ANALECTA
PRAEHISTORICA
LEIDENSIA 47

PUBLICATION OF THE P.J.R. MODDERMAN STICHTING/
FACULTY OF ARCHAEOLOGY
LEIDEN UNIVERSITY

EXCERPTA ARCHAEOLOGICA LEIDENSIA II

EDITED BY
HANS KAMERMANS AND CORRIE BAKELS

LEIDEN UNIVERSITY 2017

Series editors: Corrie Bakels / Hans Kamermans

Editor of illustrations: Joanne Porck

ISSN 0169-7447
ISBN 978-90-822251-4-3

Contents

Excavations of Late Neolithic arable, burial mounds and a number of well-preserved skeletons at Oostwoud-Tuithoorn: a re-analysis of old data

Harry Fokkens, Barbara Veselka, Quentin Bourgeois, Iñigo Olalde and David Reich[1]

In 1956 and 1957 prof. A.E. van Giffen, the nestor of Dutch Archaeology, excavated two burial mounds near Oostwoud, on a parcel named 'Tuithoorn' in de province of Noord-Holland. These mounds appeared to have been erected in the Late Neolithic between 2500 and 1900 cal BC. They contained at least 12 well preserved skeletons dating to the Late Neolithic and the Early Bronze Age. Until today these are the only burial mounds from that period in West-Frisia, moreover, they contained the only skeletons from that period in the area. Yet, apart from a few brief overviews the data has not been published. The present article is an attempt to re-analyse the data of the investigations by Van Giffen, but also of later research by M. de Weerd in 1963 and 1966, and by J.D. Van der Waals in 1977 and J.N. Lanting in 1978 in the same mounds. In the framework of the NWO-project Farmers of the Coast, the first author undertook the task to collect the dispersed data and to try to unravel the sequences of burial. Aided by the Leiden University Bakels fund, and a fund of the Province of Noord-Holland, we also had the opportunity to sample the bones for DNA and isotopes, and to study the pathology of the skeletons. Some of the analyses are not yet finished, but here we publish the excavation data using the original field drawings and day notes, and much of the original photography. We have done this in some detail because the site is one of the most important in its kind in the Netherlands and because it will play an important role in the discussion about Bell Beaker mobility and genetics in the near future. We used already some of the skeletal and DNA data in this article, but more detailed studies are following.

In tumulus II all skeletons were buried in a crouched position typical for the Late Neolithic. The oldest burial (575 also known as 'Jan van Oostwoud') was buried in a wooden chamber without grave gifts other than two small flint blades and without a burial mound. After that the burial site was converted into arable land. At least two layers of arable land are present over this Bell Beaker period grave. The plough lands contain many small Bell Beaker and Barbed Wire Beaker potsherds. Next a low burial mound was erected in at least two phases, which is contested by bundles of Late Neolithic plough marks marking its limits. In this mound at least nine other skeletons were buried, men and women. The youngest person was a person of minimally 15 years old.

1 Introduction

In 1956 and 1957 A.E. van Giffen excavated two burial mounds near Oostwoud on a parcel of land called 'De Tuithoorn'. Both were erected on ploughed arable land that was provisionally dated to the Late Neolithic on the basis of potsherds present in the prehistoric plough soil (Van Giffen 1962, 204). One of the burial mounds (indicated by Van Giffen as Tumulus I) was dated to the Bronze Age, the other (Tumulus II) to the Late Neolithic. Van Giffen very briefly published the results in 1961 in an English language paper, and in 1962 he published the Dutch translation of the same article. Van Giffen had been unable to finish the work in the NW quadrant of Tumulus II, therefore in 1963 new excavations were carried out by De Weerd, which were continued in 1966. Both campaigns remained unpublished apart from brief notes (De Weerd 1966; 1967). Finally, in 1978, Lanting excavated the site when it was going to be deep ploughed. This was the first large scale excavation at Oostwoud involving hydraulic diggers. All previous work had been done by hand. The 1978 excavations remained unpublished as well, apart from a short account (Lanting and Van der Plicht 2002, 86-89). A detailed and very useful overview and plan of the site history was published by Van Heeringen and Theunissen (2001).

The first campaigns by Van Giffen yielded spectacular results. Even today, the Oostwoud tumuli remain two of the very few burial mounds in the Netherlands that contained several well preserved skeletons from the Late Neolithic and the Early Bronze Age. In addition, they provided the first clear evidence of extensive plots of Neolithic arable land. The excavation was initially carried out by the *Instituut voor Prae- en Protohistorie* (IPP) of the University of Amsterdam, of which Van Giffen was the director for a long time. It was his last excavation as director of the Institute; he was succeeded by W. Glasbergen in 1957. At Oostwoud Van Giffen used technicians from all institutions with whom he was or had been associated as director: the Rijksdienst voor het Oudheidkundig Bodemonderzoek (ROB) at Amersfoort of which he became the first director in 1947; the IPP at Amsterdam which he had founded in 1952; the Biologisch Archeologisch Instituut (BAI) at Groningen which he had founded in 1923.

Because of the involvement of several institutions, the finds and the documentation became dispersed. The institutes at Groningen and Amsterdam had original field documentation, the IPP also housed finds. When the IPP was dissolved as a separate institute of the University of Amsterdam in the nineteen-nineties, the finds and documentation were transferred to the Provincial Archaeological Depot (now at Castricum). The field drawings of the 1956, 1957, and 1978 excavations were kept in Groningen at the BAI until 2015. Then they were handed over to the depot at Castricum as well, as the result of an effort of the first author to bring all documentation and finds together at this Provincial Depot. In January 2017 the field diary of the 1978 excavation and other documentation until then kept by J.N. Lanting was transferred to the Depot as well. Again and again, however, finds and documentation keep turning up in other places. Some of the material, for instance, is still present in the town hall of the city of Hoorn, which inherited the collection of the West-Fries Museum in Hoorn.

The complex and fragmented nature of the data is partially responsible for the disjointed publication history. In the framework of the NWO project 'Farmers of the Coast' (NWO-160-300-30), focusing on the Middle Bronze Age settlement landscapes of West-Frisia, the first author made efforts to bring all data together and to prepare a final publication. In the course of this study, the skeletal material was re-analysed as well (Veselka 2016). In addition, the skeletons were sampled for DNA by E. Altena (Leiden University Medical Center Leiden). They are presently being analysed as part of a combined Copenhagen-Jena-Harvard research program. The results of this study are presently not yet available, but the preliminary findings from Harvard (D. Reich) are very promising indeed, including proof of family relations between some of the skeletons. In this paper some of these results are briefly discussed.

