

There are some most interesting illustrations in this book. With few exceptions, they have been made directly from negatives taken during the author's various expeditions. The reproductions are the work of the Boston Photogravure Company.

WE have received from the publishers, Messrs. Macmillan and Co., a small book of "Illustrations and Diagrams" from the works of Dr. Geikie and others, that has been arranged by Mr. Cecil Carus-Wilson to illustrate, in the Oxford University Extension lectures, the geological courses delivered by him. In order to give elementary lectures on this subject to students, one must have a most liberal supply of diagrams, &c., and they must all be placed so that they may be conveniently seen. Again, when slides are used students have not time to copy them while on the screen, and in this way many important facts which could be remembered by the presence of a diagram are forgotten. By means of Mr. Carus-Wilson's hand-book these disadvantages will disappear, and the student will have good and trustworthy illustrations from which he will be able to draw more comprehensive and accurate conclusions than he could from his own rough sketches made at the time. The diagrams are printed on excellent paper, and at the foot of each is a short description, with the reference to the work from which it has been taken. The book is sold at cost price.

THE Indian Press, Allahabad, has published a very good series of geographical text-books for Indian schools, by the late Prof. S. A. Hill, of Muir Central College, Allahabad. The series consists of three little volumes, the first two of which have reached a third edition. The third volume, which is new, treats chiefly of mathematical and physical geography.

THE fifth edition of Prof. M. Foster's "Text-book of Physiology" (Macmillan) is being published. Part iii., which has just been issued, deals with the central nervous system. The work has been largely revised.

MESSRS. LONGMANS AND CO. are issuing the tenth edition of Quain's "Elements of Anatomy." The task of editing the work has been entrusted to Prof. E. A. Schäfer and Prof. G. D. Thane. We have received the first part of vol. i., and the first part of vol. ii. The former deals with embryology, and is edited by Prof. Schäfer; the latter with osteology, Prof. Thane being the editor.

THE second edition of "The Fuel of the Sun," by W. Mattieu Williams, has been issued. As the work was originally published twenty years ago, the author contributes a preface to the new edition, giving "a brief outline summary of the bearings of the growth of knowledge upon the subjects of the several chapters."

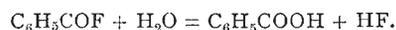
MESSRS. BAILLIÈRE, TINDALL, AND COX will publish in a few days an octavo volume (360 pages and 52 figures) entitled, "Researches on Micro-Organisms," by Dr. A. B. Griffiths. The work gives an account of recent researches in various branches of bacteriology.

THE Naturalists' Publishing Company, Birmingham, have issued "The Naturalists' Annual and Directory for 1891," edited by the editor of the *Naturalists' Gazette*. It consists of a number of short scientific articles, by various writers, and a directory indicating "the Lepidoptera of the months."

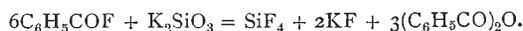
THE University College of Nottingham has published the Calendar for its tenth session. In a supplement the facts relating to the engineering department of the College are brought together.

BENZOYL FLUORIDE, C_6H_5COF , has been prepared for the first time by M. Guenez in the laboratory of M. Moissan at the Parisian École de Pharmacie. It was obtained by the general reaction lately proposed by M. Moissan, heating silver fluoride

with the corresponding chloride in a sealed tube. Equal molecular proportions of silver fluoride, AgF , and benzoyl chloride, C_6H_5COCl , were heated together for six hours in a sealed tube to a temperature of 190° . After allowing the tube and contents to cool, the drawn out sealed end was opened at the blow-pipe in order to permit of the escape of gaseous silicon tetrafluoride, which is formed in considerable quantity owing to the energetic action of benzoyl fluoride upon glass. The tube was then drawn out about the middle of its length, and bent over in a V shape; the benzoyl fluoride was thus readily distilled off from the residual silver chloride, the second limb of the V acting as a condensing tube. The product so obtained was found, as might be expected, to contain admixed benzoyl chloride. It was therefore reheated in a second sealed tube with a fresh quantity of fluoride of silver, and the product distilled in the same manner as before. The resulting benzoyl fluoride was found to be practically free from chloride. Benzoyl fluoride is a colourless liquid possessing an odour analogous to that of benzoyl chloride, but much more irritating, the least trace of its vapour producing a copious flow of tears. It boils at 145° , and readily ignites when heated in the air, burning with a flame bordered by a blue halo. It sinks in water, which liquid slowly decomposes it in the cold, with formation of hydrofluoric and benzoic acids—



In contact with solutions of caustic alkalies it is rapidly converted into fluoride and benzoate of the alkali, the reaction being almost instantaneous when the temperature is slightly raised. It attacks glass very vigorously, with liberation of gaseous silicon tetrafluoride; benzoic anhydride, containing a deposit of potassium fluoride, is found remaining in the corroded vessel.



