being fifty-six days. It was noticed that many days often elapsed between the hatching of the eggs of the same lot—even those kept under similar circumstances. The differences in the actual stage of development of the eggs when first laid may possibly explain the apparent differences in the dates of hatching.

On July 11, 1890, a snake I had in confinement laid eighteen eggs. Some of these were placed at a temperature of 16°–20° C. (61°–68° F.): at the end of October, not being hatched, they were opened, and found to contain fully-formed young ones, but these were all dead. Other eggs from the same lot, which was laid on July 11, were sent into the country and placed in a manure-heap; on September 9, an egg being opened, the embryo snake was nearly formed, but there were no movements visible; on September 24 these eggs began to hatch—that is, after an incubation of seventy-five days.

From the first set of experiments it did not appear that the actual temperature influences to any great degree the period of incubation, or at least not after the first few weeks. (In the cases described it would appear that the eggs had been deposited some seven weeks before they were removed, and then kept artificially from three weeks to a month before they hatched.) Also, that exposure to the atmosphere does not destroy their vitality, provided they are kept fairly moist, some having hatched after several days' full exposure to the air of the room; and that they may be exposed to rather low temperatures, at least for a few hours, and yet finally hatch. As might be expected, some eggs which were placed in small glass pots and hermetically sealed did not hatch.

The process of hatching was very interesting to watch. At first a slit appeared in the uppermost part of the egg, whether the egg was placed on the side or on one end; most usually the slit rapidly became a V-shaped one, which in shape and position corresponded to the snout of the young reptile—that is to say, the apex of the V corresponding to the tip of the lower jaw. The snakes would often remain for some hours in this position, with just their snouts out, and, when disturbed, would withdraw these into the shells again. In a state of nature I have seen them when completely out of the shell, retreat into it again when disturbed. When first out of the shell, the young snakes were very smooth and velvety to the touch; there was usually some opacity about the cornea, which disappeared after a few hours; the yellow ring on the neck was well marked from the very first. They were about 15 cm. (6 inches) in length, and weighed about 3 grammes (45 grains); the eggs themselves weighed about 6 grammes (80 to 90 grains). One cast its skin within a few days after birth, and died. Occasionally they were hatched with the yolk-sac adherent, and in these instances always died. From the first the snakes were very lively, and within a very few days produced the characteristic hissing noise when provoked.

Many problems in connection with the subject of the incubation of eggs might be mentioned. It would be interesting to ascertain definitely what are the maximum and minimum temperatures at which the vital processes can take place in an incubating egg. There is probably an optimal temperature, or one at which the process proceeds most rapidly or most favourably. So also it might be asked, Is the optimal temperature the same for all kinds of eggs—those, for instance, of various forms of birds and those of snakes and lizards? Is the increase of temperature, both of the incubating bird and of the incubating python, essential to the hatching of the eggs? What is the reason of the differences in the incubation periods between different birds? Why, for instance, do pigeons' eggs hatch in fourteen days, hens' three weeks, turkeys' a month, and swans' six weeks?

We know that if a hen's egg be maintained for some twenty-one days at a temperature of about 40° C. it will hatch; but I am not aware of any experiments to ascertain if they will hatch at a temperature considerably under or much over this, and what is the minimum temperature at which they will hatch at all? In the case of many of the micro-organisms, bacteriologists have found the actual limits of temperature within which the various species grow, and also that most of them have an optimal temperature—that is, one at which these lowest forms of vegetable life grow most luxuriantly.

Literature.—Valenciennes, *Comptes rendus de l'Académie des Sciences*, 1841; Sclater, Proceedings of the Zoological Society, London, 1862; Abbott, Proceedings of the Zoological Society, London, 1862; Lataste Fernand, Paris, 1877; Forbes, Proceedings of the Zoological Society, London, 1880; Fisher, *Der Zoolog. Garten*, Bd. 26, 1886.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Among the lectures which are being delivered this term, we notice the following:—Electricity, Prof. Clifton; Physical Optics, Mr. Walker; Ureas and Uric Acid, Prof. Odling; Surfaces of the Second Order, Prof. Sylvester; Disturbed Elliptic Motion, Prof. Pritchard.

