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.III.—MESMERISM, HOMŒOPATHY, CHANGE OF TYPE, AND NATURE,
IN RELATION TO NERVE-NUTRITION.

THE mental and bodily conditions induced by mesmeric, spiritualistic, and other processes, are due to nutrient changes in the brain and nervous system of which so little is known scientifically, that the phenomena are often termed mysteries. It is this ignorance as to their nature and origin which infects the theories constructed to explain them with mysticism; for the word mystic, although in its primary meaning synonymous with mysterious, is now practically used to indicate, in science, something hidden or "occult" as to cause, and distinct from ordinary phenomena—in religion, something sacredly remote from human knowledge and comprehension. The occult in science is often, for obvious reasons, conjoined with the mystic in religion. The cerebro-mental condition of mystics of all sorts and degrees belongs to that section of our new chapter which is devoted to medical psychology; it is the so-called facts of the mysticisms that we have to examine, in their relations to the influence of the nervous system and *vis nervosa* in nutrition, and to the vital powers.

At the risk of being thought egotistical, I will restrict my history, in elucidation of these questions, to my own labours, as the shortest and simplest method of inquiry.

Mesmerism first very seriously attracted scientific attention in this country when Dr. Elliotson adopted, in 1837, the theories of Mesmer and his followers, as explanatory of certain phenomena manifested by the O'Keys, two girls who were under his care in the North London or University College Hospital. Knowing that Dr. Elliotson was a thoroughly honest observer and inquirer, however much he might be mistaken in his theories, I took the opportunity of investigating the facts clinically, which my appointment as house-surgeon to the York County Hospital afforded me. The results of my inquiries appeared in successive numbers of the *Edinburgh Medical Journal*, January 1838 to July 1839 inclusive. I detailed first a series of cases of anomalous forms of hysteria, and then gave an analysis of the phenomena, both in relation to the mesmeric theories and to the then known facts of neurology and pathology. Fortunately, I was in some degree prepared for a more comprehensive method of inquiry by previous pursuits. When I was a student (1833-34), the question of oceanic steam-navigation was warmly discussed, and its practicability doubted; and I then speculated upon the possibility of substituting some other force for that termed heat as a motive power. To this end, I had gone over what have been more recently termed the correlations of heat, magnetism, electricity, and chemical affinity; and had arrived at a hypothetical source of motor force, and at a notion of a mechanism appropriate thereto for oceanic navigation, neither of which have, I believe, as yet occurred to speculative inquirers and physicists. The first conclusion to which I came in my mesmeric researches was, that all the inferences of mesmerists as to a new force in Nature were without foundation; and that, when all deceptions and tricks were eliminated, the phenomena could be referred to known general laws of life and organisation, provided they were considered in their true relations to those laws. On the pathological and clinical side, the subjects of the experiments manifested defective cerebral function. They were chiefly young women or pubescent girls, either actually suffering from some kind of nervous affection, or predisposed thereto; and, when males, they were already epileptic, or of nervous tendencies. The functions of the brain and nervous system in all were so easily disturbed by agencies either not felt or inoperative in healthy persons, that they were, and still are, designated "sensitives" by the mesmerists. Nor, when looked at from the side of mental pathology, were the fraudulent tricks practised by hysterical girls and epileptic lads on mesmerisers (and which required to be carefully eliminated from the other phenomena) without scientific value. The practical applications of mesmerism to the production of anæsthesia, the cure of nervous

