

of chlorophyll on a globin film is markedly decreased (uptake only 84 %). Still this decrease is not sufficient to assume a flat position of the chlorophyll molecule in this case. For if the molecules formed a closed, flat pattern upon the globin they need only a little more than 25 % of the equivalent area. It may be that in the fluorescent globin-adsorbates as obtained by NOACK the chlorophyll actually formed such a pattern. In order to see whether the failure to obtain such (fluorescent) adsorbates might be due to a change in state of the protein a globin film composed of 400 monolayers was examined under polarized light as GORTER has recently demonstrated (1) that protein films consisting of 1700 monolayers exhibited distinct birefringence. No such preferred direction was found in the specimen prepared by us, neither did a (deep green) film built from 180 chlorophyll monolayers show measurable birefringence. However the number of layers may be far too small to obtain results.

Professor I. LANGMUIR called our attention to a possible source of error in our method resulting from the non-uniform distribution of the pressure in our films, which heterogeneity may be caused by the shape of the surface. The method described above is therefore only strictly applicable to liquid films. As in our subsequent experiments the shape of the surface was never alike, it seems that the method may also be suitable for non-liquid films.

LITERATURE.

1. ASTBURY, W. F., F. O. BELL, E. GORTER, J. VAN ORMONDT, Optical and X-Ray Examination and Direct Measurement of built-up Protein Films. *Nature* **142**, No. 3583, 33 (1938).
2. BLODGETT, KATHARINE B., Films built by depositing successive monomolecular layers on a solid surface. *J. Am. Chem. Soc.* **57**, 1007 (1935).
3. BUNGENBERG DE JONG, H., *Koll. Zeitschr.* **71**, 184, 194 (1935).
4. HANSON, E. A., A. D. J. MEEUSE, W. F. H. M. MOMMAERTS and L. G. M. BAAS BECKING, A note on the chlorophyll-contents of the granum. *Chron. Bot.* **IV**, 104 (1938).
5. HILL, R. and H. R. HOLDEN, The preparation and some properties of the globin of oxyhaemoglobin. *Bioch. J.* **20**, 1326 (1926).
6. HUBERT, B., The physical state of chlorophyll in the living plastid. *Rec. Trav. Bot. Néerl.* **32**, 323 (1935).
7. LANGMUIR, I., V. J. SCHAEFER and DOROTHY WRINCH, Built-up films of proteins and their properties. *Science* **85**, 76 (1937).
- 7a. LANGMUIR, I., V. J. SCHAEFER and H. SOBOTKA, Multilayers of sterols and the adsorption of digitonin by deposited monolayers. *J. Am. Chem. Soc.* **59**, 1751 (1937).
8. NOACK, K., Der Zustand des Chlorophylls in der lebenden Pflanze. *Bioch. Zeitschr.* **183**, 135 (1927).

Geology. — *An Early Palaeolithic Site on the Northern Veluwe.* By F. C. BURSCH, F. FLORSCHÜTZ and I. M. VAN DER VLERK. (Communicated by Prof. J. BOEKE.)

(Communicated at the meeting of September 24, 1938.)

It is several months ago that Major J. MALLINCKRODT, of the Infantry-School for aspirant-reservist-officers at Kampen, found a piece of flint, bearing obvious traces of human workmanship, upon a newly made bicycle-path in the northern part of the Veluwe. Although at first he did not intend to make this single discovery public, when during last summer he found a number more worked flints in the heaps of loam beside various paths in the neighbourhood, the case became entirely different.

Not satisfied by the fact that his archaeological acumen enabled him soon to collect a large number of artefacts, he pursued his research further and did not rest until he had traced the origin of the heaps of loam amongst which they had been discovered.

Thus he found in the wall of a loam-pit in a special, rather narrow layer, a very large quantity of implements as well as half-finished and waste pieces that always accompany them *in situ*.

Being of opinion that he ought not keep this discovery to himself and convinced that his find was of sufficient importance to form a valuable contribution to our knowledge of the earlier inhabitants of our country, he immediately informed the authorities of the National Archaeological Museum at Leiden, at the same time, with great generosity, offering all his material for the collections of this institution.

Thanks to the cordial and unselfish co-operation of the discoverer, the writers of this article were allowed to inspect the finding-place and the artefacts and so were enabled, as on a former occasion, to combine their efforts to ascertain the true significance of the finds. Therefore, at the beginning of this report, they wish to express their sincere thanks to Major MALLINCKRODT for his co-operation with the official services, witnessing to his true scientific interest and the seriousness of his archaeological studies.

The finding-place (fig. 1, 2) is situated near Hattemerbroek, E. of Wezep, somewhat south of the railway between Amersfoort and Zwolle, and close to the cart-road known as "Keizersweg".

In the meantime identical finds have been made by Major MALLINCKRODT in a loam-pit on the artillery-range of Oldebroek, while the same enthusiastic investigator collected some similar artefacts a short time ago in the clay dredged near Vollenhove and used for the dike being constructed round

the new North-East-Polder in the former "Zuiderzee". In the following, however, we shall confine ourselves to the first-mentioned finding-place near Wezep.

