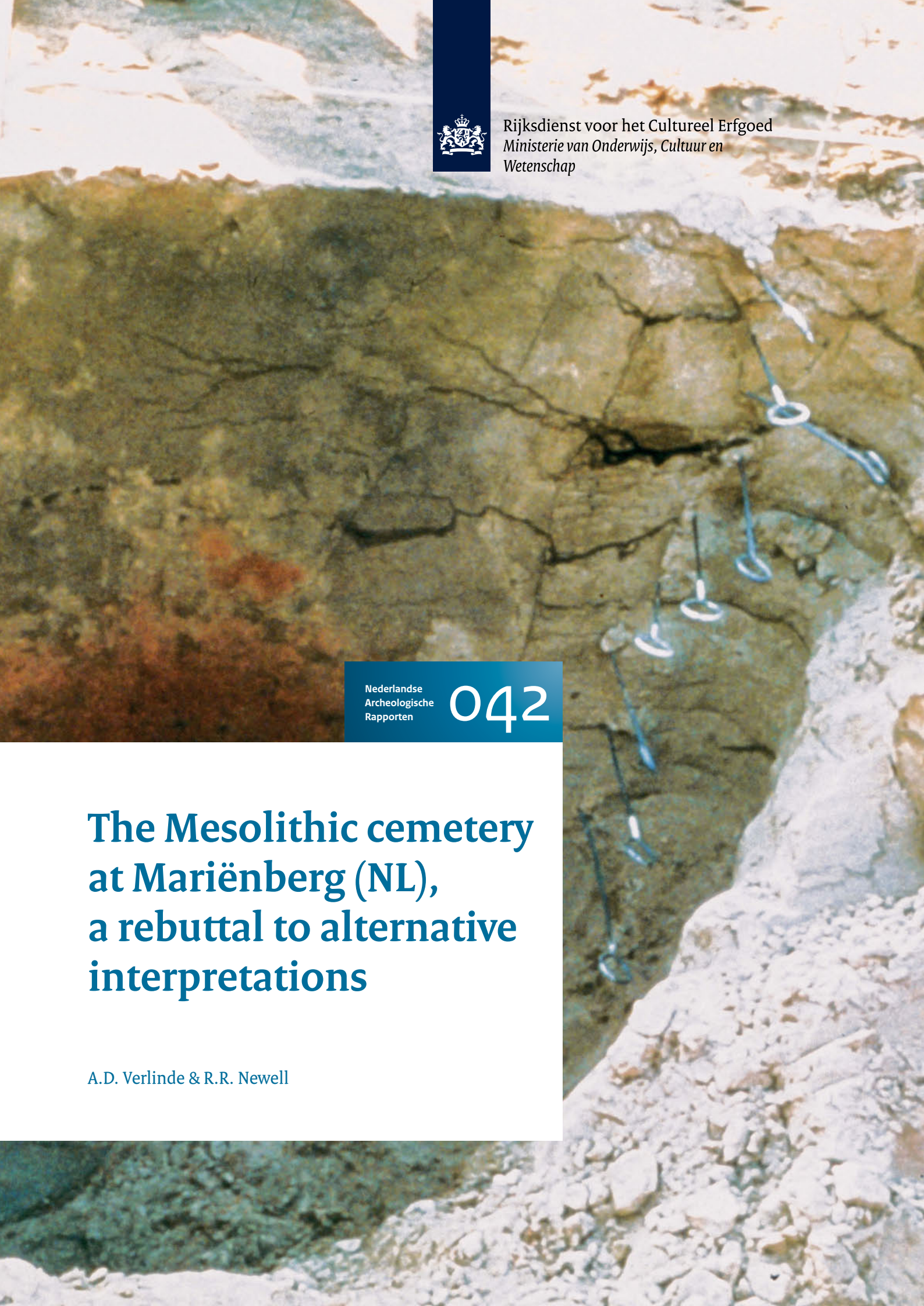

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Nederlandse Archeologische Rapporten 042

The Mesolithic cemetery at Mariënberg (NL), a rebuttal to alternative interpretations

A.D. Verlinde & R.R. Newell

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1 Introduction[1]

In 2006, the authors presented their final publication, in English, of a series of Mesolithic residential settlements[2], one of which was associated with six 'sitting graves'. These were remarkable graves, at any rate to 20th-century researchers. The mainly anthropological connotations of such graves in the Western European context were extensively discussed.
That final publication soon drew a great deal of attention, with the interpretation of the Mesolithic sitting graves evidently raising barely-veiled doubts and indeed incredulity with some readers. Some earlier, preliminary publications in Dutch and partial results and summaries had gone almost unnoticed. In fact, the first exceptions to this were the inclusion of Mariënberg (municipality of Hardenberg, province of Overijssel) in a European survey of Mesolithic graves (J.M. Grünberg 2000) and its mention in "The prehistory of the Netherlands" (L.P. Louwe Kooijmans *et al.*, 2005).
In this publication, we want to counter the criticism of Louwe Kooijmans in his 2012 article. First we shall present a new summary of the original article of 2006: *A multi-component complex of Mesolithic settlements with Late Mesolithic grave pits at Mariënberg in Overijssel*.
Then we shall successively discuss the differences of insight on the basis of old and new facts and findings, arguments and considerations. These mainly concern aspects of the dating of the Mesolithic graves, aspects of the graves' morphology, the origin and the nature of the red-stained sand layers above the grave floors, the position of the bodies, and new insights regarding the grave goods.
The treatise closes with a series of concise conclusions, together with a series of colour illustrations taken from slides, most of which were not previously published.

[1] This article is an in-depth response to the criticism by L.P. Louwe Kooijmans (2012) to the primary publication on Mariënberg (Verlinde & Newell 2006).

[2] The hearths and pits are the dominant features in these settlements. Some archaeologists, including the critic himself, interpret them as indicating "special activity areas", on the basis of find assemblages regarded as atypical. In opposition to this view, see amongst others the systematic regularities presented in the analyses in Newell 1973, 1980, 1984, and 1995, Newell & Vroomans 1972, and Price 1978. Louwe Kooijmans' assumptions without data or analysis are incompatible with the analytical results that have been independently confirmed and have an empirical basis in the ethnographic record. Outside the Netherlands, the "special activity area" is an altogether unknown concept.

2 The Mesolithic site of Mariënberg

2.1 Research history

From about 1950 onwards, farmer Willem Timmerman of Mariënberg (later joined by his son Lucas) found himself picking up artefacts from his arable fields. The finds kindled his interest and he started collecting them: some 3,000 flints and a modest number of artefacts of other kinds of stone. Soon he made the acquaintance of amateur archaeologist J. Butter from Deventer, who was active in the region around the river Vecht. It was he who identified the first few hundred pieces as belonging to a settlement of the Mesolithic. The site gradually acquired some fame among regional enthusiasts and also came to the attention of our colleagues A. Bohmers and A. Bruijn. But it was not until the 1970s that the site was listed in the national registration system (Archis) of the then Rijksdienst voor het Oudheidkundig Bodemonderzoek (ROB). Enduring contacts arose between the Timmerman family and the provincial archaeologist attached to the ROB, not least because the family came to act as a notification point for archaeological finds in the eastern part of the Vecht region.

Fig. 1. Location of the village of Mariënberg, province of Overijssel

But arable farming as a source of income of course came first, and this was soon to have its consequences. The site lay on a sandy ridge of medium height, whose relief proved too steep for agricultural machinery. A solution was sought in levelling the field, and a contracting firm started work in 1975. In archaeological terms, the digging was at once spot-on: directly beneath the humic topsoil appeared finds from a small Late Bronze Age urnfield, as well as Mesolithic features.
Willem Timmerman himself had the levelling stopped – not without a quarrel with the contractor – and notified amateur archaeologists in the Vecht region as well as the first author in his capacity as Provincial Archaeologist. This team immediately turned up to perform a rescue excavation between the tracks of the digger. This experience convinced Mr. Timmerman that the levelling procedure, for which he had been granted planning permission, should be carried out in phases and under his own direction, so that any archaeological remains might be properly investigated. The plans were adjusted accordingly. From 1975 until 1983 (with small additions until 1993), every year, generally around 1 December, machinery would be brought out to clear a manageable area of humic topsoil (50-60 cm) and to level it only after archaeological investigation.
The planning and deployment of machinery were determined by the Timmerman family, while the excavations took place under the aegis of the ROB - a form of collaboration that may well be unique.

The excavations were spread out over five areas, while two further areas with few features (22 hearths and pits altogether) were merely surveyed and described, but not measured in and drawn. The area that was by far the largest (2,110 sq m) and most important of these seven was situated near a newly built sheepfold, opposite the Timmermans' farmhouse, and was duly named after it: 'Schaapskooi'. This area was fully analysed. The other areas were only considered complementarily as part of the overall site complex; this included the identification, and in some cases the dating of the charcoal.

Preliminary results and brief reviews by the first author were published in Dutch in the annual reports of the ROB, in various issues of the *Archeologische Kroniek van Overijssel* and in overview works such as W.A. van Es *et al.* 1988, 132-134; M. Rappol 1993, 176-177; J.M. Grünberg 2000, 162-164; and L.P. Louwe Kooijmans *et al.* 2005, 179-182.

2.2 The geography of the site

The site lay on a high coversand ridge alongside the Pleistocene valley of the river Overijsselse Vecht, at a spot where the river changes its course from NE-SW to E-W. The site was on the south side of the valley, on the outer bend. A pre-World War II aerial photograph reveals that a river meander had at some time skirted the ridge, but it is unclear whether this was active during the Mesolithic. At this spot the boundary between the valley and the coversand ridge was marked by a prominent 4-m-high cliff. On the other side of the ridge, which was 50 to 100 m wide, was a gentle slope, giving the ridge an asymmetrical cross-section.
In 1978, the Netherlands Geological Survey performed a boring over 4 m deep beside the sheepfold, at the centre of the excavated area. This produced a full series of Late Glacial Coversand deposits, with the Beuningen layer at a depth of 410 cm, the Bølling layer at 240-245 cm and the Allerød layer at 100-115 cm. The main excavation level lay at a depth of 50 cm (9.30 m above Ordnance Datum, *NAP*) in or on the Young Coversand II. The uncovered features had been cut into Young Coversand II and hence could be geologically dated after the Pleistocene or the Upper Palaeolithic.

The three principal phases of soil formation in the excavated area could be deduced from the fill of the features and the soil profile. These phases conformed with the generally held theories and insights regarding soil formation in the (eastern) Netherlands.
The earliest phase in soil development that had left traces was indicated by the presence of a brown forest soil (Dutch: *moderpodzol*) dating from the Atlantic and probably also from the advanced Boreal. This barely if at all leached soil was encountered in the Late Mesolithic graves and other Mesolithic pits in a disturbed form; it is of a greenish brown-grey colour. Also in the six more widely scattered Late Neolithic burial pits

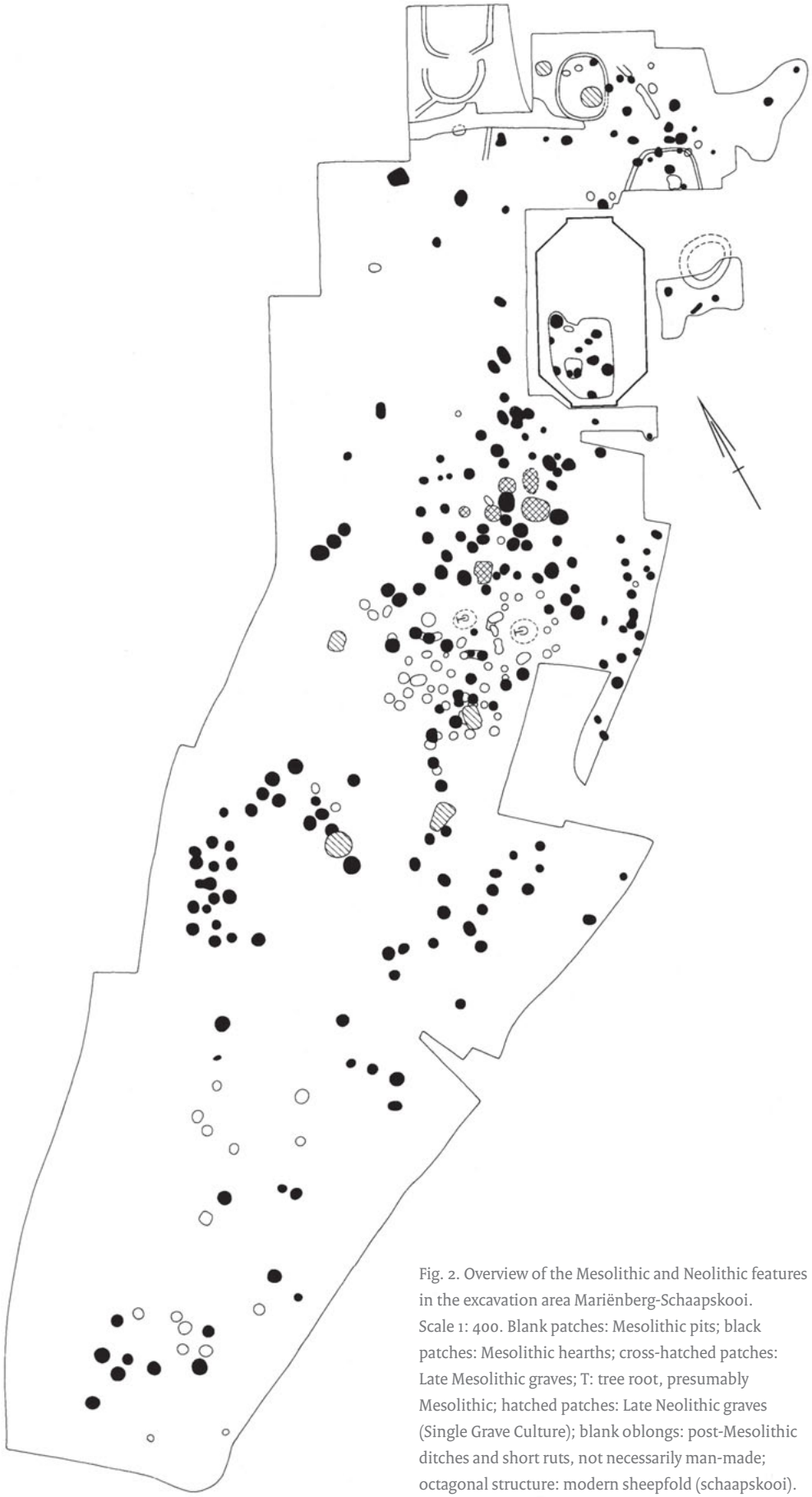

Fig. 2. Overview of the Mesolithic and Neolithic features in the excavation area Mariënberg-Schaapskooi. Scale 1: 400. Blank patches: Mesolithic pits; black patches: Mesolithic hearths; cross-hatched patches: Late Mesolithic graves; T: tree root, presumably Mesolithic; hatched patches: Late Neolithic graves (Single Grave Culture); blank oblongs: post-Mesolithic ditches and short ruts, not necessarily man-made; octagonal structure: modern sheepfold (schaapskooi).

the fill consisted of barely leached sand, but here its hue was lighter and more greyish.

After the Neolithic, the soil, probably as a result of deforestation, degenerated to a humus-iron podzol (Dutch: *haarpodzol*) witness the severe podzolisation features (leaching and iron-pan formation) locally evident in three small urn-fields of the Late Bronze Age and in the excavation level.
Curiously, the iron accumulation veins (*fibers*) typical of this soil type also appear in the Late Mesolithic grave pits but not in those of the Late Neolithic.
The third soil type was entirely anthropogenic, namely a *plaggen* soil 50 cm thick, overlying the B (iron-accumulation) horizon of the humus-iron podzol. This *plaggen*-soil cover is likely to date from the 16th century AD and later, and from then on protected the older features against further degradation.

2.3 The nature and full extent of the settlement complex

The cliff overlooking the Vecht valley marked the boundary of the site to the northwest, and the northeastern boundary of the Mesolithic features was encountered in the excavations. It is clear that the site extended further southwest over an unknown distance. The road (Hardenbergerweg) probably cuts across the southeastern slope of the settlements, at least in the vicinity of the excavation. The elongated shape of the settlement site clearly shows an adaptation of land-use to the relief of the cover-sand ridge.

The features attributable to the Mesolithic almost exclusively comprised hearths and pits (Dutch: *brandkuilen / haardkuilen*). The Schaapskooi area proved the most important area by far; it measured almost 100 x 25 m and covered a surface of over 2100 sq m. Within it, 292 hearths and pits were uncovered, lying ca 1 m apart. Within the overall area excavated (over 4500 sq m) and surveyed (800 sq m), a total of ca 400 such features were identified.
To the northeast of the Schaapskooi area, the spaces between the features, mainly pits, were about 3 to 4 m. Insofar as could be observed, the features towards the southwest were mainly black hearths.

