

Research Items.

THE KHALLAM.—Miss Erna Gunther has made a careful study of the Khallam, embodying existing literature, which is not extensive, in addition to her own personal observations. This has now appeared as No. 5, vol. 6, of the *Publications in Anthropology of the University of Washington*. The information obtained in the field was mainly collected at Jamestown, Washington Harbour, and Esquimault, but the Khallam formerly lived on the southern shore of the Strait of Juan de Fuca from the mouth of the Hoko River to Port Discovery Bay opposite Vancouver Island. They thus live in the region designated by Wissler as "the Salmon area," which extends along the Pacific Coast from Alaska to San Francisco bay. Their villages were for the most part on the coast, and their principal means of subsistence was sea food, especially salmon. Characteristically, agriculture was non-existent, vegetable food being obtained by gathering wild products—berries and roots. Each village, however, as a rule had one or two hunters, depending entirely on bow and arrow, who alone knew the mountainous country behind the shore. The villages consisted of a single row of rectangular houses with doors facing the water. The smaller houses were twenty feet by thirty feet; the potlatch house was fifty feet by two hundred feet. In camping, mats were carried to form temporary shelters. Their marriage regulations differed according to the social standing of the individual. People of high rank married outside the tribe; but such a marriage was only possible to families of considerable wealth; and although marriage with a relative was avoided, union with a cousin might be necessary in order not to mate with a person of lower rank. Poor people who could not marry outside the village or tribe because of the expense of the feasts involved made the best arrangements they could, avoiding parallel and cross-cousin marriages. Marriages with the northern tribes were the most desired. Most of the people are now Shakers, and it is difficult to obtain any complete account of the old religion, but, as in most of the American tribes, the secret society and the guardian spirit were prominent, while there was little idea of superior deities whom every one worshipped.

THE DISPOSAL OF THE DEAD AT WAKCHING, ASSAM.—Mr. J. H. Hutton has obtained details with photographs of a remarkable method of disposing of the dead at Wakching, a village of the Konyak tribe in the Naga Hills, which are published in *Man* for April. After death, the body is wrapped in leaves of the thatching palm and placed in one of a number of trees, usually six, associated with and usually near the *morungs* of the clan using them. Outside the village a rail is put up, with a screen, in front of which is a wooden figure of a man serving as the temporary habitation of the soul. This figure, which ends just below the waist, can be and is used for other dead afterwards. After nine days the head is detached from the body and cleaned by the children or relatives and placed in the village cemetery in a special stone receptacle. This is a solid conical sandstone block from two to three feet in height, with an arched recess to take the skull. The recess is closed with a flat stone and the whole covered with a conical sheath of thatching palm leaf. The skulls of males and females are treated in the same way, but the receptacle for females differs in shape. The fact that persons desirous of having children perform ceremonies over the stones confirms the view that they have a phallic significance. Many of the stones are ornamented with various carved patterns. Persons who die a violent death, or from

an epidemic, and children, are not treated in this way. The custom of disposing of the skulls of the dead in phalli of carved stone is apparently limited to Wakching and the neighbouring hostile village of Wanching. It forms a definite link between the menhir and the carved wooden soul figure and with related customs, another link between Assam and the Pacific.

HYBRID VIGOUR IN GRASS.—The results of cross- and self-fertilisation in the grass *Lolium perenne* are reported in a paper by Mr. T. J. Jenkin (*Jour. of Genetics*, vol. 17, No. 1) from the Welsh Plant Breeding Station at Aberystwyth, where much work with grasses for pasturage is being done. Some plants were found to be highly self-sterile, and cross-pollination resulted in some cases in an increase in productivity of more than 200 per cent. It appears, therefore, that seed should be used from crosses which give the greatest F_1 hybrid vigour. Two methods of cutting were also compared, in one of which the early cuttings were omitted. The latter method gave higher yields in every case, but in some F_1 families the difference was much greater than in others. Hence it would probably be possible to select certain plants which are more suitable for grazing purposes and others which are better for hay production.

INHERITANCE OF RUBBER YIELD.—The relationship of latex yield to various other features of the rubber tree, *Hevea brasiliensis*, has been studied statistically by Mr. R. A. Taylor (Bull. No. 77, Dept. of Agriculture, Ceylon). A plot of 161 trees was studied, all the trees being the progeny of a single tree at Peradeniya which is believed to be one of those sent out as a seedling from Kew in 1876. This tree had a very heavy yield, producing nearly 400 lb. of dry rubber in four years nine months. The pollen parent of these 161 trees was not controlled, but the coefficient of variation in their yield is much lower than in trees of mixed parentage. Correlation tables show a high correlation between yield in successive years. Frequency polygons show that a large number of the trees yield the mean amount or a little less, while very few show the high yields. The yield does not depend entirely on the number of rows of latex vessels. The number of rows in the cortex is characteristic of each tree, but some trees with a relatively low number have higher yielding power than other trees with nearly twice as many cortical latex vessels. In cortex renewed after tapping, the number of vessels remains about the same. A count of the vessels gives a better measure of the yield in older trees than in very young ones.