disorders, and the removal of local diseases of structure, also required to be brought into their therapeutical relations. Thus, upon a general view of the subject, the inquiry resolved itself into the old question of morbid sympathies and *consensus* of parts; and I finally came to the conclusion that the brain (the organ of consciousness and thought), like other parts of the nervous system, was subject to the laws of reflex action. And so the old question, so hotly discussed during the last century, reappeared, but in the higher range of cerebro-mental phenomena. Of late years, the doctrine of "unconscious cerebration" has so familiarised men's minds with a different view of things, that it would be difficult to give the present generation of students an adequate idea of the obstacles to research which the current doctrines as to the nature and causal relations of consciousness raised up; they seemed to me at that time almost insuperable. Nevertheless, an extension of the inquiry into the whole range of biology led me to the conclusion that cerebro-mental changes are not due to consciousness and will as direct or absolute causes, but to something beyond. This proposition I subsequently formalised, in a correspondence I had with the late George Combe and Professor Reid, thus: "The development, conservation, and reproduction of all organisms are regulated by an unerring law of design—a law as generally applicable to living matter as the law of gravity to universal matter. This law must be our guide in ascertaining the relations of the reflex, instinctive, emotional, and voluntary movements." (*Lancet*, vol. ii, 1845, p. 256.) I found that this principle was a clue to the pathology of all those obscure mental phenomena so wondrous when produced mesmerically, so varied in diseases, hallucinations, delirium, insanity, and so various in their pathological and therapeutical relations to corporeal changes. I remarked, for example: "52. External stimuli induce such changes in the nervous centres, that the involuntary motions termed reflex follow:—Can they induce analogous sensorial phenomena? 53. Dreams have hitherto been amongst the most inexplicable phenomena of mind." And then I proceed to show that the leading principle of Dr. M. Hall's theory applies to dreams, and that they might be termed "excito-sensory" (See my paper, *op. cit.*, p. 18.) The doctrine applied equally to insanity. My fundamental conclusion—viz., that all cerebro-mental changes occur independently of the will and consciousness, and that both are due to a more general cause—has never yet been comprehended even by those who have attempted to apply my doctrines to mental pathology. For this reason, they speak of "guiding sensations", of "pain causing" this and that, of "ideo-motor" phenomena, and the like. These phrases are correct in the same sense that we say the sun rises and sets, but are not scientifically true. A change in the brain-tissue is equally necessary to both sensorial and motorial phenomena; but either class may occur without the other, provided that change in the brain-tissue proper to one class occur without the other. Thus the inquiry into the causes of both adapted motions and states of consciousness passes into the sphere of vital dynamics and the correlative physical sciences.

The hysterical cunning (instinctive or impulsive insanity) exhibited by some of the subjects of mesmeric experiments directed my attention to the action of the reproductive organs in those nerve-centres which, in lower animals at least, subserve to various instincts having for their object the maintenance of the species; and I thus, by comparing the facts of natural history with those of mental pathology, discovered that the uterus and ovaria in women exercise such a direct influence upon the functions of various nerve-centres, that singular aberrations of the sexual and maternal instincts are sometimes manifested. I found, too, that numerous spasmodic disorders, neuralgiæ, and functional and structural diseases of such organs as the tonsils, thyroid body, and kidneys, as well as the mammae and stomach, were also in relation with the uterus and ovaria. The cases of hysterical cunning requiring great accuracy of observation, I had one—a case of urinous vomit—watched closely and unremittingly for forty-eight hours—i.e., until the fraud was detected. These "sympathies" between the nervous system of women and the reproductive organs are often exaggerated during menstruation and pregnancy, and at periodic intervals. Of this the kleptomania of pregnancy is an illustration. Starting from this general fact, I carried out another inquiry into the laws of periodicity in relation to ovulation, incubation, and utero-gestation, and these cerebro-mental phenomena. This I subsequently extended to the laws of vital periodicity in general, and their applications to the natural history and course of diseases, especially the acute. (See *Lancet* for 1842-43.) I published a second edition of my papers on hysteria in 1840, as a systematic *Treatise on the Nervous Diseases of Women*. Although it attracted attention, the practical value of the neurological doctrines was not appreciated. I therefore took the opportunity which the meeting at York in 1844 of the British Association for the Advancement of Science afforded me of bringing them forward again, in the shape of a paper on the Reflex Function of the Brain, which was published in the *British and*

Foreign Medical Review for January 1845. The time-honoured objection to my views was taken by Professor Alison and others at York; viz., that sensation and consciousness were the causes of the phenomena I attributed to reflex action; and I had subsequently to discuss the same objection with the late George Combe and Professor Reid (see *Lancet*, vol. ii, for 1845). My views, however, made little, indeed, I think, no progress, until 1851, when there occurred a fresh outbreak of mesmerism under new auspices, which attracted the attention of physiologists. In the *British and Foreign Medico-Chirurgical Review* for October of that year, I reviewed several mesmeric works, and re-stated my own views. I concluded that essay with the following. "These books and the phenomena they record are equally interesting: the books, as pregnant warnings against an erroneous method of scientific inquiry; the phenomena, as being destined to lay the foundation for a complete revolution in metaphysics and mental philosophy."

