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.

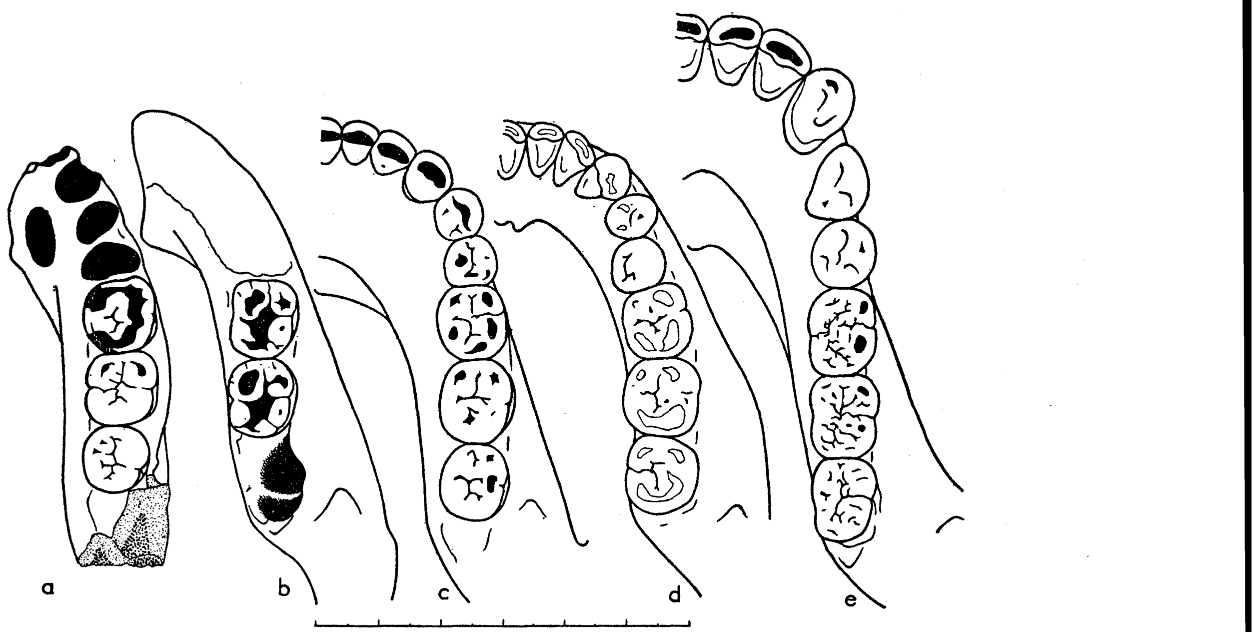

FIG. 2. Outline drawings traced from photographs of the right horizontal rami of various similarly oriented adult lower jaws, the molar occlusal plane in each being approximately horizontal. The drawings have been arranged for comparison with the mesial margins of the first molar teeth in the same transverse 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.*

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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.

pounds is placed in an arc or flame. They are degraded to the longer wave-lengths in common with the less refrangible bands.

A short time ago the writer established the identity of PbO as the emitter of the yellow-green bands through an observation of the isotope effect.[2] Grebe and Konen's isotope effect in the blue region points also to PbO as the emitter. In order to aid in the vibrational quantum number assignment, an isotope effect was sought for and found in the ultra-violet. The spectrum of this region was photographed in the second order of a twenty-one-foot Rowland grating, first using ordinary lead in an arc and then repeating with uranium lead of atomic weight 206.1. About three grams of this material, a portion of the nugget of uranium lead used in the previous experiment, was placed in the arc. Both exposures were twenty hours long.

