Symptoms.—Long after, often many years after, the specific local lesion, deposits occur in the spinal canal. According to the author's observation* the spinal troubles may be coincident with the development of fresh tertiary symptoms elsewhere. The most constant symptom is a deep-seated pain in the dorsal or lumbar region, increasing at night; a pain of such severity as to require powerful anodynes to obtain sufficient relief for sleep. There may or may not be tenderness on pressure. Usually a great deal of pain is experienced in one or both of the sciatic nerves, and tingling, numbness, and burning sensations in the legs and feet. More or less weakness, a strong sense of fatigue on slight exertion, stiffness and cramps are experienced in the muscles of the spine, of the neck, and of the extremities. As the disease is developing, the general system sympathizes to a remarkable extent; a peculiar earthy hue of the face, emaciation, and debility are observed. The symptoms may continue at this point for a long time, or partial improvement take place, and then, after some weeks or months of inaction, more serious symptoms come on. When the symptoms become active again, paralysis begins and proceeds with great rapidity, and becomes so complete that not a toe is movable. The paralysis may be due to disease of the dorso-lumbar enlargement, and both lower limbs be completely paralyzed (paraplegia) as to motion, sensation, and the reflexes. The sphincters will also be involved, and incontinence be added to the other troubles. There may be partial paralysis, one limb involved. When the arms are affected, there will be oculo-pupillary phenomena, and the respiratory muscles will be paretic or paralyzed if the disease is high up in the cervical region. These spinal troubles of syphilitic origin may be associated with corresponding cerebral lesions, when, of course, the symptoms will partake of both. There is a form of acute spinal paralysis described by Huebner which comes on during the first secondary symptoms, and is characterized by a sudden paraplegia or paralysis of one arm and the opposite leg. In a few hours, or a day or two, the mischief is wrought, and the paralysis complete.

Course, Duration, and Termination.—The course of the principal forms of spinal lesions is very protracted, and they appear long after the local primary. Rightly treated they get well promptly, but, as is the case with the cerebral disease, they are prone to relapse, yet the ultimate cure is probable. When paraplegia has occurred with absolute paralysis, a cure may often be effected in a few weeks; but that this favorable termination shall take place it is essential that the injury be recent. If the cord has been damaged, permanent disability will remain, although the disease may be arrested. Old cases may terminate fatally by exhaustion from cystitis and bed-sores. The acute form, described by Huebner, seems to be very unmanageable,

* "On Syphilis of the Nervous System," "The Clinic," 1874.

and to reach a fatal termination by extension upward. In the spinal as in the cerebral form, much depends on the treatment instituted.

SYPHILIS OF THE NERVES.

Pathological Anatomy.—The cerebral nerves seem to be chiefly if not the only nerves attacked by syphilis. The deposits may be exterior, and press on the nerve-trunks, producing a neuritis, which leads to atrophic changes and degeneration. A gumma surrounding a nerve-trunk unprovided with a sheath will grow into the tissues of the nerve, and syphilitic granulation-tissue may be deposited in places, and develop in the ordinary way.

Symptoms.—The results of such affections of nerve-trunks have a different expression according to the function of the nerve. Irritation of a sensory nerve produces pain in its peripheral distribution; but, if the nerve is destroyed, anæsthesia and analgesia are experienced. On the other hand, if a motor nerve is irritated, spasms or tonic contraction will ensue in the muscles to which this nerve is distributed; if the nerve is destroyed, paralysis ensues. As the cerebral nerves are usually affected, the same symptoms result from syphilitic neoplasms as have been described in connection with other neoplasms or tumors of the brain.

Diagnosis of Syphiloma of the Nervous System.—The first point to determine is the occurrence of syphilitic infection. The peculiarities of the syphilitic affections of the brain are their diffusion, the irregularity in the development of the symptoms, the simultaneous existence of irritation and depression, the periods of spontaneous improvement, the remarkable change in the condition of a patient receiving iodide of potassium or mercury in some form, etc.