Although the doctrines of homœopathy bear chiefly on pharmacy and therapeutics, they have intimate relations with neurology. The lineal descendants of occult science, they were attractive to the class of mystics for their own sake; but they chiefly owed their reception in England to two causes. One was a change in the hygienic condition of the population; the other, the improved education of the practitioner, consequent upon the passing of the Apothecaries' Act of 1815. The heroic treatment by copious blood-letting, mercurials, and much drugging, began to be questioned; and, in especial, the epidemic influenza of 1833 led to inquiries into the value of blood-letting in inflammation. In 1836, certain "new-fangled principles and opinions" as to the demerits of the orthodox pathology and treatment of inflammation were promulgated in the *Lancet* by Mr. R. S. Searle of Kennington. These were almost identical with the more moderate opinions now held generally. It is instructive, therefore, to read how they were first received. "Will it be believed," says "Investigator," who criticised Mr. Searle's opinions in the *Medical Gazette* of that year (vol. xix, p. 203), "that this is the language of a British surgeon in the year 1836? Surely some sort of a professional mania has broken out in the land. One man tells us that fractured thigh-bones may be cured in an amazingly short space of time by merely placing the patients in an easy position on a bed, and leaving them to nature and a pillow; another, that a few infinitesimal doses of common sulphur, each dose not being larger than the *billionth* part of a grain, will work wonders in removing some diseases over which no other kind of medicine would have any power; and a third soberly and seriously states that the antiphlogistic plan of treatment in acute inflammatory disease ought to be carefully avoided." That is, bleeding to twenty ounces daily. At this time, mercury was freely administered in inflammation, and in syphilis in destructive doses, because it was thought the poison was "eliminated" (a word of evil omen in practice) by the salivary glands, and so patients were kept for weeks in a wretched state of salivation. Large doses of drugs were given on no theory at all. Dr. Elliotson, for example, found two-drachm doses of subcarbonate of iron three times a day an almost never-failing remedy for chorea not due to structural disease; yet, if the patient was costive, the drug walked up his rectum, and had to be withdrawn by means of a spoon-shank. It was literally spooned in and spooned out.

It is a well known fact, that all social movements of whatever kind, by running into extremes, excite reaction; and it is generally admitted that this extreme of heroic pharmacy produced the extreme of homœopathic pharmacy. There were not practitioners, therefore, wanting who recognised the errors of both, and saw clearly that the curative powers of nature disturbed by the former method were left free by the latter. Another source of fallacy was, however, generally overlooked in weighing the facts of homœopathy; viz., the direct influence of the nervous system on the nutrition of organs and tissues, in exciting which homœopathy closely resembled therapeutic mesmerism. In my earliest papers, I showed that the continued direction of the attention to any organ would induce structural as well as functional changes in the organ through the nervous system, and that in this way hypochondriacal delusions, mystical meditations and suggestions (whether by reading of books, mesmeric passes, or otherwise), induced bodily disorder. Now just as "sensitives" are the best subjects for mesmeric influences, so are they for homœopathic symptomatology and therapeutics. It thus happens, that nervous patients who treat themselves homœopathically are apt to experience the symptoms which they find described as the results of taking a dose homœopathically, just as hypochondriacs who read medical works have the diseases they read about. The effects, for like reasons, of imagination so-called, fancy, conceit (or concept), so often attributed to an "evil eye," or other supernatural agency, by the superstitious, are often real; it is the cause that is imaginary. Hence the imaginative are "sensitive" homœopathically, and that which is due to the nervous system is attributed to an occult power in the drug. This "sensitiveness" of the nervous system is nothing more than a

