

corroborated by Dr. Tröndle, who, however, does not admit the presence of an acceleration.

We pass over the remaining lectures, interesting as they were, remarking only on those of Profs. Keller and Dutoit. Prof. Keller dwelt on the points of resemblance between life in the Caucasus and that of the lake-dwellers in Switzerland in prehistoric times. Prof. Dutoit gave a brilliant exposition of the assimilation which is going on of the methods of analytical chemistry to those of physical chemistry and biology. The new processes employed—which are, in point of fact, due in great measure to Prof. Dutoit himself, and have already rendered considerable services both to manufactures and science—are indirect, and have the advantage of great precision and extreme rapidity.

Turning to the separate sections, we commence with botany. Prof. Chodat, whose unique collection of cultures of algæ now numbers more than half a hundred, spoke of the bearing of his experiments on the systematic classification of these plants. Dr. Baumann, who has been studying the vegetation of the Lake of Constance, described how the small shells of gasteropods in these regions become coated with tufa, deposited by the algæ. In this interesting way immense sandbanks of coarse sand, called after the little snails whose débris form it, "Schneckerlisand," are deposited in the lake. Prof. Ernst discussed parthenogenesis and apogamy among the Angiospermæ, and showed that, contrary to Treub and Lotsy, the embryo of the Balanophoraceæ is formed normally. The asexual reproduction of garlic from the point of view of heredity and natural selection was treated by Dr. Vogler. Prof. Edouard Fischer, who has been engaged in experiments on corn-rust, showed the connection between the appearance of this plague and the position of the leaf attacked with respect to the horizontal. Mr. Jaccard discussed the influence of a mechanical force on the production and constitution of wood and woody plants.

The section of geology occupied itself with the fossils, the stratification, and the relief of Switzerland. Prof. Albrecht Heine communicated his latest observations of glacial deposits as corroborating his somewhat controverted explanation of the formation of alpine lakes by a subsidence of the earth's crust in these regions during the diluvial epoch. Dr. F. Mühlberg showed by an interesting collection of lantern-slides the fallacious nature of the interpretation of the formation of part of the Jura given by the Bonn school. Prof. H. Schardt spoke on a subject which belongs properly to the borderland of geology, the typical phenomena of injection. He pointed out how, during the gradual cooling of a mass of magma, sudden pressures of a tectonic nature must sometimes occur, squeezing the molten material into the interstices of the neighbouring rocks and causing the phenomena in question.

In the chemical section the school of Geneva was strongly represented. Dr. Reverdin's determination of the constitution of certain anisidines, in particular of the two still doubtful trinitro-*p*-anisidines, is of a more advancedly technical character than Prof. A. Pictet's interesting discovery by the process of distillation *in vacuo* of a new kind of tar smelling of petroleum, and Messrs. Briner and Kühne's re-investigation of the still obscure mechanism of the chamber process for the production of sulphuric acid. The opinion arrived at by these latter investigators is that  $\text{SO}_2\text{H}_2$  is obtained by direct oxydisation of  $\text{SO}_2$  into  $\text{SO}_3$ , the nitrous anhydride serving only as a catalytic. Of quite a different nature were Dr. Piccard of Munich's account of his experiments on

certain dyes, and Dr. W. Baragiola's report on the physical, chemical, and physico-chemical experiments which have been made on wine and grape-juice.

In the physical section there were several communications deserving of mention; we content ourselves with signalling that of Prof. Perrier and H. Kamerlingh Onnes on the magnetisation of mixtures of liquid oxygen and nitrogen. These mixtures are found simpler to deal with than pure oxygen, the specific magnetisation coefficient of which had been already shown to differ materially from what would be expected by the law of Curie-Langevin. Experiments made at a temperature between  $-195^\circ$  and  $-210^\circ$  show that the deviation from the law in question depends on the mutual approach of the molecules caused by the fall of temperature.