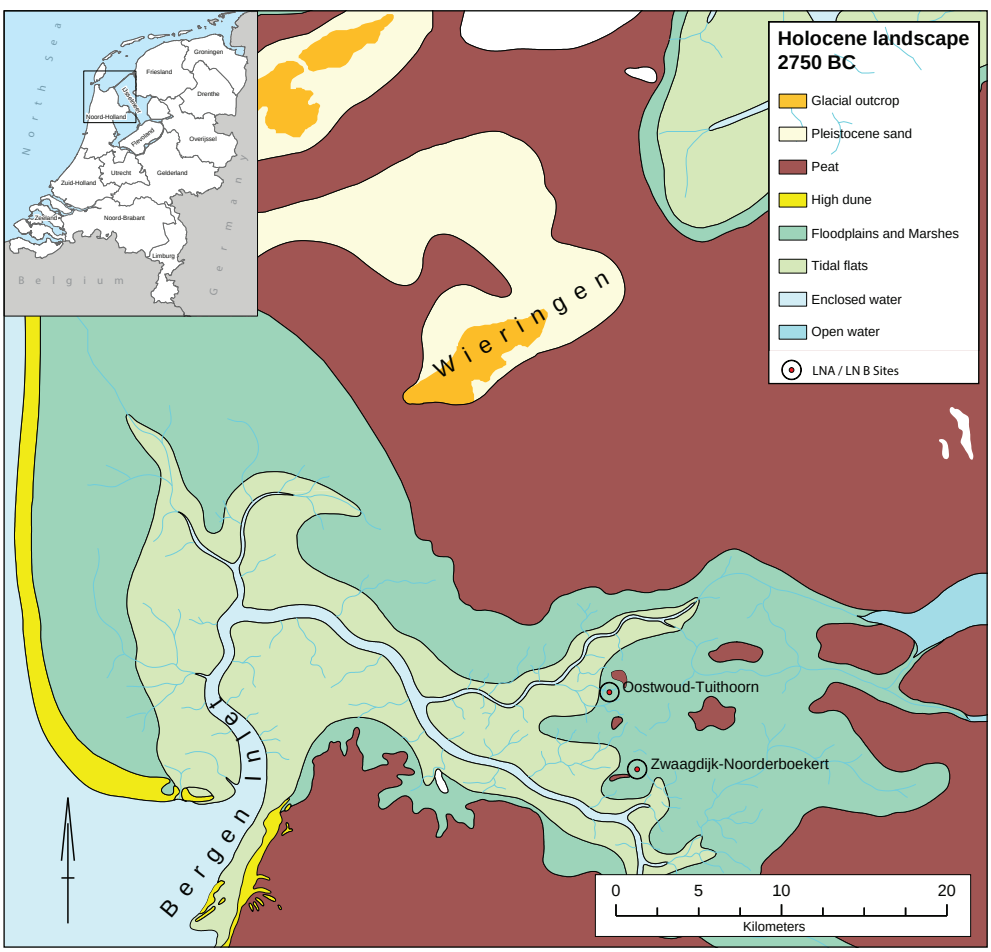


Figure 1 The site of Oostwoud in the paleogeographic situation around 2750 cal BC (modified after Vos & De Vries 2013 and Beckerman 2015, 33)

2 Environment

The West-Frisian landscape around 2500 cal BC has always been characterised as a tidal marsh environment. In the most recent paleogeographic maps of the period, Oostwoud was situated on the east end of a tidal marsh area, probably with relatively little sea influence, even though the tidal channels were still active. The Bergen inlet also was the place where the river Vecht ended in sea. In the reconstruction of Vos and De Vries (2013), Oostwoud is situated in the flood plain east of the active channels (fig. 1). The sites to the west are sites that were occupied during the last phase of the Corded Ware culture, probably around 2600 cal BC.

In his recently published dissertation, however, Van Zijverden (2017; fig. 2) gives a different reconstruction. In his view, the Bergen inlet was a relatively narrow inlet resulting in a large basin behind the coastal barriers in which tides could run up higher than in the coastal area proper. This also meant that levees were higher and the hinterland wetter than previously reconstructed. This situation changed in the Early Bronze Age, probably around 1800 cal BC after a severe storm or series of storms. These blocked the river Vecht outlet to sea and made it change its course south wards around West-Frisia.

The subsoil of the site consisted of layered 'marsh' deposits that always have been indicated as mud flat deposits. However, in view of the different reconstruction by Van Zijverden, it is much more likely that we are dealing with an extensive crevasse splay. Such splays develop when the levee of a channel brakes through during a storm event or high water discharge. Around the break-through channel (the crevasse), coarse sands and silts are sedimented in the back swamps (crevasse splay) as a result of the high dynamic floods. The channel gradually silts up, decreasing the water velocity, and resulting in a fining upward sedimentation pattern of the crevasse splays. Eventually, what remains is an elevated area which forms a well-drained island in the midst of back swamps and tidal channels (Baeteman, Beets and Van Strydonc 1999). Such splays can be extensive, even up to 1 km^2, which would also have been the case at Oostwoud, given the extensive arable land present there. According to Van Zijverden (oral information Jan 2017) this is the most likely explanation given the overall environment. His reconstruction differs from that of P. Vos, the geologist who produced the most recent paleogeographic reconstuctions, with respect that there is much more water and much less flood plain and marshes (fig. 2, 3). In figure 4 we have

