

RESEARCH ITEMS

Incomes in Rhodesia

In a paper reprinted from the *Transactions of the Rhodesia Scientific Association* (38, 63-73; April, 1941) J. R. H. Shaul has used the published returns of the Commissioner of Taxes in his annual report for the year ended March 31, 1938, which covers the year 1936-37, and the results of the census of population, 1936, to examine the distribution of incomes originating in Southern Rhodesia in 1936. Within certain limits, these incomes can be accurately described by Pareto's law. Formulæ are given for all incomes, for married persons and for other persons, and the available evidence suggests that the formula for all incomes changes its gradient at £350 and can therefore be utilized only in respect of incomes exceeding £350. Below £350 the following hypothetical expression for Pareto's law is deduced:

$$\log y = 5.457 - 0.515 \log x \quad (2.053 < \log x < 2.544)$$

The hypothetical formula for the distribution of income in Southern Rhodesia is:

$$\log y = 9.558 - 2.127 \log x \quad (\log x < 2.544)$$

$$\log y = 5.457 - 0.515 \log x \quad (2.035 < \log x < 2.544)$$

Petrology and Prehistory

AN important article on this subject appears in the *Proceedings of the Prehistoric Society* for 1941 under the signatures of A. Keiller, Stuart Piggott and F. S. Wallis. A large number of stone celts have been studied microscopically, a tiny portion of each tool being sliced and the outer surface of it replaced in such a way that finally it is almost impossible to detect that anything has been done to the specimen—compare the technique of the cheese-taster! The composition of the rock having been determined, it is often possible to say with fair accuracy whence came the raw material from which the tools were made. Naturally this information can help in elucidating prehistoric trade routes, or at any rate can throw light on the movements and contacts of peoples. For example, it is apparent "that while the most important area supplying the raw material for the stone axes of Wessex was Cornwall, axe-factories in North Wales and Cumberland exported their products as far south as Wiltshire at least". Such investigations, when continued further, will certainly yield very fruitful and often exciting results.

Inhibition of Growth by Chemical Compounds

MANY carcinogenic hydrocarbons retard the growth of both normal and malignant tissues and an association exists between the biological properties of carcinogenicity and growth inhibitory power. Tumour induction is conceived to take place in two stages: (1) interference with the growth of normal cells and (2) an adaptive cellular reaction, accomplished mainly by dedifferentiation, where the altered cells are able to achieve independent multiplication at an increased rate in an environment which makes normal growth difficult or impossible for their parent cell. While the new growth characters appear in response to a specific pathological change in the cellular milieu, the cellular changes themselves are permanent and continue to be manifested indefinitely and without reversion when the variant cells reach normal tissues either in the same host or artificially in other hosts

by transplantation. With the prospect of discovering compounds possessing enhanced inhibitory activity, but with carcinogenicity restricted, G. M. Badger *et al.* (*Proc. Roy. Soc., B*, 130, 255; 1942) have investigated the growth inhibitory activity of more than two hundred carcinogenic compounds and related substances. A striking degree of correspondence was often shown by the inhibitory and carcinogenic activity of closely related compounds, such as dibenzfluorenes or dibenzphenanthrenes, although no inhibitory activity was observed for certain carcinogenic 10- and 9:10 substituted benzanthracenes. Conversely, inhibitory activity was noted in a few compounds (1:2'-azonaphthalene) which have yielded few or no tumours in exhaustive tests, and in some of a group of synthetic oestrogens, which although not carcinogenic in the usual sense are nevertheless associated with the induction of individual types of tumour under special conditions. The results obtained with derivatives of triphenylethylene suggest that inhibitory activity may still be shown by compounds diverging widely from the polycyclic structure and possessing only a skeletal resemblance. In view of the similar inhibitory effects produced on body growth, tumour growth and gonadal activity by the polycyclic carcinogenic hydrocarbons and by oestrogens, carcinogenic in a restricted sense, it is likely that the mechanism in both cases is partly direct and partly moderated by the pituitary.

Streptolysin O

MANY strains of hæmolytic streptococci produce filterable hæmolysins. The hæmolytic activity of fresh broth filtrates in which hæmolytic streptococci have grown rapidly disappears on standing in air and can then be restored to the original level or higher by the addition of reducing agents such as hydrosulphite. This hæmolysin (streptolysin O) is produced by most strains of group A streptococci when grown in serum-free broth, by group C strains from human infections and by group G strains, but not by streptococci of other groups. Another serologically different hæmolysin (streptolysin S) is produced when hæmolytic streptococci are grown in media containing serum, and its activity is not affected by oxidation and reduction. Herbert and Todd (*Biochem. J.*, 35, 1124; 1941) have purified streptolysin O and have shown it to be a protein which hæmolyses red blood corpuscles only after activation with reducing agents such as compounds with -SH groups, resembling certain other enzymes, for example, papain, in this respect. A possible explanation of the hæmolytic action of streptolysin O is that it is an enzyme which attacks a constituent of the red cell membrane. Although no appropriate substrate has yet been found for the demonstration of its enzymic function, yet the extremely small doses in which all bacterial toxins work suggest that their action must be catalytic. It is noted that two bacterial toxins have already been identified as enzymes, namely, the α -toxin of *Cl. welchii* as a lecithinase, and the 'diffusing factor' of the same organism and of streptococci as a hyaluronidase, and the possibility exists that all bacterial toxins are enzymes.

