PART II.—REVIEWS.

The Brain as an Organ of Mind. By H. C. Bastian, M.A., M.D., F.R.S. Vol. xxix. of the "International Scientific Series."

Matthew Arnold, in the pages of our most popular monthly, has been recently urging the need of civilising the middle classes. Still more important is it that *all* classes should be civilised, and few persons are aiding in this great cause more effectually than the energetic publishers of the "International Scientific Series" and the band of distinguished men to whom they have entrusted the work. There are both a Scylla and a Charybdis into which works of this kind—works which aim at a real popularisation of science—are apt to fall, and from which the series in question has, on the whole, very fairly escaped—the Scylla of stiffening into technical manuals, the Charybdis of mere fanciful and erratic gossip.

Everything which aims at elevating the mental status of mankind must be of interest to a journal of mental science, especially to one that particularly concerns itself with the application of scientific truths to human mental needs. To this Journal, therefore, all the volumes of the "I. S. S." cannot be without a deep interest, particularly with reference to the manner in which they fulfil their function of elevating the popular intellect; but this volume, xxix., which we have now before us, has a more special interest for us, inasmuch as it is an attempt on the part of one who has earned much distinction in this field, to expound what is known or presumed about the nature and functions of the brain. If we say that the book does not quite come up to our expectations, it is rather because our expectations of what is born through Dr. Bastian's pen are very high, than that the book is below the average standard of the series. We incline to think that the chief flaw in the work is a certain want of "integration" in its structure. The different sections are not joined together with that smoothness of fit which is so specially needful in a book of this kind. To the initiated this is not of so much importance, for he can connect disjointed portions with joints from his own knowledge; but we fear that the ordinary intelligent student

seeking for scientific culture will find some difficulty here and there in understanding what relation the different parts bear to one another. Dr. Bastian seems occasionally to have forgotten that we are not all so much at home in the subject as himself. This want of integration is exemplified in the chapters which deal with the anatomy of the nervous system in the lower animals. Our author goes into considerable detail on this point, but it is sometimes a little difficult to see the bearing of these details on the main question; indeed, one is sometimes tempted to ask for a little less detail and a little more interpretation, for the writer is one who is eminently qualified, both by knowledge and wisdom, to be something more than a topographer. Again, we have here and there encountered a vagueness in the reasoning, and even in the enunciation of his own views, to which we are not accustomed in Dr. Bastian. But the workmanship is unequal, for in other places the writing is lucid and thoroughly to the point, and we recognise that logical acumen, that bold and yet cautious imagination, and that penetrative intellectual vision which have so often distinguished Dr. Bastian on many an intellectual battle-field.

The general plan of the work is thoroughly worthy of praise. Starting from the very utmost roots of the psychological tree, we rise through trunk, and branch, and twig to the flower and fruit. By commencing to study phenomena in their simplest manifestations, the mind seizes the essential, the fundamental, conception, and as it rises to more and more complex groups of such phenomena, knowledge becomes gradually differentiated and more complex in harmony with the growing complexity of the phenomena. The student in this way learns to disentangle the essential from the adventitious, and to penetrate the meaning of things which, looked at by themselves, seemed in a hopeless muddle. He follows, in short, legitimate evolution; he proceeds from the simple to the complex, from the easy to the difficult. Looked at from another point of view, the general plan is equally admirable, for the writer endeavours to gather together the three great threads of the subject, and to twist them into a threefold cord. He gives a diagram to illustrate what these three threads are—Neurology, Objective Psychology, and Subjective Psychology—as they converge together to form the only satisfactory mental science. Though one worker is obliged to dwell more upon one aspect of the subject than

another, and must therefore, to a certain extent, specialise his work, the recognition of the truths is becoming, happily, general, that to look at only one side of the subject must lead to a one-sided psychology; that the psychologist of the future will recognise the facts of anatomy and physiology, the habits and actions of other animals, including his fellow men (and brother psychologists); while he will by no means ignore his own subjective states.