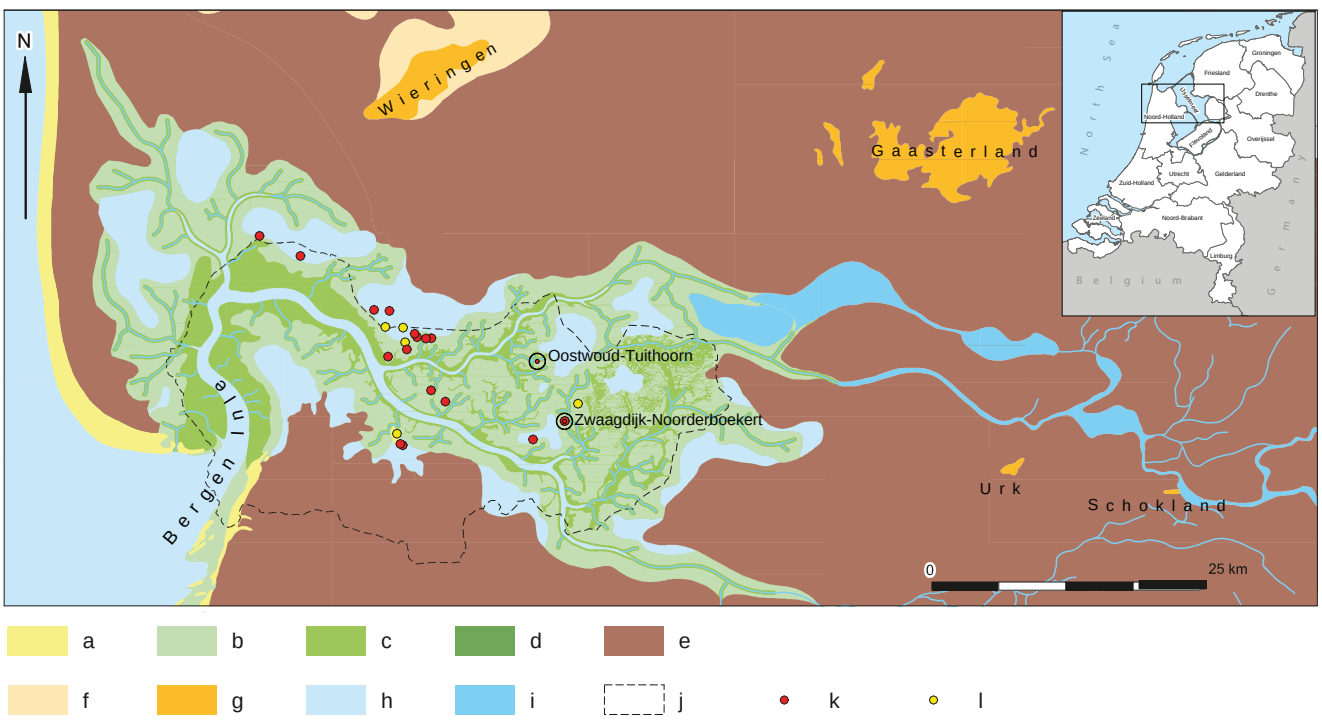


Figure 2 Paleogeography of West-Frisia approximately 2100 BC. Legend: a: dunes and beach ridges, b: tidal flats, c: tidal marshes and levees, d: former tidal marsh, e: peat, f: Pleistocene sand areas, g: ice pushed ridges, h: mainly brackish and salt water, i: mainly freshwater, j: West-Frisia, k: excavated sites, l: sites only surveyed (after Van Zijverden 2017, fig. 3.12)

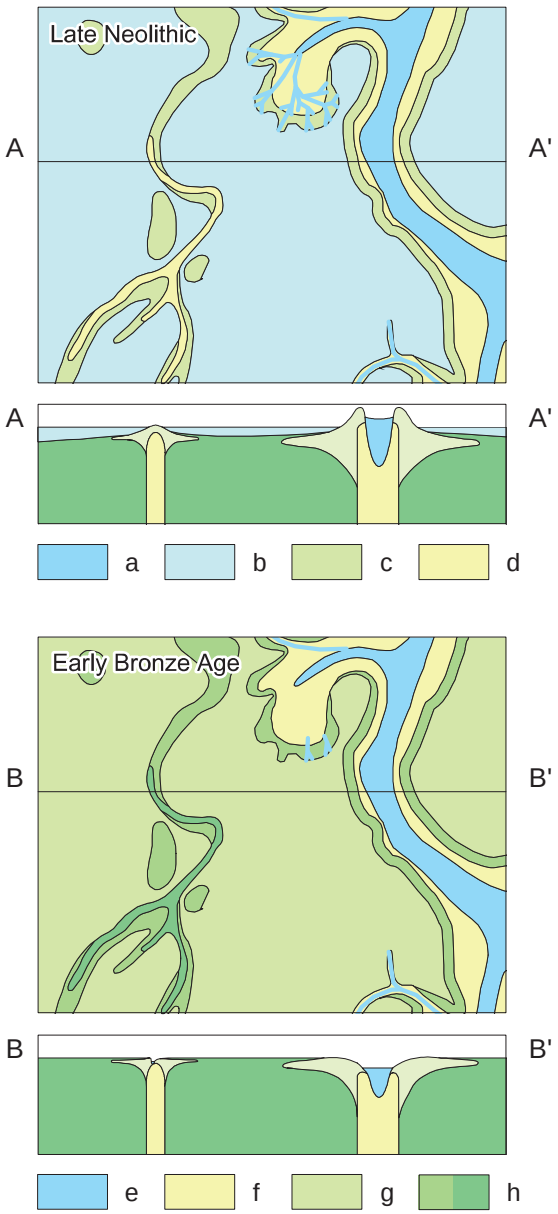


Figure 3 Reconstruction of the former landscape of eastern West-Frisia c. 2100 cal BC (A) and c. 1800 cal BC (B). Legend: a: salt to brackish water, b: brackish to freshwater and or reed swamps, c: irregularly flooded levees and creek ridges, d: regularly flooded flats, splays and residual gullies, e: salt to brackish water, f: tidal flats, g: irregularly flooded tidal marsh, h: regularly flooded tidal marsh and former gully (after Van Zijverden 2017, fig. 3.13)

combined all presently available information about the orientation of the landscape and creeks. It shows that large creeks, probably considerably older than the excavated remains, cut through the landscape in a WNW-ESE direction.

This situation is more or less confirmed by an unpublished pollen analysis carried out by W. Groenman-Van Wateringe in 1956 and 1957 based on samples from the two barrows (fig. 5). She states that '..... the area around the barrows was grown with a vegetation, poor in trees.' Yet we should add that there is a rather high percentage of hazel (*Corylus*) as well as alder (*Alnus*). The latter indicates the presence of wet areas, whereas the former could have grown on the crevasses and on the levees. Willow might be expected as well, but Groenman decided, after a discussion with Van Zeist at Groningen University, that the pollen she had counted in the first year as Salix (13%) probably were fragments of *Triglochin maritima* (sea arrowgrass; *schorrezoutgras*) that have a similar reticular structure (Letter of Groenman-Van Wateringe to A.E. van Giffen 8 March 1958; Provincial Depot Noord-Holland).

The present elevation of the Oostwoud buried soils is 1.70 below Dutch datum, indicating that without dykes, the area would be covered with more than 150 cm of water. Indeed the site was partly covered by later clay sediments, indicated by the excavators as '*Zuiderzeeklei*'. Presently the area is a polder within the perimeter of the 126 km long *'Westfriese omringdijk*' a dyke built in the 13th and 14th century AD. Before the area within the dyke was reclaimed, West-Frisia was largely covered with peat. We have to be aware that subsidence of the unstable subsoil with several peat layers is partially due to this low situation, while later sediments also cover the area as a whole. Without going into further detail about these sequences, it is clear that due to water-logging and clay sediments that prevent air from getting into the soil, the preservation conditions are excellent in Oostwoud, and in the entire part of the province of Noord-Holland indicated as West-Frisia. In this landscape, presently barren and used as grazing lands, cross-cut by many ditches to drain the soil, prehistoric burial mounds have always remained visible as low elevations. There is only one archaeological monument left, at Zwaagdijk, where this situation has been preserved, but a little is visible in figure 6.

Late Neolithic and Bronze Age farmers alike appear to have been living in an environment that we would not consider a first choice for farming. Yet the extensive plots of arable land such as those at Oostwoud, Zeewijk (Theunissen *et al*. 2014) and at Noorderboekert-Rijweg (Knippenberg 2014; Fokkens *et al*. 2016) show that the Corded Ware and Bell Beaker people living in this area were not just marginal farmers. They had plots of over one hectare that they ploughed regularly. In addition, they fished, hunted, and caught birds (cf. Fokkens *et al*. 2016). It is clear that they

lived a stable life in this wet environment which enabled them to supplement a farming existence with all other sources that nature provided. It is in such a context of farming life that we have to place the Oostwoud-Tuithoorn barrows. We do not know, however, where the people who were buried there actually lived. It is likely that they did not live far away, probably within the same kind of environment. The excavations never yielded conclusive evidence for a settlement, apart from many bone, pottery and flint fragments dispersed in the arable land underneath the barrows.

In the following sections we will first discuss the excavation history (section 3), next sequences of the arable land (section 4), then the burial mounds proper (section 5), and finally the skeletal remains found in them (section 6).