New Silver Firs from Asia

THE activities of various botanical explorers in eastern Asia have made an immediate contribution to floral beauty in the garden, but the taxonomic

and horticultural evaluation of trees is a slower process. Nurseries at Chandlers Ford and Winchester have been used to propagate the newer Asiatic silver firs from seeds collected by Forrest, Wilson, Kingdon Ward and others. Edwin L. Hillier has now described some of the species there which have grown sufficiently to provide reliable specific characters (*J. Roy. Hort. Soc.*, 66, Pts. 11 and 12, Nov. and Dec., 1941). The Chinese silver fir, *Abies Georgii*, and *A. Forrestii* promise well as ornamental trees, and sixteen other species are described in detail, mainly from the horticultural point of view. It is still too early to assess any significance the various species may have for afforestation in Great Britain, but the English material should provide useful data for a future ecological comparison with trees in the native habitat, for most of the original collections are from sites above 10,000 ft. high.

Linkage Studies

F. B. HUTT (*J. Hered.*, 32, 357; 1941) for the fowl, and W. E. Castle and P. B. Sawin (*Proc. Nat. Acad. Sci.*, 27, 519; 1941) for the rabbit, report the discovery of a fifth linkage group. Multiple-spurs are linked with duplex comb in the fowl with a cross-over percentage of 28 per cent. Multiple-spurs which are characteristic of the black Sumatra fowl are inherited as a dominant and may be easily detected in 98 per cent of young chicks. In the rabbit, furless and brachydactyly are linked with a cross-over of 28 per cent, while dwarf is now added to the agouti-wide-band linkage group.

Solar Radiation and Atmospheric Temperature

DR. H. ARCTOWSKI, a well-known Polish meteorologist who was stranded in the United States by the outbreak of war, has been investigating the effect of variations of solar radiation on atmospheric temperature, and his first results have been published (*Smithsonian Mis. Coll.*, 101, No. 5). He found that while in a few cases a direct effect on surface temperatures could be shown, these are exceptions, and he concluded that while solar variations are undoubtedly important, their effects are very complex, and probably occur mainly in the upper air. The greater part of the paper therefore consists of a study of the variations of temperature up to 17 km., mainly on the basis of *radio-sonde* ascents in the United States. Waves of rising or falling temperature, with their accompanying effects on pressure, travel in different directions at different heights, so that the combined effect at the surface is one of almost inextricable confusion, but there is a possibility that a direct effect of solar variation on temperature may occur at some level in the stratosphere. Dr. Arctowski however distinguishes *two* tropopause, polar and equatorial, which are superposed in temperate latitudes. Very little attempt is made to relate the observed changes of temperature at any height directly to observed variations of the solar constant, and it is evident that many more data are required before there is any hope of a solution of this important problem.

Adsorption of Metals of the Iron Group in Analysis

A PAPER on the above subject was read by G. J. Austin before the Society of Public Analysts and Other Analytical Chemists on February 4. The effect of pH on the adsorption and solubility of aluminium hydroxide in analysis has been studied. The ammonia

method of separating aluminium from nickel was shown to be impracticable owing to the great increase in the adsorption of nickel over a limited range of pH. Data were given comparing the extents to which adsorption takes place in the precipitation of iron, aluminium and chromium by the ammonia method, the benzoate method and the author's phosphate method. Some other methods were also referred to. It was shown that the phosphate method is better than the ammonia method in minimizing adsorption, but that in absence of phosphate the benzoate method is better than the phosphate method.

Solvent Effect and Dipole Moments

It has been known for some time that the dipole moment of a compound measured in solution may differ from that measured in the vapour state. The reason for this difference is broadly known and the so-called solvent effect has been studied in many cases. In the measurements, both with vapour and liquid systems, the main difficulty is now the estimation of the so-called atom polarization, which cannot be determined directly. By combining the two sets of measurements, some of the uncertainty attached to atom polarization may be removed. A. Audsley and F. R. Goss (*J. Chem. Soc.*, 864; 1941) have now discussed methods for distributing the polarization of binary liquid mixtures between their components. The so-called distortion polarization, the sum of the electronic and atom polarizations, $P_E + P_A$, obtained by the elimination method just mentioned, has been distributed over the carbon, hydrogen and halogen atoms in compounds of the type RX by making use of an additive relation in which $P_E + P_A$ is the sum of contributions assigned to each atom or bond. It is shown that on ascending the series from fluorine to iodine the electron polarization P_E increases but the atom polarization P_A shows a general tendency to decrease.

High-voltage Porcelain Insulators

A PAPER read recently by J. S. Forrest before the Institution of Electrical Engineers discusses the electrical characteristics and performance in service of porcelain insulators for outdoor apparatus for voltages between 33 and 220 kv., and emphasizes the necessity for a carefully planned field-testing scheme supplemented by laboratory investigation if system breakdowns are to be minimized. The first part describes the laboratory and field-testing equipment used by the Central Electricity Board and proceeds to an outline of the technique employed. The second part gives details of investigations made with the apparatus and methods previously described, and information is provided regarding the performance of line insulators, post insulators and bushings; discussing their behaviour under adverse weather conditions. Comparative results are given for normal and anti-fog insulators, the mechanism of insulator flashover in fog being described in detail with suggestions for a good anti-fog insulator. A discussion on the deterioration of insulators in service advocates field testing to prevent single faulty units of suspension insulators leading to a complete breakdown of the string containing them, and describes the mechanism of insulator failure due to cracking. Considerable attention is given to the cause and characteristics of radio interference due to power lines, data being given of the interfering field strength under various weather conditions.