shutter; (3) the motor and reduction gears, and (4) the panel for the various electrical connections. The separation of parts 1, 2 and 3 was chosen in order to eliminate the transmission of vibration.

The optical bench is rigidly constructed of cast iron. Its height is adjustable. There are leveling screws (5) under each leg which rests on a vibration absorber (6). The upper part (7) carrying the microscope (8), the light source (9) and the optical equipment (10–15) can be pivoted about the point (16). The microscope rests on a special table (17) the height of which may be adjusted according to the kind of illumination desired for the work. This table forms a unit with the pivoted part (7) of the bench. By means of adjusting screws (18) and (19), the microscope may be moved either sideways or back and forth.

The optical bench when isolated may be applied for purposes other than microcinematography, such as microprojection and still microphotography. The microscope may be used vertically or horizontally, for its position may easily be changed by adjusting the table on which it rests. For work with material such as tissue cultures, when the temperature must be kept above normal, an incubator may be slipped over the microscope without deranging it or the rest of the apparatus.

The camera unit (2) is composed of two parts: the stand and the camera platform. The stand has a T-shaped, cast-iron foot with a leveling screw resting on a vibration absorber, at each one of its three extremities, two vertical steel rods and a cross-bar. The platform may be raised or lowered the entire length of the vertical steel rods by a hand pulley or simply by sliding.

Synchronously connected with the camera (20) is the revolving shutter (21) which provides intermittent illumination when high frequencies are used. For low frequencies, down to perhaps one exposure per minute, an electric timer (22) is used for starting and stopping the motor and for turning the light on and off. This timer is governed by an electric clock (23) which closes a circuit at certain predetermined intervals. This is accomplished by means of a relay which starts the driving motor. When the camera drive has completed one revolution one exposure has been made, the machine stops automatically and is ready for a new impulse from the clock. The length of exposure is regulated by an adjusting screw (24).

The motion-picture camera (20) is mounted on a slide so that it can be moved from side to side in order to align the tube of the focus control (25) with the optical axis of the microscope.

There is no mechanical connection between the microscope and the camera; a telescope tube (26) hanging into a collar attached to the microscope excludes outside light and allows only the projected light to come on to the film. Instead of the telescope tube an observation tube (so-called) beam splitter or a bellows slipped in from the front part of the camera platform may be used.

If *macroscopic* pictures are to be taken the microscope is removed and a photographic lens is screwed into the face plate of the bellows. The adjustable microscope table can then be used to hold the objects to be photographed. With this arrangement the apparatus is employed for ordinary vertical cinematography (for objects immersed in water, for small animals, or even for animated drawings).

In order to photograph phenomena which have to be taken horizontally, for example, objects in aquariums and slow chemical reactions in test-tubes, a 45-degree mirror is attached to the photographic lens.

Film records can be taken, therefore, without using the optical bench with the microscope.

The motor is connected by a leather belt, directly for high frequencies, or indirectly, by means of the reduction gears, for low frequencies including stop motion. An electrically driven tuning-fork (27) can be used as a time control when high frequencies are desired.

The distributing panel from which all electrical connections to the machine can be made is a novelty. The panel supports rheostats for the motor and for low and high intensity arc lamps, connections for foot switch and light increaser, and several additional plug receptacles.

Casters under the panel permit its being moved about so as to be close to the hand of the operator at all times.

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SPECIAL ARTICLES

SINANTHROPUS PEKINENSIS: THE RECOVERY OF FURTHER FOSSIL REMAINS OF THIS EARLY HOMINID FROM THE CHOU KOU TIEN DEPOSIT[1]

IN the course of the excavations continued by the Cenozoic Laboratory of the Geological Survey of China at Chou Kou Tien during the season of 1928

[1] Announcement of the discovery of this extensive additional fossil material referable to the genus Sinanthropus was first made at a meeting of the Geological Society of China held on December 14, 1928; a brief preliminary description of some of the specimens formed the subject of a paper communicated at the society's annual meeting on February 14, 1929.

a new aggregation of Sinanthropus material has been discovered at the northeastern corner of the main deposit and at a level some ten meters above the stratum in which occurred the type lower molar tooth described last year.[2] For convenience in reference the region in which this new material occurred may here be designated *Locus B*, the original Sinanthropus level being then termed *Locus A*. There can be no doubt as to the contemporaneity of these sublocalities within the main deposit nor of their geological age, the rich associated mammalian fossil fauna being identical in the two and typical of the Lower Quaternary (Polycene) Age.[3]

The Chou Kou Tien field work, which this year has been ably carried on by Dr. Birger Bohlin, Dr. C. C. Yang and Mr. W. C. Pei, has resulted in the discovery and complete excavation of Locus B, and in the further extensive though not complete excavation of Locus A.