3 The excavation history

3.1 The 1956 excavation of Van Giffen (9 April – 18 May)

Since the information we have on the burial mounds, the stratigraphy, and the burials is very limited, we have made a reconstruction of the excavation process from the field diaries, the drawings, and short notes written by different people who were called in by Van Giffen to aid in scientific analyses.

Van Giffen states in his account that the Oostwoud excavations were the last ones he carried out as professor and director of the *Instituut voor Prae- en Protohistorie* of the University of Amsterdam. In 1954 he had reached the age of 70 and had retired from the positions he held at

Figure 4 The excavated area at Oostwoud-Tuithoorn (center-left) with a cut out part of the Google Earth map of 4 May 2005 which shows the course of many tidal creeks in the subsoil. These probably antedate the arable land and burial sites. They are projected on the topographical map 1:25.000 of 1999 (sources: Google Earth; http://www.topotijdreis.nl/ (visited 1 Feb 2017)

Groningen, Amsterdam and Amersfoort. Yet he still was appointed as *State Advisor for the protection and conservation of megalithic monuments and restored archaeological monuments,* which was officially based in Groningen at the Heresingel 15a (his private address), but which was *de facto* run from an office he still kept at the BAI. Even though he was retired and had passed on his positions in Groningen to H.T. Waterbolk, and in Amsterdam to W. Glasbergen, Van Giffen still determined to a large extent what happened in the field of research. Therefore, it is no surprise that a combined team of field technicians and staff of the Groningen and Amsterdam Universities and the ROB at Amersfoort were mobilized and went to Oostwoud: Professor Van Giffen could not be refused assistance.

The excavation started 9 April 1956. The field diary (*dagrapporten* in Dutch) contains entries for every day by one or two persons. The leading technician (Knottnerus, field technician of the IPP) wrote entries on progress, but very little on content. He also kept the find list. When he was at the site, which he was most of the time, Van Giffen also wrote daily reports; actually this was most of the time (fig. 7). These reports were later (in 1960) compiled by his successor at Amsterdam University, W. Glasbergen, from hand-written notes.[2] The team of technicians and draughtsmen consisted of Osinga (BAI), Knottnerus and Kikkert (IPP), Bekker, and Van Duyn and Van den Berg (ROB). As was the custom at the time, workers (about nine) were made available through the *Heide Maatschappij (HeideMij)*, an idealistic organisation (founded in 1888) which at that time still aimed for the reclamation of heath for agriculture, for planting forests in vast wind-blown sands, and for the improvement of employment under poor people.[3]

The workmen first worked under supervision of technician Knottnerus of Amsterdam. But from the diary it is clear it that after the first week Van Giffen was not really satisfied with the Amsterdam team, especially Kikkert. He complains in the diary about the quality of the contour maps and of the drawings in general. Kikkert is relieved of fieldwork duty

INSTITUUT VOOR PRAE- EN PROTOHISTORIE DER UNIVERSITEIT VAN AMSTERDAM

	Heuvel I monster 9	Heuvel I monster 11	Heuvel II monster 261
	%	%	%
Alnus	27	27	56
Quercus	2.3	3.5	3.8
Ulmus	1.2	1.1	-
Tilia	0.3	1.3	-
Fraxinus	0.4	-	1.2
Corylus	59	51	30
Fagus	0.1	0.2	-
Pinus	8.9	15	8.8
Picea	0.6	0.2	-
Σ AP - Betula + Corylus	900	452	161
Betula	7.1	10	54
Calluna	5.1	7.1	14
Gramineae	9.4	16	28
Cerealia	0.7	0.4	3.1
Chenopodiaceae	3.1	4.4	17
Plantago lanceolata	0.4	0.2	-
" major	-	-	0.6
Compositae liguliflorae	2.6	5.3	3.1
" tubuliflorae	2.0	0.7	4.4
Artemisia	+	-	0.6
Umbelliferae	2.3	5.8	-
Galium [illegible]	0.4	0.2	-
Caryophyllaceae	0.7	2.4	1.9
Labiatae	0.7	1.8	1.9
Juncaginaceae	5.6	6.2	3.8
Rumex acetosa	-	1.1	-
Epilobium	-	+	-
Rosaceae	-	-	0.6
Filipendula ulmaria	-	-	1.2
Cruciferae	-	-	1.2
Cyperaceae	29	55	4.9
Filices	24	60	33
Sphagnum	9.7	11	111
Lycopodium	3.0	2.2	3.1

Figure 5 Pollen counts of three out of thirteen samples that actually contained pollen. All samples were taken from the old surface outside the barrows (copy of a letter sent by W. Groenman-Van Waateringe to A.E. Van Giffen 8th of March 1958)

Figure 6 Images of the start of work at tumulus I, taken 9 or 10 April 1956. The images indicate the slight elevation of the barrow in the landscape of 1956

1956	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
April	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
May	30	1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	

30 May	Queens Birthday	7	Free Sunday
5 May	Liberation day	7	VG present
10 May	Asuncion day	7	Normal work day

1957	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
May	27	28	29	30	31	1	2
June	3	4	5	6	7		

Figure 7 Work scheme for 1956 and 1957 and the presence of Van Giffen at the excavation

and sent back to Amsterdam on the 17th of April. After three weeks, Van Giffen decided that he needed Praamstra and Meijer, his experienced team from Groningen, both to supervise the workmen and to make drawings of the sections and the surfaces. They arrived on the site on May 1, and immediately sacked five of the workmen. In the field diary of the 19th of April Van Giffen had already complained that they were slowing down. Praamstra and Meyer stayed on until the end of the excavations on May 18th 1956. Praamstra's fine and detailed drawing of the plans and sections are very valuable for our research and determined much of what we know about the excavations.

In 1956 Tumulus I was excavated first. They started lying out the section dams after having determined north with the compass. Next, a 1 meter wide trench was dug along the mid-west section in the SW quadrant until they reached the natural soil (field diary Knottnerus 9 April 1956). According to Van Giffen they already found a human tibia on the same day in the 'loose soil'; this must have belonged to skeleton 230. He thinks the barrow had already been levelled in the past. There is no mention of plough marks in this first trench, which accounts for the fact that in the plans a one meter wide strip just south of the w section dam lacks plough marks (fig. 8). The next day, they uncovered the skeleton near the centre and the skull of the one further south, in the SW quadrant. Elevation levels were taken, demonstrating the skeleton near the centre (230) was found at 1.12 – NAP, the skeleton 'in the south of the SW quadrant' (231) was found at 1.26 – NAP, so 14 cm lower. Some potsherds and flints were also discovered.

On the third day, they enlarged the trench in the SW quadrant to 3 meters and discovered plough marks. It was Van Duijn who first recognised them (field diary Knottnerus 11 April). Both skeletons were left on pedestals of soil (fig. 8). Next they started on the NE quadrant, followed by the SE quadrant. Here they discovered the skeleton of a pig (fig. 9). This is situated next to a more recent pit with a layered fill, but it may have been a prehistoric deposit. The excavators started to realise that the plough soil contained Bell Beaker pottery. Van Giffen returned on Friday 13th of April to the excavation and wrote that he was upset about the quality of the drawings and elevation plans. In the next week the NE quadrant was finished and they started the work in the NW quadrant.

