LETTERS TO THE EDITOR.

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The Hæmoproteus of the Indian Pigeon.

IN the course of a letter, which was brought by the last Indian mail, my friend, Colonel J. R. Adie, imparts the very interesting information that Mrs. Adie, working at Kasauli, has recently obtained very strong presumptive evidence that the præter-vertebrate life-history of the Hæmoproteus of the Indian pigeon agrees with that discovered by Ross for the Proteosoma of the Indian sparrow and for the malaria parasite, the intermediary in the case of the Hæmoproteus being a species of Hippoboscid fly of the genus *Lynchia*.

Mrs. Adie obtained from Amballa some pigeons which were heavily infected with the blood-parasite and abundantly infested with the fly. In sixteen or seventeen individuals of the fly (*Lynchia*), out of twenty-six examined, she found either zygotes, or cysts, or sporozoites—the last swarming in the salivary-glands, and in some cases coursing down the salivary-ducts. In one case a cyst in the wall of the gut was observed to burst and liberate hundreds of sporozoites.

Mrs. Adie's observations will be published as soon as the exact experiments which were in progress at the time Colonel Adie wrote are concluded; but her observations are in several ways so interesting that I think they ought to be made known at once.

A. ALCOCK.

Belvedere, Kent, July 28.

Radio-activity and Atomic Numbers.

MR. VAN DEN BROEK'S letter in NATURE of July 9 shows the importance of the charge upon the nucleus in radio-active phenomena. The cause of this may possibly be sought in considerations similar to the following.

If one assumes that an atom breaks up when all the nuclear charges are in a given relative position and that they are in rotation with an average frequency $\nu = E/h$, where E is their energy and h the element of action of the quantum theory, then each particle will pass through the critical position ν times per second. The probability that M particles should be in the unstable region simultaneously is $(k\nu)^M$, or if only relative position is involved $(k\nu)^{M-1}$, where k of course defines the size of the critical region. One would therefore expect a relation between the average life of an atom and the energy of its particles of the form

$$\lambda = (k\nu)^{M-1} = \left(\frac{k}{h} E\right)^{M-1},$$

where λ is the radio-active constant. According to Geiger the range in air is given by the formula

$$R = \frac{v^3}{1.24 \cdot 10^{27}} = 4.05 \cdot 10^{-2} E^{\frac{2}{3}}.$$

Introducing this value one finds

$$\lambda = (2.77 \cdot 10^{18} k)^{\frac{2}{3}(M-1)} R^{\frac{2}{3}(M-1)}$$

or

$$\log \lambda = \frac{2}{3}(M-1) (\log k + 18.44) + \frac{2}{3}(M-1) \log R.$$

Putting $M=85$, which would be the average value for radio-active substance, one finds the approximate formula $\log \lambda = 56(\log k + 18.44) + 56 \log R$. Geiger

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found empirically $\log \lambda = -36.7 + 53.3 \log R$. According to this k would be about 10^{-19} , i.e. of about the order $1/\nu$. In any case the close agreement between the theoretical and observed values of the coefficients of $\log R$ would seem to show that the original hypothesis is correct in its main outlines, i.e. that integration occurs upon the fortuitous coincidence of n events, the probability of which is proportional to $E=h\nu$, and that n is of the order of the atomic number M . One cannot say as yet though whether the n particles, the relative positions of which determine the stability are the positive particles or the electrons.

Mr. van den Broek's formula

$$\frac{(\lambda_{Th})^2}{\lambda_{Ra} \lambda_A} = 4.5^{M-82}$$

would reduce to

$$\frac{(E_{Th})^2}{E_{Ra} \cdot E_{Ac}} = 4.5^{M-82} \quad \text{or} \quad \frac{(\nu_{Th})^2}{\nu_{Ra} \cdot \nu_{Ac}} = 4.5^{\frac{M-82}{M-1}}$$

The simplest interpretation of this would be that the atoms of corresponding elements of the different series are geometrically similar and differ only in their linear dimensions. A change of the attractive force with the nuclear charge is obviously probable, and Mr. van den Broek's formula will certainly be of the first importance when we attempt to determine the function representing the nuclear forces in terms of the charge and perhaps also of the distance.

F. A. LINDEMANN.

Berlin, July 26.

Circulatory Movements in Liquids.

FROM a manuscript by Christiaan Huygens, containing the description of his microscopical observations in the year 1678, I quote the following passages:—

"5 Sept. Et ayant mis de petites gouttes rondes de cette urine sur le talc" (we read at another place: "ayant pris de cette eau et mis dans le microscope entre le verre et le talc"), "Je remarquay avec le microscope que ces œufs, et sans doute la liqueur mesme avec eux, avoient un mouvement continuel par lequel ils montoient dans le milieu AB de la goutte et puis descendoient par les deux costes CD, et montoient ensuite encore par AB, et ainsi toujours, car je suivais ces graines, et vis que c'estoient les mesmes qui montoient et descendoient.

"Cette continuation de mouvement est estrange et ressemble a celle de la matiere qui passe a travers l'aimant" (according to Huygens's theory of magnetism, which will be published in one of the volumes of his "Œuvres Complètes"). "Je mis par 3 fois des gouttes nouvelles et vis toujours la mesme chose. Les jours suivants ce mouvement n'estoit pas si manifeste.

"9 Sept. Dans du jus de resins blancs, et noirs, mis en expérience le jour d'apparavant, rien de vivant, mais bien de parties grasses et heterogenes, par lesquelles je remarquay le mouvement dans ce jus que j'avois vu dans l'urine le 5 Sept.

"10 Sept. Jus de resins rien de vivant. Le mesme mouvement y estoit.

