

RESEARCH ITEMS

Third Gujarat Prehistoric Expedition Finds

PREVIOUS reports on the third Gujarat Prehistoric Expedition, by H. D. Sankalia and I. Karvé, have already been noticed in *Nature*. The latest report is on "The Human Remains Discovered so Far", and is by I. Karvé and G. M. Kurulkar (Research Institute, Deccan College, Poona. *Times of India Press*, 1945). The general sequence as outlined previously has not been modified. Separated by thick sterile deposits from lower palaeolithic gravels, there occur levels containing pigmy implements and bone splinters, some of them perhaps shaped. Towards the top of these levels pottery appears and increases in amount, while at the same time the quantity of microliths grows less. The same kind of thing occurs in rock-shelter sites in the Central Provinces. As regards the skeletons found, some little information is vouchsafed, and there are a few not very clear illustrations. Physical anthropologists, however, will probably not be entirely satisfied with the account given. Doubtless a more complete description will be given when the investigations have been concluded.

Light from Glow-worms

In an article entitled "Contribucion Al Estudio Del Espectro De La Luz De Las Luciernagas" (*Pub. Fac. Ciencias Fisicomat.*, 3, No. 4, Universidad Nacional De La Plata, December 1944), Rafael Grinfeld describes his experiments and the results obtained by examining the light of glow-worms. Prof. Grinfeld constructed a small spectrograph at the Institute of Physics of La Plata, with which it was found that the spectra of the light emitted extended continuously from the red (7100 Å.) to the green-yellow (5120 Å.), and the green-blue (4900 Å.). The maximum obtained coincided very approximately with the maximum sensitivity of the human eye. A considerable amount of space is devoted to an examination of the theories of luminescence, and special attention is given to the theory advocated by Dubois in 1885, that luminescence is due to the reactions of luciferase and luciferin. In a luminous organ, light is produced by the entry of hæmolymph, or blood containing luciferin, to the area containing luciferase. More recent research has tended to confirm Dubois's theory, and reference is made to Harvey's discovery in 1916 that in the cases of the American glow-worms *Photuris* and *Photinus*, and the Japanese *Luciola* and *Cipridina*, analogous effects to those observed by Dubois are in evidence.

Cell Polarity

E. W. SINNOTT (*Amer. J. Bot.*, 31, 388; 1944) has examined the cell divisions of the developing fruits of *Cucurbita*. These fruits range in the relationships of lengths and widths. Growth had been shown to be much more rapid in the plane of length as compared with that in the width plane in those fruits which were elongated. The author shows that the similarity of the mitotic figure is correlated with the direction of growth. The orientation of the telophase axis closely approaches that of the actual division, but the anaphase and metaphase axis do this with less exactness. This suggests that the mitotic figure rotates to its final position. This position is determined by the cytoplasm. This cytoplasmic polarity is the first visible expression of the morphogenetic

control. A visible result of this cytoplasmic pattern is shown by E. W. Sinnott and B. Bloch (*Proc. Nat. Acad. Sci.*, 30, 388; 1944) in the regeneration of *Coleus* after partial severing of the stem. Those pith cells from which xylem strands are formed exhibit lignification in the secondary walls, with peculiar contours which may include several cells at once. There is a relation between groups of cells in the regeneration of a particular structure. The similarity to lines of force, Liesegang rings and colloidal properties is striking.

