

and short exposures with his coronagraphs met with success. Beautiful structure is displayed in the regions of the solar poles, and the equatorial streamers are extensive and full of detail. These photographs also exhibit a "minimum" type of corona, corroborating the observations of the other parties; they are of considerable value as records and for future study, and form the main contribution to solar physics which this eclipse has afforded.

Although the astronomical results of my party were chiefly negative, we managed to get together at odd moments a collection of specimens for the Natural History Museum at South Kensington, the Botanical Gardens at Kew, and the Physic Garden at Chelsea.

In concluding this account, I should like to place on record in this institution the fine way in which the volunteer observers of my party worked in sometimes very trying circumstances; the magnificent assistance rendered by the captain, officers, and men of H.M.S. *Encounter*; the great liberality of the Orient Steam Navigation Company in again transporting out and home all our instruments, baggage, &c., free of charge; and lastly, the assistance of many individuals who at various stages of our journey made matters as easy as possible for us.

THE RELATIONSHIP OF NEANDERTHAL MAN AND PITHECANTHROPUS TO MODERN MAN.¹

THE more the remains of Neanderthal man are studied, the more it becomes apparent that Prof. Schwalbe is right in regarding this Pleistocene race as being totally distinct from all existing races of mankind. It is true that Neanderthal man in some characters, for instance, the teeth, shows a certain degree of specialisation, but in the vast majority he is infinitely more simian than any race now living. He serves in some degree to carry human history towards an ape stage. Those who believe that modern man has been evolved in a comparatively brief and recent geological period are inclined to accept the Neanderthal type as representative of mankind of a late stage of the Pleistocene epoch, and to suppose that modern man has been evolved from the more primitive type since that date.

Two lines of research have rendered such beliefs untenable. All the remains of Neanderthal man so far discovered in France and Belgium are referable to a limited and late part of the Pleistocene epoch. The flint implements and accessory evidence show that Neanderthal man flourished in Central Europe during the Mousterian and earlier part of the Aurignacian periods. All trace of this type then disappears; the races which immediately succeed it are of the modern type; the evidence points to an extermination of the ancient or Neanderthal type early in the Aurignacian period.

In those long stretches of the Pleistocene epoch—the Acheulean and Chellean—which precede the Mousterian period, and are characterised by flints of great beauty of workmanship, no trace of Neanderthal man has been found in Europe. The remains which have been discovered show that the Europeans of the Chellean and Acheulean periods were of the modern type. Lately, M. Rutot, of Brussels, has tabulated a list of the human remains which he regards as referable to pre-Mousterian periods, and in every case these belong to mankind of the modern type.

Prof. Keith reviewed the evidence relating to the

human mandible found by Boucher de Perthes at Moulin Quinon in 1863, and came to the conclusion that it was an authentic document. Boucher de Perthes found it in a stratum containing implements of the Acheulean period. The mandible is peculiar in form, but is clearly of the non-Neanderthal type. No trace of Neanderthal man has been found in Italy, but human remains of the modern type have been found in Lombardy and Tuscany in strata which in point of formation long preceded the Mousterian period.

The most convincing evidence of the early existence of the modern type of man is to be found in England. The Galley Hill remains from the 100-ft. terrace of the Thames Valley are at least Chellean in date; according to M. Rutot they are much earlier. The fragmentary Bury St. Edmunds skull, of which Prof. Keith has lately made a minute examination, is of the modern type, and in point of date belongs to the Acheulean period. The human skeleton lately discovered by Mr. J. Reid Moir beneath a stratum of weathered chalky Boulder-clay near Ipswich is much older than the Galley Hill remains, yet in all its characters the Ipswich skeleton represents the modern type of man.

The only remains of man so far discovered in Europe which certainly antedate the Ipswich skeleton is the Heidelberg mandible, which must be assigned to the oldest part of the Pleistocene epoch. The Heidelberg jaw clearly formed part of the skeleton of a primitive form of Neanderthal man. On the evidence at present available, it must be inferred that two types of man were in existence in Europe during the Pleistocene epoch: (1) the Neanderthal type, represented by the Heidelberg mandible, near the beginning of that epoch, and by the various skeletons found in Belgium and France near its end; and (2) the modern type, represented by remains of many races belonging to the inferior, middle, and superior formations of the Pleistocene epoch. It is evident, too, that the point at which these two types of mankind emerged from a common stock must be assigned to an earlier date than most anthropologists are inclined to admit at present—probably to the older part of the Pliocene period.

That the modern type of man must be of great antiquity is evident from the degree of divergence which is to be seen amongst existing races of mankind. All the evidence at present at our disposal indicates that human races change very slowly in their physique; to produce the negro of Africa and the fair-haired European from a common stock clearly demands a very long period of time. Of all the races now existing in the world, the native Australian most nearly approaches the type which might serve as a common ancestor for African and European. He combines the characters of each, and at the same time has certain features which link him to the Neanderthal type. At least such a surmise serves as a convenient working hypothesis.

The structural differences between the Neanderthal and modern types of man are similar in nature, although somewhat less in degree, than those which separate the gorilla from the chimpanzee. Those two anthropoids are more nearly related structurally than is usually supposed. There is a similar differentiation among the modern gibbons of the Far East and among the extinct Miocene gibbons of Europe. The siamang and Paidopithecus represent the gorilla or Neanderthal form; the gibbon and Pliopithecus correspond to the type represented by the chimpanzee and modern man. In all these groups of higher Primates the same process of evolution seems to be at work.