In the mathematical section Prof. Fueter gave some instructive examples of algebraic equations possessing a prescribed group; Prof. Crelier read a paper, conceived in the order of ideas of Sturm, on correspondences in synthetic geometry, with special reference to the curve of the third order and third class; while Dr. Speiser and Prof. Bieberbach dealt with factorisation of algebraic forms and conformal representation respectively. Dr. Mirimanoff communicated a new and elegant proof of the theorem of Cantor-Bendixon, which, as he pointed out, falls into the same category as the first proof of that theorem without Cantor's transfinite numbers, that given by W. H. Young in "Sets of Intervals on the Straight Line" (Proc. L.M.S., 1, xxxv., pp. 245-268). Prof. W. H. Young gave a paper on "The Integral of Stieltjes and its Generalisation," showing how the theory of the integration of any function with respect to a function of bounded variation could be built up by the method of monotone sequences alone, and giving examples of new theorems, into the enunciation of which the new concept does not enter, and which he had obtained by means of its use.

Communications were also made to the sections for zoology, and for geophysics, cosmical physics, and meteorology, among them one by Dr. P. Mercanton, who added some details to Dr. de Quervain's account of the Swiss expedition across Greenland last year and the meteorology of that country. The rate of motion of the Greenland glaciers, which are mostly riddled with crevasses, was found, he said, to vary from one to two metres a day. At the base the grains of dust were not very large, the mean size not exceeding that of those in the alpine glaciers. Observations on some of the ancient glacial terraces showed that part of the dust was of cosmic origin.

#### PLANKTON DISTRIBUTION.<sup>1</sup>

IN the University of California Publications in Zoology (vol. ix., No. 6), Mr. C. O. Esterly discusses the vertical distribution of certain Copepoda as shown by a large number of hauls made in the region of San Diego, between the years 1905 and 1911. Dividing the twenty-four hours into a "day" period from 6 a.m. to 6 p.m., and a "night" period of the remainder, the author finds in the results obtained a distinct night migration towards the surface, with a corresponding downward movement during the day. For nine out of ten species specially considered the time of this maximum occurrence at the surface is found to vary between 6-8 p.m. and 10-12 p.m., *Calanus finmarchicus* attaining its maximum in the latter period. The depth shown for the day plurimum is more obscure, ranging between 50 and 200 fathoms.

<sup>1</sup> "The Occurrence and Vertical Distribution of the Copepoda of the San Diego Region, with particular Reference to Nineteen Species." By Calvin O. Esterly. (Berkeley: University of California Press.)

The paper contains a large collection of data especially important as all relating to the same area and extending over a long period, but a marked want of care is shown both in the handling of the records and in the conclusions drawn from them. Numerous errors left uncorrected in the tables are very confusing though not, it would seem, seriously affecting the main results. Greater importance attaches to conclusions formed often quite out of proportion to the evidence available. As regards the question of nocturnal migration to the surface, while the records show the strongest evidence of a surface maximum during the night hours, they are far too incomplete to be relied on as indicating any definite period of optimum conditions. The maximum obtained for *Calanus finmarchicus*, for example, between 10 and 12 p.m., rests on the slender evidence of a single haul of 2.8 hours in duration, in which between three and four thousand specimens occurred. If this were indeed an optimum period, a higher average than fifty-eight specimens per hour might be expected between midnight and 2 a.m. The occurrence of a species in exceptionally large numbers suggests the presence of exceptional conditions, it may be, a combination of several factors at the time, to account for it. In estimating averages such a haul may, if unsupported by other evidence, give results that are quite misleading, and where it is used, as in the present case, for time-frequency alone, it is unsafe to place narrow limits to the period in which it happens to fall. In the two-hour period preceding this, viz. 8-10 p.m., an average of 973 specimens per hour is obtained from eight hauls made during that time. Had no other data been available than the four hauls covering this period in Table 2, the average given would be no more than nineteen specimens per hour in place of the 973. The example serves to emphasise the need of repeated observations before any safe estimate of such averages can be formed, or any deductions made from the latter.

