

Research Items

Stone Structures in the Western Transvaal. A number of stone structures ascribed to "the ancients" have been investigated by Dr. Ir. E. C. N. van Hoepen and Dr. A. C. Hoffman (*Argeologische Navorsing van die Nasionale Museum, Bloemfontein, Dl. 2, St. 1*). These structures are situated at Buispoort, 24 miles north-west of Zeerust, and consist of stone walls which have served for huts, enclosures around huts and for cattle. There are also walls which served as storage platforms for grain-bins, semi-circular to nearly completely circular stone-rings surrounding threshing-floors, small structures for storing grinding stones, furnaces for smelting iron ore, heaps of slag, ash-heaps and remarkable graves. On the evidence of both Campbell and Moffat, and taking into account the reputation of the Bahurutsi for iron-working, it is concluded that these structures are the work of the ancient Bahurutsi, especially as skulls found here are similar to recent Bahurutsi skulls from Braklaagte. These structures corroborate and substantiate for the first time the fact that the Bantu did build with stone. This has an important bearing on the problem of the Zimbabwe culture. The graves found were all covered-in fissures between rocks. Many bones show signs of burning, which may be due to their burial after a Matabili raid in which the houses with their occupants were burned. A number of furnaces, without doubt for the production of iron, have been found. Potsherds and two or three broken pots were found. The material is coarse; and it contains foreign matter which does not improve the clay. It was probably introduced without clear understanding of its operation in firing. Three or four definitely globular pots were found. These are rare among the modern Bahurutsi. Pots with three legs had reached a culminating point, the legs being of enormous size. A pot with a gradually thinning lip may have been introduced by strangers.

The Manatees. Not since Hartlaub's paper of 1886 has an attempt been made to monograph the manatees (genus *Trichechus*), and Robert T. Hatt's contribution on the group in the "Scientific Results of the Congo Expedition" establishes a few hitherto unrecognised characters for the distinction of the crania of the different forms, corrects certain erroneous conclusions come to by Hartlaub, and records for the first time specific features of the post-cranial skeleton (*Bull. Amer. Mus. Nat. Hist.*, **66**, 533; 1934). While admitting only three living species of manatees, one African and two American, the author considers it probable that geographic extremes of these species are racially distinct. But the Congo specimens showed no character that could distinguish them from the better known forms from Senegal. The African species (*T. senegalensis*) is more closely related to the West Indian species (*T. manatus*) than to the South American *T. inunguis*, so that there seems to be a stronger linkage in this case between the distant African and West Indian species than between the neighbouring American species.

Bacterial Decomposition and Synthesis of Cellulose. Mme. Y. Khouvine, who has been responsible for much work on the decomposition of cellulose, has recently reviewed briefly the present position in this field (*Actualités scientifiques et industrielles*, 164.

"Exposés de chimie biologique." (2) "Cellulose et Bactéries." Paris: Hermann et Cie). In it she deals in turn with the chief aerobic, anaerobic and thermophilic bacteria that have been described as cellulose decomposers. As in many other publications, the organism *Spirochaeta cytophaga*, first isolated by Hutchinson and Clayton in 1918, and known now as *Cytophaga Hutchinsoni*, is named as being the most numerous and active cellulose-decomposing organism in the soil, though, in point of fact, it has never been conclusively shown to be active in attacking the cellulose of plant residues. It is a little unfortunate too that fungi are not dealt with as well as bacteria when considering cellulose-decomposition, for there is no doubt that under aerobic conditions the former group is of great importance. The last part of the present useful little work is devoted to the consideration of the synthetic activities of *Acetobacter xylinum*, which when growing on sugar alcohols such as mannitol or sorbitol, produces acid, and on the surface a membrane now shown by Hibbert to be true cellulose. The crystallites are not oriented as in a fibre, but by tension may be partially aligned so that an X-ray diagram is obtainable not very dissimilar from that of cotton. Details of the culture of this organism are given, and its fermentative reactions considered.