Treatment.—In these affections the most marvelous change is wrought by sufficient doses of the iodide of potassium. No time is to be lost in its administration, and usually the largest doses are required. Sometimes mercury does better, and lesions do not yield until it is administered. It has been observed, also, that cases not yielding readily to specific treatment, will do so on the exhibition of pilocarpine to promote absorption.

CEREBRO-SPINAL NEUROSES.

EPILEPSY.

Definition.—By the term *epilepsy*, as here employed, is meant true or essential epilepsy, and not eclampsia, nor convulsion from such cause as tumor, abscess, etc., of the brain.

Causes.—Heredity occupies the first place as an etiological factor. In Echeverria's * cases, about twenty-five per cent., and in Reynolds's † about thirty per cent. were distinctly due to hereditary transmission. It is a neuropathic constitution or tendency which is inherited, and this exhibits itself in various forms in different generations. In one generation it is neuralgia, nervousness, paralysis ; in another, epilepsy ; in a third, insanity. Next to the inheritance of a neurotic tendency, in point of importance as a cause, is the influence of drunkenness in the father on the product of conception. Sexual excesses and onanism are held to be frequent causes, but much exaggeration has existed in regard to their effects in this way. They are more frequently the result than the causes of epilepsy. As regards age, the greatest number of cases occur in the decennary from seven to seventeen. As regards sex, the two are about equal in their liability to the disease. According to Reynolds, not one case which was hereditary began after twenty, while twenty-six per cent. of those not hereditary were affected after twenty. Irritation of peripheric nerves, dentition, and injuries to the cranium, are among the occasional causes. Epileptic seizures have been excited by various psychical impressions—by fear, by irritation, by chagrin, and other powerful emotions.

Pathological Anatomy.—There is no morbid alteration peculiar to epilepsy. In this important respect true epilepsy differs from epileptiform seizures. Although there is no special change, various accidental pathological alterations are found in the cranial cavity. Changes in the contour and structure of the skull ; thickened, indurated, and calcareous meninges ; increase in weight of the brain according to some (Echeverria), and diminution of weight according to others ; changes in the hippocampus (Meynert) ; tumors of the cortex ; variations in the distribution of the gray matter—are gross lesions which have been ascertained to exist in old cases of epilepsy. Long ago Schroeder Van der Kolk ‡ found alterations in the medulla, consisting in dilatation of the arterioles and fatty degeneration of their tunics. Echeverria § confirmed these observations and added investigations of his own, to the effect that not only are the vessels enlarged, their tunics fatty, but that hyperplasia of the neuroglia and atrophy of the cells of the medulla are constant changes in epilepsy. The same author has ascertained the existence of sclerotic changes in the ganglia of the sympathetic, but the relation which such changes bear to the production of epilepsy is by no means clear.

Symptoms.—The phenomena of epilepsy are exhibited in two forms

* "On Epilepsy," by M. Gonzales Echeverria, M. D., New York, 1870.

† "Epilepsy," etc., by J. Russell Reynolds, 1861, p. 123.

‡ "On the Minute Structure and Functions of the Spinal Cord," Sydenham Society edition, 1859, p. 231, *et seq.*

§ *Op. cit.*, chapter xi, p. 46.

