

## Research Items.

**MAYA HIEROGLYPHS.**—Though much attention has been bestowed on the decipherment of the Maya hieroglyphs since a key was supplied by Diego de Landa, the first Spanish bishop, the result, except as regards some numerals, has been disappointing. It is obvious that the way to begin such a study is by an examination of the modern language of the country, as the study of Coptic has helped in ancient Egyptian. Hitherto the grammars of the Maya tongue have supplied an inadequate basis for its study, because their authors, Spanish priests, were ignorant of philology and phonetics and tried to build up a grammar of a primitive language by following the Latin or Spanish models. This naturally led to two classes of defects: unnatural forms were invented to express corresponding ideas in Latin or Spanish, and numbers of native expressions were overlooked because they could not be brought within the European system. Mr. A. M. Tozzer, the first travelling fellow in American ethnology of the Archaeological Institute of America, spent a considerable time in Central America, from 1901 to 1905, and he issued in 1907 a report of his ethnological work. This he has now followed up by a comprehensive grammar of the Maya language on modern lines and a bibliography of the literature. He omits any discussion of the phonetic character of the Maya hieroglyphs, and he deals with the language as unrecorded up to the time of the Spanish conquest. But he justly remarks that any elucidation of the hieroglyphs will be impossible until an advance is made in our acquaintance with their phonetic elements. This in recent years has not advanced in comparison with the gains made in deciphering the numerical parts of the hieroglyphic writing. A successful correlation of the modern Maya language with the hieroglyphs holds out a prospect of success. In this respect Mr. Tozzer's book, forming vol. 9 of the Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University, deserves hearty commendation.

**MARINE MOLLUSCAN FAUNA OF AMERICA.**—A useful summary of the marine shell-bearing molluscs of the north-west coast of America has been published by Mr. W. H. Dall (U.S. Nat. Mus. Bull. 112, pp. 217, 22 plates). In the preparation of this summary the results of more than fifty years' study of the molluscan fauna of the north-west coast have been brought together, Mr. Dall's investigations having begun in 1865. The molluscan fauna of this coast falls into three main divisions—the Arctic, containing many circumboreal species, and extending from the Arctic Sea to the southern limit of drift-ice in winter in the Bering Sea; the temperate, extending from this line southwards to Point Conception, California; and the tropical, from the latter place to Point Aguja on the coast of Peru. The total number of species (excluding nudibranchs and cephalopods) for the region is 2122. The Tertiary and Pleistocene fossils of the shores of Bering Sea afford evidence of a communication with Atlantic waters during the prevalence of more genial conditions. Several species now living in Bering Sea are found fossil in the late Pliocene of Nantucket and the Pliocene of Iceland, and, conversely, the common periwinkle of New England (*Littorina palliata*) is one of the species found in the elevated beaches of Nome, Alaska, and is now extinct on the Pacific coast. The intercommunication between the two oceans would seem to have been tolerably free at the time, though now there are quite pronounced differences between the Greenlandic and the Bering Strait Arctic assemblages of molluscs.

**A PARASITIC AMŒBA WITH PATHOGENIC CAPACITIES.**—Prof. C. A. Kofoid and Dr. Olive Swezy have recently described (Univ. California Zool. Publ., vol. 20, No. 7), under the name *Councilmania Lafleuri*, a parasitic amœba of the human intestine which "appears to have pathogenic capacities." They state that this organism is apparently cosmopolitan in distribution, but has hitherto been confused with *Entamoeba coli* because of its eight-nucleated cyst. The cyst has a thick wall, and in addition to the eight nuclei, each with a large dispersed karyosome, there are in the protoplasm acicular chromatoid bodies, fasciculate or massed in the later phases. The cysts are spheroidal, ellipsoidal, or asymmetrical, and their non-spherical form and the dispersed karyosome are among the characters given to distinguish this new amœba from *E. coli*. In fresh stools the cysts exhibit a process of repeated budding, resulting in the escape of amœbulæ. Protoplasm issues through a minute pore formed in the cyst-wall, a nucleus slips out into the protoplasmic bud, and this bud detaches itself as an amœbula. A new bud is formed and creeps away, and so on until as many amœbulæ have been produced as there were nuclei. The authors are emphatic that this is a normal process. They state that in the division of the nucleus in the cyst eight chromosomes are demonstrable at the metaphase, whereas *E. coli* has only six. In ordinary practice there will be great difficulty in distinguishing the active stages of *Councilmania* from those of *Entamoeba histolytica* and the cysts from those of *E. coli*. The reason for creating the new genus *Councilmania* is not obvious, and is not stated by the authors.