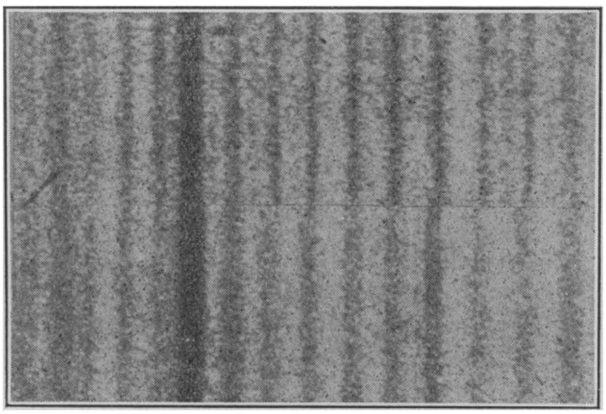

FIG. 1

Fig. 1 illustrates the experimental results near the head of the λ3485.7 band. The spectrum in the upper half of the picture consists of the sharp band lines of $Pb_{206}O$. The lower half shows the corresponding lines in the oxide spectrum of ordinary lead, $Pb_{208,207,206}O$. These are wide and unresolved, and in marked contrast to the isotopic triplets observed in the λ5678 band. The lines of $Pb_{206}O$ are displaced .037 ± .006 Å to the longer wave-lengths. The strong reference line is an iron arc line of wave-length 3490.577 Å. The enlargement of the original plates (dispersion 1.316 Å/mm) is about twenty-three fold. The wave-lengths increase from left to right in the figure.

In order to secure accurate measurements of the wave-lengths of the heads of these ultra-violet band spectra, photographs were taken at moderate dispersion with the Hilger E.1 quartz spectrograph (Littrow mounting). It was found that the wave numbers of most of the band heads could be represented to within a few wave numbers by the formula

$$\nu = 30{,}197.0 + [530.6(n' + \tfrac{1}{2}) - 1.1(n' + \tfrac{1}{2})^2] - [722.3(n'' + \tfrac{1}{2}) - 3.7(n'' + \tfrac{1}{2})^2]$$

where n takes the value 0, 1, 2, 3, etc. By comparison with Mecke's formulas for the other systems, it appears that all four have the same final state, which is probably the normal state of the molecule. The wave-lengths of the principal band heads are close to those previously measured by Eder and Valenta. They secured values 3264, 3322, 3342, 3402, and 3491 Å. The new measurements with quantum number assignments include λ3209.2 (2, 0), 3264.4 (1, 0), 3320.7 (0, 0), 3341.8 (1, 1), 3401.9 (0, 1), 3485.7 (0, 2), 3594.2 (1, 4) and a great many weaker bands.

Upon substituting the constants given above into the usual formula,[3] one can calculate the isotope effect to be expected near the head of the λ3485.7Å band, assuming that PbO is the emitter. Neglecting the rotational contribution to the isotope effect, since the origin of the band is close to the head in this case, one calculates .033Å as the separation between the lines of $Pb_{207}O$ and $Pb_{206}O$. This value agrees with the measured displacement of .037 ± .006Å within experimental error. A detailed report on the quantum analysis of the lead oxide band spectra will soon be published.

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THE LIFE-CYCLE OF HAPLOBOTHRIUM GLOBULIFORME COOPER 1914

FIVE out of eight *Ameiurus nebulosus* (common bullhead) taken in the Mississippi River near Homer, Minnesota, have shown the presence of an interesting larval cestode encysted in the liver. The cysts were small, measuring about 0.77 by 0.66 mm, and situated in the superficial tissues. Freed from the cysts they show characters which are unique in a parasite from a fresh-water host. The body is divided into two parts: a long slender anterior portion (0.5 by 0.16 mm) comprising the scolex and neck, and a posterior portion consisting of a spheroidal bladder-like organ (0.5 by 0.5 mm). The scolex contains four protrusile proboscides which measure about 0.42 mm in length when invaginated. The only tapeworm from a fresh-water host to which these larvae bear any resemblance is *Haplobothrium globuliforme*, a cestode of *Amia calva*. There is essential agreement between the larvae from the bullhead and Cooper's description of the plerocercoid of *Haplobothrium globuliforme* (found

[2] S. Bloomenthal, SCIENCE, 69: 229, February 22, 1929; *Physical Review*, 33: 285 (A35), February, 1929.

[3] See R. S. Mulliken, *Physical Review*, 25: 119, 1925; and F. W. Loomis, *Bulletin* of the National Research Council, 57: 262.