutive to thoracic disease. First, M. Fabre notices under this head the spasmodic coughs and other phenomena produced by compression of the nerves by enlarged or tuberculous lymphatic ganglia, or by aneurismal vascular dilatations. Then come the nervous phenomena in pericarditis, which may involve the sensibility, the motility, the visceral innervation, and even the intellect; those of pleurisy, sensory, motor, and vaso-motor; and then follow seven chapters on the nervous troubles in cardiac disease. These are, in all their various manifestations, pain, palpitations, syncopes, gastric and pulmonary embarrassments, insanity, and hysterical, choreic, and epileptiform convulsive phenomena. Insanity, our author holds, may own cardiac disease as its etiological factor, independent of any constitutional vice or other cause, such as rheumatism or alcoholism acting in the simultaneous production of both. Convulsive phenomena are especially connected with aortic disease, are usually preceded by epigastric or retro-sternal pain, and are due to two factors, the one nervous and the other vascular; the latter consisting in the cardiac alteration and the concomitant alteration of the arteries, and producing its effects through the cerebral anæmia resulting from these derangements, and the former a mere neurotic functional disorder, not usually serious, while the other is, as might be presumed, of the most serious import. In the pathogeny of the nervous troubles in cardiac disease, M. Fabre lays much stress on cardiac neuritis as explaining best the lasting nervous disturbances, while others may be attributed to a simple functional disorder, a neurosis, for the want of a better name. This cardiac neuritis, though difficult to anatomically demonstrate, has been actually found by MM. Peter and Lancereaux. The practical importance of this cardiac neuritis, if it exists, in a therapeutic point of view, will be appreciated when we consider that with symptoms of cardiac weakness we may have, in reality, actual inflammation of the most important cardiac apparatus, and instead of tonics and stimulants a revulsive and sedative treatment is really the one indicated.

Seven chapters are given to the nervous troubles in bronchopulmonary diseases, and these are discussed with the same thoroughness and detail as the preceding subjects. To give, however, even a partial notion of the substance of these chapters, to say nothing of the whole second part of the work, would require many pages of our journal. Our object in this notice has been to call the attention of the ambitious reader to its subject; it would be clearly impossible to convey any adequate idea of the contents of the work. The author brings to his task ample reading, and, though in some things we may not accept his conclusions, a generally good judgment. The work is an able one and well worthy of the attention of the profession.

V.—A TREATISE ON COMMON FORMS OF FUNCTIONAL NERVOUS DISORDERS.

A TREATISE ON COMMON FORMS OF FUNCTIONAL NERVOUS DISORDERS. By L. Putzel, M.D. New York: Wm. Wood & Co. Pages 256. 1880.

This is one of the volumes of Wood's Dollar Library, written especially for the series of 1880. It is devoted entirely to a consideration of Chorea, Epilepsy, Neuralgia and Peripheral Paralyses.

In designating the above-mentioned affections as "functional," the author does not mean to imply that they do not include any "change in the material structure of the organs involved," but that the diseases considered "present no primary anatomical changes which are visible to the naked eye or to the microscope, in other words, that the changes in structure are of a molecular nature." It is the belief of the author, "that due attention is not paid to functional affections, although" he says, "practically they are by far the most important, and are much more frequently encountered by physicians than diseases due to organic lesions." He thinks however, that a change is "becoming noticeable in this respect, especially in foreign literature." The present work is written "merely with the view of giving the present status of our actual knowledge of the subject, and not for the discussion of disputed questions." "The consideration of hysteria has been omitted because this disease has been described in sufficient detail in numerous works which are now in the hands of the medical public."

Exception might be readily taken to these remarks, extracted from the preface to the volume. Even with the author's qualifications of the word "functional," as he understands it, we could not admit the propriety of its application to epilepsy, neuralgia and peripheral paralyses. We believe that a majority of fatal cases of these diseases show as the result of a careful autopsy, some demonstrable lesion, which there can be no doubt forms part of the disease. In those cases which have not shown well marked lesions, it too often happens that there is some lack of thoroughness in making autopsies which impairs their value as evidence in favor of neuralgia, peripheral paralyses, &c., as being functional rather than organic. The argument in favor of such affections being functional is drawn from our ignorance, rather than our positive knowlege. But this could be overlooked, if there was any real utility in calling such diseases functional, as are so often proved to include palpable organic lesions as an actual necessary factor. In spite of the author's opinion to the contrary, we must for ourselves condemn the use of the word "functional," as applied not to transient symptoms, but to distinct morbid species, or separate diseases, as is done by Dr. Putzel. Such names denote in the present case the results of what seem to us inaccurate enumeration and analysis of the phenomena, and of the conditions, material and logical, of the diseases studied.

We are also inclined to differ from the author, when he says that as compared with other forms of nervous disease, "due attention is not paid to functional" affections of the nervous system. It has seemed to us that they have had relatively, their full share of attention. Then again, we could hardly admit that the author has succeeded in "giving the actual status of our present knowledge" of chorea, epilepsy, neuralgia, &c. It would not be difficult to show he has been very far from having attained this desirable end.

Finally we do not consider the author's excuse a good one, for having omitted hysteria from his list of functional nervous affections. For the same reason he might certainly have omitted epilepsy and neuralgia.

The work does not contain any notable contributions to the pathology of the diseases described, and fails to add any decided lines or tints to the older clinical pictures given of them, and is nothing very novel in the therapeutic way. If these remarks are just, we can hardly expect, as already said in reference to a previous work, that there is a place for this work to fill not already as well or better filled. And yet, in the awakening which the profession is having on the subject of nervous diseases, there can be no doubt it will be received with some favor by the profession. It has at any rate, the good fortune to be in the hands of powerful and ambitious publishers.

SHORTER NOTICES.

I. Index Catalogue of the Library of the Surgeon-General's Office, United States Army. Authors and Subjects. Vol. I. A–Berlinski. With a list of Abbreviations of Titles of Periodicals Indexed. Washington: Government Printing Office, 1880.

II. The Practitioner's Handbook of Treatment; or Principles of Therapeutics. By J. Milner Fothergill, M. D. Second American, from the Second English Edition, enlarged. Philadelphia: Henry C. Lea's Son & Co., 1880. Chicago: Jansen, McClurg & Co.

III. Treatise on Therapeutics. Translated by D. F. Lincoln, M. D., from French of A. Trousseau and H. Pidoux. Ninth Edition, Revised and Enlarged, with the assistance of Constantin Paul. Vols. I. and II. New York: Wm. Wood & Co., 1880. Chicago: W. T. Keener.

IV. The Surgery, Surgical Pathology and Surgical Anatomy of the Female Pelvic Organs. In a Series of Plates taken from Nature, with Commentaries, Notes and Cases. By Henry Savage, M. D., London. Third Edition, Revised and greatly extended. New York: Wm. Wood & Co., 1880. Chicago: W. T. Keener.

V. Hygiene of Catarrh, Hygienic and Sanative Measures for Chronic Catarrhal Inflammation of the Nose, Throat and Ears. Part I. By Thos. F. Rumbold, M. D. St. Louis: Geo. O. Rumbold & Co., 1880.

I. In a former issue of this journal we noticed a specimen fasciculus of this catalogue, sent out in advance to elicit the opinions of the medical press. We were hardly prepared by that, however, for this immense volume of over one thousand quarto pages, much of it in very minute type, and all closely printed, and yet only including the subjects commencing with the first, and part of those commencing with the second letter of the alphabet, that are comprised in the library of the surgeon-general's office, in Washington. It is a bibliographical work of the first magnitude, and when finished will form the most complete general index of medical literature ever published, filling, at the rate it has begun, some twenty or more volumes of nearly or quite a thousand pages each. It is fortunate for the profession that the United States Army medical authorities have the inclination and the ability to send out such a publication, and that there is in this country a library of medical works of the extent and scope here indicated.

While it is impossible that these volumes should be in all or even in many physicians' private libraries, it is to be hoped that their distribution will be such as to make them accessible to every medical scholar, in all parts of the country. It is the lack of knowledge of what has been already done that spoils a large part of the medical contributions at the present day, and access to such volumes as this will go far to do away with this deficiency.

The make-up of the volume is excellent, as is always the case with government publications of this class, and the proof-reading, which we may remark is, in such a work as this, no small task, seems to have been remarkably thorough. We hope the series may be rapidly completed, though the magnitude of the work seems to almost make this impossible.

II. The first edition of this work has been already noticed in our journal, and the general good opinion of it then stated need not be repeated here. We will only say here that while it is by no means a complete manual of medical practice, or altogether an absolutely faultless guide in the subjects of which it actually treats, it is nevertheless likely to be a very useful book to any one who has to have the care of the sick as a physician. Its plan is a good one, and its precepts generally sensible and safe, while it is written in an attractive and entertaining style, so that its perusal is no laborious task to the reader. The author has added the substance of several papers published by him since the appearance of the first edition, besides other useful matter from other sources. We can safely recommend the purchase of the volume to our readers.

III. These two volumes are a partial translation of the latest edition of a classic French work on Therapeutics that first appeared in 1836, and is still a standard in its own country. They are therefore a contribution to the medical literature of our language, and well worthy a place in the series in which they appear. They contain much that, if not new, is yet useful, and which may be profitable to the American reader. The translator has omitted nearly one-half of the matter of the original, retaining only those portions that seemed to him of most importance and interest to the American reader.

IV. This, like the above, is a reproduction in Wood's cheap series of a well known, but originally expensive work. It will doubtless be a useful addition to the libraries of gynecologists and others who do not possess the original edition.

V. This little volume of 166 pages is intended by the author—according to his preface—as a hygienic guide for catarrhal patients. It contains, indeed, about all the advice that a physician could give to a thoughtless patient. But the subject is spread out to an unnecessary length. Moreover, the physician who recommends it must give his patient a strong hint to exercise scepticism, as in some details the author becomes simply pedantic. The advice about wearing night-caps and not changing underclothing except when compelled by its physical condition, borders on the ludicrous. As regards the use of the nasal douche the author joins in the fashionable, though unfounded, crusade against it, but tries at least to base himself on some experiments to prove its insufficiency. In claiming that nasal and aural trouble may arise from carious teeth, the author makes some interesting suggestions, but his proofs are not conclusive. The book closes with a condemnation of tobacco, which, while it is based on much truth, is too much of a wholesale generalization which overreaches its aim. H. G.

Editorial Department.

WE noticed in our last issue the organization, at the Conference of Charities at Cleveland last summer, of an association for the Protection of the Insane. We have received since then the proceedings of the first meeting, including the papers by Drs. Beard, Shaw and Seguin on "Why we need a National Association for the Protection of the Insane," "The Practicability and Value of Non-Restraint," and "The Right of the Insane to Liberty," which were read at that session.

The utility and necessity of this organization will be apparent to any one who is informed in regard to the subject of insanity, or who reads these papers. It requires, however, for its effective action the support and co-operation of intelligent citizens of all professions, and especially those of the medical profession. It is a society that any intelligent and reputable physician might connect himself with, and the greater the number that do this the better will it be for the interests of the insane and the community. The annual assessment, which is the only condition of membership, is fixed at the low rate of two dollars per annum (instead of five dollars as stated in our former notice) and this is devoted to the publication and diffusion of sound information regarding insanity and its prevention, and to otherwise furthering the purposes stated in our former editorial. We trust that the organization may extend and fulfill its promise of usefulness. The President of the association is Dr. H. B. Wilbur, of Syracuse, New York, and its Secretary Miss A. A. Chevallier, 10 Marble St., Boston, Mass., both well known as earnest workers in this department of philanthropic effort.

WE would not longer defer calling the special attention of our readers to the articles of our talented young contributor, Dr. E. C. Spitzka, of New York City. We have no hesitation in saying that, as a whole, they have not been equaled by any series of articles that have appeared on the same subjects, in the whole range of American medical literature. Whether we consider the vast amount of labor they represent, the breadth and accuracy of his information respecting the best literature of his subject, or the talent exhibited for critical interpretation of facts and results, we think our thoughtful readers must acknowledge with us, that their author is entitled to no ordinary commendation.

We would point with particular satisfaction to the series of articles on the "Architecture and Mechanism of the Brain," which was begun at our request, and will be probably completed in the forthcoming volume of the JOURNAL. To such of our readers as desire to become acquainted with the inner mechanism of the brain, we would say that we know of no series of papers in recent times in any language which will better repay perusal. A very important contribution from Dr. Spitzka will appear in the January issue of the JOURNAL, among a number of other articles of a high character, which will open the eighth volume in a most auspicious manner. We do not hesitate to promise our readers, that the volume for 1881 will surpass in interest any of its predecessors.

WITH this number the seventh volume of the JOURNAL closes. The editors take this occasion to thank both subscribers and contributors for their generous support, and to ask for a continuance of the same.

They also desire to announce that for the present no change in the form or general policy of the JOURNAL will be made. In the forthcoming volume we shall endeavor to render the JOURNAL more practical, without lowering its character as a scientific periodical, devoted to the best interests of the important branch of medicine to which it relates.

The arrangements for the ensuing year are better than ever before, for securing the highest class of contributions, and for rendering the JOURNAL worthy of the patronage of thoughtful members of the profession.

THE "HAMMOND PRIZE" OF THE AMERICAN NEUROLOGICAL ASSOCIATION.

The American Neurological Association offers a prize of five hundred dollars, to be known as the "William A. Hammond Prize," and to be awarded at the meeting in June, 1882, to the author of the best essay on the Functions of the Thalamus Opticus in man.