Features from superficially disturbed areas and observations in a test trench clearly show that the site occupied in the Mesolithic was larger than that around the investigated areas: an estimated 600 x 40 m, covering a surface of 24,000 sq m. If this is correct, just 5,300/24,000 sq m = 22 % of the site has been excavated or surveyed. The overall site might then encompass almost 2,000 (i.e. 5 x 400) hearths and pits. But with a correction spacing such features at 3-m intervals, the estimated total number of hearths and pits amounts to a minimum of 700.

It is known that in the northern and central Netherlands sites with such huge numbers of Mesolithic hearths and pits are not at all unique (e.g. at Nieuwe Pekela, Zwolle and Hattemerbroek), while similar numbers are unknown from sites in the southern Netherlands. This distinction between the parts north and south of the river Rhine has given rise to several different explanatory models.

2.4 The dating and chronology of the Mesolithic complex at Mariënberg-Schaapskooi

From Mariënberg-Schaapskooi, which is the most important excavation area and contains six Mesolithic burial pits, initially 41 radiocarbon datings were carried out on 38 out of the 292 hearths and pits. The dates range from 8620 BP to 6110 BP. In calendar years, this corresponds to 7620 ± 60 to 5005 ± 40 cal BC. Since 2006, M. Niekus (Groningen Institute of Archaeology) has added sixteen further datings from fourteen features. These generally display the same range, between 7950 and 6040 BP.

The first series of radiocarbon datings was found to be of prime importance and indeed essential to understanding the chronology of the settlement complex. Statistical processing of the data allowed twelve Modes (chronological phases) to be distinguished, although the three larger chronological gaps were quite evident even from the start. Within the four principal Modes, the statistical analysis demonstrated or indicated some

Settlement Mode	no. of dat. feat	comb. date	range BC	shape	length	width	area
IV	3	7543±27	7620–7520	triang-trapezoid	14.4	11.6	128.2
III A1a	1	6805±35	-	round-oval?	3.8	2.0	5.8
III A1b	3	6692±46	6860–6660	ovoid?	19?	13.2?	>200.6
III A2	3	6588±40	6690-6545	ovoid?	>18	>3.6	>40.4
III B	1	6450±30	-	round to oval?	3.8	2.0	5.8
II A	5	6129±25	6155-6085	trapezoid	38.4	18.6	671.5
II B	2	5976±32	5997-5915	elliptical	7.0	2.8	14.4
I A	1	5435±10	-	round to oval	3.8	2.0	5.8
I B	6	5323±14	5385-5291	trianguloid or trapezoid	40.2 -12.8	21.8	695.8
I C1a	7	5162± 7	5240-5100	ovoid	22.6	9.2	153.0
I C1b	2	5124±38	5125-5125	?	38	>8	?
I D	4	5046±16	5060-5005	trapezoid	57-62	21	1249.8

Fig. 3. Chronology of the twelve 'Modes' (phases) on the basis of 38 calibrated radiocarbon dates from Mariënberg-Schaapskooi

chronological gaps of a shorter duration.
The Modes of the Mesolithic occupation and the uncovered features from other periods in the excavations are not presented in chronological order as is usually done in descriptive treatises and surveys. Their authors generally follow the chronological sequence, beginning with the earliest phenomena. By contrast, the phasing of the features at Mariënberg was constructed anti-chronologically, because in performing a complex or indeed simple analysis one should first identify any younger intrusions before analysing the older features belonging to the period under investigation.

2.5 Hearths and pits in the settlement complex as a whole

On the basis of their colour, the 400 uncovered hearths and pits at Mariënberg can be divided into those with a pale, greeny-grey fill ('pits') and those with a dark to black fill ('hearths'). A notable similarity between the hearths and pits is the homogeneity of their fill without any (visible) stratification, and even without a distinct layer, let alone a concentration of finds, at the bottom. Both types of feature presumably were backfilled with disturbed brown forest soil. While phosphate analyses of some hearths and pits do not prove this, they do not rule it out either.

The finds within the fills, if any, tend to consist of charcoal and flint waste and lie scattered throughout the fill. The fills give the impression of having been thoroughly homogenised by bioturbation, but the manner in which the features were backfilled also must have contributed to this. After all, if they were backfilled in a single episode with soil lying close by, there will have been little stratification from the start; and the same will go for the finds. A further argument in favour of this course of events is the observation that the fills of deeper hearths and pits (down to -65 cm) are fully homogenised just like those of the shallower ones, whereas in the grave pits, to be discussed below, this is not the case.

Flint finds - and even more so, finds of other stone - from the hearths and pits are rare, especially from the pits. Many hearths and pits lack finds altogether. The black hearth no. 15, close to the sheepfold, is exceptional in producing as many as 31 finds, including even a fragment of a shaft polisher. The finds from the features consist of settlement waste, mostly flakes and small blades, many of them broken and/or burnt. Far fewer items of other find categories, such as tools, cores, cooking stones, and pebbles, came to light. The finds of all kinds lay well mixed into the fill of the features, with hardly any of them on the floor of a hearth or pit, or in any way stratified higher up within the fill.

The charcoal from the features was identified on a large scale by BIAX-Consult. Fourteen species of wood were found, pine (*Pinus*) and oak (*Quercus*) being the most important by far, in terms both of prevalence and of the inferences that they allow. The third most numerous spe-

cies was alder (*Alnus*), deriving from a wet environment. Curiously, lime (*Tilia*) was absent. The pale-coloured pits in most cases were found to contain pine charcoal; the darker hearths, mostly charcoal of oak, or oak and pine combined. The oak wood may have been burnt under moist conditions, which leaves more charcoal. This may well explain the darker hue of the fills, where the charcoal would have obscured the pale shade of the brown forest soil.
The worm-eaten condition of much of the wood (preceding combustion) suggests that the firewood was mostly deadwood. Given the broad spectrum of identified wood species (fourteen, including alder), it appears that people were happy to burn any stick of wood that lay around, maybe with some bias towards pine and oak.

Bone finds came only from features 15 and 48. Three specialists joined forces to identify the burnt particles. The bone fragments from hearth 15 (10 gr) at least in part were of human origin and are interpreted as settlement waste. The two fragments from feature 48 were probably animal bone and have on the basis of their radiocarbon dating (Ox A-7635: 3460 ± 80BP) been classified as post-Mesolithic contamination.

The hearths and pits have a few distinguishing traits, which means that they may not have had identical functions or significance; indeed they appeared side-by-side for about 700 years (7970-7260 BP). Before 7970 BP there are only pale-coloured pits; after 7260 BP, only black hearths. This means that as a group, the hearths are younger than the pits. This is evident also from the rare transections: in eight of the ten instances it is definitely a hearth that cuts across a pit, while the converse was not observed. The hearths are more numerous than the pits, they are on the whole larger, their fill is of a different colour, they often contain different kinds of charcoal and in different proportions (the earliest oak charcoal dating from 7880 BP and the youngest pine from 6410 BP), while also the finds they contain differ in typology and prevalence.

The question of whether the hearths and pits served a similar function is hard to answer. After all, it is quite credible that the differences listed above should spring from a difference in age, especially since the observed differences tend not to be absolute, but rather of degree.
The generally higher find density in the hearths could merely be a result of the gradual accumulation of artefacts at the site.
But there also are traits hinting at a difference in function. First of all, the 700-year overlap period when hearths and pits co-occur. Secondly, the preponderance in hearths of oak charcoal, from wood apparently burnt under moist conditions. Its carbonisation must have emitted a great deal more smoke than did the fires in the pits poor in charcoal. If this was intentional, the smoke may have served for preserving food and animal skins. This function could in the course of time have grown in importance.
In brief, there are clues pointing either way.

2.6 The Late Mesolithic cemetery: the features

The excavation area near the sheepfold uncovered six features that clearly differed from the pits and hearths on account of their size, shape, fill colour and contents. They were from the start interpreted as Mesolithic burial pits ('sitting graves'), also on the analogy of foreign examples such as those at Bäckaskog (Sweden), Lummelunda (Sweden), Bottendorf (Germany) and Culoz sous Balme (France). For any other possible function of these pits that might have suggested itself in the course of the investigation, no credible examples - at least in Western Europe - came to our attention.
The six similar pits near the sheepfold (nos 12, 55 and 90-93) lay close together in an area measuring 5.5 x 8 m. They also lay within a dense cluster of Late Mesolithic hearths, though without anywhere overlapping with the hearths. In one case (hearth 15) there was an apparent transection due to contradictory observations in the uppermost excavation levels. The dating of the six burial pits in the closing phase of the Mesolithic was primarily inferred from nine radiocarbon datings of hearths in their close proximity (6410 ± 40 to 6180 ± 30 BP) and the lack of transections in the dense cluster. But more generally also by parallels elsewhere in Western Europe, and by the upper parts of the grave pits being backfilled with brown forest soil.
The *end* of the final phase of the Mesolithic was indicated by the presence in two of the graves of shaft polishers (hitherto regarded as a Neolithic

custom) and by the consideration that such a dating would render less likely any disturbance of the (marked?) graves by the users of the hearths.

The architecture of the six grave pits was found to be largely identical. From top to bottom, the graves comprise a roughly funnel-shaped upper pit (in at least four cases), a cylindrical lower pit (in all six cases) and a feature at the very bottom, interpreted as a footwell (in at least two cases). On or slightly above the observable floors of the cylindrical pits lay 30- to 35-cm-thick layers of bright red sand, which in five cases contained grave goods of flint and other stone. Because of the shape and size of the burial pits, the bodies cannot have been interred in a posture other than seated. The nomenclature in the literature of this type of burial pit is 'funnel-pit grave' owing to the pit shape, and on account of the body position a 'sitting grave'. The latter term seems to be the more widely used, and is the most evocative. A short discussion of the three structural elements follows below.
In two cases (nos 90 and 93) an upper pit was lacking or no longer in evidence because of a comparatively deep first observation level. Indeed these were among the shallower graves. Three explanatory models for the three observed upper pits are: 1) a relatively large construction pit to remove loose topsoil for practical reasons; 2) intentional design in funerary architecture; or 3) subsidence of the soil around the top of the pits.
Only for grave 55 can possibility 3 be ruled out, since the upper pit which in the excavation still had a depth of 5 cm, was rectangular in shape. Curiously, its fill was pale grey in colour, differing from the backfilled forest soil beneath it.
In graves 91 and 92 the funnel-shaped upper pit may well be attributable to subsidence.
The near-cylindrical cavities beneath the upper pits had diameters of 55 to 140 cm and depths of 40 to 110 cm below the uppermost excavation level or the base of the upper pit. The pit fills were derived from a brown forest soil, disturbed by bioturbation, and were of a greeny-grey or dirty-yellow colour. However, the bottom-most 30 to 35 cm of the cylindrical pits was filled with a layer of bright red sand.

During and after the excavations, the red sand layers in the six grave pits were provisionally referred to as 'ochre layers'. Yet despite several analyses, it did not become clear, right up to the 2006 publication, whether an iron compound had been mixed into the sand (preheated or otherwise, derived from iron pan, limonite or natural haematite), or whether this was a backfill of naturally red sand. This uncertainty was caused by the secondary nature of the red matter, which had precipitated onto the grains of sand like a red skin which could be rubbed off. It should be noted that the quartz grains made up almost the entire mass (ca 99%) of the red-coloured sand, which means that the amount of any extraneous 'red ochre' would have been minimal. Such a deposition had never before been encountered in the Netherlands north of the Rhine.
Immediately below the floors of graves 91 and 93, grey discolourations appeared, which extended down a further 20-25 cm. The following four observations are important for their interpretation.
1) Both underlay only the eastern part of the cylindrical pits. 2) No such features were recorded with the four other grave pits, but one may have been missed in the case of grave 12, which was excavated without supervision. 3) Owing to the considerably varying depths of the grave pits, the grey stains were not situated at the same elevation in the local soil profile. 4) The grey discolourations, which display fairly distinct outlines, have more-or-less flat bases. These four specific facts are significant and in our opinion cannot be explained by the workings of flora, fauna or pedochemical processes. Therefore these features have been interpreted and marked as man-made excavations, as footwells for the seated bodies. Even though direct evidence of their being part of the grave pits, such as artefacts or flecks of ochre, was lacking.

The posture of the bodies could not be ascertained from direct observations, since, as is usually the case, the well-drained, acidic sand had preserved no organic (skeletal) remains or even stains in the shape of body silhouettes. The posture of the bodies was inferred from the grave structures: narrow cylindrical pits in which a corpse could only be deposited crouched and upright. Parallels are known from elsewhere, for instance from Bäckaskog (Sweden). The orientation of the dead, facing roughly (south)east, is deduced from the location of the footwells be-

low the eastern part of the graves, from the 'incomplete' red-coloured layer in the western half of graves 90 and 92 (probably marking the position of the torso), and to a lesser extent from the shape of the red-stained sand body - with two bulges or a single concentration - in some of the graves. Another significant point is the location of most of the grave goods in the eastern half of the grave pits, again indicating a torso in the western half.

2.7 The Mesolithic grave goods in the red sand layers

The recovered grave goods consisted solely of flint and stone. In five of the six graves they were present in levels halfway down the thick red ochreous layers, clearly deliberately deposited there. The grave goods only appeared within the ochreous layers, in contrast to the more numerous items of settlement waste, which lay mainly above the red sand layers. All of the grave goods and almost all of the settlement waste from the red sand layers were stained red as a result of their burial for millennia in the red soil. The number of grave goods per grave ranged from 0 to 22, and were larger and of better quality than the settlement waste. The latter consisted mainly of small blades and chips, often broken and burnt. The graves together produced a total of 49 deposited items: mostly unretouched blades and blade fragments, a B-point, cores and blocks, hammerstones, and six shaft polishers. The shaft polishers lay in two graves, in sets of three, with the flat sides facing down. There being sets of three at first seemed surprising, but latterly a reorientation in the approach to grave goods, including their numbers, has turned our thoughts towards a system of numerical symbolism.

The graves are remarkably consistent in terms of architecture and distinctly clustered, and hence are likely to be the final resting places of a group of connected, prominent individuals - for example, travelling shamans, a chieftain's relatives or, in a more general sense, members of a pan-tribal social group.

2.8 Features from periods other than the Mesolithic

No features or finds from periods predating the Mesolithic came to light. The features and finds to be dated after the Mesolithic are six (or seven) loosely clustered Late Neolihic grave pits of the Single Grave Culture, including that of a beehive grave (no 96/1 1). Interestingly, Mesolithic hearth no 135 was located within the narrow ring-ditch of this grave, which is a clear indication that (at this depth) the Neolithic grave-digging left the soil undisturbed.
Not insignificant is the presence of charcoal (predominantly of pine) and flint waste in the six Neolithic graves, since this Mesolithic settlement waste closely matches that from the Mesolithic graves. The predominance of pine charcoal in Atlantic-period burial pits of different archaeological periods at the same site indicates that the waste accidentally trapped in these pits should only exceptionally if at all be used for the purpose of dating. The predominance of pine, however, reflects a differential chance of survival in disturbed conditions (and during the sieving of soil samples) due to the different cellular structures of oak and pine wood: oak charcoal will more readily disintegrate.
Spaced some 100 m apart, three small urnfields of the Late Bronze Age were uncovered, two of which were situated on slight rises in the coversand.
In comparison with urnfield plans elsewhere, it is curious that the three small urnfields had not coalesced into a single large one. Another remarkable point is the fact that the recovered pottery solely consisted of small vessels, and lacked urns of cooking-pot size.
The youngest features were reclamation ditches, a cover of *plaggen* soil, and deposits of driftsand, all dating to late-medieval and subsequent periods.

3 A few considerations regarding the criticism

Here we shall attempt a global reconstruction of how, on certain points, some colleagues came to attach very different explanations to one and the same set of data.

As indicated before, some unusual aspects[3] of the Mesolithic cemetery encountered among the hundreds of hearths and pits unjustly gave rise to scepticism. This was prompted by the fact that the rescue excavations of the cemetery in 1978 took place without the input of certain Dutch colleagues, at a time when, at least in the Netherlands, there was no experience with Mesolithic graves and just a limited amount of professional interest in the (Middle) Stone Age. All this despite the great commitment of colleague Newell, who became involved in the working out but had no part in the actual excavation. The rescue excavations were undertaken by the then State Service for Archaeological Investigations (R.O.B.) and amateur archaeologists without raising much interest, which was due also to the brief duration of the individual excavation campaigns and the fact that until well into the 1970s the small world of professional archaeologists was barely represented in the province of Overijssel. As a result, the provincial archaeologist (the first author) at the time operated more or less as a solitary professional.

