

## Research Items.

**Social Organisation in Africa.**—Dr. Thurnwald concludes his survey of African social systems in *Africa* for October. The highest forms of social organisation in Africa are found in association with cattle and cultivation of the soil. Many crafts are practised in the home for the benefit of the family. Some callings are the monopoly of certain clans. Clans may either be equal or socially graded, while there is also gradation within the clan. In the larger units under a central authority the most diverse groups may exist side by side. Generally, the tribes which are engaged directly in procuring the means of existence are the most primitive. The higher organisation is based on the association of different tribes each specialising in an occupation. By this association, however, each tribe becomes more exclusive, as their livelihood depends more and more on the exchange of their products. Among tribes such as the herdsmen of East Africa, a graded society is directed by sacred princes, society being stratified upon agricultural clans and hunters. Among the herdsmen-farmers of South Africa, cattle-keeping is still the dominant factor. In the Sudan and West Africa the organisation is that of a stratified peasant-pastoral with three grades of freemen, dependents, and slaves. The final form to be distinguished is that of the net-like state uniting various races under a king—a type of state internally associated with sacred rites such as that of Abyssinia and Kaffa, with an aristocracy derived from cattle and horse herdsmen, great families with slaves, the use of the plough and professional craftsmen of various kinds, who are also recruited from aboriginal rulers and immigrants.

**Sumeria and Oceania.**—Dr. P. Rivet, following up his previous studies of the Oceanic group of languages in which he sought to show the influence the peoples of the Pacific had exercised on the Mediterranean and African worlds, now endeavours to trace a connexion between the Oceanic languages and Sumerian. He has published as No. 24 of the *Collection Linguistique* of La Société de Linguistique de Paris, a vocabulary which gives his identifications in Sumerian, Melanesian, Polynesian, Australian, Tasmanian, Indonesian, Mon-Khmer, Munda, etc. The work is entirely lexicographical and grammatical affinities have not yet been explored. The difficulty in the comparison of Sumerian and Oceanic vocabularies lies in the fact that the former are abstract, while the latter are concrete. There are also certain phonetic changes. Sumerian, for example, does not show the tendency to nasalisation which appears in the Oceanic languages, and especially Australian. There are many examples of borrowing between Munda and Sumerian which are explained as due to commercial relations between Euphrates and Indus three thousand years before our era. A certain number of roots common to the Sumerian and the Oceanic group also appear in Indo-European and Semitic. This is also due to borrowing. The hypothesis which is put forward in explanation is that there was a single linguistic family of which the centre of dispersal was south or south-eastern Asia, and this spread by stages from Japan, as shown by Ainu affinities, to Tasmania, and from the Mediterranean and Africa to America. This takes us back beyond the age of bronze, which at present bounds our knowledge of the Indo-European tongues, to a much earlier period five thousand years before our era, and to, at least, the neolithic age. The vocabulary remained stable in remarkable degree throughout this long period.

**Increase of Elk in Sweden.**—The European elk is strictly protected in Sweden, where the open season for shooting is restricted to four days. The result has been a rapid increase in numbers, so that during the four days' shooting this autumn, some 3500 animals were killed, against 3700 last year (*Daily Science News Bull.*, issued by Science Service, Washington, D.C.). While sportsmen and naturalists rejoice at the change in status of the elk, farmers and foresters are less favourably disposed to protection. Increasing numbers and competition for food have made the animals, formerly shy and elusive, extremely bold and occasionally ferocious. In certain parts of Sweden they have damaged crops and young trees, and in places not only have they refused to budge from fields and gardens when called upon, but also have actually attacked farmers protecting their own crops.

**White-sided Dolphin in Scottish Waters.**—Formerly the general opinion was that this species was rare in British seas. Records of strandings collected by Sir Sidney Harmer, however, indicated almost annual occurrences, and the observations of Charles Oldham during the last few years suggest that it is present in schools of considerable size (*Scottish Naturalist*, 1929, p. 133). Its range in place here would appear to centre about the northern North Sea, and the records are confined to the spring and summer months, so that this may be another example of a temporary influx from the Atlantic Ocean. It ought to be added, however, that a young specimen, received at the Royal Scottish Museum, was caught in the latitude of Buchan Ness about mid-November of this year.