In the Morphological Department Prof. Ray Lankester is giving a general course on Animal Morphology, and Mr. Minchin, who has been appointed Junior Demonstrator, is lecturing on the Porifera.

The arrangements for the instruction of medical students in physiology have been considerably improved.

The Burdett-Coutts Geological Scholarship has been awarded to Mr. F. W. Howard, of Balliol.

In the Report of the Visitors of the University Observatory it is stated that Prof. Pritchard will shortly publish an enlargement of his lectures on Disturbed Elliptic Motion.

The following examiners have been appointed for next year:—Physics, Mr. Baynes and Mr. H. G. Madan; Chemistry, Prof. Tilden; Animal Morphology, Mr. Poulton and Mr. Bourne; Physiology, Mr. F. Gotch.

The statute respecting the admission of women to examinations in medicine, which has formed the subject of a good deal of controversy, has been rejected in Congregation by 79 votes to 75.

SCIENTIFIC SERIALS.

THE *Quarterly Journal of Microscopical Science* for August contains:—On the origin of vertebrates from Arachnids, by W. Patten (plates xxiii. and xxiv.). As a full description of the author's observations could not be published without considerable delay in this article of sixty pages, he gives a short account of the facts bearing directly on the subject, and at the same time presents his theoretical conclusions. Recognizing the "Annelid theory" as sterile, the author thinks that since vertebrate morphology reflects, as an ancestral image only, the dim outlines of a segmented animal, but still not less a vertebrate than any now living, it is clear that the problem must be solved, if at all, by the discovery of some form in which the specialization of the vertebrate *head* is already foreshadowed. While, since of all invertebrates, concentration and specialization of head segments is greatest in the Arachnids, it is in these, on *a priori* grounds, that we should expect to find traces of the characteristic features of the vertebrate head. Finding, from time to time, confirmation of this preconceived idea, as the unexpected complexity of the Arachnid cephalothorax revealed itself, he feels justified in formulating a theory that *Vertebrates are derived from the Arachnids.*—On the origin of vertebrates from a Crustacean-like ancestor, by W. H. Gaskell, F.R.S. (plates xxv. to xxviii.). This paper is but chapter one of a very important memoir, which approaches the subject of the ancestry of the vertebrates from a different standpoint from that of Dr. Patten. In previous papers the author had pointed out that the vertebrate nervous system is composed of nervous material grouped around a central tube which was originally the alimentary canal of the invertebrate from which the vertebrate arose, and that the physiology and anatomy of this system both best fit in with the assumption that the invertebrate ancestor was of the Crustacean, or at least of a proto-Crustacean type. In both these papers the author promised to point out the confirmation of this theory, which is afforded by the study of the lowest vertebrate nervous system, viz. that of the Ammocœtes form of Petromyzon. This promise he redeems in this paper, in which, to bring out as prominently as possible the theory, he discusses the nervous system of the Ammocœtes in terms of the Crustacean. Taking separately the prominent features of the alimentary canal and central nervous system of a Crustacean-like animal, he indicates how each one exists in the nervous system of the Ammocœtes. In a second chapter it will be pointed out how the present alimentary canal arose by the prolongation of a respiratory chamber.—On the development of the atrial chamber of Amphioxus, by E. Ray Lankester, F.R.S., and Arthur Willey (plates xxix. to xxxii.). The period of development was that before Hatschek's well-known work stops short. Series of sections were prepared in order to ascertain the mode in which the atrial chamber takes its origin, and the subsequent history of the gill-slits, viz. as to how the slits on the left side of

the pharynx originate. The relation of the larval to the adult mouth, and the details of the curious process of the movement of the mouth from a unilateral to a median position, were also included in the scope of the author's inquiries.