Despite some frustration on our part about the scepticism referred to, the situation outlined above meant that it was to be welcomed that an independent colleague[4] should intensively and critically review the excavation records and the conclusions drawn from them. Unfortunately such a critical review will be highly dependent upon the always limited and available documentation. This article mainly but not exclusively replies to this criticism, because despite the reviewer and excavator having been on good terms, major disagreements emerged about certain details and misapprehensions. This prompted us to review our excavation data, but also to formulate a rebuttal, as in our opinion the criticism is too harsh and opinionated. In this context, it is almost unprecedented that a series of such drastic counter-interpretations of part of the data, largely based on normative and personal views and assumptions, should be presented against the primary publication. However, we agree with the critic that for the Mariënberg 'graves' the principal interpretation as Mesolithic burial pits with bodies in a seated position should be up-

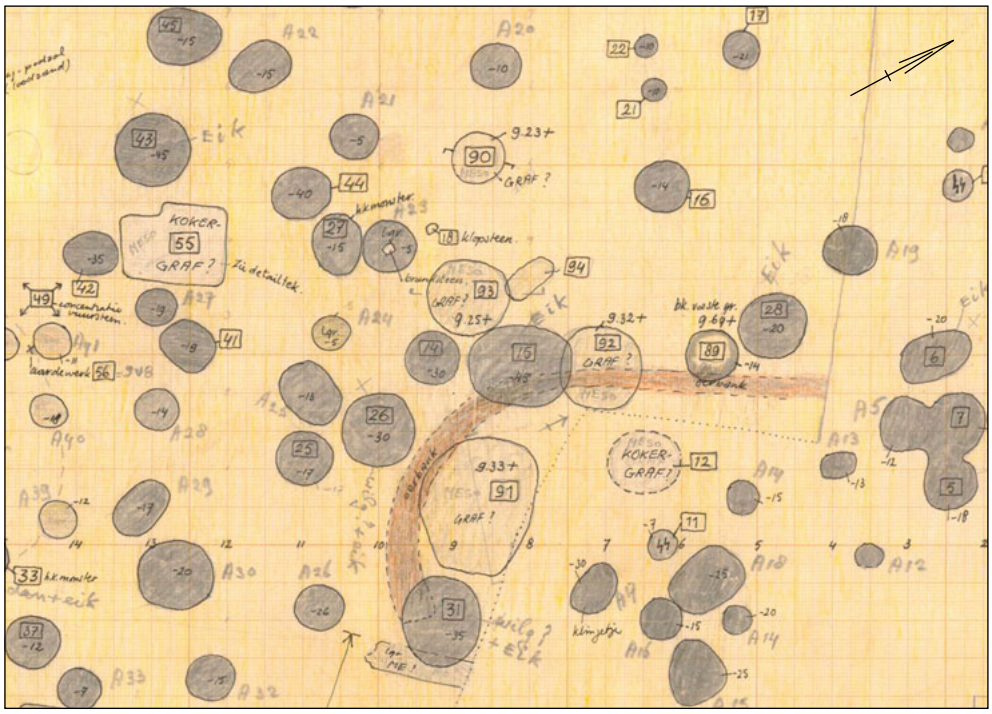

Fig. 4. Mariënberg. Detail of the excavation plan (field drawing) around the Mesolithic graves. The oval ring of iron pan (iron precipitation beneath a shallow ditch) with the associated cremation grave no. 11 belongs to a small urnfield of the Late Bronze Age. Scale 1:100.

[3] During the excavations, these were merely observations and facts.
[4] Viz. Professor Dr L.P. Louwe Kooijmans.

held. Indeed, the newly proposed alternative interpretations now allow a more in-depth understanding of the phenomenon and possibly more refined interpretations. In excavations of more everyday features, such problems of a 'psychological' nature do not arise; they are brought up by poorly understood or rare phenomena.

The criticism levelled by Louwe Kooijmans (2012) at the results published by the present authors appears to be largely based on different views and assumptions regarding the same range of data, such as his assumption of natural iron "diffusion" in the burial pits versus the anthropogenic introduction of a red pigment. Based also on interpretations of facts (such as 'blanks for polishers' rather than 'polishers' without a sharp definition of the distinction) and on sweeping conclusions in the case of a single alleged discrepancy. In doing so, the critic necessarily bases himself on the field documentation and the published material. But also he apparently wants to attribute unique or rare features to more general and hence more widespread phenomena[5], so that the traits specific to the excavated site receive only secondary consideration. Occasionally facts are highlighted and placed in a different and definitely acceptable context, in particular the cutting of the Late Mesolithic grave 12 by a Late Neolithic grave. Further, differences of opinion will arise in the dim light of uncertainty, as reconstructions and interpretations, views and assumptions by definition cannot produce absolute certainty, but offer varying degrees of likelihood. This should be kept in mind at all times.

Previously known or new facts, as well as arguments deriving from them, should be rated more highly (since they represent a greater degree of certainty) than possibilities and best guesses. The former include the various forms of statistical analysis. For instance, in the analysis of settlement units more statistical argumentation was employed than is the case in many other publications (Newell). This naturally does not enhance readability, but is of primary importance.

Louwe Kooijmans' direct criticism (and ruminations) on the publication of the Mesolithic features and finds at Mariënberg curiously enough ignores the evidence from sites outside the 'Lower Rhine' area. These do not feature until they appear in selected considerations in his section 'External References'. This means that they are not integrated in the direct criticism of details of Mariënberg.

The criticism obliges us to publish some 'technical elaborations' which normally would not or only rarely be included in a report. This will in fact 'favour' the excavators over those who did not participate in excavating or in processing the evidence. After all, any report in its details will be a summary of numerous unpublished (minor) facts, observations and considerations.

In the following we shall discuss the relevant sections of the burial pits, from top to bottom wherever possible, and with references to our comprehensive publication of 2006.

[5] 'Normatism', as in the case of the deposition level of the grave goods.

4 The dating of the graves

The authors dated the six burials quite straightforwardly as Late Mesolithic, with probably the most pressing question being whether the rather poorly known Early Neolithic could be entirely ruled out. Their Late Mesolithic dating was based upon:

1. directly or indirectly dated parallells of Mesolithic burial pits elsewhere in Europe, which in any case date from various phases in this long epoch;[6]
2. the (not closely datable) grave goods from the Mariënberg burial pits themselves (Mesolithic/Neolithic);
3. the nine radiocarbon dates of surrounding hearths (6410 ± 40 to 6180 ± 30 BP). In this respect, the sixteen additional radiocarbon dates[7] in hindsight offer no new evidence to resolve the dating problem, in addition to the 41 existing ones from Mariënberg, they all relate to hearths and pits situated outside this cluster of hearths, pits and graves;
4. the fact that in the excavation levels there were no reliable cross-cuttings of fire pits with burial pits (including grave no 92), which may indicate a rough 'contemporaneity' within a period of some 200 years. Points 3 and 4 allow a specified dating in the closing phase of the Mesolithic. This specification cannot be substantiated with hard facts, but it can with reasoning. To avoid the burials being trodden and disturbed by the users of the hearths during their activities in and around them, an argued date at the *end* of this subperiod of about 200 years would be the most likely. In the case of a considerable difference in age between the hearths and pits and the burial pits, it would be barely imaginable that no cross-cuttings should occur with the dense cluster of existing features.
5. The Late Mesolithic dating of the six burial pits is also suggested by the presence of deposited sets of shaft polishers in two of them, a phenomenon at present known only from Neolithic burials. Given the current state of knowledge of Western European archaeology, this funerary practice could be dated to the Mesolithic-Neolithic transition at the earliest.

This - by archaeological standards - fine set of dating clues is, however, ignored by Louwe Kooijmans. With two arguments, which are not unequivocal, he moves the dating of the Late Mesolithic burial pits (ca 6200 BP) to the Early Atlantic Mesolithic, which in this case means to roughly 1,000 years earlier. His two arguments run as follows:

1. One of the hearths (no 15) does cut one of the burials (no 92), although this is the sole instance. The graves, or at any rate grave no 92, therefore are (a bit or much) older than the

Fig. 5. Mariënberg. Grave goods and settlement waste from Mesolithic burial pit 93.

[6] For overview publications, see e.g. Newell et al. 1979 and Grünberg 2000.
[7] Niekus 2005/2006, pp. 88-89.

Late Mesolithic hearth, which dates from ca 6200 BP.

2. The settlement waste, in the form of more recently identified charcoal remains from the Mesolithic burial fills, turns out to belong not entirely but mostly to pine (*Pinus*). This composition does not meet the expectations of the reviewer as regards Late Mesolithic burials located among many (allegedly) contemporaneous Middle Atlantic features that contain mostly remains of oak (*Quercus*). Phrased more succinctly, his argument is that if the grave pits contain mainly pine charcoal (secondarily), this material, being settlement waste, would have been lying primarily and mostly in the vicinity of the graves, (like the pine-containing pits themselves?, see point d below). and that this phenomenon must have consequences for the dating of the graves.

Apparently he assumes that the charcoal in the grave pits indirectly reflects the climatic period, a form of geographic-ecological determinism. Therefore the reviewer considers a date in the Early Atlantic more likely, and especially in Mode II (for the settlements) or in the chronological hiatus before or after it,[8] which coincides with part of the *P*(*inus*)+*Q*(*uercus*) phase of Mariënberg (7670-6440 BP).[9]

At first glance, these two arguments appear well-founded. But the criticism particularly suffers from the fact that critics generally did not themselves take part in the excavations and hence are ignorant of, or fail to appreciate, various 'technical' details and considerations.
With regard to the critic's alternative viewpoint no 1, he refers to the slight, *apparent* cutting of the fairly pale-coloured fill of grave 92 (or the subsidence zone around it) by one of the youngest-dated black-stained hearths (no 15, radiocarbon-dated 6195 ± 35 BP). The field drawing (1978, scale 1:50) and the published drawing (2006, fig. 61, scale 1:400) by the authors do not indicate a measurable distinctiveness of the small, supposed cross-cutting. Indeed contrary 'cross-cuttings' were observed in the unrecorded intermediary levels created at close intervals between the highest recorded excavation plane and the next detailed level drawing below it. The excavators at the site debated these observations and the presumed subsidence zone around the top of the burial pit and decided that this feature should be classified as indeterminate and therefore merited no further consideration. They expressed the quandary in the field drawings by completing the contours of *both* features (fig. 4).

Recently the current line of thought was much encouraged by an unambiguous phenomenon recorded at Zwolle. There a large excavated complex of Mesolithic features was found to include a dark grey, charcoal-containing hearth (not radiocarbon-dated) that visually appeared to postdate an Iron-Age circular ditch, which it seemed to cut.[10]
This 'cross-cutting' naturally raised the excavators' curiosity because of its potential implications. Therefore the apparent cross-cutting was tested by examining a thin soil section.[11] This analysis proved that some of the darker, charcoal-rich, (Mesolithic) pit fill had collapsed into the younger, pale-coloured fill of the open Iron-Age ditch, and/or had been transported there by worms. The initial visual assessment was then changed into the converse. Interestingly, page 21 of Hermsen's publication mentions two other similar observations involving dark-coloured hearths, but these were not examined in detail. The principle behind such apparent inversions of evidence and cross-cuttings was known to us from other sites, but nonetheless in this Mesolithic context presented a fortunate surprise.
Given the far smaller age differential of the two features at Mariënberg (nos. 92 and 15), the darker hearth here too may falsely appear to be younger than (the subsidence zone around) the grave. But this has not been substantiated with the new method employed at Zwolle.
Interestingly, these marginal apparent 'cross-cuttings' all appear to involve a hearth with a dark fill 'cutting' a paler-coloured feature. The darker feature will then always appear to be the younger. Louwe Kooijmans in his argumentation indeed stresses that the cross-cutting must have been more pronounced at a higher level than the minor 'cross-cutting' recorded in the uppermost level drawing, by which he wants to emphasise the evident nature of the cross-cutting. In the light of the above considerations, this argument can therefore be discounted. Further, the upwards widening of soil features is a general phenomenon; in the cases discussed here it operates in the disturbed topsoil and hence is no longer visible in excavations. It sounds a little far-fetched to reinforce an argument with this.

[8] Our Mode II corresponds with Louwe Kooijmans' Phase 3. We here ignore his confusing and unnecessary renumbering of our main modes IV-I into his phases 1-4; for the sake of clarity in the matter of 'botanical dating', both he and we refer to phases of the Atlantic.
[9] Verlinde & Newell 2006, pp. 100-102.
[10] Hermsen 2006, p. 24.
[11] Internal report by R. Exaltus, 1995.

Table 1. Summary of the charcoal counts from the six Mesolithic and six Late Neolithic graves at Mariënberg performed by BIAX from 1995 onwards, as well as earlier identifications by others (pre-BIAX). The detected tree species apart from Quercus and Pinus are not mentioned here, but do feature in the published tables (Mesolithic: also 1 Betula and a carbonized hazelnut shell fragment; Neolithic: also 1 Salix, 4 Alnus and a carbonized hazelnut shell fragment).

six Mesolithic graves

grave or sample no.	BIAX or pre-BIAX	Pinus	cf.Pinus	Quercus	indet.	total
12	pre-BIAX	ca. 8	-	2	-	ca. 10
55	BIAX	33	-	1	-	34
90	no charcoal	-	-	-	-	-
91	BIAX	4	-	8	7	19
92	pre-BIAX	19	-	23	-	42
92-1	BIAX	20	-	-	-	20
92-2	BIAX	20	9	-	-	29
92-3	BIAX	9	-	-	15	24
93	pre-BIAX	12	-	2	-	14
93-2	BIAX	25	-	-	-	25

six Late Neolithic graves

grave or sample no.	BIAX or pre-BIAX	Pinus	cf.Pinus	Quercus	indet.	total
79a	BIAX	1	-	4	-	5
79b	BIAX	2	-	13	-	15
79c	BIAX	3	-	6	2	11
96/131	BIAX	9	-	-	-	9
131	BIAX	15	-	2	-	17
136	BIAX	19	-	1	-	20
137	BIAX	11	-	-	-	11
670a	BIAX	10	-	-	-	10
670b	BIAX	6	-	-	-	6
674a	BIAX	7	-	-	-	7
674b	BIAX	15	-	-	-	15

To summarise, our refutation of the critic's counter-argument no. 1 is that, judging only by the drawings of Mariënberg, the cross-cutting does seem to make grave 92 older than the dated hearth no. 15, but that other, well-considered but unpublished details and interpretations of the excavation contradict this or at least make it doubtful. Therefore we believe that the 'sole apparent cross-cutting' of one of the burial pits (with extended contour lines in the field drawing) should be kept out of the debate except as a 'technical' point.

The critic's second argument against the Late Mesolithic dating of the burials is of an entirely different order, concerning the composition of the charcoal in the fill of the pits. The 'problem' of the charcoal composition counts in the graves in part stems from the fact that, preceding the very large-scale identifications by the botanical agency BIAXConsult which started in 1995, various botanical colleagues had already performed charcoal identifications on a small scale. As a result, some of the BIAX results[12] may not -or not closely- correspond with the previously recorded results of earlier countings, as the prior samples could not be re-examined. In fact, the analyses complement each other.
Louwe Kooijmans points out that with one exception[13] *all* botanical samples from the six buri-

[12] Kooistra & Hänninen 1997; see Verlinde & Newell 2006, Appendix 3 on pp. 261-270, esp. pp. 268-269; see p. 132 with pre-BIAX counts for graves 12, 92 and 93.

[13] Viz., the pre-BIAX count from grave 92, which for this reason was omitted from the BIAX table on pp. 268-269 in Verlinde & Newell 2006.

als (are believed to have) contained little or nothing else than *Pinus* wood. He regards such an outcome as unlikely to be associated with Late Mesolithic or Middle Atlantic burials surrounded by contemporary hearths, most of which yielded *Quercus* charcoal. His conclusion is that the sole 'deviating' charcoal composition must be indicative of an administrative error (in a pre-BIAX count) and hence of a considerably older age for the burials; according to him this is due to the *Pinus* dominance. If this poorly founded argumentation is followed through, the burials would be about 1,000 years older (roughly 7000 BP) than the Late Mesolithic dating published by ourselves, ca 6200-6100 BP.
His conclusion, however, is unlikely or indeed erroneous for the following reasons.

a. As already mentioned, one relatively large spectrum[14] significantly deviates from the high *Pinus* proportions and shows a considerable *Quercus* component (over 50%). Because this counting does not fit, or is considered not to fit, with the critic's preconceived dating, he regards this counting as erroneous and 'coincidental'. In that case it would have to be an administrative error, since no botanist would confuse conifer with deciduous wood; the wood structures are too different in character.[15] To allege that an administrative error was made (in this case by a botanist) can only be called arbitrary, since any recording error made years ago cannot now be proved or disproved. This assumption by the critic cannot be adduced as a fact in scientific argumentation.
b. Apart from the above-mentioned relatively large count from grave 92 (whether or not it should be ignored), there is another count, involving *small* numbers of charcoal fragments, which does not contradict a Late Mesolithic date: charcoal from grave 91, with 8 x *Quercus* and 4 x *Pinus*.[16] The first-mentioned spectrum therefore is not the only exception to the dominance of *Pinus* which so surprised the critic, but merely was the more eye-catching because of the larger number of identified charcoal fragments. It would be methodologically incorrect to take into account only the spectra based on large numbers of charcoal fragments.
c. If we then consider the charcoal identifications from the six Late Neolithic graves we find that in these much later burial pits just one grave contained a majority of (wholly or largely contemporaneous) *Quercus* charcoal, as a concentration on the bottom, *i.e.* grave 79 (radiocarbon: 4420 ± 35 BP). In the five other graves, *Pinus* predominates or is the only species, be it always in small amounts. Apart from (most of) the charcoal from grave 79, the charcoal remains and flint waste in the Neolithic graves is interpreted as Mesolithic settlement waste. According to Louwe Kooijmans' dating method, as applied to the Mesolithic burial pits, these five Neolithic burials *too* should be of Boreal or early Atlantic age. Points b and c therefore clearly demonstrate that charcoal waste from Mesolithic and Neolithic burial pits is not a suitable basis for chronological inferences.
d. Accidental mixtures of old and younger charcoal waste (on the former surface and in hearths and pits) should not be regarded as representing a single episode. In fact, the mixed spectrum of *Pinus* and *Quercus* (and sometimes more rarely used wood species) produces a spurious picture. This is why the spectra are not consistent.

