REVIEWS AND NOTICES.

THE ANATOMY OF VERTEBRATES. Vol. III. Mammals. By RICHARD OWEN, F.R.S., Superintendent of the Natural History Department of the British Museum, etc. Pp. 915. London: Longmans and Co. 1868.

THIS volume completes Professor OWEN'S work on the Vertebrate Animals. It consists of chapters on the Muscular, Nervous, Dental, Elementary, Absorbent, Circulatory, Respiratory, Urinary, Tegumentary, Generative, and Mammary and Marsupial Organs; also, on Peculiar Glands, and on Generative Products and Development; and terminates with a Chapter of General Conclusions. The three volumes form a work which can scarcely add aught to the reputation of the author; but which, because of his reputation, and because it contains the systematised result of many years' labour, must hold a place in the first rank in biological literature.

To analyse thoroughly the material of the book—made up as it almost wholly is of details—would be neither practicable here, nor profitable. Criticism we shall not attempt; but will merely say that the arrangement is orderly, the language generally clear, and the general getting up creditable to the publishers. The book, however, cannot be laid aside without a brief notice of Professor Owen's views on some prominent subjects.

The first of these is the Nervous System. The author divides this into the myelon (spinal cord); the epencephalon (consisting of the macromyelon and cerebellum); the mesencephalon; the prosencephalon; the nerves; and the various organs of sense. This brief list, we must remark in passing, affords an example of a practice to which Professor Owen has a strongly marked tendency—that of coining new names, mostly of Greek origin. That his names are well chosen and expressive of what they mean, must be admitted; but we think that a list of them, with derivations and succinct definitions, would have been an useful addition to the book. The encephalon or brain of mammals is described by Professor Owen as consisting of—1, the *epencephalon*, comprising the medulla oblongata, cerebellum, and pons Varolii; 2, the *mesencephalon*, comprising the columnar elements supporting the optic lobes, with the so-called "fillet", "processus a cerebello ad testes", and the "corpora bigemina or quadrigemina"; and, 3, the *prosencephalon*, which consists of the "crura cerebri", the "thalami optici" and "corpora striata", and the mass of the cerebral hemispheres. The epencephalon is further divided into the macromyelon and the cerebellum. (The term "macromyelon" does not denote the "medulla oblongata" of other anatomists, but is applied to the intracranial prolongation of the columns of the cord as far forward as their emergence from the pons or cerebellar commissure; and includes the pons Varolii itself.) In the account of the prosencephalon, a considerable portion is devoted to the description of the cerebral fissures—of which forty-five are called by distinct names—and the extent to which they are developed in the several classes of mammalia. Thus, commencing with the Lyencephala (loose-brained animals) and the Lissencephala (smooth-brained), where the cerebral fissures and convolutions are at their minimum, we have them traced in their more extended development through the various tribes of Gyrencephala—carnivora, cetacea, perissodactyles, artiodactyles, proboscidians, and quadrumana—up to their greatest manifestation in the Archencephalic subclass, to which belongs Man only. The amount of development of the fissures and convolutions is shewn to vary within certain ranges in each order of the Gyrencephala above enumerated; but most of all in the quadrumana, where in *Midas* the cerebral mass has a fœtal smoothness, while in the Orang and Chimpanzee the convolutions attain a development approaching to—but not equalling—that met with in the brain of man. With this progressive increase of the convolutions in the four subclasses of mammals, are associated grades of development of the corpus callosum and other encephalic structures.

In summarising his account of the fissures, Professor Owen says:

"The fissures which break the surface of the mammalian brain are of different kinds, degrees, and values. Some, in the course of development and elevation of the primary masses, divide one from the other; as the cerebrum from the optic and olfactory lobes, the cerebrum from the cerebellum, and this from the macromyelon. Some subdivide primary masses into symmetrical halves; as, *e.g.*, the interhemispherical fissure, the interolfactory fissure, and the shallower indent between the mammalian optic lobes or 'nates.' One or two fissures of the cerebrum make folds that project into the hemispheral cavity or ventricle; *e.g.*, the hippocampal, and, in Man, the posthippocampal. Most are confined to its crust or wall, and of these, as I shewed in 1833, some, from their relative constancy, depth, and symmetry, may be termed 'primary', while others are of secondary or inferior rank."

