

Further experiments are in progress to examine in the early stages the growth of radium in actinium, initially freed from radio-actinium and all its products. If actinium changes directly into radium, the initial growth of the radium should be much smaller than that to be obtained three months later, when the products are in approximate equilibrium.

The results of my experiments are thus substantially in agreement with those of Dr. Boltwood. There is no doubt that the immediate parent of radium is present in actinium separated from pitchblende, but certain points remain to be settled before it is definitely proved that radium is the direct lineal descendant of actinium. Since the proof of this relationship between actinium and radium involves many important theoretical consequences, I think it is advisable to await the results of further experiment in this direction before basing far-reaching conclusions upon it.

E. RUTHERFORD.

McGill University, Montreal, January 3.

Helium and Argon in Common Rocks.

THE quantity of radium found in granites and kindred rocks (Proc. Roy. Soc., A, vol. lxxvii., p. 472), about 10^{-11} grams per c.c., suggested that the associated helium might be present in sufficient quantity for spectroscopic detection. This has proved to be the case. Thus 250 grams of Matopo granite yielded 3 c.c. of nitrogen on heating. This nitrogen, on sparking down, gave a residue of about 1/100th part of its own volume. The residue was introduced into a vacuum tube, and showed the spectra of argon and helium quite brilliantly, and in about equal intensity. Similar results were obtained with syenite rocks from Mt. Sorrel in Leicestershire, and from Norway.

It seems more than probable that these observations afford an explanation of the nature of the gases evolved by mineral springs. The invariable presence of a notable quantity of helium in such gases has always been considered remarkable. It would seem that it may be sufficiently explained by the action of hot water in disintegrating common rocks and liberating the gases contained.

It is my intention to examine a large selection of common rocks and minerals, and particularly with the view of determining whether helium in them is always associated with radium, or whether its presence can ever be attributed to radio-activity of ordinary materials.

R. J. STRUTT.

Sunnyside, Cambridge, January 13.

Ionisation and Absorption and Anomalous Dispersion.

DR. STARK (NATURE, vol. lxxiii., pp. 78, 389, 533) has given a theory, based on his canal-ray experiments, according to which spectrum series are due to positive ions. It occurred to me that its applicability to thermal emission might be tested by experiments on the ionisation accompanying the anomalous dispersion in sodium vapour. Accordingly, together with Mr. Needham, I made some preliminary experiments, using a slight modification of Prof. Wood's well-known apparatus ("Physical Optics," p. 340), of which the results seem to be of sufficient interest to deserve publication.

We used a steel tube, 40 cm. long, with an insulated iron wire stretched inside and along it about 1 cm. from the sodium surface. The poles of a battery were connected to the wire and tube through a liquid resistance and galvanometer (1 division = 10^{-8} ampere about); the tube was placed between the collimator and grating of a spectroscope, and the image of a horizontal fine wire stretched across the slit was observed in the first spectrum with a micrometer eye-piece. The separation, due to anomalous dispersion, of the two halves of the image on opposite sides of the absorption band was assumed to be a sufficient measure of the anomalous dispersion.

Curves constructed from observations of anomalous dispersion and current show that every variation of the ionisation, due to some irregularity of pressure and temperature, is accompanied by a corresponding variation in the anomalous dispersion.

The simplest explanation of the parallelism between the

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curves is that the D lines of sodium are due to positive ions rather than to neutral atoms, in accordance with Stark's theory.

G. A. SCHOTT.

Physical Laboratory, University College of Wales, Aberystwyth, December 20, 1906.

THE MILLAIS BRITISH MAMMALS.¹

WITH the appearance of this volume we have the pleasure of congratulating the author on the completion of a very heavy task. As we have had occasion to remark in our notices of the two earlier volumes, from the point of view of pictorial illustration the work is in the main all that can be desired, and there is little doubt that in this respect it will long remain absolutely without a rival. Our very heartiest congratulations may accordingly be tendered to Mr. Millais and his fellow artists on the result of their endeavours to illustrate in an adequate and exhaustive manner the living and recently exterminated mammals of the British Isles. In giving as the

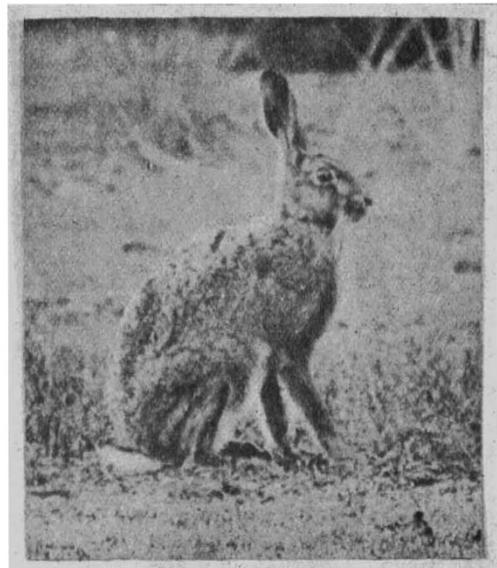


FIG. 1.—The Hare. From "The Mammals of Great Britain and Ireland."