The conditions under which this prize is to be awarded are as follows :

1. The prize is open to competitors of all nationalities.
2. The essays are to be based upon original observations and experiments on man and the lower animals.
3. The competing essays must be written in the English, French or German language ; if in the last, the manuscript is to be in the Italian handwriting.
4. Essays are to be sent (postage prepaid) to the Secretary of the Prize Committee, Dr. E. C. Seguin, 41 West 25th St., New York City, on or before February 1st, 1882 ; each essay to be marked by a distinctive device or motto, and accompanied by a sealed envelope bearing the same device or motto and containing the author's visiting card.
5. The successful essay will be the property of the association, which will assume the care of its publication.
6. Any intimation tending to reveal the authorship of any of the essays submitted, whether directly or indirectly conveyed to the committee or to any member thereof, shall exclude the essay from competition.
7. The award of the prize will be announced by the undersigned committee; and will be publicly declared by the President of the Association at the meeting in June, 1882.
8. The amount of the prize will be given to the successful competitor in gold coin of the United States, or if he prefer it, in the shape of a gold medal bearing a suitable device and inscription.

(Signed) F. T. Miles, M. D., Baltimore.
J. S. Jewell, M. D., Chicago.
E. C. Seguin, M. D., New York.

We have received with much pleasure the first number of a new Journal of Neurology (*Archives de Neurologie*), published in Paris under the direction of Professor J. M. Charcot, and edited by Dr. Bourneville. It is to appear three or four times a year, and, as might have been expected beforehand, bids fair to be one of the best periodicals of its kind. Under the direction of the renowned Chief of the Salpètrière, it cannot fail taking at once a high rank.

Periscope.

a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

Movements of the Brain.—The following are the conclusions deduced from a critical review of the literature of the movements of the brain by Dr. Vaillard in the *Revue Mensuelle de Medicine et de Chirurgie*, Aug. 10:

1. The movements of the brain are of two kinds: the one kind in relation with the beat of the heart, the other with the respiratory movements. There are, beside these, less rapid variations in volume, hardly perceptible, that appear to be connected with rhythmic changes in the tonicity of the small vessels.

2. Calm and easy respiration barely modifies the tracing of the variations of volume of cardiac origin. Exaggerated respiration *apparently* suppresses the pulsation of cardiac origin and produces an augmentation of volume during expiration and a diminution during inspiration.

3. Effort causes a very notable augmentation of the volume of the brain, to the condition that follows a strong inspiration.

4. Compression of the jugulars at the base of the neck causes turgescence of the brain.

5. Compression of the carotids produces an absolute diminution of the volume of the organ.

6. The vertical position causes a veritable aspiration on the brain, which sinks down much more than it would from its mere weight alone.

7. Elevation of the superior members favors the afflux of blood in the brain and indirectly produces increase of its volume.

8. Application of the Junod's boot to a leg, although causing evident disorders of cerebral anæmia, does not diminish the volume of the brain very appreciably, on account of the compensatory afflux of the cephalo-rachidian fluid.

9. The relations that may exist between the circulatory modifications of the brain and the phenomena of intellectual labor are not yet well determined.

Male and Female Heads—Their Measurements.—Dr. J. S. Wright (*Archives of Medicine*), from a careful study of male and female heads, concludes: 1. The brain of the educated male has a comparatively greater volume in the anterior part of the cranial cavity than the brain of the educated female. 2. The brain of the uneducated male has a comparatively greater volume in the anterior part of the cranial cavity than the brain of the uneducated female. 3. The volume and form of the brain of the uneducated male somewhat nearly resemble the volume and form of the educated female. 4. While in regard to the relations of education there is greater variation in the development of the anterior part of the brain of the female than the male, it may be remarked that the difference between the lower female brain and the higher male brain is very considerable. 5. The brain of the female shows as great a capacity for development by education as the brain of the male. 6. Under similar circumstances of mental work, hereditarily, the female brain would fully equal the male brain. 7. There can be no doubt that females ought to receive a higher education. 8. One cause of the deterioration of the race is the lowly condition of the female. 9. One cause of the amelioration of the race is found in the better brain development of the female. 10. The female should have a higher education in the interest of herself, the male and the well-being of the race. 11. An abundance of historical evidence can be adduced to show the soundness of these general propositions, that have been drawn from careful comparative measurements and calculations. 12. The above conclusions will be supported by the facts of imperfect development operating as causes of diseased conditions.—*Detroit Lancet*, Sept., 1880.

TENDON-REFLEXES AND THEIR RELATION TO MUSCULAR TONUS.—In the *Archiv für Physiologie*, 1880, H. 3, page 197, Prof. Senator communicates some new researches on this topic, after reviewing the literature, a complete history of which is to be found in previous numbers of our journal. In his researches, Senator tried to localize the strand in the cord upon the integrity of which the reflex depends. He used rabbits, an animal in which the patellar reflex is very marked. The animal was narcotized, and after careful exposure of the cord delicate incisions were made with a very narrow knife. The reflex was examined after recovering from anæsthesia. The cord was subsequently hardened in chromate of potassium and cut with a microtome.

The statement of Tschirjew's, that division of the cord between the fifth and sixth lumbar vertebræ prevents the reflex, is readily confirmed. It is further found that half-sided section of the cord intercepts the reflex merely in the extremity of the operated side. There is hence no decussation of the fibres concerned. Section of the posterior columns or their destruction in the lumbar part of the cord does not interfere with the patellar reflex. Occasionally even a slight exaggeration is seen, but this may occur after a variety of spinal injuries. Section of the lateral column, between the fifth and sixth lumbar vertebræ, prevents the reflex contraction of the quadriceps muscle of the same side. Some especially successful experiments seem to show that it is mainly the central portion of the lateral column which is here concerned. Division of the posterior cornua does not at all interfere with the tendon-reflex. In many instances it is found that a successful injury of the cord may stop the reflex on one side without depriving the animal of the use of its limb. This result, however, is not constant. In other instances it is also seen that the leg in which the tendon-reflex could no longer occur was more apt to be involved in general reflex movements. The main points in these researches are also confirmed by experiments on dogs.

These results form a strange discord with the usually accepted clinical notion that the tendon-reflex in man depends upon the integrity of the posterior columns. They agree, however, with all experimental results, all of which prove that in the lumbar cord the lateral columns contain both the sensory and motor fibres.

The author hereupon criticizes the researches of Tschirjew on muscular tonus and agrees with him on the whole, notwithstanding some polemical remarks. He mentions, by the way, the following interesting observation: He found that the tone emitted by the patella tendon is distinctly lowered in pitch by any operation upon the nerves or spinal cord which prevents the occurrence of the tendon-reflex. This is a decided proof that the tension of the tendon is diminished.

THE SENSATIONS OF LIGHT AND COLOR.—At the session of the French Association for the advancement of sciences, which, unlike its British and American namesakes, includes also medical science, M. Charpentier (of Nancy) gave a very interesting communication on the sensations of light and color, which is thus reported in *Le Progrès Medical:*

It is known that, in a physical point of view, white is composed of the mixture of the several simple colors; but this is not the case in a physiological point of view. The sensation of white (white and grey, more or less intense) is a simple sensation, while the notion of colors is the result of a different function and one more complex. The following are proofs:

1. White is not a composite color, since it acts on the retina differently from the other colors; colors have a limited visual field varying according to their nature and intensity; white has a very extensive and constant visual field. 2. The sensibility of the retina for white light is the same for all parts of the visual field, the retina is less and less sensitive to colors as we move from the point of fixation (Landolt and Charpentier.) 3. Pathological cases exist in which the sensibility for colors is totally gone (complete achromatopsy) while that for light persists; the author has even observed at M. Landolt's clinic, a case of hemiopia affecting only the color sensibility. 4. A colored light though monochromatic, when increased merely in intensity from the zero point, commences when the intensity is still very slight, to produce a simple sensation of light, and this is the case with all colors alike. It is only when it has reached a considerable intensity (and all the more so, as we recede from the centre of the retina) that it produces the impression of a specific color.

Light possesses therefore two modes of action on the eye: it acts on the one hand, on the sensibility to light, and, on the other hand, on the chromatic sensibility. These are two separate functions, the first being the simplest and most general, the color sensibility being a more specialized function. The following facts demonstrate the correctness of this view:

1. The action of light on the sensibility to light may be increased, the action on the color sense remaining the same; to do this, it is sufficient simply to darken the eye for fifteen or twenty minutes. The sensibility to light is then increased, that to color remaining unchanged. 2. On the eye being again opened to the light a sensation of white is added to all colors

which gives to the purer tints a whitened or washed appearance. 3. Finally, the addition of a certain quantity of white light, though rather strong, to any simple color does not alter the sensibility of the eye to that color.

We perceive therefore that there is also a sense of light distinct from the sense of color. It is also well known that the skin appreciates in a distinctly different manner the sensations of heat, and that the ear appreciates mere sound and musical notes with two distinct organs. The sensation of white therefore corresponds, according to this, to the inactivity of the color sense, either on account of a lack of any excitation strong enough, or more often, by the neutralization of each other, in a chromatic sense, by two complementary colors.

MULTIPLICITY OF THE LUMBAR AND SACRAL SPINAL GANGLIA.—According to text-books, we speak ordinarily of the ganglion on the posterior root of each spinal nerve. Some casual observations, however, reported by Dr. L. Davida, in the *Centralblatt*, No. 26, shows that in the lumbar and sacral region there are frequently two if not three ganglia connected with each posterior spinal root, or, if we like, that each ganglion consists of two or three separate parts. Some of the lumbar ganglia were duplex in every corpse examined, while the occurrence of three ganglia and the existence of two in the sacral region are less frequent.

THE VENOUS CIRCULATION OF THE BRAIN AND THE DEVELOPMENT OF THE PACCHIONIAN GRANULATIONS.—At the instigation of Tillaux, Dr. C. Labbé instituted an exhaustive examination of the interconnection existing between the different portions of the intra-cerebral venous system. The anastomoses with external venous branches were not included in this investigation. Four kinds of communication were recognized by the author: 1, anastomoses of the cerebral veins with one another, at the surface of the brain; 2, connections of the sinuses with each other; 3, connections between the hemispheres; and, 4, connections between the cortical system of veins and the central veins. Under the first heading Labbé mentions two kinds of anastomoses: the one situated at the height of the cerebral convolutions; the other, and the more important of the two, found in the depression between the gyri. The communications between the dural sinuses are broad, allowing the blood to pass freely from one to the other. They are, in general, placed in two planes, of which one is perpendicular to the other. All the sinuses also communicate through the channel of the dural veins. The latter proceed either directly from one sinus to another, especially between the sinus rectus and sinus transversus, and sometimes also in the falx cerebri, between the two longitudinal sinuses; or the communication is an indirect one, and effected through venous rootlets. Both forms of communication are called venæ anastomoticæ breves. The name of venæ anastomoticæ magnæ is given to two special veins, minutely described by the author, and said to be situated in the dura mater itself. One of these is called the vena anterior; it connects the sinus longitudinalis superior with the sinus petrosus superior or the sinus cavernosus. The other, called vena posterior, connects the sinus longitudinalis superior with the sinus transversus. The middle meningeal veins are also considered under the head of such communicating veins.

Connections between the hemispheres are found at the base of the brain, in the interior of the organ, and above the corpus callosum. Those at the base (the venæ interhemisphæricæ inferiores) consist of transverse branches of the anterior basilar vein. Of those above the corpus callosum, the vena interhemisphærica superior is a conspicuous vessel about one to two centimetres in length. It forms the continuation of the sinus longitudinalis inferior, and divides into two branches. Each of these communicates with the corresponding vena cerebralis interna. The latter again, by their reunion, form a special channel of communication between the hemispheres.

The connections between the central and cortical system of veins are small and insignificant.

Concerning the direct communication of arteries with veins in the pia mater, the author was unable to obtain any satisfactory evidence. The venous dilatations in the substance of the dura mater are described as "*lacs dérivatifs de sûreté des sinus*"—safety-valves they might be called in English. They occur both in children and adults, and are especially conspicuous on each side of the sinus longitudinalis superior, in the neighborhood of the transverse sinuses, and even in the falx cerebri. They may be seen also in the tentorium cerebelli. The author believes that a developmental relation exists between them and the pacchionian granulations. In his opinion, just as in varicose veins, phlebolithes are formed in these dilatations, and the formation of these exercises an irritating influence on the surrounding tissues.—*Arch. de Phys.*, March, April, 1879; *Allg. med. Cent. Zeit.*, June 30, 1880; *N. Y. Med Record*, Sept. 11, 1880.

Cranial Thermometry.—At the session of the Soc. de Biologie, June 19 (rep. in *Le Progrès Médical*), M. Francois Franck gave the results of some experiments on which he had been engaged to test the question whether the temperature in the brain substance was revealed by corresponding changes of the temperature appreciable by instruments placed on the outside of the skull and scalp. He experimented first on the dry bone and skin and then on the animal itself. He found that a layer of dry bone three millimetres in thickness placed on a copper box filled with water, made it necessary that a rise of temperature of the box of as much as three degrees centigrade should take place before the thermometer on the bone showed a difference of one-tenth of a degree. The skin was almost as poor a conductor as the bone. In the fresh tissues of the animal the same or very similar phenomena were observed. On the other hand the brain itself is a very good conductor of temperature changes, thus rendering the chance of distinguishing localized high temperature by thermometers placed externally a very uncertain method in the light of these experiments. It seems to us, however, that there is some clinical evidence that gives the method a certain value, and it is not altogether difficult to suppose that conditions exist during life that cannot be exactly reproduced in such experiments. At least this may be the case in certain pathological states if not in health.

