

it seemed to me that even supposing that the second charge had been ignited by the first, which was doubtful, this would not explain the suddenness or magnitude of the pressure. But on further consideration it appeared certain that the second charge would not be ignited by the fire from the first; and it then became clear that in this very fact we should have an amply sufficient explanation of the excessive pressure.

My object in writing this paper is to point out the probability of this explanation, and so, if possible, to induce the authorities to test it. It occurred to me several days before the report of the Committee appeared, and in spite of the improbability of such a mistake as double loading, I could not shake off the conviction that it afforded the true explanation. As I have pointed out, the blowing into fragments of a wrought-iron tube implied an explosive action such as might result from gun-cotton or dynamite, but which could not be produced by the slow burning of pebble powder. The point to be explained, then, is how the second charge could be brought into such a condition that it would explode like gun-cotton. To understand this, it must be remembered that in the usual way the grains of gunpowder burn from their outside only, so that the thicker the grains the longer will be the time occupied in burning, and for the same weight of powder the slower will the gas be given off. The reason why gun-cotton is so much more destructive than gunpowder is not that it gives off more gas weight for weight, but that when ignited by a flash it burns so much quicker. If, therefore, by any means the whole mass of gunpowder could be heated up to the firing point at the same instant, so that the grains fired simultaneously inside as well as out, the action of the powder would be as quick or quicker than the gun-cotton. And, still further, if besides being heated the powder was compressed into a fraction of the space it usually occupies, the gases so confined would be capable of a still greater pressure.

Now if the after cartridge were fired and the forward cartridge were not ignited by the flash, and considering the length and fit of the shot, it could hardly have been so ignited, then the after shot would be driven forward closing on to the forward shot and compressing the powder between until the pressure on the forward shot was at least half as great as the pressure of the gases behind the after shot, which would be between ten and twenty tons on the square inch. Thus the powder would be subjected to a squeeze between the two shot such as would result from a blow. It would be compressed to a fraction of its former volume. The cubes would be crushed into a cake and the work of compression would be sufficient to heat the powder far beyond its point of ignition. Thus the entire mass of powder would be simultaneously ignited in a highly compressed and heated state. The force of such an explosion would be practically unlimited and would be located at the very point at which the gun burst. Hence in such an action we have ample cause for the effect produced.

But it will be asked why does not the same thing happen when a rifle is doubly loaded? It is said that in that case the second cartridge is generally blown out before it ignites, and this may be so, for in the rifle the intensity of the pressure of the gas on the shot can never exceed above a twentieth part of what it is in the 12-inch gun, and hence in the case of the rifle the pressure may well be insufficient to ignite the powder between the shot.

This view of the action resulting from the firing of powder by percussion appears to me to be one which it would be well worth while to test, for if proved it would completely re-establish confidence in the strength of the guns, which has been somewhat rudely shaken.

Let a 12-inch gun be loaded with a double charge of powder and a double charge of shot, or a shot of double weight, and fired. If, as is probable, the gun does not

burst, confidence in the gun will be re-established. Then let it be loaded twice over with the powder between the shot so as to ascertain whether the action of the powder when fired by percussion would not produce an effect similar to that which we are here considering. The destruction of one gun for the purpose of establishing confidence in all the rest would not seem to be an unworthy sacrifice.

#### MOSELEY'S NATURALIST ON THE "CHALLENGER"<sup>1</sup>

THIS is certainly the most interesting and suggestive book, descriptive of a naturalist's travels, which has been published since Mr. Darwin's "Journal of Researches" appeared, more than forty years ago. That it is worthy to be placed alongside that delightful record of the impressions, speculations, and reflections of a master-mind, is, we do not doubt, the highest praise which Mr. Moseley would desire for his book, and we do not hesitate to say that such praise is its desert. The same argus-like power of observation, the same readiness to appreciate the true interest and significance of every seemingly little fact, the same energy and indomitable perseverance in gathering information and material from every source in the short space of time at the circumnavigator's disposal which distinguished Mr. Darwin, characterise also his disciple and follower in many a distant ocean land and tropical forest.