LIME ON THE FARM.—The Ministry of Agriculture has issued a revised edition of Leaflet No. 170, on the use of lime in agriculture. The practice of liming or chalking, though one of the oldest in British agriculture, has tended to be neglected during the last half-century, and the farms of to-day are suffering in consequence. The functions of lime are so numerous that it can be regarded as an all-round soil improver. Besides being an essential plant food, its presence is necessary to render artificial manures effective, and further, it acts as a corrective for soil sourness or acidity and greatly improves the working properties of heavy soil. Regular applications of lime are recommended, as a number of factors cause its depletion in the soil, and although crops vary as to their dependence on the lime supply, a well-limed soil yields more trust-

worthy results during critical periods of the season's growth. A need for lime may be indicated by the prevalence of certain weeds, e.g. spurrey, or plant diseases, e.g. finger-and-toe. A large number of the different forms of lime available are given, and their comparative values indicated, together with information as to the special points to be observed in the use of each form, and caution is advised as to the application of some waste lime products or lime rich in magnesia. The most suitable material to supply depends largely on the cost, but carbonate of lime can give as good results as burnt lime provided it is sufficiently fine and well distributed in equivalent quantity. Further, ground limestone and chalk have the additional advantage over lime in not deteriorating on storage, and in their harmlessness if applied to a growing crop. The time and method of application should be chosen with the view of ensuring the most perfect distribution. The quantity necessary to apply varies widely with the form of lime applied, but an average dressing of 10 cwt. to 1 ton per acre of ground lime, or 1 to 2 tons per acre of carbonate of lime once in four or five years is suggested.

THE GENUS CLEMENTIA IN AMERICAN TERTIARIES.—Apart from its value as a zone fossil in American Tertiary deposits, the chief interest of the genus *Clementia* (fam. Veneridæ) lies in the anomalous features of its present and former distribution. Mr. W. P. Woodring now seeks to trace its geological history, its palæobiological significance, and to describe all the known American species (U.S. Geol. Survey, Professional Paper 147—C). Eight forms, species and subspecies, with two doubtful species, are described and figured on four excellent plates. There is also a text map of the world marked to show the present range and past distribution of the genus.

THE MOLLUSCAN GENUS GISORTIA.—When last year (NATURE, vol. 117, p. 246) we recorded a posthumous paper by the late Dr. Vredenburg (died 1923) on the post-Eocene Mollusca of the Tertiary formations of north-west India, no further contribution from his able pen was anticipated. Now, however, a belated monograph by him on the cowry-like genus *Gisortia* has been published (*Mem. Geol. Surv. India: Palæont. Indica*, New Series, vol. 7, mem. 3). The generic name dates only from 1884, but so far back as 1825 one fossil and one recent representative were described. The latter, the Australian *Cypræa umbilicata* of Sowerby, remains the unique living example; but Dr. Vredenburg has described thirty-six species in all, going back in time to the Cretaceous period, many only known in the condition of internal casts. All are figured of the natural size on thirty-one photo-plates, and tables given of their stratigraphical distribution and probable zoological affinities. Judging from internal evidence, this monograph would appear to have been completed about 1917.

EARTHQUAKE PREDICTION IN CALIFORNIA.—The question of earthquake prediction is receiving renewed attention in the United States. After the San Francisco earthquake of 1906, two rows of four pillars each were erected across the San Andreas rift, along which the great movement occurred. Dr. J. P. Buwalda now proposes to extend the series so as to cover southern California, and the work is to be carried out under his guidance by the California Institute of Technology, in co-operation with the Carnegie Institution of Washington (*Daily Science News Bulletin*, Washington, No. 313 B). The monuments will be erected in straight lines across suspected earthquake-faults. If, after five or ten years, the lines remain straight, it will be

concluded that no great earthquake is in prospect there; but if the line should be distorted into the S-form, the situation will then be regarded as dangerous.

