few words; namely, chloroform and bromide of potassium. It is a well known fact that chloroform inhalation has a remarkable power of arresting epileptic convulsions. Its action in warding off a threatened fit, and in cutting short a violent and prolonged paroxysm, is uniform and certain; as uniform and as certain as the influence of sudden and extreme anæmia in exciting convulsions. I for a time supposed that the chloroform acts by relaxing the cerebral arteries; but Kussmaul and Tenner have shown that animals, when etherised, get no convulsions while being rapidly bled to death, or when their arteries are ligatured. It is probable, therefore, that anæsthetic vapours prevent or stop convulsions by lessening the reflex excitability of the nervous system, so that convulsions do not occur in etherised rabbits, even though the brain be rendered extremely anæmic by hæmorrhage or by arterial obstruction.

Recent experience has amply proved that the bromide of potassium, in full and frequent doses and sufficiently long continued, is of great value in the treatment of epilepsy. The known physiological action of this medicine renders it probable that its curative effect in epilepsy is a result of its soothing, sedative, anæsthetic influence upon the nervous centres, whose reflex excitability it lessens. In short, its action in preventing convulsions is analogous to that of chloroform, differing in being less powerful and rapid in its operation, yet, by frequent repetition, its influence may be rendered more durable and more permanently beneficial.

PLUGGING THE POSTERIOR NARES IN CASES OF PERSISTENT EPISTAXIS.

By G. D. R. MCCARTHY, ESQ., Wrockwardine Wood, Wellington, Salop.

I FEEL obliged—in common, no doubt, with the rest of my professional brethren—to Mr. Mackenzie, Surgeon to the Sidmouth Dispensary, for the interesting account, in the BRITISH MEDICAL JOURNAL for February 8th, of his successful operation in a case of persistent epistaxis; and, having several times performed it with success myself, I beg leave to state the cases briefly and as correctly as my memory will enable me.

It was from my father, a surgeon many years in practice, that I learned the manner of doing it; but had never availed myself of it till about twenty-five years ago, in the case of a man, if I recollect right, of middle age. I adopted the same plan as stated by Mr. Mackenzie, but with a piece of thick catgut; and it succeeded. The next was a girl, about fourteen or fifteen years old, of a delicate constitution, and of hæmorrhagic diathesis, for she subsequently had a copious attack of menorrhagia. The bleeding from the posterior nares was very profuse and persistent, running down into the stomach, and vomited up in large quantities. So, perceiving that to plug the nostrils would be of no use, I passed a piece of thick catgut, to which some silk was tied, having at the other end a plug of lint moistened with water and rubbed in flour. By this means, all escape of blood from the back passage was arrested; and, the silk being secured to the face by adhesive plaster, and the nostrils plugged, all was right. The girl, several years afterwards, I believe, became hearty and well.

The next case was a man, aged about 50, of a constitution much injured by intemperance. The blood was running down from the back of the nares in great quantities, and vomited up in a short time. In this case, I used a tolerably sized bougie, which I found better than catgut. It was easily seized by a pair of curved forceps which I had for the purpose of extracting pins or other foreign bodies from the pharynx, and, the end being brought out of the mouth, and a notch being cut in it, the silk, to which the plug was fixed, was tied to it, and drawn to the back of the passage as before. The epistaxis was instantly arrested.

The last case was a girl, highly nervous and hysterical, aged about 15 or 16. I adopted the same plan, and with success. I found, however, that the silk had cut a little through the ala of the nose; which induces me to think that the lower it is fastened on the face, the better, so as not to be affected by the movement of the lower jaw.

Mr. Mackenzie's plan for removing the plug is very ingenious; but the fact is, in my practice I have not had occasion for it. For, somehow, the silk gave way in two or three days; and the plug, of course, passed away, to be seen no more, though rather to the surprise and uneasiness of the patient's friends. I think I should hardly feel disposed to pass anything to remove the plug, or even to inject warm water, lest I should bring on a return of the epistaxis.

It is pleasant, in cases of this kind, to know that we have so easy (though, indeed, requiring some little manual dexterity) a method of arresting the hæmorrhage, which may baffle all our attempts with styptics.