Van Giffen noticed that the plough marks continued outside the barrow (tumulus I), which was an important finding to deconstruct the theory that these marks were the result of purely ritual ploughing underneath barrows. He noted that there are two levels of plough marks, the lowermost organized in a criss-cross grid, but the higher,

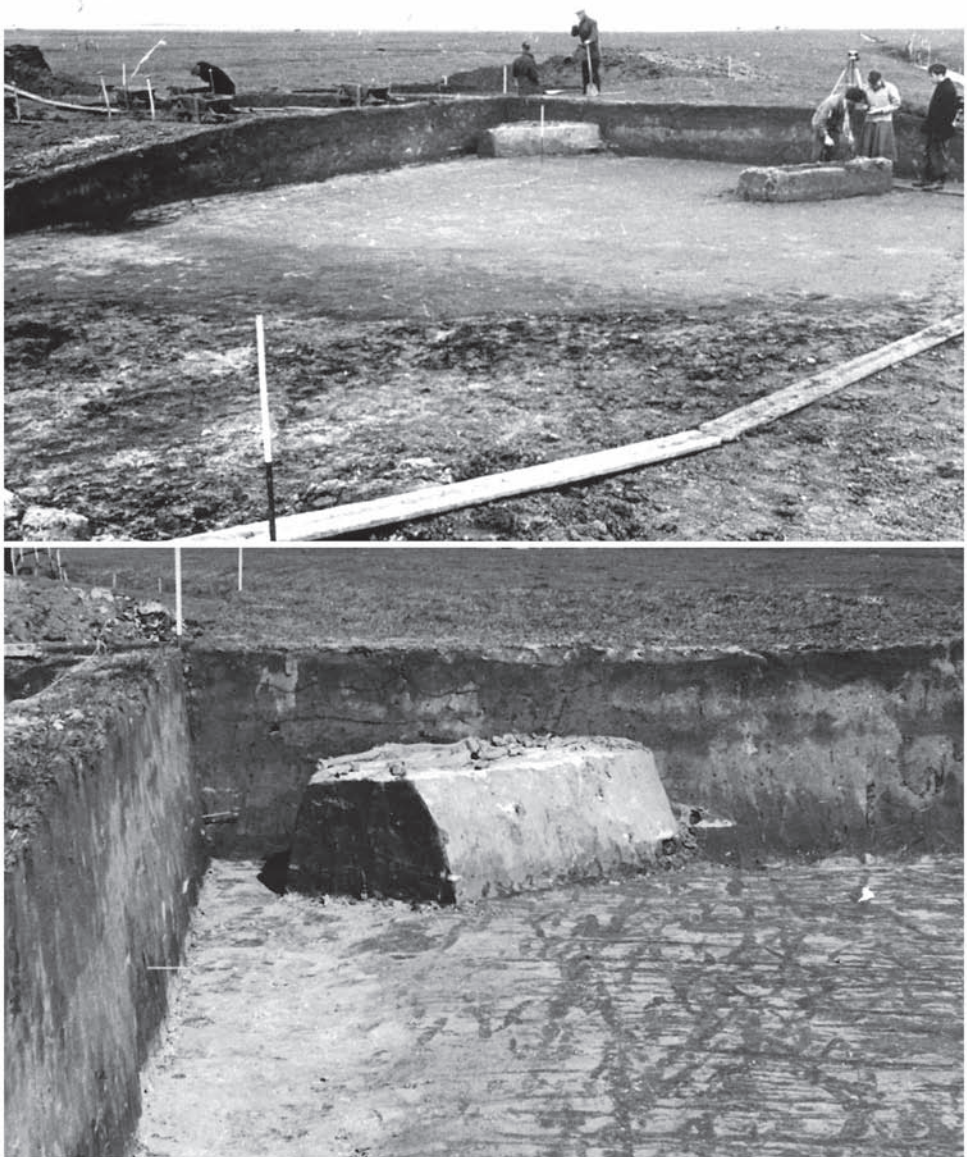


Figure 8 The SW quadrant of tumulus I with skeleton 230 (near the centre) and 231 left of pedestals of soil. Work in the NE quadrant had just started (11 April 1956). The bottom image clearly shows a strip without plough marks that was excavated just too deep, and the elevated position of skeleton 230 in relation to the plough soil

younger system appears more curved (field diary Van Giffen 18 April). They took pictures to document this (fig. 10). On the 19th of April the last skeleton in the SW quadrant was further excavated by Mr. Bijlsma, assistant of prof. De Froe.[4] The skull of skeleton 230 was embedded in the section dam, which was excavated for this reason (cf. fig. 42c). No drawings seem to have been made, only photographs. Skeleton 231 and the skeleton of the pig had already been transported to Amsterdam two days earlier. In the SE quadrant the skeleton of a cow was also found (first mistaken for a human). It was considered recent and there is no record of its documentation. The excavation of tumulus I finished 24 May.

Praamstra stated that he started drawing the plan of tumulus I on May 1st (field diary Praamstra 1-9 May). This was long after the skeletons had been removed; therefore no field drawing of them exists. Praamstra apparently had the assignment to redraw all surfaces and profiles. That is possibly the reason that no drawings made by Kikkert, Trimpe Burger, or Van Duijn survived, at least not in the BAI in Groningen.

The work on tumulus II started on the 24th of May with a 3 meter wide trench in the SW quadrant creating a west and south section through the barrow. Here they found two

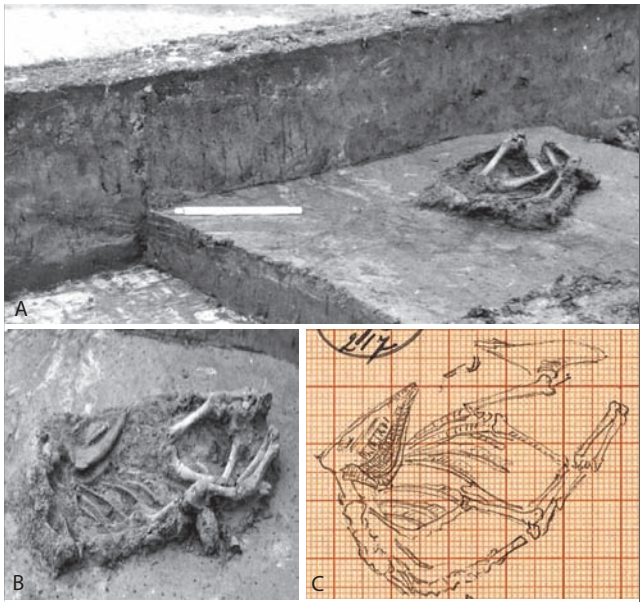


Figure 9 The skeleton of a pig found in the SE quadrant of tumulus I. A: with the sub-recent pit with a layered fill clearly visible in the horizontal and the section. The pig skeleton is situated outside that pit, and is considered a prehistoric deposit. B: skeleton of the pig seen from above. C: drawing of the pig made by Praamstra