It should be mentioned that the two last-named authors are responsible for the geological, the first-named for the archaeological part.



Fig. 1. Finding-places of the artefacts.

I. Geological part.

In order to make a geological computation of the age of the worked flints found in the loam-pit near Wezep (fig. 1, 2), the pit was dug out to 3.70 m below the surface of the soil. This revealed the profile shown on the plate and on the drawing (fig. 3) described below.

From the bottom of the pit to 2.60 m below the surface of the soil a complex of coarse sand and gravel was seen, whose original, almost horizontal strati-



Fig. 2. ● Finding-place of the artefacts near Wezep. Scale in meters.

fication apparently had been disturbed afterwards. As the gravel contained only southerly erratica it was natural to conclude that this complex (stratum *a* on photos and drawing) was part of the Higher Terrace pushed up by the inland-ice, marked on the geological map of the Netherlands 1:50,000 by the symbol II 2 (TESCH, 1927). In agreement with the accepted opinion in our country, we regard this Terrace as having been deposited in the beginning of the Saale-Riss Ice-age, when the Rhine and the Maas built up a delta in this region, which subsequently — but as we shall see at a considerably later period — was partially covered and ridged up by the inland-ice.

On the Higher Terrace, in this profile, reposed a system of strata, marked in the drawing *b* 1—5. This group consisted principally of liver-brown clayish sand (*b* 1, *b* 3 and *b* 5) in which numerous lenses of fine yellow sand were interstratified (e.g. *b* 2 and *b* 4), varying in thickness (maximum 5 cm) and extent. In the for the rest finely granulated sand, many northern erratic boulders were found, some of which had a diameter of a few decimeters. Thus, in the hole visible in *b* on the lower photo, a large flint has lain.

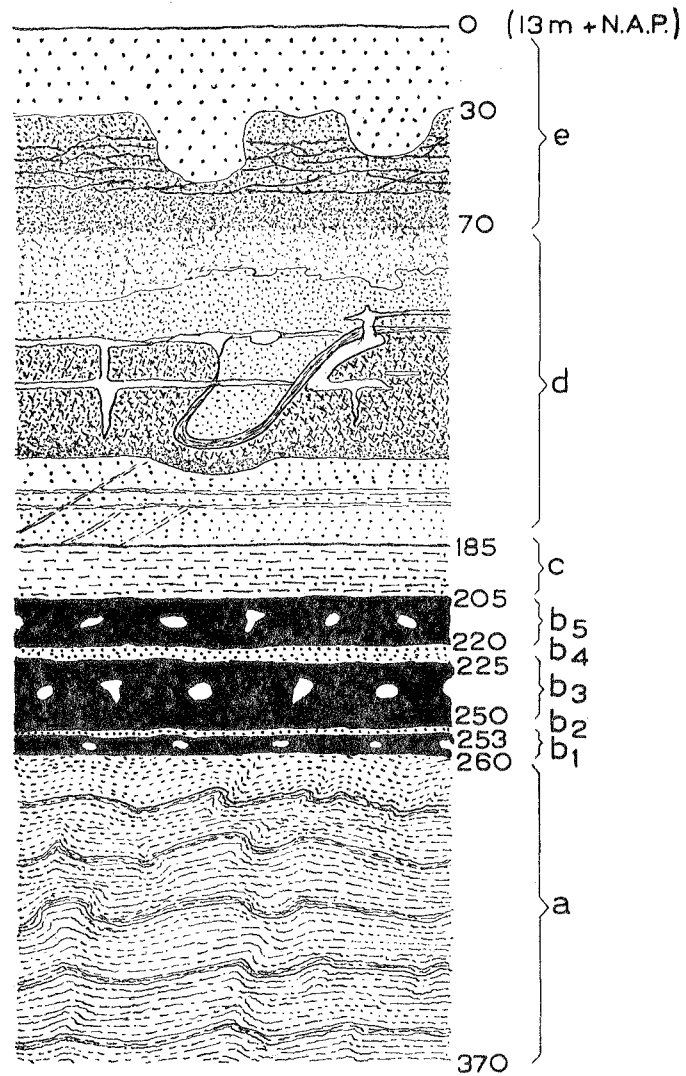


Fig. 3. The section near Wezep¹⁾.
Scale in centimeters. N.A.P. = Ordnance Datum (Amsterdam).

The artefacts are found exclusively in the strata *b1*, *b3* and *b5*.

