much. That is a sum almost sufficient for the salaries of the staff, at first.

Unattainable in the first or second year, this membership should be reached in the fifth year of the Institute's existence; and after the first decennium the benefits of the Institute will have been so incontestably proven, that no chemist, whatever his activity, will find it practicable to carry out his work without using it. Then the annual membership fees would amount to much more than we have assumed.

CONDITIONS FOR THE FOUNDATION

The foundation of so great an institution is not possible on the uncertain basis of membership fees. A realization of the entire plan can only be expected when a definite sum of money has been assured for the first outlay, and a yearly income guaranteed for a number of years.

After repeated calculation of the requirements and conditions and with the feasible assumption that nothing need be allowed for the purchase of the land, I assume that with an endowment of $150,000 and an annuity of $12,000 for five or ten years, the Institute could be called into being without subjecting ourselves to the stigma of financial rashness.

Neither sum can be obtained except through the willing participation of those persons and institutions who would derive personal or public benefit from the International Chemical Institute or who wished to serve as public benefactors.

Personal solicitations will be instituted to obtain this endowment for the establishment of the International Chemical Institute.

The liberality of one or another country will eventually decide where in Europe the main institute is to be located.

Wilhelm Ostwald

THE MAN OF PILTDOWN

The story of the Piltdown discovery is already more or less familiar to readers of this journal.[1] But the recent gathering and publishing of additional data[2] on the subject should not be allowed to pass unnoticed. This is especially true not only because of the far-reaching significance of the discovery, but also because British scientists have been known to be at odds concerning the reconstruction of the skull in question.

It will be recalled that Dr. Smith Woodward regarded the Piltdown specimen as the type of a new genus of the family Hominidæ, to which he gave the name *Eoanthropus dawsoni*, and which was defined primarily by the characters of the mandible. Of the mandible only the right ramus with first and second molar teeth *in situ* was at first discovered. The condyle and symphysis were both lacking, but the fragment was of sufficient size to enable Dr. Smith Woodward to reconstruct the symphysis with a fair degree of accuracy. It was the reconstruction of the cranium about which differences of opinion arose between Dr. Smith Woodward and Professor Elliot Smith, on the one hand, and Professor Arthur Keith, on the other.

Of the brain case nine fragments, parts of the frontal, parietal, occipital and temporal, were found. From these Dr. Smith Woodward reconstructed a skull with a capacity of about 1,076 c.c. On the other hand, a reconstruction by Professor Keith gave to the skull a brain capacity of 1,500 c.c., in other words, that of a well-developed modern European skull. After further study Dr. Smith Woodward acknowledges a small error. He finds that the "longitudinal ridge along the outer face at the hinder end of the parietal region is not median, but one of a pair such as frequently occurs in the lower types of human crania." In the published reconstruction there should thus be a slight readjustment of the occipital

[1] Science, January 17, 1913.

[2] Chas. Dawson and A. Smith Woodward, "Supplementary Note on the Discovery of a Palæolithic Human Skull and Mandible at Piltdown (Sussex)," *Quar. Jour. Geol. Soc.*, LXX., April, 1914.

and right parietal bones, "but the result does not alter essentially any of the conclusions already reached."

With this opinion Professor Elliot Smith is in complete accord. From an examination of the original fragments, he was able to determine the location of the median line of the skull. The persistence of slight traces of the sagittal suture in the regions of the bregma and lambda made this possible. The true median plane in this particular case, however, passes a little to the left of the union of the coronal with the sagittal suture owing to a slight deflection of the latter. Since this deflection is never more than a few millimeters (except where large bregmatic wormian bones are present and they are not present in this case), the bregma and lambda are good guides in locating the median plane. In line with the median plane as thus determined, the endocranial aspect of the frontal bone presents a well-defined longitudinal ridge, corresponding to the "place where the two halves of the frontal bone originally came together at the metopic suture." The cranial capacity then of the Piltdown skull is evidently not very much greater than the original estimate of 1,076 c.c.

In addition to exhaustive laboratory studies on the parts above mentioned, a painstaking and systematic search was made at the Piltdown site. The mandibular ramus had been found *in situ*. All the gravel *in situ* within a radius of five meters of this spot was "either washed with a sieve or strewn on specially prepared ground for the rain to wash it; after which the layer thus spread was mapped out in squares, and minutely examined section by section." In this spread Father Teilhard de Chardin, assisting at the work for three days, found the right canine tooth in August, 1913. The two human nasal bones and the turbinated bone were not recovered from this spread, but from disturbed gravel within less than a meter of the spot where the mandible had been discovered.

The nasal bones are said to "resemble those of existing Melanesian and African races, rather than those of the Eurasian type." In thickness they correspond to the bones of the skull previously found. The canine tooth not only corresponds in size to the mandible, but belongs to the same half (right) as that recovered. It likewise agrees with the two molar teeth in the degree of wear due to mastication. The extreme apex is missing, but whether by wear or by accidental fracture is not determinable. The enamel on the inner face of the crown has been completely removed by wear against a single opposing tooth. The worn surface "extends to the basal edge of the crown, as indicated by the clear ending of the cement along its lower margin."