"11 Sept. Dans le jus de resins rien de vivant, le mouvement de circulation de mesme que le 10e."

Have such phenomena been observed by other microscopists? Any suggestions about their precise cause would be very welcome.

The manuscript will be published in the next volume of Huygens's "Œuvres," which is in an advanced state of preparation.

Amsterdam.

D. J. KORTEWEG.

NATURAL HISTORY AND THE OCEAN.¹

(1) THIS is a new work on birds by the distinguished ornithologist, Dr. Anton Reichenow, of Berlin, which when completed will consist of two volumes. This, the first, contains a general review of the class Aves, followed by a systematic account of the Ratitæ, Natatores, Grallatores, Cutinares (Deserticolæ, Crypturi, Rasores, Gyranthes), Raptatores, and Fibulatores. Excellent line sketches illustrating special diagnostic characters are imbedded pleasantly in the text. Each family, with the genera included in it, is concisely characterised and its geographical distribution indicated, while of the species the more important are enumerated often with remarks on those of special interest. When finished "Die Vögel" will form, if not a "handbook," at least a compact and useful synopsis of systematic ornithology. Unfortunately, like so many German publications it can scarcely be said to be "bound," for with very little provocation it collapses into an inchoate mass of sheets.

(2) This will prove an invaluable book of reference for all who may have to study the avifauna of not only Australia, but of the southern hemisphere, notwithstanding that many of Mr. Mathews's co-workers will probably disagree with him in the distinctness of the numerous, and, as we think, too numerous subspecies he describes. The introduction provides us with a very interesting ornithological history of Australia, and an important discussion of the faunal regions into which the continent appears to be divided from the point of view of its birds. We observe that he recognises, as we believe rightly, the existence in Australia of an element derived from, or once forming, part of an ancient antarctic continent, then possessing a climate very different from that now existing. The nomenclature adopted by the author follows the several rules of strict priority formulated by the different international zoological congresses of recent years, and of necessity, therefore, sweeps away many names which we cling

to from being familiar to us for more than half a century, and which we relinquish, if relinquish them we must, with the deepest reluctance.

Mr. Mathews's "List" represents an amazing amount of the hardest and driest kind of work (to all appearance done once for all), which only those who have some experience in threading the mazes of synonymy can appreciate, and for this ornithological literature must be grateful to him in *saecula saeculorum*.

(3) This is a very disappointing book, full of loose and unqualified dogmatic assertions, such, for example, as: "Many [sea-birds] have for so long a time resorted to rocks . . . that though they may be active enough as swimmers and divers when upon or in the water, they are strangely laborious upon the wing. . . ." How about gannets, pelicans, many cormorants, terns, guillemots? The illustrations are very rough reproductions of pen-and-ink drawings.

(4) Dr. G. A. Boulenger is too well known an authority on the reptilia for anyone to be in doubt as to the value of this volume. "There is no work in the English language," the author informs us in the preface, "dealing with the reptiles of Europe. I have, therefore, endeavoured to supply this desideratum so far as the snakes are concerned." His account of the species found in Europe is preceded by a concise and very excellent introduction, summarising what is known of snakes generally, dealing with their external characters, their anatomy, reproduction, habits, distribution—of which one remarkable fact stated is that the zoogeographical regions into which the world is usually divided do not lend themselves any better than the ordinary divisions of physical geography to the study of the distribution of snakes—and finally, their relation to man. The systematic account is illustrated by a beautiful figure of each species, drawn by Prof. Sordelli, of Milan, for his own and Prof. Ian's "Iconographie Générale des Ophidiens," and reproduced in this volume with his permission.

(5) Mr. B. B. Woodward's "Life of the Mollusca" is another addition to the same excellent series being issued by Messrs. Methuen, to which Dr. Boulenger's belongs. The work gives a succinct account of the history, relationships, and everyday life, with general notes on the anatomy, classification, and distribution of this group of the animal kingdom. The classification here given is based mainly on conchological characters; but in the Mollusca this is never felt to stand on quite the same certain basis as that in other zoological groups, inasmuch as so many of the species are determined upon the house they inhabit, and not on the inhabitants themselves. A very remarkable instance of such a discrepancy was recently discussed in a paper before the Zoological Society, in which the conchological relationships of a new species of *Papuina* from New Guinea disagreed with those indicated by its anatomical characters. The volume is well illustrated by more than thirty plates, most of the figures of which originally

¹ (1) "Die Vögel." Handbuch der Systematischen Ornithologie. By Anton Reichenow. Zwei Bände. Erster Band. Pp. viii+529. (Stuttgart: Ferdinand Enke, 1913.) Price 15 marks.

(2) "A List of the Birds of Australia." By G. M. Mathews. Pp. xxvii+453. (London: Witherby and Co., 1913.) Price 10s. net.

(3) "The Wonders of Bird-life." By W. Percival Westell. Pp. 128. (Manchester: Milner and Co., n.d.) Price 1s. net.

(4) "The Snakes of Europe." By Dr. G. A. Boulenger. Pp. xi+269+plates. (London: Methuen and Co., 1913.) Price 6s.

(5) "The Life of the Mollusca." By B. B. Woodward. Pp. xi+158+plates. (London: Methuen and Co., 1913.) Price 6s.

(6) "The Peregrine Falcon at the Eyrie." By F. Heatherley. Pp. x+78. (London: Country Life, 1913.) Price 5s. net.

(7) "The Holiday Nature-book." By S. N. Sedgwick. Pp. 355+plates. (London: C. H. Kelly, n.d.) Price 3s. 6d.

(8) "The Ocean: A General Account of the Science of the Sea." By Sir John Murray. Pp. 256+xii plates. (London: Williams and Norgate, n.d.) Price 1s. Home University Library.