mals by many of their instinctive acts. In following its instincts the animal obeys no conscious purpose, but is impelled by unfelt stimuli from within, these stimuli being furnished by the peculiar anatomical arrangements and nutritive needs of its nervous system, inherited from its ancestors. Instinct covers in the lower animals, however, both the acquired aptitudes and the psychical automatisms in man.

This psychical or cerebral automatism is perfectly illustrated in the conditions known as trance and somnambulism. Here consciousness, while not exactly abolished, is in an aberrant state (see *Consciousness, Disorders of*), the will is suspended, but thought and feeling continue, and the body responds in systematized and apparently intelligent acts.

There are two distinctions which in a medical study of psychical automatism must be made: First, unconscious cerebration is a different thing from the psychical automatism which we are describing. The term unconscious cerebration should be limited to that very large share of our mental life which runs on beneath consciousness. Few persons, in carrying on a train of thought, bring every link in the logical chain into consciousness. We pass with a step from the first term to the last, the intermediate process being subconscious. In the association of ideas, one mental picture is often followed by another apparently remote, the missing links not rising into conscious view. Unconscious cerebration, therefore, refers simply to the subconscious part of our ordinary thoughts and feelings, and is one of the modes in which the mind naturally acts. Second, cerebral automatism, as understood by some writers, such as Carpenter and Luys, is made to include cerebral reflex acts, *i.e.*, all the mental acts which arise involuntarily in response to a stimulus. Thus we are told that the ready response of emotion at a dramatic climax, the instant formation of judgment where certain simple and common conditions are present, are all examples of cerebral automatism. From this same point of view, the common sense of mankind is but the automatically formed judgment upon the various affairs of life, which rises alike in the great mass of men. There is propriety in this view, and lines of distinction must be somewhat arbitrarily drawn. Nevertheless, the acts referred to are much more typically réflex than automatic acts, as, for example, when a novel situation excites at once spontaneously a burst of laughter. And it is better to limit the term cerebral automatism to those conditions of the mind in which spontaneity is abolished for a time and the psychical mechanism acts entirely apart from any conscious stimulus.

Cerebral automatism, as thus limited, is pathological and has a medical importance. It is a condition that is brought about by a number of causes, and makes a somewhat different clinical picture accordingly. Cerebral automatic states may be classified as follows: The epileptic, the somnambulic, the hypnotic, the automatism of inebriety, of insanity, of narcotic intoxication, of syphilis, of injuries to the head, and of overwork or cerebral exhaustion.

Epileptic Cerebral Automatism.—The automatic mental state which occurs in epilepsy accompanies much more frequently *petit mal* than *haut mal*. It generally follows the attack, but sometimes precedes it, and still more rarely takes its place, in which latter case the terms psychical epilepsy (Hughlings Jackson), masked epilepsy (Esquirol), epilepsia larvata (Morel) have been applied. It is a transitory psychical disturbance, and only one of several forms which occur at this period (see *Epilepsy*). Cases of epileptic automatism are numerous. In the simpler forms, the patient simply proceeds to do some ordinary but inapposite act. Often he begins suddenly to undress, or tries to go upstairs, and will climb upon a chair, or table, or shelf. Very frequently he puts some object near at hand in his pocket. Much more complicated acts may be done. A patient of Le Grand du Saule's, after an attack, found that he had taken passage in a steamer for Bombay. Gowers tells of a carman who, after an attack, drove for an hour through the crowded streets without accident. Trousseau relates the case of an architect who, when seized with an attack, would run quickly from plank to plank without falling; and Gowers, again, had a young lady patient who, during the epileptic automatism, would play the most difficult music. In some cases the emotional faculties are more involved, and attacks of transitory mania, or furious impulse, occur.