tendency to be more easily influenced than common by chemical agents or forces modifying its nutrition or the transformation of its tissues. There is a singular difference in individuals as to the effects of such agents. Persons of highly cultivated minds, and much engaged in occupations involving the imagination or intellect, are most intolerant of blood-letting, nervines, or any bodily injuries; while the ploughman's endurance of rough treatment—the *dura ilia messorum*—is proverbial; but this is true also of uncivilised races. Now, after 1815, peace was gradually followed by prosperity; and in due time, concurrently with improved medical education, a large addition was made to city populations as compared with the rural. At this date (the age of great cities) the proportions are more than reversed. This means increased activity of the nervous system, from all the nervous excitations consequent on city vices and pleasures and life and work, and the consequent increased proclivity to nervous disorders. Add to this, the generally increased mental culture of late years, and we have causes that serve to account for the greater sensitiveness to all things acting on the nervous system so prevalent. It must be remembered, also, that of late years a more advanced hygiene has diminished infantile mortality, and thus lives of a more effeminate and weakly class have been added to the population, while, on the other hand, a constant emigration has carried off the more masculine and stronger. In this way, the character of the more numerous middle and higher (the more protected) classes has changed somewhat of late years; so that, while they have become more imaginative, mystical, and æsthetic in arts, science, religion, and ecclesiasticism, they have for the same reason become more intolerant of copious blood-lettings, heroic doses, and all perturbative treatment; more easily influenced by small (often very small) doses of drugs; and more predisposed to receive spiritualism, mesmerism, symbolism, and mysticisms of all kinds, and the cognate doctrines and milder practice of homœopathy. From this larger point of view, I think we can explain both the alleged changes in the "types" of disease and the changes in treatment generally, as well as the development of mystic theories and practices.

The sensitiveness of the nervous system to remedial agents is obviously to be classed with that undue susceptibility to various articles of diet, and to various sensorial impressions, generally harmless, known as idiosyncrasies and peculiarities of constitution, all which seem to have equally their origin in some special condition of that part of the nervous system in relation with nutrition.

The chief characteristic of modern practice is a closer attention to the operations of "nature" and the *vis medicatrix nature*. From the time of Hippocrates downwards, these have been the guides of the judicious practitioner, while the perturbative method, with its *post hoc ergo propter hoc*, which looks for a remedy for every symptom and for specifics in practice, has been rejected. Homœopathy compromised the matter; it sought for a remedy for each symptom in its principle of *similia similibus curantur*, and, by its impotent potencies and dietetic rules, it practically waited on nature. But nature has also its mystic side in medical practice. It is doubtless true, that the order of nature is under certain conditions towards continued life and health; nevertheless, observation shews that this is not always manifested, and that under certain conditions of disease a natural return to health is impossible. It was from this erroneous idea as to the course or order of nature, that the notion of an *elixir vite* arose; although it is certain that disease and death are as much the order of nature as life itself. It is in overlooking this fact that those have erred who have laid so much stress upon trust in nature and the *vis medicatrix* that their practice has been nothing more than a waiting upon death, rather than a judicious watching and directing of the course of events. To the latter purpose, it is necessary that the natural order of events be observed both in health and disease, and in structure as well as in function, for pathological anatomy is the best basis of pathology. We must, therefore, discover the natural order of formation and progressive development of tissues and organs, to the end that we may compare it with the morbid order of retrogressive degeneration, so that tissue-anatomy in this two-fold relation is the true medical anatomy. Sir John Forbes clearly saw that the order of nature in disease required to be known; but he did not so clearly, if at all, recognise the need of the other knowledges. Nevertheless, the advances made of late years in practice owe much to his labours. When his manifesto of the reformed school of "Young Physic," as he termed it, appeared (see his article, Homœopathy, Allopathy, and Young Physic, in *Brit. and For. Med. Rev.*, Jan. 1846), he informed his friends that he had opened a department of his Review for contributions towards the advancement of the Natural History and Treatment of Diseases. It has always been a pleasant reminiscence to me that I was one of the first to respond to the call. (See my paper, On the Methods for obtaining a Natural History of Diseases, in Forbes's Review for April 1846.) Forbes's list of "Cogitanda, excogitanda, and agenda" (twenty in all) for "the Hercules of Young Physic" is a series of propositions deduced

