in the hot season, and where in the cold season bitter frosts prevail. Unfortunately, it is impossible to reach this delectable land from the coast without traversing the hot and unhealthy valleys of the Zambezi and Shire.

There is an average rainfall of 55 inches throughout the Protectorate, but it is not altogether uniform in character, some districts receiving about 75 inches, and others not more than 35 inches. Still, it is decidedly a well watered country, endowed with many perennial streams, only a small number of which dry up in the height of the dry season. Consequently, it is a land which can almost everywhere be irrigated during the dry season, and can thus grow a continual succession of crops. The water is almost everywhere wholesome to drink.

The great attraction of the country lies in its beautiful scenery, in its magnificent blue lakes, its tumultuous cascades and cataracts, its grand mountains, its golden plains and dark green forests. A pleasant and peculiar feature also of the western portion of the Protectorate is the rolling grassy downs, almost denuded of trees, covered with short turf, quite healthy, and free from the Tsetse fly; these no doubt will in the future become actual sites of European colonies, districts in which Europeans can rear their children under healthful conditions.

The lofty plateau of Mlanje is a little world in itself, with the exhilarating climate of Northern Europe. These plains and valleys are gay with blue ground-orchids, with a purple iris, and with yellow everlasting flowers. Here and there great rocky boulders stand up in stern relief against the velvet turf, and out of these elevated plains again rise other mountains, gloomy in aspect and remarkably grand in outline. The forests, on closer inspection, turn out to be mainly composed of the handsome conifer *Widdringtonia Whytei*.

No one has succeeded in reaching the highest summit of Mlanje. Mr. Johnston ascended about as far as 9300 feet, and, estimating that there were fully 700 feet more of ascent, approximately fixed the highest point at 10,000 feet. The ascent of this high peak is rendered very difficult by the enormous size of the boulders with which it is strewn. The whole mountain mass of Mlanje probably occupies, with its outlying peaks connected by saddles, an area of 1600 square miles, of which 200 square miles consist of these level or gently undulating plateaux, admirably suited for European settlements. Many of the salient features of Mlanje are repeated in the striking mountains of Nyasaland, with the exception of the cedars, which, however, are reported to exist on one or two of the highest peaks of Zomba, but have never been seen elsewhere.

The low plains surrounding Lake Nyasa and bordering the rivers offer a sharp contrast to the plateaux. Zebras, hartebeests, water-buck, pallah, roan antelopes, and reed-buck may be found in numbers, often dwelling gregariously together on these hot plains; and a few vultures, eagles, kites, and Marabout storks wheel and float overhead in the dazzling bluish-white sky, on the look-out for offal. The sable antelope, the eland, the kudu, and the bush-buck seem to prefer the sparsely forested hill-slopes to the flat plain, where there is usually much less cover. The rhinoceros still ranges over these plains, and wallows in the stagnant pools of the half-dried rivers. The heat prevailing on the plains in the summer-time is very great—almost overpowering—but in the winter and spring the air is exhilarating.

The British settlements have now a settled and comfortable appearance, with uniformed native policemen and trained natives from the Mission schools working as printers and even as telegraph operators at Blantyre. The most interesting feature in the neighbourhood of these settlements at the present time is the coffee-plantation, which, to a great extent, is the cause and support of their prosperity. The variety which is cultivated in the Shire highlands was actually introduced from Scotland, having been derived from a small plant sent from the Edinburgh Botanical Gardens to Blantyre about sixteen years ago. From this plant the greater part of the five million coffee-trees now growing in this part of Africa are descended, while the original mother tree is still alive in the Mission grounds at Blantyre. The climate and soil of Nyasaland would seem to suit the coffee-tree to perfection, and the crops given are unusually large. As yet Nyasaland has been free from the coffee disease, which, as in Brazil and India, does not appear to be able to penetrate far inland from the coast, though it has already committed ravages in German East Africa and in Natal.

EARLY BRITISH RACES.[1]

BEFORE proceeding to trace the early history of man in Britain, it is necessary to refer briefly to the physical changes which geologists tell us have occurred since the close of the Tertiary period in the configuration and temperature of the north-western portion of Europe.

