

Research Items

Early Contacts of East and West

PROF. C. G. SELIGMAN in his Lloyd-Roberts Lecture for 1935, delivered before the Royal College of Physicians, on "The Roman Orient and the Far East" (*Antiquity*, March) dealt mainly with historic contacts extending over something more than a thousand years, from 200 B.C. to A.D. 900, touching in the prehistoric period only on the distribution of the socketed celt, one of the most characteristic implements of the Late Bronze Age in central and eastern Europe, which probably reached China five to six hundred years before Christ. Its presence may be associated with events in the far north-west which started the movements of the Scyths. It was borne eastward on a wide front across the Urals. In the historic period, the great silk route, five thousand miles long, joined the Far East with Antioch, the most important city of the Roman Orient. It was first organized in the second century B.C., though long before this lapis lazuli had reached Ur and pre-dynastic Egypt (that is, 3000 B.C. and earlier). The eastern section of the route may be regarded as starting at Ch'ang An (the Han capital), or at Lang-chow in western Kansu. It crosses Sinkiang to Kashgar, 1,500 miles away, Turfan lying half-way. The middle section crosses the Pamirs to Merv, either by Samarkand or Balkh. From Merv it runs west and south across north Iran to Seleucia-Ctesiphon, just below the modern Bagdad, crosses the Euphrates at Zeugma, and so thence to Antioch. The factors tending to the use of the silk route in the first instance were neither commercial, desire for knowledge nor love of conquest, but sheer military necessity—to counter the attacks of the barbarians. But there was also the desire for a supply of fine horses from Iran, while another gift from Ferghana was the grape for wine. From east to west the road essentially carried silk and secondarily furs. In addition to gold the Roman Orient exported glass. In the great period of the T'ang dynasty (A.D. 621-907) the silk route attained its maximum importance; and while China shows the effect of the impact of western art and art forms, as well as of legend and story, it gave to the west paper and printing.

Mammals of Oregon

THE State of Oregon illustrates in general the history of any mammalian fauna under the rule of civilized man. The quest of valuable furs brought pioneers into the region, and the abundance of game is still an economic factor of some importance. As man and domestic animals increased, animals destructive to game, livestock, poultry and crops had to be destroyed or controlled, with the result that predatory animals are reported to be generally decreasing in abundance, while a few creatures such as wapiti and other deer, pronghorn antelopes and porcupines are said to be increasing in numbers. In his account of the "Mammals of Oregon" (*North American Fauna*, No. 55. U.S. Dept. Agr. Pp. 416), Vernon Bailey discusses with a large amount of detail the economic as well as the natural history and taxonomic aspects of a fauna which includes 246 species and races. Oregon shows great diversity

of altitude and of climate, and the consequent zonal distribution of its vertebrates and its plants throughout five of the seven primary life zones of the American continent (tabulated on pp. 31-53) contains much that is of ecological interest. We note that the author does not fear any undue spread of the muskrat, for although he admits that it is capable of doing serious damage in irrigated areas, he holds that more thorough trapping and a long open season usually afford all the protection necessary.

Digestion in Metazoa

THE problem of the modes of digestion adopted by the Metazoa has been reviewed by Prof. C. M. Yonge (*Biol. Rev.*, Jan. 1937). In Protozoa and Porifera, digestion is obviously intracellular, and this method is retained to a certain extent in different groups of the Metazoa. Extracellular digestion is found to a greater or lesser extent in all of them. This method is obviously advantageous since it allows food to be digested and the non-utilizable material to be removed more quickly, thus permitting an increase in the rate of metabolism. It is also associated with a differentiation in certain regions of the gut and so produces more efficient mechanisms for dealing with the various processes involved in ingestion, digestion, absorption and the formation of faeces. Some groups have acquired enzymes which enable them to deal with special substances. In general, the food passes through the alimentary canal at such a rate as will enable it to be adequately digested, taking into consideration the temperature, pH and enzymes. Such specialization has enabled the successful groups to utilize a wider range of food-stuffs and to tap more varied sources of supply. A full bibliography is appended.

Sites for Anemographs

AN account of the peculiar performance of a Dines anemograph at the Lizard (Prof. Note No. 73, Meteorological Office, Air Ministry, by M. J. Thomas. London: H.M. Stationery Office, 1936) shows the care that is required when selecting a site for an anemograph in order to get a representative record of the speed and direction of the wind. It was observed that with most winds the record showed the gustiness and variability of wind direction to be expected in a reasonably open situation, with the vane of the anemograph at a height of 40 feet above the ground, but that when the general wind in the neighbourhood was between about south-south-west and west-south-west the vane fluctuated wildly, and sometimes 'boxed the compass' at short intervals for hours. Inquiry was made into the cause, and it was found that violent eddies were being set up by a row of coastguards' houses about 30 feet high and more than 100 feet away in the direction from which the general wind was blowing during the most disturbed periods. These eddies were studied with the aid of ballons of zero lift, both free and tethered, and bamboo poles with long streamers, and the nature of the eddies was brought to light. The pamphlet shows their movement both in plan and elevation. The trouble was eventually cured by raising the vane of

the anemograph to a height of 75 feet; that is, it was brought to a height of 45 feet above the houses instead of only 10 feet. After the change, normal gustiness and variation of direction was obtained, as is illustrated by the anemogram for several hours of a severe gale during which the average wind direction changed from south to nearly west.