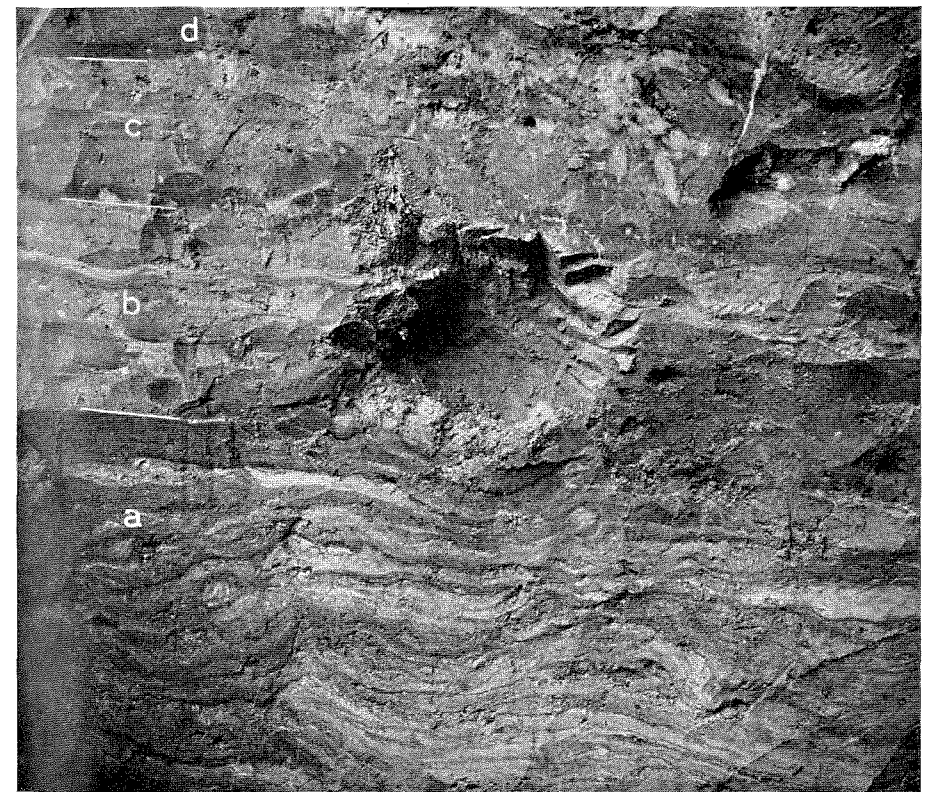
Although the material of group *b* showed a certain stratification, it seems to us, regarding the dimensions of the erratic boulders, that it should be considered rather as a modified boulder-clay than as a fluvio-glacial deposit. We were considerably strengthened in this opinion by an inspection of the second finding-place of similar artefacts, discovered by Major MALLINCKRODT 10 km S.W. of Wezep on the artillery-range near Oldebroek, where we found an analogous profile, but with this difference, that

¹⁾ The drawing of this profile we owe to the skilful hand of Prof. Dr. B. G. ESCHER, of Leiden, who with great courtesy accompanied us on one of our visits to the finding-place near Wezep.



The loam-pit near Wezep. General view.

August, 1938. F. F.



The loam-pit near Wezep. Detail.

August, 1938. F. F.

the stratum *b* from Wezep here is represented by a grey, brown-spotted plastic clay with northern erratic blocks, indubitably boulder-clay. The clay dredged at Vollenhove which contains implements of the same kind, as Major MALLINCKRODT informed us, is also a real boulder-clay.

Stratum *c* of the profile at Wezep had a thickness of 20 cm and consisted of finely stratified clayish sand with various small stones of northern origin. We incline to regard this bed as a fluvio-glacial deposit, formed in the melting period of the Saale-Riss inland-ice, especially as its position and structure correspond with the description given by TESCH of such sediments (TESCH, 1924). Above *c* lay a complex of sand (*d*), again containing northern erratic boulders, which was comparatively fine and clayish in the lower part, coarse-grained in the upper. The complex included a small bed of greyish-white sandy clay, entirely free from stones. Stratum *d* showed very clear signs of krypturbate disturbance, consisting chiefly of pockets of the greyish-white clay and the coarse sand protruding into the lower finer deposits.

Krypturbate disturbances were first described in the Netherlands in connection with what the excavations for the Twente-canals brought to light (FLORSCHÜTZ, 1934; EDELMAN, FLORSCHÜTZ and JESWIET, 1936) and were later signaled from various parts of our country (EDELMAN, 1938). In the cases where we studied these disturbances more narrowly, it was shown that they dated from the end of the Late-glacial or the beginning of the Holocene times (FLORSCHÜTZ and VAN DER VLERK, 1937 and 1938), although the deposits in which they appear may be of greater age. In the profile in question, stratum *d* which was influenced by the krypturbate movement, consequently cannot be younger than early-Holocene, but might very well have been deposited in the end of the Saale-Riss glacial, the Eem interglacial or the Weichsel-Würm glacial times.

The same may be said of stratum *e*, consisting of coarse sand, in the upper part especially mixed with gravel, showing a distinct podsolation. The complete absence of any visible connection with the krypturbate phenomena, however, forces us to consider the possibility that layer *e* was formed entirely in the Holocene. The absence of animal and vegetable fossils prevents further precise determination of the geological age of the complex *c—e*, which, nevertheless, is immaterial in determining the stratigraphic position of the artefact-layer *b*.

