

Mandibles of Peking Man*

THE late Dr. Davidson Black, honorary director of the Cenozoic Research Laboratory of the National Geological Survey of China, at the time of his lamented death was engaged on the study of the mandible of Peking man. Further material discovered since then has necessitated some modifications in the conclusions at which he arrived. This new material has now been incorporated in a study by his successor, Prof. Franz Weidenreich, in which he has been able to include the plates which Dr. Black had prepared.

The number of mandibles, or parts of mandibles, of *Sinanthropus*, which has now been obtained from Choukoutien, is eleven, of which six are juvenile and five are adult. [A further specimen was found in October last.] They are of both sexes. In his pre-fatory remarks, Prof. Weidenreich points out that the importance of the mandibles of fossil man has always been recognized, and given rise to considerable discussion, since the discovery of the Naulette jaw in 1866; but the jaw of *Sinanthropus* is of special interest. All the known lower jaws of fossil man, with the exception of Heidelberg and Piltdown, form a group which is distinguished from modern man in lacking a chin, in being more massive and bulky and in having the relief of the surface strongly developed. In these respects *Sinanthropus* conforms; but as the teeth constitute the essential factor in its classification, it is of importance to determine how far the lower jaw fits into the framework. Its significance is enhanced by the fact that, unlike the other jaws of fossil man, all the specimens come from one site, though from different levels.

In its bearing on the evolutionary problem, the evidence of *Sinanthropus*, the most primitive and geologically the oldest hominid known, is crucial. It should point the way to the solution of the problem whether the modern jaw is derived from an ape-like ancestral jaw by the retraction of the teeth and the development of the chin, modifying an original prognathism, or from a 'mesogeneiotic' form which develops on one side into the prognathism of the anthropoid, and on the other into the orthognathic form of modern man. The high antiquity of the Heidelberg jaw, combined with its resemblance to Neanderthal man, has been thought to militate against the former alternative, which demands that the earlier the jaw in a chronological sense, the nearer its resemblance should be to the ancestral type. On this question, the position of the Peking mandible should be decisive.

Prof. Weidenreich, after describing in detail the eleven mandibles now available, and recording and discussing their measurements, passes on to consider the peculiar characteristics of *Sinanthropus* and its comparison with other types, as well as the place of Peking man in the evolutionary scale, incidentally recording some interesting conclusions on *Australopithecus* and the Piltdown jaw.

As regards sexual differences, it is evident that two types, a large and a small, are represented in the mandibles. The idea that they belong to different races may be discarded. If the difference is due to

sex, as is held, the ratio in size of female to male is much lower than in recent man, and more closely resembles that of the anthropoids. In *Sinanthropus* the ratio of small to large is 85.0 per cent; in modern man (Mongol), of female to male it is 92.4 per cent, in orang, 78 per cent, gorilla, 80 per cent and chimpanzee (approximately) 87 per cent.

As regards the special character of the mandible, the male is much larger, and bulkier than that of modern man; but this does not hold of the female, although the female ramus exceeds in height and breadth that of the Mongol of to-day. In height of body the symphysis height of 40 mm. reaches the upper margin of recent man, though the two measurements do not exactly conform. The *Sinanthropus* jaw has a higher alveolar and lower basal plane than modern man. The bicondylar breadth of 146.4 mm., it is interesting to note, is greater than that of the Eskimo, 140.0 mm., which is exceptionally broad, although the bigonial breadth, 108.6 mm. is below the Eskimo measurement of 130 mm. In both, measurements the female jaw is within the range of modern man. The angle of inclination of the frontal part of the jaw is the lowest known in hominids excepting the Heidelberg jaw, which is the same, namely, 60°. Another striking feature is the parallelism between the alveolar and basal planes, which is present also in orang and gorilla.

The shape of the alveolar arch presents a very characteristic picture in all adult specimens. Compared with recent man, the arcade shows a horseshoe-shaped, long and relatively narrow curve with its frontal part equally rounded in the region of the canines and incisors, and not flattened as in recent man. The free ends of the arches come close to each other.

In regard to the relief of the surfaces, one of the most outstanding features is the absence of chin (*mentum osseum*). In one specimen the area occupied by the roots of the frontal teeth is much larger than has been observed in any other known hominid, including the Heidelberg jaw. This feature, together with the strong inclination of the frontal part, points to a very primitive stage. There is, however, the beginning of a real mental spine, which has never been observed before in any of the Neanderthal mandibles, except La Chapelle-aux-Saints.

The juvenile mandibles exhibit the same qualities as the adult in regard to their bulkiness, even when sexual differences are considered. As to the anterior alveolar arch, it is noted that in the only one concerned, it is much longer and more widely stretched than in recent man, and essentially longer than in the adult *Sinanthropus*. A distinct shortening takes place during dentition, in which *Sinanthropus* apparently follows modern man and differs fundamentally from the anthropoids.