Figure 10 The SE quadrant of tumulus I with the pig skeleton seen from the SE. The plough marks clearly extend beyond the large pits that once formed a circle around the burial mound

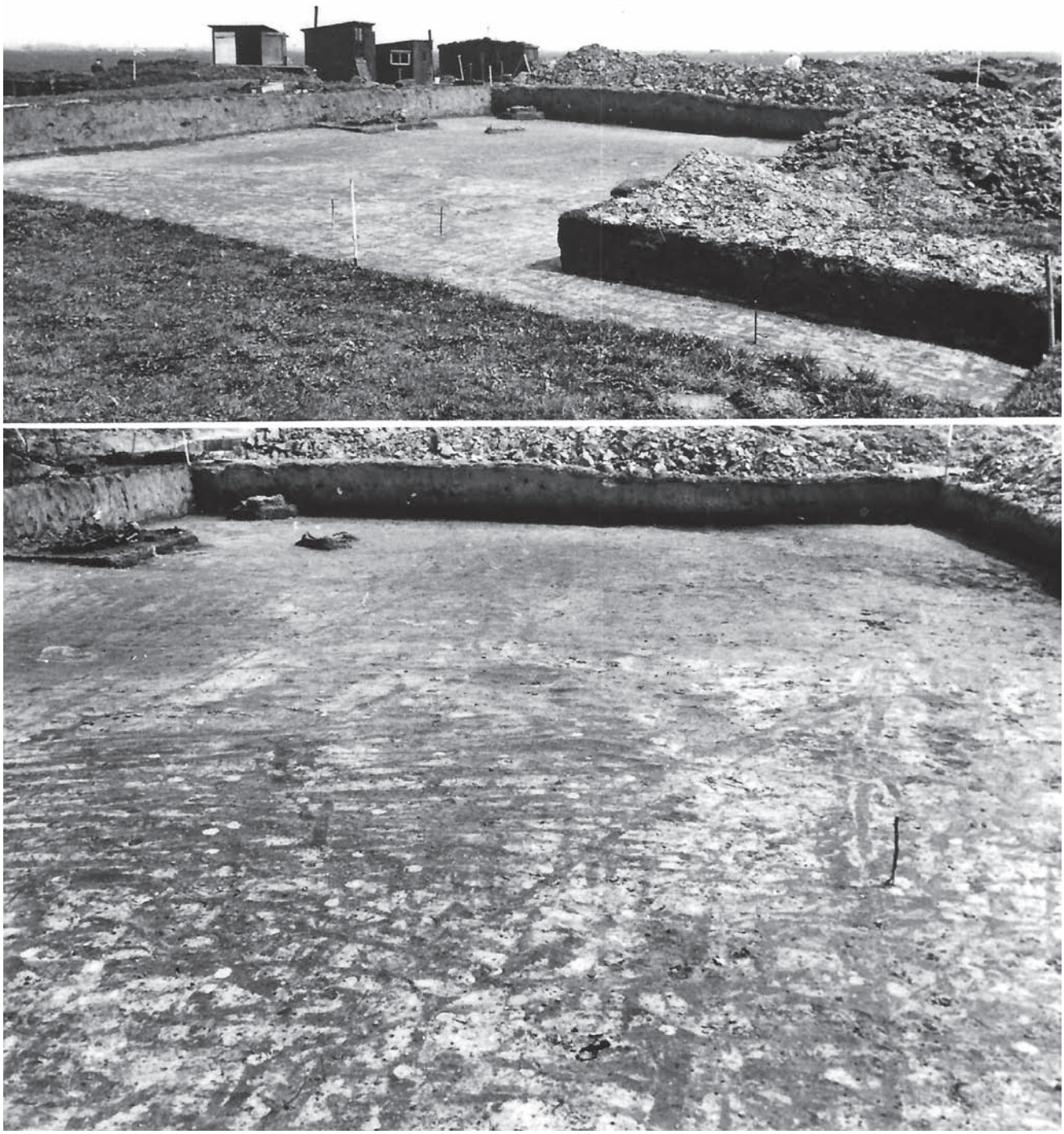


Figure 11 The SW quadrant of tumulus II, seen from the sw (top) and from the w (bottom), with from left to right the pedestals of skeletons 228, 229 and 127. The photographs are taken on 3 May 1956. The lowermost photograph also brings the bundle of plough marks around the burial mound into view (see also fig. 27)

skeletons in a crouched position (skeleton numbers 228, 229), which contrasted with the stretched skeletons in tumulus I. In the next days this trench was enlarged and a third skeleton was found (skeleton number 127; fig. 11). The NE quadrant was also prepared for excavation, this time with a 4 meter wide trench parallel to the east section. Knottnerus states that a 3 meter wide trench was also dug parallel to the south section in the SE quadrant, but this probably is a mistake. On the aerial photograph taken the next day, we can see that this trench was located in the NE quadrant (fig. 12). The plane came from the airfield at Valkenburg and was especially arranged by Van Giffen to take photographs of the excavation.

In the NE quadrant two skeletons were found, one half underneath the section dam (skeleton number 233), one that was placed on a mat or in a basket made of bulrush (skeleton number 232). The latter was lifted as a block later in May and is now in the Provincial Depot at Castricum. They decided not to excavate the NW quadrant since they would not be able to finish it (field diary 14 May).

Several geologists visited the site: C.H. Edelman, L.J. Pons, A.J. Wiggers, S. Jelgersma, but also P.J. Ente from the Soil Survey at Wageningen. Ente was the expert on West-Frisia, but especially on the top 1.20 m that was augured for the soil characteristics. Miss Jelgersma made several augurings around the site, but since their location is only documented vaguely, it is difficult to interpret them. Saturday the 19th of May the excavation was officially finished.

3.2 The 1957 excavation of Van Giffen (27 May – 7 June)

In 1957 the remaining SE and NW quadrants of tumulus were supposed to be excavated. This time Van Giffen compiled a small team with Van Delden as the leading technician and three to six workmen. Van Delden had just been appointed as a field technician on the 20th of May 1957 at the BAI in Groningen, so he was new on the job and probably sent to be trained by Van Giffen. The excavation started on the 27th of May. Van Delden was assisted by three