On the basis of these geological data, we can now make an attempt to estimate when and where the men who used these artefacts, have lived.

The first thing we may assume is that it must have been before the formation of stratum *b* and at a more or less considerable distance N. or N.E. from the finding-place. It cannot be supposed that this people inhabited the neighbourhood of Wezep, when it was covered by ice. They must have lived before that period, in all probability after the formation of the Higher Terrace, as in its deposits there is a complete absence of flint-implements.

Between the formation of the Higher Terrace and the deposit of the boulder-clay, a considerable time must have intervened. This is demonstrated by the fact that after the formation of the Higher Terrace the large rivers had the opportunity to grind out deep valleys in the delta before the inland-ice forced them to change their course, so that the boulder-clay or the remnants of it in the IJssel-valley near Deventer and the Rhine-valley near Zevenaar, for instance, came to be situated respectively 100 and 50 m below the present surface.

STEENHUIS recently discovered that in this erosion-period of the Saale-Riss Ice-age local accumulation took place before the deposit of the glacial drifts.

We borrow the following from his preliminary publication (STEENHUIS, 1937) and written communications which he has kindly permitted us to make use of.

In two districts, namely in Limburg and North Brabant, within the territory of the Central Graben, and in Gelderland and Overijssel in the neighbourhood of the old IJssel and the Regge, principally, but also in various other places situated more to the north in Overijssel and Friesland, STEENHUIS found on the Higher Terrace layers of peat, humic clay and fine sand. These in their turn, were covered by sediments from a later phase of the Saale-Riss glacial time, namely in the south of our country by Middle Terrace-deposits and in Gelderland, Overijssel and Friesland by pre-morainal-fluvioglacial material, ground-moraine and postmorainal-fluvioglacial sediments.

The preliminary botanical examination of samples of these interstratified sediments — which the Director of the "Rijksbureau voor Drinkwatervoorziening" at the Hague kindly put at our disposal — throws some light upon the climatic conditions at the time of their formation. In the macroscopic examination, relics were found of a temperate-thermophilous water- and bog-flora (*Alisma*, *Alnus*, *Batrachium*, *Carex*, *Ceratophyllum*, *Chara*, *Comarum*, *Euphorbia*, *Hippuris*, *Limnanthemum*, *Lycopus*, *Menyanthes*, *Myriophyllum*, *Nuphar*, *Potamogeton*, *Ranunculus*, *Rubus*, *Salvinia*, *Scirpus*, *Sparganium*, *Stellaria*, *Viburnum*, *Zinnichellia*), while the pollen-analysis yielded spectra with *Abies*, *Alnus*, *Carpinus*, *Picea*, *Pinus* and *Corylus*, indicating the presence of temperate-continental forests in the area. Taken as a whole, this vegetation does not differ from that during the formation of the lacustrine sediments in the Eemian Sea-epoch near Zwolle and Zutphen. Both are distinguished from the flora of the penultimate interglacial period (Mindel-Riss) by the absence of *Azolla filiculoides* Lam., which, to a certain extent, acts as an index fossil for the deposits from that interglacial time (horizon of Neede) (FLORSCHÜTZ, 1938).

Having arrived at the conclusion that the makers of the implements must have lived in an episode between the formation of the Higher Terrace and

the deposit of the boulder-clay, we can go further and estimate the time more closely.

We must bear in mind that it was only glacial drift-material and not the Higher Terrace that could provide them with the flints from which they knapped their implements. The glacier or, as is not unlikely, the melting-water which preceded the glacier must have been in the vicinity of the dwelling-place of these men and brought the flints with it. This is very plausible, as we must suppose that the inland-ice entering our country sent out glacial streams and subsequently tongues of ice, first of all into the existing valleys, such as that of the IJssel between Deventer and Zwolle. They further excavated these depressions, that thereupon became completely filled up by the glacier which ascended the valley-slopes, pushed up the Higher Terrace and finally covered it. We must also consider that the advance of the continental ice did not proceed at a steady pace. Undoubtedly there will have been periods in which the ice retreated to some extent, in other words, the advance must have been of an oscillating nature. A temporal, partial filling of the IJssel-valley, either by outwash-deposits or by the ice itself, would have been sufficient to supply the desired flints.

If our conclusion is correct that the implements belong to the advanced Saale-Riss glacial age, it follows, according to the radiation-curve of MILANKOVITSCH and the ice-age-curve constructed by SOERGEL, that those who made the artefacts must have lived between 200.000 and 180.000 years before the commencement of our era. (KÖPPEN and WEGENER, 1924; SOERGEL, 1937).

The hypothesis that the men who knapped the flints found at Wezep, were living in the Saale-Riss glacial time, is also supported by the fact that recently at several places in Germany an analogous culture has been found, which is placed by German geologists and archaeologists in the same age (WOLDSTEDT, 1935; GRAHMANN, 1938; ZOTZ, 1938).