At the beginning of the Pleistocene period, the temperature of Northern Europe became colder, and an ice-cap, like that which now covers Greenland, gradually extended itself probably as far south as Middlesex, and covered the greater part of Wales and the northern half of Ireland. This epoch is known as the Great Ice Age. At that time also the land was more elevated than now, so that Great Britain and Ireland formed part of the continent of Europe, and the western coast-line extended some three or four hundred miles further into the Atlantic Ocean than it does at present. This period of cold was succeeded by a more genial one, during which, but before the ice had disappeared, a great submergence of land and of the glaciers still upon it took place, varying at different parts of the country from 600 ft. to over 3000 ft. The climate again became colder, and on the higher parts of Wales, the North of England, and Scotland, glaciers were formed once more, but not to the same extent as formerly. Then followed, in late Pleistocene times, a re-elevation of the land to at least 600 feet above the present level, Great Britain and Ireland once more became joined to the continent, and the climate became temperate. In all probability the geographical conditions of Britain, or rather the British corner of Europe, in early and late Pleistocene times, were almost identical. Finally the land connection with the continent became severed by submergence, which went on till almost the present coast-line was reached; the sea once more rolled in over the beds of the German Ocean and the English Channel. These changes in the geographical conformation of the north-western part of Europe took place slowly, and were consequently spread over an immense interval of time.

According to some eminent geologists, man first took up his abode in the British portion of Europe, either during the early glacial or pre-glacial period. The evidence of his existence here at that early period rests upon the discovery of many flint implements of peculiar and special type on certain high chalk plateaus in Kent in drift resting on Pleiocene beds, in drift deposits of Norfolk and Suffolk, and in certain caves in which glacial drift is believed to be deposited over the flints. All these implements are of the rudest make, more or less stained, like the drift flints with which they are associated, of a deep brown colour. They show a considerable amount of wear, as though they had been rubbed and knocked about a good deal, so that the worked edges are commonly rounded off and blunt. In few instances have the implements been wrought out of larger flints, and the amount of trimming they have received is very slight, and has been generally made on the edges of rude natural flints picked up from old flint drift; indeed, sometimes she work is so slight as to be scarcely apparent; in other specimens it is sufficient to show design and object. These implements indicate the very infancy of art, and are probably the earliest efforts of man to fabricate tools and weapons from other substances than wood or bone. They give us some slight insight into the occupations and surroundings of the race who used them, as they appear to have been employed for breaking bones to extract the marrow, scraping skins, and rounding sticks and bones for use as tools or poles. From the absence of large massive implements, it would seem as though offensive and defensive weapons had not been much needed, either from the absence of large mammalia, or from the habits and character of these early people. Many archæologists are not satisfied with the evidence yet adduced as to the age of these flints, consequently of man's existence in Britain at this early date, and the question cannot be considered settled one way or other.

Whatever may be the ultimate decision as to the existence of pre-glacial man in Britain, all geologists and others are agreed that after the glacial period had passed away, and Britain had once more become a part of the continent of Europe after its submergence, a race of men known to us as Palæolithic man migrated into the country from the continent, across the valley of the English Channel, in late Pleistocene times. Man of this period is known to us from remains found in the river-drifts of

[1] A lecture delivered at the Royal Institution by Dr. J. G. Garson. We are indebted to Prof. Boyd Dawkins for permission to use the accompanying illustrations.

post-glacial age, and in the lower deposits of certain caves. As some evidence has been brought forward to show that the river-drift people, as they are called, are earlier than the cave-dwellers, we will consider the river-drift people first.

