

Research Items.

Mice and Evolution.—Following a summary of recent results of the irradiation of animals by X-rays and its effect upon inheritance of characters, N. Dobrovolskaia-Zavadskaia has discussed his own experiments upon 35 breeding mice (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc.*, vol. 4, October 1929, p. 327). In a progeny numbering about 3000, only two mutations were discovered, and these, having already been found apart from irradiation, are regarded as manifestations of pre-existing latent states brought to light under the influence of the rays. The rays can scarcely, therefore, be looked upon as a real cause of mutations, as has been alleged. On the results of these relatively few experiments, the author has the temerity to base a theory of evolution, a hypothesis of stable species with single changeable individuals, which are the source of new forms. This hypothesis conceives evolution to be based on three foundations: (1) Stability of existing species as the expression of the conservative principle of life; (2) variability of single individuals as the manifestation of the creative power in Nature; and (3) natural selection as the sifting out of the adapted species. We cannot comment on these conclusions in this note, but on general grounds we deprecate the building up of wide theories upon artificial experiments without any reference to the course of events in Nature. Although species are of the essence of the theory, the species of mouse experimented with here is not even named.

Catgut and its Sterilisation.—With the exception of antiseptic treatment, probably no procedure has advanced the practice of surgery more than the use of the ligature for tying the blood-vessels and controlling hæmorrhage. Many substances have been employed for the purpose, but catgut is usually the material to be preferred. Catgut for surgical use should be sterile in the sense of being free from any bacterial contamination, yet flexible, strong, and absorbable in the tissues. The practical problems involved in producing such a material are the subject of a report by W. Bulloch, L. H. Lampitt, and J. H. Bushill, issued by the Medical Research Council (*Special Report Series*, No. 138; London: H.M. Stationery Office, 4s. net). Prof. Bulloch contributes what must be the most complete modern account of the history and literature of the whole subject, as well as the results of thousands of sterility tests and experiments on methods of sterilising. Dr. Lampitt and Mr. Bushill deal with the physical and chemical properties of the sheep's intestine (from which 'catgut' is made) and its manufacture into sterile ligatures for surgical use. Prof. Bulloch finds that much commercial surgical catgut is not sterile, and that many of the sterilising processes recommended are inefficient. It is of interest that the last method devised by Lord Lister, who studied the subject for forty years, which consists in the use of chromium sulphate and mercuric chloride, yields a sterile product. Prof. Bulloch finds that a 1 per cent aqueous solution of iodine and potassium iodide will infallibly sterilise the most contaminated catgut if applied for not less than eight days, and is the best agent to employ on a commercial scale. Messrs. Lampitt and Bushill show that the iodine process yields a satisfactory ligature provided certain conditions are observed and precautions taken during manufacture.

Development of Mosquito Larvæ.—Dr. Malcolm E. MacGregor (*Parasitology*, vol. 21, 1929) has described observations on the significance of the hydrogen ion concentration in the development of mosquito larvæ,

especially those of *Aedes argenteus*. By gradually eliminating one and another of the interacting factors he has been able to demonstrate (a) that if the pH of the normal environment is changed the development of the larvæ is adversely affected; (b) that under bacteriologically sterile conditions the foregoing statement is no longer true; and (c) that consequently the acid or alkaline reaction of the medium, within ordinary limits, has no direct effect upon the development of the larvæ. An alteration in the pH often brings about a change in the biological group associations and the abnormal dominance of factors unfavourable to a particular species of larvæ. The larvæ of certain species show a restriction to waters exhibiting a pH index within a definite short range, and hence the pH index is often a trustworthy indication as to whether the chemical and biological group associations will favour or preclude successful development of such larvæ. The author states that of the different artificial food stuffs nothing has been found to suit the larvæ of *Aedes argenteus* so well as bread, and he describes the technique for the production of successful cultures of larvæ and pupæ under bacteriologically sterile conditions. The phase of 'suspended development' of the larvæ of many species of mosquitoes is found to have its probable explanation in the temporary or complete disappearance of micro-organisms on which the conversion of the organic materials of the environment to a suitable larvæ diet depends.

Parasitic Roundworms in Sheep.—The Ministry of Agriculture and Fisheries has recently issued two clearly written leaflets on parasitic roundworms in sheep. The first (No. 75) gives an account of the twisted wire worm (*Hæmonchus contortus*) which occurs in the fourth stomach of the sheep, and the second (No. 304) deals with the common lung worms of cattle, sheep, and goats, causing 'husk' or 'hoose'. The life-history of the respective worms so far as it is known is concisely described, and will undoubtedly "assist the direction of intelligent effort towards suitable measures of control". These measures and curative treatment are briefly described.