Artificial Radioactivity Produced by Means of γ -Rays

ARTIFICIAL radioactivity has recently been produced in the elements copper, bromine and phosphorus by bombarding them with γ -rays obtained by the action of protons of energy greater than 450 kV. on lithium (W. Bothe and W. Gentner, *Naturwiss.*, 25, 90; 1937). Observations of the half-life periods of the radioactive nuclei enables them to be identified. Copper gives a radioactive nucleus of half-life about 11 min. Heyn (*NATURE*, 138, 723; 1936) obtained by another method, a half-life of 10.5 min. for the ^{64}Cu nucleus. It therefore seems likely that this is the nucleus formed in the present transmutation, and that the process involves loss of a neutron from ^{65}Cu . In the case of bromine, the radioactive nucleus had a half-life period of about 18 min., which is the same as that of ^{80}Br obtained by the action of slow neutrons on ^{79}Br . Phosphorus gives a radioactive nucleus of weak activity with a half-life period of 2-3 min. This is probably to be identified with ^{30}P , which has been obtained by other methods indicating for it a half-life of 3.2 min. As with copper, the radioactive nuclei obtained from bromine and phosphorus are produced by the loss of a neutron from the normal nuclei.

Long Wave Spectroscopy of Benzene

SPECTROSCOPIC investigation of C_6H_6 and C_6D_6 by Angus, Bailey, Ingold, *et alia* (*J. Chem. Soc.*, 912; 1936) pointed with considerable certainty to a molecular symmetry of D_{6h} , and this has recently been substantiated by the thermal-spectroscopic determination of the symmetry number by Lord and Andrews (*J. Chem. Phys.*, 41, 149; 1937). But definite conclusions must await further experimental evidence on (a) the spectra of partly-deuterated benzenes of lower symmetry, and (b) the influence of temperature and change of physical state on the characteristics of the spectrum. Evidence on both these lines is forthcoming. Redlich has already published some interesting measurements on partly deuterated benzenes. Along the other line, the results of Sirkar (*NATURE*, 134, 850; 1934; *Indian J. Phys.*, 10, 189; 1936) are particularly interesting. From an examination of the Raman spectrum of C_6H_6 vapour at 210° C. and 16.6 atmospheres, he has shown that the intensity distribution of the rotational wings accompanying Rayleigh lines agrees with that predicted from the theory of rotational Raman scattering. In the later paper, he has given results for the temperature range from liquid air temperature to 210° C. and for solid, liquid and gaseous C_6H_6 . At low temperatures he found a slight diminution in the numerical values of frequency displacements and an increased sharpness and intensity, in agreement with the earlier observations of Epstein and Steiner (*NATURE*, 133, 910; 1934). By comparing the spectra of liquid and gaseous C_6H_6 at 210° C., he has shown that the numerical values of displacements are unchanged, but transition from liquid to vapour is accompanied by greatly diminished intensity. A similar comparison by Bhagavantam and Rao (*NATURE*, 139, 114; 1937) leads to the same result.

Knowledge of these variations will help to elucidate the part played by intermolecular forces, and will assist in explaining the apparent breakdown of selection rules when applied to experimental data.

Diamantine Compounds

IN the February issue of the *Berichte der deutschen chemischen Gesellschaft*, Dr. Oskar Böttger describes the synthesis of several complex cyclic compounds in which carbon atoms are linked together rigidly but without strain in the manner of the crystal lattice of the diamond. The parent hydrocarbon of such a series is still unknown, but as several of its derivatives have now been synthesized it is proposed to call it *diamantane*. Its highly symmetrical structure would result from the condensation into a three-dimensional network of four puckered cyclohexane rings of the *Z* variety, and its formula would be $\text{C}_{10}\text{H}_{16}$. By the action of methylene dibromide on the disodium derivative of bicyclo [1:3:3] nonane 2.6-dione 1.3.5.7 tetramethylcarboxylate, it was possible to synthesize a compound which possesses the same skeletal structure as diamantane and crystallizes in fine colourless octahedra, melting at 284° C. Hydrolysis of this ester to the corresponding tetrabasic acid was readily effected by dilute acids, whereas alkaline hydrolysis broke down one of the rings to yield a pentacarboxylic acid derivative of bicyclononane, which could be extracted in the form of its methyl ester. The freedom from ring-strain of the polycyclic system can be inferred from the ease with which this pentamethyl ester reverts to the diamantine structure by eliminating methanol, when it is heated above 200° C. On the other hand, this structure appears to influence the chemical properties of its substituent groups, since the acid groups did not yield to the usual methods of decarboxylation, nor was it possible to reduce the two keto-groups to methylene groups, for even hydrogen iodide and phosphorus under pressure yielded only secondary alcohols. The optical isomerism of the products has not yet been investigated.

Scope and Development of Indian Astronomy

IN an article in *Osiris* of September 1936, Sukumar Ranjan Das says that Indian astronomy had its beginning in the Vedas, and was then very rudimentary. This is incorrect; the ancestors of the Vedic authors brought their astronomy with them when they came to India, and these astronomical conditions are both extensive and well founded, and were quoted throughout the much later Rg Veda and the liturgical Vedas and Brahmanas. The author has happily cut himself free, however, from the current idea that Indian astronomy was ever dependent on the Grecian or Ptolemaic systems; indeed India gave more than it ever got, except perhaps as regards planetary observations. Ranjan Das suggests that the Rg Veda has three allusions to the planets, but the contexts forbid this interpretation. The most interesting section is on the *Samhitās* and older *Siddhāntas* (dating between 500 B.C. and 500 A.D.). He gives a tantalizing reference to an observation in 215 B.C. of "the Sun and Moon in conjunction at sunrise on a Sunday" and the winter solstice, or the beginning of the solar month *Māgha*. Was time at that date divided into 7-day weeks for purposes of chronology, similar to our division of the Julian days? It certainly was so divided in the days of Aryabhata I, in the fifth century A.D.