of seizures, and in the state of the affected individual in the interval between the convulsive or unconscious attacks. The epileptic seizures are : *epilepsia gravior*, the severer epilepsy, the epileptic fit, called by the French writers *le grand mal*, and *epilepsia mitior*, milder epilepsy, *le petit mal*. Adopting the classification of Jaccoud, we have the first form occurring in two modes—the *common* or *ordinary* form, and the *apoplectic ;* the second also in two—*vertigo* and *absence*. Many cases of the common form begin without any indication of their approach, but a certain number are preceded by definite sensations and warnings. The term *aura* is applied to a singular phenomenon preceding the attack and indicating its approach. No longer used, in accordance with its original signification, as a *breath*, this term expresses any manifestation, sensory, motor, or psychical, which gives warning of a paroxysm : it may be the sensation of a breath, the flowing of a hot or cold liquid, numbness, tingling, even a severe pain passing with great rapidity from the periphery to the brain. Again, the aura may consist of an impression on an organ of sense, as a flash of light, a strange odor, or a rumbling noise in the ear ; or in some local muscular spasm or cramp ; or some specter or other hallucination rising up in the mind. Warnings may be more remote, occurring some days before the seizure, when they take the shape of mental or moral perturbation ; sadness and despondency of mind, a gloomy reticence and suspicion are experienced, or an excited, irritable, quarrelsome, even dangerous and malignant state of mind comes on. More frequently than these symptoms occur merely headache, dizziness, and some confusion of mind, for a few hours or a day or two before the seizure. In a large proportion of cases seen by the author, the prodromal symptoms consisted in a sense of præcordial oppression, epigastric uneasiness, and nausea, the attack following immediately on the rise of a peculiar sensation from the epigastrium to the brain.* With or without an aura, the epileptic paroxysm when it occurs is sudden. It consists of four distinct acts : a sudden fall ; loss of consciousness, with pallor of the face ; a peculiar cry ; general convulsions. In any situation or place the individual attacked happens to be, he falls—down the stairway, into the fire, against an article of furniture ; or if, mercifully warned by some sensation, he has the opportunity, he places himself in a position of safety. The fall may be to one particular side, on which scars will be found to indicate the direction taken in falling. The fall occurs because loss of consciousness supervenes, and the control is at once withdrawn from the voluntary muscular system. Sensibility, motility, perceptions, the special senses, the reflex functions even, are at once and entirely abolished. The face grows deadly pale, and this is due to a sudden spasm of the

* Gowers ("Gulstonian Lectures," "Lancet," March 20, 1880) says this sensation occurred in one half of his cases.

arterioles of the head, whence the amount of blood passing to the brain is greatly reduced. At the moment that unconsciousness takes place, a peculiar cry is uttered, "shrill and terrifying to man and beasts," is the description of Romberg.* It may be a mere groan, and there may be an entire absence of all sound. Immediately on the occurrence of pallor of the face, the muscles of the body generally assume a position of tetanic rigidity; the head is drawn back or to one side, where it is firmly held; the jaws are tightly closed, the lips retracted into the sardonic grin, the eye fixed in a stern expression, the brow corrugated; the fingers and toes are extended, widely separated; the respiratory muscles similarly tetanized, respiration is suspended; the pulse is small, firm, and variable in frequency; a rapid venous stasis, cyanosis of the face, and blueness of the lips succeed to the momentary deathly pallor, because of the arrest of respiration and compression of the great venous trunks by the rigid cervical muscles. Just as the *tetanic stage* begins, a loud, strong, and protracted whistling inspiration is made, and then ensues the rigidity of the respiratory muscles. The tetanic condition may not be universal, may be limited to a few muscles, as those of the head and eyes, the spasms being clonic at the outset; or there may be no rigidity, the muscular twitching beginning at once, or, on the other hand, there may be nothing more than transient rigidity of the voluntary muscles. This rigid stage lasts from a minute to a minute and a half, and is succeeded by the stage of *clonic convulsions.* At first the muscles of the face, lips, tongue, pharynx, and larynx begin to twitch, the face to make horrible grimaces, the eyes to roll in their sockets. The face is still blue, the lips blue, but, as respiration goes on, the blueness is mixed with red, the superficial veins are swollen, the lips are extruded with each expiration and are covered with froth, often with bloody froth, the breath issues with a whistling, stridulous noise, the inspiration being labored, loud, sonorous, the teeth grind together, and often the cheek or tongue is caught and chewed, thus furnishing the blood which is mixed with the froth. The muscles of the extremities are violently agitated, thrown about, and with such violence that severe injuries are sustained, even fractures of the long bones or dislocations. Vessels give way and ecchymoses of greater or less extent are formed about the eyelids, and in the mucous membrane of the tongue and lips. By these marks may be ascertained the existence of nocturnal epilepsy, which otherwise remains undiscovered. The clonic stage lasts one, two, or three minutes, and its close is announced by the subsidence of the convulsions; they occur less and less, and at length there is only an occasional twitch of the muscles about the mouth, and presently all is still, the individual passing into deep sleep, in which the iris, before

* "On Nervous Diseases," "Sydenham Society's translation," by Sieveking.