Remains of man from the river-drifts have only been found in the south of England from Chard, Axminster, and the Bristol Channel, in the west to the Straits of Dover, the lower Thames,

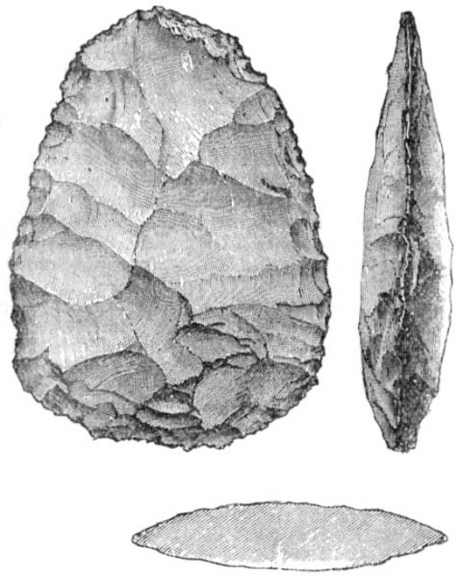

FIG. 1.

Suffolk, and Norfolk on the east, and as far north as Cambridge. They are conspicuous by their absence north-west of a line passing from Bristol to the Wash. The remains consist of a small portion of a skull, reputed to be of this period, implements of flint, quartzite, and chert, antlers of deer, and of certain fossil shells, probably used as ornaments.

The portion of skull was found by the late Mr. Henry Prigg,

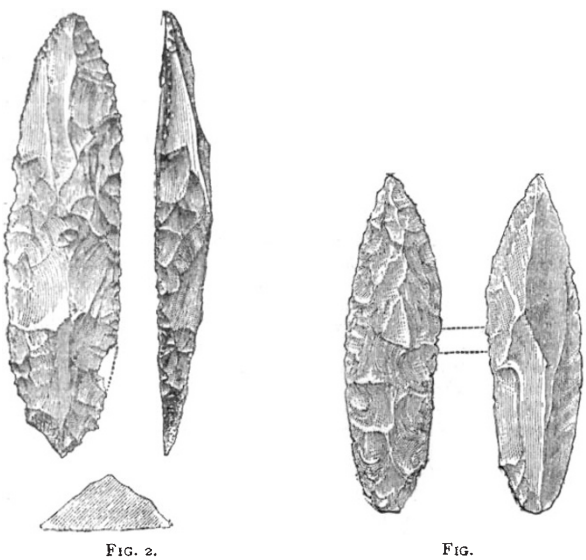

FIG. 2. FIG.

in 1882, at Westley, in Suffolk, seven and a half feet from the surface, in a pocket of brick earth eroded in the chalk, and in an adjoining pocket two molar teeth of mammoth and four Palæolithic flint implements were found.[1] The fragment of skull was part of the vertex, and included the upper portions of the frontal and parietal bones, with part of the coronal and sagittal sutures. It was examined by Mr. Worthington Smith,

[1] *Jour. Anthrop. Inst.*, vol. xiv. p. 51.

and in transit to the finder of it was unfortunately smashed. As it was not a characteristic part of the skull, it shed little light on the cranial characters of its owner. With this exception, no human bones have been found in fluviatile deposits in Britain.

The implements from the river-drift consist principally of oval-pointed flints which have been fashioned by chipping, and were used without handles, oval or rounded flints with a cutting edge all round, scrapers for preparing skins, pointed flints used for boring, flakes struck off from blocks or cores by means of large hammer-stones, often of quartzite, and choppers of pebbles chipped to an edge on one side. The tools with which these implements were manufactured consisted of anvil stones of large blocks of flint, pointed flints or punches, and carefully

FIG. 4.

FIG. 5.

made fabricators. All the implements, though simple and rude, show signs of manufacture, the more finely finished specimens having been prepared by delicate chipping. Their manufacture seems to have been carried on at certain spots, on the banks of rivers and other places, where there was plenty of material to make them from. It will be observed that at this time there were no flint arrow-heads, and that man was but poorly equipped for the chase, although it was undoubtedly by that means he gained his livelihood. Besides these flints, man doubtless used wood and bone implements; indeed, pieces of pointed stakes of wood have been found on the Palæolithic floors where he worked, by Mr. Worthington Smith. Bead-like fossil shells

FIG. 6.

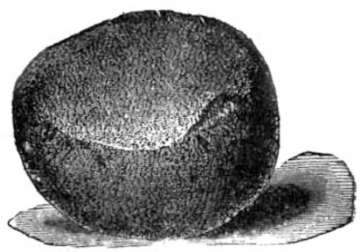

FIG. 7.

of *Coscinopora globulosa* have been found by Mr. Smith, with artificial enlargement of their natural orifices, which would indicate that they had been used for necklaces or amulets, so that primitive man seems not to have been without his personal adornments even at this time.

