

Research Items.

ANTHROPOMETRY IN CENTRAL AUSTRALIA.—A first instalment of the results of the University of Adelaide Expedition in Central Australia at the beginning of 1927, which appears in Vol. I of the *Transactions of the Royal Society of South Australia*, gives a general introductory account of the expedition and its method of working, and deals more specifically with the results of the anthropometric observations by Dr. T. D. Campbell and Mr. C. S. Hackett. Two halts were made, one at Ross Waterhole, 40 miles north-east of Oodnadatta, and one at Stuart Town, Alice Springs. The natives observed were Arunta with a few Luritja, numbering 57 in all, 44 male and 13 female, and with a few exceptions all were full blooded. In addition to the anthropometric measurements, a number of investigations were carried out, including a study of aboriginal songs, and the expedition was fortunate in obtaining a kinematograph film of a circumcision ceremony as well as other films of technological interest. A striking method of locomotion involved in an extreme case of platycnemia provided a film of exceptional interest. The means of the anthropometric measurements given are: stature 1630 mm., head length 189.6 mm., head breadth 142 mm., nose height 52.1 mm., and nose breadth 48.6 mm. Cephalic index 74.7, facial index 81.3, nasal index 93 mm. It is to be noted that the head is slightly broader than that of other records. The larger size of the nose is probably due to the greater preponderance of males. Comparing these results with other records by various workers, it is now possible to give a generalised picture of the Australian as a dolichocephalic, platyrhine with pronounced supra-orbital ridges and protruding lips, in colour dark brown, with low to deep waves on the hair, which is occasionally curly but never frizzy.

SOME CHINESE FROGS AND TOADS.—Mr. Karl Patterson Schmidt, in his "Notes on Chinese Amphibians" (*Bull. Amer. Mus. Nat. Hist.*, vol. 54, Art. 5, Oct. 1927), describes the Chinese amphibians in the American Museum of Natural History, most of which were collected by the third Asiatic Expedition. Amongst these are four new species and one sub-species—three *Rana*, one *Bufo*, and one *Batrachuperus*, which are described in detail. The distribution of the common toads of central China is interesting; a sub-species of *Bufo bufo* being common round about Shanghai and the east, *Bufo bankorensis* very abundant in the west, whilst in between both species occur. Notes on the food of *Bufo bankorensis* show that it eats beetles, ants, grasshoppers, millipedes, centipedes, earwigs, and spiders; also plant remains were found inside it, and even a small toad, *Bufo raddei* had fed entirely on beetles, and *Kaloula borealis*, as is apparently usual in the group to which it belongs, had eaten ants almost exclusively. Careful notes and descriptions are made of all the forms identified, and photographic illustrations given of six species.

NEMATODES OF BIRDS.—Eloise B. Cram (*Bull. U.S. Nat. Mus.*, 140, p. 465; 1927) has prepared an account of about 500 species of nematodes in approximately fifty genera of the sub-orders Strongylata, Ascaridata, and Spirurata found in birds. Many of the descriptions are from obscure publications, and the author has done her best, often with inadequate data, to produce a critical account. Only seven new species are described. The main emphasis has been placed on the Spiruroidea, which may be regarded as primarily and

characteristically bird parasites. These have intermediate hosts which are eaten by birds: the water birds eat the entomostracan intermediate host, and the insectivorous birds acquire the spirurid from insects. The author directs attention to the observation of Seurat that infective third stage larvæ of spirurids in arthropods when eaten by hosts other than the final one, e.g. by rodents, migrate into the tissues of such a host and again encyst as third stage larvæ. Such an infected rodent would serve as a passive vector and would account for the infection of birds of prey. Keys are given to the orders, sub-orders, families, genera and species, which will greatly facilitate identification of these parasitic worms, and appended are a list of hosts with their respective parasites, a bibliography, and an index. The Filarioidea and the Trichurata are not dealt with in this memoir.

