Letters to the Editor.

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The Boskop Skull.

TWELVE years ago there was discovered in the Transvaal a remarkable human skull of apparently great antiquity. Fitzsimons, of Port Elizabeth Museum, first described it as perhaps allied to the Neanderthal but without the large supra-orbital ridges. The skull was next sent to Capetown on loan, where it was described at some length by Haughton as allied to the Cromagnon man. Shortly afterwards I examined it in Port Elizabeth, and, impressed by the huge size of the brain, the great thickness of the bone—in places 15 mm.—and certain remarkable features in the jaw, I thought it worthy of specific rank and named it *Homo capensis*. Now the specimen has been sent to the British Museum for further examination, and there has just appeared a paper by Pycraft which will be regarded as the official British Museum report.

Prejudice has played a considerable part in anthropology. Since the belief in evolution became accepted, all old human skulls are expected to be ape-like, and if not ape-like are regarded with suspicion. Doubts have been thrown on the Galley Hill skull because it is not sufficiently anthropoid. When in 1855 a human jaw was found in the Red Crag it was submitted to Owen, Huxley, Lyell, and all the leaders of the day, but as it was not like an ape's jaw they all shook their heads and said it was an interesting curiosity, and as no one recognised its value the jaw got lost. The Boskop skull has been threatened with a similar fate. It has an enormous brain and is not at all ape-like. Therefore, according to some, it cannot be old, and in any case cannot be very interesting.

Pycraft, in concluding that it is a Proto-Bushman type, agrees with the view I expressed some years ago, and in his phylogenetic tree he places it low down on the branch that leads to the Bushman and Negro. Unfortunately elsewhere in the paper he states "very certainly that he was a derivative of Cromagnon man," and Cromagnon man he places well up the branch that gives rise to the European types of to-day.

By means of certain formulæ Pycraft estimates the cranial capacity at 1717 c.c. Haughton estimated it at 1832 c.c., Elliot Smith puts it at 1900, and I made it 1950 c.c. Sollas has just shown that those beautiful formulæ, while fairly trustworthy for normal-sized skulls, are quite untrustworthy for large skulls, giving at times an error of more than 200 c.c. If instead of estimating the capacity by formulæ suitable for normal skulls of *Homo sapiens*, which do not take into consideration the abnormal thickness in places, and the unusual thinness in others of a skull like the Boskop, we make a cast of the brain in plaster and restore it into at least approximately its original condition and then measure its size, as I have done, I still feel quite confident the capacity will be found to be more than 1900 c.c.

In Pycraft's paper there is one serious omission which I deeply regret. He admits that there is preserved "a fragment of a mandible" and it is not at all an inconsiderable fragment. It was on this jaw largely that I (not Hewitt, as Pycraft states) founded the species *Homo capensis*, believing that the jaw differs in certain characters from all other known human types. I may be entirely wrong in my view of the jaw, but it was with considerable disappointment that I found Pycraft had a good deal to say on the easy problem of the cranium, and not a single word to say on the more interesting and much more difficult problem of the jaw, and until this mandible has been fully investigated by some expert we cannot accept as final any verdict pronounced on the cranium alone.

R. BROOM.

Douglas, South Africa,
November 10.

The Energy liberated by Radium.

WHEN radium is in equilibrium with its disintegration products, it is known that the number of atoms of each of the products disintegrating per second is the same, and that this is equal to the number of α- or β-particles emitted by each product per second, according as the transformation is accompanied by α- or β-ray emission respectively. Moreover, in the case of those products (RaB and RaC) which emit γ-rays, Kovarik (*Phys. Rev.*, 23, 559, 1924) has recently established the important result that each disintegrating atom emits only *one* γ-ray (quantum). The number of γ-quanta emitted per second by the amount of Ra(B + C) in equilibrium with 1 gm. of radium was found to be $7{\cdot}28 \times 10^{10}$, from which we may conclude that each product emits $3{\cdot}64 \times 10^{10}$ γ-quanta per second.

Much valuable information on the energy of the γ-rays emitted by radioactive substances has also been obtained by measuring the energy of the β-rays excited by γ-rays incident on various elements, and afterwards applying Einstein's photoelectric equation, but further work will be necessary before our knowledge of the energy of the γ-rays is complete. Recent experimental work by Ellis (*Phil. Mag.*, 50, 521, 1925) has shown that the contribution of the γ-rays from Ra(B + C) to the total heat production of radium together with its short-lived products amounts to about 6·3 per cent., a value which is about 1·6 per cent. higher than that hitherto accepted. Theoretical calculations of this heat production have also been carried out, on the basis of the photoelectric data on the energy of the γ-rays, referred to above. Thus Meitner (*Die Naturwissenschaften*, 12, 1146, 1924) finds that the γ-rays from Ra(B + C) contribute slightly less than 9 per cent. of the total heating effect of radium (*ca.* 137 cal./hour/1 gm. Ra), whereas Thibaud (*C.R.*, 180, 1166, 1925) calculates that they contribute slightly more than 5 per cent. of the total heat production. The deviations of these calculated values from that found experimentally by Ellis are probably due to the fact that the γ-radiation from these elements is not homogeneous, but consists of several wave-lengths, which means that we must know how much these individual frequencies contribute to the aggregate effect, and on this point there is not complete unanimity of opinion. Moreover, such calculations involve a knowledge of the number Z of atoms of radium disintegrating per second per 1 gm. of the element, and here again there is a divergence of opinion. Meitner uses the value $3{\cdot}5 \times 10^{10}$; Thibaud uses the value $3{\cdot}57 \times 10^{10}$ (Rutherford-Geiger); whilst Ellis (*l.c.*) recently used the value $3{\cdot}4 \times 10^{10}$ (Geiger-Werner, *Zeit. f. Phys.*, 21, 197, 1924).

Interesting information on the latter point can be obtained if we attempt to calculate the total heating effect due to 1 gm. of radium alone, *i.e.* free from its disintegration products. Here the conditions are simplified, for radium does not emit primary β-particles. Moreover, the γ-radiation emitted by radium is homogeneous (cf. Meitner, *l.c.*)—$\lambda = 6{\cdot}64 \times 10^{-10}$ cm.—and its energy can be calculated if we make what