CONTRIBUTIONS

TO

A NEW CHAPTER IN THE PHYSIOLOGY AND PATHOLOGY OF THE NERVOUS SYSTEM.

By THOMAS LAYCOCK, M.D.,

Professor of the Practice of Medicine and of Clinical Medicine, and Lecturer on Medical Psychology and Mental Diseases in the University of Edinburgh.

IV.—THE CORRELATIONS OF THE VIS NERVOSA, THE VITAL FORCES, AND CHEMICAL AFFINITY.

MY history of the theories that have been devised to explain the relations of the nervous system to nutrition ends with the doctrine, that the *vis nervosa* and the vital forces on which nutrition and development depend are correlative with the molecular or physical forces of nature. This doctrine brings all the fundamental questions of biology into immediate relation with the most fundamental questions of both physics and metaphysics; so that, if the modern physician would fathom the depths of medicine from its new stand-point, he must be *physicien*, chemist, mathematician, and metaphysician, as well as practitioner. Feeling incompetent so to deal with the new doctrines, I shall only attempt to examine them critically in their relations to better clinical observation and practice.

The physicists say that, when the velocity or direction of motion of a body, or both, change, "we naturally attribute this to some extraneous cause. . . . This cause, of whatever nature it be, is known by the general name of force." (*Dynamics of a Particle*, by Professor Tait, chap. i.) Matter, it is affirmed, has in itself no power to set itself in motion if at rest, or to change its own velocity or direction if in motion. This negative quality is termed the "property" of *inertia*. Force is not always so applied as to cause motion in space; but, when so applied, its equivalent is termed energy. So, also, matter has not always force applied to it, so as to cause it to move if at rest (inert); but, when force is so applied, it manifests energy in resistance to the force: this is termed *vis inertiae*. Inertia is, therefore, a force-equivalent. It is obvious from all this, that these fundamental laws of motion only express our experience of motion as produced by ourselves, and our thoughts thereon: so that, in fact, all our notions of force and motion depend primarily upon the laws of muscular energy, and its applications to cause motion.

But the physicists, abandoning vital dynamics at their origin, proceed to the dynamics of inorganic matter, and investigate the relations of a "particle" or molecule of matter to force and motion; and they further proceed to say that the molecules of matter are in incessant motion, due to molecular forces; which, however, can be converted into each other, and into the work of simple motor force, as expressed by a given weight lifted a given height—foot-pounds or foot-tons: so that, however force may be manifested as energy, it is never lost, but converted into, or "conserved" in, some other form of motion. Thus muscular energy may be made to produce heat, light, electricity, galvanism, magnetism, and that regulated attraction and combination of particles or atoms of matter attributed to chemical affinity; and each may be converted into the other. Physiologically, the *vis insita* of contractile and muscular tissues and the *vis nervosa* of animals, together with the vital forces of vegetables and the contractility and elasticity of tissues, are held to be thus correlative with these causes of molecular motion.

Admitting the doctrine as to the general resemblances of these applied forces or kinds of energy, what we want to know with reference to nutrition and the vital forces is, how they differ in relation to the different kinds of matter of which living tissues are constituted. It is not enough to this end to say that the energy operative in chemical action can be expressed in foot-tons or foot-pounds. This induces very varied changes in the relations of the elementary constituents of matter termed atoms and molecules. It appears that there are at least sixty elementary bodies which thus differ from each other in their atomic constitution. At least fourteen of these enter into the composition of the blood and tissues of the human body, and subserve to vital action. Now, to this end, their moving atoms or molecules undergo a series of ascending combinations. The primary molecule, being either one rotating molecule or two rotating in relation to each other, may unite with one or more of the same kind, when the compound is termed *allotropic*;

oxygen, iron, sulphur, and phosphorus are of this class. Or, secondly, and what is more commonly observed, unlike elementary bodies, combine so as to constitute compound moving molecules; and these again with other unlike compound molecules in long series; but each combination, as in allotropy, results in the constitution of a different kind of matter. It is by such a series of ascending combinations that organic matter in all its varied forms of germinal stuff, cell, tissue, and nerve, is constituted. As it is chemical affinity which regulates all these changes, it follows that that force regulates not only those changes of velocity and direction of motion in space which dynamics discuss, but also successional changes in time, the result of which is the evolution of different kinds of matter from the simple in combination of molecules to the complex.

