III. Flint

1. Geological aspects

1.1. Geological investigations

Macroscopical investigations of flint in Limburg (P.J. FELDER 1960) and contiguous areas were carried out mainly with the aim of determining their stratigraphic value rather than of studying their archaeological recognition. This investigation of *in situ* flints recognised five types. Of these types only types 1a, 1b and 3 are important archaeologically. Type 1a (glassy, black, occurring in Lixhe and Lanaye members) includes the flints mined at Rijckholt-St. Geertruid. Type 1b (glassy, brownish, occurring in the Kunrade limestones) comprises flints from Kunrade and Lousberg, and finally type 3 (granular, occurring in the Gronsveld, Emael and Nekum members), to which Valkenburg flints belong. From this study it emerged that it was impossible to differentiate flints macroscopically, since the external appearance of the flints is also determined by local lithology.

In investigating the flint eluvium in Limburg (P.J. FELDER 1961), which includes the flints from Rullen, it was determined that the eluvial flints principally differed externally as a result of erosion and infiltration. This especially led to a change in colour. However, the stratigraphic provenance of the flints remained recognisable. After having determined macroscopically that, in external aspect, the flints are dependent on the chalk matrix in which they formed (P.J. FELDER 1960; 1961), grain size and chemical analyses of the chalks were carried out (P.J. FELDER 1975). Variations in grain size and chemical composition in the chalk are fairly wide horizontally and vertically. This means that recognition of the sediment, and thus also of flints, on the basis of grain size and chemical composition are possible only to a small degree.

In describing the lithology of the late Cretaceous strata (W.M. FELDER 1975), flints were primarily mentioned on account of the variation in their shape (pipelike, nodules and beds) and in the structureof successive layers. Thus, individual flint layers nowadays can be identified, but only when they may be studied within the context of a broader stratigraphic succession.

Macroscopically, it appears possible to differentiate certain flint types stratigraphically. It should be borne in mind, however, that detailed determination of the provenance of a displaced flint nodule remains extremely difficult.

In 1965, flint samples were collected from the flint mines at Rijckholt-St. Geertruid, and these were analysed for microfossils. In 1972 the results of this study were published (LOBENSTEIN 1972). In that paper the author concluded that it was impossible to distinguish the individual flints on the basis of microfossils.

In 1995, RADEMAKERS presented a comparative inventory of Hystrichosphaeridae in the flint layers of the Lanaye Member. He studied 48 flint beds occurring at four localities, including the Rijckholt-St. Geertruid flint mines. From this study it appeared possible to correlate series of flint beds in regional exposures using Hystrichosphaeridae. Individual flint beds, however, cannot be distinguished.

1.2. Archaeology-related studies

In archaeology-related flint studies attempts are being made to find a way to determine the provenance of archaeological flint implements. Naturally, this task is more difficult than the geological recognition of flints with regard to stratigraphical provenance. After all, archaeological artefacts represent only part of a flint nodule and are found *ex situ*. Ultimately, such a study should include examination of *in situ* as well as displaced flints.

Subsequent to the excavation of the Rijckholt-St. Geertruid flint mines, various people have analysed and described flints from these mines (e.g. BAKELS *et al.* 1974; COWELL 1981; THOMPSON *et al.* 1986; KARS *et al.* 1987 and de WARRIMONT & GROENENDIJK 1993).

In 1974 BAKELS *et al.* published a neutron activation analysis of flint from the prehistoric mines in comparison with flint from various other sources. Their preliminary conclusion was that neutron activation analysis alone was not enough to solve archaeological problems. Although differences between flints from the various deposits (amongst others Gulpen Formation (type 1a, P.J. FELDER 1960), Kunrade

limestones (type 1b, P.J. FELDER 1960) and Maastricht Formation (type 3, P.J. FELDER 1960) were expressed in this analysis, it was impossible to distinguish flints from Rijckholt-St. Geertruid from other prehistoric exploitation sites such as Rullen, Mheer and Banholt.

In 1981 COWELL published a thorough study of trace elements in flints. A total of 197 samples from the Maastricht area were examined. Of these 18 were from the Rijckholt-St. Geertruid flint mines (layer 10). As the other flint samples came from other layers (13/14) the results were difficult to interpret.