Trypanorhynchid Cestodes from Ceylon and India.—The first part of a monograph by Dr. T. Southwell on Cestodes of the order Trypanorhyncha from Ceylon and India is published in *Spolia Zeylanica*, vol. 15, part 3, 1929. An extensive historical survey of the literature of the order is followed by the author's proposed classification into three families with six certain genera and one of uncertain position, and by a description of each of the species. A list is given of the species—about three dozen—recorded from India and Ceylon and of their respective hosts. A note is added on larval cestodes collected in large numbers from the umbrella of a rhizostomous medusa in the Chilha Lake. At the anterior extremity of the larva is a deep pit the base of which—where the head or scolex would later develop—is thickened. These are plerocercoid larvæ but are not identifiable further. Dr. Southwell states that no cestode larvæ have been previously recorded from medusæ.

A Four-Rayed Clypeaster.—Mr. Iwao Taki describes an unusual abnormality in this specimen of *Clypeaster japonicus* ("Note on a 4-rayed Specimen of *Clypeaster japonicus* Döderlein". *Memoirs of the College of Science*, Kyoto Imperial University, Series B, vol. 4, No. 2, article 6, 1929.) It was found on the shore close to the Seto Marine Biological Laboratory, Seto, Prov. Kii, after a heavy storm. Several normal

individuals were obtained at the same time. Compared with these latter the abnormal specimen, which is immature, has a much rounder outline, the test is higher, the number of ambulacral pore-pairs smaller, and the outline of the petals oval with an obtuse distal part. The four rays are repeated in the madreporite, which is nearly square with only four genital pores, situated at the four corners. One of the petals is open showing it to be the anterior. The remaining three, therefore, represent the other four rays of a normal specimen. From the number of pore-pairs it is deduced that one of the posterior petals is missing, and that the tetramerism is brought about by the abortion of the right posterior ambulacrum and adjacent interambulacra.

Nets for Plankton Research.—In a recent publication by the International Council for the Exploration of the Sea ("Vergleich der Fangfähigkeit verschiedener Modelle von Plankton-netzen". *Rapports et Procès-Verbaux des Réunions*, vol. 69, September 1929 (København: Andr. Fred. Høst et Fils) Cl. Künne gives the results of some quantitative tests which have been made with three types of nets, Hensen's egg-net, the Nansen net, and the standard net of the International Council. He finds that while the Nansen net and the Hensen net are rather similar in their catching powers, the former catching about 90 per cent as much as the latter, the standard net, on the other hand, falls far short in efficiency, catching only one-tenth of the material that the Hensen net does. Moreover, this is not due so much to the lesser dimensions of the opening of the standard net, but rather to its construction. It seems probable that the netting inserted at the front tends to constrict the virtual opening of the net where it joins the silk, and the throttling rope may also help in this at times. The question is an important one and should be settled now that there is a tendency more and more to standardisation of method in order that results may be comparable. The author favours the Hensen net for its convenience in sea work, in spite of its cumbersome size.

Nitrogen Metabolism of Virus Diseased Plants.—The nitrogen metabolism of healthy and spiked sandal leaves has been studied by N. Narasimhamurthy and M. Sreenivasaya, and their results have been published as Part 6 of the "Contributions to the Study of Spike-disease of Sandal (*Santalum album* Linn.) in Vol. 12 A, Part 10, of the *Journal of the Indian Institute of Science*, pp. 153-163. They report a greater content of total nitrogen (on a dry weight basis) in spiked leaves than in healthy leaves where a leguminous host is absent, whilst little difference can be detected when the latter symbiont is present. There is, however, in all cases an increase in total water-soluble nitrogen, basic nitrogen, and total amino nitrogen, and a decrease in the nitrate nitrogen in the diseased leaves, when compared with healthy leaves, relative to either dry weight or to total nitrogen. Comparisons are drawn with the nitrogen contents of several plants attacked with virus diseases which usually show no decrease in total nitrogen content as a result of the disease.

Industrial Development of Saskatchewan.—The province of Saskatchewan in the Dominion of Canada is chiefly known as a great wheat-producing area, but the development of its natural resources in other directions is proceeding apace, and it is apparent that before very long there will be an industrial activity corresponding in many respects to that of the provinces of eastern Canada. A report issued by the Natural Resources Division of the Saskatchewan Department of Railways, Labour, and Industries, for the fiscal year

ended April 30, 1929, shows that during the past twelve months much attention has been given to the establishment of the lignite briquetting industry near Estevan, and to mineral development in that large area of Saskatchewan which lies within the boundary of the two million square mile Pre-Cambrian Shield. Mention is made in the report of the exploitation of the Province's non-metallic mineral resources, etc., its clays, sodium sulphate deposits, and volcanic ash, special attention being given to the marketing of sodium sulphate, the importance of which to the Canadian pulp and paper industry is considerable.