Before the *Challenger* expedition set sail, Mr. Moseley was known as an accomplished biologist, trained in the laboratories of Stricker, of Vienna, and of Ludwig, of Leipzig. He had taken part in the eclipse expedition to Ceylon, and besides making valuable spectroscopic observations on the sun, had found time when there to study and collect specimens of the land Planarian Worms, the structure of which was the subject of a memoir by him in the *Philosophical Transactions* (published after the *Challenger* had left in 1874) which threw altogether new light on such important matters as the nature of metameric segmentation and the origin of the blood-lymph space, cœlom, or body-cavity of higher organisms generally.

During the *Challenger* expedition, and since its return in 1876 (when he was by special statute elected to a "research" fellowship by the members of his old college of Exeter, in Oxford), Mr. Moseley has, apart from this volume and its varied contents, produced a series of original memoirs published chiefly by the learned societies of London, which have been the means of making known the most important of the results to which the *Challenger* expedition has led in the field of biological science. It is to his industry and skill, combined with the opportunity afforded by the *Challenger's* cruise, that we owe the thorough description of the anatomy of the worm-like land-living *Peripatus*, and its development, studied by him at the Cape of Good Hope (*Philosophical Transactions*, 1874), whereby a totally new light is thrown upon the relationships of the great group of Hexapodous and Myriapodous insects, and the origin of tracheæ; to him we are indebted for the discovery and description of the most remarkable among the many pelagic or surface animals taken by the *Challenger* on the high seas, the transparent Pelagonemertes (*Annals and Mag. Nat. Hist.*, 1875), as well as for the detection of the only really markedly aberrant form of life dredged by the *Challenger* in deep waters (*Linnean Transactions*, 1878), the Ascidian, *Octacnemus bythius*. The colouring matters, also, of various marine animals have been studied by him with the spectroscope and the spectra, carefully recorded in the *Quart. Journ. Microsc. Sci.* 1877. But of still greater importance and merit was Mr. Moseley's study of corals allied to *Millepora* and

<sup>1</sup> Notes by a Naturalist on the *Challenger*. By H. N. Moseley, M.A., F.R.S., Fellow of Exeter College, Oxford.

Stylaster, previously unknown (or nearly so) in the living state, although familiar as dry and bleached museum specimens. These, when freshly dredged by the *Challenger*, were treated by Mr. Moseley with those subtle devices known only to trained histologists, and as a result, he has been able to give the full anatomy of the soft parts of these corals, to show that they are compound organisms with variously differentiated "tentacular

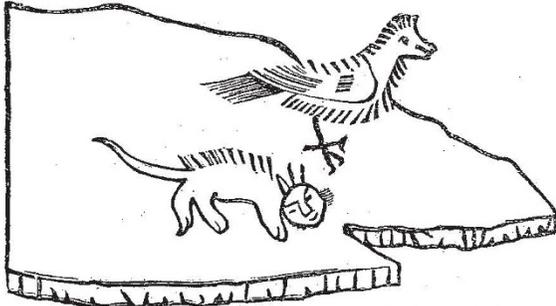


FIG. 1.—The bird and the rat living together in the same hole.

polyps" (dactylozooids) and "mouth polyps" (gastrozooids), and that they constitute a new group of hydroids, and do not belong to the Anthozoa or ordinary coral-producing class of polyps. The results of this elaborate investigation, forming the Croonian lecture for 1878, have been recently published, illustrated with twelve quarto plates by the Royal Society.

Whilst thus actually producing the chief zoological

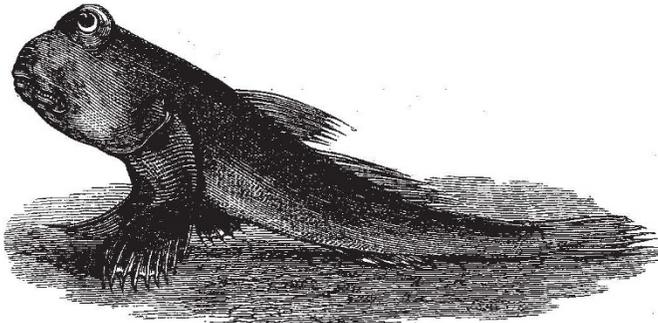


FIG. 2.—*Periophtalmus Kolreuteri* (on land; in the act of leaping).

