

## Research Items.

**ORIENTAL SEALS.**—Mr. I. M. Casanowicz has issued, in vol. 69 of the *Proceedings of the U.S. National Museum*, an illustrated descriptive catalogue of a selection of the ancient oriental seals in the Museum. The collection consists of about 90 originals with flat plaster casts made from them and upwards of 200 casts of seals lent by private owners to the Museum for the purpose of making casts from them in the laboratories. The selection has been made with the view of showing a representative series of the artistic types and the mythological subjects of the seals. They come for the most part from Mesopotamia and Asia Minor and in date range from the early Babylonian to the Persian period.

**PHYSICAL TYPES AND CULTURES IN AMERICA.**—In Part 3, vol. 55, of the *Proceedings of the American Philosophical Society*, Dr. Aleš Hrdlička puts forward an answer to the problem, frequently propounded, of the relation of physical type to type of culture in America. The main pre-Columbian cultures are: The Moundbuilders and the Pueblos in the United States; the Toltecs, Aztecs, and Mayas in Mexico and Central America; and the Chibcha, Chimú, Nascas, Kechua, and Aymara in South America. There is no physical proof of the impact of accessions from outside which influenced any of these cultures. So far as is known, the peoples of these cultures were just Indian and nothing more. Any contact there may have been was so small as to leave no physical trace. Resemblances to other peoples, e.g. those accepted by Quatrefages, Ten Kate, Rivet, and Sullivan, which were held to point to Australian and Melanesian admixture, are either due to old basic relationship or individual variations which are no proof of racial admixture. The pre-Columbian Indians, however, were not all of one type. There were at least four main types: (1) Older dolichocephals—many of the tribes from South America to Mexico and California; (2) older brachycephals (Toltec type), Central America and Ecuador down the coasts of Peru to North Africa; (3) later dolichocephals—Algonkin and most Iroquois; (4) the later brachycephals—Athapaskan tribes on the west coast from Alaska to North Mexico. Relating skull form to culture we find the Moundbuilders were partly Toltec, partly Algonkin; the Pueblos are mostly dolichoid, with here and there a strong dominant element of older brachycephals. The old Aztecs were a branch of the older dolichocephals, but the Aztecs of the Empire were a conglomerate; the Mayas were a pure sub-type of the older brachycephals. The Incas were also a conglomerate: the coast people were of Maya type; the mountain peoples old dolichocephals. It appears that it is the older brachycephalic type which has developed the higher cultures; but the Aztecs, Aymara, most of the Pueblos, and the main element of the Kechua were of the older dolichoid type. The newer dolichocephals give the Iroquois with their relatively high culture, and the newer brachycephals are responsible for some of the cultures of the north-west coast. There appears, then, no special connexion between the cultures and the physical type of the Indian.

**COURTSHIP IN SPIDERS.**—In three recent papers (*Ann. Mag. Nat. Hist.*, 9, 18, 113; *Proc. Zool. Soc.*, 1926, part 2, p. 318, and part 4, p. 1125) Mr. W. S. Bristowe and Mr. G. H. Locket have made some contribution to our understanding of the process of courtship in spiders. The keen-eyed wolf-spiders, Lycosidae, have been seen waving their decorated legs and palpi before the female. It is suggested that the males are made to begin their display by the

scent of the females and that the scent organs are situated at the tips of the legs and palpi. Crab-spiders, Thomisidae, are less keen-sighted and caress the female by tickling her as they walk over her. Among web-spinning spiders courtship is carried out by vibration of threads of the web on which the male plays, and induces the female to come out from her retreat. Some species of female show no reluctance and this display is much reduced. Mr. Locket deals very ably with the popular ferocity of the female, and shows that while it may be the rule for some, with others a common life may occur. The authors see a dual purpose in these pre-coital activities, *recognition* and *stimulation*. The necessity of stimulating the female has long been pointed out by others, and to this is now added the necessity that the female shall recognise the male so as to distinguish him from edible prey. *Realisation* would be a better term than recognition, for a virgin female cannot recognise that of which she has no previous experience. Realisation may be produced by the same physiological changes which, continuing, result in eagerness or a state of stimulation, the 'two purposes' of courtship being, in fact, inseparable.