THE NATURE AND EVOLUTIONARY SIGNIFICANCE OF MUTATIONS.—Considerable attention has been refocused on the problems of evolution by this year's presidential address to the British Association, and the paper on mutations in the *American Naturalist* (vol. 61, Oct. 1927) will be read with interest. Prof. Gates points out that while organic evolution is now generally accepted as a historical fact, there never has been greater difference of opinion concerning the causes of the vast diversification of forms of life we now know. The problem of specific diversity is certainly not a problem with a single solution, although many biologists still try to explain all specific differences and all phylogenies in terms of one evolutionary factor, or on one pet hypothesis. Prof. Gates dismisses the Lamarckian factor as having so far no satisfactory experimental evidence; he is of opinion that the melanic variations of *Tephrosia bistortata* obtained by feeding the larvæ on smoke contaminated foliage cannot be given a Lamarckian setting. These variations are in fact due to actual germinal changes induced in certain of the germ nuclei. In recent years our increased knowledge of the structure of gametes of organisms, and the way in which differences arise in the germ-plasm and are transmitted by inheritance, has thrown much light on problems connected with mutations. Mutants show visible genetic differences—differences in arrangement and structure of the chromosomes. These discrete changes in the germ-plasm are of many kinds, some 'spontaneous,' some connected with crossing, some induced by environmental factors. Of whatever kind, they must have played an important rôle in the production of species and varieties. In the tracing of phylogenies an increasing amount of importance is attached to parallel mutations and convergences, and the tendency of modern phylogenies is to deal less with divergences and more with parallelisms and convergences, a tendency shown in the recent conclusions of Bower on the phylogeny of the ferns.

CHIMERAS IN POTATOES.—Bud mutations in potatoes, involving changes in colour or shape of the tuber, are well known, but a 'kostroma' mutant from the Russian variety *Imperator* differs from the normal only in having more dissected leaves and corollas. As described by Miss T. Asseyeva (*Jour. of Genetics*, vol. 19, No. 1), this mutant remains nearly constant when propagated from tubers, but occasional leaflets revert. Removal of the 'eyes' from a tuber leads to the regeneration of fresh buds which usually show reversion to the normal parent form. In this way

the 'kostroma' mutant was shown to be a chimera. Similar experiments with several other potato varieties lead to the conclusion that many of them are periclinal chimeras in which the outer layer of the tuber differs in its genetical capacities from the inner ones. This may account for some of the phenomena of pollen sterility in potatoes, as well as for the fact that forms produced from seeds frequently have tubers different from the parent clone. It may also have an important bearing on the question of 'running out' in potato varieties. Several of the common varieties are indicated as chimeras, though they may also be hybrid in the ordinary sense. The author suggests that bud mutations are usually of a chimerical nature, but there is no indication as to how the potato chimeras may have arisen.

FOREST AND PRAIRIE.—At the last meeting of the National Academy of Sciences at Washington, Prof. Henry C. Cowles, of the University of Chicago, discussed the probable fate of the great stretches of rolling grassland beginning in Illinois and stretching across Iowa and Minnesota into Kansas and Nebraska, if they had not been ploughed into corn and wheat lands. A brief account of the paper has been issued by Science Service, of Washington. Prof. Cowles distinguished two types of prairies, edaphic and climatic. The former, occurring as interruptions in otherwise forested areas, are due to peculiar conditions of soil, soil water, soil chemistry or other soil conditions where they occur. This type is by no means permanent, but exists as a stage in the development of some more stable type of vegetation. The trees that surround the edaphic prairie modify soil conditions along the border until they are able to creep over it and establish themselves on the grassland. Climatic prairie is typified by the unbroken stretches of grassland in the west, and its existence is determined by general climatic conditions, regardless of local differences in soil. It is a permanent type, to which all kinds of plant assemblies in the region gradually revert if left to themselves, for the climatic conditions under which it develops are unfavourable to tree growth. 'Tension line' prairies also, which occupy an intermediate position between edaphic and climatic prairie, will in the end become forest under a state of Nature.

GEOGRAPHICAL FACTORS IN THE COTTON INDUSTRY.—The dependence of the cotton industry of Lancashire on imported raw material makes its location and growth at some distance from a seaport not a little remarkable, and especially was this the case in its early days, in the sixteenth and seventeenth centuries, when land transport was bad. In a paper in the *Journal of the Textile Institute* for November, Mr. H. W. Ogden discusses the geographical basis of the industry. His paper is particularly valuable for the number of old and modern maps with which it is illustrated. He takes into account only the geographical factors, without denying that historical causes have also played their part. The cotton port was originally Chester, and it was not until the Dee lost its usefulness by silting that, early in the eighteenth century, Liverpool began to displace it. Mr. Ogden goes at length into the distribution of weaving and spinning in the cotton manufacturing area, and shows that the important geographical factors were the upland area to the east, with abundant rainfall, giving an even supply of soft water throughout the year. Soft water in abundance is required for all the processes of manufacture, while the application of steam power to the industry caused a further demand for it. Details are given of the distribution of rainfall.