TIDES AND CURRENTS IN ALASKA.—The United States Coast and Geodetic Survey has issued the fourth volume in a series of publications on tidal and current observations made in the more important waterways in United States territory. Special publication No. 127 deals with south-east Alaska and is the work of Lieut. R. W. Woodworth and F. J. Haight. Tidal stations of some standing are now sufficiently numerous on this coast to permit of the discussion of tides for the main ship channels and principal parts. Unfortunately, there are as yet no stations in Glacier Bay, to the east of Lynn Channel, where the Alaskan glaciers that reach the sea must have a disturbing effect on the tides. Current observations, though of comparatively short duration, show a general north-westerly set in the waterways of south-eastern Alaska. The authors attribute this inshore current to a back eddy of the westerly drift across the north Pacific. The larger part turns south-east along the coast of North America, but a smaller part turns north and is driven into the inland passages by the prevailing westerly winds. The volume contains a useful appendix, reprinted from an earlier publication, on the general characteristics of tides and currents.

PEDESTAL ROCKS FORMED BY EROSION.—An interesting contribution to physical geology is made by Kirk Bryan in Bull. 790 A of the U.S. Geological Survey, where he deals with pedestal rocks formed in arid climates by differential weathering. It is shown that many other processes are operative besides wind abrasion, and examples attributed to chemical weathering, temperature changes, differential rainwash and sapping are described. Such processes are also operative in humid regions, but the life of the pedestals there developed is relatively short because of the rapidity of rock decay, and in the colder regions also because of the increased effectiveness of frost action. Moreover, in humid regions the formation of soil and the prevalence of vegetation inhibits the growth of pedestals except when the conditions are especially favourable, as for example when glacial erratics of insoluble rocks rest on a limestone platform.

TWO SHALLOW OILFIELDS IN TEXAS.—On Mar. 8 Dr. Arthur Wade read a paper before the Institution of Petroleum Technologists on the Sipe Springs and Deep Creek oilfields of Texas, both developed in what is technically known as the South Mid-Continent region. In the case of Sipe Springs the area is essentially an inlier of Pennsylvanian (Canyon member) rocks surrounded by Cretaceous deposits, the relationship between the two formations being that of unconformability and overlap. The structure of the field is simple, the beds dipping west at an almost imperceptible angle, with indication of a terrace running from north to south; in this the field resembles many other South Mid-Continent oilfield structures, where often the appreciation of dip is only obtainable by levelling over a wide area. Oil is produced at Sipe Springs from two sands, one at 180 ft. to 200 ft. below the surface, the other 260 ft. to 300 ft.; the former sand is lenticular and production from it is erratic; the latter is a more persistent horizon and is productive throughout the field. In common with other fields in this region, the origin of the oil is doubtful: it may either be indigenous to one of the members of the Pennsylvanian, or it may have originated in the underlying Bend group (Mississippian) from which extensive migration is known to have

occurred. In the Deep Creek field the critical formation is that of the Putnam group, mainly clays with lenticular sandstones, shale, and limestone of rather uncertain age, lying between the Cisco member of the Pennsylvanian and deposits known to be of Permian age. The sandstones contain oil and gas, also salt water. The structure is not unlike that of Sipe Springs, but the westerly dip is slightly steeper. The Sipe Springs oil is of good quality with an average gravity of 0.83; that of the Deep Creek field is similar; in fact, considering that the oil of these fields is derived from distinctly different formations, the similarity of physical and chemical properties in both cases is remarkable.

LARGE VACUUM TUBE.—What is stated to be the world's largest vacuum tube, constructed by the General Electric Co. of America, has now been in use in a radio station for several weeks. It is seven and a half feet high and weighs 100 lb. It is rated at 100 kilowatts, and is kept cool by a copper jacket through which water is kept circulating. It takes the place of eight 20-kilowatt tubes, which were formerly used. Hitherto 50 kilowatts has been the maximum power given to the antenna of a 'super-power' radio station. A battery of the new tubes will permit experiments with 500 kilowatts in the antenna. This is one thousand times the power used by a typical broadcasting station three or four years ago. Two ounces of tungsten are used in the filament, which is as thick as the lead in a lead pencil, and is eight feet long.

