

they furnished, led to his election into the Royal Society in 1851.

In 1854, Huxley succeeded his friend Edward Forbes as Palaeontologist and Lecturer on Natural History at the Royal School of Mines, a post which he held until his retirement in 1885. He was a great teacher, and the high reputation of the school, now combined with the Royal College of Science, is largely due to his great influence. At the request of the lords of the committee of council on education, he continued to act as Honorary Dean of the school, and at death he still retained that post. He also agreed to be responsible for the general direction of the biological instruction in the school, so that his place as professor of biology has never been filled up.

Huxley was twice chosen Fullerian Professor of Physiology to the Royal Institution, the first time in 1854. In the same year he was appointed Examiner in Physiology and Comparative Anatomy to the University of London. Other posts and honors were crowded upon him. In 1858 he delivered the Croonian Lecture of the Royal Society, when he chose for his subject the "Theory of the Vertebrate Skull." From 1863 to 1869 he held the post of Hunterian Professor at the Royal College of Surgeons. In 1862 he was president of the Biological Section at the Cambridge meeting of the British Association, and eight years later held the presidency of the association at the Liverpool meeting. In 1869 and 1870 he was president of the Geological and Ethnological Societies, and in 1872 was elected Lord Rector of Aberdeen University for three years. As might be expected, Professor Huxley held strong and well defined views on the subject of education. He was a man who at all times had a keen sense of public duty, and it was this which induced him to seek election on the first London School Board in 1870. Ill health compelled him to retire from that post in 1872, but during his period of service as chairman of the education committee he did much to mould the scheme of education adopted in the board schools.

He was elected secretary of the Royal Society in 1873, and ten years later was called to the highest honorary position which an English scientific man can fill, the presidency of that society. During the absence of the late Professor Sir Wyville Thomson with the Challenger Expedition, Huxley, in 1875 and 1876, took his place as Professor of Natural History in the University of Edinburgh. From 1881 to 1885 he acted as inspector of salmon fisheries. But this and all his other official posts he resigned in 1885, shortly after which he removed to Eastbourne.

In 1892, more than six years after his retirement, the dignity of privy councillor was conferred upon him. The Copley medal of the Royal Society was awarded to him in 1888, the Royal Medal having been received by him in 1852; and in December last he received the Darwin Medal, the two previous recipients being Dr. A. R. Wallace and Sir Joseph Hooker. His honorary degrees were: D.C.L. (Oxford); LL.D. (Cambridge, Edinburgh, and Dublin); M.D. (Wurzburg); Ph.D. (Breslau). The King of Sweden created him knight of the polar star, and he was elected into most foreign societies and academies of science of note. He was a correspondent of the Paris Académie des Sciences (section of anatomy and zoology), and corresponding member of the St. Petersburg Académie Impériale des Sciences, the Akademie der Wissenschaften, of Berlin, and of Munich, the Svenska Vetenskaps Akademi, Stockholm, the Halle Akademie der Naturforscher, the academies of natural sciences of Philadelphia, Boston and Buffalo, the Gottingen Gesellschaft der Wissenschaften, the Paris Société d'Anthropologie, and the Naturforschende Gesellschaft at Frankfurt-a-M. He was honorary member of the Royal Irish Academy, the Accademia dei Lincei at Rome, the Brussels Académie de Médecine, the Institut Égyptien at Alexandria, the Batavia Genootschap van Kunsten en Wetenschappen, the American Academy of Arts and Sciences, National Academy of Sciences and the Amsterdam Akademievien Wetenschappen. He was also foreign member of the Brussels Académie des Sciences, the Haarlem Maatschappij der Wetenschappen, the Philadelphia Academy of Natural Science and the Società Italiana delle Scienze.

How far-seeing Huxley was, with regard to our present scientific needs, may be gathered from his address when he retired from the presidency of the Royal Society. He saw that scientific literature would have to be organized before it could be fully utilized. His words were:

"We are in the case of Tarpeia, who opened the gates of the Roman citadel to the Sabines, and was crushed under the weight of the reward bestowed upon her. It has become impossible for any man to keep pace with the progress of the whole of any important branch of science. . . . It looks as if the scientific, like other revolutions, meant to devour its own children; as if the growth of science tended to overwhelm its votaries; as if the man of science of the future were condemned to diminish into a narrower and narrower specialist as time goes on. . . . It appears to me that the only defense against this tendency to the degeneration of scientific workers lies in the organization and extension of scientific education, in such a manner as to secure breadth of culture without superficiality; and on the other hand, depth and precision of knowledge without narrowness."