Artificial Cerebral Automatism, Hypnotism, Trance.—In the condition known as hypnotism, trance, mesmerism, "electro-biology," the phenomena of cerebral automatism are very perfectly shown, and an understanding of it gives the key to all the cerebral automatic states. When the hypnotic condition is produced artificially in a man he is instructed first to fix his attention upon some particular object, such as a bit of glass, which is held slightly above the level of vision, so as to put the ocular muscles upon a certain strain. After a few minutes, in sensitive subjects, the nervous force seems to lose its equilibrium and to concentrate itself in one particular direction. Little force is left to supply the rest of the conscious functions of the brain, and the whole mental life of the subject is narrowed into one field. The mind is but a point. The equilibrium of nervous force being once overturned, it continues unstable, and can be turned in one direction or another, according to the suggestion of the manipulator. Thus the hypnotic thinks that he sees a beatific vision, and every capacity of his mental being is expended on the feelings that such a vision excites. Or he is told that he is a murderer, and must die, and he is overpowered with fear and remorse. Or his mind is directed to the idea that one side of his body is insensible; he then feels no pain on that side. In any case, his mental energies are all so absorbed by some single dominant feeling, that ordinary sensory impulses coming up to the brain impinge fruitlessly upon consciousness, and awaken no sensations. The hypnotic is to all intents and purposes anæsthetic, blind and deaf to everything except an expected suggestion from the operator, which is the only link that holds him at the time to the external world. Under the domination of some particular idea or feeling, his mind may automatically cause him to perform many complex and apparently intelligent acts. The concentration of nervous force upon some particular function, such as that of sight, hearing, or touch, exalts these senses, so that vision is clearer, hearing more acute, and the touch more sensitive (see *Hypnotism*, *Somnambulism*). Such is, in brief, the physiology of hypnotic automatism.

Although the hypnotic condition is usually produced artificially, certain persons of a highly sensitive, nervous temperament are subject to spontaneous attacks, just as other persons suffer from the similar condition of somnambulism. Indeed, spontaneous hypnotic attacks are a kind of day somnambulism. Individuals thus suffering are generally of a hysterical temperament, with deficient will power, and their hypnotic attacks may accompany, or be complicated with, attacks of catalepsy, ecstasy, or hysterical seizures of various kinds. There are persons who have a congenital tendency to fall spontaneously into hypnotic states. Such was the case with a patient of Le Grand du Saule's, who, whenever he got into a state of excitement or expectancy, would fall off into a hypnotic sleep. Some of the reported cases of morbid somnolence belong to this class (see *Sleep, Disorders of*). In other instances the tendency to spontaneous trance states is acquired, as in a case reported by Finkelnburg: a young woman, having been once mesmerized by a professional, ever after was subject to spontaneous attacks of trance.

The condition of trance, or one closely allied to it, is induced voluntarily by the so-called trance speakers. It may also be brought on by some periodically occurring affection, as was shown in a case related by Dr. B. F. Berkley (*Western Journal of Medicine and Surgery*, N. S., vi., p. 204). A married woman, aged thirty-nine, for years suffered from trigeminal neuralgia, which finally ended in a severe form of tic douloureux occurring every

two weeks. After each attack she fell into a state of "somniloquence" lasting for an hour or two. During this time she would preach on religious topics with some amount of eloquence. She was a modern illustration of the similar states into which the priests of the Delphic oracle went when uttering their prophecies.

Hypnotic states are generally brought to an end by the passes of the manipulator. If the patient is left alone the hypnotic state continues for some hours, passing finally into true sleep, from which he awakens spontaneously. In some persons who are subject or have been subjected to periodical attacks of hypnotism, the mind recalls in one attack what occurred in the previous one. After such a person comes out from an attack he has no recollection, as a rule, of what was done in it. There are considerable variations in the degree or intensity of the hypnotic state. In the slighter degrees it resembles considerably that of profound reverie or abstraction. There is a distinction, however, between the absorbed reverie of the student and the absorbed contemplation of the hypnotic. In the former case the mind is constructing and building under a certain kind of voluntary direction; in the latter the mind is going automatically over old ground.