On top of this, the distribution map of the features around the Mesolithic burial pits shows that the pits with few remains of pine charcoal are clearly a minority, and on average lie further from the graves than do the hearths with the greatest amount of oak charcoal. By contrast, the reviewer assumes the presence of the greatest amount of pine charcoal (on the surface?) close to the Mesolithic graves to explain the predominance of pine charcoal within those graves.

Actually, Louwe Kooijmans himself points out that in the strongly anthropogenically affected feature complex of Mariënberg, *Pinus* charcoal continues to turn up for some 500 years longer than the environmental data from the pollen diagrams would suggest.
On page 403, Louwe Kooijmans (2012) in contradiction to the above, expresses the conviction that the hearths and pits were barely if at all contaminated with older charcoal. This was based on a few double countings of various charcoal samples from separate pits with "no or only modest age differences". Lanting & van der Plicht[17] however, arrived at an entirely different conclusion with remarks such as "charcoal fragments of harder wood species are virtually imperishable", and "that (at Mariënberg) the pine charcoal in the

[14] Verlinde & Newell 2006, pp. 128, 132 and 155, grave 92.
[15] Information kindly supplied by R. de Man, RCE.
[16] BIAX counts in Verlinde & Newell 2006, pp. 136-143 and 269.
[17] 1997/98, pp. 134 and 143.

double countings in two out of three cases is clearly older than the oak charcoal".
With the additional radiocarbon data supplied by Niekus,[18] this figure becomes three out of five. With so many closely spaced (waste) pits, the fill will, in the course of backfilling, almost inevitably come to contain waste from and around adjacent and older pits.
e.) In our view, an explanation for the frequent *Pinus* dominance in the Mesolithic and Neolithic grave pits at Mariënberg is the likelihood that *Pinus* charcoal *in a disturbed condition* is more robust than that of *Quercus*.[19] This can be attributed to the different internal structure of the wood, which means that (weathered) Quercus charcoal will more readily crumble and degrade than *Pinus* charcoal. *Pinus* wood has a more homogeneous and compact texture than *Quercus* and possibly also the resin in conifer wood plays a conserving role. The degree of fragmentation will be unintentionally aggravated during excavation, and afterwards during the wet or dry sieving of soil samples, which was a much-employed procedure in the large-scale BIAX analyses. By contrast, the small-scale pre-BIAX identifications were performed on hand-picked fragments. This difference in the pretreatment of charcoal may explain why in the BIAX analyses of the graves *Quercus* charcoal on average appeared somewhat less and less frequently than in the pre-BIAX counts.

To summarise, it can be said that Louwe Kooijmans accepts as a fact his alternative dating of the Mesolithic graves, on the basis of a single *apparent* cross-cutting of features. He accepts the *hypothetical* possibility of an administrative error in the charcoal identifications. Also he chooses to ignore contrary field observations, while in some cases he takes a dubious approach with small charcoal samples being insufficiently taken into consideration, while treating fortuitous (mixtures of) charcoal waste in the graves virtually as representing true episodes. Nonetheless, on p. 409 he argues the opposite with "this charcoal, like the Mesolithic settlement waste in the same fills, is considered to be secondary …".
As regards his 'botanical dating', the difference in robustness between pine and oak charcoal as we explained above will adequately account for the observed dominance of pine.

[18] Niekus 2005/6.
[19] With thanks to Dr L. Kooistra, BIAX, for an informative discussion.

5 The funnel graves, upper part

Fig. 6. Gammelke near Oldenzaal. Section across one of the burial pits in a long barrow of the Middle Bronze Age. Note the clear-cut caving around the burial pit and the subsidence within the pit.

Four of the six burial pits (nos. 12, 55, 91 and 92) in the excavation still had a visible upper part, which can be referred to as 'funnel pit' or 'upper pit'. Their specifications follow below.

Grave 12 was the first grave to be encountered, was excavated under poorly controlled conditions, and hence yields particular problems. This grave initially seemed to be the most convincing example of a grave pit with a substantial upper pit. However, the oval upper pit was the only one to extend as much as 30 cm below the uppermost recorded level before it continued downward as a cylindrical shaft. Besides, near the base of the upper pit lay a 10-cm flint blade, not ochre-stained, which remained a distinct and unexplained item among the grave goods. Louwe Kooijmans argues that these facts are best interpreted as evidence of a (seventh) Neolithic bural pit. The implication is that this grave was located exactly on top of, cutting through and badly damaging a far older Mesolithic grave. Being a flat grave, this Mesolithic burial would not have been noticeable by the Late Neolithic, some 3,000 years later. Despite the coincidence of two graves of very different dates completely overlapping, we on this point do accept the suggested interpretation, which in this case is based on the reported evidence. We shall qualify any original upper pit of Mesolithic grave 12 as 'uncertain, owing to disturbance'.

Given this new interpretation of grave 12, grave 55 remains the only convincing grave with a *deviating* shape of its (surviving) upper pit. After all, the uppermost recorded level immediately below the thin, subrecent *plaggen* soil showed grave 55 as a pale grey rectangular stain, which a few centimetres lower down abruptly merged into the cylindrical shaft. This shape indicates a man-made pit that clearly differs from the two funnel-shaped upper pits to be described below. Graves 91 and 92 were the only ones that showed a funnel-shaped widening towards the surface. This funnel shape seems to result from natural caving rather than intentional design when the pit was dug. On this point the authors and the reviewer are in agreement. The graves 90 and 93 were the only Mesolithic graves that no longer displayed any upper pits.

So of the six burial pits, three (nos. 12, 90, and 93) may have had shallow upper pits that went unrecorded, owing to Neolithic disturbance, disturbance by soil formation and excavation, and an unknown reason, respectively. Grave 55 has a rectangular upper pit, which must have been deliberately made so, since its shape and the colour of the fill exclude caving of the natural sand around the mouth of the upper pit. In the case of

just two pits (91 and 92) a funnel-shaped upper pit was observed, most probably resulting from the pits' edges having caved in. All in all, this part of the graves cannot have been of a standard shape, given its two or three different manifestations in the excavation alone. On this subject, see for instance the well-defined traces of soil subsidence and settling in and around a Middle Bronze Age grave at Gammelke near Oldenzaal (fig. 6).

This conclusion is strengthened by the fact that the natural erosion on the weakly undulating coversand ridge is unlikely to have played a substantial part in obliterating (parts of) soil features. Moreover, the uppermost 'legible' and recorded level lay below a thin (ca 50 cm) protective layer of *plaggen* soil which postdated the 15th century AD. It should be noted that in the eastern Netherlands on coversand ridges with little relief the uppermost excavation level below a *plaggen* soil is generally thought to lie at a depth of just 25 cm beneath the original, subrecent surface. This is no deeper than the natural soil formation, which also will erase archaeological features down to a depth of ca 25 cm.

6 The funnel graves: the lower, cylindrical part

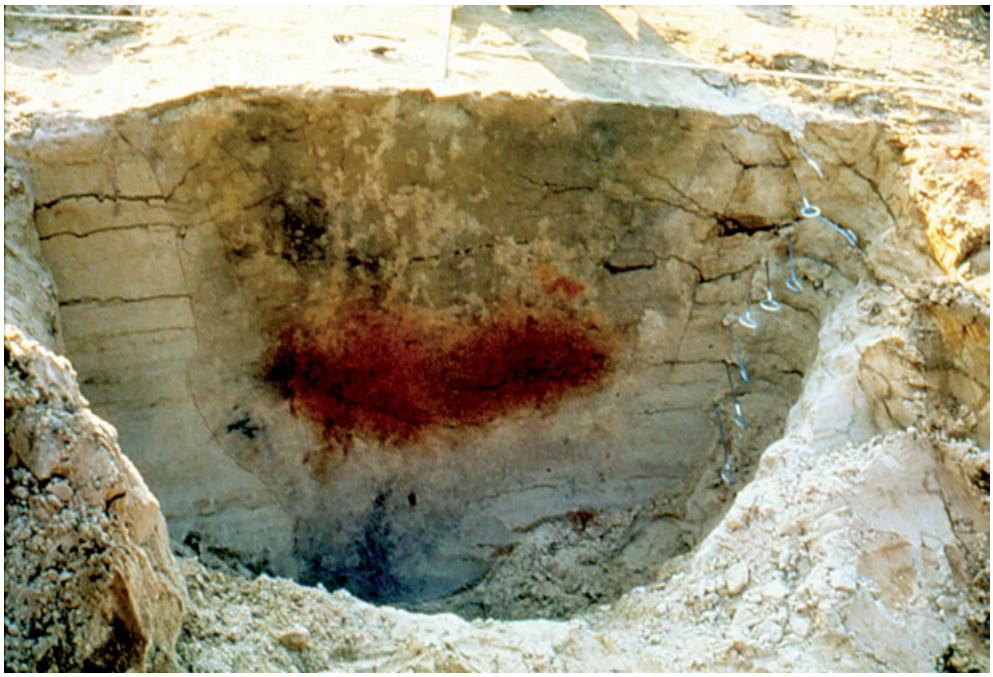

Fig. 7. Mariënberg. Section across Late Mesolithic grave no. 91, no mirror image.

There is little disagreement between the authors and the critic regarding the fill of the cylindrical pits above the red-stained sand layers in the bottom. It is a bioturbation-disturbed 'brown podzolic soil' (D: *bosgrond, moderpodzol*), which represents the contemporary soil and yellow natural sand with which the graves were backfilled in the Late Mesolithic / the Atlantic. Also there are veins of humus-iron illuviation, marking the more recent humus-iron podzol (D: *haarpodzol*) formation which probably developed after the Neolithic. We would here stress the similarity in colour between greeny-grey 'pastel' shade of the grave fills and that of fill of the pits. But in the latter, much shallower pits, bioturbation has been more intensive because of their higher position in the coversand, possibly much smaller volume, and maybe also the system of backfilling. The patchy fill of the burial pits at this depth (*i.e.* more than 25 cm below the Mesolithic surface), though faded, still appears to represent the backfilled forest soil in nature and colour.
A more recent pedological development, generally regarded as post-Neolithic, is the formation of brown iron-and-humus veins typical of a humus-iron podzol in the undisturbed sand *outside* the burial pits and their more weakly developed, squiggly continuation *within* the burial pits. This last-named phenomenon to our knowledge has rarely if ever been observed in other pre-Bronze-Age features. We believe that this is due to the firmness of the pit fill after several millennia of settling of the backfilled forest soil, by the time that the post-Neolithic humus and iron illuviation started. It is this natural soil compaction, manifesting itself in caving and subsidence in and/or around the burial pits, which contributes to the appearance of the fill. This settling was considerably intensified by the decay of organic substances in the graves, *viz.* the body and any organic grave goods such as tools and foodstuffs, and further accoutrements such as hides or basketry.

In contrast to the preceding paragraphs, considerable differences of opinion emerged when it came to interpreting the nature and the formation of the red sand layers and the position of the original floor of the grave pits. Because of the complex evidence involved, the red sand layers are discussed separately in the following section and subsequently in the section by the soil scientists D.J. Huisman and B.J.H. van Os.
Louwe Kooijmans surprisingly puts the original floors of the Mesolithic burial pits, *i.e.* the cylindrical funnel pits, ca. 5 to 30 cm higher (his table 1 and p. 413, 414) than the authors did.[20] The pits would then be correspondingly shallower. This view is not based on any observations or excavation evidence other than the depths of grave

[20] From this calculation, we omitted as separate phenomena the controversial, 20- to 25-cm-deep footwells of graves 91 and 93; while he himself omits the findless grave no. 90.

goods, but on the normative *proposition* that elsewhere grave goods are (always or often?) thought to have been deposited on the floor of the burial pit. The grave goods in five pits (only the small grave no. 90 lacked surviving grave goods) at Mariënberg were found halfway up the ca 30- to 35-cm-thick red sand layers, with clear-cut deposition levels. The critic, starting from his presupposition, equates the position of the grave goods at these 'fixed' deposition levels with the floors of grave pits, because this is what he believes to be the case elsewhere. Here he strays from the observations in this excavation, and attaches greater weight to observations elsewhere. He believes that the original pit floors became invisible to the excavators because of (as he claims) exceptionally strong (natural) iron "diffusion" near the floors. We feel obliged to discuss this remarkable speculation, because the incorrect idea has been published and therefore will without doubt continue to circulate among researchers and authors either as an acceptable alternative or maybe just to quote the opinion of a recognized archaeologist.

We shall here put forward some arguments against the idea of original pit floors halfway down red sand layers of supposedly natural "diffusion". Our further counter-arguments directly relate to the presumed iron precipitation in the red sand and therefore will be elaborated in the following two sections.

a. During the excavation, the boundaries of the burial pits (including any caving zones around them in the natural sand) were on the whole quite distinct both in the upper and the lower zone, also around and below the red sand layers. It is barely conceivable and would indeed be most extraordinary, if these *continuous* limits and the enclosed layers in the graves should be largely attributable to unspecified "taphonomic processes", as the criticism suggests.[21] During the excavation, neither the horizontal levels nor the vertical sections of the Mesolithic burial pits showed any evidence whatsoever to suggest that the boundaries between the natural sand and the fill of the pits differed from what was eventually published. These observations were made in five of the six burial pits;[22] and were not based on just one random case. Fig. 7.
b. Within the burial pits, the red sand layers do not cover the full diameter of the cylindrical pits. Put otherwise, outside and at the level of the red sand layer but within the pits (including any subsidence zones around the edges) there are areas *not* stained red. The higher pit floors posited by the critic were not observed or otherwise established even in these non-red zones, *e.g.* by the texture of the soil. Moreover, below the postulated pit floors in the red layers of course no subsidence phenomena should be present, but in some instances they *are* observed. To illustrate both points, see especially the directly drawn and photographed, rather than reconstructed, sections of graves 90, 91, and 93.
c. For the Mariënberg graves, there is absolutely no need, not even in the normative sense, to propose higher pit floors 'marked' by the deposition levels of grave goods in the red sand layers. In the Western European Mesolithic, sitting graves are known elsewhere with grave goods situated above the pit floor. Here follow five well-known examples[23] from a sample of nine analogous burial sites with sitting graves, including, in the Netherlands, Hardinxveld-Giessendam-De Bruin.
   - Bäckaskog (Sweden), a sitting grave with two items, on the floor and at the head;
   - Lummelunda 3 (Sweden), a sitting grave with grave goods in the upper layers of the grave;
   - Kolberg (Germany), a sitting grave with a boar's tusk at the upper arm**;**
   - Culoz sous Balme 2 (France), a sitting grave in an *abri*, with grave goods on the pit floor and from the knee up to the top of the head;
   - Téviec (France), a cemetery including several graves with grave goods above the level of the pit floor.

   Besides, in the Netherlands, apart from the above-mentioned sample:
   - Rotterdam-Zuid, a recently excavated and dated cremation (grave?) pit with a mace-head and a grindstone above the floor of the pit.

Outside the Western European culture area, there is Janislawice (Poland), where a recently badly disturbed sitting grave was found to contain tools, a store of flint, and personal ornaments, which lay both on and particularly above the grave floor.[24] Items above grave floors in general, and especially those near the head, tend to

[21] The term 'taphonomy' is borrowed from palaeontology, where it refers to the combined processes in the fossilisation of dead organisms; later this concept was introduced into archaeology to designate the various 'site-formation processes'. In the present context, the term is used mainly in relation to pedological, and to a lesser extent to other natural formative processes.
[22] Not counting the grave excavated without supervision, no. 12.
[23] Notes taken by R. Newell; J. Grünberg 2000, pp. 90-100; Verlinde & Newell 2006, p. 177.
[24] Gimbutas 1956, pp. 36-37; Grünberg 2000, pp. 168-170.

be ornaments, made of organic and/or inorganic material.
The situation at Mariënberg, with respect to the deposition level, cannot therefore be classified as unique or deviating; it fits within a range of known funerary customs. But for judging the deposition level at Mariënberg, preeminence should be given to the field observations - note the plural. In our opinion, these carry more weight than any line of reasoning from a perspective that is demonstrably erroneous.

d. Grave goods above and not on the floors of graves are known also from various post-Mesolithic periods. Hence the phenomenon is not a specifically Mesolithic one. We here name a few instances in chronological order, including several from the province of Overijssel, like Mariënberg itself.

1. A string of amber beads on a man's forehead in a Middle Neolithic inhumation grave at Swifterbant (Flevoland);
2. three bell beakers in an inhumation grave at Oud Avereest;
3. three accessory vessels of *Kümmerkeramik* in an inhumation grave of the Middle Bronze Age at Gammelke near Oldenzaal;
4. accessory vessels *on top of* cremations of the Late Bronze Age/Early Iron Age, from various findspots;
5. weapons and other grave goods from a Carolingian aristocratic grave at Borne, an inhumation grave.