In 1986 THOMPSON *et al.* reported on a study in which flints from Rijckholt-St. Geertruid were examined, analysing 16 different trace elements using the ICPAES method (= Inductively Plasma Atomic Emission Spectrometry). The authors considered this method to present good opportunities for distinguishing flint types. The study, however, would have to be extended.

In 1990 KARS *et al.* described flints from Rijckholt-St. Geertruid on the basis of their petrographical and geochemical composition. The authors considered their investigation to be the start of a promising project. They stressed the need for further studies, which were carried out subsequently. In 1991 McDONNELL *et al.* reported on the results of a petrographical and geochemical study of Rijckholt-St. Geertruid flints and from a number of other exploitation sites, e.g. Rullen and Mheer-Banholt. The authors pointed out that a combination of petrography and geochemisty made it possible to subdivide the flints into three categories. The results of their analysis of the Rijckholt-St. Geertruid flints show a good correspondance with the results for Lanaye Member flints (McDONNELL *et al.* 1997).

In 1993 de WARRIMONT & GROENENDIJK described the results of a macroscopical study combined with a spectrometric examination. They reached the conclusion that the six known archaeological sites between Maastricht and Aubel are subdivisible into two groups; the Rijckholt group and the Rullen group. The Rijckholt flints could still not be distinguished from the other source areas, with the exception of the Rullen group. Further studies are needed.

Until now, in archaeological descriptions the external appearance of flints (subjective method) was the most widely applied method to characterise flint artefacts. In addition to terms such as 'Rijckholt flint', also 'Valkenburg flint', 'Lousberg flint' and 'Rullen flint' were used. Such names demonstrate that indeed differences are seen to occur between the various flint types. These names, however, should never be actually linked to the mining of flint at these localities. It should be borne in mind that other localities (other than the ones mentioned) could be considered as well. For instance, 'Rijckholt flint' has not only been found at Rijckholt-St. Geertruid but also in the entire Lixhe and Lanaye members, as well as in the Zeven Wegen Member, the flint eluvium and the Meuse gravels.

The results of all studies referred to above have not yet enabled the flints from the Rijckholt-St. Geertruid mines to be unambiguously differentiated from those of other localities. The similarities with other flints of the Lixhe and Lanaye members are too close and differences too small. The usual term 'Rijckholt flint' in archaeology should therefore be replaced by 'Lixhe-Lanaye flint' to avoid erroneous interpretations and conclusions.

2. Archaeological descriptions

Parallel to the above-mentioned analyses, a good many attempts were made by archaeologists to describe the macroscopical characteristics of 'Rijckholt' flint, to distinguish it from flint varieties from other sources that at first sight closely resemble each other, both on a local/regional (southern Limburg) and on a supra-regional (western European) scale (e.g. LÖHR *et al.* 1977; ZIMMERMANN 1988; de WARRIMONT & GROENENDIJK 1993; ZIMMERMANN 1995).

These attempts found their starting point mostly in the wish to establish reliable connections between raw material varieties found at settlement sites and at extraction points. Such connections are a *conditio sine qua non* for all studies of e.g. procurement strategies, distribution patterns and exchange mechanisms. The *Working Group on western flint*, in which regional lithic specialists, geologists, and petrologists co-operate, was initiated in 1989 to study the flint raw materials exploited and used during the Neolithic in the southern parts of The Netherlands and adjacent areas in Belgium and the Rhineland. The project has three aims (de GROOTH 1994):

1 - to establish identical reference collections ('lithotheques') at different research centres working in the study area;
2 - to develop a set of variables with which the different flint types can be reliably described on a macroscopic level;
3 - to perform petrographical and geochemical analyses of the samples, as an independent method of characterising raw materials and studying within- and between-source variation.

Preliminary results of these analyses were published by McDONNELL *et al.* (1997). The following macroscopic description of the flints exploited at the Rijckholt mines is based on the variables used in this project.