DENSITY OF THE PHOTOGRAPHIC IMAGE.—In two papers in the *Proceedings of the Royal Society of Edinburgh* (vol. 45, pt. 2, p. 166; 47, pt. 1, p. 34) Dr. E. A. Baker describes in detail the large amount of experimental work carried out by him in connexion with Prof. Sampson's investigations on the temperature of a great number of stars by determining photographically the distribution of energy in their spectra. Dr. Baker's work consists essentially in a rigid calibration of the particular types of photographic plates used by Prof. Sampson, so that the true interpretation in terms of intensity can be given to the densities obtained on the plates when the time of exposure, the conditions of development, and wave-length of the light are varied. The author starts with a perfectly general expression connecting the intensity with the variable factors density, exposure time, and wave-length, and finds it convenient to consider two characteristics of the plates, which he calls p and q , and to determine how they are affected by variation in these factors. p is the so-called Schwarzschild constant and q is analogous to γ , the slope of the characteristic curve, and at higher density values is equal to p/γ . Amongst other interesting results it is found that for a constant blackening and constant exposure time, the variation of p with wave-length is very small, a result which is to be expected if p depends on the value of the effective intensity (*i.e.* the energy absorbed by the plate per second) and if equal effective intensities of different wave-lengths produce densities of the same order. The larger part of the second paper is devoted to a new theory of the relation between the number of grains of silver halide affected, the intensity of the incident light, and the duration of the exposure (see also *NATURE*, Sept. 11, 1926, p. 374). Without entering here into the details of the theory the conclusion is, to quote Prof. Sampson, "that the initial stages of the photographic action, including the deviations from the reciprocity law, are calculable and well represented by assuming that the developable product is formed in two stages, each stage requiring one quantum, and that the product of the first

stage returns in the absence of further stimulus to its original sensitive state, according to the law governing the progress of a mono-molecular change." The idea involves, apparently, two distinct kinds of absorbers of energy in the silver halide grains, one for each stage.

CALCIUM IN ALUMINIUM CONTAINING SILICON.—Mr. J. D. Grogan read a paper at the recent spring meeting of the Institution of Metals on "The Influence of Calcium on Aluminium containing Silicon." The addition of calcium to aluminium results in the formation of a compound, CaAl_3 , which is very slightly soluble in solid aluminium. By the addition of silicon to this alloy, the compound CaSi_2 is formed, which is practically insoluble in the solid state at all temperatures. Neither compound appears appreciably to improve the mechanical properties of aluminium, or to impart age-hardening properties. The addition of suitable quantities of calcium to aluminium containing silicon improves the electrical conductivity by removing silicon from solid solution. As the effect of CaAl_3 on the conductivity of aluminium is relatively small, the effect of a slight excess of calcium is not harmful.

MOLYBDENUM IN NICKEL-CHROME STEELS.—Report No. 67 from the Research Department, Woolwich, on "The Influence of Molybdenum on Medium Carbon Steels containing Nickel and Chromium," shows that the addition of molybdenum to nickel-chrome steels raises the Acl point but lowers Ar1. In many cases the Ar point is depressed to 470° C.—Ar"—unless the rate of cooling is very slow. Molybdenum has a more powerful effect than nickel or chromium in reducing the liability to imperfect hardening when the rate of cooling is slow, and reduces the softening on tempering. About 0.5 per cent. of molybdenum is sufficient to bring about most of the possible improvement in these steels. The 'mass-effect' is reduced by the presence of the third alloying element, when the mechanical results show great uniformity even in the biggest forgings. Tests can be repeated with great regularity, indicating that the steels are unaffected by slight departures from standard conditions of treatment. The elastic properties, ductility, and impact value are all improved by the addition of molybdenum, which has the further great advantage that it has a pronounced effect in considerably reducing, or completely eliminating, the susceptibility of the steel to 'temper-brittleness.' Nickel-chrome-molybdenum steels provide the best all-round combination of properties, though nickel-molybdenum and chrome-molybdenum steels approach them nearly. When treated so as to give a tensile strength of 50 tons-60 tons per sq. in., the best composition from these three types of steel—in each case with a carbon content of 0.3 per cent.—are as follows: Nickel-chrome-molybdenum: Nickel 2.6 per cent., chromium 0.6-1.1 per cent., molybdenum 0.6-0.4 per cent.; steels in this range of composition all gave very similar properties when tempered to the same hardness, the higher chromium content being an advantage when a tensile strength of 60 tons per sq. in. or more is required. Chromium-molybdenum: Chromium 1.0-1.5 per cent., molybdenum 1.0-0.5 per cent.; slightly inferior in general properties but gives higher notched-bar impact figures. Nickel-molybdenum: Nickel 2.7-4.0 per cent., molybdenum 0.6-0.4 per cent.; rather better in yield ratio than the nickel-chrome-molybdenum steel but inferior in impact value; when the nickel exceeds 3 per cent., as is necessary to obtain a tensile strength of 60 tons per sq. in., these steels show distinctly lower impact values and also become difficult to machine.