THE DESCENT OF MAN

The Descent of Man, and Selection in relation to Sex. By Charles Darwin, M.A., F.R.S., &c. In two volumes. Pp. 428, 475. (Murray, 1871.)

I.

IF Mr. Darwin had closed his rich series of contributions to Science by the publication of the "Origin of Species," he would have made an epoch in Natural History like that which Socrates made in philosophy, or Harvey in medicine. The theory identified with his name has stimulated ethnological and anatomical inquiries in every direction; it has been largely adopted and followed out by naturalists in this country and America, but most of all in the great work-room of modern science, whence a complete literature on "Darwinismus" has sprung up, and there disciples have appeared who stand in the same relation to their master as Muntzer and the Anabaptists did to Luther. Like most great advances in knowledge, the theory of Evolution found everything ripe for it. This is shown by the well-known fact that Mr. Wallace arrived at the same conclusion as to the origin of species while working in the Eastern Archipelago, and scarcely less so by the manner in which the theory has been worked out by men so distinguished as Mr. Herbert Spencer and Prof. Haeckel. But it was known when the "Origin of Species" was published, that instead of being the mere brilliant hypothesis of a man of genius, of which the proofs were to be furnished and the fruits gathered in by his successors, it was really only a summary of opinions based upon the most extensive and long-continued researches. Its author did not simply open a new province for future travellers to explore, he had already surveyed it himself, and the present volumes show him still at the head of his followers. They are written in a more popular style than those on "Animals and Plants under Domestication," as they deal with subjects of more general interest; but all the great qualities of industry and accuracy in research, of fertility in framing hypotheses, and of impartiality in judgment, are as apparent in this as in Mr. Darwin's previous works. To one who bears in mind the too frequent tone of the controversies these works have excited, the turgid rhetoric and ignorant presumption of those "who are not of his school—or any school," and the still more lamentable bad taste which mars the writings of Vogt and even occasionally of Haeckel, it is very admirable to see the calmness and moderation (for which philosophical would be too low an epithet) with which the author handles his subject. If prejudice can be conciliated, it will surely be by a book like this.

It consists of two parts. The first treats of the origin of man, his affinities to other animals, and the formation of the races (or sub-species) of the human family. Besides the obvious interest to all Mr. Darwin's readers of a discussion on the subject of their "proper knowledge," naturalists will find the detailed application of the laws of natural selection to a single common and well-known species an excellent test of their truth and illustration of their difficulties. It is in dealing with the latter, which are never extenuated or passed by, that the author introduces the subject of sexual selection. This is dealt with in the second part, which forms more than two-thirds of the work, and that not only as it affects man, but in its entire range. Reserving this division of the book for a future article, we will endeavour here to give a summary of the course of argument in the earlier portion.

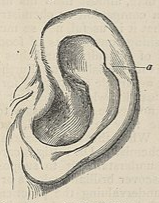
The author, justly assuming that the general principles of natural selection are admitted by all who have examined the evidence on the subject, with the exception of many of "the older and honoured chiefs in natural science," proceeds at once to discuss the proofs of the origin of man considered apart from those affecting all animals in common. The first group of facts adduced to show his kinship with other forms of animal life, relate to the strict correspondence of his bodily parts with those of other mammalia. To say that these structures are the same because they have the same uses, is untrue, for many of them have no use in the sense of active function, and we constantly find the same structures in animals turned to different uses, and the same uses subserved by different structures. To say that the bodies of men and animals are alike because they are formed on the same plan, or because they are the realisation of the same idea in the Creator, is true enough, but is beside the mark; for natural science inquires how or by what steps these things have become so, not why and from what first cause. If one sees two men very much alike, one naturally supposes that they are brothers; if they are rather less so, they may be cousins; if only agreeing in general characters, we recognise them as at least belonging to the same race or nation; and so, when the facts to be accounted for are once ascertained, nothing but prejudice or repugnance to acknowledge our true relations, can explain why it was so long before naturalists admitted the hypothesis of community of origin between men and other animals. What is called the Darwinian theory accounts for the way in which diversities have arisen, and thus has converted an apparently obvious hypothesis into a well-grounded theory. But in expounding the likeness between men and animals, the author does not confine himself to anatomical structure, but shows how the same resemblance extends to the laws of disease, the distribution of parasites, and other minute particulars.

