

tration of the acid in the ware below the glaze." Time would have been better spent in developing this point than in high-temperature experiments, which, for dishes, were superfluous. The ware is made very much thinner than has been customary, and consequently is unduly fragile. In spite of careful packing two of the specimens arrived broken. It is very desirable that we should be independent of foreign supplies of porcelain, and it is to be hoped that the enterprise of the Royal Worcester Porcelain Company and other British porcelain manufacturers will be rewarded, but prolonged use in the laboratory is the only certain means of proving the qualities of the new ware.

MESSRS. WILLIAMS AND NORGATE announce "Raphael Meldola: Reminiscences by those who knew him," with a preface by Lord Moulton and a chronological list of Prof. Meldola's publications. The work will be divided as follows:—Biographical memoir; early years; professor of chemistry; chemical investigator; naturalist; astronomer; personality.

#### OUR ASTRONOMICAL COLUMN.

THE SOLAR PHYSICS OBSERVATORY.—The report of the director of the Solar Physics Observatory for the year ending March 31, 1916, has recently been issued, this being the third annual report since the transference of the observatory from South Kensington to Cambridge. The work of the observatory has been carried on with difficulty on account of the war, two members of the staff now being absent on military service and two on munition work. Observational work with the Newall telescope and the Huggins instruments was not attempted, but the spectroheliograph was in regular use, photographs of the sun's disc in  $K_{2-3-2}$  light having been obtained on 112 days, and of prominences at the limb on 93 days. Sun-spot spectra in the region  $\lambda 5300$  to  $\lambda 5500$  were also successfully photographed with the McClean installation. Mr. Baxandall has made considerable progress in the assignment of chemical origins of lines in stellar spectra, and in a revision of the origins given by Rowland for lines in the solar spectrum. The great majority of Rowland's identifications have been confirmed, and terrestrial equivalents for many lines not identified by Rowland have been found by reference to data subsequently published. Experimental work has established the identity of the G group of the solar spectrum with the hydrocarbon band  $\lambda 4314$  (see NATURE, July 20), and it is thought that a clue has been obtained to the interpretation, in terms of carbon, of the remarkable spectrum of Comet Wells, 1882. In the department of meteorological physics, Mr. C. T. R. Wilson has continued the study of lightning discharges.

With regard to the "Annals of the Solar Physics Observatory," of which vol. iii., part 1, has already been distributed, it is now explained that vol. i. is intended to contain historical and descriptive matter, vol. ii. to refer to stellar investigations, and vol. iii. to deal with work on the sun.

RELATIVE LUMINOSITIES OF SUN AND STARS.—A convenient formula for comparing the luminosity of a star with that of the sun has been given by Mr. C. T. Whitmell (*L'Astronomie*, August, 1916). Assuming the stellar magnitude of the sun to be  $-26.5$ , and designating the luminosity, parallax, and magnitude of the star by  $L$ ,  $p$ , and  $m$ , the luminosity of the star in terms of that of the sun is given by the equation:

$$\log L = 0.0289 - 2 \log p - 0.4 m.$$

In the case of Sirius, for example, where  $p = 0.38''$  and

$m = -1.6$ ,  $\log L = 1.5093$  and  $L = 32.3$ , showing that Sirius is about 32 times as bright as our sun. The constant term in the equation depends upon the value assigned to the sun's stellar magnitude, and is equal to  $10.6289 + 0.4(S)$ , where  $S$  is the adopted value.

THE THERMOPILE IN PHOTOGRAPHIC PHOTOMETRY.—The usual method of arriving at the magnitudes of stars shown on photographs is to measure the diameters of the stellar images, or to determine the opacity of images purposely taken out of focus. In either case the result depends in part on the judgment of the observer, and the application of some purely physical method is evidently desirable. Such a method has been devised by Mr. H. T. Stetson, of the Yerkes Observatory, in which the star image is surrounded by a small circular diaphragm, and the intensity of the transmitted beam from a steady source of light, as compared with that of the unrestricted beam, is measured by means of a thermopile and galvanometer. Theory leads to the expectation of a fourth-root relation between galvanometer deflections and stellar magnitudes, and this has been confirmed experimentally. The device appears to have reached a convenient practical form, and measurements of a plate of the Pleiades, for example, indicated a probable error of 0.022 mag. for a single star. An extensive application of the method to the eclipsing variable U Cephei has been commenced, and variations not explained by the eclipse theory have been detected. When provided with a stage having a micrometer screw, and the circular aperture being replaced by a slit, the apparatus becomes well adapted for certain investigations of spectra. In this form it seems likely to be especially useful in the study of colour index, and may possibly aid in the determination of radial velocities of faint stars from objective prism plates taken through a neodymium absorption cell (*Astrophysical Journal*, vol. xliii., pp. 253 and 325).

