

### Boskop Remains from the South-east African Coast.

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THE controversy raging over the Piltdown remains, and the coming of the War shortly afterwards, were the two events which conspired to distract the attention of the scientific world from the significant discovery which was made in South Africa in 1913,

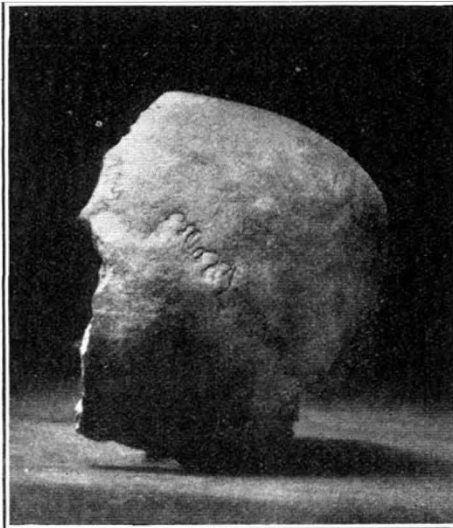


FIG. 1.—External view of the right parieto-occipital fragment of *Homo capensis*, showing the lambdoidal and sagittal sutures.

when a farmer unearthed some fragments of a human skull at Boskop near Potchefstroom in the Transvaal. Last year, the discovery of a more primitive human race in *Homo rhodesiensis* has served to redirect attention to the part which Africa still has to play in elucidating the wider questions of human origins and human migrations.

Since the time the bet between the two farmers as to the "humanity" of the Boskop remains was settled, Mr. FitzSimons, Director of the Port Elizabeth Museum, has been assiduously excavating the rock shelters in that neighbourhood. In June last he forwarded to the Department of Anatomy in the University of the Witwatersrand a consignment of skeletal material which contained the remains of several members of the ichthyophagous Strandlooper race which preceded the Hottentots along the coastal areas.

The Strandloopers, now extinct as a race, were the builders of gigantic kitchen-middens in South Africa. In the particular rock-shelter at Tzitzikama explored by Mr. FitzSimons, this material, in which the Strandloopers had been interred, was removed layer by layer to a depth of fifteen feet. At this level he came upon bones of an entirely different calibre and appearance. Recognising this fact and appreciating the possibilities of the discovery, he forwarded these specimens separately. Altogether, I have received remains of some five individuals from this site, and though mixed together and fragmentary they afford definite evidence that they belong to the same race as was found in the Transvaal in 1913.

Figs. 1 and 2, which illustrate the outside and inside views of part of the right parietal and occipital bones,

demonstrate the thickness and texture of the cranial bones in this race. Fortunately, the fragment crosses the line of the sagittal suture (Fig. 1), hence the cranial form is accurately known. It reveals the same type of breadth, flattening, and central depression in *norma occipitalis* that was pointed out for Boskop man by S. H. Haughton.<sup>1</sup>

Fig. 3 shows the inner aspect of three other pieces which were found to articulate exactly along the line of fracture. The state of preservation and general appearance of the bones justifies the assumption that they form part of the left half of the cranium represented by our right parieto-occipital fragment. Fig. 4 is an external view of the same three bony pieces on a rough reconstruction of the endocranial cavity which errs, as I have since determined, on the side of generosity in volume.

So far as the evidence goes, the skull appears to be that of a woman; for other specimens (which I believe to be male) show a more marked glabella, more robust eyebrow ridges, and a greater development of the frontal lobes of the brain. The smallness of the mastoid process, the thickened and tuberculated inferior margin of the tympanic plate, and the very vertical forehead also corroborate its feminine character.