This canine tooth is larger than any human canine hitherto found, and interlocked with the opposing upper canine. It rose above the level of the other teeth and was separated from the lower premolar by a diastema. On the other hand, there is no facet due to wear against the outer upper incisor, such as often occurs in the apes.

If a comparative anatomist were fitting out *Eoanthropus* with a set of canines he could not ask for anything more suitable than the tooth in question. It conforms to a law in mammalian paleontology, "that the permanent teeth of an ancestral race agree more closely in pattern with the milk-teeth than with the permanent teeth of its modified descendants." The canine of *Eoanthropus,* as might have been expected, resembles the milk canines of *Homo sapiens,* on the one hand, and *Simia salyrus,* on the other, than it does the permanent canines of either. It is pointed out that even in recent man if the base of the crown of the canine were raised in the gum to the same level as that of the adjacent teeth, its apex would frequently rise well above the rest of the dental series.

The various elements that make up the gravel bed at Piltdown are better known to-day than when the first report was published; additional fossil animal remains have also been recovered. Four well-defined layers have been determined. At the top is a deposit of surface soil 35 cm. thick, containing pottery and flint implements of various ages. The second bed consists of undisturbed gravel varying from a few centimeters to a meter in thickness.

The prevailing color is "pale yellow with occasional darker patches." A rude paleolith of the Chellean type was found in the middle of this layer, which likewise contained rolled iron-stained subangular flints. The third layer, some 50 cm. thick, is easily distinguished because of its dark ferruginous appearance. It contains rolled and subangular flints similar to those found in the layer above. All the fossils (with the exception of the remains of the deer) were either discovered in or have been traced to this third layer. So-called eoliths and at least one worked flint were likewise found here. The *Eoanthropus* remains came from it and near the uneven floor forming the upper limit of the fourth stratum. The latter has a thickness of about 25 cm., is non-fossiliferous, and "contains flints of a much larger size than any of those in the overlying strata." Nothing that could be called an implement or eolith has been reported from the fourth bed. Below are undisturbed strata of the Tunbridge Wells Sand (Cretaceous).

Our knowledge of the Piltdown fossil fauna has been supplemented by the finding of remains of one new form, a fragment of a tooth of *Rhinoceros,* in the same state of mineralization as the teeth of *Stegodon* and *Mastodon* previously described; while the specimen can not be determined with absolute certainty, it belongs either to *Rhinoceros mercki* or *R. etruscus,* with the evidence rather favoring the latter. Additional remains of *Stegodon* (fragment of a molar) and *Castor* (fragment of mandible) were likewise recovered. Judged from its fossil content, the third stratum at Piltdown would be classed as Pliocene were it not for the presence of *Eoanthropus* and the beaver. In view of the fact that the remains of these, although softer, are not so rolled and worn as the other fossil remains, the third bed, although composed in the main of Pliocene drift, was probably reconstructed in early Pleistocene times.

Those who might once have objected to the use of the name *Eoanthropus* for the Piltdown skull can no longer deny its appropriateness when applied to the lower jaw, especially since the finding of the canine tooth. While the probabilities are all in favor of the three parts belonging to one and the same individual, the case for *Eoanthropus* does not have to depend on producing positive proof to that effect. The only flint implement of Chellean type came from the layer above (No. 2), and is of later date than the human remains. Did *Eoanthropus* make use of the eoliths found in tell-tale association with him? The future holds this secret, and if hard enough pressed, may some day reveal it.

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THE PRODUCTION OF COAL IN 1913

THE production of coal in the United States has again broken all previous records, the output for 1913 being 570,048,125 short tons, which is considerably more than double the production of 1900 and more than eight times the production of 1880, according to a statement just issued by the United States Geological Survey, from figures compiled by Edward W. Parker, coal statistician. The value of the coal mined in 1913 is given as $760,488,785.

Compared with the previous year the output for 1913 shows an increase of 35,581,545 tons, or nearly 7 per cent. The increased activity indicated by these figures was well distributed throughout the 29 coal-producing states, 23 of which showed increases and only 6 decreased production, the decrease in one of these—Colorado—being due solely to labor trouble. Of those showing increase, 12 made record yields, and Pennsylvania, the leading coal state, broke records in both bituminous and anthracite production. The states which broke all former records in coal production were Alabama, Illinois, Kentucky, Montana, New Mexico, Ohio, Oklahoma, Pennsylvania, Texas, Utah, Virginia and West Virginia. The largest increase in the production of bituminous coal was in Pennsylvania, where 11,915,729 tons was added to the output of 1912. West Virginia showed the second largest gain, 4,522,295 tons, and Kentucky the