results of the expedition, Mr. Moseley had specially undertaken the collection of plants, since no professed botanist was attached to the *Challenger*. The *Journal* of the Linnean Society, vols. xiv., xv., xvi., xviii., contain a large series of papers by Professors Oliver and Dickie, the Rev. M. J. Berkeley, and others, on the plants thus collected by Mr. Moseley's own hands on the islands visited by the *Challenger*. Not content with zoology

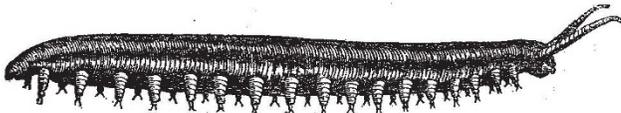


FIG. 3.—*Peripatus capensis* (natural size).

and botany alone, or rather, one should say, bringing his powers to bear on selected samples of the whole range of biology, Mr. Moseley has published the only anthropological memoir which has come to us from the *Challenger* staff—namely, an elaborate and careful account of an undescribed people—the inhabitants of the Admiralty Islands;

The results of all these researches are lightly sketched and often illustrated by woodcuts in the pages of the present volume, of which, however, they form but a limited portion. A still further development of biological science, namely, sociology—the history of civilisation, of manners, customs, and beliefs, is what the reader will find largely occupying Mr. Moseley's note-book, now published. And indeed, most entertaining and striking notes they are; the sayings and doings, the clothes and the amusements, the religions and the physical surroundings of Polyne-sians, Malays, Brazilians, Japanese, Chinese, seal-fishers, and English colonists, being set down as they impressed the observant mind of the author, accompanied by most trenchant comparisons and ingenious reflections which are characterised by a singular humour peculiar to him. Mixed with these, according to locality, we have, literally innumerable observations and suggestions with regard to such matters as basaltic columns, antarctic glaciers, flying-fish, fur-seals, phosphorescence, penguins, cock-roads, Kerguelen cabbages, land-crabs, and whales.

A few extracts will suffice to show that whilst Mr. Moseley's note-book will have special value for the professed naturalist, it is also eminently readable, and is likely to obtain great popularity amongst all those who have imaginations sufficiently vivid to allow their pos-sessors to experience that intense form of pleasure which a good book of travels can generate. An enumeration of the titles of the chapters, to begin with, will show something of the distribution of matter in the book.

We have—I. Teneriffe, St. Thomas, Bermuda; II. Azores, Madeira, Cape Verdes; III. St. Paul's Rocks and Fernando do Norhona; IV. Bahia; V. Tristan da Cunha, Inaccessible Island, Nightingale Island; VI. Cape of Good Hope; VII. Prince Edward Island, the Crozet Islands; VIII. Kerguelen's Land; IX. Heard Island; X. Amongst the Southern Ice; XI. Victoria, New South Wales; XII. New Zealand, the Friendly Islands, Matuku Island; XIII. Fiji Islands; XIV. New Hebrides, Cape York, Torres Straits; XV. Aru, Ke, Banda, Amboina; XVI. The Philippine Islands; XVII. China, New Guinea; XVIII. The Admiralty Islands; XIX. Japan, the Sand-wich Islands; XX. Tahiti, Juan Fernandez; XXI. Chile, Magellan's Straits, Falkland Islands, Ascension; XXII. Life on the Ocean Surface and in the Deep Sea, Zoology and Botany of the Ship, Conclusion.

Take the following description of a Penguin rookery at Tristan da Cunha (p. 120) as an example of Mr. Moseley's style. "It is impossible to con-ceive the discomfort of making one's way through a big rookery, haphazard, or 'across country,' as one may say. I crossed the large one here twice afterwards with seamen carrying my basket and vasculum, and afterwards went through a larger rookery still, at Nightingale Island. You plunge into one of the lanes in the tall grass, which at once shuts out the surroundings from your view. You tread on a slimy black damp soil composed of the bird's dung. The stench is overpowering, the yelling of the birds perfectly terrifying; I can call it nothing else. You lose the path, or perhaps are bent from the first on making direct for some spot on the other side of the rookery. In the path only a few droves of pen-guins, on their way to and from the water are encountered, and these stampede out of your way into the side-alleys. Now you are, the instant you leave the road, on the actual breeding-ground. The nests are placed so thickly that you cannot help treading on eggs and young birds at almost every step. A parent bird sits on each nest with its sharp beak erect and open ready to bite, yelling savagely 'caa, caa, urr, urr,' its red eye gleaming, and its plumes at half-cock, quivering with rage. No sooner are your legs within reach than they

are furiously bitten, often by two or three birds at once, that is, if you have not got on strong leathern gaiters, as on the first occasion of visiting a rookery you probably have not.