from the facts he had previously considered. Every one of these, without exception, expresses the views now current and generally advocated; yet his manifesto raised such a storm of indignation against him, that he had to retire from the editorial chair, and more than half of those who supported him by contributions to the new department of his journal shrank from making their names known to the profession. Reading my own again after the lapse of twenty-two years, I find little to change except as to style, albeit much to add; so that the methods and principles I then advocated and practised as far as possible, I advocate, teach, and practise, as far as possible, now.* The principles I then laid down were briefly these: 1. The medical history of normal structure and function (medical physiology and histology) must be the basis of both observation and classification of the abnormal, but mainly as to abnormal structure; or, pathological anatomy should be a tissue and a diathetic anatomy, in which the observation of the order of changes in the tissues and organs should have regard to the order of development of tissues and organs in the embryo and in organisms generally. 2. The order of morbid phenomena (as symptoms) in time should be observed in relation with the order of healthy phenomena in time as indicated by laws of vital periodicity, and thus the natural course of diseases—i.e., the order of development of disease and of return to health from disease—be determined. 3. The influence of the nervous system must be more regarded. In advancing these and other views, I differed from Forbes and his contributors. They dwelt upon "Nature" and "her" operations, and on the *vis medicatrix nature*, in the old Hippocratic and empirical way; but, coming fresh from inquiries into the relations of the *vis conservatrix* and *vis medicatrix* to molecular power and to physiological and pathological changes, it appeared to me that the old way had served its purpose, and that Nature must be investigated by a more purely scientific method. I soon found myself, however, far beyond the current wave of opinions and facts as to the fundamental questions involved. The inquiry, I saw, too, involved a knowledge of the correlation of forces—at that date (1845) hardly thought of, and as to which my own small attempts had experienced little encouragement.

There are the three courses open to the practitioner; he may be a meddler with Nature in the old empirical way; or he may be an effete truster in Nature; or, recognising the value of both science and experience, he will, while cultivating science, not rely too much upon it, but rather upon solid experience, enlightened, corrected, and advanced by science. In this spirit, at least, I shall next endeavour to illustrate the fundamental relations of the physical forces, *vis nervosa*, *vis medicatrix*, and vital force, to chemical affinity and nutrition.

ON THE USE OF THE SPECTROSCOPE AND MICROSCOPIC TOSCOPE IN THE DISCOVERY OF BLOOD- STAINS AND DISSOLVED BLOOD.†

By W. BIRD HERAPATH, M.D., F.R.S., Bristol.

THE discovery and recognition of blood-stains, and more especially of human blood, has been a problem which has long baffled the skill of the chemist, and the more highly trained medico-legal eye of the microscopist; and any means by which our medical jurists can lessen the difficulties and facilitate the inquiry, must be hailed as a boon by all scientific observers. Hitherto the chemical difficulties of the question have been the greater in the inverse proportion to the quantity of stain; and many minute and perfectly evident spots would even evade recognition by the test-tube in consequence of the smallness of their size, or the disadvantages of their position. The microscope would also fail in their detection if, from any peculiar circumstances, the blood-corpuscles could not be safely and securely removed from the tissues which were under careful examination; independently of which, the chemical and physical changes induced in the characters of the blood-corpuscles by the various menstrua employed in their removal rendered recognition by micrometrical admeasurement a very doubtful and uncertain operation. When blood-corpuscles are to be discovered floating in a saline fluid, as urine, saliva, or the generality of mucous discharges, the microscope will readily detect their presence; and, should the density of the fluid be very closely equal to the specific gravity of the serum of the blood, scarcely any change in their physical characters would occur, and it would then be possible to determine their exact form and size and render their probable source a question of easy solution. But when blood has been dried and long exposed

to the air, it is no longer easy to reproduce the blood-corpuscles of their pristine form and optical characters, as the various media employed to dissolve the clots act on the corpuscles with more or less celerity.

It is usual to employ either solutions of cane-sugar or grape-sugar, or mixtures of glycerine and distilled water, having a density of 1.030. Some observers have employed saline solutions for this purpose; others have used a strong solution of arsenious acid in distilled water; the objects which both classes have in view being the removal of the blood-discs and the preservation of their physical characters.