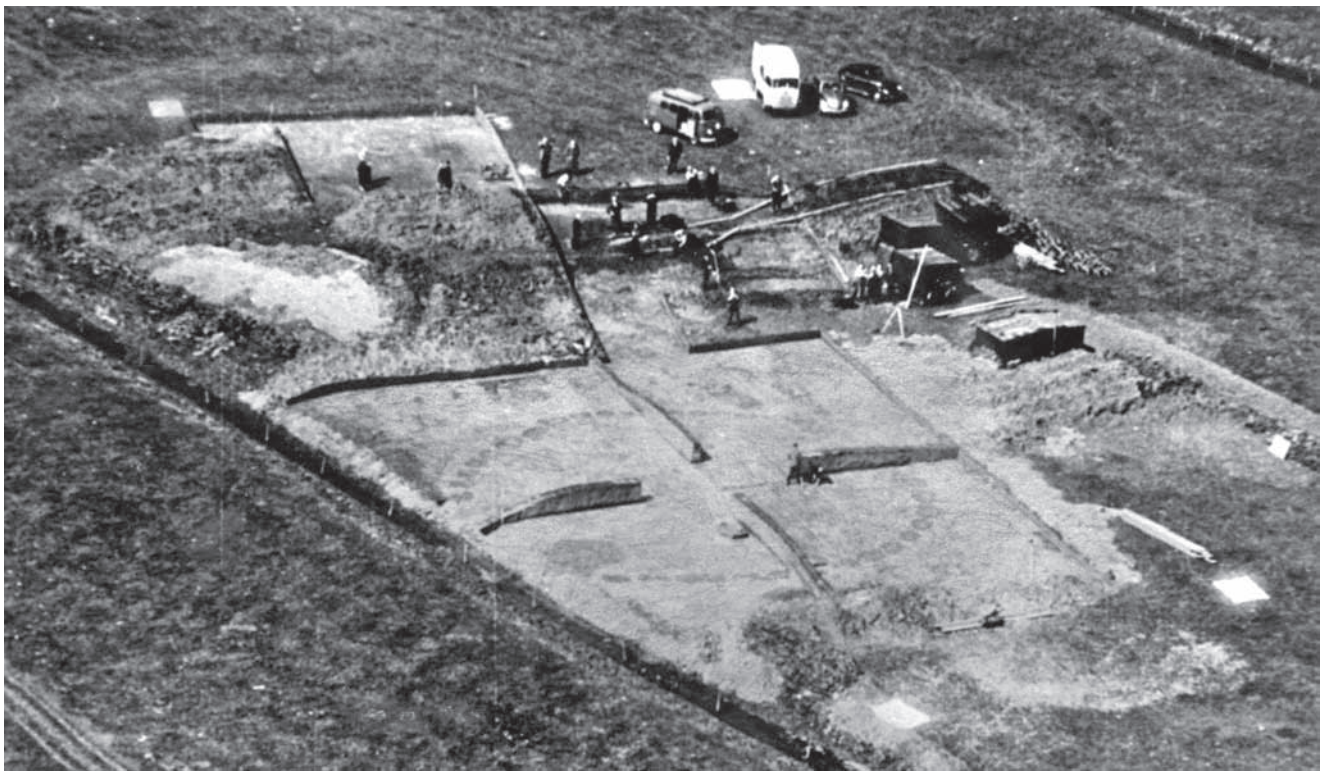


Figure 12 Aerial photograph taken on request of Van Giffen on 3 May 1956 by a plane from Valkenburg airfield. It shows tumulus I completely excavated with the pig skeleton still in place, and the sw quadrant of tumulus II (top left) with skeleton 228. In the NE quadrant of tumulus II trenches have been dug parallel to the section

workmen from the HeideMij in the first week, though six had been promised. Therefore, the work progressed slowly. It was only on Saturday the 1st of June that more workmen arrived with a foreman. In the field diary, Van Giffen mentions a problem with the find numbers. The idea was to continue the numbers from the 1956 excavations. Apparently, they did not know them precisely, so they started with number 200 first, but renumbered that to 220. Later it became clear that the numbers 220-233 already were used in 1956, so these are now double. The confusion that occurred happened because in 1956, the numbers 220-233 had been given to skeletons excavated and taken by prof. De Froe (field diary 31.V.1957).

The team started with trenches alongside the section dams in the already excavated SW and NE quadrants. The NW quadrant was excavated next; on Friday the 31st of May they had already discovered three skeletons (however, the notes give no indication of which and how). Monday the 3rd of June skeleton 235 was removed and skeleton 236 was cleaned (fig. 13). They also cleaned skeleton 239 and left both skeletons uncovered because of the rain. Here the field diary ends for reasons unknown. This has puzzled later researchers as well. The find list, however, contains entries until the 6th of June. On the 4th of June skeleton 236 and 239 were removed, on the 5th of June skeleton 242 and 243, on the 6th of June, finally, skeleton 247. All skeletons were excavated and removed by Mr. Bijlsma of the Antropobiological Laboratory. Number 250 is the last find number According to the find list, the work ended on the 7th of June.

The SE quadrant had been excavated by then and yielded no skeletons. The NW quadrant had not been excavated

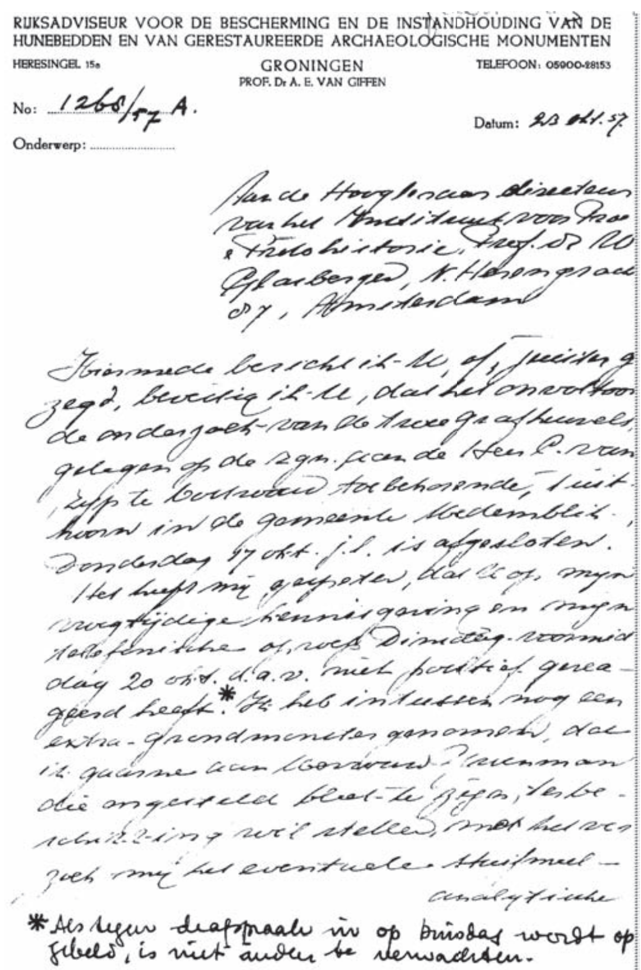
Figure 13 NW quadrant of tumulus II, seen from the NW. It shows Mr. Bijlsma cleaning a bone. On the foreground skeleton 239, Mr. Bijlsma is standing next to 242, behind that 236 has been exposed. Nothing is visible of either 247 of 235. According to the coordinates given, 235 must have been situated just behind Mr. Bijlsma. This photograph was taken on June 4 or 5, while 235 had been removed a day earlier. Since nothing is visible of its removal, this would mean that it was placed higher in the mound than 242 and 236, possibly on the same level as 239

completely. Here, several skeletons had been found, but the documentation is minimal. The field drawings of the NW quadrant were made on the 4th of June, and judging the hand writing they were made by Praamstra. This creates the impression that Van Giffen realised he could not cope with only Van Delden and a few workmen and asked Praamstra to assist. Since skeleton 235 had already been removed on the 3rd of June, while the drawing was made on the 4th of June, this may explain why all burials have been recorded on the drawing as they were present in the field, apart from skeleton 235.