Traumatic Cerebral Automatism.—Very rarely injuries of the head produce such a pathological change in the brain as to make the person injured the subject of periodical attacks of cerebral automatism. In these cases the mental condition is the same as if the patient walked in his sleep or had been artificially hypnotized.

One of the most typical cases of this kind is that related by Mesnet, of the French soldier who, after suffering from a severe injury of the head, used to pass into automatic states lasting for days. He would then unconsciously go through all the routine actions to which he had been accustomed, such as dressing, taking a walk, smoking, etc.

The Cerebral Automatism of Inebriety.—Dr. T. D. Crothers has related some remarkable cases in which the effect of the long-continued abuse of alcohol has been to induce periodic attacks of cerebral automatism. The patients fall into a state very much resembling that of hypnotism. In this condition they may go through the ordinary routine of life in so perfect a manner that no one would recognize the peculiar aberration of the mind. After a period of hours, or even of a day or more, normal consciousness returns and they remember nothing of what they have been doing. One of the most remarkable illustrations of this kind was that of a railway conductor who, after passing into the automatic state, would take charge of his car, run the train, collect tickets, make change, and do all the other duties of his position. Finally, after returning home and awaking, he could remember nothing of what he had done.

Briefer and less typical attacks of cerebral automatism occur undoubtedly in very many cases of chronic inebriety.

Syphilitic Cerebral Automatism.—Cerebral syphilis sometimes produces states of automatic mental action, though these are not of a very typical kind. The syphilitic poison causes a kind of somnolent or stuporous condition, in which the patient appears incapable of voluntary intelligent acts. When roused and set upon ordinary tasks or routine duties, he goes through them automatically and almost unconsciously.

The Automatism of Brain Exhaustion and Brain Disease.—Luys ("The Functions of the Brain," p. 183) relates the history of a young man who had been for several days engaged in making calculations of compound interest, which had caused a great tension of his mind. One evening, after dinner, he was about to go to sleep when, as he says: "Without the slightest encouragement on my part, in a state between sleeping and waking, I began, without the smallest volition on my part, to calculate and go over again exactly the same problems as when in my office. The cerebral machine had been set in motion too violently to be stopped, and this involuntary work went on in spite of me, and in spite of all the means I endeavored to employ to cause its cessation, that is to say, for from about three-quarters of an hour to an hour and a quarter." Many persons, after an evening of exhausting study, on retiring to bed have experiences somewhat similar to the above. Healthy persons also discover a little of this cerebral inertia in their disinclination, or even absolute inability, voluntarily to leave a task in which they are absorbed.

Dr. O. C. Gibbs (*Pennsylvania and Independent Medical Journal*, ii., p. 12, 1859) relates the history of a large, muscular man, aged fifty-five, who showed, in a permanent and exaggerated form, this kind of automatic condition. The person in question had been a hard drinker and smoker, but had suffered from no disease. His family at last noticed, however, that his mind was somewhat affected. His memory failed, and he would tell the most absurd stories. Gradually his intelligence diminished and his will became impaired. When he began to do a certain thing he had no power to stop himself. If he went to the barn to throw down hay he would never stop, unless interfered with, until he had pitched off the whole mow. If sent out to bring in an armful of wood he would never stop until the pile was all in, or the room was full. When he once commenced to eat, it seemed as if he could never cease. As his mind became more affected he gradually lost the power of balancing himself, and showed a constant tendency to go backward when standing, and to tip over backward when sitting. He slept much. His strength gradually failed, and he died with no marked symptoms. The diagnosis of cerebral softening was probably correct, although no post-mortem examination was made.

The Cerebral Automatism of Insanity.—The condition of cerebral automatism has been described as a form of insanity. But, on the other hand, there are forms of insanity in which cerebral automatism appears as part of the phenomena of the disease. Thus, maniacal states, especially those of epilepsy, and the impulsive acts in the various states of defective mental inhibition, may be looked upon as automatic.

Perhaps the automatic cerebral life in the insane is best shown in acute dementia, in which disease only the lowest of the mental functions remain, and the sufferer is guided only by the impulses and stimuli of his vegetative system.