OCEAN WEATHER.—A useful series of data is collected and tabulated from various sources by the Koninklijk Nederlandsch Meteorologisch Instituut bearing on the weather of the Atlantic, Pacific, and Indian Oceans. The pamphlet (*Publication* of the Institute, 101 B) giving the data for 1925 has now appeared. There is no map, but the ocean is divided into ten-degree squares from lat. 25° N. to 30° S. in the Atlantic, from lat. 10° N. to 20° S. in the Indian, and from 30° N. to 30° S. in the Pacific Ocean. For each month, in each square, is given the force and direction of the wind, pressure, temperature of the air, and water, cloud, and percentage of hours of rain. A few squares in the Pacific are blank, and the figures in some squares, especially in the Pacific and Indian Oceans, are based on few observations. Others in the northern Indian Ocean are the result of several hundred records. The publication is considerably interesting, especially after the data have been plotted on charts.

RIFT VALLEYS.—An important paper on fault troughs, both superficial and profound, appears in the *Journal of Geology*, p. 577, 1927, from the pen of Stephen Taber. He reviews the evidence bearing on the origin of the greater features of this kind, such as the rift valleys of Africa and the Rhine, and concludes that they have not been formed by thrust faulting. Of the responsible factors he favours tension as the most important, and shows that normal faulting should be accompanied by an uptilting of the plateaux along the rims of the trough. It is realised also that extrusion of lavas and increase of density of the material in depth—due in part to expulsion of gases and crystallisation—must be contributory causes in many places. There appears to be some confusion between oceanic deeps and rift valleys, but the author is wise in advocating a complete investigation of the Bartlett trough by the co-operation of geodesist, geologist, seismologist, and oceanographer.

PHOTO-ELASTICITY.—Volume 7 of *Scientific Papers* from the Institute of Physical and Chemical Research of Tokyo contains three papers by Mr. Z. Tuzi on the properties and applications of a new material, 'phenolite', intended for photo-elastic research. It is made from phenol and formalin by the catalytic action of ammonia and is baked at 150° C. It is easily worked, takes a fine polish, is very transparent, and light yellow in colour. It breaks in tension at 300 kilograms per sq. cm., its extension being proportional to the load up to the breaking point. When examined in polarised light under stress, about 10 equal stress bands are visible before the breaking point is reached, so that it admits of a much more accurate estimate of stress than does celluloid. Its coefficient of volume expansion is 0.000564 and its heat conductivity 0.00044 at 35° C. Photographs of the stress bands are given for beams of both uniform and varying thickness when loaded and when heated to 140° C. and plunged into cold water.

LIGHT QUANTA AND INTERFERENCE.—Some interference experiments with weak sources of light, which are described by A. J. Dempster and H. F. Batho in the November issue of the *Physical Review*, show in a conclusive way that a single quantum of radiation has sufficient extent to produce fringes. The helium line at 4471 Å was employed, as its decay constant is known from the experiments of Prof. Wien with positive rays, and its intensity was determined in each instance by comparison with the radiation from a black body. Using an echelon grating, the characteristic double order patterns which could be photographed showed that the quantum retained its

coherence after simultaneous passage through several steps, whilst with an air film between parallel plates, an even more stringent test could be imposed, which showed that a quantum follows the classical laws of reflection and transmission, and recombines afterwards with the difference in phase required by the wave theory of light.

ETHER DRIFT.—The latest repetition of the Michelson-Morley experiment, which is described by K. K. Illingworth in a recent issue of the *Physical Review* (p. 692), has yielded a null result, no ether drift being recorded greater than one kilometre per second, the probable error of the measurements. An interferometer was used of the modified type in which one of the totally reflecting mirrors is interrupted by a small step of about one-twentieth the wave-length of green light, upon which the fringes are formed and viewed. The half-shade appearance of the line of dislocation gives an accurate means of detecting small differences in path, so that a careful untrained observer can notice a shift of less than a thousandth of a fringe. The experiments were performed in the California Institute of Technology at various times during the summer of 1927, and included runs made both under isothermal conditions and with slow progressive changes of temperature, the effect of which could be eliminated in the final analysis of the observations.

A NOVEL ELECTRIC FURNACE.—A new form of electric furnace is described in the *Chemiker-Zeitung* of Nov. 9, which is suitable for heating quartz or porcelain combustion tubes to a temperature of 1300° C. It is mounted on rails in such a way that movements of ten to forty centimetres are possible in four directions. This enables one to remove the furnace from the hot tube and to keep it hot while the tube is cooling. The furnace is supplied by the firm Laboratoriumsbedarf Gesellschaft, Essen.

