Research Items

Irradiated Yeast and Rickets. Although a number of questions relating to the action of vitamin D still remain unsettled, the fact that irradiated ergosterol determines the fixation of calcium in the animal organism and hence induces good ossification has been indisputably demonstrated. In almost all countries this particular form of prophylaxis is practised by administering definite doses of the irradiated ergosterol dissolved in olive, arachis, sesame, or other oil. In discussing this subject before the Royal Lombardy Institute of Science and Letters (*Rendiconti*, **66**), Prof. Ernesto Bertarelli points out that these ergosterol-containing oils readily become rancid and have other properties which make them unsuitable as products to be applied extensively as prophylactics. He emphasises the advantages of replacing these oily liquids by irradiated dry brewers' yeast, which is rich in ergosterol and easy to take, and remains unchanged over long periods. The powdered yeast can easily be mixed with, for example, bread and milk in daily amounts of 0·5–0·75 gm., and the doses are simpler to handle and regulate than are small quantities of oils.

Fauna of the Dutch East Indies. The latest additions to the faunal studies in the Dutch East Indies ("Résultats Scientifiques du Voyage aux Indes Orientales Néerlandaises de LL. AA. RR. Prince et la Princesse Léopold de Belgique." *Mem. Mus. Royal d'Histoire Naturelle de Belgique*, Hors Série, 1933) are on the Sipunculidæ by J. M. A. ten Brocke and Brachiopoda and Amphineura by E. Leloup (vol. 2, fasc. 3); on Holothuria by H. Engel and "Crustacés décapodes d'Eau douce" by Jean Roux (vol. 3, fasc. 13 and 14) and "Poissons" by Louis Giltray (vol. 5, fasc. 3). Of these the most important is the last, occupying 129 pages and describing a large collection of specimens (850) many of which were caught at the surface by night or found among the corals. There are 205 species, 6 of which are new to science. A knowledge of the general distribution is much extended, most of the species having a very wide range from the Red Sea to Polynesia. It is very interesting to note that the fishes of this Indo-Pacific zone seldom pass the Hawaiian Islands or Paumotu. On the Pacific coasts of Central America one meets with a totally different fish fauna. That part of the Pacific between these islands and the American continent seems to constitute an almost complete barrier to colonisation from the west. The reason for this appears to be the surface temperature of the sea, as the American coast is bathed by two cold currents, one from the north and one from the south (the north and south equatorial drifts), both taking cold water towards Polynesia, the salinity being very much lower than in the Indo-Pacific zone and thus a natural barrier is formed for eggs and the young stages of fishes. The separation between America and Indo-Australia is very ancient, but the Indo-Pacific zone has undergone a series of successive continental formations and possesses physical characters suitable for a somewhat homogeneous fauna throughout its whole area, the main centre of dispersal apparently being the Indo-Australian archipelago.

Gill Movements in the May-fly Nymph. An interesting addition to our knowledge of propulsion mechanisms in animals comes from Prof. L. E. S. Eastham (*Proc. Roy. Soc.*, B, **115**, 30), who has analysed the gill movements in the nymph of the may-fly, *Cœnis horaria*. In this insect the four pairs of gills beat in a normal (longitudinal) direction, but work in such a manner as to produce a current that is transverse. The direction is reversible, and no permanent functional asymmetry is involved. The gills on one side are found always to be out of phase with those of the other, but, though of some importance, this phenomenon proves to be not the only factor concerned in the production of the transverse current. Indeed, analysis revealed that several factors were conspiring to that end, involving at least three different mechanical principles. The up-and-down movement of the gill in an elliptical path, with the convex side above, and the gill fringe closing on the downward stroke, recalls the action of a bird's wing; the change of angle of the gill to the direction of flow brings about what is essentially a screw action; while the alternate suction and compression between both successive gills and members of each pair, caused by the metachronal rhythm, has an effect comparable with that of the limb-movements in the filter-feeding *Cheirocephalus*.

