

RESEARCH ITEMS

Early Cult Figures from the Indus Valley

SEALS showing the figure of an unidentified deity found at Mohenjo-daro have been identified tentatively by Sir John Marshall as Śiva-Paśupati, but Saletore regards them as representations of Agni. The latter would weigh in favour of the Aryan hypothesis of Harappa cultural origins in the Indus Valley. Agni has no counterpart in the pre-Aryan cultures known to us. The argument in favour of the identification with Śiva rests in part on the character of the trident-like head-dress, which Saletore maintains does not represent Śiva's trident. This head-dress is regarded by A. Aiyappan (*J. R. Asiatic Soc. Bengal, Letters*, 5, 3; 1940) as the key to the understanding of the nature of the religious representation intended by the seals on which the figures appear. Taken as a group, there can be little doubt that the sculptor intended to show two, not three, horns. Agni is shown as three or four horned, and though he is likened to various animals such as bull, steed, winged bird, or goat, nowhere is there any suggestion that he should have a pair of buffalo or bison horns. To the ethnologist the head-dress is full of interest. Its various forms find counterparts in the head-dresses of modern Indian tribes, the Bison-horn Gonds, the Koyas and Savaras of the Eastern Ghats and the Naga tribes of Assam. That of the Kalyo Kongyu warrior of the Naga Hills is almost a modern copy of that of the Mohenjo-daro figures. The meaning of the latter can only be gathered if considered from the ethnological angle, though identity of significance must not be postulated. Nevertheless, it would appear from modern instances that there are rites allocated with fertility and buffalo cults which still exist among many tribes and even Hindu castes in a vestigial and attenuated form but may well have been a living cult when the culture of Mohenjo-daro flourished. The Mohenjo-daro deity does not possess many attributes of the Śiva of modern Hinduism, but his most fundamental qualities are suggestively indicated—the horns suggesting the trident and fertility, the phallic aspect and the pose and surroundings of Śiva's yogic characteristics.

Studies on Reef Corals

VOL. 2, No. 1, of the Palao Tropical Biological Station, Tokyo, 1940, includes several papers on reef corals dealing with growth, biochemistry and environment. S. Motoda contributes three: "A Study of Growth Rate in the Massive Reef Coral *Goniastrea aspera* Verill", "The Environment and the Life of the Massive Coral, *Goniastrea aspera* Verrill", and "Comparison of the Conditions of Water in the Bay, Lagoon and Open Sea in Palao". K. Hosoi in his work on the biochemistry of the coral has investigated the "Occurrence of Iodine in the Polyp of *Funigia actiniformis* var. *palawensis* Döderlein, the Distribution of Nitrogen in the Protein of the Polyp, and the Amount of Calcium and Carbonate in the Skeleton". N. Abe writes on the growth of the same species and its environment. Interesting observations are made by Motoda on

Goniastrea in which he finds that the actual living polyps are eaten by certain fishes. This coral when transplanted to the reef margin was much damaged by being bitten by fishes, although this did not take place in its natural habitat. The author also observed that the reef fishes in the aquarium of the Laboratory frequently pick the living polyps of the reef corals until these lose the soft bodies and are killed. Also he states that it is seen when diving that many small reef fishes are picking upon the surface of the living corals. Although, as other observers have maintained, it may be that the fishes are feeding on the algae growing on the corals, these new observations appear to show that the fishes do eat the actual polyps. In addition to the studies on corals there is a paper on the "Oligochæta from the East and West Carolines, South Sea Islands" (I) by S. Ohfuchi, and one on the "Luminescence of the Fishes belonging to the Family Leionathidæ of the Tropical Pacific" by Y. Haneda.

Measurement of Solar Radiation

A PAPER on the measurement of solar radiation for ecological work has recently appeared (Bericht über das Geobotanische Forschungsinstitut Rübel in Zürich für das Jahr 1939. Von E. Rübel und W. Lüdi. Pp. 152. Zürich: Geobotanische Forschungsinstitut Rübel, 1940). It describes a dozen different sorts of commercially produced apparatus (mostly unfamiliar to the reviewer) some intended to measure the total energy of radiation, others particular wave-lengths, and yet others the total energy over a period. The principles and limitations of each apparatus are discussed, and should enable a reader with a definite problem to choose his apparatus. The other papers deal with the changes observed in some quadrats of alpine grassland over a century, the alpine vegetation of Mt. Etna (both treated statistically), and a very brief paper on pollen analysis.

Nomenclature of Fungal Genera

MYCOLOGISTS, as the custodians of nomenclature in one of the most dynamic groups of living organisms, have the duty of critical review of their taxonomic groups, as knowledge about the systematics of their subject increases. A committee of the British Mycological Society has been appointed to perform this work, and the third of its "Nomina Generica Conservanda" has recently been published under the name of E. M. Wakefield, secretary to the Committee (*Trans. Brit. Mycol. Soc.*, 24, Pts. 3 and 4, 282-293; Dec. 1940). This deals, among other questions, with the nomenclature of *Daldinia*, *Dothidella*, *Agaricus* and *Psalliota*, *Septoria* and *Ramularia*. It is necessary that someone should work through the mass of what would be dreary detail for most workers. The recommendations of the committee are usually trenchant; only in its consideration of *Agaricus* versus *Psalliota* has it lost the determination to return from the established *Psalliota* to the valid *Agaricus*.