When the fragments have been oriented, the following provisional measurements are obtained: maximal length 210 mm., and maximal breadth 150 mm., as

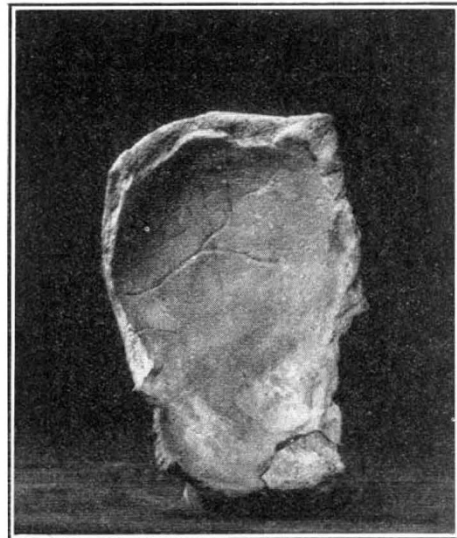


FIG. 2.—Internal view of the right parieto-occipital fragment of *Homo capensis*, showing the thickness and texture of the cranial bones.

compared with the length of 205 mm. and breadth of 154 mm. secured for the Boskop calvaria. If this length be correctly determined, we are in the presence of the longest-headed human skull yet discovered. It was undoubtedly dolichocephalic.

The first estimations of its endocranial content seemed to show, on account of the extraordinary length, a figure even higher than that secured by

<sup>1</sup> "Preliminary note on the ancient human skull remains from the Transvaal." *Trans. of the Roy. Soc. of S.A.* Vol. vi. Pt. I. 1917.



Haughton (1832 cubic centimetres), and by Broom<sup>2</sup> (1960 cubic centimetres) for the Transvaal specimen; but after taking casts from the fragments and reconstructing the endocranial cavity, my endocranial cast gives a far smaller capacity—in the vicinity of 1750 cubic centimetres. This figure still reveals a capacity far in advance of the average for modern European brains (Meckel's brain capacity was only 1320 cubic centimetres and Raphael's 1420 cubic centimetres), and is the more striking when it is remembered that the skull is female. The other male crania indicate a greater capacity.

Concerning the Boskop endocranial cast Elliot Smith said, "Its features present a curious blend of those characters which are regarded as distinctive of Mousterian and Aurignacian types of men respectively; but whereas the general form presents certain resemblances to the former, in all essential respects the cast conforms to the type represented by the Cro-magnon man of Western Europe." Broom (*loc. cit.*) goes further and believes it not unlikely that the Boskop type was ancestral to both Neanderthal and Cro-magnon man.

Unfortunately, insufficient jaw remains exist to prove or disprove Broom's contention concerning the supposed massive mandible and large canines. On the whole, the delicacy of the facial skeleton of this specimen is in strong contrast with the massive build and thickness of the calvaria, and scarcely favours the expectation of massive jaws. On the other hand, the nasal process of the maxilla is relatively enlarged and plays an enhanced rôle in bounding the nasal aperture and wall—features emphasised by Boule. ("Les Hommes fossiles") as indicating the *ultra-human*

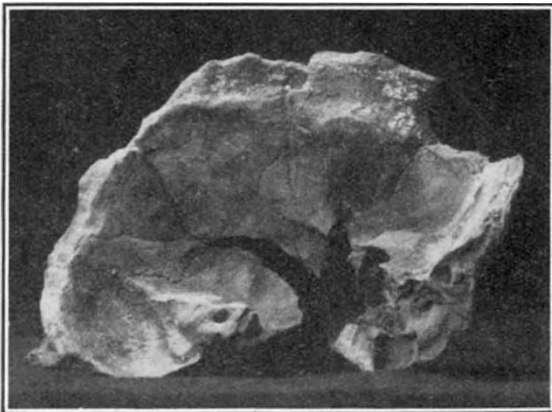


FIG. 3.—Internal view of the three fragments of the left side of the skull of *Homo capensis*. The vascular arrangements are particularly well-marked.

character of Neanderthal man. The pithecoïd nature of the small mastoid process, supra-mastoid ridge, mandibular fossa, and superciliary ridges in this type, features which once more link it to primitive Neanderthaloid forms, were emphasised by Haughton (*loc. cit.*). The same point of view is favoured by the relatively low development of the frontal lobes of the brain.