dilated, contracts, the respirations become regular, deep, and full, the muscular system relaxed, and the skin warm and perspiring. There may be, indeed, a conditien of coma lasting several hours after the convulsive stage, and fecal and seminal discharges may occur involuntarily. The duration of the comatose stage varies from a few minutes to several hours, and the patient rouses with a rather surprised, or dazed, or sheepish expression, and is entirely ignorant of the affair through which he has just passed, unless the bitten tongue or cheek reminds him of former experiences. Usually the effect on the mental and moral state is that of improvement, and the patient feels better than before. Attacks may succeed to attacks. Without coming out of the condition of coma, another convulsion succeeds to the previous one. In other cases the recovery from each paroxysm is complete, and the convulsions occur with a distinct interval of an entirely normal state. The number of paroxysms during a period of twenty-four hours may be from one to fifty—even more. Immediately succeeding the convulsions in some epileptics, there occur attacks of delirium or hallucinations, or they pass into an excitable, quarrelsome state, and are prone to commit homicidal acts. Physicians have frequently to testify as to the mental condition of epileptics, on trial for acts committed in the mania which succeeds to convulsions.

The apoplectic form of Jaccoud differs from the ordinary form just described, by the depth and duration of the succeeding stage of coma, by the evidences of cerebral congestion present, and by the paralysis—temporary or more permanent—usually in the form of hemiplegia, succeeding to the clonic convulsions. The second form—*epilepsia mitior*, milder epilepsy, or *petit mal*—exhibits iself in the two forms of *vertigo*, or vertiginous sensations, and *absence* or instantaneous unconsciousness in the sphere of ideation. In the former, the patient is seized with a severe vertigo, in which all surrounding objects are in motion, and he is unable to maintain the upright position, and would fall if not supported. With the vertigo there is loss of consciousness lasting for a second, when the normal state is restored. Usually, the vertiginous sensations and the loss of consciousness are accompanied by some partial convulsive phenomena; as grimaces, twitching of the muscles of the face, grinding of the teeth, movements of rotation of a member—of the arm, for example—or of the whole body, running forward suddenly. On an instant consciousness returns, the patient looks around with a foolish expression, it may be, and the attack is over. By *absence* is meant *absence of mind*, but not in the popular sense—in the technical sense, in this connection, of total abolition of ideation, for an instant of time. The attack may occur at any time, and consists in the most transient suspension of consciousness—in the midst of a sentence, sewing, walking, or writing: for the instant all thought is suspended;

the sentence being uttered, the sewing, the walking, or the writing is stopped, and then immediately resumed, so that the brief gap may attract no attention. Observing the appearance of the individual thus attacked, there will be seen a sudden pallor of the face and dilatation of the pupil, but no other objective phenomena. These forms of *epilepsia mitior* may precede, for a long time, the fully developed attacks, or may occur with them. The popular notion of the little importance of these seizures is not justified by the results, for absence is particularly injurious to the mental faculties. In all of these forms of epilepsy the loss of consciousness is the central fact, and without it, according to many, there can be no epilepsy. There are, however, numerous examples of convulsions, partial and general, without loss of consciousness. Dr. Hughlings Jackson* defines epilepsy as "a *sudden*, *excessive*, and *rapid* discharge of gray matter of some part of the brain on the muscles." It does not necessarily involve the loss of consciousness. His notion is that any mass of gray matter may get into a highly excited state by some kinds of irritation—"reaches very high tension and very unstable equilibrium, and therefore occasionally 'explodes.'" Irritation of a part, the destruction of which causes hemiplegia, will induce unilateral convulsions of the same region. Local convulsions, as in an arm, for example, may therefore be a "discharging lesion of a small extent of irritated gray matter." There are masked or concealed epilepsies, taking the form of tic-douloureux, or neuralgia of the fifth nerve, convulsive tic, or histrionic spasm, and angina pectoris. After a time the paroxysms assuming these forms take on the proper epileptic character, or the epileptic seizure alternates with its counterfeit. Again, epilepsy may take the form of an acute delirium (Falret's *delirium epilepticum*). The peculiarity of this affection is its sudden and unaccountable appearance, and its equally prompt and unexpected disappearance. Often the delirium takes the form of an "insane impulse," in which acts of violence are committed, or of obscene and violent language, or of some senseless conduct. It may become excessively violent and destructive, leading to the performance of atrocious murders. This condition of mind is transient and disappears in a few hours or in a day or two, and the patient is either totally unconscious or has the remembrance as of a vague dream.