Another point touched upon in the same address was the claims of science to a place in all systems of education. "We have a right," he said, "to claim that science shall be put upon the same footing as any other great subject of instruction, that it shall have an equal share in the schools, an equal share in the recognized qualification for degrees, and in university honors and rewards. It must be recognized that science, as intellectual discipline, is at least as important as literature, and that the scientific student must no longer be handicapped by a linguistic (I will not call it literary) burden, the equivalent of which is not imposed upon his classical compeer."

To the expression of such views as these we owe the increased attention now given to scientific instruction in this country, though we have not yet reached the impartial stage to which science has a right.

It may, perhaps, be too early to fix Huxley's real place in biology. Writing in these columns in 1874, the eminent German naturalist Haeckel ranked him among the first zoologists in England, taking zoology in its widest and fullest signification.

"When we consider," he remarked, "the long series of distinguished memoirs with which, during the last quarter of a century, Prof. Huxley has enriched zoological literature, we find that in each of the larger divisions of the animal kingdom we are indebted to him for important discoveries."

From the lowest animals he gradually extended his investigation to the highest. In the Protozoa, he was the first to come to satisfactory conclusions concerning the nature of Thalassicolidae and Sphaerozoida; and by his work on "Oceanic Hydrozoa," he greatly extended the knowledge of Zoophytes. His researches upon members of the important group of tunicata are of great value, and many important advances in the morphology of the Mollusca and Arthropoda are due to him.

Further, Huxley especially studied and advanced the knowledge of the comparative anatomy and classification of the vertebrata. His "Lectures on the Elements of Comparative Anatomy," and his numerous monographs on living and extinct species, afford abundant evidence of what biological science owes to him.

Huxley's place as one who has largely influenced modern thought on many questions is acknowledged by all to be a very high one. The profound and truly philosophical conceptions which guided him in his inquiries always enabled him to distinguish the essential from the unessential. First among the subjects which owe their advancement to his support is the theory of biological evolution. When, in 1860, it became his duty as professor at the Royal School of Mines to give a course of lectures to workmen in the Jermyn Street Museum of Practical Geology, he selected for his subject "The Relation of Man to the Lower Animals." The questions arising out of this topic became the subject of warm controversy at the meeting of the British Association in that and subsequent years. The lectures were published in 1863, under the title "Evidence as to Man's Place in Nature," and excited great interest both in this country and abroad.

In this and in other works he advanced the principles of the Darwinian theory, and worked out many important developments.

To again quote Haeckel: "Not only has the evolution theory received from Prof. Huxley a complete demonstration of its immense importance, not only has it been largely advanced by his valuable comparative researches, but its spread among the general public has been largely due to his well known popular writings. In these he has accomplished the difficult task of rendering more fully and clearly intelligible to an educated public of very various ranks the highest problems of philosophic biology. From the lowest to the highest organisms, he has elucidated the connecting law of development. In these several ways he has rendered science a service which must ever rank as one of the highest of his many and great scientific merits."

As a writer of English, Huxley has been unsurpassed in our time and generation. He has set a standard in scientific literature, both in clearness of exposition and in the most perfect handling of words, which it behoves his successors to closely follow. He aimed at writing clearly, and avoided the use of technical language whenever possible.

As he remarks in the preface to the volume of "Collected Essays" containing his biological and geological addresses: "I have not been one of those fortunate persons who are able to regard a popular lecture as a mere hors d'œuvre, unworthy of being ranked among the serious efforts of a philosopher, and who keep their fame as scientific hierophants unsullied by attempts—at least, of the successful sort—to be understood of the people. On the contrary, I found that the task of putting the truths learned in the field, the laboratory and the museum, into language which without bating a jot of scientific accuracy shall be generally intelligible, taxed such scientific and literary abilities as I possessed to the uttermost; indeed, my experience has furnished me with no better corrective of the tendency to scholastic pedantry which besets all those who are absorbed in pursuits remote from the common ways of men, and become habituated to think and speak in the technical dialect of their own little world, as if there were no other."

