

length of the metre has been marked by means of two fine lines. The position of the lines at a constant temperature is then determined by the micrometers, the bar being placed for this purpose in a trough of water, the temperature of which is maintained constant by an improved automatic regulator. A second metal bar, whose rate of expansion is to be determined, is placed in a separate trough of water, the temperature of which differs considerably from that in the other trough. This trough is then also brought into position under the microscopes, and the positions of the lines on the second bar determined relatively to those on the first bar. This method has the advantage that the results are independent of any change in the distance between the axes of the two microscopes during the comparison of the two bars. The optical effect of the immersion of the bars in water was investigated by M. Krusper in 1872-73, who found it to affect the comparisons very little.

The comparing apparatus at the Bureau was originally made by M. Sörensen of Stockholm, but was subsequently altered and improved by the Geneva Society for the construction of physical instruments, under the directions of M. Turettini. The lines on the bars were illuminated by light reflected on to a small mirror fixed at an angle of 45° inside the microscope, a little above the object glass. The determinations of the errors of each micrometer-screw throughout its whole length, for even no micrometer-screw has yet been made in which appreciable errors may not be detected in its use, was made in accordance with methods followed by Drs. Foerster and Hirsch, and MM. Starke and Kammerer.

The thermometers used were constructed after the form adopted by the Bureau (tome i. p. B 8), and were made at Paris by M. M. Baudin and M. M. Alvergnat. It is satisfactory to find that to the important question of thermometers the Bureau has given much attention, as in such investigations errors of thermometers are of as great importance as the errors of the micrometer-microscopes, but are not, however, always so carefully attended to as they should be. The thermometers were calibrated after the methods suggested by Dr. Thiesen and M. J. Marek ("Repertorium der Carl," t. xv. 1879), and were corrected for "exterior pressure" to a barometric height of 760 mm. at 0° lat. = 45° , as well as for "interior pressure," or vertical position, the thermometers reading from 0.02 to 0.06 C. too high when placed in a horizontal position.

During the past years this apparatus has been used in determining the rates of expansion of the platinum-iridium metres deposited at the Bureau, which are intended hereafter to be the universal standards or prototypes of the metric system. The linear coefficient of expansion for 1° C. of the platinum-iridium was found to vary from 0.00008668 to 0.00008689 , with a probable error of only ± 0.000000075 .

The high accuracy of the results obtained at the Bureau in the weighings there executed, have been already previously referred to, as they appeared in a separate form in 1881. In the present volume M. Marek gives the particulars of the experiments made by him in redetermining the density of mercury of the kind actually used in barometer tubes, taking the mean density of mercury as being comprised between that of perfectly dry mercury and of mercury exposed to moist air. Illustrations are given of the modes of purifying and of weighing the mercury. The density of four samples of mercury, as determined by weighing in water, was found after many experiments to be as follows:—

Mercury A	=	13.595631 ± 0.000029
" B	=	13.595633 ± 0.000024
" C	=	13.595458 ± 0.000056
" D	=	13.595930 ± 0.000055

In the paper, "Dilatation du Mercure," we find again that painstaking investigation and high accuracy which

characterised the papers published in 1881 above referred to. The most exact observations on the dilatation of mercury are undoubtedly those of M. Regnault (*Mémoires de l'Académie des Sciences*, tome xxi. 1847); and it is to the mathematical reduction of these observations that Dr. Broch has now applied a critical examination, employing as his first coefficient of dilatation the value obtained by M. Wullner ("Lehrbuch der Experimental Physik," t. iii.):—

$$d_t = 10^{-9} (181168 + 11.554t + 0.021187t^2),$$

instead of that of Regnault—

$$d_t = 10^{-9} (179007 + 25.232t).$$

By a reduction by the precise method of least squares, of the original observations to the latitude of 45° at the level of the sea ($B = 760$ mm.), there is now obtained for the cubic expansion of mercury the following formula, which we would recommend to the attention of those engaged in accurate work:—

$$1 + kt = 1 + 0.000181792 \cdot t + 0.00000000175 \cdot t^2 + 0.00000000035116 \cdot t^3.$$

We note that for the current year the President of the Bureau is General Ibanez (Madrid), the Secretary being Dr. Hirsch (Neuchâtel), the Committee including MM. Dumas (Paris), Foerster (Berlin), Gould (Cordoba), Govi (Naples), Herr (Vienna), Hilgard (Washington), Krusper (Budapest), Stas (Brussels), Wild (St. Petersburg), and Wrede (Stockholm). This country is not represented on the Committee, our Government having decided not to take part in this international project.