The arguments above and in the following must demonstrate that the five burials with grave goods at Mariënberg should not have shallower depths than those given in the original publication, despite what is suggested in Louwe Kooijmans' table 1 and in his chapter "Reinterpretations".
Apart from erroneously proposing shallower grave pits, the reviewer justifiably points out that the cylindrical pits originally had quite small diameters, judging by the red sand bodies - and discounting any caving areas of the surrounding parent soil, which must be of slightly later date. The latter, however, were not consistently distinct and interpretable as such, and therefore were poorly measurable, and hard to apply to the full vertical depth of each pit. After all, the pits were not perfectly cylindrical in shape. The smaller diameters (by 0 to 20 cm) of the cylindrical pits posited by the critic therefore are on the whole uncertain, based on subtle distinctions and in part dependent on the average values of grave diameters in the authors' original report of 2006. In half of the cases (three grave pits) he was unable to suggest any diameter reduction. His reassessment turns out to be pseudo-accurate and of little relevance.

7 The origin of the red sand

Fig. 8A. Mariënberg. Grave 93, level 4 with some grave goods in the red sand.

The highly remarkable layers of red sand on or close to the floor of the cylindrical pits, both during and after the excavation, drew a great deal of attention with their peculiarly bright colour and striking appearance while moist. Because of the secondary nature of the iron deposit on the grains of sand, the origin of the red sand and its colouring could not be established despite various efforts by pedologists and other scientists. Educated reasoning produced some potential explanations. These were as follows:

1. introduction of natural red sand from the surrounding area, or
2. importation of a mineral iron compound: bog iron or limonite from the surrounding area or haematite from a more distant source. These minerals might need to be heated (the first two at any rate), crushed to a powder, and then mixed with the gravedigger's spoil to produce the red sand layers.
3. Louwe Kooijmans adduces some counter-arguments to these explanations and then comes up with a third possibility, as original as it is implausible: a natural "diffusion of iron from an unknown source" by percolating groundwater. This explanation does not answer the question of the origin of the red staining, but only indicates possible post-depositional processes.

All of these possible explanations prompted arguments and counter-arguments, which here will be briefly reviewed and commented upon, also with references to the preceding section, where only archaeological arguments regarding the (original) grave floor were presented.

Option 1. Introduction of natural red sand from the surrounding area. This is the only scenario in which the red staining took place outside the grave pit. In the 2006 publication, this was considered the most likely scenario, as pedologists in the 1980s and 1990s considered the three va-

riants of option 2 unlikely. They objected to the idea of introduced iron compounds being dissolved and then massively redeposited *within* the grave pit. Yet recent further research has shed new light on this process (see the following section by Huisman & Van Os).
As for the natural occurrence of red sands in the vicinity during the Mesolithic, we consider their presence in the iron-rich sediments of the river Vecht as hardly debatable, even though nowadays there apparently is no record of such locations. Such patches may arise where groundwater wells up from the soil, in boggy soils or as a result of major fires (as may be the case in the Veluwe region). Discovering such red coloured places should have posed no major problem to the Mesolithic people, despite the then dense vegetation, given the amazing range of resources that today's Native peoples are able to find even at great distances from home. Red sand may have become visible at the surface through erosion, or through breaks in the humic topsoil caused by treefalls or burrowing creatures.
Louwe Kooijmans evidently has a lower opinion of people's serendipity than we do. Moreover, he considers the presence of any domestic waste in the red sand layers as a counter-argument for this explanation; but there is no accounting for the (lack of) tidiness of ancient undertakers.
Another argument in favour of red-sand deposition, and for option 2, is the fact that *high up* in the cylinders of some grave pits (nos. 55, 92 and 93) some red sand was also encountered, which appears to be either spilled sand (no 55) or a protrusion of the principal layer. The third explanation, the reviewer's, fails to account credibly for this irregular and high-positioned red sand, since it requires an intrusion of iron from above, or from below through the capillary action of groundwater.

Option 2, the second possible explanation for the thick red-sand deposits means that the mourners heated an iron compound, crushed it and mixed it with sand (probably some of the natural sand excavated by the gravediggers) in order to colour the sand red. But we do not know whether Mesolithic people here and elsewhere were acquainted with and applied this technique. The recent pedo-chemical analyses of the red sand layers of Mariënberg suggest that they were and did, on the basis of the chemical composition of the red pigment and the many tiny charcoal particles found among the sand grains. The above-mentioned iron compound, bog iron, must have been present in the vicinity and quite easy to find. The mineral limonite occurs less commonly.
The use of haematite in graves is documented south of the major rivers, where the mineral occurs in the low hills. North of the rivers, its presence is not (yet) known, nor is red staining in general. If it is haematite that was applied at Mariënberg, this implies long-distance transport. The red, 'ochre-containing soil' in some Neolithic graves of the Bandceramic culture has been explained by the presence of fragments of abraded haematite in some of the graves. A chemical analysis of the red soil from those graves may well shed more light on the matter. The question remains how powdered haematite (mixed with soil?) responds chemically to thousands of years in the ground – which we need to know if we want to compare it with red-coloured sand (or loam) from other burials. For the sake of convenience, the red pigment has often been termed 'ochre', analogous to similar occurrences in other Mesolithic and Neolithic graves. In any case, chemical analyses have shown the bulk of the Mariënberg red sand to consist of quartz grains, covered with a skin of iron which makes up no more than ca. 1 to 2 % of the total.

Option 3. Natural "iron diffusion from an unknown source" and "dissolution" of red matter by percolating water in the ground, which is the speculative and decidedly unspecific explanation favoured by Louwe Kooijmans. In contrast to the brown, humus-iron compounds leached from above and deposited in podzol horizons, he believes that a red iron oxide (the haematite) transformed the fill in the Mariënberg graves.
In such a context, this would constitute an unknown phenomenon, which is rejected by pedologists. Nonetheless, he believes that this "taphonomic" explanation must be correct because of his objections against the two alternatives, and his putting the floor of the grave pits at the level of the grave goods. The red sand must in his view have occupied much thinner "layers", and therefore had too little volume to supply the encountered amount of iron oxide. After the backfilling of the pits, an original thin layer/small volume of red sand must in his opinion have expanded substantially both upwards and down-

Fig. 8B. Mariënberg. The skimming of red sand in one of the burial pits. The wheelbarrow offers an indication of the volume of red sand.

wards, supplemented by a natural process involving the 'dissolution of some kind of red powder', a phrase which implies some human input after all. By this process - or these processes - of iron precipitation, the original pit floor, which he believed to be situated at the level of the grave goods, supposedly became entirely obliterated.

It will not come as a surprise that this interpretation gives rise to a series of objections. We here list the more important ones.

- The three archaeological objections in the preceding section, mostly focusing on the presumed level of the grave floor. In weighing Options 1 and 2, the considerations also relate to Option 3, e.g. in explaining the uppermost patches of red sand.
- It is not credible that the difference between the natural and the backfilled soil should no longer be discernible at the floor level, when normally this is quite distinct. The original pit floors, according to the critic, situated halfway up the red sand layers, are said to have been obliterated by 'iron precipitation' above and below the hypothetical floors (but not sideways!), while the perfectly visible floors below the red sands are supposedly phantom floors. This is a serious form of unfounded speculation.
- The presumed iron precipitation above and below his presumed high-lying pit floors, as a post-depositional process, apparently took place to similar degrees in both the natural (below) and the backfilled soil (above). Still, the upper part ('backfilled soil') and the lower part ('natural sand') of the red sand layer showed no difference whatsoever in colour, composition or density. Unfortunately, the sparse presence of domestic waste in the red sand cannot settle this argument, since these finds were documented simply as belonging to the red sand layer, whose upper or lower part was rarely specified. But the excavator's impression is that while the upper half contained little waste, the bottom half contained even less.
- In some graves the red-stained layers did not cover the full pit diameters, i.e. these red layers did not extend horizontally from wall to wall. Even in the fill beside these 'incomplete' red-sand layers, where the presumed 'original floors' could not have been 'obliterated by natural iron deposition', no trace was found of such floors. Moreover, in a process as postulated it would still be a mystery why some pits did and others did not have red sand over (almost) the full width of the cylindrical pit. Also, in the excavation, the pit floors below the red sand (excluding the footwells, to be discussed

below) were observed ca. 50-110 cm below the uppermost cleaned and recorded level, which means that their elevations differ too. Hence there is substantial variation in the position of the observed and the hypothetical pit floors relative to the water table and to the associated grey reduction zone. This makes any unusual, uniform and substantial iron precipitation most unlikely.

- In other burial pits, dated to later periods, at Mariënberg or elsewhere, not even a beginning of such iron precipitation has ever been observed.
- A form of iron supply and precipitation , if originating from the (ground)water, would produce accretions of iron compounds onto artefacts, as have been documented elsewhere outside burial pits (e.g. at Ede-Kernhem),[25] and not just a red film of iron on the artefacts as seen in the Mariënberg graves.
- In his fig. 6, Louwe Kooijmans includes "redrawns from plans and sections of the graves". In the course of redrawing, various errors have been incorporated, such as mirror images and incorrect outlines and position of the red sand layers on the grave floors.
- The following, pedological section will discuss earlier and new results of pedo-chemical analysis, including analyses of ochre-stained flint from among both the grave goods and the settlement waste from the Mariënberg burials.

[25] Information kindly provided by J. Deeben, RCE.

8 The origin of the red sand in the Mariënberg graves, a pedological and pedochemical perspective

by D.J. Huisman and B.J.H. van Os

Research question

Verlinde and Newell in their 2006 publication considered various possible explanations for the presence of red sand in the Mesolithic graves at Mariënberg. Louwe Kooijmans (2012) countered their views, conjecturing an unspecified 'taphonomic' explanation. Our aim is to find the most plausible rationale for the phenomenon, on the basis of scientific evidence. To this end, we have performed optical examinations and pedochemical analyses of red sand samples and of red-stained artefacts from the red sand. Three samples of red sand (from graves 55, 92 and 93) and seven artefacts with red staining (from graves 92 and 93) from Mariënberg were examined under a microscope with high magnification (a Zeiss Axioskop 40 with vertical incident lighting in combination with a polarisation filter; 25 to 1000 times magnification). Thus the following was established (see also figure 9: microscope photos).

Microscopic and chemical analysis

The red matter occurs in the form of a thin, fine-grained, discontinuous coating on the sand grains and the artefacts. Where it forms a more continuous layer, its surface often displays fine crazing. (fig. 9A). The sand samples contain some clumps of fine-grained red matter that is unattached to sand grains (figs. 9B, 9C). Fine particles of carbonised material occur fairly generally throughout the red sand. At some places wood structures are still evident within them; this shows that we are probably dealing with charcoal. Yet it cannot be ruled out that part of the carbonised particles derive from other kinds of organic material (figs. 9C, 9D). On some of the artefacts the red deposit is clearly present on just one side. Probably this is the side that lay uppermost in the soil. The colour of the iron minerals – bright red with even a purplish hue in parts (fig. 9C) indicates that the iron compounds consist for a large part

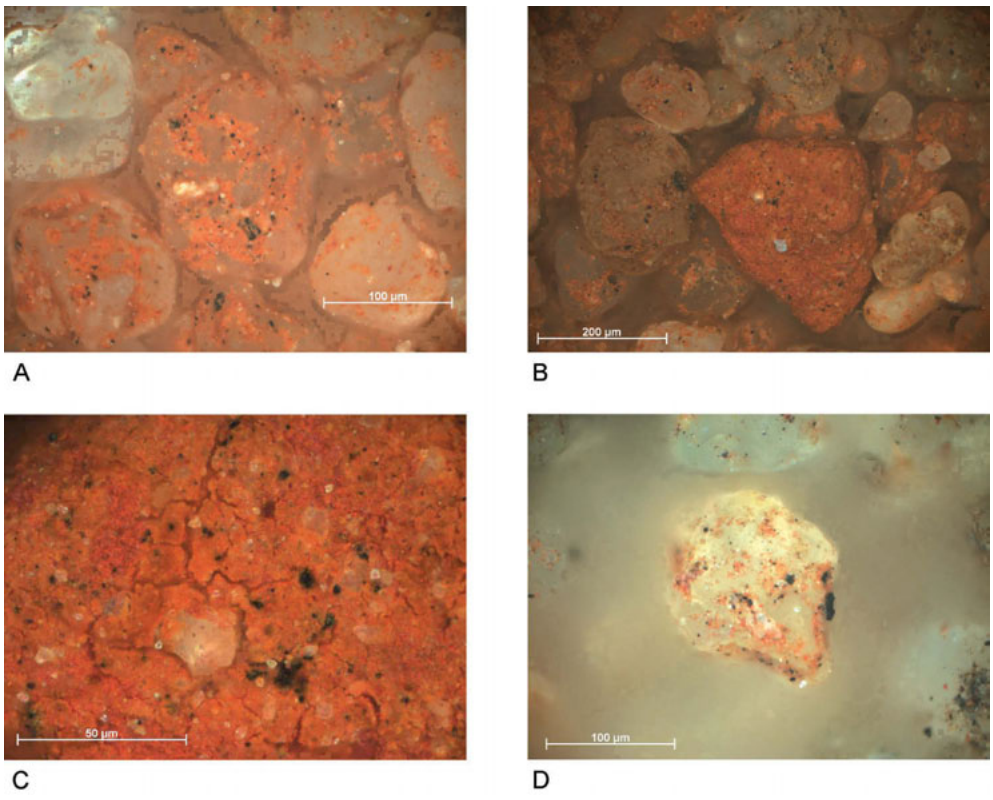

Figure 9. Mariënberg. Set of microscope photos of some red soil samples and artefacts from the red sand in the graves. All photos were taken with an Axioskop 40 microscope with incident polarised light, using the extended focus acquisition method. A: (grave 93-03) Red matter on and between sand grains, where it forms a continuous layer, crazing is visible. B: (grave 93-03) Small concretions of red matter among the sand grains. C: Detail of B. Note the black particles, and the colour, which in parts is purplish. D: (grave 55) Sand grain with several particles of black, carbonised material.

Table 1. Content of major-element compounds in the sampled red sand and artefacts.

		SiO_2 %	CaO %	P_2O_5 %	K_2O %	Al_2O_3 %	TiO_2 %	Fe_2O_3 %	MnO %
Sample no:	**Description:**								
93	red sand	91	0.15	0.50	0.66	2.93	0.17	1.95	0.012
92	red sand	92	0.0	0.68	0.46	1.93	0.08	1.27	0.00
55	red sand	91	0.27	0.33	0.78	3.01	0.28	0.82	0.012
92 B	flint	96	0.0	0.0	0.0	0.0	0.0	0.08	0.00
92 2x H	flint	96	0.0	0.23	0.0	0.0	0.0	0.20	0.00
92 I	flint	94	0.0	0.89	0.01	1.08	0.0	0.42	0.00
92 J	flint	94	0.0	0.33	0.08	1.43	0.0	0.66	0.00
93N	flint (blade)	94	0.0	1.59	0.04	0.52	0.0	0.43	0.00
93C	shaft polisher, flat side	73	0.29	2.39	0.32	5.37	0.04	16	0.037
93C	shaft polisher, convex side	72	0.0	1.51	0.35	7.27	0.05	15	0.033
93P	hammer stone	93	0.0	1.58	0.0	1.43	0.0	0.50	0.00

Table 2: Trace-element content of the sampled red sand and artefacts in ppm (parts per million) = mg/kg.