The endocranial cast of this specimen reveals further

<sup>2</sup> "The evidence afforded by the Boskop skull of a new species of primitive man (*Homo capensis*)." *Anthrop. papers of the Amer. Mus. of Nat. Hist.* Vol. xxiii., Pt. II. 1918.

an extremely broad and depressed Sylvian fossa. The cast is sufficiently complete in this region to show that here the Sylvian depression was even wider and more patent than in the endocranial cast of the Mousterian man of La Chapelle, concerning whom Boule does not hesitate to say that the island of Reil was partially exposed. It seems that, in this respect, our Boskop woman was even more pithecoïd. The sulcus lunatus also is prominently indicated in the right parieto-occipital fragment. Incidentally, it may be stated

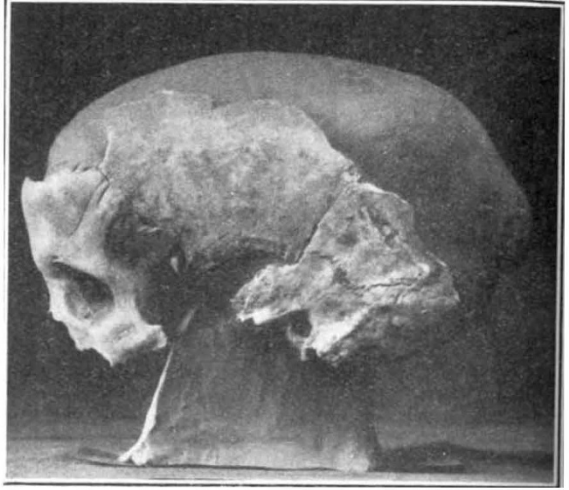


FIG. 4.—External view of the three fragments of the left side of the skull of *Homo capensis* on a rough preliminary reconstruction of the endocranial cavity. Features to be noted are referred to in the text.

that the endocranial cast indicates a marked asymmetry of brain and skull, the right frontal pole and left occipital pole respectively being more expanded than their fellows of the opposite side.

While certain of the foregoing data betray primitive, if not even Neanderthaloid, features, the study of other skeletal remains favours the Cro-magnon affiliation. A complete femur (also apparently female) indicates by its length (461 mm.) a stature in the vicinity of 5 feet 6 inches, which is considerably above that of Neanderthal man; and the male stature was presumably more considerable. Its straightness and slender build (despite a tendency to the exhibition of a third trochanter, a fossa hypotrochanterica, and a high pilastric index) are also in strong contrast with that of Neanderthal man. The vertebral column in a male specimen in the lumbar region (3rd, 4th, and 5th vertebræ) gives a general lumbar index of 97.4, which indicates a marked lumbar curve (kyrtorhachism) such as is found in modern Europeans.

The more detailed study of the remains may throw clearer light upon a bizarre mingling of characteristics which, at the present time, is highly confusing. It may prove justifiable, as Broom is already convinced, to separate this human group from both Neanderthal and Cro-magnon man as a separate species (*Homo capensis*). There is no doubt, meantime, that these new human documents, which have been brought to light through the energy and enthusiasm of Mr. FitzSimons, have further emphasised the anthropological wealth of Africa, and the need for more cautious investigation of the deeper strata of our coastal rock shelters, with



the strictest observance of the methods of modern archaeology.

Through this discovery we now know definitely that the Boskop race preceded the Strandlooper race historically. They perhaps owed their extinction to the latter, the Solutrian culture of which (so ably examined by Dr. L. Perinquey,<sup>3</sup> the Director of the South African Museum) indicates familiarity with the uses of the bow. We know further that the Boskop specimen was no human freak, but a type representative of a race once widely distributed in South Africa from

<sup>3</sup> "The Stone Ages of South Africa," etc. *Annals of the South African Museum*. Vol. viii. July 5, 1911.

the Transvaal to the remotest south-eastern corner of the continent.

The implements, culture, and æsthetic achievements of these big-brained men of pre-history still remain to be discovered. Their employment of ochre in their burial rites indicates their familiarity with pigments and the artistic and symbolical uses to which they might be put. The remarkable parallelisms between the so-called "Bushman" art and that of Cro-magnon man in Europe was insisted upon by Sollas many years ago, and the evidence may yet be forthcoming which will conclusively solve the fascinating yet elusive problem of their correlation.