"At first you try to avoid the nests, but soon find that impossible: then, maddened almost by the pain, stench, and noise, you have recourse to brutality. Thump, thump goes your stick, and at each blow down goes a bird. Thud, thud, you hear from the men behind as they kick the birds right and left off the nests, and so you go on for a bit, thump and smash, whack, thud, 'caa, caa, urr, urr,' and the path behind you is strewn with the dead, and dying, and bleeding.

"But you make miserably slow progress, and, worried to death, at last resort to the expedient of stampeding as far as your breath will carry you. You put down your head and make a rush through the grass, treading on old and young haphazard, and rushing on before they have time to bite.

"The air is close in the rookery, and the sun hot above, and, out of breath, steaming with perspiration, you come across a mass of rock fallen from the cliff above, and sticking up in the rookery; this you hail as 'a city of refuge.' You hammer off it hurriedly half a dozen penguins who are sunning themselves there, and are on the look-out, and, mounting on the top, take out your handkerchief to wipe away the perspiration and rest awhile, and see in what direction you have been going, how far you have got, and in which direction you are to make the next plunge. Then, when you are refreshed, you make another rush, and so on.

"If you stand quite still, so long as your foot is not actually on the top of a nest of eggs or young, the penguins soon cease biting at you and yelling. I always adopted the stampede method in rookeries, but the men usually preferred to have their revenge, and fought their way every foot. Of course it is horribly cruel thus to kill whole families of innocent birds, but it is absolutely necessary. One must cross the rookeries in order to explore the island at all, and collect the plants or survey the coast from the heights."

Here is an example (p. 213) of the many observations which the book contains on the habits of birds and other animals:—

"An idea of the relations of the various birds to one another in the struggle for existence will be gained from the following incident:—I saw a cormorant rise to the surface of the water, and, lifting its head, make desperate efforts to gorge a small fish which it had caught, evidently knowing its danger, and in a fearful hurry to get it down. Before it could swallow its prey, down came a gull, snatched the fish after a slight struggle, and carried it off to the rocks on the shore. Here a lot of other gulls immediately began to assert their right to a share, when down swooped a skua from aloft, right on to the heap of gulls, seized the fish and swallowed it at once. The shag ought to learn to swallow under water, and the gull to devour its prey at once in the air. The skua is merely a gull which has developed itself by fighting for morsels."

Mr. Moseley has a great deal to say about the structure and natural history of icebergs in the chapter on the southern ice, and has illustrated this part of his book with two coloured plates and numerous woodcuts. The *Challenger* was in some danger here. "As the weather became worse, we were in a rather critical position. We were surrounded by bergs, with the weather so thick with snow, that we could not see much more than a ship's length, and a heavy gale was blowing. The full power of steam available was employed. Once we had a narrow escape of running into a large berg, passing only just about 100 yards to leeward of it by making a stern board, with all the sails aback, and screwing full speed astern at the same time. The deck was covered with frozen powder snow, and forward was coated with ice from the

shipping of seas. On February 28 again there were forty icebergs in sight at noon. It came on to snow thickly at about 4 P.M., and another gale came on. The plan adopted by Capt. Sir G. Nares was to lay down the bearings of the adjacent bergs before the weather became too thick for them to be seen, and then steaming with all the power of the ship against the gale, to hang on as long as



FIG. 4.—Face of Japanese Actor. (To show the mode of painting the face. From a Japanese Theatrical Picture-book.)

possible under the lee of a large iceberg, and, when driven away from that, to steam rapidly across to the lee of another, the position of which was known by the bearings taken. So we went on steaming backwards and forwards through the whole of a thick, dark night."



FIG. 5.—Head of figure burnt at Chinese funerals, made of paste-board. (To show the mode of painting the face.)