Chromosome Homologies in *Drosophila*. *Drosophila melanogaster* has four pairs of chromosomes while *D. pseudo-obscura* has five pairs. In the latter species, five linkage groups of genes have been found, and a further study of this species (Crew and Lamy, *J. Genet.*, **30**, No. 1) indicates that snapt and tilt (wing characters) and sepia (eye colour) are located in the left arm of the X-chromosome, which corresponds in part with the right arm of chromosome III in *D. melanogaster*. On the right arm of the X are located eosin and cuprous. The rod-shaped chromosome III of *D. pseudo-obscura*, which contains the dominant stubble and the recessive glass (eye), is found to be homologous with a considerable portion of the left arm of chromosome III in *D. melanogaster*. The mutations short and jaunty in the fourth linkage group of *pseudo-obscura* (a small rod-shaped autosome) may be homologous with part of the right arm of chromosome II in *melanogaster*. Thus it appears that there has been a considerable rearrangement of the chromatin material since these species diverged from a common ancestor. The authors also discuss the nature of the action of the genes for eye colour, based on observations of colour changes during ontogeny and on the colour effects produced on eye and testis sheath by various gene combinations. They conclude that these genes are not directly concerned in pigment production, but act on the mechanism which is responsible for production and deposition of pigment, the colour of the pigment being determined by the chemical conditions at the stage of development when the pigment is formed.

Malayan Orchids. A paper on "Some Malayan Orchids" appears in the *Gardens' Bulletin* of the Straits Settlements (8, Part 2, Jan. 26, 1935). It is by Mr. C. E. Carr, and describes the orchids collected by the Oxford University Expedition to Sarawak in 1932. The plants were obtained from

the neighbourhood of Mount Dulit, at altitudes varying from near sea-level to 1,400 metres. 132 species were collected, and 32 are now described for the first time. Descriptions of the species are very complete, and lengthy diagnoses of new species appear in Latin and English. A perusal of the descriptions suggests that many kinds will, in the future, add even greater beauty to our already beautiful English orchid houses. An attempt is made to describe the perfume of several species, and both the systematic botanist and the gardener will find a great deal of interest in the paper. Members of the genera *Bulbophyllum*, *Coelogyne*, *Dendrobium*, *Dendrochilum* and *Eria* predominate in the list.

Entomogenous Fungi. Mr. T. Petch has recently published further "Notes on Entomogenous Fungi" (*Trans. Brit. Mycol. Soc.*, 19, Part 3, 161-194, Feb. 1935). Having already described seventy-five species of fungi which attack insects, Mr. Petch continues with No. 76, and his present paper finishes with No. 100, but a very useful review of the entomogenous species of the genus *Cladosporium*, and the description of eight new species of fungi relieve its abruptness and make it complete in itself. Eight species of *Cordyceps* are described critically, whilst fungi of this genus which attack orthopterous insects receive special mention. The new species are *Blastotrichum araneorum*, on spiders, *Hirsutella radiata*, *H. formicarum*, on ants, *Verticillium fuliginosum*, *Sporotrichum columnare*, *Metarrhizium brunneum*, *Patellina epimyces* and *Stereocrea coccophila*. Most of the fungi are foreign to Great Britain, and many have been collected from Ceylon.

Baluchistan Earthquakes of 1931. The recently issued part of the Memoirs of the Geological Survey of India (67, 1-82; 1934) contains an interesting study by Mr. W. D. West on the destructive Baluchistan earthquakes of August 25 and 27, 1931. The district is one that is frequently visited by earthquakes, the most important predecessors being those of December 20, 1892, and October 31, 1909. Of the two recent earthquakes, the earlier and less intense, known as the Sharigh earthquake, occurred at about 3.5 a.m., I.S.T. (August 24, 9.35 p.m., G.M.T.). The epicentre was close to Sharigh and its focus was clearly shallow, for, though the intensity was 8 (Rossi-Forel scale) in the epicentral area, it faded away rapidly, so that the total area disturbed was only about 31,000 sq. miles. The second, or Mach, earthquake occurred on August 27 at about 8.57½ p.m., I.S.T. The epicentral tract was a long, narrow, curved band, following closely the strike of the rocks for about 100 miles in a general southerly direction from Mach. Within this band, the shock reached the intensity 10, and caused much destruction to buildings. The disturbed area covered a large part of Baluchistan and Sind and contained about 370,000 sq. miles, or about the same as that of the Californian earthquake of 1906. The epicentres of both earthquakes were closely related to the re-entrant angle in the eastern boundary of the Baluchistan Hills, that of the Sharigh earthquake being on the northern side, and that of the Mach earthquake running parallel to the south-western side, of this angle.