The next argument brought forward is the equally familiar one drawn from the likeness of the human embryo to that of other vertebrata. Then follows an account of the rudimentary organs in man, which in all other species are justly held among the most important indications of affinities. One such rudiment is mentioned which is, we believe, hitherto unrecorded. It is a slight projection of the rim of the helix of the auricle, which would correspond when unfolded to the point of an erect ear. (See illustration.) This occasional abnormity may, perhaps, be recognised by future anatomists as the *Angulus Woolnerii* after its first observer.

In the second chapter Mr. Darwin shows that a consideration of the mental faculties of man, including the use of language, which has been held the greatest difficulty to admitting his kinship to other animals, may rather strengthen than weaken the arguments derived from his bodily structure. Memory and curiosity, jealousy and friendship, and even the power of correct reasoning, and of communication by sounds, are shown to belong to many of the lower animals, while the faculty of reflection and self-consciousness, and "the ennobling belief in the existence of an Omnipotent God," cannot be ascribed to the lowest tribes of the human family. At the same time

it is argued that the use of articulate language, the power of forming abstract ideas, and even the sense of right and wrong, may have been gradually acquired by steps which here and there it is not impossible to trace. The question of the origin of the moral sense leads to the proposition of the following theory. Some natural emotions are of great intensity but short endurance, and their force is not easily recalled by memory; others, though less powerful at certain times, exert a constant influence, or one which is only interrupted by being overpowered for a time by the former. Accordingly, during the greater part of life, and always when there is leisure for reflection, the gratification connected with the more violent passions, such as hunger, sexual desire, and revenge, appears small, whereas the social instincts of sympathy and the pleasures of benevolence exert their full power. Hence we find social virtues, as courage, fidelity, obedience, among savages and even animals, long before the "self-regarding" virtues begin to appear. This theory is analogous to that by which Mr. Bain explains the higher character of the pleasures of sight compared with those of smell; they can be more easily recalled ;and corresponds to the distinction drawn by the same writer between the acute and the more "massive" and permanent pleasures.

In the fourth chapter Mr. Darwin discusses the manner in which man was developed. It is shown that the broad facts on which the theory of Natural Selection rests apply



Human Ear, Modelled and Drawn by Mr. Woolner. *a*. The projecting point.

to him. He is prolific enough to share in the struggle for existence. In him, as in all organic forms, there is a constant tendency to growth, which being checked and modified by external influences, proceeds in the direction of least resistance, and so produces the variations which are often ascribed to an assumed inherent tendency. Among the various forms produced, those will survive which are best fitted for the surrounding conditions, and they will transmit their character to their descendants, still subject to the same liability to vary. Next the author argues that the mental endowments of man, including language, his social habits, his upright position, and perfect hands, are of direct advantage to him in the struggle with other animals and with his fellows. It has always appeared that the difficult point in the development of man by Natural Selection is at the period when he was more defenceless than an anthropoid ape and less intelligent than the lowest savage; but Mr. Darwin thinks that the transition may have been safely made in some large tropical island where there was abundance of forest and of fruit. That man, once developed, can maintain himself, is obvious from his present existence. The arguments in favour of civilised man being the descendant of savages, which have been so admirably developed by Sir John Lubbock and Mr. Tylor, are of course brought forward in support of the author's view, and the important question is discussed how far we may hope for future improvement in the race by means of continued Natural Selection. Thus, while admitting that the process undergoes many checks and complications among human beings, the author does not assent to the arguments urged by Mr. Wallace that it would cease to operate as soon as the moral faculties came into play.* One human peculiarity which is apparently inexplicable by Natural Selection, the nakedness of the body and presence of a beard, is referred by Mr. Darwin to the operation of Sexual Selection. To this same agency is attributed the origin of the so-called Races of Man, which is discussed with admirable clearness and impartiality in the last chapter, and this leads to the complete exposition of the theory of Sexual Selection which occupies the second part of this work, and must be considered in a future article.