This journal especially loses in him one of its best friends. We are now in the second series of fifty volumes, and his was the hand that commenced both of them. His introduction to the fifty-first volume will be fresh in the minds of our readers, and it justified the position he had occupied since 1859, as the devoted apostle of the Darwinian theory. He was, moreover, not only a most valued contributor to our columns, but his advice on many points has been freely asked, given, and followed, during a quarter of a century.

Huxley's wonderful kindness to young men is very well known. He would discuss subjects with his students, and his perfect geniality put them entirely at their ease. Always ready to extend a helping hand, he assisted many to higher ranges than they could otherwise have attained, and by words of encouragement induced others to continue their ascent.

The objects which Huxley stated he had in mind from the commencement of his scientific career are these:

"To promote the increase of natural knowledge and to forward the application of scientific methods of investigation to all the problems of life to the best of my ability, in the conviction which has grown with my growth and strengthened with my strength that there is no alleviation for the sufferings of mankind except veracity of thought and of action and the resolute facing of the world as it is when the garment of make believe by which pious hands have hidden its uglier features is stripped off. It is with this intent that I have subordinated any reasonable, or unreasonable, ambition for scientific fame, which I may have permitted myself to entertain, to other ends; to the popularization of science, to the development and organization of scientific education; to the endless series of battles and skirmishes over evolution, and to untiring opposition to that ecclesiastical spirit, that clericalism, which in England, as everywhere else, and to whatever denomination it may belong, is the deadly enemy of science. In striving for the attainment of these objects, I have been but one among many, and I shall be well content to be remembered, or even not remembered, as such."

How nobly he acted up to his principles we all know, how greatly the pursuit of his objects have benefited intellectual and material progress, we can only estimate.

In the preface of the fifth volume of his "Collected Essays," Huxley gives a quotation from Strauss' "Der alte und der neue Glaube," which describes so exactly the guiding principles of his life that it is difficult to believe the lines were written by another hand nearly a quarter of a century ago. "For close upon forty years," wrote Strauss, "I have been writing with one purpose, from time to time I have fought for that which seemed to me the truth, perhaps still more, against that which I have thought error; and in this way I have reached, indeed overstepped, the threshold of old age. There every earnest man has to listen to the voice within: 'Give an account of thy stewardship, for thou mayst be no longer steward.' That I have been an unjust steward, my conscience does not bear witness. At times blundering, at times negligent Heaven knows, but on the whole, I have done that which I felt able and called upon to do; and I have done it without looking to the right or to the left; seeking no man's favor, fearing no man's disfavor."

Huxley leaves a wife and seven children—three sons and four daughters. They mourn the loss of a loving husband and father, and their affliction is shared by all who were fortunate enough to know him as a friend. But his loss will not only be felt by these; it affects the whole intellectual world. Men will arise who, like him, will advance and extend scientific knowledge by research and exposition, but rarely will the qualities of the investigator and interpreter be combined with a more charming personality.—Nature.

[KNOWLEDGE.]

SCORPIONS AND THEIR ANTIQUITY.

By R. LYDEKKER, B.A. Cantab., F.R.S.