The following appear to be the characters on which Professor Owen depends, as distinguishing the brain of Man from that of the most highly developed Quadrumana.

1. In Man, the lateral lobes of the cerebellum attain their largest proportions, and their greatest complexity of relations with the myelon and with the other parts of the encephalon.

"If it be considered that the maintenance of the erect position in Man demands unusual power of regulating and combining muscular movements, whether with or without the cognisance of the mind, and that he exercises or can exercise a greater variety of modes of locomotion than any lower animal, flight alone being inexecutable, the characteristic size and complexity of the human cerebellum would accord with such view of its functions; and the general results of the experiments of Flourens and Magendie concur with the inferences which, in the main, may be drawn from Comparative Anatomy."

2. The part which in anthropotomy is called the posterior horn of the lateral ventricle, and which in the lower mammals, up to the Orang, retains the capacity of the supracerebellar part of the cerebral hemisphere, but in the Chimpanzee and Gorilla begins to be reduced by the encroachment of the surrounding walls, in Man has its moulding into the form of a "horn" completed, and is further marked by the distinct projection—incipient in Chimpanzee and Gorilla—of the "hippocampus minor."

3. Associated with the hippocampus minor is the appearance of a distinct fissure in the brain of Man—the posthippocampal; and, in addition, the other cerebral fissures, which have already their representatives in the higher Quadrumana, attain in Man their greatest extent.

4. "In Man alone is a bulk of body, greater than in any Quadrumana save Gorilla, associated with a large size as well as with the highest stage of complexity of the cerebral organ. This is, perhaps, the most notable and significant fact in Comparative Anatomy."

We come next to the chapter on the Teeth of Mammalia—a subject to our knowledge of which Professor Owen's labours have largely contributed. The chapter contains 118 pages. In it the author describes the typical dentitions of the various mammalian orders; and offers some remarks on the homologies of teeth. In general, "teeth are referable to the dermo- or entero-skeletal parts of the osseous system"; and, specially, homologies between classes of teeth in different animals have been recognised, giving rise to the terms "incisors", "canines," "molars," and the further division by the Cuviers of the molar teeth into "true" and "false," "carnassial" and "tubercular." According to Professor Owen, however, size and shape are unimportant in the determination of the homologies of teeth; it is to relative position that we must look. He regards the dentition of Diphyodonts—animals in which two sets of teeth are generated—as presenting forty-four teeth as the typical number; and says that, when the clue is afforded to the homologies of the teeth, it infallibly conducts to the knowledge of the nature of the teeth which are retained and of those which are wanting to complete the typical number. Thus, in Man, the second bicuspid in the upper jaw, and the first molar in the lower jaw, are the homologues of the great carnassial teeth of the lion; and the teeth which are wanting in Man to complete the typical molar series are the first and second premolars.

Limit of space obliges us to pass over many chapters, in order that we may be able to give a notice of the interesting one which concludes the book, and in which the author touches on some of the most important questions which have engaged the study of Biologists. He begins the chapter by referring to the debates on the relations of past to present species, which took place in 1830 between Cuvier and Geoffroy St. Hilaire, and to which, in all their bearings, he devoted intense attention; and states that the main collateral questions have appeared to him to be the following:

"Unity of Plan or Final Purpose, as a governing condition of organic development?

"Series of species, uninterrupted or broken by intervals?

"Extinction, cataclysmal or regulated?

"Development, by epigenesis or evolution?

"Primary life, by miracle or secondary laws?"

Regarding the first question—Homology or Teleology?—Professor Owen notices the opposing doctrines of Cuvier and Geoffroy St. Hilaire; the former holding the work of organisation to be guided by final purpose or adaptation, and the latter denying the evidence of design, and contending for the principle which he called "unité de composition." The author was at first disposed in favour of Cuvier's view; but the development of his ideas of the typical vertebrate skeleton, and the perception of the process of "irrelative repetition" of parts in plants and in invertebrates, and apparently also in the vertebrate skeleton, have led him to modify his opinion, and to reject "the principle of direct or miraculous creation—as applied to species"—and to recognise "a natural law or secondary cause" as producing species in orderly succession; such cause being the servant of predetermining intelligent Will.