Use of Drilling Mud in Burma Oilfield. The search for new and deeper sources of oil in the fields of India and Burma has during recent years been complicated by heaving or caving shales and high-pressure water

issues. Laboratory experiments and field experience have shown that the former difficulty can be surmounted by selection of a drilling fluid from which there settles out, when mixed, a minimum of free water. Also, to discourage penetration of formation water into the hole, the fluid must either be sufficiently heavy in itself to overbalance formation water pressure, or, failing this, it must be loaded with barytes, iron oxide, etc. High-pressure water issues, whether associated with heaving and caving or not, can be combatted only by application of sufficient pressure to counteract formation water pressure; this is done by the use of a loaded drilling fluid and back pressure supplied by the drilling equipment. Mr. A. W. G. Bleek, in his paper "Some Experiences in the use of Drilling-Fluids in the Yenangyaung Oilfield, Upper Burma" (*Trans. Min. Geol. Inst. India*, 39, 3, December 1934), after an exposition of these difficulties, proceeds to record personal observations made during the deepening of a well in the southern extremity of the Yenangyaung Field, Burma. All previous attempts at deep drilling in the neighbourhood had failed, and records showed that, in the case of the present well, heaving and caving must be anticipated; also water lying between 4,800 ft. and 4,900 ft. was believed to be high-pressure water. Actually no high-pressure water issues were encountered and the problem was, therefore, confined to prevention of heaving and caving and exclusion of formation water. Back-pressure drilling equipment was not called into operation though it was ready on site, and the successful deepening of this well is attributed to the use of a mud fluid which, while preventing heaving and caving, was possibly also responsible for the absence of high-pressure water issues, which are frequently attributed to poor quality fluid and consequent encouragement of flowing shales.

Ozone in the Atmosphere. A. R. Meetham and G. M. B. Dobson (*Proc. Roy. Soc.*, A, March 15) have investigated the vertical distribution of atmospheric ozone in a high latitude (Tromsø, lat. 69° 40' N.). The method used involves the measurement of zenith sky light at two wave-lengths for various zenith distances of the sun, and it has already been applied in Switzerland, yielding results which were confirmed by Regener's sounding balloon measurements. The height of the centre of gravity of the ozone is nearly the same at Tromsø and at Arosa, but the distribution is rather markedly different. At Tromsø the ozone is more concentrated in a region about 21 km. high, while in Switzerland it is more uniformly distributed through the lower 30 km.

A New Form of Cloud Chamber. C. T. R. Wilson and J. G. Wilson (*Proc. Roy. Soc.*, A, Feb. 15) describe a new type of cloud chamber which possesses very interesting features and may be further developed. In this chamber the flow of air when the expansion takes place is radial, the air leaving the chamber by slits left between flat rings of slate which are piled to form the walls of the chamber. The corresponding distortion of the tracks is a uniform two-dimensional magnification. Both back and front of the vertical chamber are of glass, and the illumination is supplied through the back, the light being stopped out of the camera as in microscope dark-ground illumination. Since the tracks scatter much light through small angles, the illuminating arrangement is very efficient. Another important innovation consists in allowing

the chamber and its auxiliary gear to fall freely under gravity, it being released as the expansion takes place. It is claimed that the chamber may thus be removed from a confined space, for example, the pole-gap of a magnet, before the photograph is taken. Since gravitational forces do not affect the contents of the chamber, convection currents are prevented and the tracks retain their form for a long time. This may prove an important advantage for some types of work.

Isotopic Water in the Sea. The densities of samples of water from different oceans have been found by H. E. Wirth, T. G. Thompson and C. L. Utterback (*J. Amer. Chem. Soc.*, **57**, 400; 1935) to be very uniform for the Mediterranean, Red Sea and Indian Ocean, with one exception of water obtained at 4,000 metres in the Indian Ocean, which gave the highest values ever found. No surface specimen from this locality was available. Low values were found for samples from the Antarctic, North Pacific and Bering Sea. One result of the investigations was that regions of high dissolved oxygen content are those of low density, and conversely. Waters from the Baltic showed low density differences from ordinary distilled water, which are attributed to dilution by land drainage, and a region of the San Juan Archipelago noted for its abundant fauna and flora yielded waters of low density differences. The paper describes an apparatus for measuring small differences of density of the order of 10^{-8} , depending on the communicating tube method; the liquid heights were altered by means of metal plungers and an oscillation circuit was used.