**Hay Rations for Dairy Cows.**—The importance of making the best use of hay in the feeding of dairy cows is the subject of an article by R. Bontifour in the *Journal of the Ministry of Agriculture*, vol. 36, p. 707. A system of rationing is strongly advocated, and the economy, which will be of particular importance to the farmer in view of the shortage of supplies during the present winter, is convincingly shown to be of real benefit to the cow and to increase her yield of milk. The nutritional properties of hay vary considerably, a poor sample having only half the value of one of good quality. To obtain the best type of hay, early cutting is important, weathered hay if cut early being preferable to that got in under good conditions but cut late. Twenty pounds of hay a day is taken as the standard requirement for the maintenance of the average cow and for the sake of those whose supplies are insufficient to meet their needs, and who must use supplementary feeding stuffs, the equivalent ration of various substitutes are given. Of these sugar beet pulp and brewer's wet grains are specially recommended if purchase is necessary. However, it is pointed out that supplementary feeding may often be avoided if the hay is rationed and a pasture dressed with a hundredweight an acre of sulphate of ammonia in late January to secure an early bite. A cow allowed unlimited hay will consume more than she can digest, and a wastage of so much as one ton of hay per cow per winter may be accounted for in this way. It is equally important to ration hay fed in conjunction with concentrates or roots, for these may actually increase the cows' appetite for hay and decrease of milk yield will result from indigestion. As a conclusion a true story is related in which a prize for the higher milk yield was obtained by surreptitiously giving the opponent's cows an extra feed of hay.

**Marine Hydrozoa of the Faroes.**—Dr. P. L. Kramp gives a summary of all known hydroids from the Faroe plateau proper and the Faroe Bank in his "Marine Hydrozoa" (Zoology of the Faroes, Pedersens, Copenhagen, 1929). The recent investigations of 1925–27 have brought up considerable material which has, however, only added six species to the number previously known. Fifty-nine species are now known from the Faroe plateau proper, inside the 200 m. line. Three more species are added from the Faroe Bank. Some of the remarks on the distribution of the species are very interesting; for example, the capricious habit of *Clava squamata*, which occurs in some places abundantly and is absent from others which appear to afford exactly similar conditions, and *Dinamena pumila*, which only occurs when *Ascophyllum* is present, although it may grow also on certain species of *Fucus*. Maps and tables are given showing the distribution of the more important species found on the Faroe plateau, almost all of which occur on the British, Norwegian, or southern and western Icelandic coasts, and many being common to the Mediterranean and South European coasts. The evidence seems to show that the hydroid fauna of the Faroes is chiefly made up of species which have their main area of distribution in the more southerly regions, although there are arctic and boreal forms. The author explains that this is due to transportation by free swimming medusæ or of hydroids fixed to floating objects, or that the polyps can live in deeper water, so that the sub-marine ridges enable them to reach the Faroe plateau either from the north or from the south, and that in no case need we take into consideration the possibility of the survival from a time when the islands were more closely connected with other countries.

**Non-Nucleated Blastospheres of a Spider.**—Dr. E. Warren (*Annals Natal Mus.*, vol. 6, 1929) describes the incipient development of the eggs of three spiders (*Polystes natalius*) which were unable to produce eggs capable of full development. In one spider (*D*) the eggs were certainly, and in another (*C*) probably, unfertilised; in the third spider (*G*) the condition was doubtful. About 80 per cent of the eggs of spiders *D* and *C* shrivelled and died on the second day after laying—due to lack of resistance to desiccation—but the surviving eggs resisted desiccation in the normal manner. In the eggs of *D* no trace of formation of polar bodies could be detected, but a normal fertilisation membrane was formed in the eggs of all three spiders. The eggs of *D* underwent a certain progressive development; those of *C* exhibited at the time of laying a variable amount of development which progressed little further, the eggs of *G* appeared normal when laid and the central nucleus underwent mitosis, but there was complete inability to form a normal embryo. In the eggs of *C* and *D* no trace of mitosis was found. The cytoplasm of all three lots of eggs exhibited a marked activity, numerous well-defined bodies being produced which looked like cells except that they had no distinguishable nuclei. These bodies formed a perfect blastosphere—without a single nucleus being found in the epithelium—which flattened at one pole and produced by the proliferation of the non-nucleated masses a ventral plate. In the eggs of *G*, nerve ganglia were formed in a totally undifferentiated plasmodium.