It only remains here to add a word on the account of the affinities and genealogy of man contained in the sixth chapter. As a kind of retribution for the attempt to raise Cuvier's order *Bimana* into a sub-class, not only have most naturalists now reverted to a modified definition of the *Primates* of Linnæus, but Mr. Darwin shows reasons for refusing to the genus *Homo* even the rank of a family in this order, which Prof. Huxley admits, and regards it simply as an aberrant member of the Catarrhine division of the *Simiadæ*. This conclusion, which seems to us to be a just one, will only be distasteful to those who so little appreciate the true characters of man as a spiritual being, that they could feel self-complacency in the brevet-rank of a sub-class.

Mr. Darwin mentions Africa as the possible seat of the Catarrhine progenitors of man, but shows the futility of speculations on this point, until we know more of the recent changes of the earth, the records of palæontology, and the laws affecting the rapidity of animal modifications. He does not advert to Prof. Haeckel's hypothesis of a "Lemuria" in the Indian Ocean, but agrees with him in next tracing the phylum of man to the *Prosimiæ*. These again were developed from "forms standing very low in the deciduate mammalian series" (possibly, as Prof. Huxley suggests, most nearly allied to the existing *Insectivora*), and thus, through the Marsupials and Monotremes from the Reptilian stock, and thence through the *Dipnoi* and Ganoids from the *Urtyhus* of the vertebrate series, represented by the Lancelet alone. Nor does Mr. Darwin stop here, but adds the weight of his judgment to the theory based on the observations of Kowalewsky and Kuppfer, which deduces the primeval *Vertebrata* from a form resembling a Tunicate larva. Perhaps the most brilliant of the many new suggestions in these volumes is one thrown out incidentally in a note to p. 212, and based upon this supposed relation of man to the Ascidians. Beyond the organic world Mr. Darwin does not attempt to trace the genealogy of man. Considering how essential this extension of the theory of evolution is held by men so distinguished as Haeckel, and how keenly the question

* In reviewing in these columns the contributions of the latter eminent writer, we took occasion to quote the estimate he expresses of Mr. Darwin's claims. Should anyone be disposed to overlook the original value of Mr. Wallace's work, he will be corrected by a somewhat similar passage in the present volume. See pp. 137, note, and 416.

of Abiogenesis has recently been discussed, the reticence shown in avoiding allusion to the subject is perhaps the most remarkable among the many remarkable characters of this great work. P. H. PYE-SMITH

OUR BOOK SHELF

Elementary Natural Philosophy. Being a course of nine lectures by J. Clifton Ward, F.G.S., Associate of the School of Mines. (London: Trübner and Co.)

THE attempt to crowd the Elements of Natural Philosophy into nine lectures cannot be otherwise than a failure. This is signally the case with the little book before us. We need hardly go farther than the table of contents to justify the statement. A single lecture is devoted respectively to Magnetism, Voltaic Electricity, Light, and Heat; Pneumatics and Hydrostatics together occupy one lecture, whereas to Frictional Electricity and Sound are given two lectures apiece. Nor does the author confine himself to a simple summary of the leading facts in each of these subjects, he tries to rush over all the field occupied by larger text-books. Hence, important facts are often lightly passed over and comparatively trivial matters made unduly prominent. In Voltaic Electricity, for example, two pages are occupied with a description of the effects of electro-chemical decomposition, when seen on the screen by the aid of the solar microscope. We recognise here, and indeed on every page of the book, those lecture-experiments with which Dr. Tyndall has made the students of the School of Mines so familiar. Mr. Ward has not only drawn largely upon his notes of those lectures, but he imitates Dr. Tyndall's language and style.

Notwithstanding this, we are quite sure Mr. Ward has only himself to blame for the errors which even a cursory glance has revealed to us. On p. 85 we read "Magnetism may be produced by *friction* (of *soft iron* with loadstone or other magnet) by magnetic induction and electricity." Magnetism is *not* produced by friction of soft iron. On pp. 36 and 37 Mr. Ward has fallen into a vulgar and serious error in explaining the electric wind. Speaking of the so-called electric fish, here is what he says:—"If the interior of the Leyden jar be charged positively, negative electricity will be attracted to the head of the fish, from the somewhat blunt point of which it will stream and cause a movement from the knob; while the gliding off of the repelled positive from the finer pointed tail, will counterbalance this movement, and keep the body in equilibrium." The author also speaks of a lighted candle extinguished by the *draft of electricity* streaming from a point. This, of course, is grossly incorrect; it is the movement of contiguous air particles charged similarly by contact and then repelled, that extinguishes the candle, or supports the gold leaf fish.