It is of importance to consider for a moment the animals which lived with man at this period. There are found in the same strata with him remains of the hippopotamus, two species of elephants and of rhinoceros, the cave bear and lion, the wild cat, hyæna, urus, bison, the wild horse and boar, stag, roe, reindeer, and other animals, many of which are now extinct. Man at that time had no domestic animals. The only clothing he had, if he wore any, was made from the skins of the animals he

killed in the chase and used for food. Being far from the sea, if he used fish as food, they would be such as he was able to catch in the rivers.

Let us now trace man of this period on the continent. In the fluviatile deposits of the Somme and the Garonne, stone

FIG. 8.

implements have been found and recognised by such competent authorities as Sir John Evans, Mr. Franks, Prof. Boyd Dawkins, and others, as identical with the drift Palæolithic implements found in England. Similar ones have been

FIG. 9.

found in Spain, near Madrid, in Italy, Greece, Germany, and other places in Europe; also in Northern Africa, Palestine, and India. From these finds we learn that man has lived in a similar state of civilisation to what he did in Britain,

FIG. 10

over a very wide area; they also show that he must have existed in this stage of culture for a very long time.

As regards his skeletal remains on the continent, a few have been found. At Canstadt, near Stuttgart, it has been stated that

FIG. 11.

portion of a skull was discovered, in 1700, in loess deposits, with bones of the cave bear, hyæna, and mammoth. At Eguisheim, near Colmar, Schaffhausen, portion of another cranium was found with mammoth and other animal remains of this period. At

FIG 12.

Clichy, in the valley of the Seine, a skull and some bones were found at depths varying from 4 to 5·4 metres from the surface in undisturbed strata, with mammoth, woolly rhinoceros, horse, and stag. The skull in these instances is long and narrow in

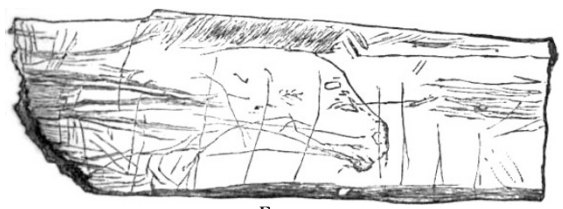

FIG. 13.

shape, with very prominent supraorbital ridges and glabella; the thigh and leg bones of the Clichy skeleton are laterally compressed, the former having a greatly developed *linea aspera*, the latter being markedly platycnemic. Further reference will be made to these specimens when we deal with the cave skeletons.

Caverns and rock shelters are well known to have been used not only by man, but also by animals, from remote times down to the present day. The strata which have been deposited in them at different times by their successive occupants, and the vicissitudes

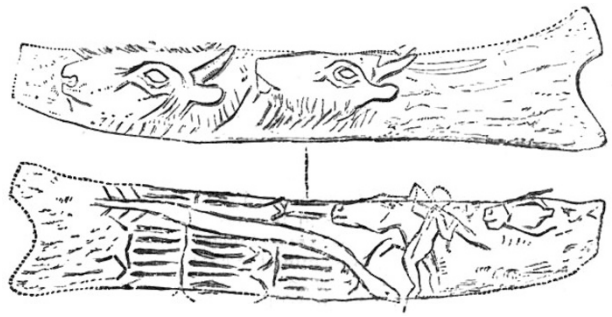

FIG. 14.

of climate, are often well marked, and give much valuable and reliable information, but great care is required in discriminating the different periods which their contents represent. The remains of Palæolithic man deposited in caves are much more widely distributed over England than those from the river-drifts, having been found as far north as Yorkshire and Derbyshire, in North and South Wales, Gloucestershire, Monmouthshire, Somersetshire, and Devonshire, also in Ireland, although these latter have not been much worked. The Palæolithic cave strata shows three sub-strata; in the two lower ones the flint implements are precisely similar to those of the river-drifts, but flat pebble implements of quartzite are also found with part of the