The first chapter points out how animals and plants come to differ from each other, and how the former, being for the most part active creatures, have developed special contractile organs called muscles; how the existence of such special organs and of peripheral impressions leading to their excitation has brought about the existence of special conducting tracks between them, and ultimately of structural paths called nerves. From such simple beginnings, such a simple means of bringing the organism into correspondence with its environment, Dr. Bastian starts his teaching, and tells us to look on the most complex nervous systems as elaborations of this elementary mechanism, interpolated between a sensitive surface and a contractile organ. The anatomy of nervous systems in general is then described at some length, and after a chapter on the "Use and Nature of Sense Organs," the nervous arrangements of the invertebrata are described in considerable detail, this description being terminated by a short summary of what such a comparative sketch should teach us with regard to the brain; the principal point being, perhaps, that the brain of invertebrates appears in connection with their special sense organs, and is essentially a group of sensory ganglia receiving impressions from such sense organs. A similar comparative account of the brain in the non-mammalian vertebrates follows. We observe that Dr. Bastian hazards no opinion as to the exact morphological nature of the cerebral lobes and cerebellum. Are they originally "sensory ganglia," homologous with the rest, or are they specialised outgrowths from the other more primitive ganglia? The chapter on "The Scope of Mind" we shall refer to more fully presently. After it comes a series of chapters on mental processes, introduced by an account of reflex action. We are not sure that it is safe to infer the "primarily unconscious" nature of that elementary "organisation of intelligence" which comes to constitute the reflex actions of lower creatures. True, these processes may be compara-

tively simple, and in ourselves they may be quite apart from our general consciousness, but does it, therefore, follow that in these lower creatures—at any rate while the reflexes in question are being organised—there should be no conscious accompaniment, though this may be of an extremely simple kind? While comparing sensation and perception, and showing how universally associated are the two processes, Dr. Bastian seems here and there to lose sight of the difference between them, for though both sensation and perception seem essential to consciousness, yet each is surely a different phase of that process. These chapters embody the chief modern conceptions as to the growth of the different mental powers, and due prominence is given to the doctrine of Inherited Acquisition, as reconciling all that is true in the Intuitive and Experiential Schools, as well as adding much that is new. The physical correlative of the association of feelings seems still an unsolved puzzle. Dr. Bastian has still to say that the connection between the different centres, which become physiologically associated, occurs in an "imperfectly understood manner." It is well to keep before us the fact that this formation of connections between centre and centre is really a very difficult one to realise, and that, though we know it must occur somehow, the explanation of how it occurs is still wanting. "Imperfectly understood manner" is, in fact, a very mild way of putting it. The relation between reflex, instinctive, and rational actions is described from the point of view of the evolution philosophy, and the general conclusion is drawn that as the nervous system of an animal becomes more developed, and thus its powers of receiving and arranging more and more varied impressions increase, the more do processes which are called rational intervene between impressions and resulting action. Interesting examples are given to show that the ant and other insects, with their inferior nervous systems, are less capable of adapting themselves to new conditions—*i.e.*, of behaving rationally—than are birds, with their more complex nervous systems. The anatomy of mammalian brains is fully described, and an account is given of the mental powers of brutes.

The human brain and its functions now come on for special consideration, beginning with the development of the nervous system in utero, and there is an interesting chapter on the size and weight of the brain; indeed, this is one of the most interesting chapters in the book. Dr. Bastian

points out clearly enough the kind of relationship we may expect to find between intelligence and size of brain, and the numerous conditions which make this relationship so complex. Besides keeping in view the influence of size of body on size of brain, it has always to be remembered that it is just those capabilities which are most distinctive of highly intellectual power which, being the most recently acquired, have the least definite structural bases, and, therefore, in a particular individual, are most apt to remain undeveloped through unfavourable influences—have, that is, the least inherent tendency to develop. Thus a person may show no marked signs of intellectual power, and yet his brain may be of more than average size owing to the presence of much imperfectly elaborated nerve matter—the potentiality of intellectual greatness which circumstances have not allowed to be perfected. The anatomy of the human brain, both internal and external, is pretty fully dealt with, the significance of convolutional complexity and variety being ably discussed, and illustrated by the consideration of various types of human brains. A chapter on the transition from brute to human intelligence is inserted between the two parts of the anatomical account. This chapter is scarcely so clear as could be desired, and consists largely of quotations. Doubtless, as Dr. Bastian indicates, the growth of articulate language with the power of thinking in symbols, and the development of the social sentiments, constitute the main acquisitions of human intelligence. The latter part of the book is occupied in giving such an account of the physiology of the brain as is yet possible, and in sketching the manner in which the higher cerebral processes are carried on—the processes which are most nearly related to the intellectual and emotional life. The kind and degree of localisation of function in the cerebrum is discussed with considerable clearness, though many of Dr. Bastian's views on the subject must remain doubtful for some time to come, and many of them will probably be much modified by the future growth of knowledge. That the cortex of the hemispheres is altogether receptive in function, while the supreme motor functions are performed especially by the cerebellum, is a doctrine which many will view with distrust, though Dr. Bastian, no doubt, succeeds in making it not absolutely in opposition to Ferrier's splendid results. Still, we must say that Ferrier's conclusions on this point seem to us more in harmony with facts than the doctrine here advocated. Dr.