To the circumstance that scorpions have their bodies protected by a coat of the hard substance technically known as chitine, the palaeontologist is indebted for a knowledge of their past history and extreme antiquity; and it is owing to the preservation of their remains in the Palaeozoic strata of both the old and new worlds that we are enabled to explain their present geographical distribution. There are many other groups of Invertebrates that we can have little doubt are fully as ancient as scorpions, but which lack a hard external investment, and whose past history is accordingly a blank. One of the most remarkable instances of this is afforded by the peculiar creatures termed Peripatus, representatives of which are found in countries as remote from one another as South Africa, New Zealand, Australia, South and Central America, the West Indies, and Sumatra. These animals have much the appearance of caterpillars, having a pair of simple antennæ, and a large number of short, conical, caterpillar-like feet extending along the whole length of the under surface of the body, and each terminating in a pair of hooked claws. They breathe by tracheal tubes, after the manner of insects, but instead of these tubes opening by a regular series of apertures along each side of the body, their openings are scattered in an irregular manner over its whole surface. And it has been considered probable that these animals are closely related to the ancestral stock of insects, spiders and their allies, and myriapods. This being so, it is evident that Peripatus must be an extremely ancient type, and there is a great probability that if their remains were suitable for preservation we should find evidence of their existence in some of the oldest rocks of the northern hemisphere. It has, indeed, been assumed from their present geographical distribution that these, as well as many other types of animals, have always been southern forms, and that their presence in the great southern continents and islands indicates a former union of all the lands of the southern hemisphere. That there was a south equatorial belt of land in Palaeozoic times seems to be pretty evident from certain peculiarities connected with the Carboniferous flowers of the northern and southern hemispheres, and it is, therefore, possible that in the case of Peripatus such an explanation may be the true one. Since, however, palaeontology teaches us that many ancient types have migrated from their original northern home to find a refuge in the remote parts of the southern continents and islands, it seems more probable that such has also been the case with Peripatus. And if we can show that this has been the case with the scorpions, which now attain their maximum development in the more southern portions of the globe, the argument will be strengthened in the case of Peripatus.

Probably most of my readers are fairly well acquainted with the external appearance of scorpions, but, for those who are not, the publishers have reproduced a very beautiful photograph of a large African species, kindly sent me by Dr. R. M. Howard, of Namaqualand, and locally known as the sand scorpion. Belonging to the great group of Arachnida, which includes the spiders, the scorpions are especially distinguished by their compressed bodies, and by the sharp separation of the cephalo-thorax from the abdomen, the latter consisting of seven segments, and being followed by six narrower segments, collectively forming the post-abdomen, the last of which is specially modified into the so-called sting. The cephalo-thorax or fore part of the body is covered by a shield-like carapace, upon the upper surface of which are carried a variable number of simple eyes, one pair of which is larger than the others, and is placed dorsally, while the smaller ones are marginal. The first pair of appendages are modified into short nipping claws, while the maxillary palpi are greatly enlarged to form the huge pair of pincers carried on each side of the head; and the four pairs of walking legs are supported by the first four segments of the thorax. It is important to add that by means of pulmonary sacks, opening by four pairs of apertures on the sides of the abdomen, scorpions breathe air, and it is accordingly only in rocks of fresh water origin, or such as were deposited near the shore, that their remains are likely to be preserved.

According to the most recent classification, existing scorpions are divided into four families, of which the first two are again subdivided into several families. An important feature in this classification are the so-

called "pedal spurs," which are found upon the articular membrane connecting the foot, a terminal segment of the legs, with the segment that precedes it. According to Mr. R. I. Pocock, the Scorpionidae, or typical scorpions, have only one such spur, whereas two are present in the other three families. It will, however, be quite unnecessary to further consider the classification of the group in this place; but it is important to notice that one of the sub-families of the Scorpionidae is confined to Africa south of the Sahara, and the Indian and Malayan countries; while another has representatives not only in those regions, but also in northern South America and Australia. At the present day, indeed, scorpions are found in Europe only in the more southern countries, where the majority of the species are of comparatively small size; and it is in the tropical and sub-tropical regions of the globe that the group attains its maximum development, the largest forms being, we believe, South American and South African. No scorpions are found in high northern latitudes, although they range as far south as Patagonia, and none are known from New Zealand. The species here figured belongs to the typical sub-family of the Scorpionidae, which is confined to the Ethiopian and Oriental regions.*

According to the researches of Dr. Scudder, the modern scorpions agree with one another in that the median dorsal eye tubercles are, as a rule, far removed from the front margin of the cephalo-thorax, and thus placed behind the lateral eyes. Apparently the only fossil scorpions agreeing with this group that have been hitherto discovered occur preserved in amber of late Tertiary age; scorpions being quite unknown in lower Tertiary or Secondary rocks. Needless to say that this is not owing to their non-existence in these epochs, but is due either to such rocks being unsuited to the preservation of their remains, or having been deposited far out to sea.