In warmer climes anthropology occupied, as we have said, much of the traveller's attention. The Tongans interested him by their expressive faces and gestures. A boat full of them was commanded by a noble, degraded from his rank by the missionaries, as a punishment for habitual drunkenness (p. 285).

"The coxswain of the pilot's boat, the ex-member of the nobility, wore, as I have said, a pea-jacket; a photograph was taken of the boat's crew. I could not persuade the coxswain to take off the pea-jacket, in order to make the group uniform [the others were quite naked, except a cloth round the waist]; he would only promise that if he were photographed with the jacket on in the group, he would allow himself to be taken with it off, separately afterwards. The jacket was a thick garment of the usual pilot cloth, fit only for an English winter, but the man evidently regarded it as a mark of distinction and decoration, and a proof that he was coxswain. I had much difficulty in getting a lock of hair from one of the boat's crew, and only succeeded by the help of a missionary, who explained that I did not want it for purposes of witchcraft. The man was also evidently loth to part with a single lock of what was his chief pride. I often, in collecting hairs of various races, subsequently, for scientific purposes, had amusing difficulties to contend with, and I suspect that some of the girls, from whom I got specimens, thought I was desperately in love with them."

Here is a suggestive association of man and the pig (p. 517)—

"Rats live in the mountains [of Tahiti], and climb up and devour the ripe bananas, and the groves of the trees are traversed in all directions by the tracks of wild pigs, which likewise feed on the fruit. It is strange that the pig should run wild and thrive, under such widely different conditions as it does, and should be able to exist equally well on wild plantains in the warm Tahiti, and on penguins and petrels in the chilly Crozets. In this power of adaptation it approaches man."

In his account of his short visit to Hong Kong and Canton, Mr. Moseley has much to say about the habits of the Chinese and their literature, medicines, and amusements. He reproduces several curious woodcuts from a Chinese work on natural history, the "Shan Hoi King." One of these (Fig. 1) represents, according to the description in the margin, "The Bird and the Rat which live together in the same hole. They come from the mountain of the tailed rats and birds in Wai Une, where they may still be seen." "No doubt," Mr. Moseley remarks (p. 431), "the rat is the ground squirrel (*Spermophilus mongolicus*), and the bird must be an owl, which is associated with it, just as is the small ground owl (*Speotyto cunicularia*) of America with the prairie dog and also with the ground squirrel of California, in the holes of which, as familiarly known, it lives. The genus *Speotyto* is, however, peculiar, as far as is known, to America and the West Indies; and the fact that an owl lives in the holes of the Asiatic ground squirrel is not known to naturalists. Mr. R. Bowdler Sharpe, however, tells me that a small owl, *Carino plumipes*, exists in northern China, which lives in holes in the ground. Possibly this bird has developed the same curious habit of association with a rodent, as has the American ground owl. If so, the fact is very remarkable."

Our second woodcut, borrowed from Mr. Moseley (Fig. 2), represents a fish (*Periophthalmus*) of very strange habits, which, like the land-crabs, though allied to aquatic animals, and irresistibly suggesting to the observer the notion that it is most at home under the water, yet would actually be drowned in all probability were it kept under water for long. Mr. Moseley has chased these queer fish in Ceylon and the Fiji Islands (p. 296). "They are very nimble on land, and difficult to catch. They use their very muscular pectoral fins to spring with, and, when resting on shore, the fore part of their body is raised and supported on these. There seems to be no figure of this very remarkable fish, which shows it at all in the attitude which it assumes when alive. The accompanying woodcut has been drawn from a specimen kindly lent to me by Dr. Günther, and I have

put the fish as nearly in the natural position which it assumes when on land, as I can from memory." Space does not allow us to reproduce the excellent account of the Pearly Nautilus which follows here in the chapter on Fiji.