In secondary dementia, and in idiocy and other states of mental enfeeblement, the mental activities, so much as remain, are more or less automatic.

Medico-Legal Relations of Cerebral Automatism.—In conclusion, I have only space to call attention to the very evident medico-legal importance of a knowledge of cerebral automatic states. This applies especially to the more frequently occurring forms, such as those of artificial, epileptic, and possibly inebriate, automatism. There is no doubt that a cerebral automatic is irresponsible, morally, for his acts, and except in inebriate automatism, the courts would sustain the medical view. Unfortunately, it is as yet practically almost impossible to demonstrate by objective tests that an accused person was really in an automatic state.

Charles L. Dana.

AUTOPSIES.—(Synonyms: Post-Mortem Examination; necropsy; Latin, *Autopsia cadaverica, sectio, obductio*; French, *nécropsie, autopsie cadavérique*; German, *Leichenschau, Section, Obduction.*) An examination of the body after death, to investigate the condition of the various parts of the body, to note any changes in the organs, and to determine as far as possible the cause of any such changes.

General Considerations.—An article intended, as this is, to aid the general practitioner in making a post-mortem examination would fall short of the mark were it to give simply the various cuts to be made in order to expose and permit of the examination of the different organs. While it would be out of the question, in a handbook, to detail all the possible alterations in the viscera, and the method of their recognition, yet there

are several points, apart from the question of the cuts to be made, which deserve attention.

The sooner after death an autopsy is made, the better, as putrefactive changes modify the appearances of pathological as well as of normal organs.

In case an autopsy is to be held, the undertaker should be requested to postpone the injection of any embalming fluid until the examination has been made, as the preservative fluids modify considerably the appearances, owing to the coagulation of albumen and the alteration of color produced thereby. If for any reason the autopsy is to be made late, it is desirable, where this is possible, to have the body kept on ice.

FIG. 444.

FIG. 445.

What shall the physician take to the house, and what may he rely on finding there? He should take instruments, twine, a sponge, and a rubber sheet a yard square. The fewer instruments he can get along with the better; there is less to carry; fewer to soil, and less liability of leaving any behind.

One needs a stout knife from seven to nine inches in length, of which half belongs to the handle, half to the blade. The blade should be from three-quarters of an inch to an inch and a quarter in width, varying according to the length (Fig. 444).

Also a sharp-pointed scalpel and a medium-sized pair of scissors. A pair of small, probe-pointed scissors, as represented in Fig. 445, is very useful, though not absolutely necessary.

One needs also a pair of forceps (Fig. 446) and a large needle (a sail needle that can be bought at a hardware store for a few cents will answer the purpose).

Two other instruments, not absolutely essential, though very convenient, are the costotome (Fig. 447), a stout pair of shears for cutting the ribs when calcified, and the enterotome (Fig. 448), a pair of long-handled scissors having one blade terminating in a rounded, hooked end, used in opening the intestines.

FIG. 446.

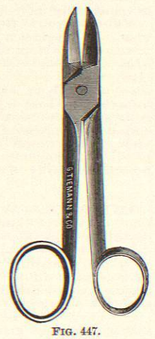

FIG. 447.

This outfit will serve for any autopsy in which the brain and cord are not to be removed.

To open the head, a saw (Fig. 449), a chisel (Fig. 450), and a hammer having the handle terminating in a hook (Fig. 451) are necessary.

To remove the spinal cord, a chisel known as a rachitome (Fig. 452) is very useful, though the ordinary straight chisel will answer the purpose.

One of the first requisites in an autopsy made in a private house is cleanliness, and in no way is this so much aided as by having a good sponge; a medium-sized, soft, lamb's-wool sponge is the best. The physician should never rely on finding this article at the house, but should take one with him. After the autopsy it can be washed with soap and water, and is then ready for use at the next autopsy. The better the quality of the sponge the longer it will last and the better work it will do.