Up to the present the following additional specimens undoubtedly referable to the genus Sinanthropus have been recovered from Locus A, either in the field itself or during laboratory preparation of material from this sublocality: the greater part of the right horizontal ramus of an adult lower jaw with three molar teeth *in situ* and having the premolar, canine and distal half of the lateral incisor sockets preserved; a somewhat worn right upper molar tooth (M1 or M2) showing definite evidences of injury during life; the labial side of the crown and portion of the root of a permanent upper median incisor; an immature lower (?) permanent incisor, and lastly the labial half of the crown and root of a worn lower median permanent incisor, posthumously crushed and deformed. These specimens are deeply pigmented and mineralized in a manner characteristic of all fossils recovered from Locus A.

In contrast to the material from Locus A, no fossils from Locus B are deeply pigmented, most of them being quite white or of light buff color. For the most part they are imbedded in a hard, yellowish travertine which in places has been very irregularly reduced to a clay-like consistency apparently as the result of weathering action. On account of the difficulty of working this matrix but a small part of the hominid material from Locus B has as yet been prepared, but sufficient preliminary work has been done to warrant its definite reference to the genus Sinanthropus. A score or more of teeth both deciduous and permanent, representing many phases of dentition and ontogenetic age, together with the complete symphysis region of the lower jaw of a very young individual have already been prepared. Though the greater part of the right ramus of the jaw of this immature specimen together with parts of the calvaria of both immature and adult individuals are already partly exposed in various blocks of travertine, no description of this material will be possible until it is completely prepared. However, even at this early stage of the work, it is evident that despite the archaic structure of its lower facial region, Sinanthropus like Eoanthropus was a large-brained form, though unlike the latter the calvaria of Sinanthropus does not appear to be unduly thick.

Since many months must elapse before an adequate description of all this new material can be published and since the morphology of the two jaw specimens presents features of unusual interest, it has been thought worth while to illustrate this brief note with the accompanying line drawings.

In Fig. 1 the two diagraph tracings at the left represent normal variations in chin development

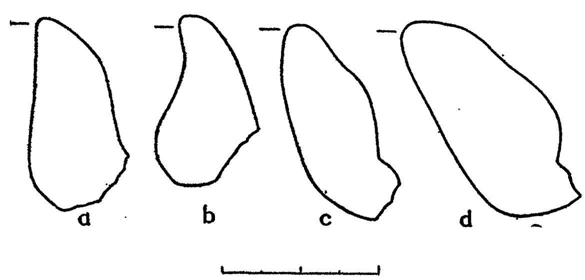

FIG. 1. Mid-sagittal diagraph tracings of the symphysis mandibulae of various immature individuals in each of which the two deciduous and first permanent molar teeth were together functional. *a*, Copper Age child (Homo .404–11) from Kansu; *b*, recent North China child (Homo 44 ♂); *c*, Sinanthropus; *d*, chimpanzee. The specimens have all been similarly oriented, the plane of the infradentale being indicated in each case by a short horizontal line. In *a*, *b* and *c* the permanent incisors are erupted and worn though their root apices are not completely formed; in *d*, the milk incisors are still *in situ*. Natural size.

within the genus Homo and each shows the characteristic morphology of the lingual surface of the symphysis within that genus. The complete absence of the mental prominence and the peculiar morphology of the lingual aspect of the symphysis in the genus Sinanthropus become evident at a glance. In Sinanthropus a genioid pit takes the place of the upper mental spines for the attachment of the genioglossus muscles, the genioid tubercle below this depression is prominent and unpaired while the digastric depressions in this form differ markedly from those characterizing any member of the genus Homo. Though the so-called ape-shelf is not extensively de-

[2] *Pal. Sin.*, Ser. D, Vol. VII, Fasc. 1, 1927; see also SCIENCE, February 3, 1928, p. 135.

[3] *cf.* Zdansky: "Die Säugetiere der Quartärfauna von Chou Kou Tien," *Pal. Sin.*, Ser. C, Vol. V, Fasc. 4, 1928.

veloped in this immature Sinanthropus jaw, the general architecture of the symphysis region makes it evident that the very generalized hominid dentition of this specimen is supported within a framework of a type which has heretofore only been encountered among forms having relatively formidable canines.