Though there are some good points in this little book, we regret our inability to recommend it either to schools or students. We venture to think the author betrays his want of experience in teaching science by the over-crowding of his facts; the first lecture, for instance, is accompanied by thirty-three distinct experiments. Teaching—especially science teaching—requires "precept upon precept, line upon line, here a little and there a little;" otherwise there is an almost certain danger of the learner obtaining loose and superficial knowledge, the end of which is not sound instruction, but disastrous conceit.

W. F. B.

Essays on Darwinism. By J. R. R. Stebbing. (Longmans and Co., 1871.)

MR. DARWIN, in his recent work, very truly observes that "false facts are highly injurious to the progress of science, for they often long endure; but that false theories are comparatively innocuous." Mr. Stebbing's work can then do little harm, as it supplies us with
whatever, whether true or false. The
cate who serves Mr. Darwin with mor
tion, and who seems but little, if at all,
the arguments and objections adduced
Some who are already convinced of
winism will read with pleasure a seri
interesting essays in its favour; but, th
confirm a disciple, they are singular
convert an opponent. Before Mr. Ste
upon this subject we strongly recomm
carefully Mr. Grote's "Examination
Philosophy."

*Das Wesen und die Ziele der Chemisch
des Chemischen Studiums.* Akade
gehalten von Dr. Rudolph Fittig.
and Händel, 1870. London: Willia

So busy are the majority of Ge
research, that it is seldom we are privi
opinions on the object of the science,
should occupy as a study. Dr. Fittig
of his appointment as Professor of Ch
versity of Tubingen to deliver an in
which these points are discussed with
ability. Starting with the assumptio
of men estimate the value of a scienc
to satisfy want and contribute to the
Fittig goes on to claim for chemistry
view the first place among the scien
asks, "is there another science which,
of its results to man, almost from his
last, is so true a companion as chemi
ceeds to show that it is useful, not so
what the nourishing constituents of fo
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to produce means of nourishment. Fu
that there is not an article of clothing
of which chemical knowledge has no
and the same knowledge is necessary
spread of disease may be prevented,
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by the study of chemistry, Dr. Fittig is
it is a total misunderstanding to sup
purpose is to discover brilliant colours
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compounds been colourless and without
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change of this composition *in order to
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decomposing of substances.* . . . .
to multiply the number of substances
nature, not for the sake of producing
benefiting the world, *but to discover th
nature.* He is no true chemist who o
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Dr. Fittig has done well to point out
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jacent. Each course occupies from 50 to 100 hours during a term of four months and a half. Some professors go with their students through a complete course of elementary instruction, whilst others leave this chiefly to private study, devoting the greater part of their time to inducting their pupils into the method of especial research. The attendance of students at the lectures is ensured by the circumstance that the Natural Sciences form part of the objects in which medical men, chemists, and teachers, are examined before they are allowed to enter upon the exercise of their calling. We are informed that, at a University with nearly 700 students (each remaining generally eight terms), some fifty would attend, within one term, the course of Natural Philosophy, or Botany; about twenty-five that of Zoology, or Comparative Anatomy; from fifteen to twenty that of Mineralogy, or Palæontology; and about thirty-five that of Geology. These were the numbers usually seen in the lecture-rooms, but there were, of course, other students who were prevented from attendance by various causes. The majority of those students who are desirous of receiving a perfect scientific education, and have the means for it, take advantage of the great variety of collections and instructors by prosecuting their studies at two or more Universities, finishing them at those places which offer the largest collections, and, in natural combination, the best instruction.