Among other recent papers on the Anatomy and Physiology of the Nervous System we may mention the following:

FLINT, Is the Action of the Medulla Oblongata in Normal Respiration Reflex? *Am. Jour. Med. Sci.*, July.—SIMANOFFSKY, On the Influence of the Irritation of Sensory Nerves on the Functions and Nutrition of the Heart, *St. Petersb. méd. Wochenschr.*, No. 26.—LANGENDORFF, On a Contralateral Reflex in the Frog and General Spinal Reflexes in Rabbits, *Centralbl. f. d. med. Wiss.*, No 28.—WILDER, The Cerebral Fissures of the Domestic Cat, *Science*, July 31.—MYERS, Nervous Force and Animal Electricity, *Va. Med. Monthly*, August.—DALTON, On the Form and Topographical Relations of the Corpus Striatum, *Brain*, July.—IRELAND, Notes on Left-handedness, *Ibid.*—WALLER, On Muscular Spasms known as Tendon-Reflex, *Ibid.*

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b.—PATHOLOGY OF THE NERVOUS SYSTEM AND MIND; AND PATHOLOGICAL ANATOMY.

POLIOMYELITIS AND NEURITIS.—A paper by E. Leyden in the *Zeitschr. f. klin. Medicin*, I., No. 3, which is very fully abstracted by S. Guttman in the *Deutsche med. Wochenschr.*, July 24, discusses very elaborately the subjects of the anterior spinal paralysis of children and adults, progressive muscular atrophy and multiple neuritis. From his investigations Leyden concludes that there are, in what is called infantile paralysis, several different kinds of anatomical lesions, and that the situation of the poliomyelitic patches at the enlargements of the cord and their etiology and development permit the inference in many cases of their peripheral origin. After a thorough analysis of the previous anatomical investigations of cases diagnosed as acute or sub-acute poliomyelitis, he recognizes two separate forms, one consisting of small circumscribed patches in the anterior grey horns, commencing in the formation of fatty granulations and ending in sclerosis, with destruction of the ganglion cells; and this is especially the condition in the essential or atrophic infantile paralysis and the corresponding affection in adults; and a second form consisting of diffusely extended atrophy of the great ganglion cells, and of the ground substance of the anterior grey cornua (more or less involving the whole length of the cord), and characterizing more especially the sub-acute type most frequently met with in adults. The true nature of this last type is yet uncertain, since from its exceedingly chronic course the anatomical lesions of its earlier periods have not yet been observed. To these two he adds still a third form, multiple peripheral neuritis, the symptoms of which may be much like those of poliomyelitis and which may be acute, sub-acute, or chronic in its course.

Leyden holds that progressive muscular atrophy may originate peripherally as well as centrally, as examinations in some cases have found the spinal cord intact. This, he claims, is the case with all the forms of atrophic paralysis, and a separation is practically impossible as the forms all pass into each other. Dr. Leyden has always admitted the occurrence of peripheral neuritic paralysis both in the spontaneous rheumatic form and in that following acute disorders, and has always preferred the symptomatic designation of atrophic paralysis to the less certainly correct anatomico-pathological ones. The characteristic trophic and electric phenomena of poliomyelitis may also occur with peripheral nerve troubles; up to the present, anatomical proof is wanting of disease of the spinal ganglia. Many cases called poliomyelitis correspond more nearly to peripheral neuritis than to spinal disease. The possibility of a cure of cases of months' or years' standing, scarcely conceivable on the supposition of a central disorder involving atrophy of the ganglion cells, is readily explainable if the trouble is peripheral. Leyden shows from well-founded anatomical and histological data that a special form of neuritis probably is involved in atrophic paralysis, sometimes limited to peripheral nerves, but frequently affecting the ganglion cells secondarily, and in severe cases leading to their destruction. Nevertheless, it ought not to be called poliomyelitis, but rather should be designated as acute, sub-acute, and atrophic paralysis, like lead paralysis, which usually starts in the periphery and consists of neuritis and myositis of the extensors. But in some cases the neuritis extends to the cord, causing more or less alteration of the grey anterior columns and atrophy of the ganglion cells.

Leyden states, as characteristic of multiple neuritis, that it affects chiefly the motor nerves in various parts, and especially the radial and peronei nerves, which are the ones most exposed to traumatic and rheumatic influences. The nerves subjected to this acute or sub-acute process are reddened, swollen, congested, and later they exhibit a lipomatous thickening. The degenerative process, extending thence to the finest muscular branches, produces atrophy of the muscle, which becomes pale, flaccid and soft, the atrophy being accompanied with increase of the nuclei of the sarcolemma and abundant deposit of fat between the muscular bundles. The degeneration decreases centripetally, nevertheless it may go so far as to involve the anterior roots.

Not infrequently rheumatic pains of the extremities with paroxysmal exacerbations immediately precede the motor weakness, and are often accompanied by formication and painful sensations of numbness. The nerve trunks are sometimes sensitive to pressure, and pain on pressure in the muscles is a constant symptom. The distinction of these symptoms from the pains occurring in spinal affections, such as chronic meningitis or pressure myelitis, is not easy and requires further experience. The paralytic symptoms, the condition of the reflexes, the electric excitability all correspond in their course to those in cases of traumatic peripheral paralysis, and with the decrease in the latter there appears, sometimes slowly, sometimes quickly, the atrophy of the muscles. Other trophic symptoms accompany the muscular atrophy, such as thickening of the skin, growth of hair and nails, swelling of the carpal and tarsal bones, arthropathies, and rarely œdema and exanthemata. The development of the neuritis is always accompanied with a fever in character like an infection fever. The development is sometimes decidedly acute, sometimes sub-acute. In the earlier stages it advances rapidly and may threaten life by involvement of the respiratory muscles.

The duration of the disease varies, and it may be fatal in a few days, weeks, or months, or it may produce permanent atrophy. In the early stages the prognosis is bad, but if the morbid process comes to a standstill it is improved. As causes we may reckon chill, over-exertion, acute infectious disorders, diseases of the bones, syphilis. For treatment Leyden recommends, in the first period, salicylate of soda and salicylic acid; Kussmaul found warm baths useful, cold ones are to be avoided; morphia hypodermically and chloroform liniment to combat pain. In the further treatment, perfect rest of the muscles is prescribed with tonic medication and diet. Caution is advised in the use of electricity, as bad results have been reported from the too early employment of the induced current. In conclusion the author recommends warm baths, sulphur baths, etc.

SATURNINE APHASIA.—M. Ernest Gaucher, *La France Médicale*, June 26, reports a case of a man previously healthy and with no constitutional disease, who had followed for a long time the business of a house painter without experiencing any of the effects of lead, but who, being out of business, engaged himself in a white lead manufactory, and was in a very few days seized with lead colic. Recovering from this he returned to work but in two days he suddenly fell unconscious, while at his work. The syncope lasted a quarter of an hour. He was taken to the hospital, and when admitted there the only symptom besides the blue line on the gums and the usual lead constipation, was a persistent severe headache. The special senses were all right, appetite preserved, the urine high colored and scanty, without albumen. Three days later slight head symptoms, delirium and vertigo appeared for a day or so, but left him again with only the persistent cephalalgia. For a week, (Jan. 18 to 25) this condition continued; on the morning of the 25th it was observed that he had vomited during the night, and when questioned he was found completely aphasic, and unable also to write. Intelligence, sensibility, and motility were perfectly preserved, and he made signs to show that his headache still continued. After the visit he fell asleep and on awaking his speech returned, leaving him as he had been in all respects before it was lost.

The author relates this case on account of its comparative rarity; he had not been able to find a similar observation in the literature. As regards its pathogeny, he is inclined to attribute it to the presence of the toxic agent, lead, in the cerebral substance, rather than to any secondary vasomotor disturbance. The transitory character is accounted for by him to the lead not being definitely fixed in the tissues.

SENILE GENERAL PARALYSIS.—Seppilli and Riva report in the *Rivista Sperimentale di Freniatria*, VI., I. and II., a case with very full post-mortem details, and, after a lengthy discussion, close with the following conclusions:

1. Cerebral aneurisms may be the product of endarteritis of the small vessels, and are either true or dissecting, according as they are formed by dilatation of the vascular walls or to an accumulation of blood that works itself into the lymphatic spaces.

2. The presence of these cerebral aneurisms, hyperplasia of the connective tissue of the brain, adipose or pigmentary degeneration of the nerve cells, and diffuse atheroma, may be considered as the most prominent general characters of the senile form of general paralysis.

3. The principal clinical features by which we diagnose the senile form from other forms of general paralysis, are: the atheromatous pulse, the slight intensity of the apoplectic attacks, the little tendency to elevation of temperature and the lack of that periodical elevation due to the aggravation of the meningo-cortical processes, the progressive mental weakness and the vague delirium with aberrations of an affective character without any trace of ambitions of expansive mania.

THE DISORDERS OF HEARING IN HEMORRHAGIC PACHYMENINGITIS.—Moos, *Zeitsch. f. Ohrenheilk.*, IX. p. 97 (abst. in *Deutsche med. Wochensch.*,) reports the microscopic findings in the inner ear in a patient dying in the Marburg insane asylum with cerebral hemorrhagic pachymeningitis. Impairment of hearing was an accompanying feature of each of his paralytic attacks.

Microscopic extravasations of blood were found in various portions of the labyrinth, part showing granular degeneration of blood corpuscles, part passing through pigmentary metamorphosis. The vessels were engorged with blood corpuscles and altered in their walls. Besides these there were visible signs of inflammation, and atrophy and degeneration in the connective tissue and its cell-elements as well as in the epithelium and the nerve element. The author concludes from these facts that the disorders of hearing in cerebral hemorrhagic pachymeningitis are due to extravasations by diapedesis into the labyrinth, accompanying the meningeal hemorrhages, and which may go to the extent of completely suppressing the auditory function. They are accompanied with atrophic and degenerative processes within the labyrinth, involving the auditory nerve and its terminal apparatuses, due largely to the circulatory disturbances in the blood and the consequent nutritive disorders.

INSANITY IN CHILDREN.—Dr. Isaac N. Kerlin, in the *Proceedings of the Association of Medical Officers of American Institutions for Idiotic and Feeble-Minded Persons*, reports briefly four or five cases of juvenile moral insanity, and sums up in the following conclusions:

1st. The affective insanity of children is manifested in paroxysmal passion, destructiveness and incorrigibility, in emotional storms and fantastic willfulness.

2d. Delusions rarely exist, for these doubtless depend upon a prior organization of definite ideas, which being more or less limited in the child's mind, the extent of delusion is likely to be also limited.

3d. The diagnosis in those uncertain cases which border on normal childhood, as in case IV., consists in the unlikeness of the patient in general behavior to the usual standard of childhood. Headache, coated tongue and sick stomach are frequent, as also irregularity of the heart's action and low vital temperature; a singular lustre of the eyes was noticeable in all the cases above enumerated.

To diagnose between idiocy and juvenile insanity is not so difficult: the latter condition is excitable, erratic, intractable, intense; speech, sight and hearing are generally all perfect, which is an exceptional fact in idiocy and imbecility; the moral nature is usually perverted to the last degree in the insane child, while the idiot and the *enfant arriere* are trustful, kind and loving; the insane child is suspicious, secretive, and violent in its likes and dis likes. We should not omit from our investigation a careful inquiry into the antecedents of the child; family history may throw much light upon doubtful features, aiding not only in our diagnosis, but in the prognosis and treatment.

NARCOLEPSY.—Dr. Gelineau, *Gaz. des Hopitaux*, Nos. 79 and 80, describes at length and discusses a case in his practice which, with the exception of one previously reported by MM. Casse and Semelaigne, is new in its manifestations, and seems to be one of a new disease, for which he proposes the name "Narcolepsy" (*ναρκωσις, somnolence*, and *λαμβανειν, to seize*). The patient, otherwise well, and with no history sufficient to satisfactorily account for the condition, had suffered for about two years with sudden attacks of somnolence, coming on without warning and irresistibly at frequent intervals, preceded and followed by no specially abnormal symptom, but apparently answering an actual physical need of frequent healthy sleep. It could be interrupted by pinching or some other excitations, but the gain in wakefulness thus obtained was compensated for by an increased tendency to sleep and a longer continuance of the slumber next time. During the sleep the pulse, which normally was sixty-six to sixty-eight, fell to fifty-eight or sixty, the pulpils, small in the waking state, were slightly dilated, the attacks lasted as a rule from one to five minutes. They occurred every few minutes, and could be brought on by merely closing the eyes, and by any slight fatigue or emotion. The sexual appetite was considerably diminished considering his age—thirty-eight years—but in all other respects his health was excellent; there was no mental impairment whatever.

Dr. Gelineau discusses at length the diagnosis of the case and finds it to not agree with any hitherto described species of disease, certainly not with epilepsy, which was the diagnosis of M. Semelaigne in his case. Its pathology can be only conjectured. Dr. Gelineau is inclined to think that there existed in his patient some special cerebral condition, perhaps a scarcity or spasm of the arterioles, which produced the symptoms, and to locate the trouble in the pons, considered by Vulpian as the centre of association for emotional movements. In his patient, in fact, he believes there was a sort of *sideration* of the pons, causing on the one hand a transitory cerebrospinal paralysis, and on the other a momentary cerebral anæmia which, in turn, produced sleep.

No treatment proved of any lasting benefit. At first, induced by the appearances and the antecedent diagnosis, Dr. Gelineau tried picrotoxine and the bromides, with the effect, if any, of only aggravating the condition. Then he had recourse to nitrite of amyl, which seemed at first to help a little, but soon failed, then apomorphine hypodermically, caffeine, strychnia, all without avail. So far, therefore, there is no known remedy, and the disorder must be put among the neuroses most intractable to medicine.

Unilateral Lesion of the Spinal Cord.—A typical case of lesion of one-half of the cord is reported by Dr. R. Schultz in the *Centralbl. f. Nervenheilk.* (No. 15, 1880.) The interesting physiological deductions to which it leads must, however, be taken with allowance, as the patient is still alive. A laborer, twenty-nine years old, was attacked by some men and badly wounded and bruised. A knife had entered the back but little to the *right* of the median line, between the spinous processes of the fifth and sixth dorsal vertebræ. The wound could be probed to a distance of five centimetres without feeling exposed bone. The attending physician had found at that time anæsthesia of the left leg, with hyperæsthesia and slight paresis of the right leg. There existed, moreover, retention of urine and involuntary defecation. Within three weeks he left the hospital.

