LETTERS TO THE EDITORS

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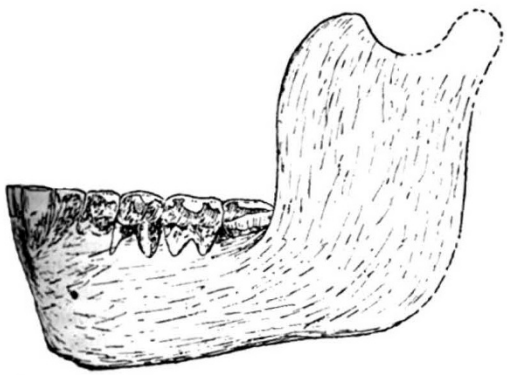
Jaw of the Male Sterkfontein Ape-man

On June 24, we blasted out at Sterkfontein, at a spot only about 8 ft. away from where we discovered the old female skull of *Plesianthropus*, the almost perfect lower jaw of a large male. The left mandible is complete except for the loss of the condyle and a little part of the margin of the angle. The whole symphysial region appears to be complete, while the right ramus is much broken and crushed. All the teeth of the left side are present, though worn.

The horizontal ramus is considerably larger than that of man but essentially similar. The ascending ramus is higher than in man, but otherwise not unlike that of the human jaw.

The front of the jaw is remarkably interesting. It does not slope rapidly backwards as in the living anthropoids but more downwards than backwards, giving an appearance not unlike that of the Heidelberg jaw. The front of the Sterkfontein jaw is narrower owing to the incisors being smaller. The symphysis, so far as can yet be seen, seems to agree fairly well with that of the Heidelberg jaw, and there appears to be no simian shelf.



TRUE SIDE VIEW OF MANDIBLE OF MALE *Plesianthropus transvaalensis* (BROOM). ½ NATURAL SIZE

The molars are badly worn along their outer sides. The canine has its crown ground down quite flat and in line with the other teeth. Parts of the outer sides of the premolars are in the counter slab and will later be replaced

The molars and premolars are much larger than in the Heidelberg jaw, and the canine very much larger. The molars and premolars are much worn. In the case of the 1st and 2nd molars, the whole outer sides of the crowns are worn off; but on the inner side parts of the enamel cusps still remain.

The canine is the most interesting tooth of the jaw. We know the unworn lower canine crown in the male *Plesianthropus*. It is much larger than in man and has a well-developed and pointed main cusp and a small posterior cusp. In the female the upper canine we knew was worn down as in man, but in the male it was suspected that the lower canine passed in front of the upper as in the anthropoid apes. Now we find that the lower canine, while it may in the young animal pass up in front of the upper, is ground down, as age advances, by attrition with the upper, exactly as in man. The whole jaw is thus practically a human jaw.

This jaw is much too large to have fitted the elderly female skull recently discovered; and the skull that belonged to this jaw must have been remarkably large. If a restoration of the skull is made from the known female skull, but large enough to have fitted this jaw, it is seen that we have a skull that is nearly human.

The brain of the female skull was only about 450 c.c., but the male skull that belonged to this jaw must have had a brain of 600 c.c., or perhaps even 700 c.c.

Another interesting point is that on the lower part of the front of the jaw there is a little bony thickening which might be regarded as an incipient chin.

This jaw seems to us to be of considerable importance on the question of man's origin.

R. Broom
J. T. Robinson

Transvaal Museum,
Pretoria, South Africa.
July 3.

Shape of Hæmocyanin Molecules

In a previous communication[1] it was shown that the electron microscope can record the individual molecules in a solution of the respiratory protein from *Limulus polyphemus*. An unexplained feature of these photographs was the fact that the diameters of the molecular images were not uniform but showed considerable spread about a mean value. Hæmocyanins from several invertebrates have been under study in this laboratory partly to provide an interpretation of such apparent variation in molecular size and partly to see the reason for the reversible changes in molecular weight that have been established[2] through ultracentrifugal analysis.

Special attention has been given to the hæmocyanin from *Busycon canaliculatum*, living specimens of which were kindly provided by the Fish and Wild Life Service of the U.S. Department of the Interior. This hæmocyanin was selected because of its great molecular weight. Its published *p*H stability diagram records components with sedimentation constants of 130, 102, 61 and 13·5 Svedberg units, the two heavy components being absent at *p*H values above about 9. The principal component in freshly drawn 'blood' seems to be the one with the sedimentation constant 102 and an estimated molecular weight 6,800,000, but the existing data do not record the relative proportions of these components.

Electron micrographs have been made of fresh *Busycon* hæmocyanin and of this protein purified by ultracentrifugation. The *p*H of the solutions was established by adding minimal amounts of phosphate buffer and dialysing against distilled water to remove excess salt. Preparations for electron microscopy were made by putting these solutions and dialysates on the usual collodion-covered screens or by spreading them on glass slides for atomic replication. Shadowing was with gold at a 6–1 angle; photography was carried out with an R.C.A.-type *EMU* instrument.

Sufficiently diluted hæmocyanin near its natural *p*H yields an electron micrograph such as that reproduced herewith. Its single molecular particles are obviously uniform and possess a well-defined internal structure. Careful examination indicates that each large particle consists of rod-like sub-units stacked together, apparently in bundles of four. The