**BUD MUTATIONS.**—That bud sports, or bud mutations, frequently give rise to important new varieties has long been known. Darwin studied many such cases, and Cramer in 1907 compiled an account of all the cases then known. Mr. A. D. Shamel, in a recent publication of the Experiment Station of the Hawaiian Sugar Planters' Association, describes and clearly illustrates many modern instances. He believes that in many plants the selection of bud mutations is quite as important as seed selection in the origination of new varieties. Such occurrences are notoriously frequent among citrus fruits, where many often occur on the same tree, but they are also relatively common and have given rise to new varieties in potatoes, sugar-cane, apples, peaches, and pears, as well as in grapes, plums, strawberries, and a great variety of cultivated garden-plants, such as dahlias, chrysanthemums, roses, and carnations. Less is known concerning the frequency with which they will come true from seed, and this, of course, lessens their evolutionary significance.

**PRESERVATION OF THE KAURI PINE.**—Most of the Kauri pine, *Agathis australis*, the finest conifer south of the equator, has been destroyed in New Zealand by the lumberman. It is satisfactory to learn from the State Forest Report for 1920-21 that a remnant of the primeval forest of this species near Dargaville, 908 acres in area, was acquired by the State last year, and will be preserved intact as the National Kauri Park. An illustration in the report shows the stem of one veteran which is 36 ft. in girth. Other forests, of which the Kauri is an important constituent, need not, however, disappear. Investigations commenced a year ago by Mr. W. R. McGregor show that this species is readily regenerated under the shade of a natural-shelter wood. Complete re-establishment of a felled area requires a period of

twenty-five to fifty years, and is effected by the selection method. With proper precautions against fire, the Kauri forests that remain in New Zealand can be so managed as to yield a rich store of timber for centuries to come. The other important conifers in New Zealand, *Dacrydium cupressinum*, *D. Colensoi*, *Podocarpus dacrydioides*, and *P. totara*, also regenerate vigorously, and the process of their regrowth is in evidence in all situations where fire and grazing are excluded.

**THE MOSS ROSE.**—The origin of the moss rose is the subject of a paper by Major Hurst and Miss M. S. G. Breeze in the current issue of the Journal of the Royal Horticultural Society. It differs from the cabbage rose (*R. centifolia*) only in the much greater development and branching character of the glands on petioles and sepals and the branching of the latter. The cabbage rose has been in cultivation for more than two thousand years, and the earliest record of the moss rose is from Carcassonne, in southern France, where it probably originated as a bud-mutation from the cabbage rose at least as early as 1696. The mossy character has since arisen independently from two other varieties of the cabbage rose. In 1775 the Unique Rose appeared in a garden in the Eastern Counties as a tinged-white variety, and in turn gave rise to the "Unique Moss" through a bud-mutation in France about 1843. The Rose de Meaux is a miniature variety of the cabbage rose which may date from about 1637. A moss mutation appeared from this in the West of England in 1801. Both the moss and cabbage rose are sterile, and there is little doubt that all these derivatives arose from the old cabbage rose as bud-mutations. The records show that at least seven bud-reversions from the moss rose to the cabbage rose occurred in the period between 1805 and 1873. In the half-century following 1788 seventeen varieties of the moss rose appeared, one of which was single and fertile and extensively used in crossing. Twelve of these bud-mutations are parallel to corresponding earlier variations in the old cabbage rose. Bud-mutation is therefore a frequent phenomenon in *Rosa centifolia* under cultivation, and there is, as the authors suggest, a direct connection between this condition and the sterility. The evidence indicates that the mossy character is probably a simple Mendelian dominant.