frontispiece of the present volume a picture of a southern right-whale attacked by a party of grampuses, or killers, it may possibly be objected that the author has introduced a scene which cannot now be witnessed in British waters. Since, however, the past as well as the present state of the fauna of our islands enters into the purview of the work, there may be justification for such an illustration; and even if this be not the case, the privileges of artistic license may be pleaded as sufficient excuse. Had space been available, we should have had much pleasure in reproducing one of the full-page illustrations which form by far the most striking feature of the work. Failing this, we have to be content in presenting to our readers (by the courtesy of the publishers) three of the smaller illustrations as examples of the pictorial merit of the work.

The groups included in the present volume comprise the hares and rabbit; the ungulates, of which (if we exclude the white park-cattle, which are obviously not wild animals) the red deer, the fallow deer, and

¹ "The Mammals of Great Britain and Ireland." By J. G. Millais. Vol. iii. Pp. xii+384; illustrated. (London: Longmans, Green and Co., 1906.) Price 67. 6s. net.

the roebuck are the only survivors in a wild, or half-wild, condition; and the cetaceans.

In regard to the hare, the author discusses, without coming to any very definite conclusion, the popular idea that this animal sleeps with its eyes open. Without having any first-hand information to offer on the question, we venture to suggest that the idea has no foundation in fact, as it must be obvious that when an animal is unconscious it can make no use of its eyes, whether open or shut. Many persons, it appears, doubt whether the rabbit can swim; but on this point Mr. Millais has ample testimony, and he describes in detail the manner in which this rodent makes its way in the water on the rare occasions that it takes to that element.

In "British Deer and their Horns" Mr. Millais



FIG. 2.—Head of an English Red Deer killed in 1905. Points, 15. Generally considered to be the finest example taken within recent years. From "The Mammals of Great Britain and Ireland."

has already shown that he is well acquainted with the habits of the three surviving British representatives of the Cervidæ, and on this subject his observations in the volume before us are well worthy the best attention of the reader. Of special interest is the statement that the new antlers of deer begin to grow before the old ones are shed, this, so far as we are aware, not having been previously recorded.

In the course of his account of the red deer Mr. Millais devotes a considerable amount of space to the contention that the division of this widely distributed species into local races is not supported by the evidence available. "All the needless names on the part of scientific zoologists, who in most instances

have worked on insufficient evidence, have," he writes, "only resulted in endless chaos, to the somewhat supercilious amusement of sportsmen, who in this case have shown that they know more about the red deer than the zoologists."

To the allegations in this statement we have no hesitation in giving a flat denial, and it is nothing short of presumption on the part of an amateur naturalist like Mr. Millais to set up his opinion against those of specialists of the calibre of Prof. Einar Lönnberg, of Upsala, and Dr. Satunin, of Tiflis.

The plain fact of the matter (and there are occasions when it is necessary to write strongly) is that our author does not realise what naturalists mean by local races or subspecies, as may be gathered from his remarks concerning the intergradation of different local forms of red deer. Is he aware, we may remark, that the essential idea of a subspecies is that it should intergrade with the typical or some other form of the species, and that many naturalists claim that when such connecting links have died out the aberrant form must rank as a species? Lack of knowledge characterises also his remarks concerning minor local differences in animals. The fact that Perthshire grouse are distinguishable by an expert from the birds found in Caithness, and Tay salmon from Tweed salmon, is, for instance, no argument against the validity of subspecies. On the contrary, it tends exactly the other way, merely giving rise to the question as to the degree in which it is advisable, or practicable, to recognise such local differences in zoological nomenclature.

That the large, black-bellied eastern red deer, or maral, and the small North African red deer are perfectly distinct from the typical red deer of Sweden does not admit of argument. Dr. Lönnberg, in a paper (*Arkiv Zool.*, vol. iii., No. 9, 1906) which may have appeared too late for mention by Mr. Millais, goes further than this, and separates the Norwegian red deer as *Cervus elaphus atlanticus* and the Scotch animal as *C. e. scoticus*; but these local forms, as might be expected, are much nearer one another than are those mentioned above.

In treating of the white park-cattle, Mr. Millais, we are glad to see, recognises the fact that they are essentially descendants of albino domesticated breeds, and in no sense wild animals. He believes, however, that they are derived from Continental rather than British breeds. In this respect he runs counter to the opinion of Low, who knew more about these cattle than many later writers; and it would seem that he is unacquainted with the white Pembroke breed, of which specimens are now living in the Duke of Bedford's park at Woburn. Anyone who has seen these animals will have little doubt as to where to look for the ancestry of all breeds of park-cattle.

