RESEARCH ITEMS

Biological Productivity of Lakes

IN studying the biological productivity of lakes, quantitative determinations of the standing crop of plants (producers) and of animals (consumers) have been made on several Wisconsin lakes by C. Juday, who described his results at the Autumn Meeting of the U.S. National Academy of Sciences held during October 13–15. The ratio of plants to animals is not a static, but a dynamic, factor, which shows seasonal and annual fluctuations, as well as variations in shorter periods of time, especially with respect to the phytoplankton. The annual variations range from 10 : 1 to 15 : 1 when stated in terms of live weight. In soft-water lakes the ratio can be readily modified by the use of organic fertilizers, such as soy bean meal and cotton seed meal. The effect of these fertilizer fluctuations on the growth-rate of fishes is now being investigated. Manning and R. E. Juday (1941) found that the biological productivity of the upper stratum (epilimnion) of a lake is correlated, within certain limits, with the chlorophyll content of the phytoplankton. In terms of glucose, the computed productivity ranged from 14 to 44 kgm. per hectare a day in August in seven lakes.

Modification of Injury Produced by Röntgen Radiation

ATTEMPTS to modify the amount of injury produced by Röntgen radiation are of interest from theoretical and practical points of view. They indicate the importance of indirect effects of the radiation in the final injury to cells under certain conditions, and offer some hope of improving the tumour injury—tissue injury ratio in cancer therapy. Two types of experiments in which the radio-sensitivity of cells have been modified were described by T. C. Evans at the Autumn Meeting of the U.S. National Academy of Sciences held during October 13–15. It has been found that the effect of Röntgen radiation of decreasing the fertilizing power of Arbacia sperm is, within certain limits, proportionately increased as the concentration of the sperm in sea water (during irradiation) is decreased. The resistance of the sperm to this action of the radiation is greatly increased upon the addition of sufficient amounts of (1) dead sperm, (2) living sperm of Nereis, (3) egg albumen, (4) gelatin and (5) Arbacia egg jelly. Another line of evidence for the effect of the 'medium' on the radio-sensitivity of cells is derived from experiments on the skin of certain mammals. In these experiments it has been found that the resistance of the skin is increased when the circulation of the blood is blocked during the irradiation.

Heavy Carbon Isotope in Plant Metabolism

THE use of the heavy carbon isotope in studies of plant metabolism was discussed by R. Belkengren, A. O. Nier and G. O. Burr, of the University of Minnesota, at the Autumn Meeting of the U.S. National Academy of Sciences held during October 13–15. The normal carbon dioxide of the air contains about 1·1 per cent of the carbon isotope ^{13}C. Using methane in a thermal diffusion column, the heavy carbon was increased to 5–10 per cent. This methane was burned to carbon dioxide and fed to green plants by photosynthesis. The accuracy of the mass spectrograph is such that the percentage of heavy carbon dioxide $\left(\frac{\text{mass } 45}{\text{mass } 44} \times 100\right)$ can be found to the second decimal place. Hence the amount of heavy carbon that has gone into any chemical fraction of the plant can be determined with fair accuracy even after considerable dilution. Young bean and radish plants were used for the experiments reported. When exposed to heavy carbon dioxide in darkness, the leaves of the bean seedling do not form a measurable amount of any diffusible compound that is transported and respired in other parts of the plant. However, in light the newly formed photosynthate is rapidly transported to all parts of the plant and incorporated at varying rates into every chemical fraction thus far examined. Within three hours root tips 30 cm. from the leaf are respiring heavy carbon dioxide, and after 24 hours the terminal centimetre of growing roots contains 30 per cent of the newly fed carbon. The conversion of newly formed photosynthate into chlorophyll, xanthophyll, lipids, cellulose, starch, protein, amino acids and amides has been measured.

A Trisomic Grasshopper

H. G. CALLON (*J. Hered.*, **32**, 296–298; 1941) has found a trisomic individual of the grasshopper *Mecostethus grossus*, which is a rare species in Britain. There is usually only one chiasma situated near the centromere in each bivalent of *M. grossus*. Consequently, a trivalent is never formed in this trisomic individual, but the three homologous chromosomes are represented by a bivalent and a univalent. This univalent may be passive in the spindle similar to the *X*-chromosome, and may be included in one telophase group or it may, unlike the *X*-chromosome, be included in the spindle and remain near the equator until after the disjunction of the bivalents. As a result of this latter process, a diploid restitution nucleus is formed. The external appearance of the trisomic individual was similar to a normal male *M. grossus*.

Heparin

THE unit of early crude preparations of heparin, the blood anti-coagulant, originally found in liver and afterwards in most tissues, was defined as the minimum quantity necessary to keep 1 ml. of cat blood fluid for 24 hours at 0°. Units so defined in terms of some potentially variable animal reaction have not the advantage of units stated to be the specific activity contained in a fixed weight of standard preparation and measurable by any quantitative and standard biological test. Workers in Toronto have already proposed the crystalline barium salt of heparin as a standard having 100 units/mgm. F. C. MacIntosh (*Biochem. J.*, **35**, 770, 776; 1941) has now devised a simple method of test wherein oxalated horse plasma, to which heparin has been added, is recalcified in the presence of an excess of thrombokinase. The clotting time depends on the concentration of heparin. The method reveals differences in activity which are definitely greater than those determined for the same samples by methods using whole mammalian blood, and suggests that even crystalline barium heparin contains several individuals the activity of which appears to be unequally directed towards the different stages of the coagulation process. He also describes a colorimetric method for the standardization of heparin. Any high molecular weight sulphuric acid ester will give a characteristic colour change when added to an aqueous solution of a metachromatic dye such as toluidine

blue. The effectiveness of any substance in producing this colour change appears to be roughly proportional to its anticoagulant potency as obtained by the plasma-kinase method. A number of synthetic anticoagulants have thus been compared with heparin; for example, chlorazol fast pink and Bayer 205 (Germanin) have anticoagulant activities of the same order as heparin by the biological and colour tests, although their action may not be identical with that of heparin.