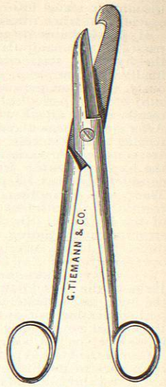

FIG. 448.

At the house there can be obtained the following articles: half a dozen newspapers, several pieces of old cotton cloth, a slop pail, and, if there be no running water, a pitcher of water.

The physician cannot be too careful to avoid wounding the feelings of the family in the house where the autopsy is made. A room left in a state of confusion, or the soiling of carpet, chairs, or utensils with drops of blood, not only gives offence to the friends, but often prevents the careless physician getting permission for autopsies in the future, as the family are very likely to give their neighbors an account of Dr. A.'s slovenliness.

In making an autopsy in a private house, it is often necessary to alter the position of table, chairs, or the like. Before any change is made, it should be the duty of the physician to take mental note of the arrangement of articles in the room, in order that, when the autopsy is finished, everything may be restored to its former place.

All articles required in making the examination should be obtained before the autopsy is begun.

The body will be found either upon a bed, with or without a board under it, or upon an undertaker's frame set on horses, or in an ice box. In any of these positions the examination can be made without moving the body, unless the head is to be opened, which cannot be done with the body in an ice box except the head be raised and supported above the level of the box.

FIG. 449.

FIG. 450.

The clothing covering the trunk should be torn down the middle line, in front, and drawn to either side. Newspapers should then be tucked in at the sides of the body, beneath the head and over the pubes, so as to cover the clothing, but to leave exposed the whole anterior surface of the trunk from the chin to the pubes. Should any fluid be spilled later, it will fall upon the paper and not soil the clothing.

The rubber sheet should be spread out on the floor near where the operator stands; the slop pail is to be placed upon it; the sponge should be moistened and be laid near the hand, ready for instant use; the instruments are to be placed upon a newspaper spread out upon the thighs of the corpse. All appliances are to be made ready before any cutting is done. Once a beginning is made, the performer's hands become so bloody that nothing can be touched later without soiling.

The physician should examine his hands carefully with reference to the presence of

cuts or abrasions of any sort. If there be any, they should be covered with contractile collodion. Do not use flexible collodion; it is likely to peel off during the autopsy. While performing the autopsy the operator should be careful to avoid scratching, cutting, or pricking his hands. If there is a suspicion in his mind of a wound received, it is best to wash and examine the place at once. The man who performs an autopsy may well apply to himself Spenser's line, "Of hurt unwist most daunger doth redound." Any wound should be thoroughly washed, squeezed, disinfected, and covered with collodion. The writer's experience leads him to believe that specialists in pathological anatomy, having their hands, as they do, almost daily in contact with dead bodies, are far less liable to infection from scratches or cuts than are those who only occasionally make an autopsy. Hence the greater importance of care in this respect on the part of the general practitioner.

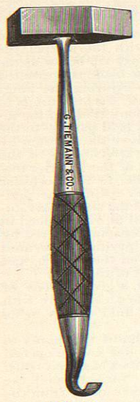

FIG. 451.

Every autopsy should be thorough, and should be made according to some definite method. The physician ought always to bear in mind the fact that an autopsy once made is made for all time. There is no going back, as there is to the bedside, for further examination in regard to obscure points. Whatever is to be observed must be observed before the physician leaves the house. Further, when organs or parts are separated in the dissection their relations are lost. Hence the importance of noting certain points before organs have been removed or their relation to other parts lost. A proper order in the various steps in an autopsy is of the first consequence.

That method is obviously the best by means of which the most will be discovered and the least overlooked. Nothing but practical experience can determine such a method, and the one given here is that which has been found by repeated trials to give the best results. It is essentially the method taught by Virchow and his pupils.