Now, if we consider what correlates this *regulating* physical force in life and organisation, we find it to be that known as *vis insita* and vital force; for all elementary changes whatever can and do go on in the tissues of both vegetables and animals independently of a *vis nervosa* and nerve-tissues. As to the latter, the same law of evolution holds good; for both are evolutions from the general to the special, inasmuch as brain and nerve function is to control and combine into a whole—an unity—all the various changes going on in the organism, so that the ends aimed at in life and organisation may be duly attained. Thus the highest evolution of chemical affinity, as an arranging force in brain-tissue, is in immediate relation with consciousness, and with its fundamental fact, the Ego, or I, or the One. Consequently, chemical affinity, as thus manifested in the results of chemical action, cannot even be thought about as a *cause* of atomic motion in living organisms, and most obviously in regard to muscle and brain energy, without at the same time considering what are the relations of the laws of molecular motions as chemical action to that adaptation to ends which is the result of all the molecular changes that all living matter whatever undergoes. Here, then, the same difficulty arises which (as I have already shown) has beset all inquiries into the functions of the nervous system, and into their relations to nutrition on the one hand and states of consciousness on the other. Thus it is plain that the solution of the most fundamental questions in life and organisation and mind depends upon a knowledge of the laws of complex combinations of atoms in motion, as well as of the laws of motion. It is precisely such a kind of knowledge as that which constitutes the science of astronomy.

Since chemical action takes place when the mode of combination of moving atoms or molecules is changed, a primary inquiry arises as to the various modes in which they do, can, or may combine. Cohesion is one mode; but that involves no chemical change. Solution is a molecular mixture of atoms in fluids and gases, whereby they come into contact by the force of cohesion, or are repelled from each other by heat. Chemical change is thus facilitated, and may result, but not necessarily. A third mode of combination is true chemical action, which consists of two distinct processes; viz., first disarrangement of the existing atomic combinations of the two combining bodies, and then re-arrangement. The chemist names that process *dialysis* by which he artificially separates elementary bodies from each other when in mixture; *analysis*, that by which he artificially disarranges the atomic combinations; and *synthesis*, that by which he artificially re-arranges them. These three modes of combination are not only manifested in the chemical processes of nutrition, but are essential to them as a whole; and for this combination the chemist has no name. Much less has he a name to denote the conjoined processes of disarrangement and re-arrangement in ascending series and evolutionally to ends, from the simple to the more complex, which is of the essence of bio-chemical energy. Oxidation, eremacausis, and the like, imply merely analysis and synthesis; *diastasis* is a name for a compound. I propose, therefore, to designate this entire result of chemical energy by the word "*diathesis*", from *diatithemi*, I arrange. The word is already in general use pathologically (commonly pronounced "*diathesis*"), to indicate that particular arrangement in an individual as to tissues which constitutes a tendency to disease of particular kinds of tissues.

Let us now examine chemical affinity as manifested in the chemical action or diathetic energy of different kinds of matter. The changes which the sperm-cell and germ-cell undergo are biochemical changes, eminently diathetic. Besides the hydrogen, nitrogen, and carbon, from the combination of which with the oxygen of the atmosphere chemists say energy is produced, they contain at least two other important elementary bodies highly diathetic; viz., phosphorus in the spermatozoa, and sulphur in the albumen of the egg. If we ask chemistry what are the chemical relations of these two bodies to vital action, we have literally no answer; and yet, as a fact of experience, nothing is more certain than that they are as essential as oxygen, carbon, and nitrogen to all vital changes. The large trade in phosphatic manures is a sufficient proof of the importance of phosphorus to vegetable life; and