Bastian, of course, admits the existence of localisation; indeed, he had already indicated the existence of localised "perceptive centres" in relation with the different sense organs before Ferrier had experimentally proved this relationship, though Bastian regards this localisation not as definitely limited to particular isolated areas, but as affecting particular "cell and fibre mechanisms" more or less mingled together. Why, however, this mingling should occur in the highest centres and not in the lower we do not clearly see.

We have thus gone through the book pretty systematically, and briefly noticed its peculiarities, but there are two or three points we should like to refer to in rather more detail.

In Chapter X., on "The Scope of Mind," there is an attempt to define what is meant by the term "Mind," and to modify very considerably the meaning commonly attached to it. After a protest against the term being used to express some independent entity instead of being applied to the sum of mental states, Dr. Bastian advances the opinion that it would be advantageous to enlarge very much the ordinary meaning of the word, and to make it include not only the conscious "results of nerve action," but also "the results of mere unconscious nerve action, which," he says, "constitute so many integral parts of our mental life." He does this on the grounds that no distinct line can be drawn between the actions accompanied by consciousness and the actions not so accompanied, because the former may gradually pass into the latter; that in our thinking processes many unconscious links are constantly interpolated; that the fundamental contrast maintained by most psychologists between the subjective and the objective does not really exist, but is rather due to our ignorance of the relation between consciousness and matter. "Thus, it would appear," says he, "that if we are, as so many philosophers tell us, to regard the sphere of Mind as co-extensive with the sphere of Consciousness, we should find 'Mind' reduced to a mere imperfect, disjointed, serial agglomeration of feelings and conscious states of various kinds, while the multitudes of initial or intermediate nerve actions (which serve to bind those other nerve actions, commonly associated with conscious correlatives, into a complex, continuous, and coherent series) would have no claim to be included under this category."

We cannot help thinking that the course recommended here would be very inconvenient, for the word "Mind" has

come for us to be so strongly associated with the notion of consciousness that to speak of mind without consciousness seems like a contradiction in terms. We fancy, moreover, that Dr. Bastian makes the difficulty he alludes to by refusing to recognise that contrast between subjective and objective which most psychologists agree in recognising. When we do this the difficulty vanishes, and we can regard all the nerve actions of animals as fundamentally like one another, and so avoid the inconsistent dislocations of similar things to which Dr. Bastian objects, while we reserve the term "Mind" for that other aspect of things which we know as our own subjective states. It is perfectly true that no fundamental distinction can be made between one *nerve action* and another; the simple reflex merges into the "rational" action, but that is quite a different thing from merging into a phase of consciousness, for the rational *action* is an affair of matter and motion. We can trace the physiological process without introducing a psychical element at all; but the phase of consciousness belongs to a different category of phenomena, which must be kept distinct from molecular nerve motions. If we choose to apply the term "Mind" to all that series of actions as *actions* which maintain the correspondence between organism and environment, we should, no doubt, be logical and consistent enough, for we should not be confusing the mental and physical aspects of the question together; but, as we have said, this course would be highly inconvenient, because the word "Mind" has already acquired such a powerful association with the conscious aspect that to apply it to the physical aspect—the molecular motions of nerve matter—could only cause confusion—such confusion, indeed, that we should soon be driven to do with the word "Mind" what Dr. Bastian has wisely urged us to do with that awkward word "Tubercle"—namely, expunge it altogether from our vocabulary.

Following out his view of Mind, Dr. Bastian regards the nervous centres, as a whole, as the *organ of mind*, though he excludes the phenomena of outgoing currents from the sphere of mind for reasons that are not very clear to us. We cannot say that we altogether like the term "organ of mind" as applied either to the hemispheres or in the wider sense, but it has now got such a hold in our language that probably we must continue to use it and make the best of it, trying not to be more illogical than we can help.

The meaning of the cortical convolutions is a point on which some very good observations are made, though the subject is still somewhat obscure. It seems, speaking generally, as though convolution had been a more convenient means of cramming more grey matter into the cranium than an enlargement of the cranium to a corresponding extent would have been; and it seems as though this method of increasing the cortical grey matter had come into action independently on several different occasions, since we find both convoluted and unconvoluted brains in each of various mammalian groups, two animals having the common character of convolution being by no means necessarily more closely related to one another than they are to certain other animals whose brains are scarcely convoluted. It would seem, then, that as the earlier mammals with simple brains branched out in various directions, similar causes had in several different cases produced a similar condition (similar in the mere fact of convolution) of the cerebral cortex, an interesting example of the general biological doctrine that superficial resemblance does not always imply affinity of race. Dr. Bastian brings out well the important fact that degree of convolution is in close relation with size of animal, a fact which, perhaps, agrees rather better with Ferrier's view of the kind of connection which exists between the cerebral cortex and the lower motor centres than with Dr. Bastian's own idea of this connection. Yet, on the other hand, as the latter points out, increased power of motion is sure to induce greater powers of sensory perception through enlarged intercourse with environment, while greater degree and complexity of movement involve more complex machinery for receiving and arranging those impressions—kinæsthetic Dr. Bastian calls them—to which movements give rise. It seems yet scarcely settled to what extent these surface foldings remain constant in their relationship to one another and surrounding parts—whether, that is, their exact arrangement is in a sense accidental, or whether they indicate real functional constancies; whether, for example, a certain convolution found to perform a certain function in one animal should always perform the same function in an allied animal, or whether this function might get shifted, as it were, on to a neighbouring fold in consequence of a slight difference in the folding. The exact degree of the correlation between folding and function is important, because the comparison of the foldings in different animals and individuals may be expected to give us some help in comparing their functions.