American Journal of Science, November 1890.—Further study of the solar corona, by Frank H. Bigelow. The author has made a series of measures upon photographs of coronal streamers taken in 1878, July 29, by Prof. Asaph Hall. This has been done with a view of testing the validity of the equation that he has assigned to the coronal curves in a discussion of them by spherical harmonics.—Superimposition of the drainage in Central Texas, by Ralph S. Tarr.—A description of the "Bernardston Series" of metamorphic Upper Devonian rocks (continued from October), by Prof. B. K. Emerson.—Analysis of rhodochrosite from Franklin Furnace, New Jersey, by P. E. Browning.—A re-determination of the atomic weight of cadmium, by Edw. A. Partridge.—On the occurrence of nitrogen in uraninite, and on the composition of uraninite in general; condensed from a forthcoming Bulletin of the U.S. Geological Survey, by W. F. Hillebrand. It is found that nitrogen exists in uraninite in quantities up to over 2·5 per cent., and seems generally to bear a relation to the amount of UO_2 present. This is the first discovery of nitrogen in the primitive crust of the earth.—Anthophyllite from Franklin, Macon County, North Carolina, by S. L. Penfield.—Pre-glacial drainage and recent geological history of Western Pennsylvania, by P. Max Foshay.—On the so-called perofskite from Magnet Cove, Arkansas, by F. W. Mar.—Experiments upon the constitution of the natural silicates (continued from October), by F. W. Clarke and E. A. Schneider.

SOCIETIES AND ACADEMIES.

LONDON.

Zoological Society, November 4.—Prof. W. H. Flower, F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the months of June, July, August, September, and October, 1890, and called special attention to several of them. Among these were a young male example of the Wild Cattle of Chartley Park, Staffordshire, presented by Earl Ferrers; a Water-Buck Antelope (*Cobus ellipsiprymnus*) from the Somali Coast, presented by Mr. George S. Mackenzie; an example of the Horned Screamer (*Palamedea cornuta*), obtained by purchase; and a young female of Speke's Antelope (*Tragelaphus spekii*), presented by Mr. James A. Nicolls.—The Secretary exhibited, on behalf of Dr. A. B. Meyer, a coloured photograph of a singular variety of the Rose-coloured Pastor (*Pastor roseus*), with a red head, obtained near Sophia; and read a note from Dr. Meyer on this subject.—Mr. G. A. Boulenger made some remarks on an early reference to the Syrian Newt (*Molge vittata*) in Shaw's "Travels," published in 1738.—Mr. J. J. Lister gave an account of his recent visit to the Phœnix Islands, Central Pacific, and exhibited specimens of the birds and eggs obtained there.—Mr. Smith Woodward exhibited and made remarks upon the calvarium of an adult male *Saiga tatarica* from the Pleistocene deposits of the Thames Valley. The specimen had been obtained by Dr. J. R. Leeson from recent excavations in Orleans Road, Twickenham, and was the first trace of this Antelope discovered in Britain.—Mr. W. T. Blanford read a paper on the Gaur (*Bos gaurus*) and its allies, with especial reference to the exhibition of the first living Gaur ever brought to Europe in the Society's Gardens. He described the characters and geographical range of the three allied species of flat-horned taurine Bovines—the Gaur or Sladang (Bison of Indian sportsmen), the Gayal or Mithan (*Bos frontalis*), and the Banteng (*Bos sondaicus*); and he discussed the question whether *B. frontalis* is ever found in the wild state.—A communication was read from Dr. A. B. Meyer, containing the description of a new species of Squirrel from the Philippine Islands, which he proposed to call *Sciurus cagsi*.—Mr. R. Lydekker read a paper on a Cervine jaw from Pleistocene deposits in Algeria, which appeared to indicate the former existence in that country of a large Deer allied to *Cervus cashmirianus*. For this form Mr. Lydekker proposed the name *Cervus algericus*.—A communication was read from Dr. A. Günther, F.R.S., on the skull of the East African Reed-Buck. In this paper Dr. Günther described the skull of an Antelope obtained by Mr. H. C. V. Hunter in Masai Land, which he identified with *Cervicapra bohor* (Rüppell) from Abyssinia. He pointed out the differences from the skull of the South African species, for which the name *Cervicapra redunca* (Pallas) is generally employed.—Mr. P. Chalmers Mitchell described a graphic formula, designed for the purpose of representing geographical distribution. The regions were indicated by lines, the sub-regions by symmetrically placed numbers. This formula could be drawn rapidly, and printed without engraving.—Mr. W. L. Sclater read the description of a Jerboa from Central Asia, which he proposed to refer to a new genus and species of Dipodinæ under the name *Eucoreutes naso*.