the quantity contained in visceral, muscular, and cerebral tissues shows how important both are to animal and mental life. In diseases, too, of these tissues, they are both abundantly excreted. In therapeutics, both have an increasing value; that of phosphorus in diet and medicine has only recently been recognised, but sulphur was formerly so much esteemed in medicine that it was named divine (*theon*). Now, the differences between elementary bodies as those just named may consist either in differences in the *inertia* of the basic atoms, or upon differences in the velocity or the direction in which they move: so that differences in their combining proportions, when determined by weight, may indicate atomic differences as to *inertia*; and when by volume (or space occupied), differences of velocity of motion. Now bodies may be isomeric as to either weight or volume, and yet differ as to kinetic force. Thus Dr. B. W. Richardson shows, by his very ingenious experiments, that two anæsthetic fluids isomeric in composition—viz., the acetate and formiate of methyl—so differ in the mixture of atoms that, while the acetate requires a temperature of 268° Fahr. to vaporise it—that is, to overcome atmospheric pressure—the formiate requires only 121° (*Med. Times and Gazette*, Feb. 22nd). And Dr. Richardson shows further that neither the specific gravity of the fluid nor the density of the vapour explains the difference. It can only be referred to an evolutionary law. In particular series, those compounds of the class in which the carbon-molecule is increased require a higher temperature. The varying intensity of action of drugs in men and animals seems referable to some similar law. Thus two rising Edinburgh chemists, Dr. Crum Brown and Dr. Fraser (in a paper read to the Royal Society of Edinburgh), have detailed a well-conducted series of experiments showing that the intensity of action of the poisonous alkaloids, strychnia, brucia, morphia, codeia, nicotia, is greatly diminished by combination with the iodide or sulphate of methyl; and the mode of action is also changed. Strychnia, thus modified, is made to resemble in its action the curare or wourali poison, causing paralysis instead of spasm.

It is probable, from these facts, that the chemical action of the elementary bodies has some as yet hitherto unnoticed relations to a diathetic force, which is correlative with both complexity of combination and evolutionary differentiation of molecular motions. But this is not all; in the instances quoted, such molecular motions occur either as vital action or as the results of it; and, whether occurring in vegetables or animals, are inseparably in relation with heat. Thus, in generation, so soon as the sperm-cell, with its highly diathetic elementary body, phosphorus, comes into contact with the germ-cell and its sulphur element, there is an integration, or mixture, or fusion of the two, provided the temperature be suitable, so that both change their molecular composition, and a new—the primordial—cell, with its germinal matter, is formed. This is stable until the further application of heat (in incubation), when another series of molecular changes begins, cells multiply by division, and integrate into tissue, and all the processes termed vital action go on in continual evolutionary series.

Professor Beale, in his interesting microscopic researches into "germinal matter", has demonstrated that a similar series of changes takes place in the elementary constituents of living tissue. A like law of diathetic energy is also manifested by the microscopic particles or organisms known as ferments, and which have so important a share not only in the various processes of the arts, but also in the development and mortality of epidemics and fevers. The greater prevalence of epidemics of late years may be referred to the same class of causes which have influenced the development of that greater susceptibility of the nervous system to undergo change that characterises homeopathic and mesmeric "sensitives". We have only to substitute "ferments" for drugs and mental influences, and the analogy is complete. For example, a deficiency in iodine, or sulphur, or phosphorus, in the tissues, may render a person more sensitive to the physiological action of the alkaloids. Exhausting illness, especially if the nervous system suffer, induces this susceptibility. When I was suffering much from pain and exhaustion, I took a dose of tincture of aconite, which I was assured did not exceed one minim, yet it so modified my brain-tissue, and therewith my perceptions, that the scream and rattle of a midnight railway-train was transformed into the grandest ærial music pealing amidst landscapes of surpassing beauty. I felt and studied at the same time the tingling of the tongue and the muscular twitches that aconite causes. A simple act of listening restored the railway rattle to its normal cadences; and all this change in the diathetic condition of the brain-tissue must have been caused by a quantity of the drug so very small that, under other conditions of nutrition, it would not have been felt. When we thus take a comprehensive view of the results of culture, whether of plants, or animals, or man, and examine into the causes of epidemics and of endemic degenerations like cretinism, the conclusion is strongly forced upon the mind that the great laws of development and decline of individuals and nations are in close relation with the due supply for nutrition of certain diathetic com-

pounds, like iodine and chlorine, sulphur and phosphorus, and the oxides of calcium, sodium, and potassium. As to these points, the foot-pound reveals nothing, and chemistry is almost a blank. What method of research should be followed, is for the scientific inquirer to determine. It appears to me, however, probable that, since motions to ends are the things to be observed and compared, the "graphic method" already so usefully and successfully applied to physiological research will have a still wider application, and will ere long take its place besides spectrum-analysis. For example, the vibrations of air around us, and of a hypothetical ether, as light, and all their relations to the changes they induce in the sense-nerves and cerebral centres in relation with consciousness, admit of this kind of observation. A higher mathematics may also bring out new laws.