Benzoyl fluoride appears, therefore, to fulfil the expectations concerning it in resembling very closely its nearest analogue, benzoyl chloride, in properties, the differences being only those due to the more active nature of the halogen fluorine, and to the remarkable affinity of the latter element for silicon.

THE additions to the Zoological Society's Gardens during the past week include an Indian Chevrotain (*Tragulus meminna* ♂) from India, presented by Mr. Greenberg; a Globose Curassow (*Crax globicera* ♂) from Mexico, presented by Mr. R. M. Pryor, F.Z.S.; two Long-eared Owls (*Asio otus*), British, presented by Mrs. Twickline; an Eyed Lizard (*Lacerta ocellata*, var.) from Southern Spain, presented by Mr. Francis Napier; a Black-headed Gull (*Larus ridibundus*), British, presented by Miss Lanze; an Alligator (*Alligator mississippiensis*) from Florida, presented by Mr. C. J. Owen; a Cryptoprocta (*Cryptoprocta ferox*) from Madagascar, purchased; two Crested Porcupines (*Hystrix cristata*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE DUPLICITY OF α LYRÆ.—At the meeting of the Royal Astronomical Society on November 14, Mr. A. Fowler exhibited some photographs of the spectrum of α Lyræ which indicate that it is a spectroscopic double of the β Aurigæ and ζ Ursæ Majoris type. The photographs were taken with the 10-inch refractor belonging to the Royal College of Science, with two prisms of $7\frac{1}{2}^\circ$ each in front of the object-glass, and form part of a photographic study of stellar spectra recently commenced at Kensington by Prof. Lockyer with a special object. The evidence of duplicity of this kind of binary star depends upon the fact that when the two components are moving in opposite directions in the line of sight, the lines that are common in their spectra are displaced towards opposite ends of the spectrum, in accordance with Doppler's principle, and therefore appear double. When the motion is at right angles to the line of sight, there is, of course, no such displacement,

and the lines therefore appear single. Hence, during a complete revolution the lines will twice reach a maximum separation and twice appear single. The principal lines in the spectrum of α Lyræ are due to hydrogen. These do not exhibit a duplication, because the separation is less than their thickness. A variation in their width, however, is very obvious. The K line of calcium is the next strongest, and is sufficiently fine and distinct to render the duplicity very apparent. Fourteen photographs of the spectrum have been taken from October 3 to November 4. The maximum separation of the K line was recorded on October 8 as 7.8 tenth-metres. On October 17, 28, and November 1, 8 p.m., the same line appeared single. At 8.30 p.m. and 10 p.m. on the last-named date, the separation was respectively 2.3 and 3.8 tenth-metres. A discussion of the data obtained from all the photographs shows that they are fairly satisfied by assuming a circular orbit, the plane of which passes through the sun, and the remarkably short period of revolution of about 24.68 hours. This period does not appear inconsistent with the relative orbital velocity of 370 miles per second indicated by the photograph taken on October 8, and is confirmed by the three photographs taken at short intervals on November 1. If 370 miles per second be taken as the maximum relative orbital velocity, the distance between the components is about 5,000,000 miles. The total mass will therefore be about 22.5 times that of the sun, and as there is no appreciable difference in the intensity of the K lines, the masses of the components are probably about equal. In the cases of β Aurigæ and ζ Ursæ Majoris, Prof. Pickering found, respectively, periods of 4 and 52 days, and maximum orbital velocities of about 150 and 100 miles per second.

PARALLAXES OF NEBULÆ.—Prof. Holden proposes to determine the parallaxes of nebulae by taking short exposure photographs of their nuclei, and measuring their positions relative to neighbouring stars, in a similar manner to the method adopted by Prof. Pritchard for the photographic determination of the parallaxes of stars. A short exposure photograph taken at Lick Observatory, of $\Sigma 6$ and the stars near it, indicates that the method is one from which good results may be obtained.

CATANIA OBSERVATORY.—Prof. Riccò has been appointed Director of the new Catania Observatory. The work of the Observatory will be principally connected with astronomical physics, celestial photography, meteorology, and seismology.

WASHINGTON OBSERVATIONS, APPENDIX II.—This consists of an account of the work done by Mr. Asaph Hall, on Saturn and its ring, extending over the years 1875–89. Besides giving details of every observation made by him, he sums up afterwards the results obtained, from which we gather the following information. From a series of observations of the white spot on the equator of the planet, he finds the time of rotation of Saturn to be 10h. 14m. 23.8s. \pm 2.30s. mean time: this differs slightly from that obtained by Sir William Herschel, who gave 10h. 16m. 0.4s., and said that his result could not be in error by so much as two minutes. The ball of the planet during the fourteen years of observation has undergone very slight changes, with the exception of the white spot which broke out on December 7, 1876. Although a careful examination was made to find if a notch could be seen in the outline of the shadow of the ball on the ring, no such phenomenon was recorded. Of the principal rings, no division was recorded in the inner ring. The Cassini division gave the impression "of not being a complete separation, or that small particles of matter remain in this partly dark space." The Encke division of the outer ring, although specially looked for could not be definitely stated as a "real and permanent division," although a slight marking was seen at times.

