juice free from substances which interfere with the determination of nitrate nitrogen by the phenoldisulfonic acid method. The greatest modification lies in the elimination of carbon black, certain brands of which are known to adsorb nitrate nitrogen. The simplicity of the method should commend it to workers in the field of plant chemistry. The use of carbon black was found to be unnecessary since the colloidal complex formed by the reaction of the $Ca(OH)_2$ with the $CuSO_4$ and $AgSO_4$ adsorbs all the coloring matter present in plant juices.

Place a sample of plant tissue sufficient to yield approximately 10 cc of juice in a cheesecloth bag and freeze thoroughly for at least two hours. This is best done by solid CO_2, although an ice-salt bath may be used, if sufficient time is allowed for thorough freezing. Remove from refrigerating medium, thaw and press at once in any device which will give sufficient mechanical pressure. A hydraulic press of small size is extremely convenient for this expression, since it is essential that the pressure be the same on all samples if a comparison of the results is to be made. Collect the expressed juice, centrifuge to remove any solid material, and pipette a suitable aliquot (usually 2 cc) into a 100 cc volumetric flask.

To the juice in the flask add about 20 cc of nitrate-free distilled water; 5 cc of saturated $AgSO_4$ solution; 1 cc of N $CuSO_4$ solution, and 0.2 gram of finely divided $Ca(OH)_2$, shaking after each addition. These reagents should be thoroughly tested for the presence of nitrate nitrogen, and only those showing an absence of nitrates should be used. Make to volume with nitrate-free water, and filter after standing at least one hour. Discard the first portion of the filtrate. A suitable aliquot of this can be evaporated to dryness on a steam bath, and the nitrate-nitrogen determined by the phenoldisulfonic acid method, using NaOH to neutralize the acid according to Harper.[8] If a precipitate forms at this point, allow to flocculate and filter.

A detailed study of the method above proposed has been published.[9]

In connection with some determinations of the nitrate nitrogen in the juices of the beet plant, a significant negative correlation appeared between the weight of the leaves and the nitrate nitrogen found in the juice of these leaves. Upon further study, the correlation calculated from a statistical study of 578 individual leaves divided into twelve composite samples indicated a correlation of -0.855 ± 0.052. An explanation of this may be found in the following facts:

(1) The juice of the midrib of the beet leaf contains more nitrate than the juice from the remainder of the leaf.

(2) The ratio of the weight of leaf tissue after removal of midrib to the weight of midrib is much higher in the large leaves.

These facts offer an explanation for the correlation, for, since the high nitrate juice is in the midrib, and the proportion of the weight of midrib to the weight of the remainder of the leaf is greater in the small leaf than in the large, it is obvious that the smaller leaf should have a higher nitrate content.

In view of the above facts, it has become the practice in this laboratory to choose leaves of uniform size and to remove the midrib of these leaves before the extraction of juice for analysis. It is hardly probable that this entirely eliminates the error attributed to the size of the leaves, since considerable venous tissue remains, but it is felt that this error is much less when the midribs are discarded.

A more complete study of the above facts has been prepared, and will be published soon.

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[8] H. J. Harper, *Journ. Ind. Eng. Chem.*, 16: 180, 1924.
[9] D. E. Frear, *Plant Physiol.*, 5: 359, 1930.

THE GEOLOGICAL BACKGROUND OF PEKING MAN (SINANTHROPUS)[1]

THE *Sinanthropus* discoveries are significant for a number of reasons, quite apart from the valuable evidence they present regarding the close relatives of the anthropoid stock from which the genus *Homo* evolved. (The anatomical facts themselves are made available through the reports issued periodically by Dr. Davidson Black from the laboratory of Cenozoic Research in Peiping. Therefore, beyond brief comments on the cast of the skull and on the photographic reproductions thrown on the screen, this short outline of the salient points deals with other aspects of the discoveries, which are reported officially in the publications of the Geological Society of China.)