It may be mentioned here that the teaching of Science in German Universities is not entirely dependent on the public collections. Beside the staff of "ordinary" professors, there are younger men attached to the University, who have the right to teach, but can make only such use of the collections as the ordinary professor is disposed to grant. Most of them select, for their course of lectures, branches in the teaching of which they can dispense with the collections of the Museum—as, physiology of plants, histology and microscopy, history of development, general biology. This institution of "private docents," as they are called, is valuable not only to the students, but also to the body of instructors, inasmuch as it forms a preparatory school for men who intend to undertake the duties of an ordinary University teacher. The presence of an able and popular "private docent" has also not rarely had the beneficial effect of exciting to fresh exertions the ordinary professor, who had gradually lapsed into a course of stereotyped lectures. Nevertheless this institution can be regarded only as supplementary to the system of scientific education which is principally carried out in connection with the Museums.

We are not aware that there has ever been any lack of men combining an exact knowledge of some branch of Natural History with the aptitude for teaching it; nor have we ever heard of complaints that the duties of teaching seriously interfered with those of the curatorship; on the contrary, their union in one individual can have and has had only a beneficial effect. As teacher he knows best how to regulate the accessions and modify the arrangement of the collection, so as to meet the requirements of, and to be in accordance with, his system of teaching; and as curator he takes care that those parts which are not in direct connection with the lectures are not neglected, or that valuable specimens are not sacrificed for temporary purposes in the lecture-room or student's laboratory. Work in the Museum is as necessary for the training of the students as attendance in the lecture-room; and it is the duty of the teacher to devise suitable objects of research for his pupils. But if he had not the management of the collection, how could he be certain that the materials required are present, or will be made available? Would it be possible for him to superintend the student's work in a place where he is not the master? Were those duties assigned to two individuals, they would soon clash, to the injury of the service expected from the Institution.

The existence of numerous large or well-adapted collections, their utilisation for educational purposes, and the devotion of adequate time to instruction, are among the principal causes which have rendered the system of scientific education successful throughout Germany. But we must not forget that this success is due to the Universities only, and is limited to the classes receiving a University education. In the schools of lower degree, Science (with the exception of chemistry and natural philosophy) is only taught in the form of book-knowledge, in which the pupil takes but little interest, and therefore it has no great or lasting influence on the culture of his mind.

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II.

THAT selection in relation to sex has been an important factor in the formation of the present breeds of animals was more than indicated in the "Origin of Species," and the theory has since been especially worked out by Professor Haeckel. It includes two distinct hypotheses. One is that in contests between males, the weakest would go to the wall, and thus either be killed outright, or at least debarred more or less completely from transmitting their characters to another generation. This may be regarded as a particular case of Natural Selection, and may be compared with the theory of protection by mimicry, suggested by Mr. Bates, and carried out by him and by Mr. Wallace. But though in the lists of Love the battle is often to the strong, even more frequently it is to the beautiful. This introduces a new process, of which the effects are not nearly so obvious as those of Natural Selection, either in its simplest form or in the more complicated cases of mimicry, and of sexual selection by battle. Many circumstances must combine in order that the most successful wooers shall have a larger and more vigorous progeny than the rest. In the first place, all hermaphrodite and all sessile animals may be excluded, and also those cases in which sexual differences depend on different habits of life. Mr. Darwin then shows that secondary sexual characters are eminently variable, and that males vary more than females from the standard of the species, a standard determined by the young, by allied forms, and sometimes by the character of the male himself when his peculiar functions are only periodical, or when they have been artificially prevented. Moreover it is the males who take the active part in pairing, and who not only fight for the possession of their mates, but display their colours, their voice, or whatever

be their peculiar attractions, in order to gain the same end. This rule is confirmed by the exceptional case of the cassowary and a few other species in which the hens court the male birds, fight together in rivalry, and accordingly assume the brighter colours and more attractive shape usually worn by the male. Not only the parental and incubating instincts, but the usual moral qualities of the two sexes are in these cases reversed: "the females being savage, quarrelsome, and noisy, the males gentle and good." But it is further necessary to show that the females exert a choice among the males, and that the latter are polygamous, or arrive earlier at the place of pairing, as is the case with some birds, or else exceed in numbers, at least when both sexes are mature. On this point a series of observations is recorded relating chiefly to man, to domesticated mammals, and to insects. The rule as to transmission of male characters to both sexes appears to be that when variations appear late in life they are usually developed in the same sex only of the next generation, although they are, of course, transmitted in a latent condition through both; while, on the other hand, the differences which appear before maturity in the