### Insulin and its Value in Medicine.<sup>1</sup>

By Prof. J. J. R. MACLEOD, F.R.S.

CARBOHYDRATES are essential in the chemical processes upon which life depends. Not only is the glucose, the form in which they are mainly absorbed into the blood, the source of muscular energy, but it is also in some way necessary in the oxidation of fats. Preceding its oxidation, glucose undergoes a series of preliminary changes which proceed step by step in such a manner that a long series of intermediary substances is formed; and when anything interferes with the process at any stage, as in diabetes, glucose accumulates in the blood and tissue fluids, causing the main early symptoms of the disease, hyperglycæmia and glycosuria. Later involvement of the oxidation of fats results in the accumulation of the ketone bodies in the organism, and these, by their toxic action, cause the often fatal condition of coma.

The control of this process of carbohydrate metabolism has for years been assumed to be the function of a hormone derived from the Isles of Langerhans of the pancreas. Although the existence of this hormone was fairly certain, little success resulted from attempts to extract it in potent form from the pancreas, probably because it was destroyed by the powerful digestive enzymes also present in such extracts. Banting and Best circumvented these by making extracts of the degenerated residue of pancreas following ligation of the ducts, it having previously been shown that in this residue the islet cells are more or less intact but the external secretory cells are largely degenerated. The extracts were found to remove the two chief symptoms of diabetes in depancreatized dogs. Alcoholic extracts of adult beef pancreas were also found to contain the hormone, and by their continued use it was possible considerably to prolong the life of the diabetic animals. J. B. Collip then succeeded by fractional precipitation with alcohol in ridding these alcoholic extracts of irritating substances, so that they could be repeatedly injected into diabetic patients.

With larger supplies of insulin available, it was now possible to show that it removes all of the observable symptoms of diabetes in depancreatized dogs. Thus, not only did it cause glycogen to become deposited in large quantities in the liver when sugar was fed to the animals,

the first analysis giving more than 20 per cent. of this substance (J.B.C.), whereas without insulin traces only are found, but it also caused the respiratory quotient (ratio between CO<sub>2</sub> and O<sub>2</sub> in respired air) to become raised. These results were soon confirmed on diabetic patients. In more recent work, in which depancreatized dogs were given insulin daily along with considerable quantities of carbohydrate, life has been prolonged for over four months, and by careful comparison of the sugar balance of the animals it has been found, by F. N. Allen, that a small amount of insulin is capable of causing relatively much more glucose to be metabolised than when a large amount is given. Or, in other words, the glucose equivalent per unit of insulin is much higher with small than with large doses.

Although there can be no doubt of the high therapeutic value of insulin in the treatment of many cases of diabetes, its value as a new instrument for the investigation of problems of metabolism other than those relating to this disease is also high. Evidence for this belief is founded, among other things, on the striking effects of insulin on normal animals. When it is administered to rabbits, for example, the first effect is a very rapid lowering in the percentage of sugar of the blood—first observed by J. B. Collip—and when this reaches a certain level symptoms of a peculiar nature supervene. These consist usually of violent convulsive seizures each lasting for a minute or so, and of a gradually increasing state of coma, with fall in body temperature, ending often in death from respiratory failure. Symptoms of a similar character occur also in other animals, including man, after large doses of insulin.

The symptoms were found to be dependent on the lowering of blood sugar; thus, they usually supervene in normally fed animals when the blood sugar has fallen to about 0.045 per cent., and they are removed immediately by the addition of glucose to the blood either by administering this sugar subcutaneously or by causing it to be liberated in the body from glycogen, as by the injection of adrenalin (epinephrin). It was found, moreover, that, of all the sugars, glucose alone has an immediate and lasting effect, even leavulose and galactose, which are its nearest neighbours, having only a slight and transitory action.

Although the symptoms commonly occur in well-fed

<sup>1</sup> A Lecture delivered in the Section of Physiology of the British Association at Liverpool on September 17.