If the action of the solvent or medium, from its deficient density or peculiar chemical properties, have resulted in a destruction of the blood-corpuscles and a solution of the colouring matter, the microscope would no longer either recognise the mammalian character of the blood, or even assure us of its presence. In this condition of the inquiry the chemist alone, by the employment of tests, could decide the question of the presence of dissolved hæmatine, and would chiefly rely on the action of heat in coagulating the albumen and destroying the colour; whilst upon another portion of the fluid he would assure himself that ammonia would not produce any great change of colour, thus deciding the non-vegetable character of the colouring matter.

But during the past two or three years an addition has been made to our optical instruments, in the aid which we have obtained in the recognition of various substances by the effects which they have on the absorption of different portions of the spectrum; and we have various forms of spectroscope according to the purposes for which they were intended. The first invented spectroscope was a very efficient but cumbersome instrument, and astonished the world by the discovery of four new metals in consequence of the remarkable peculiarities of their coloured flames; and thallium, cesium, rubidium, and indium have been thus isolated from other substances and added to the list of elementary bodies. Many of those around me are familiar with that form of instrument, and need no further description. Shortly afterwards, Professor Stokes introduced a modification of this instrument, which enabled liquids and coloured fluids to be submitted to the same mode of testing them by their absorption spectra; and on the table is a form of fluid spectroscope, which I have long employed for this purpose, a more powerful and efficient instrument than that recommended by him for these experiments.

In this instrument, essentially a direct vision or Hofmann's spectroscope, the liquid to be examined is placed in a small test-tube, and that is held in a clipped spring, which supports it during the examination, whilst a bright light is transmitted through the liquid previously to its analysis in the spectroscope. The spectrum shows various bands of absorption in well-marked optical liquids—some of the most beautiful of which are certainly weak solutions of permanganate of potassa and dilute solutions of crocine and hæmatine.

In the first case, five dark bands are seen in the green part of the spectrum, and in that of blood two sharply defined black bands are seen, one in the green, and another on the border of the orange ray. The intensities and positions of these bands vary according to the age of the blood-stain, and result from the alteration in the colouring matter of the blood by drying and by exposure to air.

The stains when old have a much less decided or evident absorption, the bands are weaker, and an additional band of a diffuse character is found in the red ray. But it does not appear to be possible to form any positive or accurate opinion on the age of blood; from various observations it has been ascertained that these changes take place with more rapidity under some circumstances than in other apparently similar cases. In all optical experiments on blood, it is necessary to use *excessively dilute* solutions of the colouring matter; otherwise the fluid is either absolutely opaque to light, or, if it transmit any light at all, nothing but the extreme red rays are observed. When still more dilute solutions are used, the blue end of the spectrum is quite absorbed, and so are two bands in the green, and occasionally also one in the red. These optical properties of blood were first pointed out by Hoppe (*Virchow's Arch.*, 1862, p. 446), and subsequently more minutely by Professor Stokes (*Proceedings of the Royal Society*, 1864), and Mr. Sorby (*Quarterly Journal of Science*, 1865). Professor Stokes has investigated the effects of different chemical re-agents upon the colouring matter of blood (*Proceedings of the Royal Society*, 1864, p. 355 *et seq.*); and he has arrived at a very intelligible solution of the various phenomena exhibited by this remarkable substance, and has come to the conclusion that arterial and venous blood in the recent fluid condition contains a substance called crocine, which, like indigo, is capable of existing in two different states of oxidation and colour; that in arterial blood scarlet crocine is the form in which it is found, and in this condition very dilute solutions produce two very sharply defined black bands of absorption; one, the more intense of the two, close to and parallel with the sodium line D; whilst the second is found in the green ray about the breadth of the previous band distant from it.

* I proposed also, as the means to the proposed reformation, an entirely new organisation of the profession. Age and experience have cooled my enthusiasm as to that scheme; but I still think it applicable to the more limited field of the British Medical Association.

† Read before the Bath and Bristol Branch, January 1867.