**ANTARCTIC ECHINOIDEA.**—The sea-urchins collected by the Australasian Antarctic Expedition (1911-1914) have now been reported on by Prof. R. Koehler. There are only 21 species and a variety, and they belong to 11 genera all previously known. The new forms are distributed in the following genera: Notocidaris, 1 species, 1 variety; Goniocidaris, 1 sp.; Sterechinus, 1 sp.; Echinostoma, 1 sp.; Pourtalesia, 2 spp.; Abatus, 1 sp.; Antipneustes, 4 spp. *Goniocidaris impressa* n., from Maria Id., *Notechinus novaezealandiae* Mortensen, from Macquarie Is., and *Echinostoma australe* n., from 35° S. 135° E., are not Antarctic. The discovery off Adélie Land of *Abatus cavernosus* (Philippi), *A. shackletoni* Koehler, and *Pseudabatus nimrodi* Koehler, considerably extends the known range of those species. Antipneustes is a name that replaces Amphipneustes Koehler 1901 to avoid confusion with the unknown Amphipneustea Wiegmann 1837; some of the species are remarkable for the size of the brood-pouches in the female. It is unfortunate that the young individuals contained in some of the pouches were not preserved well enough for study. Indeed the harvest of echinoids, especially among the more interesting but fragile heart-urchins, would have been much richer had it not been for careless packing. The report ends with a complete list of the eleutherozoic echinoderms found up till now in the antarctic and subantarctic regions.

**MARINE CRUSTACEA OF THE ANTARCTIC.**—The Commission dealing with the scientific results of the Belgian Antarctic Expedition has just issued a report on the Edriophthalma ("Rés. Voyage de la *Belgica* en 1897-99," Zoologie, Tanaidacés, Isopodes, et Amphipodes. Anvers, 1926). The determination of the species was entrusted to Bonnier on the return of the expedition, but the work was interrupted by his death, and not until now, more than twenty years later, has it been possible to complete the examination of the material. As M. Th. Monod, who undertook the task, justly remarks, owing to this long delay in working out the results many of the species brought back by the *Belgica* were rediscovered and described by the later expeditions to the Polar seas—by the *Southern Cross*, *Français*, *Pourquoi Pas?* *Discovery*, *Terra Nova*, and *Gauss* in the Antarctic, and by the *Ingolf* in the Arctic. But although the publication of these various reports has considerably

reduced the number of the *Belgica* species new to science, it has given M. Monod a unique opportunity of collating all the evidence on the geographical distribution of these polar forms. Taking the parallel of 60° S. as approximately the limit of the antarctic and subantarctic fauna, Monod enumerates 15 species of tanaids and 133 of isopods collected by the different expeditions, including the *Challenger*. 21 out of the 27 isopod species of the *Belgica* fall into this category, 8 of them taken by the *Belgica* alone—seven being new to science, and one, *Astacilloechus Ingolfti*, recorded also from the Arctic by Hansen. The isopods form the most important part of the collection. 2 tanaid species, 1 new, and 1 new amphipod are also recorded, together with 11 other species, including the ubiquitous *Jassa falcata* and *Leucothoe spinicarpa*. The new species are defined, and the paper is well illustrated throughout with careful detailed drawings.

**MILK OF THE MONOTREME.**—Milk obtained from an echidna (*E. aculeata*) has been examined by Mr. Hedley R. Marston (*Australian Jour. of Exper. Biology and Med. Science*, vol. 3, pt. 4, Dec. 1926, p. 225). The specific gravity was 1.023. The proteins consisted of a casein with albumin and globulin. Carbohydrate was present as lactose. The fat was pure triolein, and glycerides of soluble volatile fatty acids were absent. The figures obtained were (per cent.): Total solids, 36.75; casein, 8.4; albumin and globulin, 2.9; lactose, 2.81; fat, 19.62. Compared with cow's and human milk, the total protein and the fat are both very high and the fat is peculiar, but the figures are approached by those of rabbit's milk, which contains 12.0 and 13.5 per cent. of total protein and fat respectively. The author remarks that either the young echidna must store fat during the lactating period, or must be endowed with an extraordinary power of oxidation of fatty acids, otherwise extreme acidosis would follow consumption of a diet so rich in fat.

**MOLLUSC AS AGENT IN THE SUGAR-CANE ROOT DISEASE.**—Dr. Paul Bartsch and Mary E. Quick have been studying the small snail which, by penetrating worm-burrows and feeding on the root of the sugar-cane in Louisiana, admits infection with resulting decay of the root (*Jour. Agric. Res.*, vol. 32). The authors have successfully identified this snail with the well-known and widely distributed little *Zonitoides arboreus* (Say). This is demonstrated by means of careful comparison of its detailed anatomy with that of specimens of *Zonitoides arboreus* taken from their normal habitat under decaying bark, where their food consists largely of mycelial threads of fungi. The little animals appear to be largely nocturnal in their habits. Excellent figures of the animal, its shell, and its anatomy are given.