The Eruptions of Mayon Volcano.—In *The Philippine Journal of Science* for September last, L. A. Faustino describes Mayon Volcano and its eruptions, with special reference to the great outburst that took place last year. The volcano is a cinder cone with venticular lava-flows, and its profile follows very closely the hyperbolic sine curve discussed many years ago by Becker. Surface indications point to only one orifice, and if there have in the past been subordinate openings, they have since been hidden. None appeared in 1928. The original vent broke through a Tertiary basement in late Tertiary or early Quaternary time, and Mayon is to-day the most active cone in the Philippines. The ejected materials are of porphyritic basaltic composition and they have repeatedly smoothed the irregularities caused by erosion and weathering, thus maintaining the almost perfect symmetry and form of the cone. Since the destructive eruption of 1814, twenty-eight well-defined eruptions have been recorded, the longest period of relative quiescence being from 1900 to 1928. The eruptions can be described in terms of the sequence recognised by Perret in his well-known description of the Vesuvius eruption of 1906. In the case of Mayon, the luminous, *liquid lava* phase is of shorter duration than at Vesuvius; the intermediate, *gas* phase, characterised by vapours and gases with but little ash, is longer; and the dark, *ash* phase is marked as usual by a preponderance of ejected ashes.

Late Cretaceous and Tertiary of New Zealand.—In his presidential address to the Geological Section of the Fourth Science Congress of New Zealand, Dr. J. Henderson gave a detailed series of correlations of the Tertiary and late Cretaceous deposits for seven characteristic areas of New Zealand (*Trans. and Proc. N.Z. Inst.*, 60, pp. 271-299; 1929). The strata are divided into three groups on diastrophic grounds. The first, following the Hokanui deformations, when New Zealand was more extensive than now and diversified with a great chain of mountains of which the present axial highlands are the roots, extended from the Albian to the close of the Eocene. Widespread movements then occurred, and basic rocks were erupted in many districts. The resulting elevation, however, was not great, and base-levelling reached its climax during the succeeding Ototaran or Oligocene period. In the Miocene, the andesitic lavas of Auckland and Hauraki were poured out. These seem to have relieved the crustal stresses in part, for the post-Ototaran movements are found to be more pronounced in the South Island, where volcanic outbursts were less active. During the Pliocene, the Kaikoura movements reached their climacteric. Since then the Castlecliff beds and their correlatives have been laid down, and the basaltic vents of Whangaroa have continued intermittently. The paroxysmal rhyolitic outbursts of the Rotorua-Taupo region began a little later than the first emissions of basalt. The published address contains valuable correlation tables and a full bibliography.

Crystal Structure of Ice.—An elaborate investigation of the crystal structure of ice, now of importance in many connexions, is described by Dr. W. H. Barnes in the November number of the *Proceedings of the Royal Society* (pp. 670-693). The older data for this are conflicting, and even now the possibility cannot be ruled out that, quite apart from high pressure modifications, different forms may exist under slightly different conditions. Dr. Barnes's results, however, which are based upon the interpretation of X-ray diffraction photographs taken by various methods at the Davy-Faraday Research Laboratory, show that the space group in the specimens studied by him was one of the two known as D_{6h}^4 (dihexagonal bipyramidal) and D_{3h}^4 (ditrigonal bipyramidal), with the probability in favour of the former. Photographs taken by the powder method also failed to reveal any change in structure between the temperatures of standard melting ice and of liquid air. Four molecules go to build up each unit cell, and it is probable that the lattice is ionic.

Melting-point of Palladium.—The highest standard point in the thermometric scale which can be measured conveniently with the gas thermometer is the melting-point of gold, 1063° C. Above this, recourse is usually made to radiation thermometry, with for technical purposes an agreed value for the radiation constant (c_2). It is, however, useful to have other higher fixed points, and of these the most important is the melting-point of palladium. One determination of this was reported in the *Bureau of Standards Journal of Research* for May of this year, yielding the value 1554°. A second determination, made at the National Physical Laboratory by F. H. Schofield, is described in the *Proceedings of the Royal Society* for October, and gives the temperature as 1555°. Older determinations, made at the Physikalisch-Technische Reichsanstalt in 1919 (1556°), and at the Nela Laboratories in 1920 (1557°), are also in remarkably good agreement with the new numbers, and it thus seems probable that the agreed value of 1555° which has been taken as the melting-point for the purposes of the International Temperature Scale cannot be in error by more than 2°. It is an interesting fact that Prof. Callendar obtained a value only five degrees below this in 1899, working with a resistance thermometer of platinum, and extrapolating from the boiling-point of sulphur.

