Research Items

Pithecanthropus—Man or Gibbon ?

THE arguments put forward by Dr. E. Dubois in support of his view that *Pithecanthropus erectus* is to be regarded not as a man, but as a genus allied to the gibbon (see NATURE, Feb. 13, p. 291) have been examined and met by Prof. W. E. Le Gros Clark (*Man*, April 1937). The evidence of the volume of the endocranial cast provides no ground for inferring kinship between two animals because their cerebral development is different. Dubois' startling conception that the brain in its phylogenetic development grows discontinuously by doubling its size at each stage rests on quite inadequate observation. The endocranial capacity of *Pithecanthropus* may be assumed to be somewhere between 900 c.c. and 1000 c.c., and of *Sinanthropus* I at 915 c.c. Yet Dubois, while insisting that *Pithecanthropus* is gibbon, accepts Peking man as human. *Pithecanthropus* even comes within the range of modern man, of whom examples have been noted with a cranial capacity of about 833 c.c. A number of features in the endocranial cast of *Pithecanthropus* indicate a human status. Such are the convolutional pattern of the frontal lobes, which are more complex than in the apes, and the extremely simple fissuration of the brain, while the 'association areas' must have been incomparably more extensive than in the anthropomorphous apes, and the expansion of these areas can only be related to the development of mental attainments distinctive of the Hominidæ. The characters of the femur, which Dubois takes to indicate the gibbon status of *Pithecanthropus*, are open to serious question. Not only does the palæontological evidence not support his prejudice against the view that the Trinil femur is human because this implies that the frame of man reached its perfection for pedal progression long before his brain attained its present complex structure, but also the arboreal habits believed to be related to other characters of the femur are not proved conclusively. The evidence of the lower jaw fragment from Kedung Brubus is so questionable that it scarcely deserves serious consideration.

Arctic Birds in New Zealand

A SHORT but extremely interesting list of arctic birds which spend the northern winter in New Zealand has been compiled by R. A. Falla, covering fresh records since Oliver's paper in 1930 (*Rec. Auckland Inst. Mus.*, 2, 1 ; 1936). They include fourteen species, of which the two most common forms in New Zealand are bar-tailed godwits (*Limosa lapponica baueri*) and knots (*Calidris canutus*). Others are two species of skuas, turnstones, Asiatic golden plover, three species of sandpiper, Asiatic whimbrel, two species of phalarope. Considering the small number of expert observers in New Zealand and the wide expanses which must go unnoticed, the list promises that further work is likely to add many names to this wandering fauna. As a rule, the migrants arrive about October in winter plumage, and set out on the return journey in April, when the adults have completed a pre-nuptial moult. Mr. Falla considers that birds of the year, which have not completed their post-juvenal moult in April, do not migrate, but spend the southern winter in New Zealand. The northern movement of the adults in April, however, bears upon Prof. Rowan's suggestion that increasing daylight is the stimulus which sets the migratory movement in motion, for on the contrary these New Zealand wintering birds undergo the physiological changes associated with migration, and commence migration while the days are shortening.

Studies of Species of *Silene*

E. M. MARSDEN-JONES and W. B. Turrill have continued their investigations on the genetics, life-histories and ecology of *Silene vulgaris* (*S. Cucubalus*) and *S. maritima* in the seventeenth paper of the series "Researches on Silene maritima and S. vulgaris" (*Bull. Misc. Inform.*, *Kew*, 45–53, 1937). In this paper, the genetical relationships of a Welsh mountain plant are discussed on the basis of controlled selfings and crossing with typical *S. maritima* and *S. vulgaris*. The Welsh plant is classified taxonomically as a variety of *S. maritima*, but shows a number of aberrant characters which suggest either previous contamination with *S. vulgaris* or the retention of more ancient phenotypic character combinations than now usually found in coastal populations. Analyses are given of the genetical behaviour of a large number of crosses, and some are compared with results obtained in earlier researches. The importance of this series of papers is that a very full knowledge of two species of plants is being obtained from many points of view : cytological, ecological, genetical, phyto-geographical and taxonomic. When the work that has been planned is completed—and it is well in hand—the real make-up and history of these two species will probably be better known than for any other species of wild plants.

New Species of Algæ

ON the Templeton Crocker Expedition of the California Academy of Sciences 1932, a number of algæ were collected from thirty-two stations, principally among the Galapagos Islands. W. A. Setchell and N. L. Gardner of the University of California are working out this collection. They have published a preliminary account of the new species, varieties and combinations that have been identified up to the present (*Proc. California Acad. Sci.*, 22 ; 1937). The new species already amount to 45 (18 Myxophyceæ, 1 Chlorophyceæ, 3 Melanophyceæ and 23 Rhodophyceæ). Collections along the coast of Lower California are also interesting in extending farther south the known distribution of many Californian species. The authors hope to publish the full account shortly.