A Foliar Endodermis and the Function of the Endodermis. Almost throughout the vascular plants, the vascular system of the young absorbing root is enclosed within an endodermis, and the fact that this means that the stelar sap is enclosed within a cylinder of living protoplasts embedded in the peculiar network formed by the Casparian strip has been interpreted as the mechanism determining the osmotic entry of water into the stele. Further experimental examination of the passage of solutes across the endodermis has therefore considerable significance, and George Trapp has recently used the foliar endodermis of the Plantaginaceæ, having made a thorough study of its structure and distribution, for a re-examination of its behaviour in retaining solutes. Using relatively high concentration of non-toxic dyes, which were absorbed by cut shoots of *P. arborescens*, very definite results could be obtained in comparatively short periods of time. Dyes the diffusion of which is confined to the cell membranes were prevented from outward diffusion from the veins wherever the endodermis was present. Trapp's experiments are described and discussed, after a discussion of the structure and distribution of the foliar endodermis in this family, in the *Transactions of the Royal Society of Edinburgh*, **57**, part 2, No. 18, 1933.

Preservation of New Potatoes. The popularity of the new potato has led to investigations being carried out as to the possibility of devising some method of storage so that the characteristic flavour will be retained. Interesting results of experiments on these lines are described by A. M. Smith in the *Scottish Journal of Agriculture*, **17**, 202. Since the thin skin is one of the most highly valued properties of the new potato, immaturity at the time of lifting is essential. This is preferably achieved by anticipating the ordinary harvest by about a fortnight, as late planting (the other alternative) is liable to expose the crop to bad climatic conditions. Storage of such

immature potatoes clearly requires special treatment, as they are more liable to mechanical injury and show a greater respiratory activity than mature tubers. The greatest measure of success was achieved by the following method, attention to conditions of temperature and humidity proving of the first importance. The tubers were packed in ordinary fruit barrels of 2–2½ cu. ft. capacity and stored in a cellar at a temperature of about 40° F. The barrels held 40–50 lb. of potatoes placed in six or seven layers interspersed with a packing mixture of approximately equal volumes of granulated peat and sand, the moisture content averaging between 10 and 12 per cent. The peat helps to retain the moisture while the sand aids aeration. The presence of 1 per cent calcium carbonate appeared to reduce the tendency to sprout in some cases, but both this method and the addition of apples (also claimed as a deterrent to sprout development) need further study before conclusive evidence is obtained. As regards the best variety to use, King Edward appears to fulfil the necessary conditions most nearly, but it is probable that further trial will show that many other varieties are equally suitable.

Grassland and Grazing. An interesting résumé of the experiments on grassland management carried out at Jeallott's Hill by Mr. Martin Jones is given in the 1933 issue of the *Journal of the Royal Agricultural Society*, vol. 94. Provided a pasture lies on an adequately drained and limed soil and maintained at a satisfactory level of fertility, the character of the sward can largely be controlled by the grazing methods adopted. In the case of grassland newly sown with a simple mixture of grasses and clover, the latter could be obtained as the dominant if close grazing were carried on from March until May, competition with the earlier growing grasses being thereby avoided. On the other hand, if heavy stocking was always avoided and no grazing at all allowed before mid-April, grasses could be secured as the dominant feature. An intermediate result was brought about by resting the field up to April and then alternating close grazing with intervals of a month's rest. Overstocking in the winter and understocking in the summer induced the poor weedy condition which is of only too common occurrence on farms in general. Similar differential results were obtained with an old established pasture, where equilibrium had apparently been reached for a number of years, the rapid increase in rye grass and clover and the reduction of weeds being specially noticeable. Individual species of grass could also be encouraged at will, the predominance of rye grass or cocksfoot, for example, depending chiefly on the time of year at which the field was rested.