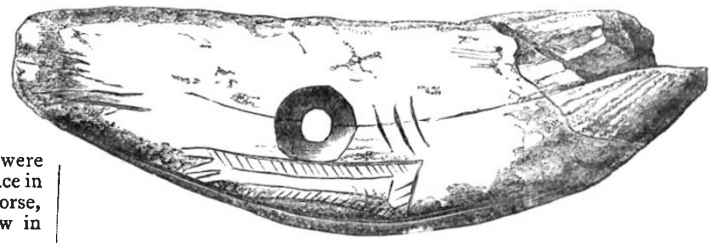

FIG. 15.

natural smooth surface retained, while the rest is chipped and fashioned into an implement.

In the upper substratum more highly finished articles, which would point to a higher and probably a different social condition, later in time, are obtained. We have in this higher substratum flints of oval and lanceolate form, trimmed flakes, borers, and rounded hammer-stones (Figs. 1, 2, 3, 4, 5, 6, and 7). These are of smaller size than the earlier implements, and some of them had evidently been let into handles of wood. Bone needles, with an eye bored at one end (Fig. 8), bone awls (Fig. 9), scoops (Fig. 10), and harpoons (Figs. 11 and 12), barbed on one or both sides of deer's antler, are also met with. Of great importance are the representations of animals which have been found incised on bone. as. for example, the

portion of rib with the incised figure of a horse upon it, found in this layer in Robin Hood Cave in Derbyshire (Fig. 13).

No portions of the human skeleton have been found in the Palæolithic stratum of British caves, except a single tooth.

On the continent many caves have been discovered in France, Belgium, Germany, and Switzerland, with similar deposits and implements to those found in England, and showing also the same two stages of culture. More numerous examples of figure carving of the same type as that found in the Derbyshire cave have been obtained in French caves (Fig. 14), and the teeth of carnivorous animals and shells, both artificially bored for ornaments (Fig. 15).

By associating British and continental evidence we can form a good idea of the mode of life of the cave-dwellers of Palæolithic times. The caves gave him shelter in cold weather, from which he further protected himself by fires, and clothing made from the skins of animals he secured in the chase, sewn together by means of bone needles and tendons of reindeer for thread. Armed with flint-tipped spears and daggers of bone ornamented with carved handles representing the chase, he lived by hunting the reindeer, the wild horse, and the bison; he also lived on birds and fish, which he speared with barbed harpoons. The game he brought home was cut up with flint knives, and cooked; the long bones were broken with heavy flints for the marrow they contained, which was evidently considered a delicacy. When not engaged in the chase, the manufacture of flint implements must have formed an important part of his home work. He must also have spent much time in carving ornaments on bone. These, it may be remarked, show that he was an artist of no mean order in depicting animals, but give us little information regarding his own form, as he seldom represented himself, and when he did he figured himself in miniatures and naked (Fig. 14); they also show that he was in the habit of wearing long gloves to cover his hands and arms (Fig. 15). Besides ornamenting himself with perforated shells, pieces of bone, ivory, and teeth, he probably painted his body of a red colour. He, like the river-drift people, possessed no domestic animals, and had no dog to assist him in hunting.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. J. Lorrain-Smith has been appointed Demonstrator in Pathology, in the place of Mr. L. Cobbett, who has been elected to the John Lucas Walker Research Studentship.

An Isaac Newton Studentship in Astronomy, worth £200 a year for three years, will be vacant in the Lent Term. Candidates must be B.A.'s under the age of 25 on January 1, 1895. Names and testimonials are to be sent to the Vice Chancellor by January 31, 1895, with a statement of the course of study or research proposed.

At the biennial election to the Council of the Senate, held on November 7, Dr. Peile, Mr. C. Smith, Dr. Maitland, Dr. Sidgwick, Dr. D. Macalister, Dr. Forsyth, Mr. Whitting, and Mr. R. T. Wright were returned for a period of four years.

Dr. Donald Macalister was, on November 9, elected without opposition to represent the University on the General Medical Council for a second term of five years.