Half a year later Dr. Schultz found paresis of the right leg, with frequent tremors of the same, and cutaneous hyperæsthesia of the right leg and right side of the trunk. Numbness was complained of in the left leg. The right lower extremity is of smaller size than the left, but no differences exist in the cutaneous temperature. The muscular sense and the coördination of the right leg are impaired, but no ataxia exists. The skin of the right leg and the right side of the trunk is hyperæsthetic up to the median line, and to a line at the level of the seventh dorsal vertebra. Above it there exists an anæsthetic zone corresponding to the height of the sixth dorsal vertebra. The sensation of tickling is acute on the right side, also the sense of temperature, while the sense of space is augmented, like the sensibility to pain. Faradic and constant currents are felt more acutely on the right side than on the left (up to the level of the wound).

On the left side the sense of touch appears normal, but there exists analgesia, so that deep pricks cause no pain. At the level of the wound there exists a hyperæsthetic zone. The tendon-reflexes are normal on the left side, augmented on the right. No differences could be found in the electric reaction of the muscles between the two sides. The sexual functions, as well as those of the rectum and the urinary organs, were not altered.

The author attempts no further comments, since they must suggest themselves to everybody. He remarks, however, that the hyperæsthesia of the opposite side, is probably analogous to the transfer of sensibility, so much commented upon lately.

Fatal Chorea.—Mr. Octavius Sturges has recently made a study (*Lancet*, July 17, 1880) of some statistics of fatal chorea, and deduces the following conclusions:

1. Chorea, regarded as a disease of itself fatal, belongs almost exclusively to puberty, and especially to female puberty; its immediate exciting cause having distinct reference, in many instances, to conditions of unusual sexual excitement.

2. Besides the operation of sexual causes, mental disturbance has to be reckoned; not fright only, but worry, anxiety, and despondency also, while the force and influence of such impressions is to be seen in the course as well as in the origin of fatal chorea.

3. Acute rheumatism appears as a cause of fatal chorea in but a small pro-

portion of cases; yet the association, infrequent as it is, is distinct and unquestionable.

4. Chorea in its fatal, no less than in its non-fatal forms, shows strong preference for the female sex of all ages. Children, however, very rarely die of it, and boys, practically speaking, never.

5. Mental excitement, in varying degree (although not amongst the symptoms of ordinary chorea), is met with in so large a proportion of its fatal examples that we are justified in regarding this occurrence as of bad augury.

6. "Vegetations," new or old, on the auricular surface of the mitral valves, with or without similar deposits on the aortic valves, and sometimes with pericarditis, are met with in the great majority of cases dying of, or with, or shortly after chorea. This condition, however, does not, as a rule, contribute directly to the fatal issue; it is found equally amongst those that die *with* and those that die *of* chorea. In some of the most marked and typical cases of fatal chorea, the valves of the heart have been found absolutely healthy.

7. There is no other morbid condition except that which concerns the heart, occurring with sufficient frequency or uniformity to be regarded as characteristic of fatal chorea.—*Med. News and Abstract*, Sept., 1880.

EPILEPSY OF TRAUMATIC ORIGIN CURED.—In the *Centralblatt für Nervenheilkunde*, August 1, 1880, we find the following interesting report, abstracted from the Bohemian original by Rotter. A man, forty-five years of age, struck his head against the wall and could not remove it except with considerable force. He felt some pain at the spot, but neither blood nor any wound was seen. For three days some swelling existed, which passed off completely. After some time he found a small wart at the seat of the injury, which, when removed, left a bleeding wound which closed soon. During the next three years he remained perfectly healthy. In October, 1879, he suffered from attacks of rigor of the left arm, lasting some minutes, and occurring three or four times a week. In November he had a sudden attack of vertigo, and spasms of the entire body, in consequence of which he fell to the ground, but without losing consciousness. After three hours, a second, milder attack followed. The next day the patient was seen, with the following result: He is of medium size, feeble constitution, moderately nourished, pale, anxious appearance; he complains of debility, rigidity and dizziness; the eye appears slightly reddened, the pupils are wide and sluggish; p., 70. t., normal. No disturbance of intellect or motility. In the line of the sagittal suture, two and a half centimetres from the coronal suture, there is a shallow depression and adhesion of the scalp to the bone. In the centre of this depression, a small ulcer, covered with flabby granulations, through which the probe can enter one and a half centimetres without touching carious bone. With appropriate treatment the attacks occurred but rarely until the next February, when the patient, in combing himself, extracted a nail from the wound. It was a fragment of a shingle-nail two centimetres long and about two millimetres thick, slightly bent, covered with blood. The wound is of the depth of one and a quarter centimetres; its walls are hard and covered with granulations. After cicatrization the patient remained in perfect health, complaining simply of rigidity of the great toe of the left and little finger of the right side.

Bilateral Sclerosis of the Cord after Unilateral Lesion of the Brain.—A. Pitres describes, *Journ. de Méd. de Bordeaux*, Aug. 8, the case of a woman seventy-one years of age, who suffered from complete left hemiplegia of long standing, with contracture of the left arm and both legs. After her death, which occurred from pneumonia, the autopsy revealed no lesion in the left hemisphere, in the right a small patch of softening in the anterior portion of the caudate nucleus, a sub-ependymal depression under the median portion of the thalamus, and an old *foyer* extending from the lenticular to the caudate nucleus through the internal capsule. There were also slight inequalities in the pons and medulla. The medulla and cord after hardening in bichromate of ammonia solution were examined and there was found a sclerosis of both lateral columns of the cord throughout its whole extent, and of the column of Türck on the right side. The sclerosis extended upward to the crossing of both pyramids in the medulla, above that point it was limited to the right side. The sclerosis of the column of Türck was very well defined, and, contrary to the usual rule in descending spinal degenerations, it extended below the dorsal region, being as prominent in the lumbar enlargement as above. The corresponding column on the left presented only a slight thickening of the connective tissue on its internal border; the other portions of the cord and medulla were healthy.

M. Pitres concludes from these facts that an injury of merely one hemisphere may be followed by bilateral secondary sclerosis of the cord. He will discuss the complex questions incited by this case more fully in a future memoir.

Paralysis Agitans.—At the session of the Societe de Biologie, July 3 (rep. in *Gaz. des Hopitaux*, No. 78), M. Luys exhibited two plates, one representing the cells of the pons in their normal condition, and the other the same in a subject who died with the symptoms of paralysis agitans. These latter are notably hypertrophied. While in their normal state they measure from 20-25 m. in diameter, the ones shown were from 40-45 m., that is to say, double the usual proportions.

This fact, not hitherto observed, seems destined to offer a rational and physiological interpretation for the dynamic troubles of paralysis agitans. We have, in fact, in this disease a true functional hyperexcitation, which has become unmanageable, of the excito-motor regions of the spinal axis, produced by surcharge of nervous influence. The concomitant hypertrophy of the generating mechanism of this influence seems to indicate a natural relation between the disorder of the apparatus and the functional trouble, the hypertrophy being, after a fashion, the semeiological index of the phase of motor excitation to which the nerve element is subjected during life.

Hydrophobia.—The *Philadelphia Medical Times* of July 31st, contains the reports of two cases of hydrophobia by Drs. James Collins and C. K. Mills, with the microscopic examination by Dr. Carl Seiler, which were read before the Phil. Co. Med. Society, May 25th. The same number contains the report of a rather interesting discussion of this paper that took place at a subsequent meeting of the society on the 9th of June last. The remarks of Dr. Mills on the two cases reported, expressed the following views of the disease. He rejected the theory that it is a specific blood disease, considering it to be rather a primary nervous affection, a sort of reflex neurosis, a peripheral irritation being conveyed by afferent fibres to cerebral and spinal centres, and the excitation of these latter producing the symptoms. In support of this view he adduced the fact that the disease has followed the bites of animals not rabid, the great variations in the symptoms of different cases, the resemblances to tetanus, the fact that in the two cases reported the *post-mortem* microscopic examination showed that the central nervous organs and the blood-vessels had long been in an unhealthy condition, preparing it for the trouble set up by the bite. The lesions found in the floor of the fourth ventricle were noteworthy as corresponding to those found in other convulsive diseases: congested and hemorrhagic areas situated a little above the acoustic striæ with other scattered vascular points, sometimes corresponding in their situation with nuclei of certain cranial nerves. In short, he denied that it (hydrophobia) was due to a special morbid virus, that it was accompanied with any specific changes in the blood, and that it had any specially characteristic lesion of the nervous system. He regarded it as a reflex from peripheral irritation and claimed that many cases resulted from fear or imagination.

The discussion was opened by Dr. Mills giving an abstract of his paper with the above views, and amongst others the following speakers took part. Dr. C. B. Nancrede remarked that he could not accept the theory that there was no specific virus of hydrophobia. It was true that many persons are bitten who do not get the disease, but all persons are not equally susceptible, the dogs that do the biting are not always mad, but may be merely suffering from tapeworm, the inoculation is not always perfect if the dog is rabid, the virus may be wiped off the teeth by clothing. The idea that dogs not rabid could communicate the disease was an error caused by the fact that it has a very long period of incubation during all of which the bite may be poisonous. There is no peripheral irritation to speak of in wounds from mad dog bites, they heal readily and it is difficult to keep them open. Cauterization increased the chances for peripheral irritation while it decreased the liability to the disease. It is not possible to attribute it always to fear or imagination since nine per cent. of three hundred and nineteen collected cases were in children too young for this to have any effect. It is not necessary to draw any conclusion against the specific virus of hydrophobia from the fact that other diseases have similar symptoms, since the symptoms depend upon the special nerve centres affected, and the disorders of these may have other and obvious causes. Hydrophobia is not alone in having a long period of incubation, the virus of syphilis also requires a variable period to produce its effects.

Dr. Richard A. Cleeman said it was impossible to determine whether the lesions found after death were primary effects of the poison or secondary ones due to the convulsions. Nor can we at present declare the path taken by the poison. One thing in favor of the theory of a specific virus is the fact that where the bite is through the clothing there is much less danger of the disease, while at the same time the dog's teeth are more apt to make a jagged wound. Nor can we always suppose fright, for in a case seen by him with Dr. Nancrede the wound had caused no alarm in the little patient or his mother. There is undoubtedly in hydrophobia extreme reflex excitability.

Dr. J. B. Roberts had seen two fatal cases of hydrophobia in which there was no history of dog bite.

Dr. Packard desired to call attention to two or three points which, it seemed to him, had not been enough dwelt upon, if at all, in the discussion.

1. He would ask whether these were not established facts: that a certain chain of symptoms, of which Dr. Collins' case afforded a good illustration, and which constituted the disease known as "hydrophobia," was in many cases clearly traceable to the bite of a dog; that such dog was always affected with "rabies canina;" that such disease was always markedly distinct from tetanus or any other form of nervous disorder; and that not one case of recovery, after the development of the symptoms of hydrophobia was on record.

2. Many of the cases of this particular disease have occurred in children who had never heard of hydrophobia, and in persons who had totally forgotten the fact that they had been bitten; some of them in persons who did not believe there was any such disease as hydrophobia. If it were a purely nervous affection it might occur from fright; but no such instance is known.

3. Facts upon record show that this disease is much less apt to follow bites inflicted upon portions of the skin protected by clothing, in which the teeth of the animal would be more or less wiped clean before puncturing the skin; and this as well as some of the other features of the disorder, was in favor of the theory of a specific virus.

4. It is not possible to draw any analogy between this disease and the effects, for example, of rattlesnake bites, since in the latter case the symptoms come on immediately, without the period of incubation always observed between the bite of the dog and the development of hydrophobia. Then the rattlesnake is provided with a special apparatus—a duct leading from the poison gland to the tip, or near the tip of the fang, and the gland or sack being compressed by the muscles closing the jaws so as, in the act of biting to effect a hypodermic injection, as it were, of the venom.

Dr. W. R. D. Blackwood recognized a distinct difference between hydrophobia and tetanus. He mentioned the case of a man whose hand, without being bitten had been covered with the saliva of a rabid dog, and who died of hydrophobia. In this case there was neither wound nor peripheral irritation, but there must have been absorption of a virus. In another case a dog, a woman and another dog were bitten by a rabid animal in rapid succession. The woman's wound was cauterized with nitric acid and she escaped the disease, while both dogs became mad.

Dr. W. W. Welch also related a case where hydrophobia was caused by a pet dog licking the face; there was no wound, but merely absorption from a broad surface.

Dr. Frank Woodbury said that since hydrophobia is known to arise spontaneously in dogs, it is possible that it may also originate spontaneously in man. This is the only explanation of those cases in which true hydrophobia appears without proof of inoculation, unless we are prepared to believe that the evidence is always defective.

In closing the debate, Dr. Mills maintained his former position that all the facts of hydrophobia could be accounted for by the view that the symptoms manifested were the result of peripheral nerve irritation, of localized cerebral or spinal disease, or of psychical conditions. He could not say why peripheral irritation produced hydrophobia in one case and not in another, but the same was the case with tetanus and epilepsy. The fact that the bites of healthy dogs occasionally produced the disorder was against the theory of a specific virus. To say that these dogs were in the incubation stage was a mere assertion, wanting proof. As regards the amount of peripheral irritation required, he held that a large wound or one cauterized was less likely to produce tetanus, epilepsy or hydrophobia than a small one. Peripheral irritation of the fifth nerve was especially likely to cause trouble, hence the special liability of wounds in the face to be followed by these accidents. The fact that hydrophobic symptoms so often followed dog bites in children, he attributed to the greater impressionability of the nervous centres in the young than in adults. The same symptoms might and did occur undoubtedly in other diseases than those following bites, and this more commonly than was generally supposed. He did not credit very fully the statements as to retro-inoculation from men to animals.