In comparing *Sinanthropus* with other forms, Prof. Weidenreich records his agreement with Prof. R. Dart and Dr. R. Broom that *Australopithecus* is neither chimpanzee nor gorilla, but comes well within the human line of development. This conclusion he bases on the character of the teeth, which resemble those of *Sinanthropus* (to be dealt with in a later monograph) rather than those of chimpanzee or

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gorilla. As regards the mandible, comparison is difficult, owing to the imperfect state of the *Australopithecus* mandible. Differences, however, from that of chimpanzee and gorilla are to be noted as well as resemblances to juvenile *Sinanthropus*.

The two mandibles of special importance in view of their rivalry with *Sinanthropus* on the score of antiquity, are Heidelberg and Piltdown. In regard to Piltdown, Prof. Weidenreich reaffirms his previously expressed inability to accept this jaw as that of a human being. To accept it, he maintains, would imply that in England lived a hominid with the brain case of recent man and an anthropoid-like jaw, while at the same time there was in the Far East another human being with the most primitive brain known hitherto, and a jaw distinctly more closely related to that of recent man than to that of the chimpanzee. The Piltdown jaw, in fact, as has been demonstrated by H. F. Friederichs, approaches most nearly the jaw of an orang, and no direct comparison between it and the mandible of *Sinanthropus* is possible. Piltdown does not come within the line from which *Sinanthropus* was derived, but belongs to the highly specialized group orang, chimpanzee, gorilla—forms removed from the human line.

With regard to the Heidelberg mandible, the antiquity of this has been called into question, but on the other hand the Steinheim skull has been considered to belong to the third Riss-Würm interglacial or even earlier. Yet it approaches recent man more nearly than does the Neanderthal type. The

general conclusion seems to be valid that the geological antiquity of hominid finds in Central Europe does not guarantee morphological primitiveness. The high geological age claimed for the Heidelberg find does not decide anything in regard to its phylogenetic precedence. The teeth of Heidelberg show none of the pithecoïd characters which mark *Sinanthropus*, though the latter is of about the same age. In Heidelberg man, small teeth are combined with a bulky jaw which is no sign of primitiveness. None of its distinctive features, to which attention has been directed, are really a mark of primitiveness.

Of the Neanderthal mandibles, the Ehringsdorf adult is closest to *Sinanthropus*.

On the general evolutionary problem, the evidence of the *Sinanthropus* mandible points to the conclusions: that Peking man is a direct forerunner of recent man; that only a general line which human evolution follows can be traced to a remote destination, and that regressive and progressive factors are to be found in every fossil mandible to a certain extent; that *Sinanthropus* does not represent a 'specialization', and that certain characters which may be regarded as a mark of primitiveness are found associated in the *Sinanthropus* mandible; and that the development of certain other characters such as the beginning of development of a mental trigonum, makes it quite possible that Peking man may have possessed the faculty of speech, as many indications in his cultural life appear to suggest.

Science Masters Association

ANNUAL MEETING

THE thirty-seventh annual meeting of the Science Masters Association was held on January 5-8 in Manchester. Only once before has the Association been north of Birmingham for its meeting, and never before to Manchester, but the generous activity of the host—the University of Manchester—and vigorous efficiency of the local committee, provided one of the most thoroughly satisfying meetings the Association has ever had. There were as usual exhibitions by leading publishers and manufacturers of scientific apparatus; there were demonstrations by the University science departments, and a particularly complete exhibition at the College of Technology, whither the whole meeting was bodily transferred by bus for one evening; and an unusual feature for a provincial meeting was the members' exhibition, never before held outside London.

The president for the year was the Vice-Chancellor of the University of Manchester, whose presidential address was as happy in delivery as it was penetrating in substance. He reminded his audience that the university teacher of medicine, himself a specialist, must train men so that all may have the general grounding which makes the good 'general practitioner', and yet so that the ten per cent who are to be specialists may have a proper foundation for their work; and noted a parallel with the task of the science master, who must use his specialist knowledge to train the ninety per cent of citizens as well as the ten per cent of technicians. He pleaded for an early

study of living things and their interdependence, even at the expense of the exact sciences, recalling the unique appeal of biology and its humanizing and broadening influences. He also expressed the hope that universities and schools would soon find an escape from a position in which each accused the other of fostering early specialization. It is for the teacher a peculiar merit of biology that it is not a science where control is simple or laws easy to arrive at; thus it affords a link between the physical sciences and ordinary life.

Other lectures, and the demonstrations arranged in the University science departments, were generally relevant to the recent research work going on in the University. Prof. W. L. Bragg demonstrated methods and results of crystal-structure investigation, and Mr. R. W. James, to whom the Association was able to offer the first public congratulations on his election to the chair of physics at the University of Cape Town, lectured on "The Architecture of Solid Matter". Prof. D. R. Hartree demonstrated the differential analyser. Perhaps the most popular exhibition was in the Chemistry Department, where Dr. G. N. Burkhardt had arranged a comprehensive series of demonstrations of recent spectroscopic work on vitamins and carotene. Prof. I. M. Heilbron, speaking on "Modern Technique in Biochemistry", showed how by colour separation and distillation it is possible to separate nearly-related substances in minute quantities; vitamin D₃ has thus been isolated, and vitamin A nearly so.