		S ppm	Cl ppm	Zn ppm	Zr ppm	Sr ppm	Rb ppm
Sample no:	**Description:**						
93	red sand	0.0	753	0.0	162	33	26
92	red sand	0.0	578	0.0	212	36	22
55	red sand	0.0	674	20	239	38	27
92 B	flint	0.0	928	0.0	0.0	0.0	0.0
92 2x H	flint	1361	0.0	0.0	0.0	2.9	0.0
92 I	flint	2229	340	0.0	0.0	0.0	0.0
92 j	flint	2769	254	0.0	41	7.0	0.0
93N	flint (blade)	2462	353	0.0	0.0	0.0	0.0
93C	shaft polisher, flat side	10101	1389	44	66	54	7.6
93C	shaft polisher, convex side	6620	1086	31	2	14	9.2
93P	hammer stone	1304	841	0.0	57	5.8	0.0

		As ppm	Ba ppm	Ni ppm	Mo ppm	Nb ppm
Sample no:	**Description:**					
93	red sand	8.71	0.0	0.0	0.0	4.9
92	red sand	8.89	0.0	0.0	0.0	4.2
55	red sand	0.0	0.0	0.0	0.0	0.0
92 B	flint	0.0	0.0	0.0	0.0	0.0
92 2x H	flint	0.0	0.0	0.0	0.0	0.0
92 I	flint	0.0	0.0	0.0	5.6	4.4
92 J	flint	6.17	0.0	0.0	0.0	0.0
93N	flint (blade)	0.0	0.0	0.0	4.7	5.0
93C	shaft polisher, flat side	22	249	73	0.0	0.0
93C	shaft polisher, convex side	31	327	77	0.0	0.0
93P	hammer stone	0.0	0.0	0.0	0.0	0.0

of haematite. This implies that they are unlikely to have been deposited from iron in the groundwater or by illuviation from above. Instead, this red haematite was probably imported from locations where heamatite deposits occur or derived from locally available iron compounds such as bog ore or ironstone that were heated.
The composition of the sand samples and of the red surface of the artefacts was analysed by means of a hand-held device for x-ray fluorescence spectrometry (XRF).[26] By this non-destructive technique the inorganic-chemical composition of the material can be determined. The results of these analyses are presented below (tables 1 and 2):

The outcome of all these analyses reflects the combined composition of the red matter and the sand or artefacts. Since sand and flint consist of almost pure silica (SiO_2), the other recorded elements must belong to the red part of the soil. However, this does not apply to the sampled sandstone shaft polisher (93C); this rock contains a wider range of minerals, including iron compounds (hence the 16% ferric oxide, Fe_2O_3).
The analyses show that the red matter consists of iron minerals and little else. An earlier analysis at Wageningen (1996) of red sand from Mariënberg recorded significantly higher levels of lead and zinc. However, the lead and zinc content of all the samples in this study remained below the detection limit (10 ppm). The iron content in the sand is not much higher than what would normally be found in sandy soils. Apparently, just a small amount of iron-rich red pigment is sufficient to colour the soil, definitely so if it is deposited as a thin skin on the grains. The iron-oxide content of the red sand is between 0.82 and 2%. If we reckon that sand normally contains 0.26% iron oxide[27], then between 0.56 and 1.74% iron oxide must have been added. The amount of Fe_2O_3 that should be added to one m3 (i.e. about 1,500 kg) of soil falls roughly between 8 to 26 kg of iron oxide. The total volume of red soil in the six burial pits amounted to about 0.8 m3, 800 litres (see table 3 and Verlinde & Newell 2006, p. 167).
Table 3 shows the distribution over the pits of the added volume of red material.

No raised trace-element levels were encountered in the iron-rich red sand layers (table 2). Iron minerals such as haematite, goethite and amorphous iron hydroxides very readily absorb phosphate and arsenate from the groundwater. Raised levels of these minerals are therefore also found in bog ore and iron pan. In the investigated artefacts and soil samples, phosphorus values are raised but arsenic is almost absent (though it is present in the sand, see table 2). The highest As values were found in the shaft polisher, but these are probably due to the rock itself rather than to the adherent red matter. At first glance, the ratio of other trace element to/As values appear to be quite low, but we should remember that the iron content in the sample (and hence in the analysed soil) is also quite low. If we put the measurements from Mariënberg beside those of various ochre samples from the Netherlands (see fig. 10: Fe_2O_3/As content), we see that although the Mariënberg values are low, the ratio between As and Fe_2O_3 is similar to that in the ochres.

Mariënberg's low values of trace metals such as copper, lead, and zinc indicate that the iron oxides probably did not derive from a haematite

Table 3. Minimum and maximum amounts of added ferric oxide per grave (red area), in kg and litres.

Grave no. (red area)	Volume of red sand (litres)	Weight of red sand (kg)	Minimum addition of Fe_2O_3 (kg)	Maximum addition of Fe_2O_3 (kg)	Minimum addition of Fe_2O_3 (litres); density of processed bog ore = 2kg/litre)	Maximum addition of Fe_2O_3 (litres)
12	151	227	1,3	3,9	2,5	7,9
55	191	287	1,6	5,0	3,2	10,0
90	30	45	0,3	0,8	0,5	1,6
91	235	353	2,0	6,1	3,9	12,3
92	44	66	0,4	1,1	0,7	2,3
93	159	239	1,3	4,1	2,7	8,3
total	810	1217	6,9	21,0	13,5	42,4

[26] At the Rijksdienst voor het Cultureel Erfgoed (RCE), Amersfoort.
[27] Unfortunately, no background samples of the sand were taken. Therefore the mean values for Dutch sandy subsoils were used, as published by Van der Veer et al., 2006, p. 32.

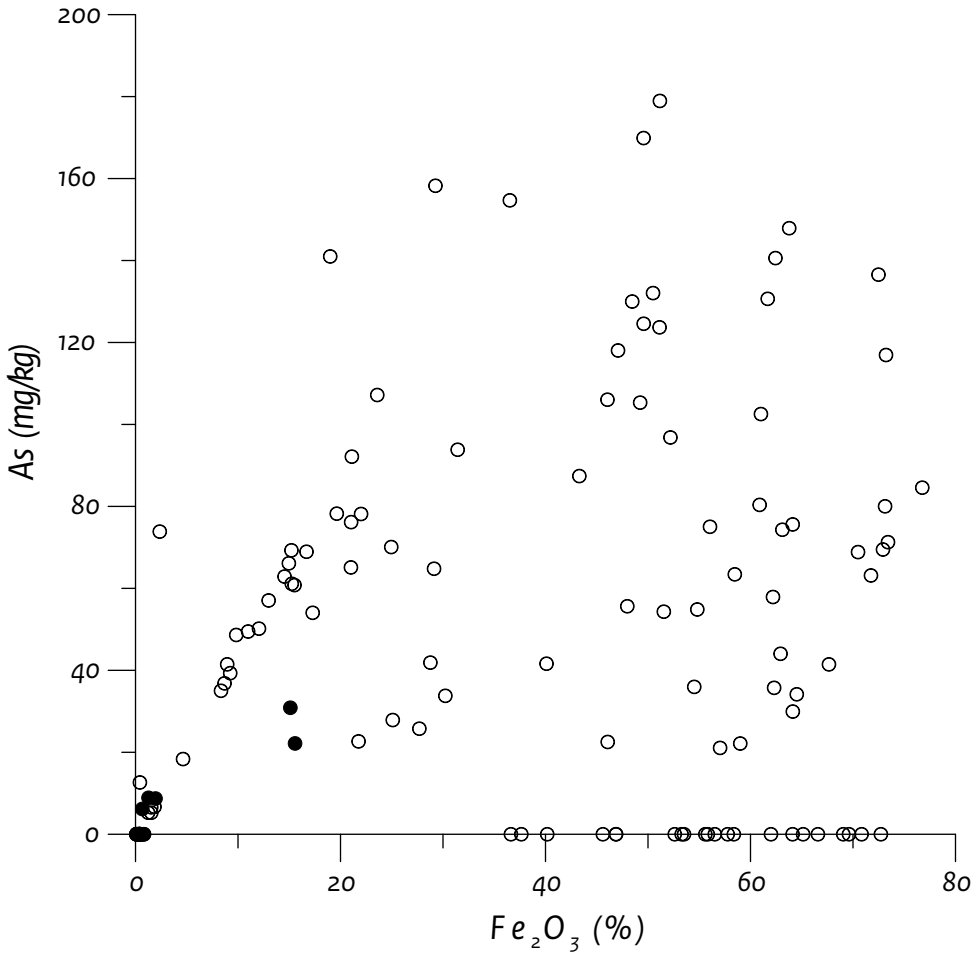

Figure 10. Diagram showing Fe2O3 vs As content in Mariënberg samples (solid dots) compared with ochre samples (open circles) from Milheeze, Geldrop and Eindhoven (as yet unpublished data, RCE). The Mariënberg values are low, but display the same ratio.

source rich in heavy metals.[28]
The comparatively low values for As and MnO render it unlikely that this material was derived from bog iron, but this cannot be ruled out: in bog iron, there may be zones where these elements occur in low concentrations. Also it is possible that in the course of red material or ochre production from bog iron, arsenic (As) evaporated during the heating process leading to deviant, lower As/Fe2O3 ratios.

Interpretation and discussion
Possible manners of red sand formation

1. A reddish layer in a *natural* soil profile can originate from dissolved iron (Fe2+) from the groundwater coming into contact with oxygen. Above the reduction zone, the iron oxidizes to Fe3+ and is deposited in the soil as iron oxide or hydroxide (e.g. as goetite, lepidocrocite or ferrihydrite; limonite is a mixture of such minerals). The cool Dutch climate will not allow the formation of a mineral such as haematite. Only heating of iron oxide or hydroxide minerals could produce haematite here. If haematite is imported, it can originate from metamorphic rocks, or from buried soils that were formed in much warmer geological periods. Gley stains, bog iron and iron pans will result if this process continues for longer periods; these have a patchy, orange-brown colour.

2. In *acid soils* such as humus podzols, iron displacement and accumulation may occur. In these soils, iron will leach out of the top horizons (A and particularly E) and be deposited in the underlying B horizon. This is almost always accompanied by eluviation and redeposition of

[28] Iriarte et al., 2009.

humus and/or clay particles. As a result, the illuvial accumulation horizons are almost always brown in colour.

3. In *anthropogenic features*, red staining in a range of hues may have various causes (see Huisman & Deeben 2009). In the first place, differences in organic-matter content and hydrological properties between the feature and the parent soil may cause bog-iron-like phenomena, as would happen in a natural gley zone. In the second place, heating (e.g. by a fire in a pit) may cause iron minerals in the surrounding soil to be transformed into the bright red haematite.[29] Finally, it is possible that red matter, intentionally prepared or otherwise, may have ended up in a pit through human agency, deliberately or accidentally.

The likelihood of the various possibilities

1. The first possibility – natural formation of bog ore – is an unlikely explanation for several reasons:
   a. The red staining is limited to the bottom part of the pit. In the surrounding parent soil, there is no trace of such iron accumulation.
   b. The red matter is bright red in colour. Natural minerals in bog ore are brown or orange rather than red. Haematite – the mineral producing the red colour – is formed naturally only in tropical soils. It may also be formed by the heating of other iron oxides and hydroxides.[30]
   c. The red matter contains minute particles of carbonised material throughout. In the case of illuvial iron oxides or hydroxides, these particles too should have been coated with the iron skin.
   d. It is unlikely that bog-ore formation should cause just one side of an object to be coated in iron minerals.

2. The second possibility – a downward displacement of iron in an acid soil – is even less probable:
   a. The illuvial horizons (B horizons) of humus podzols are brown in colour, because iron deposition is combined with the redeposition of organic matter and sometimes clay. Yet at Mariënberg the fill above the bottom of burial pit 91, as well as the other burial pits, is red, a shade never encountered in the B horizon of a podzol.
   b. Moreover, podzolisation would not produce a local effect like that seen at Mariënberg, where the red matter is limited to the anthropogenic feature itself. The field photograph of the section across a burial pit (fig. 7, grave 91) clearly shows that podzolisation did take place: the fibres of a humus-iron podzol (Dutch: *haarpodzol*) are clearly visible. But they occur throughout the section, not just within the feature. Besides, it is evident that these fibres are brown in colour.

3. The most logical explanation of the red layer therefore is that the phenomenon is related to the features (the grave pits) in which it was encountered. Of the various options, again some can be ruled out.
   a. Bog-ore formation due to the chemical and hydrological conditions in the feature would cause (iron) accumulation all around the feature in the natural soil (see Huisman & Deeben 2009, fig. 89A). The red staining at Mariënberg occurs only in a horizontal layer within the pit fill.
   b. Heating – for instance, by a fire burning in the pit – can only cause red staining if iron minerals are naturally present in the soil. Here the soil outside the pits appears to be very poor in iron. Even within the red layers, the iron content is still quite low. Heating would generally produce just a very thin red surface, and in any case not a thick, diffuse and massive horizon like those we see here.
   c. The only remaining and plausible explanation of the red layers in the features at Mariënberg then must be that a red mineral material was deliberately introduced into the pits. We cannot state with certainty what that material was. Local production of ochre in the form of haematite by heating local iron-rich deposits such as bog ore is known to have been practised in the Late Palaeolithic[31], as it may have been at Mariënberg. Nor can it be ruled out that haematite from deposits elsewhere was imported and ground to a powder which was mixed with the soil. This would have been quite practicable, given the relatively small quantity of pigment (a total of 6.8 to 21.1 kg, see table 3) needed to redden all of these graves. Such powder, mixed

[29] Wadley 2010.
[30] Gialanella et al., 2011.
[31] Ibid.

into the fill by bioturbation and maybe also as part of the funeral rites, may well have produced the homogeneous red staining of the sand.

Conclusion

To summarise, the following observations point to the introduction of an extraneous, ochre-like compound into the feature, while definitely excluding a natural cause:

- The red rather than brown colour of the pigment, indicative of heated iron minerals or naturally occurring haematite.
- The presence of great numbers of carbonised (charcoal) particles (without iron skins) mixed in with the red matter.
- Iron-arsenic ratios that correspond with those found in ochre elsewhere.
- Red deposits occurring on just one side of artefacts.
- The massive red staining is restricted to the fill of the pits; comparable phenomena are absent in the natural sand surrounding these features.
- The archaeological context and association with finds, notably grave goods.
- The availability of raw materials: bog ore naturally occurs in poorly drained depressions.

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9 The footwells

Beneath two of the five cylindical burial pits excavated under supervision (nos. 91 and 93), a colour difference was observed in the eastern and central part of the floor, hence below the red-sand layers. These features are marked by a dark, partly mottled grey colour, surrounded by the evenly grey-reduced natural sand. This reduction zone represents the uppermost level of the more-or-less permanent influence of groundwater. The two oval stains excavated below the observed pit floors, together with the burial pits formed continuous and well-delineated features. They are most clearly visible in the drawn and photographed sections, where they are easier to see and interpret than they are in the bisected horizontal levels, the sections having been recorded in a single observation.[32] In the field drawings, the bisected stains interpreted as footwells are shown by a single horizontal outline.

In the interpretation of the two deepest soil discolorations, various possible explanations were *considered* during the excavation and in its reporting: disturbance by vegetation or by animals, natural pedological processes, or human activity. The authors after due deliberation decided that the last-mentioned alternative was the most plausible; however, without putting down their considerations in writing. This could wrongly suggest that they had jumped to this conclusion without any consideration of alternatives. Therefore the authors here add the following explanation.

1. In our considerations, the botanical option was the first to be rejected, because of the clean-cut delineation of the two pit-shaped discolourations and because of their relatively great depth below the surface (ca. 90-150 cm). And also because below the top of the red sand layers there was no evidence of disturbance of a botanical or any other kind. Still, we did note a vertical, intensively bioturbated zone above the red sand in the cylindrical part of grave 91, which may be due to a decayed massive taproot (fig 7).
2. That animal disturbance caused the deep-down, grey staining was judged to be far from likely, since both patches seamlessly joined up with the burial pits, while the latter also display no traces of disturbance by animals other than earthworms, beetles, and the like. Nor are there any disturbances of this kind outside the burial pits. Curiously, the base of the stained area under grave 91, at 130 cm below the higest recorded level, merges into a series of flat strips (level 11), which have remained unexplained in terms of all four options.
3. A pedological explanation for the two ovoid pit-shaped stains was given serious consideration, together with the anthropogenic ('footwell') explanation. After all, these stains and part of their delineations were quite faintly observable and partly situated in a reduction level, where soil colouring can be hard to interpret. But in the case of these two stains, there was the puzzling fact that they occurred under just *part* of the two grave pits and were absent under the others. Other arguments against this option were those pointing to an anthropogenic origin.

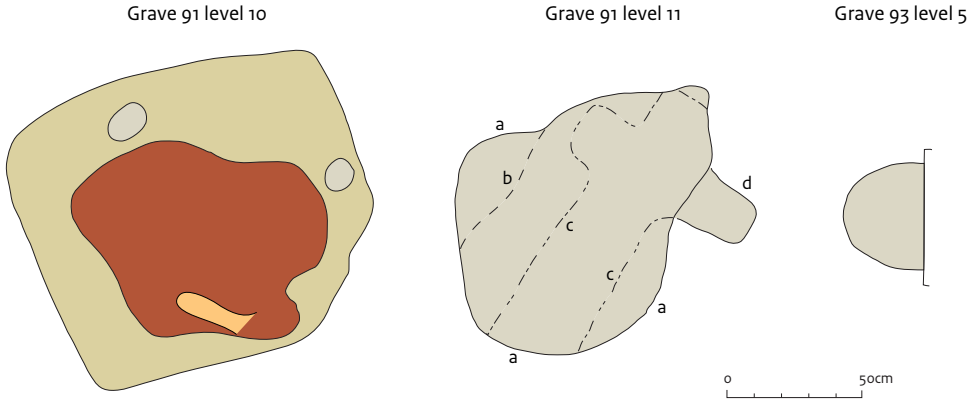

Fig. 11. Mariënberg. (Field) drawings of the bottommost excavation levels in the footwells of graves 91 and 93. In level 11 of grave 91, the contour lines a-d of the footwell are at intervals of ca 2 cm. Level 10 in this grave lay a little higher, in the red-coloured layer.

[32] Verlinde & Newell 2006, pp. 154, 160 and 164.

Fig 12. Mariënberg. Detail of a section of grave 91. See also figs. 7, 11 and 21.

