Research Items

Human Hair and Primate Patterning.—A study of the puzzling problems presented by the human hair has been made by Dr. Gerrit S. Miller and is published by the Smithsonian Institution (*Misc. Coll.*, vol. 85, No. 10). Most solutions offered assume tacitly that all the peculiarities of the human hair arise from man's special constitution and its reactions to the natural environment or to the artificial conditions that man has imposed upon himself; for example, that bareness of skin comes from the habit of wearing clothes; that baldness comes from barbers and wearing hats; that greyness is due to the lessening of bodily energy which goes with increasing civilisation and 'domestication', and so forth. These solutions do not take into account the zoological possibility that many features of the human hair may be generalised primate traits instead of specifically human developments. In other words, they may be special examples of 'patterning', a tendency which attains its greatest development in the primates. Human hair patterning shows itself more conspicuously in the head than on the limbs and body. It is not exactly duplicated in the head of any of the other primates, but all the elements can be found rarely in non-human members of the tribe. In man, both sexes have certain elements in common, but the females' pattern differs in the extension of the bare area over the whole of the base and the sides of the face. The first step in baring the forehead is shown in one of the Celebean macaques, while the essentially human forehead can be seen in the orang. Among non-human primates a bare or nearly bare area round the mouth is usual, while the extension of the bare area to the cheek is seen in the great apes. Yet some, such as the orang and the African guenon, have a beard like a male Caucasian or an Australian. Similarly, baldness, turning grey, and other features, as well as racial differences in man, can be shown to be instances of patterning.

Contact Modifications in Language.—M. A. Meillet, in a study of the modifications which result when a people changes over from one language to another (*Scientia*, vol. 5, Jan. 1932), points out that the student of the history of languages who confines his attention solely to the language which has survived runs the risk of over-simplification. A language may preserve intact the linguistic type of the tongue from which it derives its morphological characters, as the morphology of the French language contains no elements which are not derived from the Latin, and yet show the effect of influences to which it has been subjected. In the area that is now France two changes of tongue have taken place within historic times. Further, there are elements in French which can be explained as belonging to neither the Gallic nor the Latin tongues; they must be derived from a language spoken before the introduction of the former in the millennium before Christ. One of the effects of the introduction of Latin into Gaul was that a considerable proportion of the population must have become bilingual; and a second period of bilingualism followed after the invasion of the Franks. Of the latter there is evidence in, for example, the inverted form of interrogation after the German model "Kommt er?"; the use of *on* = *man*; the use of *rien* from Latin *rem* = *nicht*; the retention of *h*, features none of which was present in Latin. A second modification was the use of one language to express the mode of thought of another, as at the present day in certain localities German thought is expressed in a Slavic language. There is also the matter of accent, as the Provençal retains the Provençal or Gascon pronunciation of the vowels as opposed to the standard of Paris and the north. Further, tendencies in the earlier language may be inherited and influence the development of the derivative language. Thus certain progressive modifications observed in the Celtic tongue seem to have been carried over and to appear as tendencies influencing the development of French.

Four-Tusked Elephants.—During recent years there have been several newspaper discussions regarding the possible occurrence of large elephants with four tusks. Field observation tended to show that a few such specimens had been seen. J. G. Dollman has now revised the whole question (*Nat. Hist. Mag.*, Jan. 1932), and shows that various examples are known of abnormally grown tusks, which, springing from a single root, have split into several branches, sometimes quite distinct from one another. Sir Frank Colyer has suggested that sometimes such abnormal growth may have arisen from a divided tooth germ, and that many are doubtless due to injury of some sort—the passage of a bullet or the splitting of the tusk during the prising up of a tree root. It seems likely that such cases may parallel the cases of four-tusked elephants which have been recorded in the field, and that a true duplication of tusks (although mirrored duplication is a common enough form of abnormal growth amongst some animals) has so far not been proved for the tusks of an elephant.

The Elutriator in Biology.—The *Proceedings of the Linnean Society of London*, part I, 1931-32, contains a brief account of Mr. A. G. Lowndes's paper on the possibilities of the use of the elutriator in biology. This simple instrument depends on the use of different velocities of water current to effect a grading and separation of the finer particles of a powdered substance, but it is obvious that the method has considerable possibilities in comparing the swimming powers of various fresh water organisms. Mr. Lowndes describes the behaviour of various organisms he has studied. Two species of *Daphnia* with different powers of swimming could be completely separated in the elutriator, and the method would seem to have a wide range of usefulness, both in separating the organisms from mud or silt and in effecting some separation of the organisms from one another. It may also provide a useful method of studying the behaviour of various organisms which attach themselves to a substratum in various stream strengths.