A good figure of Mr. Moseley's protégé, *Peripatus*, is given on p. 159, and is transferred to these pages (Fig. 3). A clear and intelligible account of the points of interest in the anatomy and habits of this caterpillar-like creature is given in the chapter on the Cape, and we read how both the author and von Suhm (one of the three other naturalists of the expedition, the other two being Sir Wyville Thomson and Mr. Murray) hunted high and low for specimens near Cape Town. Von Suhm "was unsuccessful; but I was lucky enough to find a fine specimen first under an old cart-wheel at Wynberg. Immediately that I opened this one I saw its tracheæ, and the fully-formed young within it. Had my colleague lighted on the specimen he would no doubt have made the discovery instead." It was, however, we take leave to assert, in spite of Mr. Moseley's modesty, no chance which brought the *Peripatus* to his hands, but, simply enough, the unwearied energy and ingenuity which characterised his proceedings throughout the voyage. At the Island of St. Thomas (p. 15) the party "heard of" *Peripatus*, but did not procure any. In New Zealand (p. 279) we again find mention of *Peripatus*, this time brought to Mr. Moseley's hands by a local naturalist, Mr. Locke Travers, F.L.S. Another result of Mr. Moseley's exertions at the Cape was his discovery of two specimens of the skull of the excessively rare and curious Ziphioid whale, *Mesoplodon Layardii*.

Tattooing and the use of paint as an ornament in China and Japan are amongst the subjects which Mr. Moseley discusses at length (p. 489), bringing a variety of facts together from his observations of Polynesians, as well as other races. The painting of the face by Chinese and Japanese is not similar to that practised by European ladies. "An even layer of white is put on over the whole face and neck, with the exception in Japan of two or three angular points of natural brown skin, which are left bare at the back of the neck as a contrast. After the face is whitened, a dab of red is rubbed in on the cheeks, below each eye. The lips are then coloured pink with magenta, and in Japan this colour is put on so thickly that it ceases to appear red, but takes on the iridescent metallic green tint of the crystallised aniline colour. In modern Japanese picture-books the lips of girls will sometimes be seen thus represented green. I suppose the idea is that such thick application of paint shows a meritorious disregard of expense. It is curious that the use of aniline colour should have so rapidly spread in China and Japan. In China, at least, such was not to be expected, but it seems to have supplanted the old rouge, and it is sold spread on folding cards, with Chinese characters on them, at Canton and in Japan."

"This form of painting the face seems to be exactly of the same nature as savage-painting, and possibly is a direct continuation of it. It is like the painting of our clowns in pantomimes. In China the faces of men (as opposed to women) seem not to be painted at the present time either on the stage or elsewhere; but in Japan, actors in certain plays are painted on the face with bright streaks of red paint, put on usually on each side of the eyes. The kind of painting is exactly that of savages (Fig. 4). It is a curious fact that this form of painting, surviving in adults on the stage, is still used elsewhere for the decoration of young children. It is quite common to see children on festive occasions, when elaborately dressed by their parents, further adorned with one or two transverse narrow streaks of bright red paint, leading outwards from the outer corners of their eyes, or placed near that position."

"Such a form of painting possibly existed in ancient

times in China. When a man of distinction was buried in China in former times, a certain number of servants were buried with him. Now, figures made of pasteboard and paper, about three feet or so high, are burnt at the funeral service, in small furnaces provided for the purpose in the temples, together with cartloads of similar pasteboard gifts, which are thus sent by the survivors for the use of the dead in the next world. Earthenware figures were similarly buried with great men in old times in Japan.

"The pasteboard heads of these funeral servants and retainers are painted with streaks, some of which are put on in almost exactly the same style at the angles of the eyes as those of modern Japanese actors. It seems a fair conjecture that the streaks on these heads (Fig. 5) are a direct survival of an actual former savage form of painting which was once in vogue in China, probably used to make fighting-men hideous. It is well known that primitive customs survive in connection with funerals all over the world with extreme tenacity. The numerous interesting survivals existing in the case of English funerals are familiar."

In connection with colour and decoration, we must draw the attention of breeders of poultry to the important experiment on sexual selection suggested on p. 373. Mr. Moseley in fact proposes to test the existence of a preference for colour on the part of hen-birds, by variously dyeing and manipulating the colours of two of more cock-birds kept with her.

The last chapter is one of the most interesting in the book, since here Mr. Moseley does not compress his wonderful richness of material into the short space which is necessary where he adopts the method of telling the reader all that he saw and thought about in one locality after another of the long list visited by the *Challenger*. Here he launches out more fully into discussion and gives a summary, intended for the general reader, of the most striking features presented by the life of the ocean surface, of the deep sea, and of the colony of cockroaches, rats, and other animals and plants which established themselves or were introduced on board-ship.