Gemstones. The latest of the series of handbooks on "The Mineral Industry of the British Empire and Foreign Countries" published by the Imperial Institute is one on "Gemstones" (137 pp. 2*s*. 6*d*.) which summarises in a handy form the economic and statistical information available on this subject. The introduction deals, in a popular style, with the physical characters on which the beauty of the stones depends and mentions the methods used for identifying different species. A description of the various minerals and their modes of occurrence is followed by an account of the methods adopted for cutting and polishing the stones. The main part of the book deals with each producing country, describing the stones obtained, the location, type and extent of the deposits and the method of working. Technical data for the expert and interesting information for the gem-lover are also provided. A useful list gives the London prices for cut gemstones of various qualities and weights. About five-sixths of the world's annual output of diamonds is produced in the British Empire, which is also well furnished with supplies of other important stones. Australia contributes opal; India, Burma and Ceylon provide jade, sapphire, ruby, spinel, agate, garnet, tourmaline, chrysoberyl, zircon, moonstone and the various forms of quartz; South-West Africa yields tourmaline and beryl and South Africa has deposits of beryl and emerald. The volume should be read by all interested in gemstones and in the gem industry.

Saxton's Maps of England and Wales. The county maps of England and Wales by Christopher Saxton published between 1574 and 1579 provided material for English maps for a long period, but very little is known of the method Saxton used in compiling his sheets. In many of the sheets there are certainly striking omissions of physical features large enough to be shown on the scale used. Mr. G. Manley has studied the problem in certain of the Pennine sheets and makes some interesting suggestions in a paper in the *Geographical Journal* of April ("Saxton's Survey of Northern England"). Mr. Manley finds that Saxton's choice of hills to be marked was dictated by several reasons: historic names, sources of streams, beacon hills, boundary hills and lastly a category of hills that are characterised if anything by the extent of the view which they offered from the summit but not necessarily by great height. These would appear to be hills which Saxton or his assistant climbed. He may have gone up other hills but it is unlikely. Certainly his river valleys are often incomplete at their heads. From the hill-tops he reached, Saxton seems to have estimated distances along single bearings. He was careful about detail in well-inhabited lands, but worked rapidly in uninhabited country, where his maps are weakest, especially when he surveyed by this method a rugged land like the northern Pennines and Lake District, where much detail at lower altitudes was hidden from his elevated viewpoints.

A New Objective for X-Ray Cinematography. A new objective specially computed for X-ray cinematography has been produced by Messrs. Carl Zeiss and is described in the *Zeiss Nachrichten* of April 1934. This lens has several unusual features which are of interest. For the cinematography of the fluorescent screens used in X-ray work, a very fast lens is required on account of the small amount of light available. The new lens, the *R*-Biotar, has an aperture of *f*0·85, which is larger than that of any satisfactorily corrected lens previously available. In computing it, special attention has been given to the reduction of spherical aberration, which judging by the details given has been very successfully done. The lens has, however, no depth of focus, and a very narrow field, neither of which defects is important for the purpose for which the lens is to be used. With such a large aperture the dependence of the correction on object distance is very large, so that in its normal form the lens can only be used when the distance of

the object is large compared with the focal length. A special lens has been designed for use in sound-film work where closer objects are used. On account of its unusual proportions, the lens, which is made for both standard and substandard cinematography, can only be used in existing cameras after alterations have been made to the latter. Moreover, no iris diaphragm is provided as this would still further increase the difficulty of using it in existing cameras. With such critical focusing as is required, it is necessary to ensure that the film lies perfectly flat and that successive frames come into exactly the same place. The light emitted from the fluorescent screens used lies almost entirely within the visible region, and the transmission of the lens in this region is very good although 30 per cent of the incident light is lost by reflection at the glass-air surfaces. This lens in combination with modern high speed photographic emulsions makes possible X-ray cinematography at a picture frequency approaching that normally used.

Trichromatic Reproduction in Television. In a paper read before the Royal Society of Arts on May 2, Mr. J. C. Wilson gave an account of some experiments that have been conducted in the Baird television laboratories in an attempt to develop a television system in which the transmitted scene is reproduced at the receiver in colours. The scanning at the transmitter and receiver was accomplished by the use of a scanning disc with three spiral segments, each segment containing 15 holes. The three segments were responsible for the red, green and blue components of the picture respectively, and by rotating the disc at 600 r.p.m., the image was scanned 30 times per second in all, 10 times per second in each colour. The system is thus a trichromatic system in which the three colours are presented successively and fused owing to the persistence of vision; only one channel between transmitter and receiver is therefore required. The holes in the scanning disc were covered with the appropriate coloured gelatine filters, and the photoelectric cells at the transmitter were selected to give a satisfactory balance between the three sets of signals. The light sources at the receiver comprised a neon lamp and a mercury vapour lamp. While the colour quality of the reproduced image was apparently quite good, the definition with only 15 lines was very crude and any extension of the method is limited by the limitations inherent in mechanical scanning devices. The work was, however, mainly intended to investigate the nature of the problem and the difficulties that have to be overcome.