Research on Tobacco.—In the fifty-fourth Report of the Connecticut Agricultural Experiment Station (*Bulletin* 326) an account is given of experiments dealing with various aspects of the tobacco industry. The practice of topping and suckering the plants is recognised by growers as producing better leaf growth, and the investigations showed that these processes, if properly carried out, would also accelerate the ripening of the leaves, reduce the liability of the plant to wilt and encourage root growth. Tobacco normally produces large numbers of seeds per plant, and the ease with which sufficient seed is obtained has led to a lack of attention being paid to its quality. Trimming the inflorescence, however, so as to allow only a limited number of pods to develop, was found to result in an increase in the weight of seed produced. Leaving some of the upper leaves on the stalk until the pods were mature had a similar effect, and since the

first formed pods in the centre of the inflorescence yielded the heaviest seeds, their selection is recommended. A study was also made of the effect of temperature and humidity on the rate of the process of curing and the quality of the final product. Relative humidities less than 70 per cent or more than 90 per cent were found unsuitable, the best results being obtained with 80-85 per cent humidity at a temperature of 95° F. for early and 85°-90° F. for late pickings.

Algæ in the South Indian Cretaceous.—Mr. L. Rama Rao, Central College, Bangalore, recently recorded the occurrence of *Lithothamnion* in some of the limestones of the South Indian Cretaceous (NATURE, **128**, 225, Aug. 8, 1931; **128**, 873, Nov. 21, 1931). He has since sent a further communication, in which he says he has now recognised algæ in the flints and cherts of the Niniyur (Danian) stage—especially in a band of flints from about a mile south-east of Sendurai. Some of the flints are 'pebbly', nearly 2 cm. in diameter, and, under the microscope, are seen to consist of patches of algæ. Others, which are more massive, reveal broad patches of algæ. *Lithothamnion* is common, while several other types of algæ occur. Before silicification, the rock appears to have been largely of the nature of an algal limestone.

Sedimentation in Coral Reef Regions.—The rate and nature of the sedimentation in coral reef regions is of importance with regard to their formation, and has been the subject of careful studies by Mayor, Vaughan, and others. The latest research is by S. M. Marshall and A. P. Orr, published by the British Museum (Natural History) in vol. 1, No. 5, of the *Great Barrier Reef Reports*. Bottles were placed down on the surface of the reef in different positions and in the anchorage to 3·6 m. Their contents were collected weekly, the contained sediments weighed and graded into size percentages. The loss by solution in 1 in 3 hydrochloric acid in the different grades was calculated, together with the further loss by ignition, and the ash residue. The percentage of the latter is small in the larger grades of sediment, but in the smallest shows varying amounts, 8-29 per cent. It is not clear whence this ash is derived. Almost the only organic material in the same are the frustules of diatoms, the bulk of the ash presumably being carried in suspension from the neighbouring high lands. Three hand borings were driven down to 15 ft. through the surface of the reef, and showed mud with little sand below 6 ft. This result was unexpected, the coral reef being a mere capping of a mud shoal. The ash in this mud varied up to 37 per cent, increasing in amount with depth. The last part of the paper contains experiments as to the effect of sediment on living corals. These show that the reef corals when helped by water movements are able to deal with any ordinary amount of mud or sand falling upon them. Coral colonies with large polyps and branching corals are best able to clean themselves, the immense *Fungia* polyps when buried from above almost seeming to "climb through 6 cm. of sand unaided". Ordinarily, sediment coming from below, due to movement of sand along the reef surface, "kills in a day or two all the polyps thus covered". We are hence driven to conclude that in protected situations within reefs there is little likelihood of coral colonies being killed by the deposition of sediment. Another explanation thus becomes necessary to explain the barrenness of such areas so far as coral growth is concerned.