Is the succession of Species broken or linked? In answering this question, Professor Owen brings forward the evidence afforded by palæontology of the existence of a gradual and connected chain between the *Palæotherium* and the now existing horse and its congeners;—a chain of intermediate forms which Cuvier expressly asserted to be necessary for the support of the doctrine of gradual transmutation of species, and which has been discovered since his time.

The gradation is shown in the dentition and in the formation of the hoof. *Palæotherium* had a functionally developed first premolar tooth, and a foot with three toes. *Hipparion*, another extinct species, had the first premolar tooth smaller than in *Palæotherium*, and the lateral hoofs shortened, and, as it were, dangling by the side of the middle one. In *Equus*, the first premolar tooth is small and soon shed; and the lateral toes are reduced to the condition of hoofless "splint-bones". Between *Palæotherium* and *Hipparion* are two other extinct species—*Paloplotherium* and *Anchitherium*, presenting intermediate gradations. Of these genera, the single-hoofed Horse family cannot be traced further back than the pliocene tertiary period; the tridactyle *Hipparion* belongs to the miocene strata; and the species with three functional hoofs to the eocenes.

The consideration of the manner in which these gradations were produced leads to an examination of the hypothesis of natural selection. On this point, we shall find that Professor Owen has more to say farther on. Here, he bases an argument on the fact that animals of the genus *Equus* occasionally revert to the tridactyle type. Now, he says, the mother of a tridactyle colt might also bring forth a tridactyle filly; and these, pairing, might restore the race of hipparions, with distinct phalanges and hoofs.

"Now the fact suggesting such possibility teaches that the change would be sudden and considerable; it opposes the idea that species are transmuted by minute and slow degrees. It also shows that a species might originate independently of the operation of any external influence; that change of structure would precede that of use and habit; that appetency, impulse, ambient medium, fortuitous fitness of surrounding circumstances, or a personified 'selecting Nature', would have no share in the transmutative act."

Professor Owen, then, holds that the instance of the Horse and its palæozoic congeners shows departures from the parental type, probably sudden and seemingly monstrous, but adapting the progeny to higher purposes—and, in the case of the Horse and Ass, fitting these animals for the use of Man. The origin of new species is not, therefore, to be ascribed to a succession of creative changes; and their disappearance has not been the result of cataclysmal destructions, but has been due to defeat in the contest which the individual of each species had to maintain against surrounding agencies. In this the author agrees with Mr. Darwin, whose knowledge and labours, he says, have furnished large illustrations of the principle regulating the extinction of species.

The author now comes to an examination of the doctrine of Natural Selection as applied to the *preservation* of species; and here he dissents from Geoffroy St. Hilaire's hypothesis of the effect of the "ambient medium" in producing changes, and from the natural selection doctrine of Darwin. Taking a low form of animal life—the coral-polype—as his text, Professor Owen asserts that it is unnecessary and unreasonable to invoke the aid of a new application of creative power for the formation of every species of coral, or for the transition from the old quadripartite to the modern sexpartite type; that there is no evidence that the coral-polypes that formed the reefs of Wenlock and Cheddar worked in an ocean constituted otherwise than the present; and that an innate tendency to deviate from parental type, independent of inner volition (impossible in the case of the coral-polype) or of outward selection, has been the most probable way of operation of the law of derivation of species.

Extending, now, this doctrine of derivation, Professor Owen asks—in entering on the question of Epigenesis or Evolution—whether the demonstrated series of conversions may not have included that into the vital form. Once a believer in the doctrive of successive development of the simplest forms of living beings from pre-existing germs, he appears now to have abandoned that notion, and to be, in this matter, a follower of Geoffroy St. Hilaire and Pouchet, rather than of Cuvier and Pasteur. He thinks that

"It is more consistent with the present phase of dynamical science and the observed gradations of living things, to suppose that sarcode or the protogenal jelly-speck should be formable through concurrence of conditions favouring such combination of their elements and involving a change of force productive of their contractions and extensions, molecular attractions and repulsions, than that all existing sarcodes or protogenes are the result of genetic descent from a germ or cell due to a primary act of miraculous interposition."