We have given an abstract of the more important points in the above discussion as much to show the kinds of views held as for any other reason. It seems reasonable to hold the view that hydrophobia is a distinct disease due to a special virus, which may be at some future time detected, though if it is not it will not be singular in this respect, since the infections of other well recognized disorders have not yet been isolated and may never be. It is rather remarkable that none of the speakers used the fact that there is no necessary confusion between rabies and tetanus in the lower animals. The other fact recently re-demonstrated by Raynaud that the human saliva is capable of producing the disease in other mammalia, though discredited by Dr. Mills, seems reasonably well established. If hydrophobia was confined to adults of the human species, we might infer a psychic irritation, as, indeed, is often the case, but there is no good reason to think that this is the rule. The discussion is interesting but does not by any means exhaust the subject or indicate very correct views on the part of several of the speakers.

Hysteria in Children.—Dr. H. Schmidt, of Bremen, has studied this subject, and finds that the disease though rare undoubtedly occurs in children. Four cases were observed by the author in Strasburg, and from his experience with them, in addition to the information gained from an examination of the literature of the subject, he draws the following inferences: I, cases of marked hysteria occur in children of both sexes; 2, hysteria, however, is a rare disease in the earlier years of life; 3, the "basis" of hysteria may be either anæmia or chlorosis, or acquired "nervousness;" 4, mild cases are amenable to treatment by a merely psychical regimen. The main therapeutical indication usually consists in the improvement of a vitiated constitution.—*Jahrb. d. Kinderheilkunde*, April 5, 1880—*N. Y. Med. Record*, Sept. 11, 1880.

Muscular Atrophy in Pott's Disease.—MM. Proust and Ballet in a joint paper in the *Revue Mensuelle* for June, give the history and post-mortem findings, both gross and microscopic, of a case of Pott's Disease, involving the cervical and upper dorsal regions, characterized clinically by absence of paraplegia, and atrophy of the interossei and thenar eminences on both sides, and pathologically by sclerosis of the internal radicular zones and of the direct cerebellar tracts, atrophy of the anterior cornua with degeneration of the corresponding anterior roots and nerves, all in the inferior cervical region of the cord. The other portions of the cord and its membranes were healthy, but at this point there were found the lesions described by Michaud as external caseous pachymeningitis, especially anteriorly. The pathogeny of these alterations is discussed at some length. The atrophy of the muscles though rare in this disease agrees with the pathological findings, the atrophy of the cells of the anterior horns, which, indeed, was diagnosed during life.

The sclerosis of the direct cerebellar tracts was rather irregular as is usually the case in such degeneration from compression of the cord. This was not the case with the other local alterations, which the authors account for as follows: The posterior roots, compressed by the neoplasm of the pachymeningitis, are irritated, and this irritation is propagated as far as to the columns of Burdach through the internal radicular zones, where it becomes the provoking cause of a peri-radicular inflammation, terminating in the formation of the posterior tracts of sclerosis found at the autopsy. Next this sclerosis of the posterior column advanced to the grey horns, causing atrophy of their nerve cells, and finally the degeneration of the anterior roots, which, in turn, was followed by the muscular atrophy. The whole process was therefore an ascending degeneration,—a sort of ascending neuritis. Whether this is the correct explanation or not—and they consider it as altogether the most plausible one,—the connection of the symptoms and the pathological lesions is worthy of notice.

At the last meeting of the British Medical Association, held in Cambridge August 10th to 13th inclusive, and reported in the *British Medical Journal*, August 28th and Sept. 4th, the following papers were read:

Unilateral Convulsions due to Brain Disease.—By C. E. Brown-Séquard, M.D., F.R.S. (Paris).—An analysis of more than 500 cases has led to the following conclusions as regards unilateral convulsions due to brain disease: 1. These convulsions can be caused by a lesion in almost any part of the brain. 2. They can be produced by any kind of lesion. 3. They can be associated with any other symptom of brain disease, or may be, for a time or till death, the only symptom existing. 4. They can appear at once in all parts of one side of the body, or begin in any muscle or groups of muscles (eye, face, neck, trunk, or limbs). 5. They can pass into general convulsions or follow such convulsions. 6. They usually last longer than general convulsions due also to brain disease, and still longer than genuine idiopathic epileptic convulsions. 7. They often appear without consciousness, either at their beginning or at any time of an attack. 8. They can take place either on the side of the brain-lesion which causes them, or on the opposite side, the cross convulsions being more frequent than the direct ones. 9. The right limbs are attacked more frequently than the left in cases of direct or of cross convulsions, and also when unilateral convulsions appear in cases of lesion in the two cerebral or cerebellar hemispheres. 10. In the same individual and from a single lesion unilateral convulsions can appear at first on the side of the lesion, and then on the opposite side, or *vice versa.* 11. These convulsions can appear on the side of hemiplegia or on the opposite side, the paralysis, in either case, being a cross one; but they can also be direct when the paralysis is also direct, and cross while the paralysis is direct. 12. Direct unilateral convulsions are more frequently produced than cross ones by lesion of the great cerebral ganglia, the crura cerebri, the cerebellum, the pons varolii, the medulla oblongata; while, on the contrary, cross convulsions are much more frequently than direct ones caused by lesion of the centrum ovale or the convolutions. 13. In animals, as he had found, an irritation of the base of the brain, and even of the motor part of the crura, the pons, and the medulla (the anterior pyramid) generally produces muscular contractions on the corresponding side; while irritation of the so-called motor centres, or of the fibres uniting these parts with the cerebral ganglia, usually produces movements on the opposite side, so that the same general effects are generated in animals as in man. 14. Jacksonian convulsions (either when exclusively and persistently unilateral or only temporarily so) can appear on the side of the lesion, or from lesions in parts of the brain considered as not belonging to the motor apparatus. 15. The study of unilateral convulsions brings forth a large number of facts altogether in opposition to the views now held about cerebral localization. 16. The diagnostic significance of unilateral convulsions is often considerable, owing to the association of this symptom with other cerebral morbid manifestations.

On Transfer-Phenomena in Epilepsy Produced by Encircling Blisters.—By Thomas Buzzard, M.D., F.R.C.P. (London).—The author referred to some remarkable results, published by him in the *Practitioner* for October, 1868, which followed in four cases the application of an encircling blister to a limb which was the seat of a marked epileptic aura. In one, a tickling in the left arm had always preceded the fit. After the application of a blister encircling this limb the tickling was transferred to the left leg. In another, characterized by a similar aura, the fits, as well as the tickling, ceased after the application of an encircling blister. In a third, the sense of numbness in the left wrist was transferred to the right wrist. A fourth patient was a woman, whose fits had always been preceded by cramp in the right hand, and who, after the blister, was affected with cramp in both hands before her fits. In one of these cases a subsequent necropsy showed cerebral tumor. Dr. Buzzard had recently applied encircling blisters to some other cases with the following results: In a patient whose fits had always been preceded by cramp in the left foot and shaking, with numbness of the left leg, an encircling blister was applied to this limb, and it was the right leg which now shook and was numb. In another, tingling in the left arm was the symptom, and, after blistering, there was jerking of both arms and the left leg. In a third, the attacks were preceded by cramps of the left hand. The patient had had a severe fit two days before observation, and the left hand was quite powerless. An encircling blister was applied to the left forearm. Next day the left hand had quite regained its power, but the patient complained that the right hand had *ipso facto* become weak. The dynamometer showed 40° as the grasp of the left hand, and only 18° with the right. The author's original observations had been recorded many years before those experiments had been performed in France, in which the removal of anæsthesia from one-half of the body was found to be accompanied by its transfer to the other side. He urged that the phenomena pointed to a power of influencing the nervous centres by impressions upon the skin; and referred to other trials of a therapeutic character which he was basing upon these observations. His aim was, in a case of aphasia, to rouse into activity the posterior portion of the frontal convolution of the *right* hemisphere, by directing powerful impressions to contiguous grey matter, by means of painful electrical currents to the tongue and mouth, besides other sources of irritation to the left arm. He had nothing as yet important to record in this direction.

On Paralytic Chorea.—By W. R. Gowers, M.D., F.R.C.P. (London). The object of the paper was to direct attention to a variety of chorea which sometimes presented a difficulty in diagnosis. Three symptoms might ordinarily be recognized in chorea: spontaneous movements, incoördination of voluntary movement, and muscular weakness. These were not always proportioned. Any one of them might so predominate as to give a special character to the case. In the form now considered, the last-named element (muscular weakness) predominated, and appeared at first sight to be the only symptom. A series of illustrated cases were narrated. The arm was always the part affected, and the muscular weakness, which alone was noticed by the friends, and sometimes by the medical attendant, might be very great and real. In some cases, however, the natural weakness might be less than the loss of use would suggest. There was no weakness of face, tongue, or leg. Close observation would, after a time, usually detect a slight occasional choreiform twitch, but this might be quite absent. There might be marked twitching in the other arm, which was not weak. The affection might pass off without more conspicuous spasm. Sometimes, choreiform movements became more marked as power increased. The course of this form was often tedious, but did not pass into severe general chorea. The variety was brought under the notice of the section chiefly on account of the diagnosis; since, in several cases which had come under the author's notice, the nature of the affection had been misconceived. In his experience, whenever a child, between the ages of seven and fifteen, presented gradual loss of power in one arm, without affection of the face, tongue, or leg, the disease was always chorea. Even although choreiform movements might not be observed, the subsequent progress of the case would always justify the diagnosis. The paper concluded with some remarks on the possible relation of the change in the nerve-elements in this form to that which underlay ordinary chorea.

Affections of Vision from Cerebral Disease. By David Ferrier, M. D., F. R. S. (London).—Dr. Ferrier reviewed, in connection with recent investigations made by himself and his colleague Professor Gerald Yeo—a full report of which was laid before the Physiological Section—the various theories respecting the relations of the cerebral hemispheres to vision, and the clinical facts relating to crossed and hemiopic visual defects. The clinical evidence pointing to the localization of a distinct visual centre was considered, but it was stated that at present this alone could not be regarded as by itself sufficient. The visual centre in the monkey included not only the angular gyrus but the occipital lobe; for, though the occipital lobes might be removed almost entirely without loss of vision, yet, in order to cause complete and permanent blindness, it was necessary that the angular gyri and occipital lobes should be destroyed on both sides. A portion only of one visual centre would in time suffice for vision with both eyes. Hence extensive lesions might be found in the visual centres without obvious visual defect, without thereby disproving the existence of a visual centre. From Dr. Yeo's and his recent investigations, it would appear that the hemispheres had a double relation with the eyes. The connection of the angular gyri was mainly crossed. Hence lesions here, and in the corresponding medullary fibres, caused crossed amaurosis in amblyopia. Here the facts of cerebral hemianæsthesia were passed in review, and Charcot's views and scheme of the optic tracts discussed. Perimeters of cases under the author's own care were shown, and the crossed amblyopia which they demonstrated was explained in connection with the experimental results. Where there was an unilateral lesion of the angular gyrus and occipital lobe together, but not of each singly, hemiopia occurred and lasted for some time in the monkey, but not permanently. In connection with this fact, the lesions causing hemiopia were described, and the clinical cases which had been recently placed on record were analyzed. Taken by themselves, the clinical facts were not as yet sufficiently definite to establish any causal relationship between cortical lesions as such and hemiopia; but taken in relation with the experimental data, the fact of hemiopia from cortical, or rather sub-cortical, lesions in the occipital region could be satisfactorily accounted for by destruction of the medullary fibres radiating into the angular gyrus and occipital lobe, not the occipital lobe only. The occipital lobe in clinical records was a term too often vague and wanting in precision. Some considerations were advanced on the diagnosis between hemiopia from direct lesions of the optic tract and cerebral hemiopia; and the signs and duration of the affection in each case were discussed. A perimeter was shown of a case under the author's care, where there seemed to be a progressive restoration from a condition of hemiopia due to a cerebral lesion.

The facts of experiment on monkeys showed that recovery took place, and, therefore, it might be expected in man, even though it were more slow and less perfect. This referred only to truly cerebral hemiopia, and not to hemiopia depending, as it did frequently, on lesions of the corpora geniculata or optic tract.

STERTOROUS BREATHING IN APOPLEXY, AND THE MANAGEMENT OF THE APOPLECTIC STATE. By R. L. Bowles, M. D. (Folkestone). — After pointing out that stertor had been considered only as a symptom of the apoplectic state, Dr. Bowles proceeded to demonstrate that it really was as much a condition of slow suffocation in the pharynx as croup was in the larynx, and that its results were equally disastrous; but happily the pharyngeal form of suffocation, or stertor, could be readily removed without any operation, by merely arranging the position of the patient so as to do away with the gravitation of the tongue, or mucus, or fluid into the back of the pharynx. It was then pointed out how the removal of this condition of suffocation in a case of apoplexy changed its aspect and affected its treatment, pathology, and final results; and typical cases were related illustrating these assertions as well as many important practical points in the management of a severe case of apoplexy. Various kinds of apoplexy were defined and explained by Dr. Bowles, and for convenience named as follows: nasal, buccal palatine, pharyngeal, laryngeal, and mucous; all of these caused more or less obstruction to respiration, which obstruction could and must in every case be removed. The paper concluded by specifying many diseases as well as apoplexy, in which these principles had been applied, and showing that in many of them recovery had ensued, which otherwise appeared impossible.