Element 93. The experiments on the bombardment of uranium with neutrons led Fermi to conclude that elements with an atomic number above 92 are formed (*NATURE*, **133**, 898; 1934). It was assumed that the product, with a period of 13 minutes, which is precipitated from a highly oxidising and acid solution along with manganese, is the highest homologue of the latter, or element 93. A. V. Grosse and M. S. Agruss, however, had expected other properties for this element, and they now describe (*J. Amer. Chem. Soc.*, **57**, 438; 1935. See also *NATURE*, **134**, 773; 1934) some experiments in which protactinium, the longest-lived isotope of element 91, was used as an indicator in experiments similar to Fermi's. Manganese dioxide and rhenium sulphide were precipitated from uranyl nitrate and protactinium solutions. The behaviour of element 91 and the reported behaviour of element 93 were found to be identical within the limits of experimental error. The authors, however, report that Fermi has tested whether the artificial radioelement is precipitated with zirconium phosphate, the coprecipitation being a very clear and definite reaction for element 91, and has found that the active products are not precipitated, which speaks against identity with element 91.

Properties of the Telephone Transmitter. The design of early types of telephone transmitter was almost entirely empirical. In the commercial form, the electrical resistance of a small column of specially prepared carbon granules is made to vary by the sound waves which it is desired to transmit. In appearance the carbon granules are like granite chips, and the column consists of a series of sharp corners and edges in contact with more or less plane surfaces.

In the Engineering Supplement to the *Siemens Magazine* of March, it is stated that the Company, seeing that the limit of progress on purely empirical lines was practically reached, decided to attack the problem experimentally and theoretically, and appointed Mr. G. W. Sutton to analyse the working of the 'Neophone transmitter' and to measure its mechanical and electrical properties if possible. He describes in this supplement a new method of measuring these properties, and attempts to make a complete analysis of the 'Neophone' transmitter, which incorporates some of the latest developments. The influx into the industry all over the world of a younger generation of engineers trained in the modern technique of acoustics and of audio-frequency engineering has enabled research work on a larger and more effective scale to be done. The introduction of new raw materials and of improved factory processes has also helped. The author has collected many experimental data which will be found useful. Considering that the time permitted for the research was somewhat limited, the agreement between the calculated curve and the observed frequency characteristic is very good. The demand for an improved quality of speech in telephone transmission probably arises from the education of the faculty of discrimination of the public by the gramophone and by broadcasting.

Current Measurement at Radio Frequencies. At a meeting of the Meter and Instrument Section of the Institution of Electrical Engineers on April 5, Dr. H. E. M. Barlow read a paper entitled "A Valve Ammeter for the Measurement of small alternating Currents of Radio Frequency". This paper comprised a description of an alternating current milliammeter having four ranges, 5, 10, 20 and 30 milliamperes, and suitable for measurements at frequencies from 25 cycles to 5×10^6 cycles per second. The instrument makes use of a two-electrode thermionic valve, with its direct-current supplies arranged to give the saturation current in the anode circuit. Under these conditions, if the temperature of the filament is raised by a small amount, a rapid increase takes place in the saturation current. Thus if an alternating current is superimposed on the direct current through the filament, the increase in the anode current provides a measure of the alternating current. In the first arrangement of the instrument described in the paper, suitable filter circuits are included to restrict the alternating and direct currents to their appropriate paths. A simple resistance-bridge arrangement is connected in the anode circuit, by means of which the steady current through the galvanometer is balanced out. On the application of alternating current the balance of the bridge is upset, and the deflection of the galvanometer indicates the value of the current to be measured. An alternative arrangement of the instrument employs a second valve so connected in the circuit that any drift of the galvanometer zero, due to variation of filament battery voltage, is avoided. Among the advantages claimed for the instrument are that it is sensitive and quick in response, that several ranges can easily be incorporated in one instrument, and that it has a high overload capacity. A typical calibration curve for an instrument having a range of 5 milliamperes is included in the paper, and shows that the accuracy of indication is within 0.5 per cent from 25 cycles per second up to nearly 5 megacycles per second.