Although the results of more recent inquiries place

¹ From Hunterian Lectures delivered at the Royal College of Surgeons, England, on February 26 and 28, March 1, 4, 6, and 8, by Prof. Arthur Keith.

Pithecanthropus at the beginning of the Pleistocene period, the Pliocene date originally assigned by Prof. Dubois seems the more probable one. There can be no doubt that the Javan fossil form is human in every point of structure save that of size of brain. Pithecanthropus, like Neanderthal man, was evidently a primitive form which had survived long after much higher types of mankind had been evolved. If we look upon Pithecanthropus as representative of mankind at the close of the Pliocene epoch, then we must suppose that the human brain was doubled in size during the earlier part of the Pleistocene period. Such a rapid degree of evolution is unknown in the whole history of palæontological discovery. It will probably be found that Pithecanthropus is representative rather of a Miocene than of a Pliocene stage in the evolution of man.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—An exhibition of 50l. a year, tenable for two years, is offered each year by the governing body of Emmanuel College to an advanced student commencing residence at Cambridge as a member of Emmanuel College in October. The governing body may award additional exhibitions of smaller value should properly qualified applicants present themselves. The exhibitions will be awarded at the beginning of October. Applications, accompanied by two certificates of good character, should be sent to the master of Emmanuel not later than September 24.

THE sixth annual report of the president and treasurer of the Carnegie Foundation, covering the year ending September 30, 1911, has just been received, and is here summarised. The endowments now amount to 2,424,600l., comprising Mr. Carnegie's original gift of 2,000,000l. in 1905, an accumulation from income of 224,600l., and 200,000l. received in 1911 as the first instalment of Mr. Carnegie's additional gift of 1,000,000l. in 1908. Of the income of 118,000l. for the year 1910-11, 105,200l. was expended in retiring allowances and pensions, 7200l. in general administration, and 3200l. in educational publication. Thirty-one retiring allowances and seventeen widows' pensions were granted during the year, increasing the number in force to 373, the average annual payment being 326l., and the total distribution to date 349,200l. The exchange of teachers conducted through the Foundation sent nine American teachers to Prussia during the year and received seven Prussian teachers in the United States, in both instances with gratifying results.

THE second part of the report referred to above is a comprehensive survey by the president of educational progress and tendencies from a national point of view. Private and local educational initiative without guidance and federal and State grants without supervision are so wasteful financially and so hurtful educationally that agreement and cooperation must inevitably increase. The great variation in educational efficiency that now exists is shown to be unnecessary and wasteful. It is neither necessary nor desirable that some States should spend only one-eighth as much as others *per capita* for education, have only half as long a school year, enroll only half as large a proportion of their school children, and spend only one-fifth as much in educating each teacher. A better adjustment is developing between the colleges and the high schools. Many universities and colleges have advanced within ten years from competing with

high schools, while other institutions, like Harvard, have broadened their entrance requirements so that they can be met by the average good high school. The increase in the number and size of post-graduate schools—50 per cent. in the last decade and tenfold in the last thirty years—has been much greater than the natural need. Poor and pretentious graduate schools, conducted with the funds of undergraduate colleges and attended chiefly by subsidised students, often merely impair the appreciation of good undergraduate teaching and hamper real research, through the multiplication of mechanical seminars, dissertations, and the like. Professional education, also, is hampered by an enormous duplication of facilities, resulting in great financial waste, and often in a competition in low entrance requirements and poor instruction. Some States have four, five, seven, and nine schools of engineering each; New York city alone has six, and Pennsylvania has thirteen, five of these having fewer than forty students each. The report will be sent to any address upon request to the Carnegie Foundation, 575 Fifth Avenue, New York City.

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, March 27.—Dr. Aubrey Strahan, F.R.S., president, in the chair.—Bernard Smith: The glaciation of the Black Combe District (Cumberland). After a brief discussion of previous work and literature, a short sketch is given of the geological structure of the district. With the exception of the western coastal plain the main topographical features are pre-Glacial, but they have been either subdued or accentuated by glaciation. The chief pre-Glacial drainage-lines determined those of the present day.—J. F. N. Green: The older Palæozoic succession of the Duddon Estuary.

DUBLIN.

Royal Dublin Society, February 27.—Mr. R. Ll. Praeger in the chair.—Prof. T. Johnson: *Heterangium hibernicum*, sp. nov., a seed-bearing Heterangium from Co. Cork. This is a fossil plant from the Carboniferous slate, near Bandon, and is contained in the National Museum. The specimens were described in 1864 by W. H. Baily, of the Geological Survey, as "linear plants" under the name of *Filicites lineatus*. They represent the recently discovered group of seed-bearing ferns which connect the ferns with the lowest group of flowering plants. The Bandon specimens are of special interest in that one of them bears a small "seed" in direct continuity with the parent plant.—Prof. Henry H. Dixon and W. R. G. Atkins: (a) Changes in the osmotic pressure of the sap of the developing leaves of *Syringa vulgaris*. The osmotic pressures were calculated from the depression of freezing point of the sap, determined by a thermo-electric method, before described. Measurements were made from February to October, and it was found that the osmotic pressures ranged from 11 to 13 atm. in the buds, from 10 to 15 atm. in the leaves, increasing with age. Mean molecular weight determinations of the sap solutes usually lay between 160 and 180. (b) Variations in the osmotic pressures of some evergreens. The leaves of deciduous plants showed an increase of pressure with age. Ilex and Hedera were found to behave similarly. The highest pressures were observed in March and April, and also from October to December, as the leaves are then at their maximum average age just before the growth of young leaves and elongation of the shoots. No