SYPHILITIC INSANITY. By C. R. Drysdale, M. D. (London).—Dr. Drysdale contended that syphilis was a cause occasionally, although very rarely, of mania, melancholia, and dementia; but not, so far as he could judge, of the well-marked form of paralysis of the insane. Some writers on syphilis, among others, Dr. Lewin of Berlin, seemed to allege that syphilis never caused insanity, while some German authors gave syphilis too large a part in the causation of mental disease. With regard to the idea that it never gave rise to insanity, the same allegation had been made by eminent writers, not thirty years ago, concerning cerebral syphilis. Disease of the brain and spinal cord was now universally admitted to be sometimes due to the virus, and therefore there seemed no great difficulty in believing that one of the functions of the brain, intelligence, should be sometimes perverted by syphilitic disease of the organ. In the great majority, indeed, of cases where syphilis attacked the brain, it also injured the intellect more or less. Sometimes loss of intelligence was one of the first symptoms. There were three divisions into which the syphilitic intellectual lesions fell: depression, mania, and dementia. Many persons doubtless would admit that cerebral syphilis caused depression of spirits going on to dementia. Dr. Drysdale said he had seen several well-marked cases of that form. One gentleman contracted syphilis in 1869, then had iritis, eruptions, ataxia, epilepsy, and finally became demented, and died in an epileptic fit. In another case, a man who had been temperate, contracted syphilis, had ptosis, then fell into melancholia, and died in a lunatic asylum. Suicidal cases were sometimes clearly syphilitic in causation. In the delirium caused by the brain-affection, they would throw themselves out of the window, etc. Acute mania occasionally occurred in the eruptive stage of syphilis. Dr. Drysdale narrated a case, where the patient had roseola, and became so violent that he was taken into a lunatic asylum and fed with a stomach pump. Specific treatment soon made him recover. In another case, there were diplopia and ptosis; the patient became furious; iodide of potassium in large doses cured him. The diagnosis of syphilitic insanity was often most obscure. If squinting, ptosis, or paralysis of the motori oculorum were present, of course it was not so difficult to pronounce; but not infrequently no such symptoms were present. In such cases, it would be well to find out, if possible, the most intimate friends of the patient, and try to make out whether syphilis had existed. The possibility of a given case of mania or imbecility being syphilitic should be borne in mind, and treatment cautiously essayed. General paralysis of the insane had very marked characters. In the male sex it rarely occurred before the age of 35, and was almost confined to the middle classes, whilst, when it was occasionally met with in women, it only attacked poor women. Syphilis had no such selection of age or sex. On opening the cranium of a patient with cerebral syphilis, one never found that generalized meningitis seen invariably in general paralysis of the insane. Cerebral syphilis presented partial lesions. Again, in general paralysis, the brain-affection was confined to the meninges. In syphilis all parts were affected: brain, skull, and vessels. Lastly, when general paralysis existed, all treatment was out of the question. Syphilis was sometimes very amenable to specific treatment.

THE following are the titles of a few of the recently published articles on the Pathology of the Mind and Nervous System:

FOLSOM, The Classification of Mental Diseases, *Boston Med. and Surgical Journal*, July 22.—GOLDSBERRY, Hysteria, *Med. Jour. and Exam.*, July.—JEHN, On Acute (Transitory) Mania and Acute Maniacal Delirium, *Deutsche med. Wochensch.*, No. 27.—HUGHES, The Medico-Legal Aspect of Cerebral Localization and Aphasia, *Alienist and Neurologist*, July.—KING, Case of Morbid Juvenile Pyrophobia caused by Malarial Toxæmia, *Ibid.*—SAVAGE, Hints on Nervous Exhaustion (Neurasthenia), *Lancet and Clinic*, Aug. 21.—SULLIVAN, Death by Lightning, *Boston Med. and Surg. Jour.*, Aug. 19.—DEBOVE, Note on the Attacks of Asystolie in the Course of Exophthalmic Goitre, *L'Union Médicale*, 24, June.—POOLE, A New Aspect of Facial Paralysis, *N. Y. Med. Record*, Aug. 28.—HAZARD, Consciousness in Epilepsy, *St. Louis Clinical Record*, Aug.—PITRES, New Facts Relative to the Study of Cerebral Localizations, *Le Progrès Médicale*, Aug. 7.—OGLESBY, Nystagmus, *Brain*, July.—HUGHLINGS-JACKSON, On Right or Left-Sided Spasm at the Onset of Epileptic Paroxysms, *Ibid.*—WHITTAKER, Writers' Cramp, *Detroit Lancet*, Sept.—BUCKHAM, Insanity, *Ibid.*—SABINE, The Medico-Legal Relations of Alcoholism: Its Pathological Aspects, *Boston Med. and Surg. Jour.*, Sept. 2.—REED, Diphtheria and the Resulting Paralysis, *Boston Med. and Surg. Journal*, Aug. 12.

c.—THERAPEUTICS OF THE NERVOUS SYSTEM AND MIND.

THE TREATMENT OF EPILEPSY.—The following are the closing paragraphs of a clinical lecture, by Dr. E. C. Seguin, in the *Philadelphia Med. Times*, June 5, 1880:

"The remainder of my hour I shall devote to an exposition of the treatment to which I usually resort in epilepsy. It is in general a routine treatment, and yet it is also as rational as I can make it. In the first place I use only one formula, in order that I may keep an exact record of the quantity of the bromides that is taken in each case that comes under my care. This gives me a standard for all, and enables me to compare readily the quantity of bromides taken by different patients. My first solution is the following:

℞	Ammonii Bromidi, - - - - - - - -	℥ ss
	Potassii Bromidi, - - - - - - - -	℥ i.
	Aquæ, - - - - - - - - - -	f. ℥ vii. M.

"The result of my experience shows that simple water is best for our bromide solutions. I never employ any elixirs or syrups, for patients soon tire of them, and as a rule, greatly prefer the saltish taste to salt mixed with sweet. In my second solution I substitute bromide of sodium for bromide of potassium, as it seems to suit some patients better than the latter. In my third solution, which I have used during the past two years only, I substitute chloral for bromide of ammonium in the above, and this prescription I find is excellent for a certain class of cases. Allowing seven teaspoonfuls to the ounce, it is seen that in the first mixture, one teaspoonful contains ten grains of bromide of potassium and five grains of bromide of ammonium; in the second, ten grains of bromide of sodium and five grains of bromide of ammonium; and in the third ten grains of bromide of potassium or sodium and five grains of chloral: that is, in every instance, one teaspoonful of the mixture contains fifteen grains of "anti-epileptic." It is generally necessary to produce mild bromism; but severe bromism is very injurious. It is always a delicate matter to steer between the two extremes of too little and too much bromide, and it ordinarily takes me from one to three months to fix upon the proper dose in any given case. Hence I invariably refuse to treat out-of-town patients for epilepsy unless they consent to remain in New York for at least a month after the treatment has commenced. You will find the most marked difference in individuals in regard to the toleration of the bromides. Thus, in a lady whose case I now recall, thirty grains a day produced a most profound effect; while, on the other hand, I have known a baby, only a few months old, to take seventy grains a day and yet exhibit no signs of bromism. At present there is a gentleman under my care who is taking one hundred and sixty grains of bromides in the twenty-four hours without the slightest inconvenience. In order to determine the effect of the bromides, we must observe (1) whether the intellectual faculties show a tendency to become sluggish and dull, and (2) whether the muscles have lost tone, which produces a change in the physiognomy. A delicate test of bromism is that discovered by Voisin, viz., the irritation of the fauces and soft palate with a spatula or brush, as the disappearance of this reflex is a very constant sign of bromism. It should never be omitted. Voisin claimed that when this point was reached we need go no farther; and this is a good general rule, though it has its exceptions. In some cases the attacks return from time to time, notwithstanding this evidence of bromism.

"The eruption of acne is looked upon by the patient and friends as a very important sign of bromism, but not by the physician. It is really due to some peculiarity of the individual when it occurs, and varies greatly in severity and location in different patients. The shoulders, neck, and face are the regions that are most apt to be affected. In some cases the acne becomes troublesome long before doses sufficiently large to control the epilepsy are reached; but the gentleman who is taking one hundred and sixty grains of bromides a day, scarcely suffers at all from it. More serious effects of bromism are those such as paresis and impairment of intellect; but it is never necessary to push the remedies to this excess, and when such results are seen, it is generally in cases where the patients have gone on taking large quantities of bromides after they have given up medical advice. It is very seldom, however, that morbid bromism is produced in the treatment of epilepsy, if proper caution is observed.

"The time that it is necessary to keep up the use of drugs is a subject that is still under discussion. Some authorities are content with one year; but I confess that my experience has led me to be rather an extremist in the other direction, so that I now hold that the patient should not give up their use until he has been three years without, not a fit, but any epileptiform manifestation whatever, however slight. I am supported in this regard by Brown-Séquard and Voisin, who place the limit at from three to five years. I have seen cases where the patients have left off taking the medicine at the end of two years and then had a return of the trouble. You will often be importuned by the patient and his friends to allow him to give up; but you must be firm in insisting upon the continuance of the course of treatment. It is very seldom, however, that we can prevail upon patients to keep it up for three years after the attacks have entirely ceased; but when the latter have returned they are apt to come back to us in great penitence.

"The time in the day for the administration of the bromides is a most important factor in success in treatmant. For a time I followed Brown-Séquard in his practice of giving the greater part of the necessary quantity at bed-time, on account of the fact that in the immense majority of instances the attacks occurred between bed-time and 8 or 9 a.m. Of late, however, it has been found of advantage to modify this rule, and my plan is now to give the greatest amount just before the time that the attacks are wont to occur, whenever that may be. In the case now before us we can go upon Brown-Séquard's old rule; and I propose, indeed, to order only one dose of the bromide mixture in the twenty-four hours, for the reason that the patient never has any fits now except early in the morning. At first he should take two teaspoonsful at bed-time, and the dose should then be gradually increased until a small amount of bromism is produced. It is best to give it on an empty stomach, and I think we are much less likely to have acne producd if we use alkaline instead of simple water for our mixture. Hence I employ Vichy with those who can afford it, and a solution of bi-carbonate of sodium among the poor.

"In conclusion I will mention the manner of giving the bromides in different cases, it being understood that the patient in each instance is an adult:

1. "When the attacks occur at night or early in the morning, we might give one teaspoonful of the mixture before each meal, and then at bed-time.

2. "When the attacks vary as to time, we might give two teaspoonsful in the morning, one before supper, and two or three at bed-time.

3. "When the attacks are more liable to occur in the day-time, we might give three or four teaspoonsful in the morning, one before supper, and two or three at bed-time.

4. "In the nocturnal form we would give three or four teaspoonsful at one dose, either at bed-time or early in the evening. The gentleman who is using one hundred and sixty grains of bromides a day takes six teaspoonsful in the morning and five at night."

MENTHOL.—In the *Edinburgh Medical Journal* for August, Dr. A. D. Macdonald calls attention to the antiseptic and antineuralgic action of menthol, the crystalline solid obtained from oil of peppermint, the pain-obtunding properties of which are well known. Dr. Macdonald claims priority, however, in demonstrating that this property of the oil is due to this crystalline principle. He employs it in the following combination: Menthol, one grain; clove oil, ten minims; and rectified spirit, fifty minims. This applied locally has given relief in his practice, to neuralgias, toothache, and sciatica. He does not claim that its effects are more than temporary, but that it will afford relief until constitutional remedies have had time to take effect, and that in some cases it is better than any other local applications. The principal objections to its use are its price, its insolubility in water, and its odor, which is disagreeable to some persons. The first of these is valid against its very extensive use as an antiseptic where large quantities are required, but hardly applies against its use in neuralgia, where the reverse is the case. The second may be obviated by using spirits as a solvent with some combination such as given above, and the odor may be masked by any kind of perfume agreeable to the patient.

COFFEE AND TEA.—Dr. A. B. Prescott, Professor of Organic and Applied Chemistry in the University of Michigan, gives in the *Physician and Surgeon* for August, a comparison of the physiological effects of coffee and tea, as shown by the best and latest researches, some of the latest having been made under his supervision at the laboratory of the University.

The conflict of authorities in regard to the action of these two beverages is well shown by the extracts given by the author in this paper, and it is especially unfortunate when we consider how often the choice is practically presented to the individual. Dr. Prescott aims to show the difference between a medium cup of coffee and an average cup of tea, so that one may make his choice intelligently. He says the effects must be mainly due to the properties and proportions of their constituents; namely, alkaloids, tannin, volatile oils, and nutritive substances.

As regards the alkaloids of tea and coffee, there is but little reason to doubt their physiological identity, though some have said that caffeine is the stronger of the two. The question, therefore, is as to the quantity in either drink. A pound of tea probably contains at least three times as much of the alkaloid as an equal weight of coffee, but since a pound of tea furnishes four or five times as great a quantity of beverage as a pound of roasted coffee, it is fair to presume that the effects of the alkaloid in the latter are greater. Our author is inclined to consider this difference as slight, but from his own statements and figures it seems to us he underrates it. Tea contains a much larger quantity of tannin than coffee, but only a small portion is extracted in the preparation of a palatable drink. The essential oil of tea, to which it probably owes it flavor, is conjectured to be an organic stimulant. That of coffee, developed by roasting, may perhaps have some part in producing the digestive disturbances sometimes caused by coffee. These, however, Dr. Prescott thinks are more likely to be due to the nutrient substances contained in it when modified by roasting. He says, "The caffeine of both these beverages undoubtedly produces injury to the nervous system in many cases; but when the coffee causes palpitations, sleeplessness, etc., *not resulting from tea*, let me suggest that some attention be directed to the digestive organs." This may be correct, but the immediate effects of coffee in many cases bear out the theory that it contains a greater quantity of alkaloid than tea, and that it is a more direct and quicker stimulant and disturber of the nervous system.

The Æsthesiogenic Properties of Wood by External Application.—M. Dujardin-Beaumetz, *Bull. Gen. de Thérap.*, August 15th, has been experimenting with the external application of various kinds of woods to affect sensibility on four hysterical females in his service at the Hospital St. Antoine, Paris. He found that the yellow quinine bark was most efficacious, and then followed in order arbor vitæ, rosewood, mahogany, pitch pine, walnut, maple, and apple, while ebony, ash, poplar, and sycamore were without effect. It is a question in our minds whether he might not have found this order greatly modified in other cases. It will perhaps be remembered by our readers that somewhat similar experiments, by Dr. Hammond, showed that horn buttons and other similar substances also possessed æsthesiogenic properties in hysterical subjects. The conclusions he deduced from the facts were not favorable to any belief in any real property of these substances producing the effects, apart from the mental condition of the patient, which we know is extremely potent in hysteria.