A new atomic theory has been lately promulgated, according to which elementary bodies and molecules are constituted of elastic rings linked together as duads—the atom of sodium, for example, consists of two rings—or more complexly, and rotating according to harmonic ratios. On the 18th of February, 1867, Professor Sir William Thomson read a paper to the Royal Society of Edinburgh on these "Vortex Atoms", in which, after noticing Helmholtz's "admirable discovery" of the law of vortex motion in a perfect liquid (*i.e.*, without viscosity or fluid friction), he pointed out that it inevitably suggested the idea that Helmholtz's rings are the true atoms. It is only needed to assume that they possess inertia and incompressible occupation of space, and the hypothesis will serve to explain the elasticity of gases, and the varieties and allotropies of known simple bodies and their material affinities. I must refer to the published abstract of the original paper for further details. (*Proceedings of the Royal Society of Edinburgh*, 1866-67, No. 73, p. 94.) It is utterly impossible to do justice here to the new range of inquiry which such a change in the atomic hypothesis opens out, and of which we shall hear more from Sir W. Thomson. I will, however, mention one fact. The dynamical theory of spectrum-analysis, as taught by Professor Stokes before September 1852, required that the ultimate constitution of simple bodies should have one or more fundamental periods of vibration, as has a stringed instrument of one or more strings, or an elastic solid consisting of one or more tuning-forks rigidly connected. Sir William Thomson shews that the hypothesis of rotating or vortex atoms is congruous with this theory, while that of the Lucretius atom is not. Now, if we apply this hypothesis to aesthetics, and to the best theory I know—that of D. R. Hay—as to the Ideal in form, colour, and sound, we find that the principles are purely harmonic ratios of vibrations of the same dynamical kind as characterises alike the harmonic movements of the planetary system and of chemical molecules or atoms. (See my "Further Researches into the Reflex Function of the Brain", *Brit. and For. Med. Chir. Review*, vol. xvi, 1855, p. 155.)

I will add a few words as to the evolution of the molecular forces and their relations to the great forces of Nature. If it be true that rotation is the primary form of motion, then there is a correlative primary force. In nature this is solar and planetary; light is motion from a rotating body, the sun—magnetism and its correlative galvanism motion from the rotating earth. It is a simple truth, that the planetary or cosmical forces are our forces. Our eyes and our brains are so perfectly adapted to solar and planetary light that, although we have not yet mastered the mechanism, we know enough not only to feel assured there is no greater wonder in creation, but also that, if our hearing mechanism were equally adapted to those ethereal vibrations, we should hear the "music of the spheres." Such, indeed, are the close diathetic relations of the solar forces to life and organisation, that the most wide-spread religion of antiquity—the worship of the sun, and light, and fire—was founded upon them. Modern chemistry would be imperfect without a knowledge of the three kinds of forces, chemical, luminous, and calorific, which are communicated by the solar rays. And even the rotation of the earth on its axis is too important a kind of motion not to be of importance in considering the relations of the nervous system to terrestrial magnetism. Although we may not be able to concede to the mesmerists that the human body is a magnet, there are facts that serve to shew it is influenced by the great magnet on which it dwells.

The correlations of consciousness and organisation, from these new points of view, belong to Medical Psychology; and I refer the reader to my published work for the applications of them to theory and practice. (See "Mental Dynamics" in *Mind and Brain*, vol. i, part 3, p. 217; and "Mental Physiology", vol. 2.) I need only add here, that the order in which molecular changes occur to ends needs to be investigated, not only in relation to the forces that excite them, but to the ends obtained and the thought involved in the order and the ends.

I shall endeavour to illustrate practically, under the guidance of these principles, the effects on the nervous system of spermatorrhoea, and of excessive and unnatural excitation of the sexual feelings in both sexes.