He compares the attractive and assimilative movements exhibited by the *protogenes* or amæba with the phenomena of magnetised substances; and asks whether the amæbal phenomena are so much more different from the magnetic than they are from the mammalian phenomena, as to demand a special miracle, or creative act, for their manifestation.

"It is conceivable that the same CAUSE which has endowed His world with power convertible into magnetic, electric, thermotic, and other forms or modes of force, has also added the conditions of conversion into the vital mode."

The author next notices the phenomena of Mind as associated with brain, and regards thought as bearing the relation to the brain of man that electricity bears to the battery of the torpedo: "both are forms of force, and the result of action of their respective organs." He protests against being charged with materialism because he rejects the hypothesis that an abstract entity produces psychological phenomena by using the brain as a mere instrument; and asserts that his doctrine is not inconsistent with religious belief, and that his "faith in a future life and in the resurrection of the dead rests on the ground of their being parts of a divine revelation." Mental phenomena are, then, but the highest manifestations of life; and life itself—as Locke stated—"is not the substance itself, but an affection of it."

He finally touches on a delicate question—the nature of the soul. Regarding this, he dissents from the ordinary theologian's view; and believes it to be a result of the work of brain—how produced, is a mystery. But he believes that, in the resurrection of the body, soul will again, as now, form a part of the "reintegrated sum of forces". We think that there are many who, admitting the doctrine that the term Life is only an expression denoting the aggregate of the phenomena manifested by living beings, and dependent on a proper amount and quality of matter, and that Mind is the highest manifestation of life, will consider that Professor Owen has not sufficiently distinguished between Mind and that entity of which science can teach little or nothing, but the belief in which, as that in the resurrection of the body, is founded on divine revelation. This is the only comment which we shall make on this highly interesting chapter. Each man who reads it must study it as the expression of opinion on the part of one, from whom some comment on the subjects treated in it would naturally be expected.

Of the work itself, the author's reputation renders praise superfluous, and criticism presumptuous. As science advances, what he has written will be, more or less, confirmed or modified, and some may be even proved to be erroneous. But the work will still remain a monument of patient labour and profound thought, worthy of one who glories in having been a disciple of Cuvier, and the conservator of the museum of John Hunter.

RESEARCHES ON THE INTIMATE STRUCTURE OF THE BRAIN. Second Series. By J. LOCKHART CLARKE, F.R.S., etc., *Philosophical Transactions*, 1868; Part 1.

OUR readers will hardly require to be reminded that to Dr. LOCKHART CLARKE we are indebted for the most exact knowledge of the intimate structure of the spinal cord, medulla oblongata, and brain. The *Philosophical Transactions* have been enriched by several essays on this subject from his pen, and in public recognition of the value of his researches they have been rewarded by a gold medal of the Royal Society. The medical literature of the present day further bears witness to the indefatigable industry of our distinguished anatomist. The pathological anatomy of locomotor ataxy, of tetanus, and other structural diseases of the nervous centres, have all been elucidated by the investigations of Dr. Clarke, upon whom the Dublin College of Physicians have conferred the unsought distinction of their membership, in acknowledgement of his services to medical and anatomical science—a graceful act, adding lustre alike to the donors and to the recipient. The monogram now before us consists of descriptions of the morphological changes undergone by the cord in its passage into the medulla, and of the morphological changes whence the nuclei of the medulla are developed out of the elements of the cord. To speak generally, Dr. Clarke shows that the relative positions of the white and grey elements are reversed. The extremities of the posterior horns appear at the surface as the grey tubercle of Rolando; the posterior columns transformed into the posterior pyramids, are shown, being opened outwards, to form the fourth ventricle. The expanded *caput cornu posterioris* becomes the principal nucleus of the sensitive division of the trigeminus; the *cervix* gives origin to the grey matter of the posterior pyramid and of the restiform body, from which the remains of the vagal nucleus go to form the double nucleus of the auditory nerve. The hypoglossal and spinal accessory nuclei are developed in the anterior grey matter of the anterior horn and the intermedio-lateral tract. The author's researches show that the olivary bodies, which appear in the medulla, must be regarded as motor centres through which different movements are effected by sudden or violent impressions on the special senses, as they are connected