Measurement of Radioactivity.—The new electrical counter for α -particles and β -particles which was described by Prof. Geiger and Dr. W. Müller last year is so extremely sensitive to weak radiation that it could be used immediately to demonstrate the radioactivity of potassium, and has since been applied to the study of the cosmic rays. An investigation of its utility in the measurement of radium preparations has now been made at Prof. Geiger's instigation, and is described by H. Neufeldt in the issue of the *Physikalische Zeitschrift* for Aug. 15. The counter employed was of special design, and could, if desired, hold the radioactive preparation internally, the strength of the latter being measured by the secondary β -rays produced in the counter by the γ -radiation. Quantities of radioactive material equivalent to 10^{-6} mgm. radium could be measured in this way, as compared with about 10^{-3} mgm. with the most refined of the older methods. The precision of the measurements was about ten per cent, and the only important disadvantage inherent in the use of the instrument appears to be the long time—of the order of several hours—required to obtain sufficient auxiliary data to allow for the large number of particles of uncontrollable origin which are recorded by it, due very largely to

the cosmic rays and the radioactivity of the material of the counter itself.

Viscosity of Solutions.—Although much experimental work on the effect of concentration on the viscosity of solutions has been carried out, it has been found difficult to represent the results by means of equations. In the October number of the *Journal of the American Chemical Society*, G. Jones and M. Dole describe some very accurate measurements of the viscosities of barium chloride solutions at 25° over a range of concentration of 0.005 to 1.0 molal. They find that the fluidity ($1/\text{viscosity}$) can be represented by an equation of the form $\phi = 1 + A\sqrt{c} + Bc$, which also fits other data with proper values of A and B . The term in \sqrt{c} was suggested by the Debye and Hückel formula for electrolytes, and since A is always negative for electrolytes it is suggested that it represents the 'stiffening effect' on the solution of the electric forces of the ion atmosphere. For non-electrolytes A is zero. The value of B may be positive or negative.

The Active Principles of Pyrethrum Flowers.—The use of pyrethrum flowers, or an extract in the form of liquid insecticides, has increased considerably during the last five years, and some method of determining the amount of active principles in them has been required. In 1916, Staudinger and Ruzicka found that the two active principles of pyrethrum flowers were pyrethrin-I and pyrethrin-II, which were shown to be esters of a ketone-alcohol, pyrethrolon, with two acids, chrysanthemum monocarboxylic acid and chrysanthemum dicarboxylic acid methyl ester, to which they were able to attribute structural formulæ. In the October number of the *Journal of the American Chemical Society*, Gnadinger and Corl describe the isolation of pure pyrethrin-I and -II from Japanese pyrethrum flowers. They then worked out a method for the determination of these principles in the flowers by means of the reducing action on alkaline copper solution as compared with that of dextrose, and in this way were able to use much smaller quantities of material than were required in previous methods. The percentages found ranged from 0.40 to 1.21.

A Novel Evaporating Plant.—In the *Chemiker-Zeitung* for Oct. 16 is described a novel form of evaporating plant for which many advantages over other types are claimed. The principle involved is the distribution of the liquid into extremely thin layers, which are allowed to flow over funnel-shaped heating surfaces. The time required for the vaporisation of a given bulk of liquid is thus enormously reduced and the vapours can be removed rapidly without encountering the resistance of a column of liquid. The process is continuous, and since the liquid is also kept constantly in motion, there is no danger of superheating, foaming, or bumping. The heating units can be built up into columns of varying heights according to the degree of concentration of liquid required, and by means of separate steam-pipes they may be heated to different temperatures, so that when the evaporator is used for the distillation of oils a preliminary separation into fractions is effected. Fractionation may be completed by combining the evaporator with suitable dephlegmators and condensers. The apparatus is also well adapted for the concentration of solutions in which prolonged heating is apt to induce chemical decomposition; when once regulated for a particular operation, very little supervision is needed. The efficiency of the evaporator may be judged from the fact that 80-90 kilograms of water can be evaporated per square metre of heating surface in one hour without using a vacuum pump. The apparatus is patented and manufactured by Messrs. Zahn and Co., Ltd., of Berlin.