LILÆA¹

THE genus *Lilæa* was founded by Humboldt and Bonpland for a very curious plant closely allied to our native *Triglochin*, which was first found by them in New Grenada. The present memoir, which has apparently only recently reached Europe, is one of the most elaborate studies probably ever made of the entire morphology, histology, and development of a single flowering plant, and is due to the unexpected discovery of the plant in 1875 in the Argentine Republic. The curious reductions of structure which are the result of a more or less aquatic mode of life have always made plants of this kind attractive to investigators.

The careful investigation of the structure of the flower throws some light on a point which has been much controverted, whether the stamen is ever an axial structure or not. *Lilæa* bears its flowers in a spike, and there are no less than three kinds:—(1) below, female; (2) in the middle, hermaphrodite; (3) at the top, male flowers. These latter consist of a single stamen in apparent direct prolongation of the floral axis. It is about these in the similar cases of *Naias* that discussion has arisen. Now Hieronymus contends that this stamen is really only pseudo-terminal, but that it consumes in its development the primitive meristem of the growing point, and so eventually occupies its place. He extends the same explanation to the cases of *Naias*, *Zannichellia*, *Casuarina*, *Brizula*, and others which have been held to support the axial origin of stamens. But as Sachs remarks ("Textbook," second edition, p. 541), the question cannot be settled wholly on anatomical grounds. And in *Lilæa* there can be no doubt that in the hermaphrodite flowers the stamens are lateral. In the male flowers he sometimes finds a lateral rudiment of a pistil; and this must be held to clinch the argument that the stamen is not really cauline, but always lateral and only pseudoterminal.

Lilæa has a fourth class of flowers, the adaptive origin of which is interesting. The whole plant is at first partially submerged—perhaps was once wholly so. The

¹ "Monografía de *Lilæa subulata*." Por J. Hieronymus. *Actas de la Academia nacional de Ciencias en Córdoba*. (Buenos Aires, 1882.)

lowest flowers of the inflorescence are female, and seated in the axils of the sheathing leaves; but the style is enormously elongated so as to carry the stigma to the surface of the water for fertilisation. This recalls the habit of *Vallisneria*. But, as Mr. Bentham reminds us, the resemblances of *Hydrocharideae* and of *Naiadaceae* are essentially adaptive, and must not blind us to the real profoundly divergent affinity.

It is worth noting, as a hint to those interested in researches of this fascinating kind, that the investigations of Dr. Hieronymus were made partly on material preserved in a mixture of two-thirds alcohol and one-third glycerine, partly in an aqueous solution of salicylic acid (no further details are given).

W. T. T. D.

PROFESSOR FLOWER

PROFESSOR FLOWER'S resignation of the office of Conservator of the Museum of the Royal College of Surgeons was received at the last meeting of the Council of that body, held on March 13, whereupon it was moved by Sir James Paget, seconded by Mr. Erichsen, and resolved unanimously:—"That the Council hereby desire to express to Mr. William Henry Flower their deep regret at his resignation of the office of Conservator of the Museum of the College.

"That they thank him for the admirable care, judgment, and zeal with which for twenty-two years he has fulfilled the various and responsible duties of that office.

"That they are glad to acknowledge that the great increase of the Museum during those years has been very largely due to his exertions and to the influence which he has exercised, not only on all who have worked with him, but amongst all who have been desirous to promote the progress of anatomical science.

"That they know that, whilst he has increased the value and utility of the Museum by enlarging it, by preserving it in perfect order, and by facilitating the study of its contents, he has also maintained the scientific repute of the College by the numerous works which have gained for him a distinguished position amongst the naturalists and biologists of the present time.

"And that, in thus placing on record their high appreciation of the services of Mr. Flower, the Council feel sure that they are expressing the opinion of all the Fellows and Members of the College, and that they will all unite with them in wishing him complete success and happiness in the important office to which he has been elected."