Displacement Pumping of Oil-wells.—The evolution of production methods as applied to lifting oil from the reservoir after it has ceased to flow naturally has been marked by stages in which ordinary pumping, bailing, and swabbing have gradually given place to gas lift, at least in the penultimate phase of oil-well history. The effect of gas lift is to postpone the time when it is necessary to put the well 'on the beam', as it is termed, that is, the recovery of oil by direct pumping. Actually gas lift is practicable from the first sign of initial decline of oil-flow in the well until either running pressure and rock pressure are equal or until input oil to gas ratio becomes such that the practice has to be discontinued for economic reasons. In the circumstances the search has been for a method which would practically eliminate pumping altogether, for some mechanism which would make it possible to produce oil from the well by appeal to compressed air or gas when other forms of gas lift were impracticable. Displacement pumping, using air, has been known as a hydraulic process for raising varying quantities of fluid over moderate lifts for a long time; the 'displacement pump', of a type now adapted to oilfield work, is a comparative new-comer in this field, the operating medium being either gas or air. It is claimed that this method of bringing oil to the surface is practicable until the well has entirely exhausted itself, to the exclusion of the direct pumping stage altogether. A great deal of experimental work has been done in achieving this notable result in oil-well engineering, and the Institution of Petroleum Technologists was fortunate in learning about displacement pumping from such an able exponent of production technique as Mr. Albert Millar, whose paper was read on Feb. 9.

Artificial Disintegration of Aluminium.—The fields close to atomic nuclei can be investigated both by experiments on the scattering of α-particles and by experiments on artificial disintegration. In the case of aluminium, data obtained in both ways now exist, and are summarised and discussed by J. Chadwick and J. E. R. Constable (*Proc. Roy. Soc.*, Feb.). The scattering experiments, due to Riezler, fix the extension of the region within which α-particles are attracted by the nucleus and the height of the potential barrier at this point at about 5×10^{-13} cm. and 8 million electron-volts. Chadwick and Constable's extensive new experiments on the disintegration of aluminium by the α-particles from polonium show that within this barrier there are at least four energy levels into which α-particles can be captured. Their value is in the neighbourhood of five million electron-volts, and each is associated with the ejection of two groups of protons. The same picture also accounts for the production of γ-rays when aluminium is bombarded by the α-particles from polonium, and predicts that their energy should be about 2·3 million electron-volts, which is identical, within the limits of experimental error, with the results of the direct observations of Webster.

Moving Coil Reproducers and Flexible Disks.—Dr. N. W. McLachlan has recently discussed details of moving coil reproducers (*Phil. Mag.*, Jan. 1932). He determined the modulus of elasticity of paper and used it to compare the stiffness of conical sheets and disks of the same radius. The combination modes of a reed-driven paper disk are determined, and a comparison with theory shows that the paper must be heterogeneous. The exact solution for a reed-driven disk vibrating in a vacuum without loss is found. The case of a coil-driven circular aluminium disk was examined experimentally, and it was shown that the frequency band occupied by the first symmetrical mode is only five cycles. With constant current in the coil the output at resonance is about

two thousand times greater than at non-resonant frequencies. The author analyses the influence of the magnetic field upon the output and upon the coil impedance of the reproducer. It is shown that the oscillation of a coil driven by an alternating current in a non-uniform magnetic field is accompanied by a motion of translation, and he points out that this is akin to the process of the rectification of an alternating current. A series of impulse records is shown giving the natural damped oscillations of moving coil reproducers of the horn and large diaphragm kind. He deduces that their field of utility lies in the determination of the main symmetrical mode in the upper register and the low-frequency modes associated with the 'surround' constraint.

Physical Properties of Nitrobenzene.—Mazur has reported (NATURE, **126**, p. 993; 1930) a sharp fall in the dielectric constant of nitrobenzene, an arrest in the heating curve (*ibid.*, **127**, p. 741; 1931), and a sharp change of slope in the density-temperature curve (*ibid.*, **127**, 893; 1931) at a temperature about 4° above the melting point, and the inference to be drawn from these results would be that there are two forms of liquid nitrobenzene. Massy, Warren, and Wolfenden (*J. Chem. Soc.*, Jan.) describe experiments on the viscosity and density of nitrobenzene at various temperatures which show no such discontinuities. The density curve is a perfectly straight line and shows no trace of the discontinuity reported by Mazur. Since the dielectric constant is intimately connected with the degree of orientation and capacity for free rotation of the dipoles of the medium, it is to be expected that the viscosity curve should show a break corresponding with the break in the dielectric constant curve reported by Mazur. Here again no trace of a break was found, the curve being a straight line.