The flints in layer 10 of the Lanaye Member are nodular in shape and in general have a length, width, and thickness of at least 20 cm. They show a broad range of variation in texture, colour and in the size, shape and colour of macroscopically visible inclusions, often within single nodules. Moreover, quite often a notable variation, with gradual changes, is visible in individual nodules.

The colour varies from very dark to very light grey, both sometimes with a suspicion of blue.[2] The lighter grey parts often contain areas with dark and light zoning. The surface of artificial fractures is smooth, but not glossy, the texture mainly fine grained. Occasionally the darkest parts may be described as 'glasslike', i.e. they show a slight translucency, best visible along the edges of blades and flake.[3] Most of the material, however, is completely opaque.
The main types of inclusions are:
- groups of black and white round specks (< 1 mm);
- small and medium-sized (> 1 mm, < 10 mm) round or ovoid spots, light grey or white, smooth, with the same texture as the matrix;
- small and medium-sized (> 1 mm, < 10 mm) round or ovoid spots, black or very dark grey;
- (> 10 mm) spots, round or irregular, abrupt border, light grey or whitish, with a rougher texture than the matrix;
- medium-sized and large ringed spots (5-50 mm), round or irregular in shape, with a smooth and whitish outer ring and a smooth or rough, light grey centre;
- vague, large lighter grey flecks.

Natural fracture planes often are covered with iron incrustations. Fresh pieces possess a thin and rough ('sandpapery') cortex, off-white or yellowish/light brownish in colour.

In the wasters recovered during excavation no preference for dark or light material was visible. Both dark and light grey artefacts circulated over long distances, e.g. three conjoinable blades and flakes of the light grey/opaque extreme found at the Michelsberg site at Linden-Kraaienberg (LOUWE KOOIJMANS & VERHART 1990); very dark grey blades reached the Schussenried settlements in Baden-Württemberg (KEEFER 1988).

Several of the existing archaeological descriptions of so-called 'Rijckholt flint' lump together flints from different layers within the Lanaye and Lixhe members, worked at different extraction points in the region (e.g. Banholt or Mheer, Rode Bosch). Thus, the 'clear dark brown zones' directly under the cortex mentioned by ZIMMERMANN (1988) as one of the characteristics of Rijckholt flint, were neither encountered on a sample of 1,000 stone picks from the underground mines, nor on cortical flakes recovered from the fills of shafts 19 and 24. This trait seems to be connected with material exploited at Banholt and Mheer, as recently suggested by de WARRIMONT & GROENENDIJK (1993).

In this respect it is also important to keep in mind that those combinations of traits often described as characteristic for 'Rijckholt' flint are in fact extremes of the continuum defined in the present study.

On the basis of these macroscopically visible characteristics 'Rijckholt', or rather 'Lixhe-Lanaye' flint may be distinguished from 'Baltic'

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[2] No Munsell color values are presented here, because 'Rijckholt' flint is extremely susceptible to weathering/patination.

[3] FELDER's (1960) two-fold division of 'texture' referred only to regional material. In recent macroscopic descriptions, used for a broader range of raw material types, the variable texture is divided into three categories: glass-like, fine-grained, coarse-grained. Glass-like applies e.g. to the so-called 'light-grey Belgian flint' of the Liège region (LÖHR et al. 1977, 154), to flints of the Obourg-type (MARIËN 1952), and to most of the Baltic flints (ZIMMERMANN 1995, 48); the material from the Lanaye and Lixhe Chalks, as well as the Kunrade Chalks would be described as 'fine-grained', and 'Valkenburg' flint as coarse-grained.

flint types, and from several types exploited in the vicinity of Rijckholt: 'Lousberg', 'Simpelveld', 'Vetschau', 'Valkenburg', 'light-grey Belgian'; as well as (most of the) material from 'Rullen' and, with some hesitation, 'Banholt/Mheer'. It is still impossible, however, to make a reliable distinction between material from Rijckholt, Jandrain-Jandrenouilles, or Spiennes, all deposited in the same geological period (de GROOTH 1994).[4]

[4] In this respect a new method, based on the non-destrcutive study of meso-fossils in flints, seems very promising, but awaits full publication (AFFOLTER 1991a; 1991b; 1996).