

THE EXPRESSION OF THE EMOTIONS IN MAN AND ANIMALS.

THE following remarks on this interesting subject are extracted from a review of Darwin's latest book in the *Academy*. They are from the pen of Dr. Anton Dohrn. How often it has been stated that among the chief privileges of man as contrasted with the lower animals is the great gift of physiognomical expression—a gift which seemed all the more peculiarly human as it became obvious that other animals, being destitute of the innumerable emotions of man, could not present traces of the innumerable expressions dependent on these emotions. The belief in this elementary constitution of man's nature was so great at one period that physiognomy came to be regarded as a science as important and conclusive as astrology had been in the Middle Ages; and the more hidden the actual connection between mind and body in this case, the more one pretended to intuitive knowledge about it, the more one shrank from subjecting the great achievements of which some profound physiognomists boasted to a critical examination. When we remember how Lavater spent a great part of his life in the study of physiognomy, and recall how Goethe entered into correspondence with him on the subject and sent him portraits and silhouettes, can we wonder that the great mass of the people held a belief in the most direct connection of character and mind with the expression of the face? Goethe, it is true, was not an absolute believer in the art of judging of the inside of a man by looking at his outside, for he wrote on one occasion to Lavater: "Seitdem ich keine physiognomische Praetension mehr mache, wird mein Sinn sehr scharf und lieblich, ich weiss fast in der ersten Minute wie ich mit den Leuten dran bin;" he nevertheless occupied himself in thinking over the principles of this so-called science.

Mr. Darwin himself, in the Introduction of his work, gives us a short review of what has been done in physiognomy by treatment with the scientific method. It is not so much physiognomy, however, that constitutes the main subject of interest in the new book as the Darwinian theory which lies before us in a new guise where we would scarcely expect to meet it. Mr. Darwin has in fact fulfilled a promise given in the preface of the "Descent of Man," of which work it forms a part and may be considered the third volume. It is not the anatomy nor indeed can it be called the physiology of expression of which Mr. Darwin treats. His object is rather to trace its origin in the ancestors of man, and to give an exposition of the principles involved in the different modes of expression in man as well as in other animals. Mr. Darwin is always bound to face a considerable difficulty in all that he writes. Having originated the doctrine of natural selection, it falls to his lot more than to any one else to show the universal application of this principle in all forms of organic life. In truth, there is no one who has done so much to search out the hidden corners where the action of natural selection is to be recognised, and where this principle alone gives a satisfactory explanation of problems hitherto unsolved.

Writers in the *Revue des deux Mondes* and other journals and books may use every effort to convince their readers that the theory of descent is not Mr. Darwin's great achievement, but is due chiefly to Lamarck and others; it nevertheless remains a simple truth that Mr. Darwin's elucidation of the actual influence of natural selection throughout the whole organic world has been the means of overthrowing the old doctrines of separate creation—still held by some naturalists even of high rank, and believed in by all those who cling to old traditional beliefs rather than to new scientific doctrines, for the simple reason that they believe all human knowledge to be vanity, and as a consequence to prefer ignorance to inquiry.

Though Mr. Darwin not only originated the doctrine of natural selection as the chief principle ruling the development of the organic world, but is also its chief supporter and expounder, he nevertheless holds that natural selection in the strictest sense does not afford a universal explanation of all the phenomena of organic life, past, present, and future. The theory of sexual selection, for example, was proposed to meet the difficulty. When endeavouring to explain all the facts by natural selection, Mr. Darwin perceived that changes in organisms occurred which were clearly not dictated by the simple action of this great principle, but by some other and minor one, which he termed the principle of sexual selection. The acceptance of this principle has met with considerable resistance

from a good many naturalists, and even many evolutionists, who, seeing in it, we believe wrongly, an abandonment of the theory of natural selection, make war against their own leader. Perhaps these same gentlemen will not be entirely satisfied when they examine the three principles to which Mr. Darwin reduces all the modes of expression of emotion in man and animals. For if everything that happens is only to be tried by the test of its survival on account of its usefulness in the struggle for existence (which would bring it within the domain of natural selection), it may appear as if the three principles of expression do not come within the range of the discussion.

The first of these principles is that movements which are serviceable in gratifying a desire, or in relieving a sensation, if often repeated become so habitual that they are performed whenever the same desire or sensation is felt, even in a very slight degree.