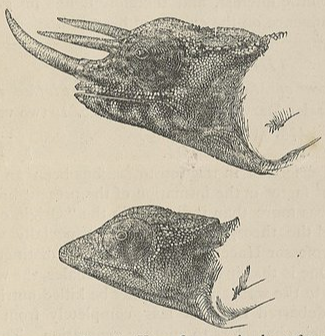

Fig. 2.—*Chamæleon Owenii*. Upper figure, male; lower figure, female.

parent are equally developed in both sexes when transmitted to the offspring. The numerous apparent exceptions to these laws of inheritance and of sexual selection are examined with wonderful fairness and fertility in resource. I may particularly refer to the discussion of the ways in which the young and adults of both sexes differ among birds. The extreme intricacy of some of the questions considered is best shown by a postscript in which, with characteristic candour, the author corrects "a serious and unfortunate error" in the eighth chapter.

The remainder of the first and the greater portion of second volume are occupied by a survey of sexual variations throughout the animal kingdom. Passing rapidly over the other invertebrate classes, the author devotes two chapters to the secondary sexual characters of insects. The weapons, the ornaments, and the sounds peculiar to the males of this vast group of animals are briefly described, and the remarkable analogy between insects and birds which is seen in so many other particulars is traced here also. The brilliant colours of many caterpillars, which, of course, cannot be due to sexual selection, offer one of the many difficulties which are faced, and this is explained by the aid of what the author terms Mr. Wallace's "innate genius for solving difficulties," as being due to natural selection. The bright colours warn the enemies of the caterpillars that they are unfit for food, and so benefit the latter, "on nearly the same principle that certain poisons are coloured by druggists for the good of man." Many cases are probably further complicated by mimicry, savoury caterpillars assuming the colours of distasteful ones so as to share in their immunity, in the same way that a druggist might label his bottles of sweetmeats "poison," to keep them from the shop-boy.

In the frigid classes of the lower Vertebrata one would think that sexual selection would have little play; yet Mr. Darwin gives several instances among fishes, amphibians, and reptiles in which weapons or ornaments, peculiar to the males, appear to have been acquired by this means. (See Fig. 2.) But it is in the great class of birds that the most complete series of examples is found, and our advanced knowledge of the habits of this class renders it

Fig. 3.—Head of *Semnopithecus rubicundus*. This figure (from Prof. Gervais) is given to show the odd arrangement and development of the hair on the head.

the best possible field for the exposition of the whole theory. Again and again our author forestalls the evidence adduced in the chapters on sexual selection among birds, when tracing its first obscure operation among lower classes, and falls back on the same stronghold when explaining its less obvious working in the mammalia.

Among birds the rivalry of beauty has led to far more striking results than has the rivalry of strength. Foremost of these is the power of song, which, in accordance with the law of the least waste, is usually confined to birds of inconspicuous colours, while the combination of the harsh note with the magnificent plumage of the peacock is a familiar converse example. The object of the adornment of birds is conclusively proved by its being, as a rule, confined to males, and often to them only during the breeding season, as well

as by the pains they take to exhibit their beauties to the hens. The difficulty is to show the precise way in which the results have been attained by gradual selection. In two remarkable instances, the wings of the Argus pheasant and the train of the peacock, Mr. Darwin succeeds in tracing the gradations in the same bird or the same family by which these wonderful and elaborate ornaments have been brought to their present perfection. The woodcuts which illustrate these gradations are unfortunately too numerous to be reproduced here; they are admirably drawn, and convey the impression of the feathers as nearly as is possible by the means employed. Indeed, we may here remark that throughout these volumes the original cuts, generally of details of structure, contrast very favourably with the figures of species taken from Brehm's "Thierleben," which are feebly drawn and ill-engraved.