Removal of Sulphur Dioxide from Library Air. It is well known that books and papers stored in cities where atmospheric pollution is high are in a uniformly poorer state of preservation than similar books and papers stored in country or suburban localities where the air is purer. Experiments have shown that papers exposed to an atmosphere containing sulphur dioxide in an amount varying from 2 to 9 parts of sulphur dioxide per million parts of air for 10 days underwent pronounced physical and chemical deterioration, manifested by a large increase both in brittleness and acidity. A valuable study of a method of removing sulphur dioxide from the air entering a library has recently been published by the Bureau of Standards, Washington (Misc. Publications, No. 142. 5 cents). Tests were made in the Folger Shakespeare Library, Washington. They show that the sulphur dioxide is not completely removed from the air by washing it with untreated water in an air-conditioning system. Effective elimination was obtained on washing the air with water that had been treated with alkaline material at a rate sufficient to maintain the hydrogen ion concentration of the wash water within the range 8·5 to 9. It was proved that the sulphur dioxide content of the washed air was entirely dependent upon the hydrogen ion concentration of the wash water. The composition of a specific mixture of chemicals commercially available was found to be very satisfactory. An air washer of the commercial type using untreated water does not remove enough of the sulphur dioxide from library air. The hydrogen ion concentration should not be allowed to rise above *p*H 9·0 owing to the danger of removing zinc from brass fittings.

Nessler's Reagent. An alkaline solution of mercuric iodide and potassium iodide, probably containing the compound HgI_2, 2KI, is Nessler's reagent and gives a brown colour or precipitate with ammonia. The composition of the brown compound has been variously given since its discovery by Nessler in 1856, but in a recent study (Nichols and Willits, *J. Amer. Chem. Soc.*, April 1934) it is shown to have the composition represented by the empirical formula $NH_2Hg_2I_3$. The compound is very insoluble and tends to form in very minute particles, which are negatively charged and form a colloidal solution. These particles can be separated by ultra-filtration. They are formed instantaneously in the reaction. When ammonia solutions of higher concentrations are nesslerised, the yellow colour changes to red owing to agglomeration of the particles. This may be prevented and the colour made permanent over a wider range of concentration of ammonia by adding a protective colloid, for example, by adding to 50 ml. of Nessler solution 1 ml. of a 0·5 per cent alkaline ash-free gelatin solution containing 1 per cent of perhydrol. The colour is of as great or a greater intensity than that produced in the standard method.

Stellar Spectra of Type *B*. A detailed study of the wave-lengths, origins and behaviour of lines in *B*-type spectra was made in 1931 by Dr. Struve (noted in NATURE, 129, 442; 1932). Much work still remains to be done on these lines, and an important contribution has now been made by R. K. Marshall (*Pub. Obs. Univ. Michigan*, 5, No. 12). The spectra of 11 stars (the same as those discussed by Struve, with one exception) were measured over the range 3587–5047 A., with special attention to the near ultra-violet. They were all taken with the single-prism spectrograph of the 37½-in. Ann Arbor reflector. Intensities of all measurable lines are given as found in each of the 11 stars (which range in spectral type from *O*9 to *B*8), together with the atomic symbol, when identified, and the laboratory wave-lengths and intensities. Of the 534 lines finally tabulated as genuine, only half have been even provisionally identified, and only about two fifths of these are considered as satisfactory identifications. An interesting set of spectrophotometer tracings shows the differences between individual spectra as well as the main general features, and the variations of intensity with spectral type of the more important lines are also well marked.