Kolbe's Reaction.—The mechanism of the formation of hydrocarbons by the electrolysis of salts of organic acids, discovered by Kolbe in 1849, has been the object of a considerable amount of investigation. On electrolysing potassium acetate solution, for example, ethane and carbon dioxide are formed. Matsuda (*Bull. Chem. Soc. Japan*, Jan.) finds that an oxidising substance is formed during the electrolysis, which he identifies as hydrogen peroxide. He considers that acetyl peroxide is the primary product of the reaction at the anode, most of it being decomposed in the earlier stages of the electrolysis as follows: $(CH_3.COO)_2 = CH_3.CH_3 + 2CO_2$. It may also be hydrolysed into peracetic acid and acetic acid, or into hydrogen peroxide and acetic acid. The hydrogen peroxide will be decomposed in the alkaline solution, so that its amount will begin to decrease at a certain point in the electrolysis. The relation between the formation of hydrogen peroxide and the *p*H value and concentration of the solution were studied.

Astronomical Topics

Geological Studies of the Moon.—The surface of the moon is now known in such detail, thanks to excellent photographs and persevering telescopic study, that it is possible for the geologist to trace the steps of the formation of many of the features. Prof. O. Matousek, of the Charles' University, Prague, read a paper a year ago before the Geological Society of America, which is printed in the *Pan-American Geologist*, vol. 54. The Sinus Iridum is the region examined; a diagram shows the various systems of faults, which divide themselves into groups in various directions, the parallelism of each group being very close. Two remarkable dislocations are indicated, in each of which a large region appears to have suffered a lateral shift of several miles. One is in the eastern cape, Heraclides; this is sometimes compared to a woman's head; the portion corresponding to the face has been shifted towards the north-west. The other dislocation occurs in the middle of the coast-line of the bay, producing a conspicuous little promontory. Several of the faults are marked by rows of small craters, and the author considers that in these cases at least the craters are genuine volcanoes.

Another diagram shows a vertical section of the bay, the strata being arranged in a manner deduced by the author from a study of the faults, which appear to have caused vertical displacements as well as horizontal ones. The floor of the bay is supposed to be the result of a great lava inundation.

Mr. W. Goodacre read a paper at the February meeting of the British Astronomical Association on a long cleft which he has detected in the south-east region of the Mare Humorum; it does not appear to have been noticed before. It is probably a similar formation to some of those studied by Prof. Matousek.

Spectra of *B*-type Stars.—A useful contribution to the study of stellar spectra of type *B* has been published by Dr. O. Struve (*Astrophys. J.*, **74**, 225). Thirteen stars, covering all the sub-types from O_9 to B_8, have been investigated for the purpose of obtaining a reasonably complete list of wave-lengths and origins of absorption lines in these stars. A list is given of 379 lines between λ3820 and λ4924, of which 130 are newly identified with known elements. Only 73 still remain unidentified. Wave-lengths are given to 0·01 A., and origins (in the case of blends) appear in the order of probable importance of the components. Estimated intensities on an arbitrary scale of 1 up to 10 (excluding hydrogen lines, which may be so high as 50) are given for ten typical stars. An investigation is also included of the contours and intensities of the helium lines. Both neutral and ionised helium lines show an expected broadening by the Stark effect, but the relative intensities of He I lines vary in a curious manner. The intensity ratio singlet/triplet is at a maximum at type B_2, decreasing both towards type *O* and (more slowly) towards type B_9.

Annuaire Astronomique Camille Flammarion.—This attractive annual (Paris: Ernest Flammarion, 1932. 12 francs) is full of useful information: there are sunspot statistics from the beginning of the century; ephemerides and other information about the planets—it is well to point out that the ephemeris for Pluto, quoted from *Lick Bulletin*, is for the equinox of 1900; this is not stated in the *Annuaire*; the correction for precession is $1\frac{3}{4}$ minutes of time, which would cause difficulty in identifying such a faint body. An omission in the diagram of future eclipses may also be pointed out; this extends to 1950, but omits the important Norwegian eclipse of July 1945. There are diagrams of the important occultations of the year, which include several of the Pleiades and one of Regulus. There are also tide tables, and comet statistics, which are kept up to date by M. F. Baldet. The stellar information is very full; there are reproductions of stellar spectra, and diagrams of the light-curves of variables. There are star maps for each month, with notes on the phenomena of each month. The book deserves a place on every astronomer's table.