Variation of Wind with Height

A DISCUSSION of the variation of wind with height at Wadi Halfa (Sudan), by J. Durward, is the subject of Professional Note No. 72 of the Meteorological Office, Air Ministry. The direct observation of upper

winds by pilot balloons is being extended into many parts of the world where the average values of those winds were formerly deduced from cloud movement, or from maps of computed pressure distribution at different heights deduced from observed surface pressure and assumed upper air temperature, and it is interesting to see to what extent observation supports theory. Wadi Halfa lies just inside the tropics, and is several hundred miles from the nearest point on the Red Sea. Were it not for its continental position, the predominance of winds from between north and north-east noted up to a height of about 4,000 feet might be described as appropriate for a place in the north-easterly trade-wind belt of the northern hemisphere, but these winds are better classified with the etesian winds of the Mediterranean and Egypt. At Wadi Halfa the wind from December to February generally backs with increasing height above 4,000 feet and normally blows from about north-west between 10,000 feet and 13,000 feet. In Shaw's "Manual of Meteorology" (2, p. 259 of 1928 edn.) is shown a map of normal pressure at a height of 4,000 metres (13,000 feet) due to Teisserenc de Bort, and on it the isobars run from about west-south-west to east-north-east. If the wind follows the isobars at that level there is therefore an apparent discrepancy of nearly 70° between observation and theory. Observation in this case covers one year only, but that is held to be a long enough period in which to obtain normal winds at Wadi Halfa, where the constancy of the pressure gradient throughout the year is remarkable and the wind is in consequence remarkably steady.

New Method in Geometrical Optics

IN a series of memoirs, starting in 1890, A. Gullstrand has made a deep investigation into the properties of optical systems, and in particular has put forward the thesis that no optical instrument can give a point-to-point correspondence between two surfaces, but that there are, on each surface of the object space, two systems of lines that can be represented point by point in the image space. Unfortunately, Gullstrand's methods are very complicated. Boegehold and Herzberger managed to simplify them in a particular case, that of his "fundamental law". Now C. W. Oseen ("Une méthode nouvelle de l'optique géométrique", *Kungl. Svenska Vetenskap-sakademiens Handlingar*, Tredje Serien, 15, No. 6 ; 1936) has given a general method, based upon contact transformations and their invariants. Because the calculations have a character independent of the choice of co-ordinates, all the terms introduced have a geometrical or optical significance. This new method gives a large part of Gullstrand's results, in some cases making them almost obvious, and also gives other results not previously obtained. Oseen comes to the conclusion that Gullstrand's theory of representable lines is not general, and that there really is an optical image corresponding to any surface of the object space. He attributes Gullstrand's failure to reach this conclusion to the illegitimate assumption that the ray always cuts the surface considered at an angle different from zero.

Diameter of Lightning Discharge

THEORIES of the processes taking place in a lightning discharge channel involve the size of the channel, but the experimental evidence on this point has been confused. B. F. J. Schonland (*Phil. Mag.*, March) has been able to examine a photograph of a lightning flash taken at short range (about 250 metres) which enabled him to make a direct estimate of the diameter of a discharge. Successive strokes of the flash were separated by the wind, and may readily be distinguished on the photograph—there were about ten strokes separated by intervals of about 0·05 sec., so that the whole flash lasted about ½ sec. The negative was sufficiently free from over-exposure and halation to allow a determination of the discharge diameter, the distance of the flash from the camera being known. The values found ranged from 23 cm. for the heavy first strokes to 11 cm. for weak branch strokes. There is a discussion on the question whether these figures represent the actual diameter of the electrical core of the discharge.

Further Atomic Transmutations by Means of γ-Rays

THE production of radioactive isotopes by bombarding elements with an intense beam of γ-rays from lithium recently reported in these columns (NATURE, 139, 555 ; 1937) has been further extended (W. Bothe and W. Gentner, *Naturwiss.*, 25, 126, 191; 1937). The isotope of bromine ^{78}Br has been obtained, with a half-life of 3·5 min. Silver gives ^{106}Ag with a half-life of 24 min. Zinc gives a nucleus with a half-life period of 38 min., probably to be identified with ^{63}Zn. Gallium gives two isotopes, ^{70}Ga and ^{68}Ga, with half-life periods of 20 min. and 1 hr., respectively. Tantalum gives ^{180}Ta with a half-life of 14 min. In some cases radioactive isotopes were produced which have not yet been identified. Thus molybdenum gives a nucleus of half-life 17 min., and antimony gives one with a half-life of 13 min., which is probably ^{120}Sb. Indium gives either ^{112}In or ^{114}In with a half-life of 1 min., and tellurium either ^{127}Te or ^{129}Te with a half-life of 1 hr.

Lead-Uranium-Thorium Ratio in Uraninite

RECENT investigations show that the composition of a single crystal of uraninite may not be uniform throughout the crystal. C. M. Alter and L. A. Yuill (*J. Amer. Chem. Soc.*, 59, 390 ; 1937) have now examined a single well-developed crystal of uraninite from the Wilberforce locality weighing approximately 42 gm., which was divided into three parts, outer, middle and core, by filing each face down an equal amount, the particles of steel being removed magnetically. Determinations of the lead-uranium-thorium ratio of the sections confirmed the variation of composition disclosed in previous work, in which the sections were removed by solution in acid. The ratio Pb/(U + 0·36Th) was 0·1668, 0·1678 and 0·1864 for the outside, middle and core, respectively. The higher ratio in the core is unusual, and the ratios are different from those found previously with other crystals. The discrepancy in age using the data for the whole crystal and those for the core amounts to approximately eighty million years, while the discrepancy between the ages calculated for the whole crystal and the outside portion is about forty million years. The age of the mineral, as calculated by a formula given in the paper, is 1,100-1,200 million years, so that the relative error is not so serious, although the results emphasize the need for careful selection of material in order to obtain reliable data for age calculations. Erroneous results may be obtained by the analysis of a single crystal if the whole crystal is ground and analysed.