**CONSTITUTION OF THE EARTH.**—The latest issue (vol. 1, No. 8) of the *Geophysical Supplement* to the *Monthly Notices of the Royal Astronomical Society* is devoted entirely to seismology and geodynamics. One paper, by L. F. Richardson, is concerned with the design of vertical seismographs. H. H. Turner deals with the seismological observations of *P* and *S* for the five years 1918–1922, during which the times for *P* and *S* have been compared in the *International Seismological Summary* with the adopted tables of times; the comparisons are summarised and discussed for epicentral distances less than 120°. The paper raises several new questions which must be left for later investigation. The other two papers are by H. Jeffreys; in one he rediscusses the seismic disturbances which have been best observed at short distances, and concludes that the outer layers of the earth's crust consist of about 12 km. of granitic

material above a basaltic layer about 25 km. thick. No further great change of material appears to occur down to a depth of about 1000 km. The velocities of compressional waves in the two outer layers are estimated at 5.6 km. and 6.2 km./sec., that in the sub-basaltic layer being 7.8 km./sec. His other paper deals with the viscosity of the earth; the lithosphere is shown to be practically non-plastic, while even in the rest of the rocky shell the time of relaxation is as high as two years. The forces tending to produce secular displacement of the earth's crust (chief among them being the equatorial drift) are incapable of causing important distortion of the lithosphere during geological time, but might give appreciable bodily displacement of the lithosphere over the interior. A region stripped of granitic material by the separation of the moon would probably persist. The viscosity found for the lower parts of the shell would not preclude convection currents.

**MAGMATIC DIFFERENTIATION.**—A paper on the Katmai magmatic province, by C. N. Fenner (which appears as a supplement to the *Journ. Geol.* for Oct.-Nov. 1926), is a most notable recent contribution on the origin of igneous rocks. A large number of analyses of Katmai rocks has been made, and the variation diagram indicates an almost linear variation of the oxides over a wide range of silica percentages. It is shown that differentiation by the separation of successive crystalline phases gives a broken and scattered diagram of very different and more complex form. Presumably, therefore, this process has not operated to any appreciable extent in the evolution of the Katmai rocks. There is, indeed, no known process which is competent to provide a linear variation, though Dr. Fenner suggests that volatilisation as a transporting agent is more likely to fulfil the requirements than gravitational sinking of crystals or squeezing out of residual fluids. In the course of the paper the origin of micropegmatite and graphic intergrowths is discussed; the field evidence for differentiation in different classical regions is surveyed; and many examples of the indubitable action of volatile fluxes are described. It is concluded that the operation of a variety of processes is indicated, and that Bowen's scheme of crystallisation differentiation cannot be accepted as having anything approaching the almost universal applicability that has been claimed for it in recent years.

**THE FRACTURE OF QUARTZ BY HEAT.**—We have received from Mr. Bernard W. Holman a copy of a paper read by him before the Institution of Mining and Metallurgy on Jan. 20, on "Heat-treatment as an Agent in Rock-breaking," together with further photographs illustrating the paper. An examination of Roman and other ancient fire-workings shows that the fragments of quartz are mostly in the form of a granular sand, and not of angular cracked fragments, as would be obtained if a fire were built against the face and water used for quenching. The granules are often cubical. Laboratory experiments show that disintegration at the transformation point, 575° C., gives granules and not splinters. Gentle pressure on a correctly heat-treated specimen gives thin laths of silky transparent quartz, often with finely toothed edges. Quartz from different sources gives varying results, and some specimens become fragile even when quenched from 300°. Only a few varieties will give the silky laths, which are the most friable form of quartz. A change in the dielectric constant is observed at as low a temperature as 340°, and the temperature at which disintegration begins varies over a range of 20°. It is suggested that the results may have a bearing on the nature of the allotropy of quartz.

It should be noticed, however, that disintegration in quartz may occur at low temperatures through the expansion of gases and vapours contained in the cavities, the extent of the cracking depending on the rate of heating, and this fact may account for some of Mr. Holman's results, without assuming any allotropic change other than the well-known transformation at 575°.

**THE CREATION OF MATTER.**—At the meeting of the Mathematics and Natural Philosophy Section of the Academy of Sciences of Vienna on Dec. 16, a communication was received from Dr. Arthur Haas on the increase of frequency of light quanta which impinge on swiftly moving particles of matter. The quantum and the particle are supposed to move in opposite directions and the quantum on impact has its direction of motion reversed. In these circumstances, when the speed of the particle is of the order of the speed of light, the frequency of the quantum may be so raised that the quantum is converted into a proton doublet with a wave-length of 0.013 tenth metres. As an example, the case of a particle moving with half the speed of light may be taken. The frequency of the quantum is then trebled by the impact. The author points out that the above leads to the possibility of a cosmical reconstruction of matter out of light quanta.