THE CRYSTAL STRUCTURES OF MERCURIC AND MERCUROUS IODIDES.—An investigation of the crystal structures of the mercury iodides carried out by M. L. Huggins and P. L. Magill, and published in the October number of the *Journal of the American Chemical Society*, confirms the previous results of other workers. Crystals of both compounds are tetragonal and the required data for the analysis were obtained from Laue and spectral photographs. In the case of mercuric iodide, HgI_2 , each mercury atom is surrounded tetrahedrally by four iodine atoms each at a distance of 2.77 Å., and each iodine atom by two equidistant mercury atoms. The molecules appear to be arranged in layers, and the shortest distance between two iodine atoms in different layers is 4.10 Å. The crystals readily cleave parallel to the (001) faces and this is probably accounted for by the fact that the attractive forces between the layers are much weaker than those between the atoms in any one layer. Mercurous iodide, Hg_2I_2 , is an aggregate of $IHgHgI$ molecules, each mercury atom being surrounded by four iodine atoms and vice versa. The shortest inter-atomic distances are: Hg - Hg, 2.72 Å.; I - I, 3.42 Å.; Hg - I (on same tetragonal axis), 2.75 Å.

ALUMINO-SILICATES AND OXALATES.—Alumino-silicates are of considerable variety and of abundant occurrence in the mineral kingdom, and many views have been expressed as to their constitution. Recently, Prof. Walter Wahl, of Helsingfors, in a series of papers published in Finnish journals and summarised in the *Zeitschrift für Kristallographie* (vol. 66), has worked out a complete analogy between these and the alumino-oxalates. He had found that certain alkali aluminium trioxalates can be split up into

optically-active enantiomorphous isomers. It therefore becomes necessary to write a co-ordination formula with a central sexavalent (co-ordination number of 6) aluminium atom surrounded by six (C_2O_4) groups, giving a complex trivalent anion. In some of these complex compounds the central aluminium atom is quadrivalent (co-ordination number of 4). Replacing the oxalate groups by 'silicyl' (SiO_3) and 'disilicyl' (Si_2O_5) groups, co-ordination formulæ on the same lines are written for a large number of minerals. For example, orthoclase is written shortly as $[Al_2(SiO_3)_2(Si_2O_5)_2]K_2$ and leucite as $[Al_2(SiO_3)_4]K_2$; these formulæ suggesting an explanation of the breaking down of orthoclase into leucite and silica at a high temperature. Polymerised formulæ for the micas occupy almost a page of print. Silica also is not always quadrivalent in the silicates, as suggested by analogy with the fluosilicates $[SiF_6]R_2$, and there may thus be isomorphous replacement of silica with co-ordination number of 6 by aluminium also with co-ordination number of 6. Such a replacement had indeed been suggested by P. A. von Bonsdorff in 1821, but this was acceptable only before the current views of valency had developed, and these it seems must now be modified.

THE 'ISOMERIC' CHLORIDES OF RUTHENIUM. The results of work carried out by J. L. Howe and described in the October issue of the *Journal of the American Chemical Society*, seem to dispose of two of the problems connected with the chemistry of ruthenium, namely, the apparent existence of two isomers in the M_2RuCl_5 series and the valency of ruthenium in the blue compound formed when ruthenium solutions are treated with a strong reducing agent. It is shown that the series previously considered to be $M_2Ru^{III}Cl_5$ is really $M_2Ru^{IV}Cl_5OH$ containing quadrivalent, instead of trivalent, ruthenium, and that the so-called 'aquo' series is actually an ordinary series of trivalent ruthenium crystallising as $M_2Ru^{III}Cl_5 \cdot H_2O$. There are, therefore, no isomeric ruthenium chlorides, and since K_2RuCl_5 does not exist, a possible co-ordination number of five can no longer be claimed for ruthenium. In all the above salts the co-ordination number is six. Hydrated ruthenium oxide is usually considered to be $Ru_2O_3 \cdot xH_2O$, but is more probably $RuO_2 \cdot xH_2O$, since in solution it always gives H_2RuCl_5OH . When the latter substance is reduced by two units, it gives the blue solution referred to above, which, therefore, contains bivalent ruthenium, as Claus supposed.

VARIATION OF ENGINE POWER WITH HEIGHT.—The manner of variation of the power of an engine with height has been the subject of much discussion in certain scientific circles for some time. It is of fundamental importance in the reduction of aeroplane performance to a standard basis of comparison. Many investigations have been pursued to determine whether it is more accurate to regard the engine power at a definite rate of revolution as a function of the density only or of the pressure only. Recently Mr. Capon (R. and M. 1080, Aero. Research Committee, London: H.M. Stationery Office. 4d. net) has suggested that the power is more precisely represented as a function of $(\text{pressure})^{2/3} \times (\text{density})^{1/3}$. In a memorandum (R. and M. 1099, Aero. Research Committee, London: H.M. Stationery Office. 4d. net) entitled, "A Discussion of the Law of Variation of Engine Power with Height," Mr. Clauert reviews this whole subject and shows that the simple pressure law is undoubtedly better than the simple density law, but for greater refinement, Mr. Capon's suggestion certainly gives a very close approximation to the truth.