The climatic conditions must not necessarily have been unfavourable in that episode neither; on the contrary, pollen-analysis of samples of the so-called "potklei" from the province of Groningen, clay which is considered as having been deposited in lakes of melting-water from the advancing glacier, have so far yielded spectra with *Abies*, *Alnus*, *Betula*, *Picea*, *Pinus*, *Quercus*, *Salix* and *Corylus*, so that the continental ice apparently penetrated through a temperate-continental forest and not through a barren tundra. Up to the present, in fact, nothing has shown that even at the maximum extension of the glacier, it was extremely cold in the Netherlands south of the ice-border. There are found no relics in our country of a tundra-fauna (VAN DER VLERK, 1938) and -flora, nor kryptofauna phenomena dating from that ice-age, while from other sources arguments can be produced against an arctic climate (SCHREUDER, 1936). This is in contrast to the conditions during the Weichsel-Würm glacial period, when the glacier did not pass the Elbe (SCHREUDER, 1936; FLORSCHÜTZ, 1930 and 1936).

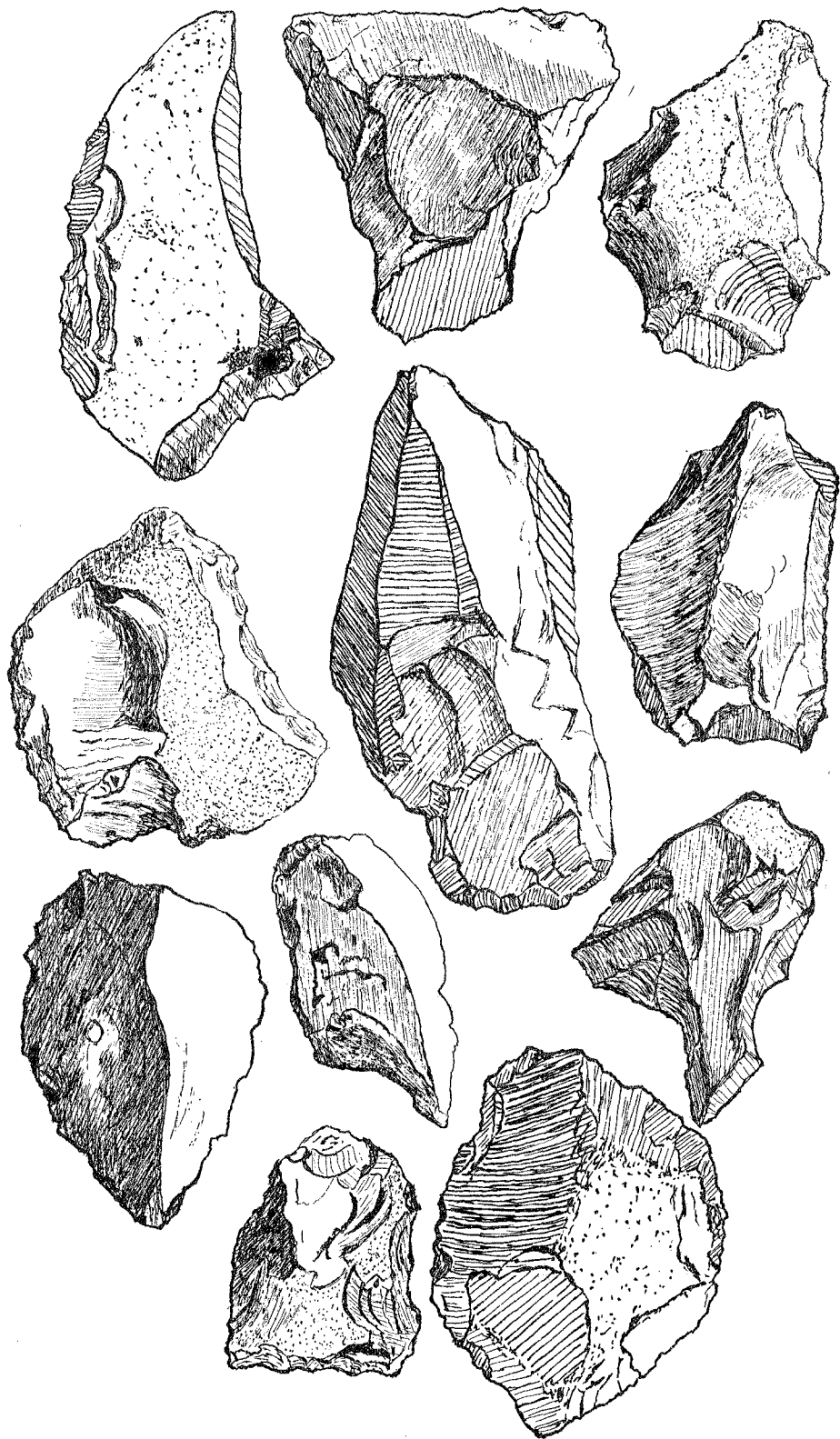


Fig. 4. Artefacts from Wezep. Natural size.