METHOD OF MAKING A POST-MORTEM EXAMINATION.—An autopsy consists of two parts—the external examination or inspection, and the internal examination. In a medico-legal autopsy the inspection is of the first importance. In the ordinary autopsy inspection should consist in noting the size, development, and nutrition of the body. Under the head of nutrition the amount of subcutaneous adipose tissue and the size of the muscles should be observed, the former by pinching up a fold of the skin. The presence or absence of rigor mortis, the degree of lividity of the dependent portions, should be noted. Among the common abnormalities are variations in the color of the skin, œdema of subcutaneous connective tissue, localized or diffuse, and localized lesions of many kinds. A greenish discoloration of the abdomen, if present, should always be noted, as it indicates that putrefactive changes have begun, and this fact may modify the interpretation of appearances observed in the internal organs.

Internal Examination.—In the majority of autopsies performed by the general practitioner the examination is limited to the thorax and abdomen. In case the head is to be opened it should be done before the thorax, otherwise much of the blood in the veins will have escaped through the divided superior cava, and a correct determination of the amount of blood originally in the brain cannot be made. The spinal cord is best removed after the brain, but before the thoracic and abdominal cavities are opened, especially in a private house, because of the soiling which is sure to take place from escape of blood from the latter cavities, if they have been first examined, when the body is turned on its face.

The best order of procedure, then, is brain, spinal cord, thoracic and abdominal organs. Inasmuch as only the thorax and abdomen are examined in the majority of cases, the method of doing these will be given first, then the method of examination of the brain, and finally that of the spinal cord.

The character of the incisions in an autopsy is the opposite of that of the incision in an ordinary dissection. In a dissection one uses the point of a scalpel held like a pen, the fingers and wrist alone being moved. The point of the knife describes the arc of a circle, thus making a series of irregular nicks. Although such cuts are well adapted to the isolation of parts in an anatomical dissection, yet they are the worst possible for removing organs and displaying the interiors, requiring much time and leaving an irregular, hacked surface. The cuts to be made in an autopsy are long, sweeping ones, using the whole cutting edge of a large knife held firmly in the fist in a line with the forearm; the wrist should be kept immovable, the elbow and shoulder joints alone being moved. In this way one may rapidly make large incisions having smooth surfaces and a straight bottom.

One other point is worthy of mention. All parts should be put upon the stretch when they are incised; but put them upon the stretch first, then cut. Never try to seize and cut at the same time, as one is in this way liable to cut one's self.

To examine the thorax and abdomen, take the large knife already described (Fig. 444), grasp it firmly in the fist, make an incision in the middle line anteriorly, beginning at the sternal notch and ending at the pubes. The knife should be held parallel to the body, so that its whole cutting edge is brought into use. Over the sternum the incision should be carried to the bone; over the abdomen, to a depth varying with the thickness of the abdominal wall, going nearly but not quite through it.

It is best to carry the long primary incision to the left of the umbilicus, so as to avoid the round ligament. Next, by means of several short cuts carry the incision through the abdominal wall at the tip of the sternum, making it long enough to admit two fingers. Insert the fore and middle fingers of the left hand into this incision, and make strong upward and outward traction on the right half of the abdominal flap. This serves the double purpose of drawing away the flap from the intestines, thereby lessening the risk of cutting them, and it puts the abdominal wall upon the stretch, permitting of its easier incision. Now complete the cut through the abdominal wall to the pubes.

FIG. 452.

Next divide the pyramidales muscles at their attachment to the pubes; this allows of a greater lateral withdrawal of the flaps, and gives better opportunity for the examination and removal of the abdominal organs. In some countries it is customary to make transverse counter incisions in the abdominal wall from the umbilicus outward. This is a bad practice. It is unnecessary so far as room is concerned, and there is the disadvantage of increased mutilation, more sewing, and greater liability of leakage.

While the long primary incision is being made the operator should have the sponge ready to absorb any fluid that may escape. If there be much fluid in the abdominal cavity, it should be removed at this stage.

The next step in the autopsy is to determine the position of the arch of the diaphragm. To do this, insert the right hand, palm upward, beneath the ribs; pass it along the inner surface of the ribs until the highest point