In regard to relics of the old wild ox or aurochs, Mr. Millais states, on the alleged authority of the present writer, that two horns, formerly used as drinking cups, are preserved in Paris. If he will refer to "Mostly Mammals" he will find it stated that, up to the French Revolution, both these horns were preserved in Alsace, and that only one, which probably did not belong to the aurochs at all, was mounted as a drinking cup. Both have now disappeared, so far as can be ascertained. Since Mr. Millais is sceptical as to the view now generally accepted with regard to the colour of the aurochs, or urus, it may be well to quote the observations on

this subject of Prof. T. Noack, who, after referring to certain errors by the copyist in the German edition of Herberstein's work published in 1556 or 1557,¹ concludes as follows:—"Der *Bos primigenius* hat sich aber zweifellos in verschiedene Lokalrassen gespalten, die vielleicht auch verschieden gefärbt waren, den wir haben keinen Beweis dass alle Ure schwarz mit weissgrauem Rückenstreif waren, der auch bei dem Herbersteinchen Exemplar sehr gut angedeutet ist." As the late Prof. Nehring was also convinced that Herberstein's aurochs was black, it will require much more evidence than is offered in the present volume to make us believe that it was more probably red.

As regards the section on British Cetacea, which occupies a large portion of the volume, we are glad to be able to accord almost unstinted praise to the author. Mr. Millais has seen for himself a considerable number of the species he discusses in their native waters, and he is therefore able to write with authority regarding their habits and appearance. Many of his sketches and photographs are there-



FIG. 3.—The Common Rorqual. From "The Mammals of Great Britain and Ireland."

fore of special value and interest. He has, of course, much to say with regard to the recent occurrence of a number of sperm-whales in northern British waters, and as the result of these observations it may be hoped that the statement as to this species being an exclusively tropical and subtropical cetacean will in time disappear from text-books. It may be added that our author appears to be in some degree of uncertainty whether the right-whales, on the one hand, and the finners and humpbacks on the other, represent families or subfamilies, since in one passage he refers to the two groups as being of subfamily rank, and yet gives their titles as *Balænidæ* and *Balænopteridæ*. In referring to the horny "bonnet" and tubercles on the head of the southern right-whale, the author makes no reference to the important observations of Prof. E. Lönnberg in his account of the cetaceans of South Georgia; this, however, may be due to the latter having been published too late for mention.

That the present volume and its fellows will do something to arouse greater interest among the wealthy classes (for it is not a poor man's book) in the mammals of the British Isles may be sincerely

¹ In one place Noack gives the date as 1556 and in a second as 1557.

hoped. In all that relates to the habits of the animals he describes, and likewise in matters connected with sport, the author, who is an energetic and enthusiastic field-naturalist, may be taken, at all events in the main, as a trustworthy guide. On the other hand, from what has been stated above, it is evident that in matters connected with systematic zoology it will be advisable for his readers to consult the writings of trained zoologists before taking all Mr. Millais has to say as gospel.

R. L.

THE MATHEMATICAL TRIPOS AT CAMBRIDGE.

NOT only have physicists and engineers and other men who apply mathematics been anxious for many years for reform at Cambridge, but everybody who has wished to see the study of mathematics retain its place in general education. Again, nearly all who are interested in the training of those mathematicians who are expected to devote their lives to original investigation have expressed much the same anxiety. The long-considered principles of a proposed large reform were brought before the Senate eight months ago in a report of the mathematics board, to which were appended twelve resolutions supported by every one of the mathematical professors and university lecturers in mathematics; and these resolutions, after they had been before the Senate five or six months, were voted upon and carried by majorities varying from 10 per cent. to 40 per cent. on October 25, 1906.

To carry out these resolutions, regulations for the examination have been prepared, and must be approved at an early meeting, but at this late hour a force is being organised which means, not merely to oppose the regulations, but to kill all hopes of reform by reversing the recent decision of the Senate.

The proposed syllabus of subjects for part i. includes geometry, algebra and trigonometry, and analytical geometry, with elementary work in the infinitesimal calculus, dynamics, and optics.

It seems to us very good, and will no doubt in time in the hands of the mathematics board become excellent. Six papers will be set, each paper possibly containing questions from all parts of the syllabus. The questions in the physical subjects will be of such a character as to test knowledge of the physical phenomena and their relations, and not merely an ability to deal with the analytical developments of hypotheses. A large proportion of such riders as are set will consist of simple examples illustrating numerically or otherwise the corresponding theory. In their answers candidates will not be restricted to the use of the methods indicated in the syllabus. The most important regulations are that a student may take part i. in his second term, and that the three lists of honour men shall be placed in alphabetical order.

Schedule A of part ii. is not only an excellent course on mathematics, including elementary parts of the theory of functions and differential equations, but it includes those parts of dynamics, hydro-mechanics, astronomy, electricity, and optics (we wish we could say physical optics) which give the best illustrations of the applications of the mathematical part, illustrations which must be interesting even to