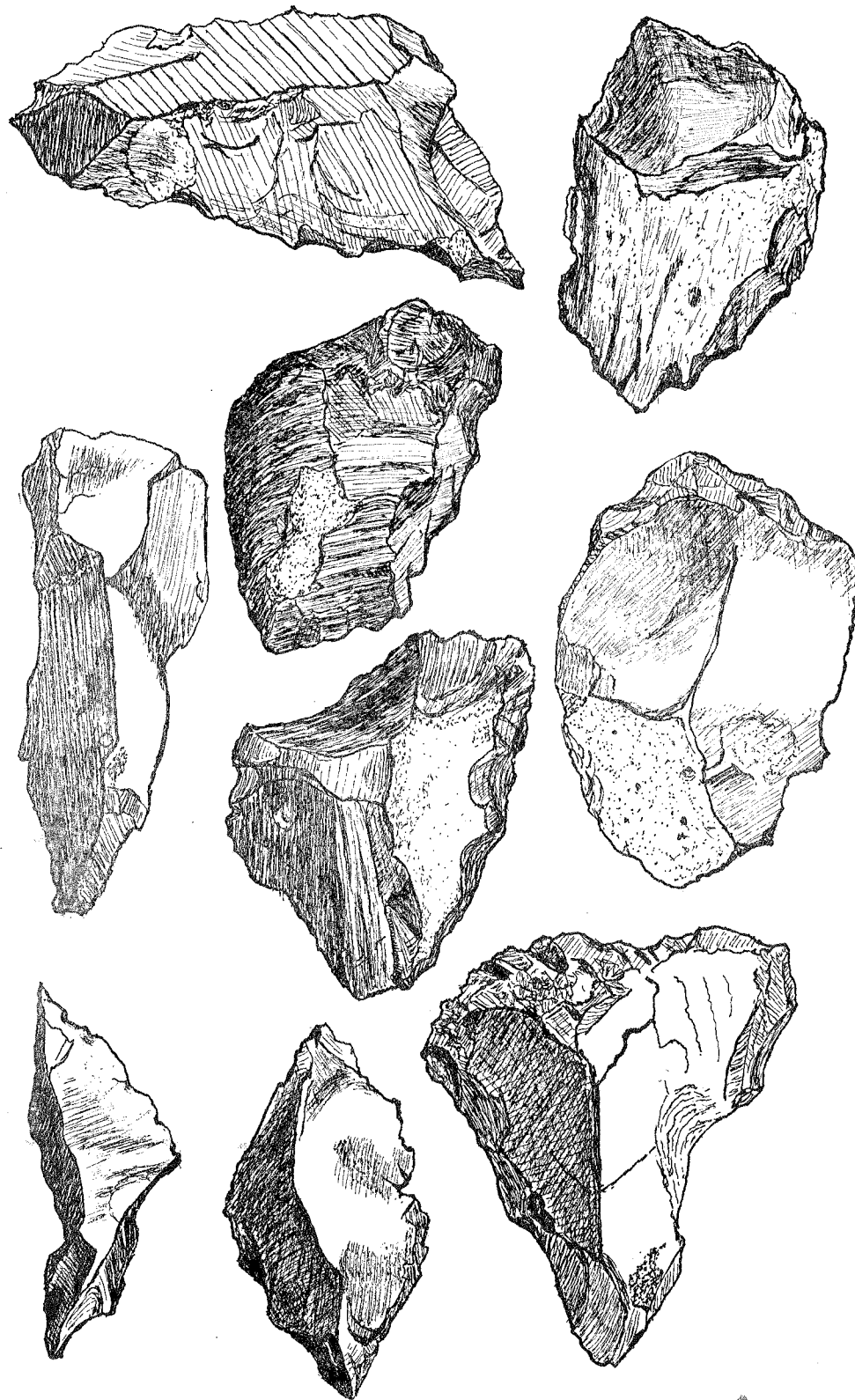


Fig. 5. Artefacts from Wezep. Natural size.

Having made in this way an attempt to compute the geological period in which this people lived, we have still to answer the question where these men lived. And just as there is no reason for us to go further back in time than to the phase immediately preceding the glaciation of our country, neither are there any grounds for supposing that their dwelling-place was far removed from the finding-spot of the artefacts, although it must be acknowledged that this cannot be entirely excluded. The fact that most of the implements show no signs of having been conveyed, may it be in the ground-moraine, renders it, however, improbable. The assumption, therefore, that our men lived on the high western border of the contemporary IJssel-valley, not more than some kilometers to the N.E. of Wezep, will meet with few objections. They may have made their tools on the spot, and left a number of the artefacts behind them, when they were driven away by the glacier which rose out of the valley.

In conclusion we may say that the artefacts which are found near Wezep, once belonged to men who lived before the deposit of the boulder-clay, in all probability after the formation and even after the scouring-out of the Higher Terrace, that is to say about $\pm 190,000$ years before our era. Perhaps this people had a settlement on the western side of the depression what we now call the northern part of the IJssel-valley.