The three principles, with the many instances by which they are illustrated in Mr. Darwin's book are of interest not only as teaching physiognomy, but, as we have already indicated, in attempting to introduce the theory of evolution into our knowledge of the functions of man and other animals. To take an example: if we consider how a person uncovers his canine teeth in expressing defiance or contempt, the action would be explained by all those who are not evolutionists by an endeavour to show the direct influence of scorn or defiance on the muscles that execute this movement. It would be difficult to find a satisfactory explanation of such uncovering of the canine teeth in a sneer. One could hardly understand why contempt or defiance is more nearly related to uncovering the canine than other teeth; why, in short, it has anything whatever to do with teeth. Mr. Darwin, however, on seeking out the origin of such action, finds it in another function that belonged to the ancestors of man—to the lower animal, in which showing the teeth, and especially the canine teeth, denoted readiness to bite and fight. Man, as a rule, no longer bites his enemies, yet the uncovering of the canine teeth in a sneer is still a very usual function to express indignation, contempt, defiance, or scorn. That this should ever happen in man is only to be understood by his relationship to the lower animals, and thus a special physiognomical function of man is derived from another more or less defensive function of those animals.

A similar movement, and one only to be interpreted by similar reasoning, is the protrusion of the lips in anger and scorn: in itself it is useless and would have no meaning, but viewed as an offspring of animal function it is clearly understood. A great number of other instances of a like kind might be quoted from Mr. Darwin's book.

Regarded from a biological point of view, this book derives its chief interest from being a successful attempt to trace the origin of special functions, to introduce the theory of evolution into the domain of physiology. Here it seems we do meet with an element not strictly an essential constituent of the theory of natural selection, for as natural selection tends to preserve only what is useful and serviceable for the struggle of existence, movements that are not actually beneficial ought not to be retained.

The second principle is that of antithesis. The habit of voluntarily performing opposite movements under opposite impulses has become so firmly established in us by the practice of our whole lives that if certain actions have been regularly performed in accordance with the first principle under a certain frame of mind, there will be a strong and involuntary tendency to perform directly opposite actions, whether these are of any use or not, under the excitement of an opposite frame of mind. This principle points still more directly to a hidden root whence actions spring. The former leads us to look for an origin of animal action that is not to be found in direct usefulness alone, while the movements which Mr. Darwin classes under the principle of Antithesis seem, to judge by the examples and illustrations he gives, often to be quite superfluous and without the slightest direct bearing.

Lastly, the third principle is the direct action of the excited nervous system on the body, independently of the will and independently, to a great extent, of habit. The direction which this nerve-force follows is necessarily determined by the lines of connection between the nerve-cells with each other and with various parts of the body. But the direction is likewise in a large degree influenced by habit, inasmuch as nerve-force passes readily along accustomed channels.

The origin of functions is a question as yet almost wholly untouched. The discussion of this strange subject leads us of necessity to another of an equally remarkable nature, namely, the active and passive resistance which the theory of descent finds in more than one physiological school.

In earlier years, when physiology existed almost everywhere in, so to speak, personal union with anatomy, the dislike felt by physiologists for abstract morphology was less marked. Though

physiology was always regarded as the cardinal science in relation to the great problem of life, it did not altogether disregard the aid of anatomy and morphology in working out solutions of special physiological problems. The labours of a man like Johannes Müller alone suffice to prove this, and his handbook of physiology teaches on almost every page the important influence of morphological research. If we extend our gaze still farther back, we find this striking feature of a combination of scientific physiology, anatomy, and morphology becoming more strongly apparent.

After Johannes Müller, however, and as soon as the great break happened about the theory of Vitalism, especially after the publication of Du Bois-Reymond's great work on *Thierische Electricität*, physiologists in general got rather out of the habit of carefully studying anatomical or morphological problems, while in some quarters there sprang up the idea that morphology was not so much a science as an excellent pursuit for amateurs—a more or less innocent amusement to which one might devote one's attention if one chose, but which would exercise no influence on the general march of human ideas, and through a want of method and exactness could scarcely be termed a science. Exactness came to be identified with experimental research, and physiological laboratories, provided with complex apparatus and frogs, rabbits, and dogs and other animals, were considered the chief tribunal, before which Life was challenged to confess its latest secrets.

There can be no question that this line of physiological research derived great advantage from the application of physics to the consideration of physiological questions. Thus the physiology of the senses and nerves attained to a wonderfully high degree of true exactness. It is perhaps due to these very results that at the time when the methods of experimental physiology were held in such respect the microscope and microscopists were a little too lightly regarded—a feeling which culminated in the dictum that a microscopical discovery scarcely lasted longer than five years. It must be admitted that at the very period of the highest development of experimental research in physiology, morphology laboured under a temporary want of new ideas. The struggle against the overwhelming influence of speculation in the beginning of this century had ended in the other extreme, in an accumulation of mere facts. The want of ideas was necessarily followed by the absence of criticism, and thus morphology and zoology resembled in some respects a dictionary containing all the words necessary for the construction of a thoroughly philosophical book, but which is not the book itself.

Mr. Darwin came, and the book was written. By it morphology became burdened with important questions, the answers to which have not only a bearing on morphology itself, but extend its boundaries into fields where it touches on one of the most fundamental questions by which the human mind ever has been or can be agitated. The "Origin of Species" led to investigation concerning the origin of innumerable other things the beginnings of which had hitherto lain in utter darkness and were believed hidden once and for ever. The theory of evolution began to affect with its principles and methods nearly every department of human thought, but the stronghold from which it derived its methodical power was and is morphology.