When, however, we reach the Palæozoic coal measures, which are mainly of fresh water origin, and, therefore, just where we should expect to find such creatures, remains of scorpions have been met with both in Europe and North America, some of the species attaining very considerable dimensions. Both in these Carboniferous scorpions and also in certain still older ones from the Silurian rocks, the eye tubercles are placed either on the actual front margin of the cephalo-thorax or only a short distance behind it; and these forms are thus regarded as forming a group apart from the modern scorpions. In the Carboniferous genus *Cyclophthalmus*, the median eye tubercles are immense, and occupy almost the entire front half of the cephalo-thorax; the lateral eyes forming a semicircle behind and to the sides of the larger ones. The maxillary palpi form pincers proportionally as large as in the modern forms, while the legs have similar double claws. The genus *Eoscorpion*, which is likewise common to the Carboniferous rocks of both halves of the northern hemisphere, has all the general features of the preceding, with the exception that the arrangement of the eyes is different; while *Proscorpion*, of the upper Silurian rocks of North America, is also of the same general type. With *Palæophonus*, of the Silurian of Scotland and Gotland, we reach, however, a more primitive type, in which the walking legs gradually taper to thin extremities, which terminate in simple claws or points, although the palpi still form large pincers.

Such is the palæontological history of scorpions; and a very remarkable history it is, seeing that most of the Palæozoic types are almost as highly specialized as their existing descendants, and thus showing that we should have to go much further back before we reached the ancestral type. With the exception of certain cockroach-like insects, which occur in the middle Silurian, the scorpions are indeed the oldest land animals, and are therefore entitled, in spite of their unpleasant propensities, to our utmost respect.

We have said that in Palæozoic times there existed a south equatorial land girdle, distinguished from the land of the northern hemisphere (from which it was probably isolated) by the peculiar character of its fauna; and as the Palæozoic scorpions inhabited the northern land, it is scarcely likely that they were also found in the southern zone. Early in the Secondary epoch the latter zone appears to have been split up, and the continental areas consequently assumed some approach to their present configuration. The descendants of the ancient Palæozoic scorpions began soon after, in all probability, to migrate southward, along the different lines of communication; and we thus can readily understand why some of the existing sub-families are represented in such widely separated areas as India, Africa, South America and Australia, without resorting to any comparatively recent connection between these countries. In this connection it is important to notice that the South American and African scorpions belong to distinct genera.

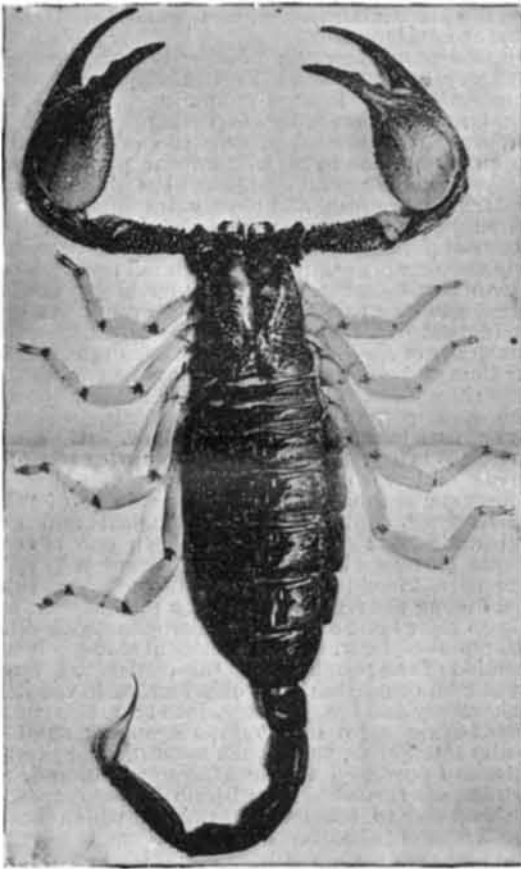
If such an explanation holds good in the case of the scorpions, there is no reason why it should not be equally valid in the instance of *Peripatus*. It may be objected that, whereas in the case of the scorpions we have only sub-families which occur over such widely sundered areas, in *Peripatus* we have one and the same genus. The objection would, however, be equally valid if we assumed that genus to have attained its present geographical distribution by the aid of a southern band of land, seeing that there is no evidence that such a tract has existed since the end of the Palæozoic or the commencement of the Secondary epoch.†