In Fig. 2 the lower jaw fragment of the adult Sinanthropus specimen from Locus A is illustrated in comparison with drawings of similarly oriented adult jaws of other forms. The permanent molars in the Sinanthropus specimen, though considerably worn, display in their form and proportions the characteristic tooth morphology of the genus. The form and size of the socket for the canine make it evident that the root of this tooth in adult Sinanthropus was but slightly longer and more massive than those of the premolars. There is a very evident progressive diminution in the size of the molar teeth from before backward. The architecture of the jaw itself is much less hominid than that of the teeth which it supports and, like the immature Sinanthropus specimen, represents a framework which till the discovery of Eoanthropus had been supposed to be associated only with an anthropoid type of dentition. It can no longer be doubted that distinctive hominid teeth characters were evolved in the human family long before the architecture of the supporting jaw lost its anthropoid form.

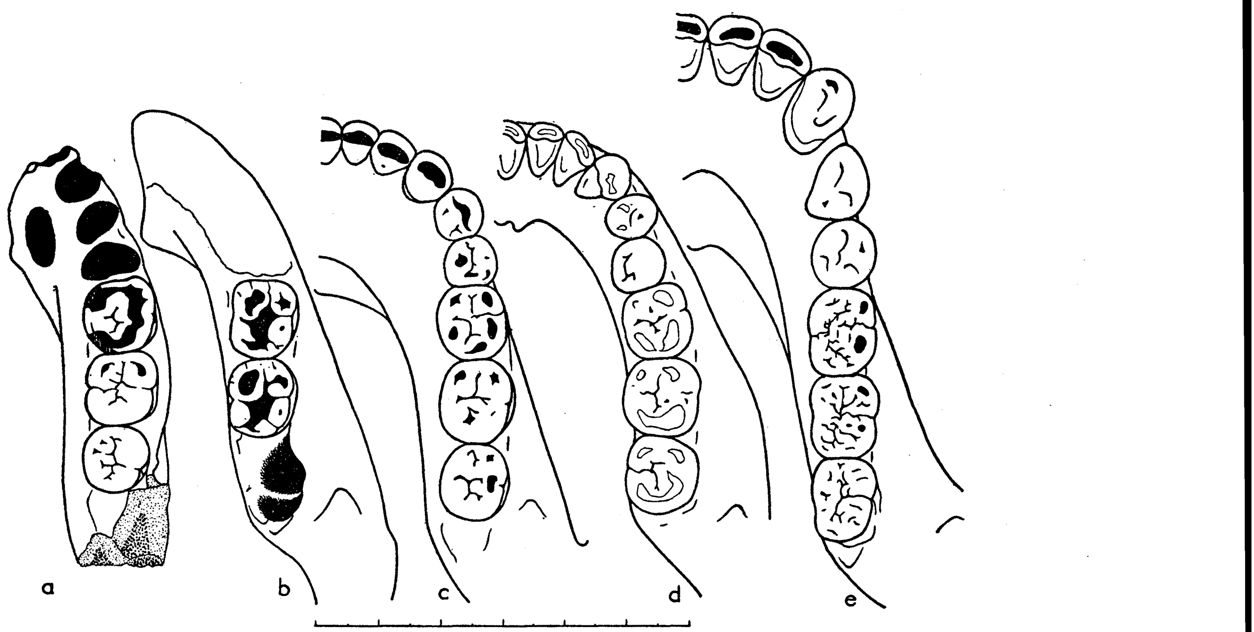

FIG. 2. Outline drawings traced from photographs of the right horizontal rami of various similarly oriented adult lower jaws, the molar occlusal plane in each being approximately horizontal. The drawings have been arranged for comparison with the mesial margins of the first molar teeth in the same transverse plane, the alignment of the lingual margin of the molar series in each case being approximately at right angles to this. *a,* Sinanthropus; *b,* Eoanthropus (from cast); *c,* Paleoanthropus s. H. heidelbergensis (from cast); *d,* recent North China male (Homo 39 ♂); *e,* adult female orang. Five sixth natural size.

It thus becomes evident that the conclusions based on the earlier study of the type lower molar tooth of Sinanthropus have been verified in detail, and in addition it is now possible to state that, in spite of the archaic structure of its lower facial region, Sinanthropus was a large-brained form, probably having a cranial capacity falling well within the range of normal variation of this character in the modern genus Homo. On completion of the work of preparation and restoration, a full and adequately illustrated report on this new material will be published in Volume VII, Series D, *Palaeontologia Sinica.*

DAVIDSON BLACK

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AN ULTRA-VIOLET LEAD OXIDE BAND SYSTEM

USING Lamprecht's measurements, Mecke has recently arranged the lead oxide spectrum into three systems.[1] These measurements extend from 6000Å down to about 3600Å. Below 3600Å there is a strong group of bands which Lamprecht did not observe. Eder and Valenta give photographs and measurements of these ultra-violet band spectra in their well-known "Atlas." These bands appear when lead or its com-

[1] R. Mecke, *Die Naturwissenschaften,* 17: 122, February 15, 1929.