Thus of a sudden the sister sciences physiology and morphology became once more of equal importance, and one might perhaps say that at present morphology has just claims to be held the greater. Such a claim however would be vain and useless, for it is impossible that physiology should any longer delay to adopt with equal energy the methods and principles of the theory of evolution, and by so doing range itself once more close beside morphology—may, and embrace so entirely the doctrine of evolution that a break between physiology and morphology, such as has existed during the last twenty or thirty years, will be rendered impossible in future.

And it cannot be questioned that the new task of physiology will be to investigate the origin of functions. If it be true that all organisms now living are the descendants of former living ones, and that these former living ones possessed simpler characters, this of course will hold good equally in respect to their functions, and it becomes necessary to trace not only the change and differentiation of the organs, but also those of the functions. To do this effectually physiology must not restrict its investigations to frogs, rabbits, and dogs, but extend them over the whole animal kingdom. And in doing so it will at once find how powerful an aid morphology is, how indispensable and how ready to help its sister science, and how rich in questions which on its part it is unable to solve except by alliance with comparative physiology.

This is a powerful reason for congratulating ourselves on the appearance of Mr. Darwin's new book. It not only gives rules and principles to

physiognomy, connecting by new ties man and his mental world to animal life and its bodily constitution, but traces a new and highly important line of inquiry with respect to the origin of functions. In showing how in many cases the function of expressing emotions has its origin in other functions, he has led us to that immense and almost endless path which physiology must traverse in respect to all and every function in order to attain that point where life itself becomes but a function of matter, a part of which Spinoza determined when he said, "Cujus essentia est existentia."

THE COAL COMMISSION.

THE evidence taken by the Committee on Coal has now assumed such proportions that a tolerably accurate opinion of the causes of the recent high prices can be formed. The following summary of the *Times* is reproduced as a contribution to a subject not the least important of those which will arise in the immediate future:—

The inquiry before the Committee on Coal tends to establish at least one explanation of the recent rise in prices. It seems clear that the rise is due in a very great degree to the vast increase in the demand for the purposes of the iron trade, and for some other manufactures. Mr. Lowthian Bell, bears testimony on this point which seems conclusive. He is president for this year of the Iron and Steel Institute, and is intimately acquainted with both the iron and coal trades, and no man is better qualified to speak of them. The result of his experience is that, while there has been a great development in iron and chemical works, there has not been a corresponding development of coal-mining. The idea that the rise in price is due to any combination on the part of masters or men seems to him quite absurd. The simple explanation is to be found in the fact that there has been a great increase in demand and a falling short in production. It will be somewhat satisfactory if this perplexing problem proves to be really solved by the old simple explanation of a change in the balance of demand and supply, though it will follow that the Committee are not likely to devise any prompt remedy for high prices.

The statistics furnished by Mr. Bell give a remarkable picture of the growth of the iron trade. "Forty years ago there was not a factory on the banks of the Tees, and coal was supplied in unlimited quantities to the works on the Tyne at so low a price as 1s. 6d. per ton." It was not till 1850 or 1853 that the price began to rise, in consequence of the growth of the factories; but since then the amount of coal consumed by them increased to a million and a quarter tons in 1861, and to three millions and a quarter tons in 1871. The discovery of the Cleveland ironstone has been the chief cause of the increased demand, and Middlesbrough represents the consequent trade. Before 1850 the tons of pig-iron made in a year were 110,000. In 1871 the pig-iron manufactured amounted to 1,695,377 tons, and Mr. Bell believes that in 1872 it approached 2,000,000 tons. The number of puddling-furnaces has within the same period multiplied from 250 to at least 1,650. But the figures are still more important which show that the proportion of coal consumed in the iron trade to the total amount raised has been continually increasing. In 1861 the quantity of coal raised in the Northumberland and Durham districts was nearly 20,000,000 tons, and the quantity consumed by the iron works was about 14 per cent. of the total. But in 1872, while the amount of coal raised had only increased to 29,000,000 tons, the proportion required for the ironworks had risen to 28 per cent. Taking the Durham coalfield alone, the proportion of coal consumed in the ironworks was last year as high as 47 per cent. In that year, moreover, while production fell by half a million tons, the consumption in the iron trade increased by more than half a million. Coal was brought overland from South Wales and the West Riding, and for once was actually "carried to Newcastle." Mr. Bell, however, does not consider the ironworks alone responsible for the increased demand. Within the Durham district the demands of other industries have increased in half the proportion of the demand of the iron manufacture. All manufactures have been flourishing, as, for example, the alkali works: and much is due to the great extension of railways and to the substitution of steam for wind as the motive power of ships. But such facts as we have quoted