Metallotherapy.—M. J. Garel, *Revue Mensuelle*, June, reports a case of a man fifty-four years old, suffering from a combination of symptoms, connected apparently with cardiac disorder, angina pectoris, vertigo, contractures, epistaxis, etc., with varying areas of anæsthesia, treated by the application of metals, and especially with gold internally. The treatment is related in minute detail, and the writer ends his paper with the following conclusions:

1. Gold, and probably other metals, given in its native state internally, act, as on the skin, by simple contact. It is a phenomenon probably electric in its nature, and in our opinion has probably nothing in common with the physiological effects of a corresponding chemical compound.

2. The simultaneous internal administration of an active and inactive metal does not permit the return of sensibility; for, the same as on the external skin (according to a law already known), the sensibility recalled by an active metal disappears when over this is placed a plate of an inactive one.

Cocculus Indicus in Epilepsy.—M. Hambursin, of Namur, *Bull. de l'Acad. Royale de Méd. de Belg.* (abstracted in *N. Y. Med. Record* August 21), after reviewing the other remedies employed in epilepsy, speaks very highly of Cocculus Indicus as an agent modifying this disease by its action on the vaso-motor nerves. He uses it, however, in much larger doses than were employed by M. Planat, who first used it in epilepsy. He employs the tincture, and usually begins with ten drops, morning and evening, increasing the dose two drops each day till sixty drops is reached; then he increases by ten drops a month till one hundred drops is reached. If the attacks have now ceased, he continues with this dose; if not, he goes on till one hundred and fifty drops is reached, and would give even more if needed. The use of the remedy should not be interrupted for fear of impairing its effects. It produces symptoms of cerebral congestion; hence it may be presumed that it acts by keeping the vessels of the brain in a state of permanent relaxation, and thus prevents the vascular tonus which causes the sudden anæmia of the brain, the basis of the epileptic attack. He concludes his paper with the histories of six cases of epilepsy in which the attacks were completely suppressed by this treatment, after the failure of bromide of potassium.

The abstract does not give the strength of the tincture used, but we presume it was the same as that used by Planat, a saturated tincture, as stated in the American Dispensatory.

Nerve Stretching.—Dr. A. Gen has collected seventy-three cases of nerve-stretching used as a therapeutic measure. In traumatic neuralgia it was employed six times—cured four, improved one (recovered entirely after neurotomy), no improvement, one. In neuralgia from other causes, in fourteen cases—cured ten, improved three, one died from the hemorrhage. In clonic spasms and contractions, six times—cured four, no improvement, two (one cured by neurotomy). In peripheral epilepsy, once—cure. In tetanus, sixteen times—cured seven, symptoms improved but disease terminated fatally in six, symptoms did not improve and patients died, three. In anæsthetic leprosy thirty times,—in all cases with marked benefit.

As the therapeutic action of nerve-stretching is not well understood, he performed some experiments in the laboratory of Prof. Tarchanoff with a view to determine it. Some of his conclusions are as follows: Not only mild stretching, but also the use of force equal to half what is necessary to rupture the nerve, may produce an increase of its irritability and conduction. Mild stretching has no effect upon the reflex irritability, but if the force used be great, it is diminished; this effect is also observed on the opposite side, indicating the central seat of the change in its effects. Hence the operation is not limited to the peripheral parts only of the nerve as Vogt was inclined to think. Under the microscope he found the traces of hyperæmia and capillary hemorrhages; the axis cylinders and myeline may be severed, but the Schwann's sheath is intact. He found also peculiar constrictions in the medullary fibres. He considers that the diminution of the reflex activity is the main feature, and in the cases operated on was the condition called for.—*Voyenno Meditsinsky Journal.*—*N. Y. Med. Record*, August 14th.

Nerve-Stretching in Tabes—In our April issue we noticed the fact of an apparent cure of a case of locomotor ataxy by the operation of nerve-stretching by Langenbeck of Berlin. The name of the physician operating should have been given as Langenbuch, however, instead of Langenbeck as printed. The operation has been since repeated, as we are informed by Dr. M. Bernhardt, by Esmarch, in Kiel, on a case characterized by severe ataxic pains and incoördination, and both symptoms were relieved.

Cinchonidia.—Dr. David Cerna ends the account of an experimental physiological investigation of the action of cinchonidia, in which frogs, dogs, and rabbits were employed as the subjects for experimentation, with the following conclusions. It will be seen that in these he makes a comparison of the action of quinia and cinchonidia:

1. Quinia in minute doses increases reflex action by stimulating the sensory nerves. In larger doses the reflex action is depressed by stimulation of Setschenow's centre.

2. Quinia causes at first an increase in the number of heart-beats, due to an early paralyzant action on the peripheral inhibitory nerves. The later sedation of the pulse is owing to its influence on the cardiac muscle.

3. The lowering of arterial pressure is due to the action of quinia upon the heart itself.

4. Cinchonidia depresses the reflex activity by influencing, like quinia, Setschenow's centre.

5. Cinchonidia lowers both the pulse and the blood-pressure, the causes probably being similar to those by which quinia produces its action.

The Galvanic Bath in the Treatment of Tremor.—At the session of the medical section of the French Association for the Advancement of Science (rep. in *Le Progrès Médical*, Aug. 11th), M. Constantin Paul gave an account of his experience with the galvanic bath in the treatment of various forms of tremor, in which the use ot ordinary induction or galvanic currents had failed. His apparatus was essentially a water bath traversed by an extra current in an ascending direction. The application could be graduated at will and was given for half an hour every other day. In mercurial tremor its success was constant; alcoholic tremor, cure; multiple sclerosis, almost constant amelioration; paralysis agitans, amelioration; chorea, one case successful, one unsuccessful; tremor in a case of incomplete paraplegia, cured; tremor from spinal irritation, success almost constant; locomotor ataxia, failure. He proposed to continue his therapeutic experiments, but deemed he had sufficient data already to recommend the use of this therapeutic method.

Alcohol.—At the same meeting MM. Dujardin-Beaumetz and Audigé reported the results of their experiments on the toxic action of alcohol. It had been objected to some of their former experiments that, having been performed on dogs by the hypodermic method, they caused only an acute intoxication not comparable with the slow and gradual poisoning we know by the name of alcoholism. To meet these objections they took up the subject again, experimenting this time on pigs and giving them the various commercial alcohols by way of the stomach, mixed it with their usual food in the morning, the quantity being from one gram to two grams and seventy centigrams to each kilogram of the animal's weight. They continued their experiments for more than a year, but do not consider the time yet long enough to allow of positive conclusions. Their paper concluded as follows:

In the hog, the continuous use of alcohol for a year, and in rather large quantity (200 grams a day), does not suffice to produce visceral derangement. This fact is in itself not extraordinary. In the case of a man given to the excessive use of alcohol it is not in the course of months, but of years, that we meet with the worst symptoms of alcoholism. We must not forget the enormous difference between man and the animal experimented upon, as regards the nervous system. The predominance of the brain in the one, compared with its minute size in the other, ought to profoundly modify the conditions of intoxication in the two cases. The cerebral excitement caused by the abuse of alcohol, and which precedes the period of collapse, probably causes multiple disorders; in the hog, on the contrary, whose brain is very little developed in proportion to the body, no excitement is produced, and the first action of alcohol is to cause simply a deep and quiet slumber.

Nicotine.—Dr. B. F. Lautenbach, *Phila. Med. Times*, July 17th, has found that nicotine when injected into an artery in cats and rabbits does not cause death as it does when injected into a vein. Instead there was produced increased frequency of pulse, loss of tactile sensibility, prominences of the nictitating membrane, and, in some experiments with cats, convulsions. All the animals recovered in a very short time.

These results are exactly the same as those observed by Schiff and the author on the introduction of the poison into the radicals of the vena porta, from which they at the time deduced the conclusion that one function of the liver was to neutralize these poisons. These later experiments render that theory needless, as it appears from them that passage through any set of capillaries will have the same effect. No explanation is offered of this curious difference between the results of the injection of nicotine into afferent and efferent blood-vessels.

Nicotin Poisoning.—In a previous number we have reviewed some important results on this topic, by B. von Anrep. The same author has now published a second article continuing his researches. (*Arch. f. Phys.*, 1880, III., p. 209.) The smallest dose which he found sufficient to produce spasms in rabbits, is 0.75 of a drop of nicotin dissolved in water (subcutaneously). A slight excess beyond this is fatal. The spasms are clonic and quite intense. They are repeated two to three times, and followed by tremors and ultimately by a transitory paralysis. If death does not occur within the first half hour the animal recovers, invariably. A second dose of the same size, given within a few days after the apparently complete recovery, is now surely fatal, but does not produce the spasms described. This fact is not in contradiction with the accustomation to poisons, since rabbits may be habituated to as large a dose as two drops, by commencing with minimal doses and increasing them gradually. In his former researches Anrep had found, that the susceptibility to a second *large* dose is also increased in frogs, by a single poisoning, and that this effect is due to an enfeebling action of the drug upon the heart, persisting for some days. In the case of mammals the heart is likewise debilitated, but this action does not persist, and is *not* the cause of death. The real mode of death from the repetition of a non-fatal dose in the case of mammals was found to be failure of the respiratory centre. This was shown to be the case by the earlier appearance and longer persistence of dyspnœa in the second poisoning. Moreover, a dose so small as not to produce dyspnœa at all in a normal rabbit, will interfere decidedly with the breathing as late as four days after previous poisoning with three-fourths drop nicotin. The drug evidently enfeebles the respiratory centre, and this effect remains for some time, and accounts for the increased action of the second dose.

The spasms produced by nicotin in rabbits are the result of both medullary and spinal irritation—mainly the former—since they persist, though very much feebler, after division of the cord. Section of one-half of the cord enfeebles them equally on both sides posterior to the section, hence the author supposes that in the conduction of the spasmodic impulses from the medulla oblongata to the nerves, the grey substance is alone concerned. To test this view he sought to eliminate the grey substance.

Sklarek had previously claimed that arsenious acid paralyzes the spinal grey substance, since burns and other painful irritations not accompanied by passive movements of the limbs produce no reflexes or reaction after poisoning with this substance. These facts Anrep could confirm. Moreover, previous poisoning with arsenious acid (0.013—rabbit) prevents the nicotin convulsions. As arsenious acid, however, does not prevent the conduction of voluntary impulses, our author (together with his teacher, Rosenthal) assumes the existence of two centrifugal paths in the grey substance, one for the conduction of voluntary impulses, another for the passage of spasm-impulses. The latter is acted upon by both arsenious acid and nicotin in an opposite manner. Further research showed, that many other substances can also prevent nicotin spasms, for instance, caffein, cocain, pyrocatechin, hydrochinon and physostigmin.

Some of these substances (though not all) produce convulsions as an effect of their own, for instance, pyrocatechin and cocain. These spasms are *not* intercepted by previous nicotin-poisoning. The author enters hereupon into a discussion of some not quite transparent views as to the exhaustion of the medullary spasm-centre. The only further fact of interest he announces, is the observation that enormous fatal doses of nicotin produce —apart from the first described spasms—a later onset of tetanic convulsions. These *second* spasms of large doses are neither prevented by any of the above substances, nor by a previous moderate nicotin-poisoning. The first convulsions, however, of large as well as small doses, do not appear when the animal has been subjected to a previous nicotin poisoning within the last four days.

Strychnia on Sensory Nerves.—In the *Philadelphia Medical Times* (Sept. 11, 1880) we find a posthumous article from the pen of B. F. Lautenbach, intended to prove: 1st, that the sensibility to touch is conveyed to centres by other channels than the other forms of sensibility; and 2d, that a physiological difference exists between motor and sensory nerves. His experiments show that when a frog has one of the hind legs ligatured and is poisoned with strychnia, no reflexes can after some time be produced by burning, galvanizing, or applying acids to any part of the skin but that of the protected leg, while mere touch of any part of the body can still evoke spasms. The mucous membranes likewise seem to lose their sensibility to painful impressions from strychnia. When strychnia is injected under the skin of a ligatured leg, the tactile sensibility is found to be increased, while the sensibility to heat, pressure, acids, and electricity is abolished. The motility of the leg is at the time unimpaired.

Strychnia.—At a recent meeting of the Academie des Sciences (reported in *L'Union Medicale*, July 24), M. Vulpian offered the following communication from M. Richet on the action of strychnia in large doses:

We are aware that strychnia is a poison that in doses of two to three milligrammes rapidly kills a moderate sized dog. Rosenthal has shown that by using artificial respiration we lessen the convulsions and weaken the action of the poison so that a double dose is required to cause death. Leube, Pauschinger and Buchheim have performed some rather contradictory experiments in this matter, but in the main have confirmed Rosenthal's conclusions.

I have found that by using artificial respiration we may, without producing immediate death of the animal, cause it to absorb a hundred times the usual dose of the poison (for example, 5 grams of muriate of strychnia to a dog weighing 10 kilograms). We then observe phenomena altogether different from those that strychnia in smaller doses produces. It is practically a new poison, the effects of which are interesting to study.

After having fitted a canula to the trachea, if we inject under the skin (of dog or rabbit), or into the saphenous vein, one centigramme of muriate of strychnia, the animal is almost immediately seized with a violent convulsive attack. This attack would be fatal but for the artificial respiration; but if this is continued the convulsions cease after a few seconds, and the heart, after a period of convulsive and hurried palpitation, takes on a more regular rhythm.