Sexual selection has, of course, been continually checked and modified by the never-ceasing influence of natural selection, sometimes, as in the case of the horns of stags, being only somewhat diverted, but often directly opposed, as when it produces dangerously conspicuous colours, and dangerously cumbersome ornaments. In the case of birds, Mr. Darwin holds that the usual tendency of sexual selection being to produce variation in males, its transmission to hen birds has been checked by natural selection. Mr. Wallace, on the other hand, believes that both tendencies have generally operated together, in opposite directions, so as to make successive generations of males more and more conspicuous than the primitive type, and those of females less so. The fact that, as a rule, young birds resemble hens in their plumage, is a strong argument for the former opinion, since most naturalists admit that early characters are the most trustworthy guide to natural alliances, *i.e.*, to true genealogy. To explain the transmission in some cases of brilliant colours (acquired probably by sexual selection, and therefore properly a male character) to both sexes indiscriminately, Mr. Wallace has framed the ingenious hypothesis, that the females have been protected from the dull uniformity threatened by natural selection, by their very general habit of building covered nests. Our author looks at the facts in a reversed way, and supposes that in most cases these hen birds, having inherited bright colours from the males, were led to the habit of building covered nests for the sake of protection.

Among mammals sexual selection has chiefly operated by increasing the size and strength of the males, and furnishing them with weapons of offence;* but besides allurements to the senses of smell and hearing, this class offers not a few instances, especially among the Quadrumana, of brilliant colouring being developed as a secondary sexual character. Here also we have the most striking instances of the production of defensive organs by the same process, as in the manes of lions, the cheekpads of some of the *Simiidæ*, and possibly the upper tusks of that ancient enigma, the barbirusa. Lastly, it is in the class of mammals that we meet with cases of what may be called primary sexual ornament, as in *Cercopithecus cynosurus*, which make one wonder, with a thankful wonder, why such apparently obvious results are not more common. We must, however, admit that such adornment is not more disgusting, nor that of which we copy a figure more ludicrous, than the personal decorations of savages. Sir Joshua Reynolds says that if a European in full dress and pigtail were to meet a Red Indian in his warpaint, the one who showed surprise or a disposition to laugh would be the barbarian.* But who could stand this test when meeting *Semnopithecus rubicundus* or *Pithecia satanas*?

We must admit, notwithstanding such anomalies, that, on the whole, birds and other animals admire the same forms and colours which we admire, and this, perhaps, may be admitted as an additional argument in favour of their kinship with us. Some of the ugliest creatures (like the hippopotamus) appear to have been quite uninfluenced by sexual selection, while the magnificent plumes of pheasants and birds of paradise are undoubtedly due to its operation. That it has occasionally led to unpleasing results in birds and monkeys of aberrant taste, is no more strange than that all savages do not carve and colour as well as the New Zealanders, or that most Englishmen admire ugly buildings and vulgar pictures. The prevailing aspect of nature is beauty, and the prevailing taste of man is for beauty also. The *means* by which natural beauty has been attained are various. Natural selection is one, by which the healthiest, and therefore the most symmetrical forms survive the rest. Protective mimicry is another, by which fishes have assumed the bright colours of a coral garden and butterflies the delicate venation of leaves. Flowers again have in many cases obtained their gay petals and fantastic shapes from the advantage thus gained for fertilisation by insects. The successive steps which have led to the graceful forms and brilliant tints of shells, to the intricate symmetry of an echinus-spine or a nummulite, these are as yet untraced even in imagination.

But that many of the most striking ornaments of the higher animals, and almost all those which are peculiar to one sex, have been developed by means of sexual selection, is a conclusion which can no longer be distrusted. There remain doubtless many exceptions to be accounted for, many modifying influences to be discovered; but the existence of a new principle has been established which has helped to guide the organic world to its present condition. Side by side with the struggle for existence has gone on a rivalry for reproduction, and the survival of the fittest has been tempered by the success of the most attractive.

P. H. Pye Smith

* The very general transmission of such weapons to both sexes may, perhaps, be explained by the need females have of means to defend their young.

* Discourse delivered at the Royal Academy, December 10, 1776.

HELMHOLTZ'S TONEMPFINDUNGEN

Die Lehre von den Tonempfindungen, von H. Helmholtz. (Braunschweig: F. Vieweg. London: Williams and Norgate. 3rd edition. 1870.)

THIS work traces the connection between physical and physiological acoustics, on the one hand, and the general principles and practice of music, on the other. Professor Helmholtz's qualifications for taking up this subject are unique. In each branch of science involved in the inquiry he has a reputation at least equal to that of any specialist in that branch. In the combination of eminently original mathematical power and consummate