We have already referred to Dr. Bastian's views about the motor functions of the cerebral cortex—that these functions are not truly *motor* in the usual sense of the word, and that the activity of the supreme motor centres —cerebellum and corpora striata, has no conscious accompaniment. Upon these views is based his account of speech and its defects — that complicated and little comprehended subject which no one has yet succeeded in giving an altogether satisfactory account of. Dr. Bastian, of course, makes the principal speech centres sensory in nature, and gives to the "auditory word centre" the chief functions connected with language, while the visual and kinæsthetic "word centres" are of minor importance. The last he regards as corresponding with Broca's convolution, and as being a necessary part of the route for stimuli, both for articulation and writing. The subject, as a whole, is far too complicated to be discussed here, but we may just make an observation or two about it. In the first place, is there any such definite distinction between *motor* and *sensory* centres as is commonly supposed? We are inclined to think that too much is made of what is, no doubt, a convenient artificial distinction, but which corresponds to no real and impassable difference in nature; for, after all, every centre probably both receives and despatches impressions, and is in this sense both sensory and motor. Indeed, these centres, divided for convenience into two parts, are in reality a single mechanism for co-ordinating impressions and outgoing stimuli. A good deal of confusion seems to arise from this halving of a co-ordinating mechanism. Then, secondly, there seems no reason to assume, as Dr. Bastian does, any inherent improbability in the notion that what we may broadly call our consciousness of effort should be to some extent associated with the *motor* side of the higher cerebral functions. He seems to start from this assumption, and to make facts square with them. We see no inconsistency or improbability in Ferrier's theory of "motor ideas," though admitting, as every one must, that afferent impressions from moving parts have much importance in regulating movements; and hence in the mechanism of speech we should be quite prepared to attribute much more importance to articulatory centres than Dr. Bastian does, though we fancy that the subject is still too vague for very definite opinions.

Finally, we must still admit that quite apart from the inherent mystery of our being, apart from the ultimate impenetrability of this strange consciousness of ours, the

brain itself as a material organ, and its functions, in terms of molecular motion, are still an enigma, even to one who knows more about them than most people do.

The Emotions. By JAMES McCOSH, D.D., LL.D. London: Macmillan and Co., 1880.

The Scottish School of Psychology was once a great power. In the days when Locke's sensational philosophy had developed into the devout anti-materialism of Bishop Berkeley, and that again into the startling scepticism, very plainly atheistical, of Hume, men recoiled violently from the accepted line of thought, and felt that they must strike out something new. They said with a certain naïve intensity, that these destructive results were at variance with common sense. To that, as their criterion of truth, they made appeal: and to bring out its answer, they devoted their mental energies to introspection. They "looked into their own minds." Consciousness, and the things it revealed, were reflected on deeply—explained and enlarged with triumphant vigour. Reid and Stewart gave place to the more ingenious Hamilton. The school made converts in France, also shocked at revolutionary theories; and Jouffroi, Victor Cousin, and a host of minor lights, convinced themselves and their audiences, and sang the praises of Introspection and Common Sense.

This state of things, however, could not last for ever. In two directions philosophy advanced beyond them—towards the Idealism of Kant and Hegel in Germany, and towards the materialistic and physiological side in England and France. Against either of these schools they were without an answer, and therefore, in our own time, they have fallen into the background and will very soon be as extinct as the Schoolmen. They were without an answer to the physiological philosophers, because their view of the mind was founded on no basis whatever, except the mental phenomena as they appear "to the mind's eye;" and these may easily be illusory or misleading. The prominent facts as to nerve action and reaction, on the other hand, are seen to explain many things which before seemed dark, and for those accustomed to the hasty hypotheses of modern science it is not a great leap to the conclusion that they will, in the end, explain everything. The Idealists,