4. The possibility of man-made excavations (footwells) in the bottom of the two burial pits was suggested by the continuous boundary lines in the sections. Also by the fact that both pit-shaped features were of roughly the same size (30-40 litres), displayed the same shape in section, and were situated only under the eastern and central part of the pit floors. These observations would be difficult to explain as having a natural origin, all the more so since they were absent from three other graves. However, in the case of a Mesolithic excavation, both stains would be explained as a feature of grave construction. That these features at some time were indeed open pits – which with a pedological origin could not have been the case – is evident from the caving zone along especially the eastern side of grave 91 (fig. 7). Traces of subsidence continue down into the top of the footwell and hence extended well below the pit floor that Louwe Kooijmans imagined halfway down the red layer. Curiously, he does not altogether rule out human agency in the case of the footwells, given his ambiguous remark that "there may have been some digging and soil disturbance at the base of the pits". There was no other evidence of any digging in (or somewhat above) the pit-shaped features, such as patches of 'ochre', settlement waste, or a lumpy soil texture. In any case, the two footwells must have been filled up before the red material was thrown in.

While the authors favour the anthropogenic explanation, Louwe Kooijmans after some tentative counter-argumentation resolutely opts for a 'taphonomic' one, which already plays a dominant role in a large part of his alternative explanatory model. His arguments for natural staining and against human excavation are as follows.

a. Of both pit-shaped features, whose existence he does not deny, that of grave 93 lay under the centre of the pit, not under its eastern part; this location would impede its use as a footwell.
b. He *regards* the grey staining of the 'small pits' (*i.e.* the footwells) as a secondary natural phenomenon, as he does various other phenomena.
c. Louwe Kooijmans puts the deposition level of the grave goods in the red-sand layer (on his postulated but unobservable grave floor), and presupposes a secondary formation of the red sand - contrary to the authors' view that the deepest part of the grave was backfilled immediately upon deposition of the body.
d. The presence of footwells would imply a (variant) posture of the body so far unknown in Europe, for which reason it must be deemed unlikely. He rejects the possibility that such features may in fact have been overlooked elsewhere. On this point too, the critic engages in normative argumentation.

To these objections the following comments can be put forward as addenda or specifications to our arguments under points 3 and 4.

To a:
The drawn and photographed sections show that the footwell features under both grave 91 and grave 93 clearly appear under the eastern half, which indeed includes a large part of the centre. If we - to our mind justifiably - exclude the later subsidence zone(s) along the periphery of the grave, the eastward orientation of the footwell becomes more understandable, viewed from the perspective of the burial procedure (see also our point 4). Fig. 7.
The sections result from a single instance of comprehensive observation and recording; hence we may accord to them a higher degree of reliability than to series of separate observations in consecutive horizontal excavation levels, from which some features emerge less distinctly. For instance, the floor of footwell no. 93 (Level 5) sloped gently towards the centre, as shown in the original field drawing. As a result, the stain at somewhat higher levels extended further towards the east. This shape of the footwell can also be deduced from the section. In any case a sufficient area of the grave floor would have remained for the body to be seated on.

To b:
We must here draw attention to the difference in depth between the two footwells. The footwell of grave 91, up to 135 cm deep, extended into the reduction zone, while that of grave 93 went no more than 80 cm below the uppermost excavation level, thus remaining just *above* the grey reduction zone and within the oxidation zone. This difference in elevation should mean a major

difference in the capillary effect, which implies that the colour(s) of the fill of both footwells should not be so lightly attributed to the same, natural cause.

To b and c:
The critic's interpretations are grounded in his alternative, unsubstantiated view. They are opposed by our own, which are at least partially evidence-based. Therefore his point c at any rate is reversible; his view is incompatible with ours.

To d.
That the posture variant of the bodies should be (as yet) unknown elsewhere, cannot be a valid argument for claiming that the observations and interpretations at Mariënberg must *therefore* be wrong. This skewed manner of reasoning, to match already known archaeological features, as a 'normative method' would rule out any future discovery of new phenomena.
Indeed, if this inhumation rite should not occur elsewhere, which - given its difficult detection - is doubtful, we would here be dealing with a new posture variant. But the sample representativity is too slight for a well-founded, definitive statement. Interesting in this context is a mention by Grünberg, that at Kolberg (Germany) limb remains of a seated body were observed in a *Mulde, i.e.* a depression of some kind, under the central part of the grave floor.[33] This observation is strongly reminiscent of the footwells at Mariënberg and drives home the above warning against a normative approach.
Therefore, we believe that we have convincingly argued that the two deepest stains most probably were footwells, i.e. human excavations and part of the grave architecture.

[33] Grünberg 2000, p. 43.

10 The posture of the bodies

In 2006[34] and before, the posture of the bodies in the six Mesolithic graves was inferred from the shape and dimensions of the cylindrical graves, the presence of the two footwells, the distribution of red sand and variations in the red-sand layers and the distribution of grave goods. Direct evidence was lacking, since in the acidic sand no traces of human bone or soil discolorations left by the body were observed. There were just a few scattered fragments of burnt (animal or human?) bone. Any reconstruction of the bodies' postures is therefore based on contextual evidence. The available clues do point to a seated posture, with the body facing roughly southeast.

Louwe Kooijmans (2012) approaches the matter negatively, rejecting the reconstructions almost integrally, because he will not accept clues as hard evidence. While this is obvious, it is also hard to practice archaeology without making reconstructions or interpretations based on contextual and circumstantial evidence. He claims that all patterns are easily explainable by "incidental differences in the formation process of the red staining". Here Louwe Kooijmans again follows his all-embracing 'taphonomic' precept, merely referring to natural processes in general without presenting specific derivations or explanations. This is a reprehensible *modus operandi*. He regards only the asymmetrical distribution of red sand in grave 90 (and 92) as a proper indication for posture reconstruction, an argument that he subsequently ignores.

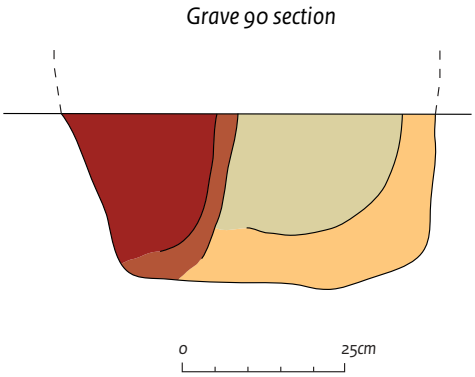

Fig 13. Mariënberg. Section of grave 90, computerised version of the field drawing.

To our mind, this is in fact the most convincing clue regarding body posture, together with the two footwells as discussed and interpreted above. Thus three of the six graves offer contextual evidence of a uniform orientation of the dead: facing roughly southeast. In the other graves, the red sand pattern (one or two concentrations in its distribution) offers little to go by in terms of body orientation. Still, the location of most grave goods in the eastern half of the pits does suggest that the dead were buried facing east; as will be shown in the following section, which deals with the grave goods.

[34] Verlinde & Newell 2006, p. 168.

11 The grave goods and their positions

The positions of the grave goods shed more light on aspects discussed in the preceding sections. Therefore the grave goods require some elucidation and discussion, as they too have become a subject of criticism and even of amazement.
Throughout the excavations, artefacts have been found, some of them burnt, together with charcoal fragments and some burnt bone remains, also in the graves. These finds have been interpreted as settlement waste. In the red-sand layers alone, also other stone and flint items were uncovered, which were distinct from the waste by their superior quality, their size, type, position and unburnt condition. They lay at the same level, halfway down the thick red-stained layers, where they had clearly been deposited. These items were interpreted as grave goods, with just a few of the smallest blades causing some uncertainty about their possible attribution to waste. So far, the critic agrees with the authors.
Still, serious disagreement revolves around the critic's curious assumption that the grave goods' deposition level in the red layers represents the original floors of the grave pits, as discussed above. In the following, we shall stick to the pit floors as observed in the excavation, *beneath* the red sand deposits.
The number of grave goods in the six graves varies from 0 to 22. The three eastern graves have almost identical numbers: 7 to 9. The recovered grave goods all consist of flint and stone. No evidence was found of artefacts of organic material, if indeed there were any. The red pigment in the graves might to some slight extent have conserved any organic material.[35]
The position of the Mesolithic grave goods with respect to the observable pit floors below the red sand layers varies somewhat, ranging from ca 10 cm (grave 92) to 35 cm (grave 91) above the floors, not counting the two footwells. The horizontal distribution of the items is uneven.[36] But with some exceptions, they lay in the (south)-eastern half, close to the centre of the graves.[37]
This distribution of the grave goods suggests that the bodies were seated in the west of the pits, facing east, since (most of) the grave goods are likely to have been placed in front of them.
In graves 91 and 93, the evidence from the grave goods is supported by the position of the footwells, which also suggested an easterly orientation of the bodies.
The main distribution of the red sand in the western half of graves 90 and 92 also suggests an eastward orientation, as the bulk of the red sand can be expected on the torsos.

The artefacts from the red layers are all 'ochre-stained', as a result of their having lain in this soil for thousands of years. This goes for the grave goods as well as the settlement waste, a few flint flakes excepted. The red staining on the flint and stone artefacts had affected all kinds of surfaces: on rock, on worked flint surfaces, on older, patined flint surfaces, on white-coloured

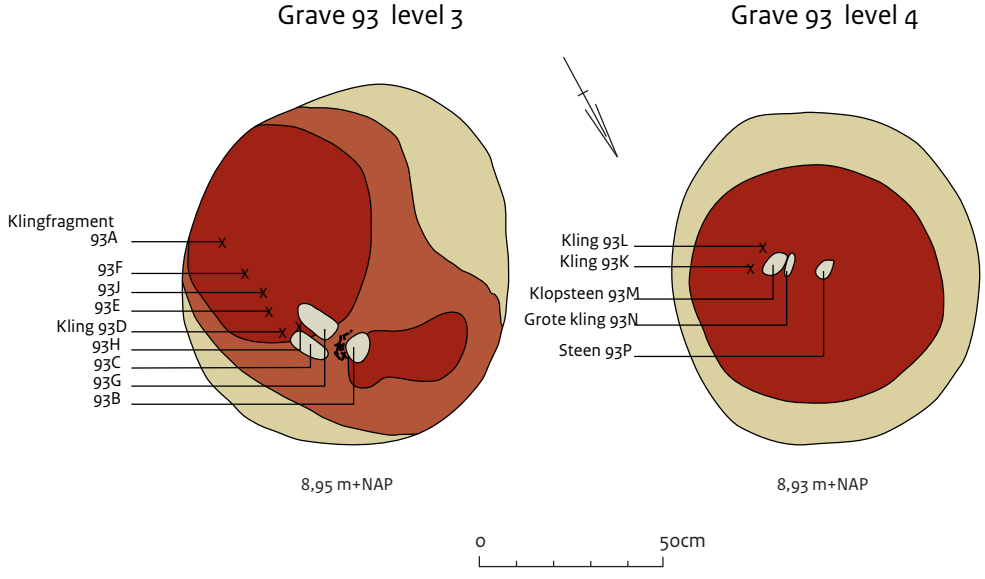

Fig. 14. Mariënberg. Computerised version of the field drawings of the two closely superimposed levels 3 and 4 in grave 93, with the distribution of finds in the eastern and central part of the red sand.

[35] Cf. the fairly favourable conservation conditions for bone material within the Roman-Period enclosed native settlement at Raalte-Heeten, where the good preservation of bone in the local coversand is attributed to the plentiful iron compounds resulting from the contemporaneous, supra-local iron industry at the site.
[36] Verlinde & Newell 2006, p. 168.
[37] Of the grave goods, at least 3 of the 49 items lay elsewhere; the interior of grave 12 was poorly recorded.

cortex and on burnt flint waste. Chemical analyses of the flint have shown that the red staining was due to a deposit of iron compounds. For this phenomenon, see the contribution by Huisman & Van Os.
Among the various phenomena relating to the six Mesolithic graves, the red staining and the recovered sets of shaft polishers have attracted most attention, from the excavators as well as others. After going over the basic data, it is with restrained surprise that the critic mulls over the unexpected presence of shaft polishers, the possible meaning of the two sets of three polishers, the broken specimens, the poorly-defined or absent central grooves on the polishers, and the use of blocks/cores of flint as grave goods. In the reasoning of the next-of-kin and presumably also the persons who died, these assemblages might well be more meaningful than is obvious to us.

Among these, we can reckon the *number* of objects per find category.
The six Mesolithic burials together yielded the following 49 grave goods, the smallest (child's?) grave (no 90) being the only one to lack any surviving items.
B-points: 1;
blades (complete or incomplete, some retouched; the size of the blades bearing little or no relation to any of these three categories): 31;
cores / blocks: 7;
shaft polishers: 6;
hammerstones: 4.
Specified by category, the assemblages break down as follows.
Grave 12: 3 blades (1 retouched); 2 cores/blocks; 3 shaft polishers; 1 hammerstone; total: 9 items.
Grave 55: 3 blades (1 retouched); total: 3 items.
Grave 90: no grave goods; total: 0 items.
Grave 91: 1 B-point; 6 blades; total: 7 items.
Grave 92: 6 blades; 1 core; 1 hammerstone; total: 8 items.
Grave 93: 13 blades (1 retouched); 4 cores/blocks; 3 shaft polishers; 2 hammerstones; total: 22 items.
Certain 'rhythms' can be detected in the numbers of items per grave, which make it likely that they were significant in the funerary rite; yet this cannot be proved, because of the small number of furnished graves. Still, it is difficult to attribute the pattern to coincidence when we consider the following set of quantitative data.

Five of the graves contain blades. There are two graves with 3 blades, two graves with 6 and one grave with 13 blades, which is one blade (fragment) 'too many' if we assume a 'rhythm' of threes. Maybe two of the fragments belonged to the same blade, which broke before or after it entered the grave, or a small blade (fragment) was erroneously classified among the grave goods rather than the settlement waste (see point a, below). Reckoning in multiples of three, we find an apparent 'doubling rhythm or pattern' being applied as 1 : 2 : 4 (grave 93).
Moreover, in at least three or four graves (55, 91, 92 and probably 93) small clusters of three or multiples of three blades were deposited together. In the case of grave 93, we are dealing with one cluster of 6 to 8 blades and 6 or 7 more scattered blades, while there is some uncertainty regarding the attribution of some of the blades to either grave goods or settlement waste. In the case of grave 12, no record was kept of any clustering.
Three graves contained cores/blocks. One grave (no 92) with 1, one grave (no 12) with 2, and one grave (no 93) with 4 cores/blocks. Here too, the doubling rhythm of 1 : 2 : 4 (grave 93) is in evidence.
Three graves contained hammerstones: two graves with one, and one with two specimens. Here the doubling rhythm is abbreviated to 1 : 2 (grave 93).
Two graves contained shaft polishers, three in each. Assuming sets of three, the 'rhythm' in this case is further reduced to 1 : 1. This number of three shaft polishers is remarkable, because only one or two are needed for practical purposes. However, no deposits of one or two were encountered.
Three graves each contained one retouched blade; the other blades were plain ones. In this category too, the 'rhythm' is limited to 1 : 1.

In the centrally situated grave no 93, which was lavishly furnished with 22 items - and lacked any indication for multiple interments -, the deceased most probably was of high status. This individual seems in a regulated manner to have been given 'more of the same', rather than items of a different kind. Despite the small data set, the phenomena described are more than likely to reflect deliberate decisions. It seems that the numbers of deposited grave goods per category were significant in the funerary ritual. The num-

bers 1 and 3 and their duplications emerge as particularly meaningful.
The identified phenomena can, certainly in such a funerary context, be interpreted in a symbolic sense, with numbers representing concepts. Numerical symbolism, a form of abstract thinking, is recorded or believed to have been practised in many cultures and religions. This early evidence of it in (the final phase of) the Mesolithic is known from far beyond The Netherlands.
An interpretation in this vein may well be applicable to the numbers of shaft polishers in the graves, as an alternative to the apparent pointlessness of a set of three, which has no practical purpose, or to the assumption of a 'spare specimen' (lacking a groove) to accompany the deceased, as the authors suggested earlier.
The phenomenon of this apparent symbolism at Mariënberg is somewhat reminiscent of Alexander Marshack's famous interpretations of marks and signs on Upper Palaeolithic artefacts, which are believed to have a cognitive and linguistic meaning. Such interpretations have been criticised on various accounts, not so much for the assumption of symbolism in itself, as for the attempts to interpret the symbols in terms of content. The latter will always be unprovable and speculative. This goes even more for numerical symbolism, given the innumerable variations that this form of symbolism takes in different culture-historical contexts. "The most difficult domain of (Palaeolithic) archaeology is the spiritual culture" (comment to Marshack 1972, p. 463), which is why we should refrain from attempting to interpret the apparent numerical symbolism at Mariënberg.