We can then inject successively stronger and stronger doses without causing death. The effects vary according to the dose injected. There is first a *tetanic* period (the same that has been noted by the majority of authors); then later a *convulsive* period, characterized by spasmodic incessant contractions of all the muscles. A little later still, when the quantity absorbed exceeds one centigram per kilogram of the animal's weight, there appears a stage which we may call *choreic*. It is characterized by violent rhythmic and very quick jerks, repeated about every three or four seconds, during the interval the animal being almost perfectly relaxed. When the quantity exceeds four centigrams per kilogram's weight, the choreiform motions cannot be produced, and this we call the stage of resolution. There is no reflex movement, the spontaneous respiratory movements cease, and the heart, tumultuous and irregular in the earlier tetanic stage, contracts frequently but regularly. The pupil, widely dilated at the beginning is now closely contracted.

The arterial pressure, which was enormously increased at the commencement, gradually decreases (in one case from 0.34m. of Hg. to 0.05m). The rectal temperature undergoes analogous variations. It rises during the convulsions to 41°C. or even 42°C., falling to 35° during the period of resolution.

Dogs and rabbits that have taken large quantities of strychnia (as much as five centigrams per kilogram's weight) may thus live for four hours or more. The accidental interruption of the respiration has generally been the cause of death in my experiments. Indeed, during the stage of resolution the cessation of the artificial respiration for half a minute for example causes an immediate arrest of the heart. Any hemorrhage also, however slight, causes immediate death.

For the experiment to be a success it is necessary to inject the strychnia rather slowly (for instance, 5 grams per hour). It is also necessary that the artificial respiration should be vigorous and the pulmonary ventilation very complete. For this reason we succeed better with rabbits and small dogs than with dogs weighing 12 kilograms or more.

If, instead of injecting large doses, we give very small ones (say one milligram per kilogram), death takes place very quickly by syncope, the heart stops at once. This syncope is not at once mortal, but after three or four repetitions a final one occurs and the animal dies. When the dose injected equals 5 centigrams per kilogram, these syncopes do not occur, and we have here a true physiological paradox, of which we have not many examples elsewhere.

When the quantity of strychnia absorbed is very great, we find that the vagus has very little control of the heart. But, for this to be the case, it is necessary that the quantity should exceed 5 centigrams per kilogram's weight of the animal. The muscles preserve their normal excitability; as regards the motor nerves, although their action on the muscles is much diminished I have never been able to prove its complete abolition.

It appears, therefore, that the complete absence of reflex or spontaneous movements is due rather to the suppression of the functions of the cord than to the loss of the motor functions of the nerves and their terminal motor plates. The animal is, therefore, in a condition analogous to that of one under the influence of alcohol or chloral. Strychnia, thus, in large doses acts like curare and a little like chloral.

Unfortunately we cannot admit that artificial respiration is a heroic method of counteracting the effects of strychnia poisoning. In fact, the smaller the dose becomes by elimination, the more pronounced are the cardiac accidents (arrest and syncope), and death occurs from stoppage of the heart. Nevertheless as prolongation of life, if only for a few hours, is a capital indication, I am of the opinion that in serious cases of strychnia poisoning it will be absolutely necessary to have recourse to artificial respiration, and with tracheotomy to render it possible to make it the more effective.

These phenomena are best produced with monochlorated strychnia, the physiological study of which best affords a knowledge of the mode of action of the drug. I shall shortly return to the subject.

The following are some of the recent articles on the Therapeutics of the Nervous System and Mind:

RIDENOUR, Chloral Hydrate in Traumatic Inflammation of the Brain, *Toledo Med. and Surg. Journal*, June.—RUSSELL, What shall be done with the Inebriate? *Alienist and Neurologist*, July.—WILSON, Anæsthesia by Ethyl Bromide (Summary), *Med. and Surg. Rep.*, Aug. 7.—OLIVER, Blood-letting in Puerperal Convulsions, *Proc. Med. Soc. Co. of Kings*, Aug.—GRAY, On the Treatment of Certain Cases of Insanity, *Ibid.*—CLARK, The Treatment of Puerperal Eclampsia by Morphine, *Am. Jour. of Obst.*, July.—SMITH, Convulsions in Children, *Ibid.*—ZANGRILLI, Note on the Treatment of Eclampsia, *Gazz. Med. di Roma*, Aug. 1.—DRESCHFELD, On the Application of the Electro-Magnet for the Cure of Anæsthesia, *Brit. Med. Jour.*, Aug. 7.—POOLEY, Nerve Stretching, *N. Y. Med. Record*, Aug. 14.—CHANNING, The use of Mechanical Restraint in Insane Hospitals, *Boston Med. and Surg. Jour.*, Aug. 19.—SMITH, Galvanism in the Treatment of Puerperal Convulsions, Traumatic Injuries, and other Painful Conditions, *Gaillard's Med. Jour.*, Aug.—WALLER, The Early Avoidance of Writer's Cramp, *Practitioner*, August.

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Die Hydrotherapie auf physiologischer und klinischer Grundlage. Vorträge für praktische Aerzte und Studirende. Von Dr. Wilhelm Winternitz. Zweiter Band, II. Abtheilung: Der Einfluss allgemeiner thermischer Applicationen auf Körpertemperatur und Stoffwechsel. Mit 12 Holzschnitten. Wien, 1880.

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Della Clinica Psichiatrica della R. Universita di Modena, diretta del Prof. Tamburini. Contributa allo Studio delle Malattie Accidentali dei Pazzi. Dei Dottori Seppilli, Giuseppe e Riva, Gaetano. Milano, 1879.

Sulla Genesi delle Allucinazioni. Pel Prof. Augusta Tamburini. Reggio nell 'Emilia, 1880. (Repr. from *Rivista Sperimentale di Freniatria.*)

Sulle Modificazioni Sperimentale della Sensibilita e Sulle Teorie Relative, Nota Preventiva. Dei Dottori G. Buccola e G. Seppilli. (Repr. from *Rivista Sperimentale.*) Reggio Emilia, 1880.

The Brain as an Organ of Mind. By H. Charlton Bastian, M. A., M. D., F. R. S. New York: D. Appleton & Co., 1880. 708 pages. Chicago: Jansen, McClurg & Co.

How to Understand Music. A Concise Course in Musical Intelligence and Taste. To which is added a Pronouncing Dictionary and Condensed Encyclopedia of Musical Terms and Information. By W. S. B. Mathews. Chicago, 1880. 296 pages.

A Treatise on the Practice of Medicine, for the Use of Students and Practitioners. By Roberts Bartholow, M. A., M. D., LL. D. New York: D. Appleton & Co., 1880. 853 pages. Chicago: Jansen, McClurg & Co.

Notes on Neurasthenia. By C. H. Hughes, M. D. (Reprinted from *Alienist and Neurologist*, October, 1880.)

In Memoriam. Frank H. Davis, M. D. (Reprinted from *Chicago Medical Journal and Examiner*, Sept., 1880.)

A Practical Treatise on Nasal Catarrh. By Beverly Robinson, A. M., M. D., (Paris). New York, 1880. Wm. Wood & Co. 182 pages. Chicago: W. T. Keener.

Diseases of Pharynx, Larynx and Trachea. By Morell Mackenzie, M. D., London. New York: Wm. Wood & Co., 1880. 440 pages. Chicago: W. T. Keener.

Transactions of the Medical and Chirurgical Faculty of the State of Maryland, Eighty-second Annual Session, held at Baltimore, Md., April, 1880.

Lunacy Reform, IV. The Right of the Insane to Liberty. By E. C. Seguin, M. D. (Reprinted from *Archives of Medicine*, August, 1880.)

A Case of Probable Abscess of the Brain Following After and perhaps Dependent Upon Acute Inflammation of the Middle Ear. By Frank Allport, M. D. (Reprinted from *American Journal of Otology*, July, 1880.)

Malaria. By Charles H. Lothrop, M. D. (From Transactions of the Iowa State Medical Society, 1880.)

On Occipital Headache as a Symptom of Uræmia. (From *Archives of Medicine*, August, 1880.)

On Osteo-Malacia Occurring in a Case of Chronic Dementia. By Ringrose Atkins, M. D. (Reprinted from British *Medical Journal*, June 26, 1880.)

On the Habitual Drunkard's Act of 1879, with an Account of a Visit to the American Inebriate Homes, February 2, 1880. By Stephen S. Alford, F. R. C. S. London, 1880.

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The Rise of American Dermatology, being the President's Address Before the Third Annual Meeting of the American Dermatological Association at New York, August 26, 1879. By Louis A. Duhring, M. D. (Extracted from Transactions of Association.)

Programme of the Twenty-ninth Meeting of the American Association for the Advancement of Science, held in Boston, August, 1880.

Lacerations of the Neck of the Uterus. By A. Reeves Jackson, A. M., M. D. (Reprinted from *American Practitioner*, 1880.)

A Contribution to a Knowledge of Fracture of the Rim of the Acetabulum, Based on the Reports of Twenty-seven Cases and Experiments on the Cadaver. By N. Senn, M. D. (Reprinted from the Transactions of the State Medical Society of Wisconsin.)

Malaria. Annual Address Delivered before the Madison County Medical Society, at Edwardsville, April 27, 1880. By J. L. R. Wadsworth, M. D. (Reprinted from *St. Louis Medical and Surgical Journal*, July 5, 1880.)

The Irritable Bladder in the Female. By L. S. Oppenheimer, M. D. (Reprinted from the *Louisville Medical News*, June 12, 1880.

Puerperal Epilepsy and Protracted Gestation. By L. S. Oppenheimer. (Reprinted from *American Practitioner*, October, 1880.)

The Use of the Sphygmograph in Practice. By A. B. Arnold M. D. (Reprinted from Transactions of the Medical and Chirurgical Faculty of Maryland, 1880.

The Foramen of Monro. Some Questions of Anatomical History. By Burt G. Wilder, M. D. (Reprinted from *Boston Medical and Surgical Journal*, August 12, 1880.)

THE FOLLOWING FOREIGN PERIODICALS HAVE BEEN RECEIVED SINCE OUR LAST ISSUE.

Allgemeine Zeitschrift fuer Psychiatrie und Psychisch. Gerichtl. Medicin.
Annales Médico-Psychologiques.
Archives de Physiologié Normale et Pathologique.
Archiv fuer Anatomie und Physiologie.
Archiv fuer Path. Anatomie, Physiologie, und fuer Klin. Medicin.
Archiv fuer die Gesammte Physiologie der Menschen und Thiere.
Archiv f. Psychiatrie u. Nervenkrankheiten.
Archivio Italiano per le Malatie Nervose.
Archives de Neurologie.
Brain.
British Medical Journal.
Bulletin Générale de Thérapeutique.
Centralblatt f. d. Med. Wissenschaften.
Centralblatt f. d. Nervenheilk., Psychiatrie, etc.
Cronica Med. Quirurg. de la Habana.
Dublin Journal of Medical Science.
Deutsche Medicinische Wochenschrift.
Deutsches Archiv f. Geschichte der Medicin.
Edinburgh Medical Journal.
Gazetta del Frenocomio di Reggio.
Gazetta Medica di Roma.
Gazette des Hopitaux.
Gazetta degli Ospitali.
Gazette Medicale de Strassbourg.
Hygeia.
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Jahrbücher für Psychiatrie.
Journal de Médicine et de Chirurgie Pratiques.
Journal of Mental Science.
Journal of Physiology.
Journal de Médecine de Bordeaux.
La France Médicale.
Le Progrès Médical.
Lo Sperimentale.
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Mind.
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Norsk Magazin for Lagensvidenskabens.
Practitioner.
Rivista Clinica di Bologna.
Rivista Sperimentale di Freniatria e de Medicina Legale.
Revue Mensuelle de Medicine et de Chirurgie.
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St. Petersburger Med. Wochenschrift.
Upsala Lakareföreningş Forehandlinger.

The following domestic exchanges have been received:

Alienist and Neurologist.
American Journal of Insanity.
American Journal of Medical Sciences.
American Journal of Obstetrics.
American Journal of Pharmacy.
American Medical Journal.
American Practitioner.
Annals of the Anatomical and Surgical Society.
Archives of Comp. Med. and Surgery.
Archives of Dermatology.
Archives of Medicine.
Atlanta Medical and Surgical Journal.
Boston Medical and Surgical Journal.
Buffalo Medical Journal.
Bulletin National Board of Health.
Canada Medical Record.
Canada Medical and Surgical Journal.
Canadian Journal of Medical Sciences.
Chicago Medical Journal and Examiner.
Chicago Medical Review.
Chicago Medical Times.
Cincinnati Lancet and Clinic.
Clinical News.
College and Clinical Record.
Country Practitioner.
Detroit Lancet.
Dial.
Gaillard's Medical Journal.
Independent Practitioner.
Indiana Medical Reporter.
Index Medicus.
Maryland Medical Journal.
Medical Annals.
Medical Brief.
Medical Herald.
Medical News and Abstract.
Medical Record.
Medical and Surgical Reporter.
Michigan Medical News.
Monthly Review.
Nashville Journal of Medicine.
Neurological Contributions.
New Orleans Medical and Surgical Journal.
New Remedies.

New York Medical Journal.
Pacific Medical and Surgical Journal.
Philadelphia Medical Times.
Physician and Surgeon.
Physician and Bulletin of the Medico-Legal Society.
Proceedings of the Medical Society of the County of Kings.
Quarterly Epitome of Braithwaite's Retrospect.
Quarterly Journal of Inebriety.
Rocky Mountain Medical Review.
Sanitarian.
Science.
Southern Clinic.
Southern Practitioner.
St. Joseph Medical and Surgical Reporter.
St. Louis Clinical Record.
St. Louis Courier of Medicine.
St. Louis Medical and Surgical Journal.
Therapeutic Gazette.
Toledo Medical and Surgical Journal.
Veterinary Gazette.
Virginia Medical Monthly.
Walsh's Retrospect.

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