II. *Archaeological part.*

Besides numerous waste and half-made pieces, we have found at least near Wezep some 50 flints which are clearly recognizable as human implements. Of course steps have been taken so that in the steady working going on at this place the artefacts that are revealed, shall be collected for the National Archaeological Museum. The present publication is necessarily of a preliminary character, as a larger collection of these flints may perhaps enable us to make sharper distinctions.

The material is fairly good flint, partly covered by the natural rough crust. Many of the artefacts have a white patina ("white implements", fig. 4, except the left one on the third range from above), some with rusty-brown spots. Although we may assume that the tools found were not all made or used on the same place, most of them do not show the smooth surfaces that would indicate their having been carried a long way. Most of the artefacts, however, display a modification of the original sharp edges caused by pressure, but this is to be attributed to the effect of human hands and not to natural forces.

The bulb of percussion is struck off. The striking platform is large, prepared and flat and forms an obtuse angle with the removed side. The cleft apparently was made by strokes with a stone, the finer trimming by pressure at the sides. Thus the forms illustrated in figs. 4 and 5 were evolved: several points beside some awls and scrapers. Many of the artefacts have a strong resemblance to those which have been called Levallois-flakes.

On the basis of this short description of their forms we will now, as far as is possible, place our finds, according to their typological characteristics, in the nowadays accepted schedule of the earliest human civilization.

It can be said immediately that the primitive nature of the implements points to an early palaeolithic culture, while the absence of larger, doubly worked hand-axes excludes them from being assigned to the Chellean or Acheulean.

It is only in recent years that the earlier division of the Lower Palaeolithic into Chellean (Praechellean), Acheulean and Mousterian successively has proved to be unsatisfactory, as these cultures cover a comparatively small area, confined to the middle and south of France and the Pyrenean peninsular.

Besides, small industries have been discovered first in England which are partly contemporary with, and partly even older than the hand-axes-culture. These industries are called in chronological order Clactonian and Levalloisian. It is to this cultural family, found chiefly in north-west Europe, but apparently just as well present in the middle of Germany (Markkleeberg, Vahrholz) (GRAHMANN, 1935 and 1938; WOLDSTEDT, 1935; ZOTZ, 1938), that our pieces bear the most affinity. Our preliminary impression is that the implements of Wezep most resemble those new finds in Germany and those former ones, known under the name of "Pre-mousterian", whilst they may probably be placed in the chronological system constructed by BREUIL (BREUIL, 1932; BREUIL and KOSLOWSKI, 1934), either in the second period of the Clactonian or, more probably, in the earliest Levallois-cultures of the Somme. Since, according to BREUIL, these industries occurred before the close of the Saale-Riss Ice-time, we, following a completely different way, arrive with regard to the age of the artefacts of Wezep at the same results as FLORSCHÜTZ and VAN DER VLERK reached by geological considerations¹).

Through these discoveries the history of the human inhabitants of our country has again been traced back many more thousands of years.

It is to be hoped that the ever increasing number of amateurs in the Netherlands who devote themselves with so much enthusiasm to the collection of artefacts, may be encouraged by Major MALLINCKRODT's example and the success it met with, to co-operate with the official services in the effort to extend our knowledge of the earliest inhabitants of our country.

Leiden
Velp (G.), September 6th, 1938.

¹) In this connection it may be useful to point out that the two artefacts from Bathmen, near Deventer, now in the British Museum in London, are likely to belong to a culture contemporaneous with those of Wezep, Oldebroek and Vollenhove.

At a recent visit to London, where I had the opportunity of studying the descriptive article where the circumstances of the finding of these artefacts are given, I found no ground whatever to doubt their genuineness in any respect.

LITERATURE.