The conditions under which the Conservatorship of the Museum of the College will be held in future are at present under discussion, and will probably be decided at the next meeting of the Council on the 10th inst., when the office will be declared vacant, and candidates invited to send in their applications.

THE DEEP-SEA DREDGINGS OF THE "TALISMAN"—CRUSTACEA

IN a previous article attention was called to some of the more remarkable of the deep-sea fishes taken during the recent cruise of the French frigate the *Talisman*: not less interesting were the numerous forms of Crustacea dredged during the same cruise, a fine collection of which were also on view at the Jardin des Plantes, Paris, as part of the spoils brought home after the voyage. From a survey of the specimens it is evident that these Crustacea are to be found at all depths of the ocean: some pass their lives floating on its surface, feeding thereon or amid the acres of Sargassum weed; while others live at depths of from 4000 to 5000 metres. The so-called swimming crabs which form a section of the Brachyura would seem to be extremely rare at great

depths. Certain species taken during the *Talisman's* cruise are remarkable for their very extensive geographical distribution; thus, species of *Batynectes* which were found at depths of from 450 to 950 metres off the coasts of Morocco and about the Cape Verd Islands, seemed very closely related to the swimming crabs (*Portunus*) of our own seas, and again to be very nearly connected to species of the same genus collected at the Antilles, in the Mediterranean, and in the Arctic Ocean. Another section of the Brachyura, with sharp triangular bodies (*Oxyrhyncha*), contains species which are to be met with at much greater depths; thus *Lispognatus thompsoni* (A. M. Edw.) was dredged off the coasts of Morocco from depths of between 600 and 1500 metres, and *Scyramathia carpenteri* was taken at the same place from a depth of 1200 metres. The former of these species has been found in the North Sea, and the latter has been taken off the north of Scotland and in the Mediterranean. The Crustacea intermediate by their forms between the Brachyura and the Macrura were found in abundance at very great depths, and the forms found seemed in great measure to belong to "transition" forms; so one was often surprised to find a form, which taken by itself appeared abundantly distinct, quite connected with others by numerous intermediary forms. Thus species of *Ethusa*, *Dorippe*, *Homola*, and *Dromia* seem to present such numerous shades of gradation as to perplex one completely in the difficult task of classifying these genera. Some of these forms are also very remarkable for their geographical distribution: a species of *Dicranomia*, described by Milne-Edwards from the Antilles, was found off Morocco, and *Homola cuvierii*, up to this thought to be peculiar to the Mediterranean, was found at the Azores and the Canaries. But the most remarkable instance of the geographical extension of which some genera are capable is furnished by some species of the family Lithodina. These Crustacea to this have been known as inhabitants of the Arctic and Antarctic regions, living in the littoral zone, but now they have been found under the tropics; the only difference being that in this latter locality they have contrived to find congenial conditions of life by abandoning their shallow-water life and betaking themselves to the cool depths of over 1000 metres. A fact like this is not without its interest, inasmuch as it shows how some forms can spread themselves from the frozen seas of the north to the seas of the tropics, and so from the region of one Pole to the other; altering their conditions of life as necessity demanded, and resuming their old habits when the opportunity to do so again occurred.

The Crustacea known as Hermit Crabs were found to extend to a depth of 5000 metres; as is well known, the terminal portions of the bodies of these Hermits are soft, not covered like the head and claws of the crab with a strong calcareous shell, and these animals have the habit of tucking the soft part of their bodies for security into the body-whorl of some empty shell; but at the great depths referred to shells suitable for this purpose are not to be found, and the hermit crabs inhabiting these depths must often be in great difficulties for material wherewith to cover themselves. In one specimen taken off Morocco this covering consisted of a living colony of a very pretty species of *Epizoanthus*.

Species of the family Galatheidea were found in profusion at all depths; but the colour of their body, generally that of a red or pink hue, was in the forms from the great depths of a uniform white. Some species were found which occupied the interior of those lovely siliceous sponges belonging to the genus *Aphrocallistes*. One new species, *Galathodes antonii*, was found at a depth of 4000 metres, and another, from the same depth, with its abdomen coiled twice upon itself, has been also described by A. M. Edwards as new (*Ptychogaster formosus*).

Of the group of Eryonidae a considerable number of both genera and species were dredged. Of these, those