Gastric Cancer in Mice

By hybridization followed by inbreeding, L. C. Strong has produced a strain of mice (*NHO*) which developed gastric cancer on injection with methylcholanthrene (*J. Nat. Cancer Inst.*, 5, 339; 1945). Eight generations of these mice were injected with methylcholanthrene, and they were selected for resistance to tumour formation at the site of injection. Mice of later generations of the strain developed gastric cancer spontaneously. Dr. Strong suggests that the carcinogenic agent has been responsible for bringing about a germinal mutation that causes a susceptibility to the development of gastric cancer. Methylcholanthrene would thus have a twofold effect: (1) converting somatic tissue into gastric carcinoma; and (2) changing the germ plasm so that the character of the gastric mucosa is changed. Injection with methylcholanthrene appeared to raise the mutation-rate; thus four obvious mutations were observed in 1,500 mice injected with the carcinogen, while only eight mutations have been seen in 210,000 normal mice. In discussing the paper, D. F. Jones and H. B. Andervont suggest that the result might have been due to selection. Apart from the genetical problems involved, the animals developing gastric cancer should be of value in cancer research.

Rust-resistant Clover

LATE-FLOWERING varieties of subterranean clover in Australia are frequently attacked by the rust-fungus *Uromyces trifolii*, but early maturing types are not susceptible. K. Loftus Hills has shown (*J. Counc. Sci. and Ind. Res.*, Canberra, 17, (2), 74; 1944) that resistance to the disease is an inherited character. The late variety, Mt. Barker, was crossed with the early kind, Mulwala, and, in the third generation, both early and late immune segregates were obtained. These also possess, to a large extent, the agricultural value of the parents.

Seedless Fruits

THE role of growth-regulating substances in the production of seedless fruits has been included in the general review of the action of these substances by J. van Overbeek (*Ann. Rev. Biochem.*, 13, 631; 1944), where the work of Gustafson in particular is summarized. Work upon this specific subject, however, is reviewed by P. Maheshwari (*Sci. and Culture*, 6, 85; 1940), who includes many references to Japanese work (especially that of Yasuda) not often referred to by the American workers.

Solanum Grafts

L. R. Detjen (*Proc. Amer. Soc. Hort. Sci.*, 43, 147; 1943) describes an uncompleted experiment of exceptional interest on *Solanum* grafts. 'Earlianna' tomatoes were grafted on to *Datura stramonium* L., *Nicotiana tabacum* L., *Solanum tuberosum* L., *S. nigrum* L. var. *guineense*, and *Lycopersicon esculentum*

Mill. In each case the flowers of the grafted plants were self-pollinated and the resulting seed saved and sown. No seed was available from the '*S. nigrum*' plants, but seed from the other plants showed notable differences in germination rate, and the resulting seedlings showed differences in vigour, those from the '*Datura*' seed being most and those from the '*Nicotiana* plants' being least, vigorous.

The Drakensberg of Natal

THE great wall of the Drakensberg, forming the western boundary of most of Natal, is a spectacular erosion scarp which is as old as South Africa itself, since its development began when Gondwanaland was dismembered in the late Jurassic. The origin and evolution of this striking feature is described by L. C. King (*Trans. Geol. Soc. S. Africa*, **47**, 255; 1945). Emission of the Stormberg lavas provided a volcanic landscape which became well planed in the Basutoland region at about 5,000 ft. above sea-level. When the outline of South Africa came into existence, this 'Jurassic' land surface, remnants of which can still be recognized, was tilted southwards in Basutoland, and eventual east and west drainages were shed from a divide near the eastern coast. The short eastern drainage soon developed a steep slope or scarp facing seawards. This was the ancestral Drakensberg, with its initial site probably near the axis of the Natal Monocline. From the Cretaceous to the Miocene, both drainages developed widely planed landscapes; but owing to the shorter distance to the sea, the eastern system had the advantage and gradually forced back the asymmetrical divide not only against the original 'Jurassic' surface, but also against the 'High Veld Miocene' surface that was being produced by the western drainage. Thus the Drakensberg of northern Natal separates the two 'Miocene' surfaces of the High Veld and Natal, while the southern and higher part separates the Natal surface from the Basutoland plateau. During the Miocene, South Africa was uplifted and the chief cycle of erosion terminated in the coastal region. But in the upper reaches of the river systems it has continued up to the present day, steadily forcing the Drakensberg to the west, while later cycles have been progressing up the rivers. No younger cycle has ever reached the escarpment and will not do so, according to King's estimates, for about ten million years. The Drakensberg has already receded more than 100 miles at an average rate of about 1 ft. in 230 years.