In addition to numerous tables of measurements of the ball and of the various rings, the author adds three plates of the planet as it appeared under favourable conditions in the opposition of 1884.

BIOLOGICAL NOTES.

RATE OF GROWTH IN CORALS.—But little is as yet known as to the rate of growth of corals under different conditions. In the third edition of Dana's "Coral and Coral Islands," a *résumé* will be found of all that is known about this subject up to 1890, but some very interesting details have been published by Alexander Agassiz in the August number of the *Bulletin of the*

Museum of Comparative Zoology at Harvard College. A series of specimens are figured, which have been taken off the telegraph cable laid between Havana and Key West, in June 1888, from a portion that was repaired in the summer of 1881; so that the growths could not be more than about seven years old. It is to be observed that this portion of the cable was laid at a depth of only from six to seven fathoms, and that the district in which it was laid was most favourably situated as regards food supply to the corals. Some of the specimens belong to species whose rates of growth have not yet been recorded; they are as follows:—*Orbicella annularis*, figured on plates 1 and 2. Verrill mentions that the thickness of this coral formed in sixty-four years was not more than about 8 inches; the specimens from the Havana cable grew to a thickness of 2½ inches in about seven years. *Manicina areolata*, Ehrenb., figured on plate 3, has grown to a thickness of 1 inch; while *Isophylla dipsacea*, Ag., figured on plate 4, shows a still more rapid growth, projecting 2½ inches above the cable. Of course it is quite possible that these corals are of less than seven years' growth, but it is not probable that more than a short time passed before some of the swarms of pelagic coral embryos which must have floated past the cable found a place of attachment thereon.

TUOMEYA FLUVIATILIS, HARVEY.—Over three-and-thirty years ago the late Prof. W. H. Harvey bestowed this name on a rare and curious freshwater Alga sent to him from the United States by Prof. Tuomey, of Alabama. Harvey's description was published in the third part of his "Nereis Boreali Americana," but Harvey, as was his wont, sent a scrap of his plant to Kuetzing, who at once described and figured it as *Baileya americana*. Prof. Farlow gives the priority to Harvey's name, and we believe he is right. The systematic position of this little Alga is a matter of some importance. Harvey says, "The plants referred to *Batrachospermæ* naturally group themselves into two sub-orders, distinguished from each other by the habit of the frond, but closely related in structure and fructification, and these seem to me inseparably connected by the genus *Tuomeya*, which unites in itself the characters of the seemingly so dissimilar genera *Batrachospermum* and *Lemanea*;" but the specimens at his command were too imperfect to enable the complete structure to be made out, and until the other day no light was thrown upon the subject. In December 1888, Mr. Holden found the species in some quantity in a brook near Bridgeport, Conn., and since it has turned up in several distant localities in the United States. Mr. W. A. Setchell has lately published the results of a very detailed investigation of the structure and development of this form, as the result of work done in the Cryptogamic Laboratory of Harvard University. It grows on smooth rocks or stones, in brooks or small streams, preferring places where the current is accelerated; in a few rare cases it has occurred upon aquatic grasses; it seems to be easily cultivated, one batch of specimens, even under such treatment, producing the reproductive organs; the plant seldom exceeds 5 cm. in height, and is bushy and rigid, in this latter respect presenting a marked contrast to the larger species of *Batrachospermum*, which in size, colour, and manner of growth it much resembles, and with which it very frequently grows. When dried, it is non-adherent to paper, resembling in this some of the *Lemanea*. Each main filament is composed of a single row of cells placed end to end, the apical cell being in a state of active growth, here and there at intervals the older cells of the filament branch out into a di- or trichotomously branched ramellus, of which several may arise from the same node, and the branchlets from these, intertwining as they increase, form a dense mass of cells round the central filamentous axis, and finally make up a hollow cylindrical frond composed of two sets of cells, somewhat resembling the structure seen in some forms of *Lemanea*. Before, however, this hollow cylinder is fully formed, filaments are given off from the basal portions of the inner cells of the ramelli, which differ from the ramelli cells in being cylindrical and simple. These grow downwards, forming a dense cortical layer around the axis; some, however, grow obliquely outwards, even protruding themselves beyond the outer limits of the frond, and may possibly become detached, forming new plants. Both the antheridia and procarps are to be found on the same plant, but generally on separate portions of the frond; the antheridia in shape, colour, and character of contents exactly agree with those of *Batrachospermum*; they are borne at the tips of branches which arise from or near the nodes. These mostly pass out horizontally to the surface of the frond. The antheridial branches are at first unbranched; their ends just