with all the sensory ganglia of the medulla. The decussations of the pyramids connect the lateral and the anterior columns and the anterior and posterior grey substance; and it is inferred by Dr. Clarke that the anterior pyramids are excito-motors through the grey matter within themselves and the pons. In a physiological point of view, these connections are exceedingly interesting; thus, the several different centres of origin of the spinal accessory nerves are brought into connection with other nerves, the cervical spinal, the hypoglossal, and the vagus—supplying the muscles employed in forced inspiration. Dr. Clarke has traced the development of the various nuclei and nerve-roots through their respective phases. Of these, we would more especially direct attention to his description of the reactions of the auditory and facial nerves, together with the origin and course of the roots of the nerves. In the latter, the facial, the relations are so complex as to have baffled previous observers. By the peculiar method of dissection adopted by Dr. Clarke, it is shown that the facial nerve, on reaching its nucleus, bends down the medulla oblongata along the *fasciculus teres*, and after a short course again bends forward to form a loop along the side of the median furrow. The cut end of this nerve, as exhibited only by transverse section, was mistaken by Stilling for the "constant root of the trigeminus," and by Schroeder van der Kolk for the cut end of one of the *striæ medullares*. It would be impossible further to follow the elaborate details of the exposition of the relations of the facial nerve and nucleus to the trigeminus. We can only repeat our opinion of the importance of these researches, bearing as they do upon the physiology of the movements of the muscles of the face and jaws in the acts of mastication and articulation.

The author concludes with a chapter of remarks, showing the importance of connecting physiology and pathology with anatomy and experiment, and enforcing his remarks by a reference to blunders that have arisen out of a want of the information to be gained by a combination of these means.

The paper is illustrated by sixty-five lithographed drawings that convey to the eye the author's descriptions as contained in the text. These drawings are so true to nature, that, by their help alone, an attentive student might trace the morphological changes to which the nuclei and nerve-roots in the medulla owe their development.

We should not do justice to the author, if we omitted to notice the strikingly lucid language in which Dr. Clarke conveys his descriptions of these complicated structures. The essays to which allusion has been made contain a storehouse of facts from which anatomists may, and doubtless will, draw freely. We believe that it is not too much to say, that their full value will not be appreciated for several generations to come. It is devoutly to be hoped that his life may be prolonged, in order that he may be enabled to complete the labours upon which he is still engaged, and that he may at some time be induced to bring together in one work the valuable information at present scattered in the columns of the Journals of the day.

MIDDLESEX HOSPITAL: REPORTS OF THE MEDICAL AND SURGICAL REGISTRARS FOR THE YEAR 1868. London: 1869.

THESE Reports, compiled and arranged by the labour of the Medical and Surgical Registrars of the Middlesex Hospital, Dr. CAYLEY and Mr. HENRY ARNOTT, constitute another of those valuable contributions to the statistics of medicine and surgery which have in recent years been furnished by several of the London Hospitals.

The number of patients admitted into the hospital during 1868 was 2,043, making, with 225 remaining on January 1st, 1868, 2,268. Of these, 1,209 were males and 1,059 females. On December 31st, 225 patients remained under treatment. Of the rest, 1808 had been discharged—1648 cured or relieved; and 256 had died. The mortality per cent. among patients treated to the termination of illness, was 12.469. The total number of patients in the medical wards during the year was 1,108; of these, 758 were discharged cured or relieved, and 153, or 15.193 per cent, died. The Medical Registrar, Dr. Cayley, besides giving well arranged tables of the diseases and their results, appends some valuable summaries. Of the causes of death, he says: "One hundred and fifty-three patients died during the year. A *post mortem* examination was made on 139 of these. In forty-three cases there was Bright's disease of the kidney; in three the characters were those of acute nephritis; in eleven the kidneys were large and fatty; in twenty-two contracted and granular; in seven lardaceous. In twenty-eight cases there was valvular disease of the heart; in twelve it was associated with Bright's disease. Recent pericarditis was met with nineteen times; in nine of which it was associated with Bright's disease of the kidney. Old pericardial adhesions occurred seven times; white patches on the pericardium twenty-three times. Recent tubercle was met with twenty-three times; in five cases it was associated with Bright's disease; in three of which the kidney was fatty and in two lardaceous. One case was associated with cancer. In no case were recent tubercle, and valvular disease of the heart associated together. Obsolete tubercle was met with 18 times; five times it was associated with valvular disease of the heart, five times with Bright's disease, four times with bronchitis and emphysema. Lardaceous or amyloid disease was met with seven times; twice associatad with pyelitis, twice with tuberculosis of the lungs, once with syphilitic disease of the bones." He also makes some special comments on the cases of scarlet fever, typhus, typhoid, pyæmia, and acute and subacute rheumatism. In speaking of rheumatism, it is entered that 164 cases of the disease (acute and subacute), were admitted; and in one case admitted for scarlatina, acute rheumatism supervened. Three patients died. Of 157 of these patients, 94 had pericarditis or a valvular murmur; the signs of heart-disease being, in seventy-one, present on admission. Pneumonia appeared in eight cases; and two were associated with bronchitis.