ON THE MANAGEMENT OF SEVERAL FORMS OF UTERINE HÆMORRHAGE IN PARTURIENT WOMEN.

By HUMPHRY SANDWICH, M.D., Beaconsfield, Bucks.

THE following cases, the details of which are copied from my Case-Book, are forwarded in aid of the well conceived design of "preserving from oblivion the notes of very many useful and instructive occurrences in private practice," and of thus handing down to posterity "the hitherto unwritten" mass of "obstetric experience." The writer's chief difficulty is the cultivation of "brevity and condensation."

1. *Case of Incipient Asphyxia from Uterine Hæmorrhage after Labour.*—Having met with several examples of excessive uterine hæmorrhage, both that which results from atony of the uterus, and that which occurs in women of high nervous irritability, their effective management has occupied much of my attention. Occasionally I have met with both these morbid predispositions in the same individual. A most exquisite example of these two sources of danger occurred to a lady in Bridlington, at the birth of her eighth child, in the year 1829. She had had her children rapidly up to that time, in addition to one or two miscarriages. Her constitution was of that kind which predisposes to chorea and nervous angina, traces of which complaints had occasionally appeared. At this time also she was habitually dyspeptic. She had a favourable labour on the present occasion, and the placenta was thrown off in rather quick time. The uterus contracted not with a permanent and steady contraction, but evinced that tendency alternately to contract and relax, which gives the accoucheur no little anxiety. The hæmorrhage following parturition was not inordinate during the first half hour. Soon afterwards, the nurse informed me of its increase. The uterus had now become soft, boggy, and augmented in volume, indicative of internal hæmorrhage. The napkins also shewed signs of a decided flooding having set in. The patient began to sigh, and to complain of faintness and a sense of indescribable wretchedness. In spite of the prompt application of towels wrung out of cold water, applied both to the uterus and the vulva, and firm pressure on the uterus by both hands grasping that organ through the wetted napkins, the symptoms of decided collapse quickly supervened, with indistinct vision, ringing in the ears, and other signs of enfeebled circulation. The extremities also became rapidly cold, and a sense of impending dissolution seized the unhappy sufferer. By this time, however, the local application of cold had produced contraction of the womb, the action of which, assisted by the pressure of the hand, expelled many coagula with much fluid blood. The advantage thus gained was secured by the continued pressure of one of the female assistants, and the steady application of the cold napkins. To meet, however, the general sinking of the circulation, brandy in small doses, alternated with five grains of carbonate of ammonia, made still more cordial with the aromatic spirit of ammonia in peppermint water, was freely given. Cold water was frequently dashed on the face, the head being thrown back and below the horizontal level. Meanwhile, bottles and tins filled with hot water, and wrapped in flannel, were applied to the feet, the hands, and the scrobiculus cordis. Notwithstanding these remedies, aided by laudanum interposed in suitable doses to quiet irritation, the action of the heart was sustained most imperfectly and with extreme difficulty for several hours. The patient continued as cold and blue as one in cholera, or as a person who had been submerged some time under water, and in whom there was a dubious struggle for resuscitation. The dyspnoea was extreme, and the difficulty of swallowing, as well as aversion to the trouble of it, equally extreme and distressing. I persevered, however, most resolutely in pouring down the throat wine, brandy, and ammonia, and in having the extremities rubbed with warm towels, while the cold ones were at length removed from the abdomen. Eventually the storm subsided, but not before the lapse of many hours, there being a strong tendency to relapse. As soon as some warmth was restored, I kept it up by the expedient of directing two of the servant-maids to undress, and fold their mistress in their arms. This measure acted most beneficially in maintaining animal heat. The patient took more than a pint of brandy and other cordials before she rallied. Some intoxication ensued.

In order to shew that this attack, though rendered more desperate by the loss of blood, was dependent chiefly on an idiosyncrasy of the nervous system, it is only necessary to mention the fact that, about two years afterwards, the patient suffered from a similar and most perilous attack of impending asphyxia from nervous angina, brought on by an inordinate application of the mind to her domestic concerns, *when she was not pregnant*. Moreover, ten years afterwards she had an analogous