**New Varieties of Hops.**—The twelfth report by Prof. E. S. Salmon, on the trials in 1928 of 102 new and commercial varieties of hops (*Journal of the Institute of Brewing*, 35, 523; 1929), is of special interest in that those plants, originally raised in or selected from the Experimental Hop Garden at Wye College, are

now sufficiently established at East Malling Research Station for their distinctive characteristics to be ascertained. The most outstanding features are the high yields of 20 cwt. or more to the acre obtained from 23 of the hops, and the high preservative qualities of certain of the new varieties. In particular, two of the latter gave values 1.52 and 1.21 per cent higher than that of the best hop obtainable in 1928, and there seems good grounds for believing that hops equal or superior in preservative value and flavour to the best American hops will be available for cultivation in England. In this connexion it is reassuring to learn that variety rather than soil or climate determines the brewing value of a hop. Investigations on the incidence of mosaic disease, which was high in 1928 though lower than in 1927, have shown that though many of the new varieties are themselves immune, they may act as 'carriers' of the virus, and so transmit the disease. Though this transmission has at present been demonstrated only by grafting, it is clear that it may take place rapidly in hop gardens by other means, and a number of formerly puzzling cases are thereby explained. A list of susceptible varieties is given. Observations of downy mildew confirmed the experience of previous years, namely, that a variety though severely attacked on its bines may be resistant on its cones, and conversely that severe attacks on the cones may occur while the bine remains healthy.

**Bibliography of Tides.**—A bibliography of tides for the years 1910–27 has been compiled by Prof. J. Proudman and published as *Bulletin* No. 12 of Section d'Océanographie, Union Géodésique et Géophysique Internationale. The entries are chronologically arranged under ten headings. Only publications in a Latin or Teutonic language are included. Publications on the utilisation of tidal energy and ephemeral tide tables have been excluded.

**New Zealand Earthquake of June 17, 1929.**—Two preliminary reports on this interesting earthquake have recently been published, one by Messrs. H. T. Ferrar and L. I. Grange, the other by Mr. H. E. Pyfe (*N. Z. Jour. of Sci. and Tech.*, vol. 11, pp. 185–191, 192–197; 1929). The main centre of the earthquake appears to have been situated on the White Creek fault, which crosses the Buller River seven miles to the west of Murchison. The re-leveling of the district by the Public Works Department shows that the country on the east side of the fault has been uplifted. At a distance of nine miles from it, there is no appreciable change of level, but towards the fault the change increases though with some oscillations. At the fault, the east side has been raised 14 ft. 9 in., but, about 550 yards to the east of the fault, the uplift is 16 ft. 1 in. The course of the fault is marked by shattered ground and disturbed vegetation; trees lean over at all angles or are uprooted and split. The block on the west side of the fault has not yet been re-levelled.

**Spectra of Xenon and Arsenic.**—The November number of the *Journal of Research*, published by the Bureau of Standards at Washington, contains papers by W. F. Meggers, T. L. de Bruin, and C. J. Humphreys, on the arc spectra of xenon and of arsenic, both of which had been previously only incompletely described. Xenon has been studied in special detail, and is likely to furnish lines which are even better suited for standards of wave-length than those of krypton. The majority of the lines lying between 3000 Å. and 10,000 Å. which have been measured—three hundred odd—have been fitted into a term scheme generally similar to those already known for the lighter inert gases, but there are certain differences consequent on the high atomic number of xenon which

will almost certainly be found to an even greater extent in the spectrum of radium emanation, which is now under investigation. The analysis of the arsenic spectrum is less complete, and has been extended so far only to the infra-red and ultra-violet lines, new lines which have been found in the visible region not being included. These papers have been made very readable by the inclusion of histories of the older work on the elements in question, and contain good large-scale reproductions of the spectra.

**Structural Stresses.**—The Engineering Experimental Station of the University of Illinois has for some time been determining the stresses in structures of forms too complicated to admit of mathematical treatment by means of tests on models made of 'pottery plaster', which is plaster of Paris with an addition which delays its setting. *Bulletin* No. 195 of the Station contains an account of the tests of beams of circular, rectangular, triangular, and H section bent into U shape, carried out by Profs. F. B. Seely and R. V. James. In the first instance the legs of the U were forced together until the beam broke at the bend, then the two straight lengths were supported at the ends and loaded in the middle until the beam again broke. The results obtained show that the plaster model gives trustworthy information as to the maximum stress a structure will stand if five to ten tests are made and the mean taken. The H section beams broke at the abrupt change of section unless provided with a fillet of at least  $\frac{1}{2}$  inch radius.

**Preparation of Telluric Acid.**—Several methods of oxidising tellurium or its dioxide to telluric acid have been described. A new one is given by Mathers and Bradbury in the November number of the *Journal of the American Chemical Society*. Tellurium dioxide is mixed with five equivalents of calcium hydroxide and heated at 975° for one hour exposed to air. Complete oxidation was very nearly attained. The percentage of oxidation was smaller at lower temperatures or with less calcium hydroxide. The calcium tellurate was treated with an excess of concentrated nitric acid, whereby soluble calcium nitrate and insoluble telluric acid were formed. This telluric acid, after filtration or decantation, was dissolved in water and crystallised until pure.