Intergeneric Hybrids of Saccharum

E. K. JANAKI-AMMAL (*J. Gen.*, **41**, 217-254; 1941) has described intergeneric hybrids of *Saccharum* with species of *Narenga*, *Erianthus*, *Sorghum*, *Zea*, *Bambusa* and *Imperata*. The variety and number of these hybrids together with their morphology and fertility provide astonishing and most valuable information regarding the possibilities of hybridization involving a high polyploid, such as is found in *Saccharum*. The present paper describes: (1) the cross *S. spontaneum* ($2n = 112$) with *Erianthus ravenneae* ($2n = 20 + f.$). The F_1 has 66 chromosomes and is fertile and gives rise to diploids, triploids and tetraploids. Segregation of *Erianthus* characters occurs among the diploids. The chromosomes of *S. spontaneum* form bivalents, by autosome synthesis in the F_1 , and may form trivalents with some of the chromosomes of *Erianthus*. The sugar content of the diploid F_1 is lower than in *S. spontaneum*. (2) The cane *POJ2725* arose from continued crosses of *S. spontaneum* with *S. officinarum* ($2n = 80$) and has $2n = 106$. When this plant was crossed with *Imperata cylindrica*, thirty-five seedlings with fairly high sugar content were obtained. These were (a) vegetative seedlings and resembled the maternal parent, (b) selfed or parthenogenetic seedlings with 108-112 chromosomes, (c) triploid self seedlings ($2n = 156$), and (d) true hybrids ($2n = 120-134$). Seedlings from this last category segregate for *Imperata* characters. (3) In crosses of *S. officinarum* with *Zea Mays* ($2n = 20 + 1B$), one hybrid which survived had 52 chromosomes and remained dwarf and has not flowered. Novel characters, not present in the parents, are seen in the hybrid.

South African Geology

THE country around Potchefstroom and Klerksdorp is one of the most interesting districts of the Transvaal, including, as it does, all the principal geological formations from the Witwatersrand to the Coal Measures of the Karroo, with the exception of the Waterberg system. The area has been described in detail by L. T. Nel and others in the "Explanation of Sheet No. 61", recently published by the Geological Survey of South Africa. The extraordinarily thick Witwatersrand system was accumulated above a denuded and subsiding surface of the Older Granite, occasional pebbles of which have been found in the lower Witwatersrand grits. A second unconformity comes between the Witwatersrand and the Ventersdorp lavas and is particularly marked in the Klerksdorp area. A third break is found at the base of the Transvaal system, which was deposited on a comparatively flat surface like that of a peneplain. After the close of this period the older rocks were subjected to regional folding and erosion. Long afterwards the Coal Measures of the Karroo system were deposited. Most of these flat-lying beds have been since removed by denudation, and the underlying structure is seen to be a major syncline of Transvaal sediments with older formations arched up on both sides. The axis curves round the Vredefort dome, part of which appears in the south-eastern corner of the area mapped. As the Older Granite which occupies the central portion of the dome is older than the Witwatersrand system, it must have been raised as a solid plug through a vertical distance of thousands of feet. The origin of this unique structure, with its associated overturning of the surrounding rocks and the production of pseudotachylyte, has aroused wide

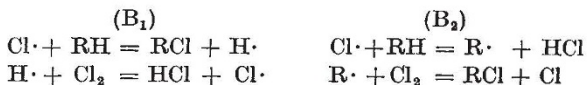
discussion. Dr. Nel, however, is obliged to admit that a complete solution of the tectonic problem cannot yet be claimed. The memoir contains an important review of the magnetic anomalies in the Witwatersrand system, petrological details of the many igneous rocks of the area, and a full account of the economic products, with special reference to gold and water supplies.

Heavy Oxygen

THE fact that oxygen in air has a somewhat higher atomic weight than that in water was discovered by Dole in 1935, and the difference has since been measured by several observers. There is still some uncertainty attached to the results owing to (1) the still imperfectly known degree to which different natural waters differ in density, (2) the possibility of variation of the same source of water at different times, (3) the possibility of different isotopic separations during the purifications. The rapid and complete exchange of oxygen in many inorganic salts with the solvent water suggests that the Dole effect could be measured by this method, and some experiments with sodium dichromate have been reported by O. R. Alexander and N. F. Hall (*J. Amer. Chem. Soc.*, **62**, 3462; 1940). Exchange experiments were made with water synthesized from atmospheric oxygen and Lake Mendota water as standard. The results showed that the excess density due to air oxygen is $7.65 \pm 0.2 \gamma d$ with Madison city water regarded as normal and $7.1 \pm 0.2 \gamma d$ with Lake Mendota water regarded as normal. The oxygen of the dichromate was somewhat heavier than that of the lake water and much lighter than that of the air water. These experiments thus substantiate the Dole effect.

Reactions of Atoms and Free Radicals in Solution

IT appears that substitution and displacement reactions in organic chemistry fall into two groups in which the reaction proceeds by (A) an ionic or polar mechanism and (B) atomic or free radical. The photochemical (peroxide catalysed) chlorination of a hydrocarbon is a familiar example of a B-type reaction with two possible mechanisms with the chlorine atoms produced in the primary process:



The substitution of chlorine for hydrogen on the asymmetric carbon atom of an optically active compound by process B_1 would result in Walden inversion with retention of optical activity, whilst the reaction according to process B_2 would yield an optically inactive *dl* product if a free radical with an appreciable half-life period is formed. H. C. Brown, M. S. Kharasch and T. H. Chao (*J. Amer. Chem. Soc.*, **62**, 3435; 1940) have investigated the photochemical chlorination of primary active amyl chloride from this point of view. Six possible isomers result from the introduction of a second chlorination, and it was necessary to isolate the 1,2-dichloro derivative and examine it for optical activity. This could be done by careful fractional distillation, and the product was found to be optically inactive, thus indicating that substitution occurred by process B_2 . The other products of the reaction were also investigated, and the two isomers not previously reported were isolated.