Although not coming strictly within the scope of its title, this article may be concluded by a brief reference to some of the habits of scorpions. All scorpions are nocturnal and somewhat sluggish creatures; but while some species, in which the tail is light, carry it stretched nearly straight out behind, those in which it is heavier habitually curve it over the back; and those forms in which the appendage is carried in the latter manner are further distinguished by raising their bodies much higher on the legs than is the case with the others. Some kinds, again, when walking, carry their large pincers stuck out in front of the head

to act as feelers. All scorpions are carnivorous, while many of them, in spite of their sluggish appearance, are able to capture and kill such alert creatures as cockroaches. Mr. Pocock, who has kept scorpions in captivity, writes that "as soon as a cockroach is seized, the use of the scorpion's tail is seen, for this organ is brought rapidly over the latter's back, and the point of the sting thrust into the insect. The poison instilled into the wound thus made, although not causing immediate death, has a paralyzing effect upon the muscles, and quickly deprives the insect of struggling powers, and consequently of all chance of escape. If the insect is a small one—one in fact that can be easily held in the pincers and eaten without trouble while alive—a scorpion does not always waste poison upon it. Thus I have seen a *Parabuthus* (one of the genera of scorpions) seize a bluebottle fly, transfer it straight to its mandibles, and pick it to pieces with them while still kicking. . . . An insect is literally picked to pieces by the small chelate mandibles, these two jaws being thrust out and retracted alternately, first one and then the other being used; the soft juices and tissues thus exposed being drawn into the minute mouth by the sucking action of the stomach."

Old fables die hard, and none is more persistent than the legend that the scorpion, when surrounded by a ring of fire, puts an end to its existence by turning its tail over its back and stinging itself to death. No matter that naturalists have proved that their poison is innocuous to their own kind, and that scorpions are killed by a very moderate elevation of temperature, the old, old story is still as firmly believed as ever by the general public.

In an article published in the last edition of the *Encyclopædia Britannica*, the Rev. O. P. Cambridge refused to believe that there was any substratum of fact in the popular legend, but Mr. Pocock, writing in *Nature* for 1893, is more merciful. He thinks, indeed, that a scorpion may occasionally sting itself, either by



THE GIANT SAND-SCORPION OF NAMAQUALAND.

a random blow meant for an unseen enemy, or when it has been irritated by the contact of any strong stimulant, such as acid or mustard, or even that in the madness of pain it may be driven to turn its weapon on itself; but that in any case there is any intention of causing its own death cannot for a moment be admitted.

Although, probably, many of my readers are acquainted with it, for the benefit of those who are not, I must conclude with a well known Indian story. Where scorpions and centipedes abound, it is the general custom of servants in India to turn their masters' boots upside down before helping to put them on. In the instance in question, where this precaution had been omitted, a cavalry officer had just put his foot into a regulation boot, when he felt something sharp touch his heel; with the greatest promptitude he lifted his leg and stamped violently on the ground in the hope of destroying the supposed scorpion before it had time to use its sting. He found that a spur, with the rowels uppermost, had been inadvertently dropped into the boot!

THE COLOCYNTH.

CONSUL Edwin S. Wallace, writing to the State Department from Jerusalem, says: The colocynth or bitter apple (which provides in its dried pulp a well known purgative medicine), grows abundantly on the maritime plain that lies between the mountains of Palestine and the eastern shore of the Mediterranean. It is found from below the city of Gaza on the south to the base of Mount Carmel on the north. The dwellers along this plain pay little attention to the plant, and spend neither time nor labor in its cultivation. It grows without cultivation, the soil and climatic conditions producing it without the help of the husbandman.

The plant itself resembles our common cucumber,

but its fruit is globose, about the size of an orange, of a light brown color. Its rind is smooth, thin, and parchment like.

The fellaheen, or peasants, gather the fruit in July and August before it is quite ripe. It is sold to Jaffa dealers, who peel it and dry the pulp in the sun. It is then moulded into irregular small balls, packed in boxes, and shipped mostly to England.

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* Mr. Pocock writes me that he believes the specimen to be *Opisthophthalmus pallipes*. The total length of the specimen in the original photograph, which is natural size, is just over five inches.

† It may be well to state that there are many fatal objections to the theory of an Antarctic continent, which united South America, Africa, and Australia, having existed in Tertiary times.