High Rupturing Capacity Fuses on Medium-Voltage Circuits

A PAPER read by R. T. Lythall in London last year before the Institution of Electrical Engineers reviews the problems of excess and fault current protection in so far as they may be solved by the use of high rupturing capacity fuses, or by developments based upon these fuses. A brief commentary on non-tripping and tripping types of fuses and on the fault-clearance ability of the cartridge fuse is followed by consideration of the various forms of protection afforded. A survey is made of future possibilities, with special reference to a scheme for open-circuit protection, a new time-limit fuse with an accuracy equal to that of the high rupturing capacity cartridge fuse and which may supersede the overload coil with a shunt fuse, and a solution of the earth-fault protective problem. The paper also considers the selection of fuses for different duties, the economics of fused switchgear, and the need for fuse designers to attempt a greater measure of standardization.

Magneto-Hydrodynamic Waves and Sunspots

WITHIN the last two years, Hannes Alfvén has dealt with a new theory of sunspots, and has provided a summary of the results of his investigations (*Mon. Not. Roy. Astro. Soc.*, **105**, 1; 1945). In approaching the sunspot problem he postulates the existence of the magnetic field which is always associated with sunspots, and assumes that this field is the primary phenomenon. If there is a magnetic field over a certain region of an electrically conducting atmosphere, the hydrostatic pressure within this region is decreased by the magnetostatic pressure, and this decrease in pressure explains the cooling of the spot. For hydrostatic equilibrium in the solar atmosphere the density of matter at a certain level must be always the same, and as a consequence a static equilibrium is possible only if the temperature in the magnetic field is lower than that outside it. As a spot magnetic field cannot be produced near the surface of the sun, it is supposed to originate near the centre of the sun, from which it is transmitted outwards along the magnetic lines of force of the sun's general magnetic field. This transmission is effected by a new type of wave, the 'magneto-hydrodynamic wave', with a velocity of the order of one metre per second, so that it reaches the solar surface in about forty years, producing strong magnetic fields there. The wave front intersects the solar surface at high northern and southern latitudes, proceeding later towards the equator, and this affords an explanation of the wandering of the spot zone from high to low latitudes. Comparison of a 'sunspot zone progression curve' with theory enables certain conclusions regarding the sun's general magnetic field to be drawn. It appears that the sun's dipole moment is between 1.5×10^{33} and 6.2×10^{33} gauss cm.³, and that the boundary between the dipole field and the homogeneous field lies within 2.4×10^{10} cm. from the centre. This second result implies that the currents responsible for the solar magnetic field are essentially situated inside one third of the solar radius—a view which is not unreasonable from other considerations.

Determining Position During Flight

In a paper entitled "Method of obtaining an Astrofix employing only Sextant, Chart and Short Tables of Predetermined Calculations" (*Mon. Not. Roy. Astro. Soc.*, **105**, 1; 1945), J. H. Clarke shows how to obtain position lines at right angles and parallel to great circle routes. Before the flight, it is necessary to calculate the altitude of a selected star as observed from the place of departure at the instant of its crossing the great circle route. During the flight another observation of the star's altitude is made at a time as near as possible to the predetermined G.M.T. of its transit, and the difference between these two altitudes gives the distance run along the great circle route, from which a position line is obtained at right angles to the route. To obtain a position line parallel to the route, before the flight a calculation of the altitude of a suitable star is made when its azimuth is 90° different from the direction given by the great circle. During the flight the altitude of the star is taken when it is as near as possible to this second predetermined time. The difference in altitudes enables a position line to be drawn. If any of the observations are taken a minute or two before or after the proper G.M.T., corrections can be applied by means of a precomputed table. The method has the great advantage in necessitating only the minimum amount of calculation during the flight.