**THE EXAMINATION OF TEXTILES BY X-RAYS.**—An interesting addition to the many and varied uses of X-rays in the examination of materials has been developed by Messrs. Truesdale and Hayes in the research laboratory of the Dunlop Rubber Co., Birmingham. In the Journal of the Textile Institute, vol. 12, No. 11, November 1921, they describe how, by the aid of radiography, they have studied the movement of the threads in the canvas of a motor-tyre during the several processes of manufacture of the tyre. For this purpose the canvas was specially woven so that every twentieth thread, both warp and weft, had been previously impregnated with a heavy salt. Thus the X-ray photograph reveals a series of squares, the pattern being in the form of a check. The most suitable salt for the purpose was found to be lead chromate formed by precipitation on the yarn by first soaking it in lead acetate and then in potassium bichromate. The X-ray plates or films were placed in actual contact with the material, so that the dimensions of the radiograph were those of the canvas. In the case of a tyre the film was placed inside the tyre, in contact with the first ply, and held in position by spring clips. The X-ray tube was on the outside, and care was taken that the X-rays were normal to the film. As the series of reproduced radiographs shows, the dimensions of the sides and angles of the squares are affected in some of the

processes. By measuring predetermined squares on the radiograph taken after each process the change due to the previous process can be arrived at. The method proves to be an effective means of ascertaining whether the stretch of the canvas threads, resulting from the various processes in the manufacture of the tyre, is within the limits of stretch tolerated by the yarn—a point of extreme importance to the tyre manufacturer.

**PROPAGATION OF EARTHQUAKE WAVES.**—Dr. S. W. Visser, of the Royal Magnetic and Meteorological Observatory of Batavia, has recently issued an important paper on "The Distribution of Earthquakes in the Netherlands East Indian Archipelago during 1910-19, with a Discussion of Time-tables." For several years the tables in use of the times of transit of the primary and secondary waves as recorded on seismometers have been recognised as requiring corrections, and both Geiger and Gutenberg in Germany and G. W. Walker in this country have made definite suggestions towards this end. By a detailed discussion of the earthquakes having their origin near Batavia, Visser has been able, by means of a careful examination of the records obtained at distant stations, to draw up new sets of tables so far corroborating the suggestions already made, but carrying out the corrections much more completely and through the whole range of distances from the epicentre. The corrections of the primary times of transit are most conspicuous in the range from 50° to 100° arcual distance, being an increase of as much as 10 seconds at the distance of 60° or 70°. In the case of the secondary times of transit the corrections are more in evidence, being a decrease for small arcs (less than 50°), an increase for larger arcs (up to 70°), and a marked decrease for arcs greater than 80°. Visser also discusses what seems to be the manner of propagation of the waves which enter the nucleus of the earth, and gives general support to the views expressed by Knott in his recent paper on the propagation of earthquake waves. In the light of the corrections now supplied it will be necessary to recalculate the forms of the seismic rays, especially for the secondary waves. Visser fully bears out the conclusion already come to that the primary wave ceases to be recorded at distances greater than about 110°, but finds evidence of their reappearance beyond 140° with a retarded time of transit.

**HARMONIC DEVELOPMENT OF TIDAL THEORY.**—Dr. A. T. Doodson, of the Tidal Institute, University of Liverpool, has just published in the Proceedings of the Royal Society (A, vol. 100, p. 305, 1921) a paper on "The Harmonic Development of the Tide-generating Potential." Since 1883 the development given by Sir G. H. Darwin has been universally used and has proved of remarkable value, but the assumption usually tacitly made, that no terms not included in his schedule need be considered in tidal prediction, has been shown by work at Liverpool on tidal observations to be unjustified. It was therefore decided to make a new development in which, in view of the possibility of terms being magnified by resonance, great accuracy has been striven after. All terms the coefficients of which exceed one ten-thousandth of the leading term are included; this degree of accuracy is unnecessary for practical tidal work, but the needs of research were also kept in mind. Unlike Darwin's development, which was algebraic and founded on the old lunar theory, referring everything to the orbit rather than to the ecliptic, the present work is essentially numerical and strictly harmonic; Brown's new lunar theory is taken as the basis of the development. Many terms which are too large to be ignored for modern purposes, but do not occur in Darwin's schedule, have been found.