The same remarks are applicable to the averages for *Eucalanus* and *Metridia* especially. For the former three maxima are shown, for the afternoon, evening, and morning severally, and the suggestion is even put forward that these are probably of normal occurrence, and should be considered so. The maximum for *Metridia*, placed at 10-12 p.m., rests, like that of *Calanus*, on the unsafe basis of a single haul of 31,900 specimens, the same haul as that from which the maximum for *Calanus* was obtained. The second highest aggregate for this species, namely 3401 specimens, was obtained from three hauls made between midnight and 2 a.m., and is apparently likewise dependant almost entirely on one haul of 3200 specimens, leaving an average of 100 specimens for the other two. In the case of *Labidocera trispinosa* the disproportion is greater still. Here the maximum, falling between 6 and 8 p.m., shows an aggregate of 2630 specimens obtained during this period in five successful hauls out of thirty, one haul containing 2425. The second highest aggregate, falling between 4 and 6 a.m., with a total of 527 specimens obtained in seven hauls, includes one haul with 500 specimens.

It cannot be lost sight of that all of these higher figures occur between the late evening and early morning hours, and, as a matter of general observation, the night preponderance of Copepod plankton near the surface will not perhaps be questioned by many. But data such as these are manifestly too incomplete alone to bear any interpretation more restricted than this, and though regarded by the author as implying different optimum periods characterising the different species, seem rather to express collectively particular instances of more or less abundant occurrence, in which any one or other

of the species considered might equally well have been encountered on another occasion. It is indeed difficult to understand how, reasoning on such frail evidence, the discussion is carried even to the point of recognising in these different maxima obtained hidden characters distinguishing the species which are supplementary to those of structural features, such as to indicate, it may be, with more extended knowledge the apparent rather than real nature of the latter.

In estimating the hourly averages for the surface hauls the time occupied is made to include, rightly it would seem, that of hauls from which a species was absent. Thus is obtained the average number of animals occurring per hour of hauling. In calculating the depths for the day plurima, as shown by the self-closing nets, the averages based on the number of animals per fathom passed through are not treated in the same manner, but merely express the depth of the layer of water as a fixed quantity regardless of the number of hauls made through it. Thus, for *C. finmarchicus*, the region of the day maximum shown between 50 and 77 fathoms is estimated by all the animals in all the hauls (seventeen) made through that section of water being treated as though occurring in one haul through 25 fathoms. The average found at this depth, namely, 15.7 per fathom, therefore denotes no more than the distribution over the layer concerned of an aggregate of animals captured between 50 and 75 fathoms, and cannot be considered as on the same plane with that found between 75 and 100 fathoms, where six hauls made through a similar depth of water show an average of 5.7 animals per fathom. If the repetition of hauls through a given column of water be not given a true value, the averages are incomparable with one another, and important evidence afforded will be lost in the results obtained.

Considerable distortion of the latter averages is liable to have arisen through no allowance having been made for differences in the size of the nets used, amounting to as much as one-half the mouth opening. The impression that such allowances are of no practical value, if intended to be understood literally, might have been removed had the author tested the different-sized nets against one another.

L. R. C.

## THE BRITISH ASSOCIATION AT BIRMINGHAM.

### SECTION K.

#### BOTANY.

OPENING ADDRESS BY MISS ETHEL SARGANT, PRESIDENT  
OF THE SECTION.

WE were welcomed to Birmingham last night, and now—made free of the city—we assemble this morning to justify our position as its guests. But before entering on the work of the section, your president is authorised, and even required by custom, to glance at the events of the past year in the botanical world.

My predecessor in this chair had a great loss to record in the death of Sir Joseph Hooker, the *doyen* of British botanists, and a familiar figure at so many meetings of this Association, where we were proud to feel that he belonged to our section. This year we have no peculiar grief, but we join with the whole Association in lamenting the death of Lord Avebury. We have some right to offer a special tribute to his memory, since several of his published works were on botanical subjects. His book on the "Fertilisation of Flowers" in the "Nature Series" opened a new world to many non-botanical readers, and there are