**THE SCHOLES BOMB CALORIMETER.**—A bomb calorimeter of the type originally introduced by Berthelot, embodying a number of new mechanical features, and suitable for the determination of the calorific power of solid and liquid fuels, has been placed on the market by Messrs. G. Cussons, Ltd., of Manchester. The bomb body, cover, and most of the details of the calorimeter are made of stainless steel and are machined from the solid billet. A small spanner is employed to screw the cover-nut home, and the body and base are screwed together by hand. The cover of the bomb forms the base on which the bomb stands, and the ignition rods (one of which acts as a support for the crucible cradle) are attached to the base. A form of self-sealing rubber ring, which is isolated from the combustion zone, and has been found to remain in perfect condition after more than 200 determinations of calorific power, prevents escape of oxygen or products of combustion. Oxygen enters the bomb through a spring-loaded non-return valve and is discharged through a screw-down valve. The device obviates the necessity for a gland and stuffing-box. Attachment of the ignition wire to the ignition rods is effected by insertion of the wire in slots, in which it is secured by movable sleeves. The chamfered edge of the sleeves acts as a wire cutter, effecting economy of the nichrome wire used in firing the charge.

**RADIOGRAPHIC EXAMINATION OF COAL.**—We have received a portable stereoscope and some stereoscopic X-ray photographs of coal, coke, and quartz, taken by Messrs. Kemp and Thomson, Technical Radiological Laboratory, 20 Laverockbank Road, Edinburgh. X-ray stereoscopy is, of course, very familiar in medical radiology, and its utilisation for the present purpose is of interest in providing another illustration of the uses of X-rays in industry. In the case of coal the photographs reveal the extent and distribution of the 'free' mineral ash of relatively high density. The authors have also applied X-ray methods to the study of the 'jig-washing' of coal, whereby the extraneous stony and shaly matter is mechanically separated out from the clean coal.

**THE BURNING OF GASES IN NITROUS OXIDE.**—The scanty chemical literature relating to the burning of

gases in nitrous oxide is considerably extended by the recent communication to the Manchester Literary and Philosophical Society by Prof. H. B. Dixon and W. F. Higgins, of the results of their investigations of the burning of hydrogen, methane, ethylene, propylene, and acetylene in nitrous oxide. Davy's generalisation that combustible bodies require a higher temperature to ignite in nitrous oxide than they do in oxygen is not confirmed, all the gases tested having *lower* ignition points in the former gas than in either oxygen or in air. These ignition points correspond with temperatures below that at which the thermal decomposition of nitrous oxide is appreciable. The length of a hydrogen flame is increased about twelve-fold and its diameter about two-fold when the air in which the gas burns is replaced by nitrous oxide. The spectrum of the flame in nitrous oxide is continuous from red to violet with the 'steam' lines well marked. The red tinge in the flame at ordinary pressures is due to the formation of nitrogen peroxide. The paper contains tables of the respective ignition points of hydrogen in nitrous oxide at pressures between 150 mm. and 1000 mm. of mercury, and of ethylene and propylene in nitrous oxide and oxygen at 150 mm.-1000 mm. pressures.

**THE SEPARATION OF RADIOACTIVE SUBSTANCES.**—J. Kendall, E. R. Jette, and W. West have published details of the application of ionic migration methods to the separation of mesothorium-1 from barium, in the *Journal of the American Chemical Society* for Dec. 1926. The separation depends on the fact that the respective ions have different mobilities, and that during electrolysis the faster ion will gradually concentrate in front of the slower, an accumulation of radioactive material being shown by an increase in the activity per unit weight. By introducing other ions in suitable concentrations to keep the boundary sharp, and incorporating the greater part of the solution in agar gel, much more rapid and convenient separation is effected than by fractional crystallisation. Since mesothorium-1 is isotopic with radium, it is possible to apply exactly the same method to the separation of radium and barium, as it is known that isotopic ions have identical mobilities. The fact that the ions of mesothorium-1 and radium have greater mobilities than the barium ions shows that the increase in ionic mobility with atomic weight is continuous throughout the whole alkaline earth group.

**THE VALUE OF TANK TESTING.**—The value of the method of ship model testing in experimental tanks initiated by William Froude at Torquay in 1868 has been proved over and over again. Such testing gives the designer a mass of useful data and settles the form of hull and propeller to give the best results. But as Pepys said long ago, "It seems worthy of note how small things are sometimes found to mar or mend a ship's quality of sailing." The importance of minor details was really the theme of Mr. G. S. Baker's paper, "The Economy of Tank Testing of Ship Forms and Research in Ship Propulsion" read on Jan. 28 to the North-East Coast Institution of Engineers and Shipbuilders. The points dealt with included the form of the shaft webs and brackets; the bossing and direction of rotation of the propellers; the shape and section of the blades. At first, tank testing was confined to the determination of the factors which make up the resistance of war-ships in still water. It was extended to the study of propellers by R. E. Froude and to merchant ships by Messrs. Denny. In the National Tank, of which Mr. Baker is director, during the years 1924-26, no less than 80 designs were tested, and in an appendix to the paper are notes on the results.