The Hindu Kush Earthquake of November 21, 1939

THIS earthquake has been studied especially by S. M. Mukherjee and A. R. Pillai, of the Colaba Observatory, Bombay ("The Hindu Kush Earthquake of November 21, 1939", by S. M. Mukherjee and A. R. Pillai, India Meteorological Department, Sci. Notes, 8, No. 91, pp. 85–90 + 2 pages of reproductions of seismograms). By Geiger's method of least squares, the epicentre of the earthquake was obtained at 36° 11′ N. and 70° 53′ E. The depth of focus was found to be 210 ± 14 km., which makes the earthquake a deep-focus shock. The hypocentral time is obtained as 11h. 01m. 43s. U.T. The authors note that there is a tendency for the Hindu Kush shocks to originate from very near the same focus, and also that this earthquake was recorded with initial compression at Bombay and the European stations, similar to most of the preceding shocks from the same epicentral region. It is remarked that the Hindu Kush earthquakes of a strong nature tend to occur in winter, while the weaker ones occur at all seasons. All these facts point to the possibility that all shocks from this region may originate from the same causes and by the same mechanism. The authors recognized the pulse *sP* at about 8°, the smallest epicentral distance for which seismograms were available. It is suggested that for the Hindu Kush earthquakes, a study of the *sP* phase may afford very reliable information concerning the epicentre and depth of focus of the shocks from the seismograms of a single Indian station. The desirability of more open time-scales on the seismograms is suggested.

The Microcoulomb Experiment

UNDER this title, Prof. F. Ehrenhaft has published (*Philosophy of Science*, 8, 3; 1941) a résumé of his work, extending over thirty years, on the charges carried by minute solid particles in gases. It is recalled that, so long ago as 1909, using a method similar to that of the well-known Millikan experiment, Ehrenhaft obtained a value $4{\cdot}6 \times 10^{-10}$ E.S.U. for the mean charge on particles of colloidal silver. Certain particles, however, gave values for the charge considerably smaller, in some cases only one tenth of the electronic charge. The present article summarizes the very extensive and protracted researches carried out by the author, first at his Institute in Vienna, and later, after his expulsion from the Institute, abroad, into the genuineness of this effect. The charges have been studied in various forms of apparatus, both at normal and at high pressures. Particles of wax and selenium of perfect sphericity as viewed under the microscope have been prepared and studied. In order to avoid the uncertainties associated with the use of Stokes's law as a means of determining the masses of these minute spheres, Ehrenhaft has worked out a microscopical technique for the direct determination of their diameters, and produces evidence that the density of the particles is identical with that of the same substance in bulk. The mass is thus determined directly, without reference to the laws of motion through a viscous medium. The very ingenious microscopic technique is fully described in the paper. Prof. Ehrenhaft believes that the anomalous effects are genuine, and that in many cases the particles studied carry charges which differ from the fundamental electronic charge, or integral multiples of this charge, by amounts well beyond the limits of experimental error.

Sodium Arsenites

THE composition of the alkali arsenites is not very well established, in spite of the fact that very large quantities of sodium arsenite have been used in the past few years for the control of harmful insects; more than $7\frac{1}{4}$ million pounds were used in the United States in 1938–40 for three kinds of insects alone. O. A. Nelson (*J. Amer. Chem. Soc.*, 63, 1870; 1941) has made a phase rule analysis of the system containing Na_2O, As_2O_3 and H_2O, and the results show that solid phases of the following compositions separate: (1) Na_2O, $3As_2O_3$, (2) Na_2O, As_2O_3, (3) $2Na_2O$, As_2O_3, $7H_2O$ and (4) $2Na_2O$, As_2O_3. Of these, (1) and (3) were not previously known. The system was examined by Schreinemakers and De Baat in 1917 and some of their results could not be confirmed by Nelson, who gives reasons for supposing that these results are improbable.

XZ Aurigæ: An *N*-Type Variable

G. Alter and D. L. Edwards have issued a paper with this title (*Mon. Not. Roy. Astro. Soc.*, 101, 5; 1941), which shows that this star is not a β-Lyræ type as recorded by Prager and Schneller. This discovery was made by an accidental comparison of a photovisual plate of a star field with the corresponding Franklin-Adams chart, when it was found that XZ Aurigæ was not present on the chart (limiting mag. 15), while it appeared on the Sidmouth photovisual plate as a star of magnitude 10. Further exposures showed that the star had a colour index of about $+4^m$, for which reason it was necessary to make fairly long exposure-times for photographic magnitudes to obtain a star image with the Mond Astrograph. Thirty-four comparison stars were chosen in the surrounding region, their magnitude range being large enough to exceed that of XZ Aurigæ in the photovisual scale, though not sufficiently large to secure the extension of the fainter photographic magnitudes, as the available apertures are too small. On three occasions only was it possible to secure both photographic and photovisual magnitudes, and the colour index was found to be $+3{\cdot}8$ to $+5{\cdot}0$. In view of this large colour index the 12-inch McClean objective prism was used to obtain the spectrum, but good photographs could not be taken owing to poor weather conditions and also to the fact that the star was close to the limiting magnitude obtainable with the instrument. The best photograph taken on March 30, although of poor definition, showed that the spectrum is almost certainly of late *N*-type—a view supported by the large colour index obtained. Wolf's observations, which were published in 1917, showed that the photographic magnitude was 14·5, and this is corroborated by the present investigation. It is remarkable that the colour index was found to change by about one magnitude in 10 days.