- BREUIL, H., Le Clactonien. Préhistoire, **1**, Fasc. II (1932).
- BREUIL, H. et L. KOSLOWSKI, Etudes de stratigraphie paléolithique dans le nord de la France, la Belgique et l'Angleterre. *l'Anthropologie*, **41** (1931), **42** (1932) and **44** (1934).
- EDELMAN, C. H., Over de verbreiding van kryoturbate verschijnselen in het Nederlandsche Pleistoceen. Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap, 2e Serie, **55** (1938).
- EDELMAN, C. H., F. FLORSCHÜTZ und J. JESWIET, Ueber spätpleistozäne und frühholozäne kryoturbate Ablagerungen in den östlichen Niederlanden. Verhandlungen van het Geologisch-Mijnbouwkundig Genootschap voor Nederland en Koloniën, Geologische Serie, **11** (1936).
- FLORSCHÜTZ, F., Fossiele overblijfselen van den plantengroei tijdens het Würmglaciaal en het Riss-Würminterglaciaal in Nederland. Proc. Kon. Akad. v. Wetensch., Amsterdam, **33** (1930).
- , Palaeobotanisch onderzoek van jong-pleistoceene afzettingen in het Oosten van Overijssel. Proc. Kon. Akad. v. Wetensch., Amsterdam, **37** (1934).
- , Ueber die Flora in den Niederlanden während der letzten Eiszeit. Proceedings Sixth International Botanical Congress, **1** (1936).
- , Die beiden Azolla-Arten des niederländischen Pleistozäns. *Recueil des Travaux Botaniques Néerlandais*, **35** (1938).
- FLORSCHÜTZ, F. en I. M. VAN DER VLERK, Fossiele cellenstructuur in jong-Pleistoceene Oost-Nederlandsche afzettingen. Proc. Kon. Akad. v. Wetensch., Amsterdam, **40** (1937).
- et —————, Les phénomènes périglaciaires et leur rapport avec la stratigraphie de l'époque weichselienne (würmienne) en Twente. Livret-guide pour l'excursion dans la région „glaciaire" néerlandaise, organisée par le Congrès International de Géographie, Amsterdam (1938).
- GRAHMANN, R., L'âge géologique de l'Industrie paléolithique de Markkleeberg. *L'Anthropologie*, **45** (1935).
- , Abschläge von Clactonienart in Mitteleuropa. „Quartär", *Annals for Research on the Quaternary and its Industries*, **1** (1938).
- KÖPPEN, W. und A. WEGENER, Die Klimate der geologischen Vorzeit. Berlin (1924).
- PATERSON, T. T., Studies on the Palaeolithic Succession in England, no. 1. The Barnham Sequence. *Proceedings of the Prehistoric Society*, **3** (1937).
- SCHREUDER, A., Palaeontologische bedenkingen tegen de IJstijdtheorie. *Vakblad voor Biologen*, **17** (1936).
- SOERGEL, W., Die Vereisungskurve. Berlin (1937).
- STEENHUIS, J. F., Nieuwe bijdrage tot de stratigrafie van het Nederlandsche Pleistoceen. „Geologie en Mijnbouw", **16** (1937).
- TESCH, P., Opmerkingen over het glaciale landschap westelijk van den IJsel. Tijdschrift voor het Onderwijs in de Aardrijkskunde, **2** (1924).
- , De glaciale kneding. Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap, 2e Serie, **44** (1927).
- VLERK, I. M. VAN DER, Nederland in het IJstijdvak. Orat. inaug., Leiden (1938).
- WOLDSTEDT, P., Die Beziehungen zwischen den nordischen Vereisungen und den paläolithischen Stationen von Nord- und Mitteleuropa. „Mannus", *Zeitschrift für Deutsche Vorgeschichte*, **27** (1935).
- ZOTZ, L. F., Zum gegenwärtigen Stand der Altsteinzeitforschung in Deutschland. „Quartär", *Annals for Research on the Quaternary and its Industries*, **1** (1938).

Anatomy. — *The External Morphology of the Brain of Notoryctes typhlops*. By A. N. BURKITT. (University of Sydney). (From the Dutch Central Institute for Brain Research, Amsterdam). (Communicated by Prof. C. U. ARIËNS KAPPERS).

(Communicated at the meeting of September 24, 1938.)

The following account is based upon material collected for the Department of Anatomy of the University of Sydney. A number of specimens of *Notoryctes* in varying conditions of preservation (all now in 10 % Formalin) have been collected chiefly from Ooldea on the East-West Railway line on the South Australian border or from Hermannsburg. I am indebted particularly to Mr. SMART formerly of Ooldea, to Mr. PETERING of Hermannsburg and Mr. LARNACH and Mr. SCHAEFFER of my Department for their help in collecting and preserving these specimens. The brains were in all cases preserved by carefully opening the skull and membranes dorsally on one side of the mid line and then immersing the animal in 10 % formalin. The abdomen was also opened. In most cases the animals were alive when caught, and were killed by chloroform or ether. Most of the drawings are made from a particularly well preserved and dissected specimen, (N. 13).

Much of the description has been confirmed however by an examination of microscopic sections, stained by CRESYL VIOLET, and by the WEIGERT PAL method. These sections include a transverse W. PAL (D. N. 1.), a transverse CRESYL VIOLET series (D. N. 2), a horizontal W. PAL series (D. N. 6), and a sagittal Iron Haematoxylin series of the right half of the brain of N. 13.

I am also indebted to Professor ARIËNS KAPPERS for his kindness in placing all the resources of his Institute at my disposal, for his advice and help, and to Dr. ADDENS for help and assistance, especially with the drawings, while I have discussed many of my problems with Dr. UNA FIELDING of University College, London. For the cutting of the sections, I am indebted to Mr. WISE and Mr. LARNACH of my Department, and to Mr. BROUWER of the Dutch Central Institute for Brain Research.

In regard to the removal of the brain from the skull, owing to the fragility and small size of the brain, it was only after several attempts that practically undamaged specimens were removed. The use of fine eye scissors and scalpels and especially of fine bone forceps for middle ear operations, proved of great value.

The external morphology of the brain has been described in 1895 by