The six shaft polishers of sandstone in graves 12 and 93 were deposited in similar ways: sets of three grouped together with the flat sides facing down, close to the centre of the deposition level (in the case of grave 93 at any rate, also in the eastern half). Within both sets of three, one specimen lacks a well-defined groove or indeed any groove. The four other polishing stones showed shallow grooves, which do not seem to have been used, but merely scored. Maybe the noted difference marks a functional distiction in the funerary ritual, but the sample is too small to permit a well-founded conclusion.
The shaft polishers from grave 12 were all three broken and incomplete and were buried in that state. In grave 93 one specimen was broken but buried complete (the broken-off piece lay close beside the larger part, to which it fitted perfectly). It was unclear whether this polisher had been buried broken, cracked or intact. The patina on the broken surfaces reveals little, but it seems unlikely that a quite sturdy object like this should have broken after burial, so deep down in the pit. Interestingly, the breaks in three of the four shaft polishers are similar; only in grave 12 was a corner broken off rather than an end. Yet these breakage patterns fail to tell us whether the items were deliberately broken before burial as part of a ritual, or accidentally in the course of some use.
In the funerary rites, three kinds of reasoning theoretically may have played a role in the selection of such grave goods, all three of them possibly affecting the depositions at Mariënberg.

a. The use of complete, used or unused tools as grave goods, ready for use in the afterlife or on the way there, from the moment of burial. These would be the hammerstones and the blank blades that were recovered intact. The lack of retouch on most of the blades is no useful criterion, since many blades are perfectly serviceable even without retouch.
b. The use of supplies of raw materials as grave goods, which required just a few familiar actions by the deceased to avail themselves of tools *post mortem*. These are flint blocks and cores,[38] as well as complete shaft polishers without a groove or a merely marked-out groove.
c. The use of no-longer-employable items as grave goods; these are incomplete or broken objects, in this case some shaft polishers and some blades. Various ideas may underlie this practice, such as offering personal mementoes or items used in a funerary rite.

Certainly as regards the shaft polishers in the graves, five above-mentioned phenomena relating to these objects need not be considered as problematical as the critic does with his functionalistic view of the grave goods. In funerary ritual, functionality and rationality after all tend to play a subordinate role.

[38] See also the section 'The funnel graves: the lower, cylindrical part', which mentions a flint supply from a sitting grave at Janislawice (Poland).

12 Summary and conclusions

A critical article by Louwe Kooijmans (2012) responds to a small part of the publication of the Mesolithic settlements and cemetery at Mariënberg, a remarkable site by any 20th- or 21st-century standard. The criticism has without doubt contributed to a better understanding of the comprehensive final report of 2006, but also causes confusion. Louwe Kooijmans, an independent colleague, reviewed much of the data in a selective manner. He attacked or ignored various facts and interpretations and replaced them by other opinions. This prompted the original authors to reconsider the excavation and their original publication. Despite the open collaboration, major professional disagreements surfaced between the authors and the critic with regard to various insights, be it that these were limited to certain parts of the settlements and cemetery complex. These differences of opinion to our mind arose mainly from the fact that the critic in archaeological matters pushed towards normative situations (to match those known from elsewhere) and, by contrast, in pedological ("taphonomical") matters adopted unusual and unsubstantiated points of view.
In the overview below, we present some further explanations and enhanced insights, and summarise and evaluate the points of difference, in response to Louwe Kooijmans' remarks under his heading of 'Reinterpretations'.

1. The earlier dating of the Late Mesolithic burials put forward by the critic is incorrect. His view is founded on a single, highly debatable 'cross-cutting' of two features and on the global 'dating' of some fortuitous charcoal assemblages. The last-mentioned dating is based on his personal views marked by geographic-ecological determinism. The reviewer failed to take into account the details of an apparent cross-cutting and the greater robustness of *Pinus* charcoal versus *Quercus* charcoal in secondary contexts (*cf.* the predominance of *Pinus* in the Neolithic graves at the site). These two points were not discussed in our primary publication; their mention here results from our reconsiderations.

2. The upper parts of the funnel graves are dissimilar in shape. The authors and the reviewer agree that two somewhat funnel-shaped pit mouths arose from subsidence around the circumference. But this cannot be the case with the rectangular mouth of grave 55. The most pronounced 'funnel', that of grave 12, is indeed, as the reviewer suggests, explainable as a fortuitous overlap of a Mesolithic grave by a Late Neolithic one.

3. The critic under the heading of 'Reinterpretations' suggests that the authors presented somewhat excessive diameters of some of the cylindrical part of the funnel graves, because of caving along the edges of three burial pits. This point to our mind is far too trivial and uncertain to be put forward as an alternative point of view.

4. It is not true that the burial pits were shallower (by 5-30 cm) than what was published by the authors. Louwe Kooijmans' postulated equation of the deposition levels of the grave goods with 'original' pit floors is an incorrect, normative assumption. In fact, he implicitly denies the validity of the thorough field observations. He posits that feature delineations vanished as a result of unparallelled forms of natural iron diffusion and precipitation in the graves, and fails to take into account the less current deposition of grave goods above the level of pit floors elsewhere.

5. The voluminous red-sand layers above the grave floors at Mariënberg are without doubt due to introduced red material. Yet the critic elevates them to unique and unexplained natural phenomena of iron "diffusion from an (introduced?) unknown source". The red layers in the grave pits are believed to have expanded upwards and downwards as a result of post-depositional processes, which would explain their thickness. Against such speculation a wide array of arguments can be put forward, such as the levels at which the large and smaller red-sand patches were found with respect to the water table, and the absence of similar phenomena in some parts of the graves. Also, and more importantly, there are pedochemical arguments that point to introduced material, most probably anthropogenic.

6. The critic chooses to explain the two features interpreted as footwells both in and above the grey reduction horizon as resulting from general, unspecified pedological processes.

He ignores the similar dimensions and specific positioning of these features, the difference in elevation, the absence of such features below the other burial pits at the site, and the lower lying subsidence zones in and around the cylindrical pits just above the footwells.

7. The critic wants to explain almost all of the remarkable features in the burial pits by natural, post-depositional processes: 'taphonomy' is his baseless catch-phrase. Obviously, taphonomic influences will have affected the site in general, but not in this pattern or on this scale, to this unique and mysterious effect.

8. The orientation of seated bodies in Western European Mesolithic burials, where known, is variable. At Mariënberg the orientation of the bodies towards the (south)east could be established in four of the six cases. But when the most convincing evidence is rejected (the footwells) or ignored (graves 90 and 92 with red sand in their western half), of course little will remain of such inferences. Furthermore, the presence of most of the grave goods in the (south-)eastern half of the burial pits is a significant clue to torso position in the western half.

9. On the basis of the field observations at Mariënberg and parallels elsewhere, there is no reason to reject the position of grave goods lying (somewhat) *above* the floor of the grave pits. Nor is it incongruous that such artefacts should in some cases be damaged, or a small supply of raw materials. See also the paragraph of the apparent numerical symbolism under the heading 'The grave goods and their positions'.

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Appendix

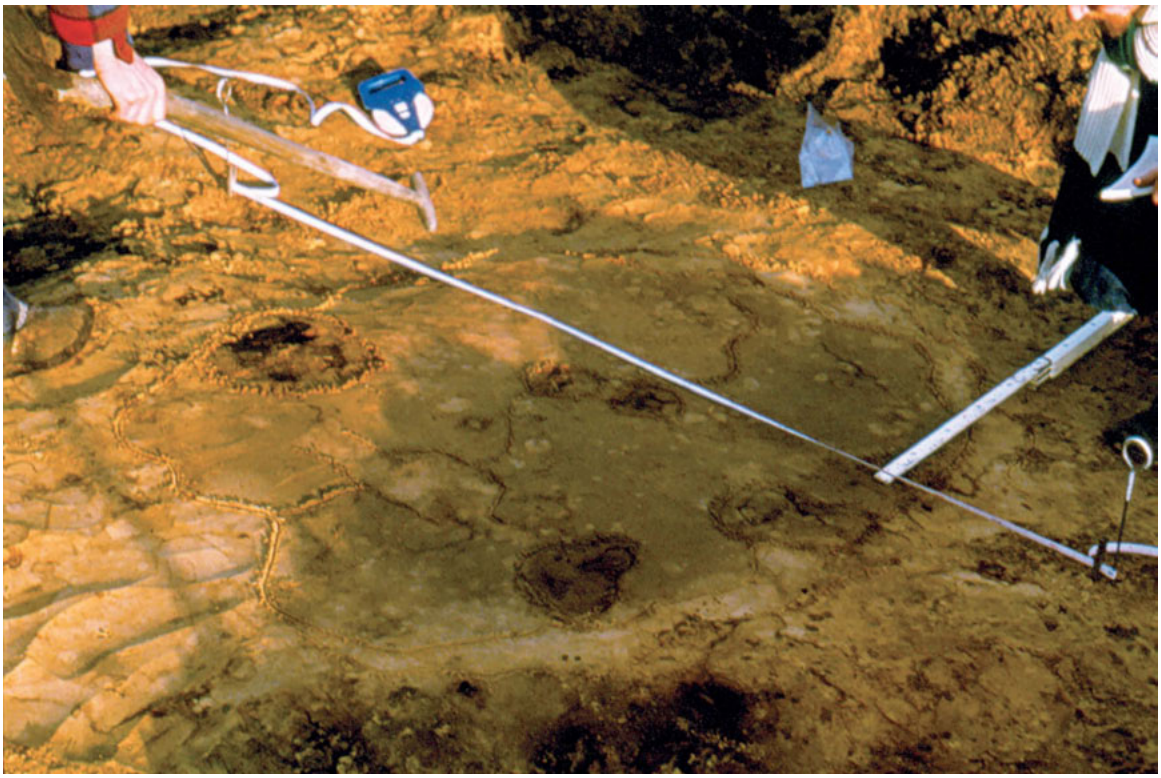

Fig. 15. Mariënberg. Late Mesolithic grave 55, level 1 (below the highest recorded level, which is level 0).

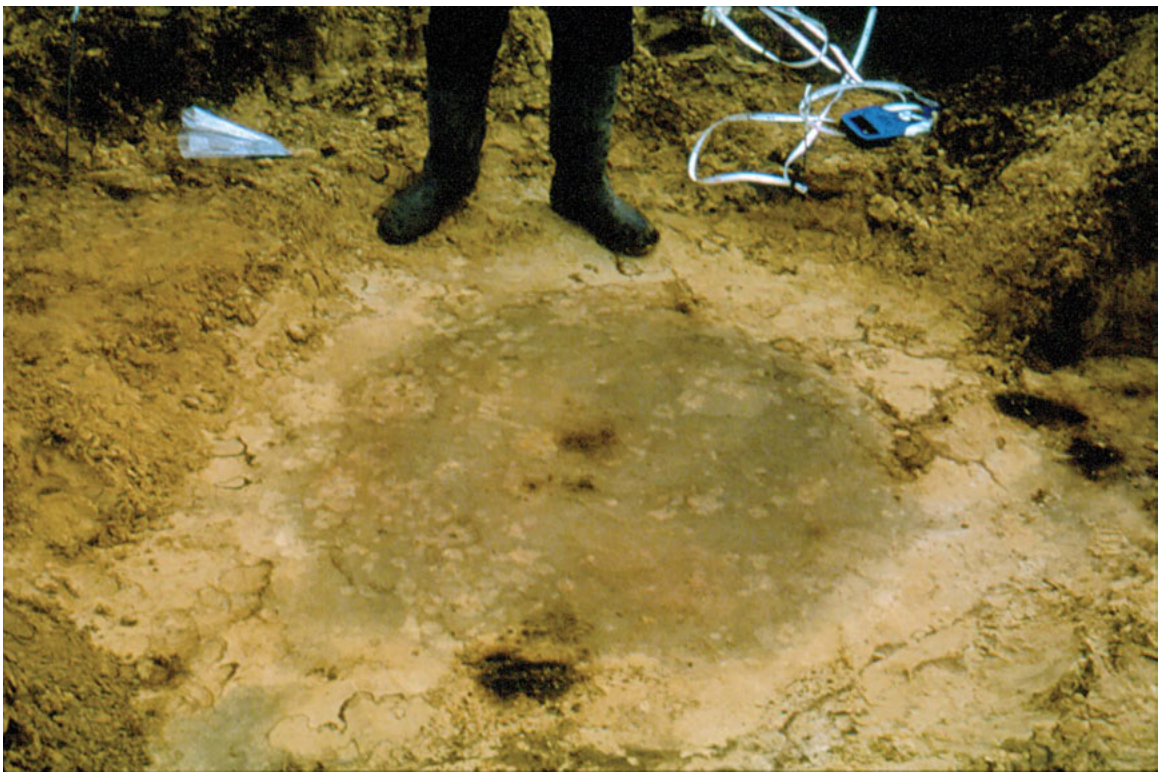

Fig. 16. Mariënberg. Late Mesolithic grave 55, level 2-3.

Fig. 17. Mariënberg. Late Mesolithic grave 55, level 5.

Fig. 18. Mariënberg. Late Mesolithic grave 55, level 6.

Fig. 19. Mariënberg. Late Mesolithic grave 55, level 7.

Fig. 20. Mariënberg. Late Mesolithic grave 91, level 10, second part.

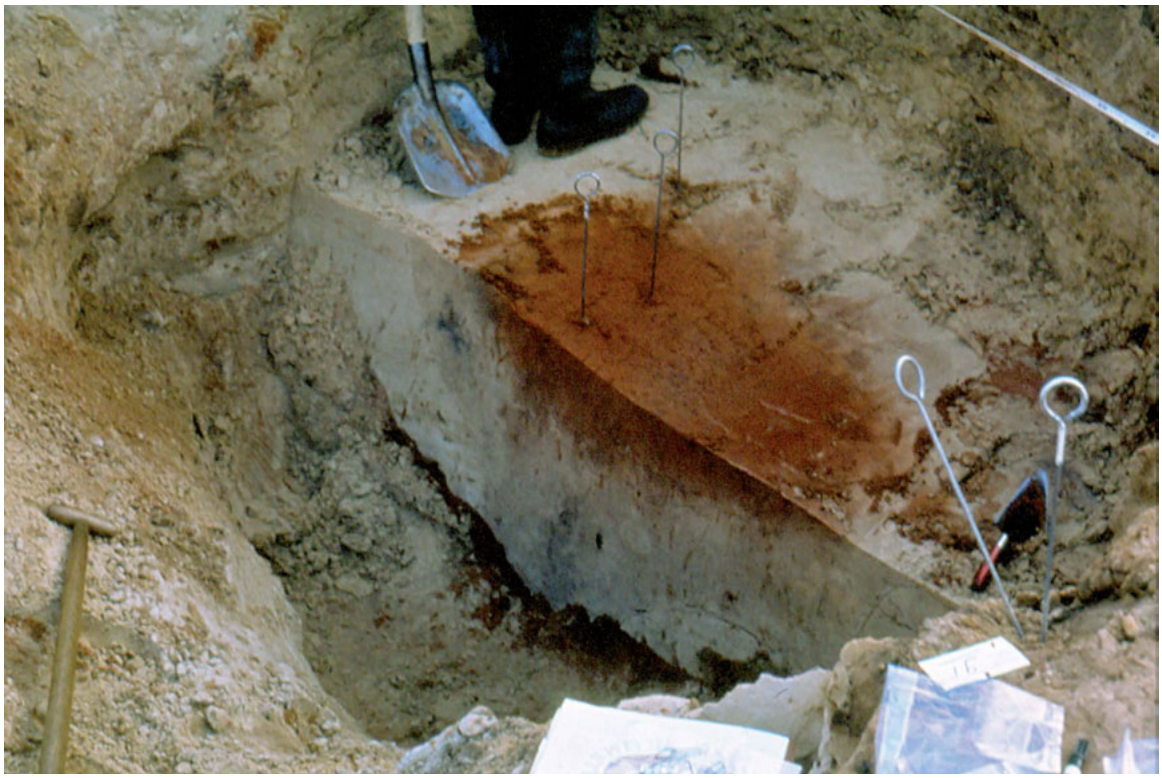

Fig. 21. Mariënberg. Late Mesolithic grave 91, level 10 with footwell in section.

Fig. 22. Mariënberg. Late Mesolithic grave 91, level 10-11, part 2, transition from the cylindrical part of the grave to the footwell.

Fig. 23. Mariënberg. Late Mesolithic grave 92, level 2.

Fig. 24. Mariënberg. Late Mesolithic graves 92 and 93 (background), levels 1 and 2.

Fig. 25. Mariënberg, early December 1978. Landowner Willem Timmerman (standing) and field technician Gerard van Haaff beside one of the burial pits (Neolithic grave 79?) on the snow-covered site.

In this issue of Nederlandse Archeologische Rapporten 042 (NAR), the authors A.D. Verlinde and R.R. Newell once more discuss the Late Mesolithic cemetery at Mariënberg (province of Overijssel). The nature and dating of the features uncovered here have been hotly debated since their publication in 2006. Broader insights have been gained, and with new facts and data and a clarifying set of as yet unpublished colour photographs of the excavations, the original interpretations and dating are given a nuanced and robust further underpinning.

This scientific discourse is aimed at professional archaeologists and Stone Age enthusiasts in the Netherlands and beyond. Through this and its other publications, the Cultural Heritage Agency (Rijksdienst voor het Cultureel Erfgoed, RCE) aims in due course to educate a wide audience about Dutch archaeology.

By supplying knowledge and advice, the Rijksdienst voor het Cultureel Erfgoed plays an essential part in caring for the cultural heritage of the Netherlands.