Course, Duration, and Termination.—Epilepsy is one of the most chronic of diseases, and its duration numbers many years. At the outset there may be many months' interval between the attacks, but, as the case progresses, the attacks increase, and the intervals between them become shorter. The periods of return are very irregular. Now and then attacks strictly antiperiodic are encountered, and others are connected with the menstrual functions. As attacks are often determined by preventable causes, the number may be much increased by

* "A Study of Convulsions," and "On the Investigation of the Epilepsies," and various papers.

indiscretions. Among these are indulgence in alcoholic fluids, sexual excesses, and errors in diet. Probably the last named is the most important of these noxious influences. Nocturnal attacks may escape recognition for a long time, and the origin of the disease dates from some diurnal attack, or from a seizure in which the bitten tongue, ecchymoses, and general muscular soreness served to indicate the nature of the disturbance. An unexpected decline in mental power, changes in the disposition, and impaired health in certain directions without any apparent reason, may be explained by nocturnal epileptic attacks. The existence of epilepsy is not incompatible with a condition of perfect health. In the interval between the attacks, still more in the future progress of the cases, various alterations in the motor, sensory, and intellectual sphere are produced. In the motor group may be mentioned clonic convulsions or clonic or tonic spasms in a single extremity, or group of muscles; in the sensory, numbness of certain areas in the extremities, headache, neuralgia, etc. The most important results of epileptic seizures are changes in the intellect, weakness of memory, impaired judgment, etc., gradually increasing until ultimately these unfortunates pass into the condition of dementia. Occasional epileptic attacks do not seem to have much influence on the condition of the mind, and in confirmation of this opinion are always quoted the cases of Cæsar, Napoleon, and Petrarch. The statistics of Reynolds prove that the number of attacks alone is not responsible for the effect on the intellect, but the mind suffers more when the attacks follow in quick succession. Epileptics early suffer changes in the moral sphere, in the affections, the disposition, and the emotions, before any intellectual decadence is observed. Although the prognosis is unfavorable as respects cure, decided amelioration can be effected in a large proportion. A few cases are cured, and the number of cures increases with the improvements in therapeutics. The earlier the treatment is undertaken the more favorable the termination. The less the number of attacks within a given period and in the aggregate, the more favorable. If there be a distinct peripheral cause, as injury to a nerve, a tape-worm, etc., the prognosis is more favorable; but, when the status epilepticus is established, it does not suffice merely to remove the cause. If central lesions exist, the termination by recovery seems quite impossible. Heredity apparently increases the intractability of the disease, but some notable exceptions have been published. Nocturnal attacks are less amenable to treatment than diurnal. The forms of epilepsia mitior are, as a rule, more difficult to manage than epilepsia gravior. Absence especially has disastrous effects on the mind. Finally, treatment has an important influence for good or evil over the course, duration, and termination of epilepsy in all its forms.

Treatment.—The success of the management of epilepsy depends largely on the skill with which various sources of peripheral irritation are investigated and removed. Every case, therefore, requires