The Surgical Report, by Mr. Henry Arnott, shows the total number of cases in the surgical wards to have been 1188; of whom 861 were discharged cured or relieved, and 103 died; the mortality per cent. (excluding frequent cancers) being 5.233. Besides twenty cases of cancer of internal organs, tabulated in the medical report, there are given the statistics of 135 cases of cancer under treatment in the surgical wards. Mr. H. Arnott remarks, that it is the custom at the hospital to sponge the fresh wound after operating with a solution of chloride of zinc; and that in some cases deemed unfit for operation, injection with acetic acid has been employed. Erysipelas is noted as having been of somewhat more frequent occurrence in the surgical wards than in 1867; but there was only one instance of apparent infection.

The operations performed were 137 in number, with a mortality of twelve. The amputation cases were unfortunately very fatal. After eight amputations, six patients died; the two cases of recovery being after amputation at the hip-joint and at the upper third of the thigh—while, contrary to what generally occurs, the amputations at more distant parts were all fatal.

The cases of strangulated hernia were, on the other hand, very successful. Of fourteen patients, one only died. Taxis was successful in five cases; operation was performed in the others. In the fatal case, the symptoms of strangulation had existed nine days before the admission of the patient in a moribund state. At the operation, the intestine was found to be gangrenous.

Much credit is due to both the Registrars for the manner in which they have endeavoured to make the records of their hospital conducive to the increase of medical and surgical knowledge.

PROGRESS OF MEDICAL SCIENCE.

THERAPEUTICS.

TREATMENT OF TAPEWORM.—Dr. Johan Rulle, in an "Inaugural Dissertation", gives the following results, derived from the administration of certain components of the extract of male-fern to twenty-nine patients affected with tænia. 1. Not only the filicic acid, but also its decomposition-products, which are soluble in alcohol, will destroy tapeworms. 2. One must be very cautious in concluding that tænia are destroyed whilst in the intestinal canal, as the absence of the ova of tapeworms does not always indicate the non-existence of the parasites. 3. The precipitate thrown down on the addition of hydrochloric acid to extract of male-fern, previously treated with ammonia, is more active than filicic acid. Out of nine cases in which the acid alone was administered, there were two only in which the worm was completely expelled, whilst in two the agent was quite useless. With the precipitate, on the other hand, the worm was wholly discharged in four instances, and a completely negative result followed but once. 4. The pure filicic acid was administered in twenty-four instances without a change of diet, and in fifteen where the diet was changed: in one of these cases, the result was imperfect; and in a second, failed altogether. The hydrochloric acid precipitate failed in three instances in which the diet was unchanged; in nine other instances, in which the diet was restricted, there was not a single miscarriage. Hence the great importance of attending to the diet as a condition of success in the treatment of tapeworms. 5. Filicic acid, given in the form of pill, removes tæniæ with the greatest certainty when it is combined with castor-oil. This increase in the action of the agent is to be ascribed, not to the solubility of the acid in the castor-oil, but rather to the drastic action of the latter remedy. 6. Drastics assist the cure of tapeworm, not only because they bring away the parasite, but also by their favouring the deeper penetration of the anthelmintic into the intestinal canal. 7.