Entomological Society, November 5.—The Right Hon. Lord Walsingham, F.R.S., President, in the chair.—Lord Walsingham announced the death of Mr. Atkinson, of the Indian Museum, Calcutta.—Mr. A. H. Jones exhibited a number of Lepidoptera collected in June last near Digne, Basses Alpes, including *Papilio Alexanor; Parnassius Apollo*, larger and paler than the Swiss form; *Anthocharis tagis*, var. *Bellezina; Leucophasia Duponcheli; Thecla spini; Thecla ilicis*, var. *cerri; Lycæna argiades*, var. *corretas; Melitæa deione*; and *Argynnis Euphrosyne*.—Mr. W. E. Nicholson also exhibited a collection of Lepidoptera, formed near Digne last June, which included very large specimens of *Papilio Machaon; P. Podalirius; Thais rumina*, var. *medesicaste*, larger and redder than the Mediterranean specimens; *Apatura ilia*, var. *clytie; Argynnis adippe*, var. *cleodoxa; A. Daphne; Melanargia galatea*, var. *leucomelas*; and many others.—Mr. C. O. Waterhouse exhibited the wings of a large species of *Attacus*, split in halves longitudinally so as to show the upper and lower membranes.—Dr. D. Sharp, F.R.S., exhibited a photograph he had received from Prof. Exner, of Vienna, showing the picture obtained at the back of the eye of *Lampyris splendidula*. He stated that this picture is continuous and not reversed, and shows the outlines of lights and shades of objects at a distance as well as of those closer to the eye.—Mr. H. Goss exhibited a specimen of *Zygæna filipendulæ*, var. *chrysanthemi*, which he had taken at Rhinefield, in the New Forest, on July 15 last. Dr. P. B. Mason said this variety was known on the continent of Europe, and was figured by Hübner in his "Sammlung," a copy of which work he exhibited. He added that he possessed a similar specimen of this variety taken in Wyre Forest, Worcestershire. Colonel Swinhoe stated that he possessed a similar variety of a species of *Syntomis*.—The Rev. Dr. Walker exhibited seven varieties of *Melanippe thuleana*, nine of *Coremia munitata*, and a few of *Noctua conflua*, illustrating the varied forms of these species occurring in Iceland. Dr. Mason said that the only British specimens of *N. conflua* which he had seen resembling the Iceland form of the species were taken at Wolsingham, Durham.—Mons. A. Wailly exhibited and remarked on a number of Lepidoptera from Japan. The collection comprised about thirty species, eleven of which, it was stated, were not represented in the British Museum collections.—Mr. A. C. Horner exhibited a number of rare species of Coleoptera, including *Homalota crassicornis*, Gyll., *H. humeralis*, Kr., and *Euryporus picipes*, Pk., collected at Church Stretton, Shropshire; and also *Amara nitida*, Sturm., *Oxypoda amœna*, Fair., *Homalota testaceipes*, Heer, and *Lithocharis apicalis*, Kr., from the neighbourhood of Tonbridge.—Herr Meyer-Darcis exhibited a specimen of *Termitobia physogastra*, Gangelb., a new genus and species of *Brachelytra* obtained in a white ants' nest from the Congo. Dr. Sharp commented on the interesting nature of the exhibition.—Colonel Swinhoe exhibited a collection of moths from Southern India, which comprised about forty species. He also read a paper, describing these species, entitled "New Species of Moths from Southern India."—The Rev. T. A. Marshall communicated a paper entitled "A Monograph of British Braconidæ, Part IV."—Lord Walsingham read a paper entitled "African Micro-Lepidoptera," containing descriptions of seventy-one new species, and of the following nine new genera, viz. *Autochthonus* (type *A. chalybiellus*, Wlsm.), *Scalidoma* (type *Tinea horridella*, Wkr.), *Barbaroscardia* (type *B. fasciata*, Wlsm.), *Odites* (type *O. natalensis*, Wlsm.), *Idiopteryx* (type *Cryptolechia obliquella*, Wlsm.), *Microthauma* (type *M. metallifera*, Wlsm.), *Licmocera* (type *L. lyonetiella*, Wlsm.), *Oxymachæris* (type *O. niveocervina*, Wlsm.), and *Micropostega* (type *M. æneofasciata*, Wlsm.). Several European and American genera were recorded as new to the African fauna; and the occurrence of one Australian and two Indian genera was also noted.