**Enantiomorphism in Organic Compounds.**—The October number of the *Journal of the Chemical Society* contains an important paper by John Read, I. G. M. Campbell, and T. V. Barker, on the optically active diphenylhydroxyethylamines and isohydrobenzoin. The authors discovered that crystals of pure *d*- and *l*-isohydrobenzoin, when deposited from ethyl acetate, exhibit characteristic hemihedral facets; when chloroform is used as solvent, however, the distinctive facets are not developed. Pure *dl*-isohydrobenzoin, when crystallised from ethyl acetate, separates as a conglomerate of enantiomorphously related crystals, composed of *d*- and *l*-isohydrobenzoin respectively; but the crystals deposited from chloroform are morphologically indistinguishable from one another so far as plane faces are concerned. The latter crystals, however, have been shown by polarimetric observation to be also of two kinds, consisting again of the pure *d*- and *l*-forms; moreover, despite the absence of plane hemihedral facets, the two sorts of crystals can be segregated through the circumstance that either the right or the left side of each crystal displays a marked tendency to degenerate into curved boundaries. This diagnosis by means of curved surfaces is entirely novel, and is of great interest in connexion with the so-called 'Pasteur principle', namely, the establishment of molecular enantiomorphism from a study of crystal form. The authors point out that this principle cannot be accepted as generally true, for there is

nothing in the undoubted enantiomorphism of structure of *d*- and *l*-isohydrobenzoin crystals which categorically demands plane-faced boundaries, still less facets indicating right- or left-handedness. At the present time, the only question which can be raised is that of the frequency with which enantiomorphism of structure unfolds itself on the surface. Enantiomorphous hemihedrism among organic compounds is a good deal rarer than is commonly supposed, since in many cases it stands revealed only after repeated attempts at crystallisation, possibly with changes of solvent.

**Hydraulic Pneumatic Engineering.**—The *Journal of the Royal Society of Arts* for Nov. 29, 1929, contains a paper by Mr. J. O. Boving on new developments in hydraulic pneumatic engineering, in which particulars are given of many interesting applications of hydratomats in which falling water is used for compressing or rarefying air and for raising water. Simple forms of hydraulic air compressors have been built for centuries in the Vosges and Pyrenees for providing air for forges and the air lift pump is in common use. Research work, however, has led to great improvements in such apparatus and many installations are now in use for irrigation and other purposes. One compressor plant described is at Alston, Cumberland, where there is an available head of 180 feet. The falling water is led to a steel separator tank about 400 feet below the top of the intake pipe in an old mine shaft from whence it again rises to a tail-race. The entrained air becomes compressed to about 90 lb. per sq. in. and is used for drilling, etc. A typical plant lifting water from a drainage canal is that at Bambanwala on the Upper Chenab Canal, Punjab, where a syphon rarefier works in conjunction with a continuous vacuum lifter which drains the town of Bambanwala. Other installations described were those on the Rio Ebro in Spain, and at a tin mine in Nigeria. "There is", said Mr. Boving, "a wide field for applying the ideas to other uses, not yet fully explored."

**Alternating Current Potentiometers.**—Dr. C. V. Drysdale read a paper to the Institution of Electrical Engineers on Dec. 6, giving an historical account of the evolution of the a.c. potentiometer and describing some of its many practical applications. He pointed out that no department of electrical testing involves such difficulties and such costly equipment as that of accurate a.c. measurements. Most of the instruments suitable for these measurements have a very limited range, owing to the fact that their deflections obey a square law. The ranges to be covered vary from a few millivolts to hundreds of thousands of volts and from milliamperes to thousands of amperes. As polyphase measurements have also to be made, special wattmeters have to be used for power and phase measurements. The cost of suitable apparatus to make all these measurements accurately runs to thousands of pounds and is beyond the means of all but the wealthiest factories. The direct current potentiometer first suggested in practical form by Sir Ambrose Fleming so far back as 1885 is the most universally used apparatus for d.c. measurements, and so many attempts were made to construct an a.c. instrument which could fulfil the same functions. One of the best of these instruments is the Drysdale a.c. potentiometer. It is particularly useful for testing wattmeters and ordinary supply watt-hour meters. It can also be used for measuring the frequency of alternating currents and the magnetic fields which they produce. These instruments are much in demand in countries where facilities for obtaining special instruments are limited, but they are often in general use even in well-equipped laboratories.