(1) The story of the discovery at Chou-kou-tien offers a striking example of the romance of scientific research, beginning with Andersson's studies of the Tertiary and Quaternary history of North China, and his search for fossiliferous deposits (1921), followed by Zdansky's careful paleontological work on the mammalian remains (1922), and the finding of the first teeth when the material was being prepared in the laboratory at Upsala (1926); continued by Bohlin's methodical excavation leading to the unearthing of the single tooth on which Black based the new

[1] Abstract of paper presented at the meeting of the British Association, Bristol, by permission of the director of the Geological Survey of China.

genus *Sinanthropus* (1927); carried on by Pei's further discoveries of teeth, jaw and skull fragments (1928), and culminating in the finding of the uncrushed skull on December 2, 1929; and the reconstruction of the second skull six months later.

(2) Unlike the scanty remains of *Pithecanthropus* and *Eoanthropus* the material available in the case of *Sinanthropus* represents parts of ten individuals. It is surprising that all the material recovered is from the head, no limb bones having been so far recognized.

The most perfect skull is complete down to the roof of the orbital cavities, and has unfused sutures, being of a young adult.

It may be added that no stone implements or other sign of culture have been found.

(3) The main fossiliferous deposit occupies one of a series of old caves following former underground solution-channels in tilted strata of Ordovician limestone. It consists of a series of roughly stratified reddish sands and gravels, locally cemented into a tough travertine, mixed and interlayered with gray limestone breccia, due to the progressive collapse of the roof as the floor was built up. Probably at no time was the open cavity as high as the present depth of the deposit. The latest finds owe their preservation to the protection of a choked lateral conduit branching from a low level in the main cavity.

(4) As a minor point may be mentioned the accessibility of the locality. Chou-kou-tien is a village on the edge of the Western Hills, 45 miles from Peiping, which, on account of its coal, limestone and granite, is served by a branch of the Peking-Hankow Railway. Though not of use for passenger service, this railway has allowed the removal of great quantities of unprepared fossil material which can be carried away in bulk, to be worked up in the laboratories in Peiping. During the seasons 1927–29 1,475 cases of fossils were taken out in this manner. In addition, the quarrymen of the place are available for the task of blasting out the limestone and travertine walls, and excavating the less consolidated parts of the deposit in which the fossils occur. Thus, during the same three seasons a total of 8,800 cubic meters was excavated, despite the fact that the countryside has undergone a period of severe military and political disturbance.

(5) Parts of *Sinanthropus* have been found at five distinct levels, separated by as much as 60 vertical feet of deposit. The same is true of much of the mammalian fossil material, thus showing that the entire deposit is essentially of one and the same geological age. There is thus no chance of error in dating any particular horizon within the body of the deposit.

(6) The faunal assemblage is very rich, well preserved, varied in character, and suited to exact dating in terms of Chinese geological chronology, as well as of value in determining the climatic and environmental habitat of the period. Over fifty mammalian types, besides frogs, snakes, turtles and birds, have been already distinguished, and when comparative studies have been made should permit of close correlation with fauna in other parts of the world. Most characteristic types are *Sinanthropus* ("Peking Man"), *Euryceros* (flat-antlered deer), *Rhinoceros,* cf. *sinensis, Hyaena sinensis.* Interesting types are the big beaver (*Trogontherium*), primitive buffalo (*Bubalus*). There are suggestions of a southern affinity. It is distinctly older than the Loess fauna (Middle Pleistocene), which includes *Rhinoceros tichorhinus, Hyaena crocuta, Cervus elaphus,* in place of those mentioned above. The general assemblage is Villafranchian in type and can be closely dated as very early Pleistocene in view of the absence of truly archaic types, and the presence of modern types, including *Equus;* but it is definitely distinct from and older than Middle Pleistocene. This age tallies with the physiographic and climatic stages as determined from entirely independent evidence in other localities in North China.

(All new data are issued from the Laboratory of Cenozoic Research under the control of the Geological Survey of China and the Peiping Union Medical College. A bibliography up to December, 1929, appears in a paper by Teilhard and Young in *Bull. Geol. Soc. China,* Vol. 8, No. 3, 1929. Further data appeared in Vol. 9, No. 1, 1930.)

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