#### RECENT INDIAN MUSEUM PUBLICATIONS.

THE latest serial publications of the Indian Museum reach a very high level of excellence. Vol. v., No. 3, of the Memoirs consists of Mr. Stanley Kemp's report on the Decapod crustacea of the Chilka Lake, an area where the density of the water ranges according to season between freshness and a saltness equal to that of the sea. The species, which number 54, include crabs, hermit-crabs, Thalassinids, Caridea, and Penaeids. Among the permanent inhabitants, or species capable of withstanding every seasonal change in the water, from fresh to salt, it is surprising to find such characteristically marine forms as Leucosiid and Xanthid crabs, Alpheidæ, and the pelagic Lucifer. The permanent inhabitants constitute 72 per cent. of the whole. The seasonal immigrants (about 75 of the whole) all appear, whether normally marine or fresh-water species, to breed in the lake. The casual visitors (about 20 per cent.) are almost all from the sea. Among the 12 species described as new is *Athanas polymorphus*, the males of which are trimorphic. The report is a model of clear and critical exposition, being rich in inference and illustration, but always concise and explicit.

No. 1 of vol. vi. of the Memoirs contains two important papers, one on Indian Tunicata by Dr. Asajiro Oka, the other by Colonel J. Stephenson on Oriental earthworms. The first deals with simple Ascidians and pelagic forms, and does not go much outside the collections made by the *Investigator*. Perhaps the most interesting item is a full descrip-

tion of the extraordinary deep-sea genus *Hexacrobylus*, hitherto known but imperfectly from a single specimen discovered by the *Siboga* expedition, but now elucidated by five well-preserved specimens dredged by the *Investigator* from 1912 fathoms off Ceylon. In *Hexacrobylus indicus*, which the author regards as an aberrant Molgulid, the body is ovate and covered with delicate hairs; the branchial aperture is a wide transverse slit, ventral in position, and surrounded by six many-lobed tentacles, which collectively resemble thick, prominent, warty lips; the branchial siphon is nearly as large as the trunk itself; the branchial sac is scarcely distinguishable from the œsophagus, and is imperforate and destitute of stigmata, endostyle, and dorsal lamina; the gonads are symmetrically developed on both sides of the body, and the ovaries and testes have separate ducts: though differing from the *Siboga* species, it agrees with it in those features which separate it so widely from all other Ascidians. Another interesting new genus is *Monobotryllus*, which, though a simple Ascidian, is most closely related to some of the holosomatous compound Ascidians.

Colonel Stephenson's paper, which treats of Oligochaeta collected mainly in southern India and Ceylon, though largely anatomical and systematic, is dignified by much instructive comparison and criticism. Twenty species and five varieties are described as new, among them a *Pontodrilus* from Ceylon remarkable in its habitat, far from the sea, at an elevation of 6200 to 7000 ft. Two new genera are defined, namely, *Erythrœodrilus* from Bombay, apparently related to the Madagascar *Howascólex*; and *Comarodrilus* a Megascolecine from Cochin, in alliance with *Woodwardia*.

Part vi. of vol. xi. of the Records contains three papers of more than common interest. Dr. James Ritchie gives an exhaustive description of *Annulella gemmata*, a remarkable new Hydroid discovered by Dr. Annandale in a brackish pond at Port Canning in the Gangetic Delta. It is a minute form, solitary and usually attached, but also freely locomotive. Its attachment is by a "basal bulb," which alone is invested by perisarc, and is regarded as something between a basal disc and a hydrorhiza. Its tentacles, which are of extreme length, have the cnidoblasts concentrated in whorl-like rings, the cnidoblasts being almost identical with those of *Hydra*. The usual methods of propagation seem to be non-sexual, but Dr. Annandale, who kept specimens alive, states that minute medusæ are liberated. The non-sexual methods include longitudinal fission, transverse fission of the basal bulb, and the detachment of remarkable planula-like buds.