This year has been memorable as the twenty-first anniversary of the establishment of the University Extension Lectures, the system having been founded by the University of Cambridge in the year 1873. The twenty-first annual report of the Cambridge Syndicate has just appeared. During the past session seventy-five science courses have been delivered at various centres. This number is less than those of the last two or three years, the diminution being attributed almost entirely to the decrease in the temporary work undertaken by the Syndicate during the preceding sessions for the technical instruction committees of various County Councils. Whereas in some places grants of money from the local authorities have enabled local committees to arrange more easily courses of University Local Lectures on scientific subjects, in others the cheap technical classes organised independently by the local authorities have influenced very injuriously the attendance at the local lectures, and in some cases caused their discontinuance. The County Councils are just beginning to feel their feet, but it seems ungenerous of them to forget that they were helped over their initial difficulties by University Extension Lectures. The Technical and University Extension College at Exeter, which is under the joint management of the local authorities and the Cambridge Syndicate, has now completed its first session's work, and about six hundred regular students have already joined the College. Its success affords a striking illustration of the method by which under the Local Lectures system permanent educational institutions can be established. It should not be forgotten that the Cambridge University Extension movement was similarly largely instrumental in the foundation, a few years ago, of University College, Nottingham, Firth College, Sheffield, and other local colleges.

THE *London Technical Education Gazette*, the first number of which has just been published, is intended to contain the official announcements of the Technical Education Board of the London County Council; notices of important steps in technical education taken by the various institutions in London; and useful information bearing upon the work. In the list of the conditions which have to be fulfilled by evening classes in science, in order to obtain grants from the Board, we are glad to note the following:—"That as a condition of aid being granted by the Board for the teaching of chemistry, metallurgy, physics, mechanics, and botany, it will be regarded as indispensable that provision should be made, to the satisfaction of the Board, not only for the experimental illustration of the lectures or class teaching, but for experimental work by the students themselves, either in laboratories belonging to the institution, or, where this cannot be arranged, in the laboratories of some neighbouring institution with which the class should be associated; and every lecture must be followed by at least one hour's practical work on the same evening, or some other evening in the same week."

SCIENTIFIC SERIALS

Wiedemann's Annalen der Physik und Chemie, No. 11.—Experimental researches on the origin of frictional electricity, by C. Christiansen. Friction by itself does not generate electricity. The appearance of the latter is due to chemical decompositions which are initiated by contact and completed on separation. These results are those of experiments with a tube coated on the inside with various insulators, arranged so that mercury could be brought into contact with them and withdrawn, after which a charge was indicated by a galvanometer.—On thermo-couples of metals and saline solutions, by August Hagenbach. In the case of couples consisting of metals and their salts, the E.M.F. increases with the dilution, and more rapidly than the difference of temperature. In combinations of platinum with hot and cold saline solutions the same acids give about the same forces, and differences of concentration have a very marked influence. The highest E.M.F. obtained was that of a platinum-cupric-chloride couple, which, with a 5·6 per cent. solution, and with the two communicating portions of the liquid at 25° and 80° respectively, gave an E.M.F. of 0·1541 volts.—Changes of length produced by magnetisation in iron, nickel, and cobalt ellipsoids, by H. Nagaoka. The optical lever method was employed. As the field intensity increases, iron first expands and then contracts, going through the opposite stages on reversing, and showing a decided hysteresis. Nickel simply contracts. Cobalt contracts first and then expands, the expansion increasing to a limiting value as the field intensity increases.—On elliptically-polarised rays of electric force, and on electric resonance, by L. Zehnder. The author shows how to produce circularly and elliptically polarised electric rays by two wire gratings placed one behind the other, with the directions of wires crossed.—On refraction and dispersion of rays of electric force, by A. Garbasso and E. Aschkinass. To produce a prism capable of affecting ether waves of the length of those due to Hertzian oscillations, a prism was constructed of a series of parallel glass plates, upon which were stuck "resonators" made of strips of tinfoil. This was placed between an exciter and a suitable resonator. It was found that the rays were refracted by angles differing according to the wave-length. The deviations for three different resonators were 9° 6′, 7° 18′, and 5° 24′ respectively.