The significance of colour in marine animals is very suggestively treated, and the origin and use of phosphorescence likewise considered in an original manner. He says (p. 590):—

"The light emitted by phosphorescent animals is quite possibly in some instances to be regarded only as an accidental product, and of no use to the animal producing it; although of course, in some cases, it has been turned to account for sexual purposes and may have other uses occasionally. There is no reason why a constant emission of light should be more beneficial than a constant emission of heat, such as takes place in the case of our own bodies, and it is quite conceivable that animals might exist to which obscure heat rays might be visible, and to which men and mammals generally would appear constantly luminous."

The concluding paragraph contains a suggestion which could be carried into effect without expense by the Government, and there can be no question as to the naturalist best fitted to direct such an undertaking. Mr. Moseley says:—

"The urgent necessity of the present day is a scientific circumnavigating expedition which shall visit the least known inhabited islands of the Pacific, and at the same time explore the series of islands and island groups which yet remain almost or entirely unknown as regards their botany and zoology. These promise to yield results of the highest interest, if only the matter be taken in hand in time, before introduced weeds and goats have destroyed their natural vegetation; dogs, cats, and pigs, their animals and their human inhabitants have been swept away, or have had their individuality merged in the onward press of European enterprise. There is

still, to the disgrace of British science, even in the Atlantic Ocean, an island, the fauna and the flora of which are as yet absolutely unknown. The past history of the deep sea, of the changes of depression and elevation of its bottom, is to be sought to a large extent in the study of the animals and the plants inhabiting the islands, which rear their summits above its surface. These insular floras and faunas will soon pass away, but the deep-sea animals will very possibly remain unchanged from their present condition long after man has died out."

Besides numerous woodcuts, Mr. Moseley's book is illustrated by two coloured plates of antarctic icebergs, and a track-chart of the world, with contour-colours of the sea-bottom. A very copious and carefully-prepared index is appended. Throughout the book the references to literature of all kinds bearing upon the myriad topics touched upon are very abundant, and form one of the most intrinsically valuable features of the work.

E. RAY LANKESTER

#### METEOROLOGICAL NOTES

FROM the third annual Report of the Forest Meteorological Stations of Germany, being the Report for 1877, we learn that this system of inquiry into the influence of forests on weather and climate now includes fourteen stations scattered over a region extending over 7° of latitude and 5° of longitude, the stations being at heights ranging from 10 to 3,051 feet above the sea. The instruments and observations have been planned on satisfactory and comprehensive principles, and in a few years results eminently *ad rem* may be looked for. In the meantime the thermometric observations point to highly important results. Each station has three sets of thermometers for air temperature, similarly protected—one set in the wood, the second set high up in the crown of a tree, and the third set in an open space outside the wood, while earth thermometers are placed both in the open and in the wood, on the surface of the ground, and at depths of 6, 12, 24, 36, and 48 inches. The results show in every case a lower air temperature inside the wood as compared with the open country outside, the mean difference amounting to 1°.3. As regards the temperature of the surface of the ground, the mean deficiency in the wood shaded by the trees is 2°.5, an amount which gradually diminishes with the depth to 2°.0 at 48 inches, the lowest depth observed. It would be a problem of great interest to ascertain how deep this cooling of the earth's surface extends when it is screened by trees from solar and terrestrial radiation. What are called the "true means" of atmospheric pressure are calculated from the observations at 8 A.M. and 2 P.M., the formula being

$$\frac{\text{VIII.} \times 2 + \text{II.} \times 5}{7}$$

Since the stations range in height from 10 to 3,051 feet, and otherwise differ in their physical conditions, it is scarcely necessary to point out that the method of reduction adopted is very faulty.

SOME years ago a good deal of writing appeared in the periodical press depreciatory of the climate of Rome on account, as alleged, of the exposure of that city to the pestilential malaria of the Campagna. Many of the opinions then expressed will not bear scrutiny when confronted with the facts of the mortality and health of Rome. It was to counteract these opinions, which obtained wide currency, that a book entitled "The *Times* Newspaper and the Climate of Rome," by S. A. Smith, was recently published. The author has brought to his task the experience of a twenty years' residence, by which he has been enabled to sketch familiarly and with general truthfulness the broad features of its climate in its hygienic rela-