Dr. Annandale contributes an account, biological and systematic, of sponges parasitic on Indian Clionid sponges. Ten such parasites are reviewed, along with five Clionid hosts, the greater part of the collection being furnished by a few ounces of *Madreporarian* coral. The methods of attack and defence are discussed very fully. Among assumed methods of protection observed in certain Clionids inhabiting great depths, where the inorganic conditions of life may reasonably be supposed to be constant, is the production of gemmules.

Mr. F. H. Graveley's copious and well-ordered notes on the habits of insects and other Arthropods must be greatly commended. In addition to recording many original observations of behaviour, courtship, breeding, etc., particularly of that retiring group the Pedipalpi, the author has extracted references to multifarious observations published, mainly in Indian journals and in books relating to India, by other writers.

NO. 2443, VOL. 97]

#### RECENT ECONOMIC ENTOMOLOGY.

THE economic importance of the Coccidæ ("mealy bugs" and scale-insects) is very great, especially in warm countries. It is satisfactory to see, therefore, the first part of an extensive monograph on the Coccidæ of South Africa, by C. K. Brain, published as part 2 of vol. v. of the Transactions Royal Soc. S. Africa (Cape Town, 1915). This contains a general introduction to the study of the family and detailed descriptions of the genera and species of the *Pseudococcinæ*, *Ortheziinæ*, *Coccinæ*, *Monophlebinæ*, and *Margarodinæ*. The systematic work has been done with great care, a notable feature being the charts demonstrating in the case of each species the range of variation in the lengths of the antennal segments; the illustrations—photographs and drawings—fill thirteen plates. The author has spared no pains to enlighten his readers, but it was scarcely necessary to include in his glossary the information that "ovum" means "an egg," and "transparent," "so clear as not to obstruct vision."

The *Bulletin of Entomological Research*, vol. vi., part 4, lately issued, contains, as usual, several noteworthy papers. Prof. G. H. F. Nuttall and Mr. C. Warburton describe briefly, with clear illustrations, thirty species of ticks from the Belgian Congo, and point out the importance of each as a carrier of disease. Mr. C. H. T. Townsend, of the U.S. Department of Agriculture, establishes—in reply to some recent sceptical criticism—that *Phlebotomus* is truly the infective carrier of the *Verruga* parasite. Dr. G. A. K. Marshall describes, with excellent figures, some weevils injurious to various cultivated plants in India. The highly useful *Review of Applied Entomology* has just commenced its fourth volume, and the first summary in the medical and veterinary series directs attention to the existence of the British and Irish sheep-fly (*Lucilia sericata*) as a pest in the southern United States, together with *Phormia regina*, on the authority of Messrs. F. C. Bishopp and E. W. Loake, in a paper published in the *Journ. Econ. Entom.*, vol. viii., No. 5.

Literature on the common house-fly continues to accumulate rapidly. Mr. R. H. Hutchinson (U.S. Dept. Agric., Bull. 345) contributes some interesting observations on the "Pre-oviposition Period" of the insect, with a view of estimating the value of fly-traps for reducing the numbers of eggs and larvæ. He finds that the term of the female's life before egg-laying varies from 2½ to 23 days, "most of the records falling on the fourth, fifth, sixth, ninth, twelfth, and fourteenth days after emergence."

The larval trombidid mites known as "harvest bugs" are too familiar as a well-nigh intolerable pest in some localities. Mr. Stanley Hirst (*Journ. Econ. Biol.*, vol. x., No. 4) gives a careful description of this larva under the name of *Microtrombidium autumnalis*. He also describes a Japanese species, *M. akamushi*, which carries the germ of a disease known as "river fever."

In a Technical Bulletin (No. 21) of the Michigan Agricultural College Experiment Station, Mr. Geo. D. Shafer continues the account of his investigations as to how "contact poisons" kill insects. Such gases as sulphuretted hydrogen, hydrocyanic acid, and the vapours of carbon disulphide, benzene, or paraffin affect insects when actually taken up by the tissues, where their presence seems to prevent oxygen assimilation. This result is due to the harmful effect of such gases and vapours on the enzyme-like bodies—reductases, catalases, and oxydases—which are functional in insect tissues. The contact poisons are believed to affect the activities of these enzymes to an unequal degree, thus disturbing their normal balance.