the most deliberate and searching investigation. Has there been an injury? Is it of the cranium or of a peripheral nerve? Many cases have been cured by the application of the trephine, and the number is increasing. So favorable have been the results of this practice that, if a severe blow on the cranium has been followed by epilepsy, and any injury of the bone can be detected, the trephine should be used. Cicatrices so situated as to exercise pressure on a nerve should be dissected out—a practice of special necessity when an aura or any uneasy sensation starts from the affected part. If there be a defined aura so situated as to be intercepted in its passage to the brain, various expedients have been resorted to for this purpose, as a ligature about the thigh, leg, or arm, the application of a blister to surround the limb, or the cauterization, by nitrate of silver, of a band around the extremity. Permanent relief has been obtained by cutting down on the point whence an aura proceeds, and not only removing a source of irritation, but dividing or stretching a nerve-trunk. When the impression arises at the epigastrium and passes thence to the brain—probably the most frequent of all prodromic symptoms or warnings—most careful attention must be given to the diet. The author has witnessed more good from regulation of the diet than from any mode of medication. Epileptics eat largely and bolt their food. When stomachal symptoms exist, an epileptic should be restricted to the milk-diet for several weeks, and should then gradually have additions made to it; but the permanent diet should not exceed milk, eggs, a little meat once a day, a single vegetable, a very little bread and butter, and one fruit. Restriction to this plan of diet will often effect remarkable improvement. If there be worms present in the canal, they should of course be expelled. If stomach symptoms are present, good results are obtained from drop-doses of Fowler's solution three times a day, from half-grain doses of the oxide or nitrate of silver, or a suitable quantity of oxide of zinc. These remedies are beneficial only in cases of epilepsy dependent on stomachal derangements. The danger of staining by the use of silver remedies should not be overlooked. From the negative point of view there are several important questions connected with the stomach and alimentation. Coffee, tea, tobacco in any form, and all kinds of alcoholic drinks, must be forbidden to all classes of epileptics. It is important to prevent paroxysms, since habit enters largely into the mechanism of epileptic seizures. The means of intercepting an aura have been referred to. Brown-Séquard suggests various peripheric irritations—pulling on the great-toe, inhaling a little carbonic-acid gas, etc. The inhalation of ether and chloroform may render the attacks less severe, but the practice is questionable. When the attacks are nocturnal, a sufficient dose of chloral, or better, the hypodermatic injection of morphine at bed-hour, will act most efficiently to prevent them, but as the morphine habit will be quickly formed, other remedies should be preferred. The nitrite of amyl by inhalation will often avert an impending attack. The advantage of this remedy consists in the facility with which it is employed. A perl containing three to five minims can be broken up in a handkerchief and inhaled without delay. Nothing should be done during the paroxysm but relieve the body of all constricting bands, and put the epileptic in a position where he will not injure himself. The question of a suitable remedy for the disease is by no means a complicated one. There can be no question of the superiority of the bromides, and notably the bromide of potassium, over all other remedies. Their long-continued use is attended with few disadvantages, and the mental condition improves rather than declines under their employment. The bromides of sodium and potassium are chiefly administered, but while the potassium bromide is rather more effective as a remedy, the sodium bromide is far less hurtful, and should be preferred in cases requiring the protracted administration of such remedies. The point to arrive at in the course of the use of the bromides is an anæsthetic state of the fauces—an important fact which we owe to Voisin. The fauces must have their reflex sensibility so far reduced that no movements are excited by touching the palate, base of the tongue, or any part of the throat. The amount required to produce this result will vary, according to the individual susceptibility, from one half to two drachms per day, but it should be borne in mind that it is not the quantity of the medicine required, but the effect produced, which should guide the administration. Bromism may be prevented by the occasional use of a purgative, by maintaining free action of the kidneys, and by combination with Fowler's solution, two or three drops morning and evening. Next to the bromides, probably, are strychnine and picrotoxin in utility. The author has given strychnine with the bromides in cases of epilepsy occurring in weak and anæmic subjects. It is adapted to those cases in which there is mere instability of nervous matter, due largely to anæmia, and is contra-indicated in those cases characterized by exalted reflex excitability, with peripheral irritation. In the treatment of epilepsy by bromides, the mistake is made of giving it irregularly, or of suspending it capriciously. It should not be suspended, even if bromism occur; it should be diminished in amount and active elimination set up, and then resumed in the dose necessary to maintain anæsthesia of the fauces. It should be continued for a long period after the convulsions have ceased, probably not less than two years.

Cases of nocturnal epilepsy are not so much benefited by the bromides as the diurnal. In the former the author has seen better results from picrotoxin, and from curara, especially. In nocturnal cases characterized by depression, phosphorus and phosphide of zinc have seemed to do much good. In the state entitled "absence," *petit mal*, and in epileptic vertigo, nitro-glycerine has acted favorably.