Ultimately, Van Giffen was unable to conclude the excavations as planned. The NW quadrant in particular was not excavated completely. The reason for ending the excavations remains unclear; it is likely that Van Giffen realised that without his trusted team of excavators it would be impossible to achieve proper documentation and excavation. On the 23rd of October 1957 he writes to Glasbergen that the unfinished excavation at Oostwoud was concluded on the 17th of October, probably by backfilling the excavated quadrants (correspondence between Van Giffen and Glasbergen in dossier 137; fig. 14). This indicates a hasty ending in June.

From this account it becomes clear that in 1957 Van Giffen had much less influence on the archaeological community in the Netherlands than in 1956. His team was minimal; there was little or no assistance from his successor at Amsterdam, nor from Amersfoort, only from Groningen. From the letters exchanged between Glasbergen and Van Giffen in 1957 it is apparent that Glasbergen also kept his distance from his dominant and demanding predecessor. In his letter dated the 23rd of October, Van Giffen complains that Glasbergen did not give a positive answer to a request he made on the phone (fig. 14). Glasbergen's comment in the margin of the letter is clearly dismissive: '*als tegen de afspraak in op Dinsdag wordt op gebeld, is niet ander te verwachten*' (if against what has been agreed one is called on the phone on Tuesday, one cannot expect anything else).

This leaves the 1957 account of the excavations very limited indeed. In fact, the find lists contain the majority of information. This is a pity, because the NW quadrant of the excavation yielded several skeletons that ended up being poorly documented. A few sketches remain on the field drawings, accompanied by a few photographs. It is not clear who made the drawings. The situation of trenches and features recorded in the end was as indicated in figure 15a and b. These drawings of the excavations of 1956 and 1957 were published by Van Giffen in 1962.[5] We have reproduced them here, but added colour and accents to make them better readable on the present scale. These drawings are the ink versions of the originals drawn by Praamstra in the field, and they were also prepared for publication by Praamstra in his meticulous and very well readable manner. The published sections of tumulus I are especially important because these were not amongst the original drawings that now are stored in the depot in Castricum. Moreover, it is only in the published plan that Praamstra has indicated the location and position of the skeletons in tumulus I, and of skeleton 243 in tumulus II. This skeleton was found in a crouched position facing north, while most others face south. Only skeleton 235 is not indicated on this plan because it had already been removed when the field drawing was made. Careful consideration of the section drawings demonstrates how different features are related to the plough marks and the skeletons. We will discuss this in sections 4 and 5 below.


RIJKSADVISEUR VOOR DE BESCHERMING EN DE INSTANDHOUDING VAN DE
HUNEBEDDEN EN VAN GERESTAUREERDE ARCHAEOLOGISCHE MONUMENTEN
HERESINGEL 15a GRONINGEN TELEFOON: 05900-28153
PROF. Dr A. E. VAN GIFFEN
No: 1268/57 A. Datum: 23 okt. 57
Onderwerp: ....

*Als tegen de afspraak in op Dinsdag wordt op gebeld, is niet ander te verwachten.

Figure 14 Letter written by A.E van Giffen to W. Glasbergen on 20 October 1957, and comments made by Glasbergen

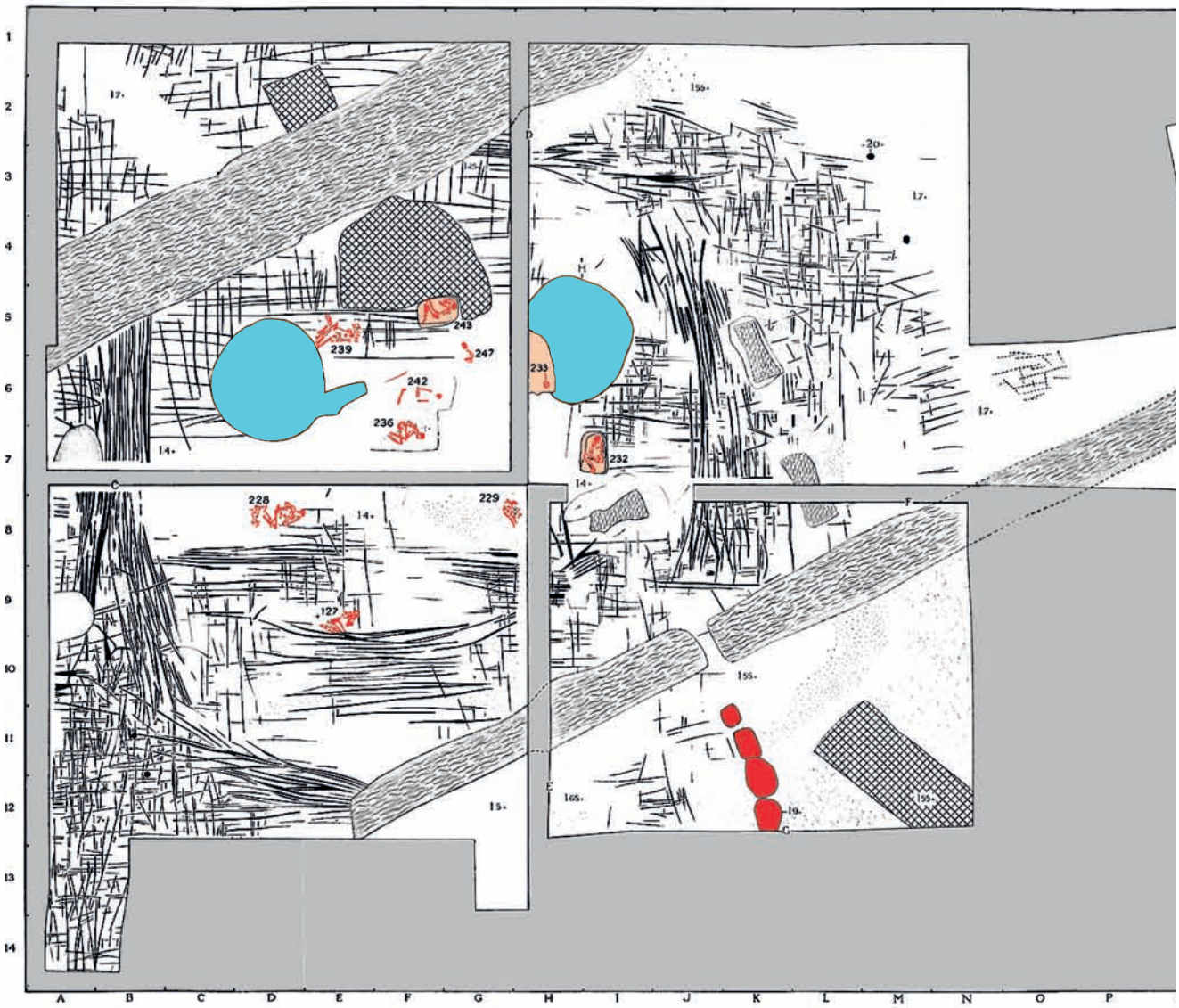
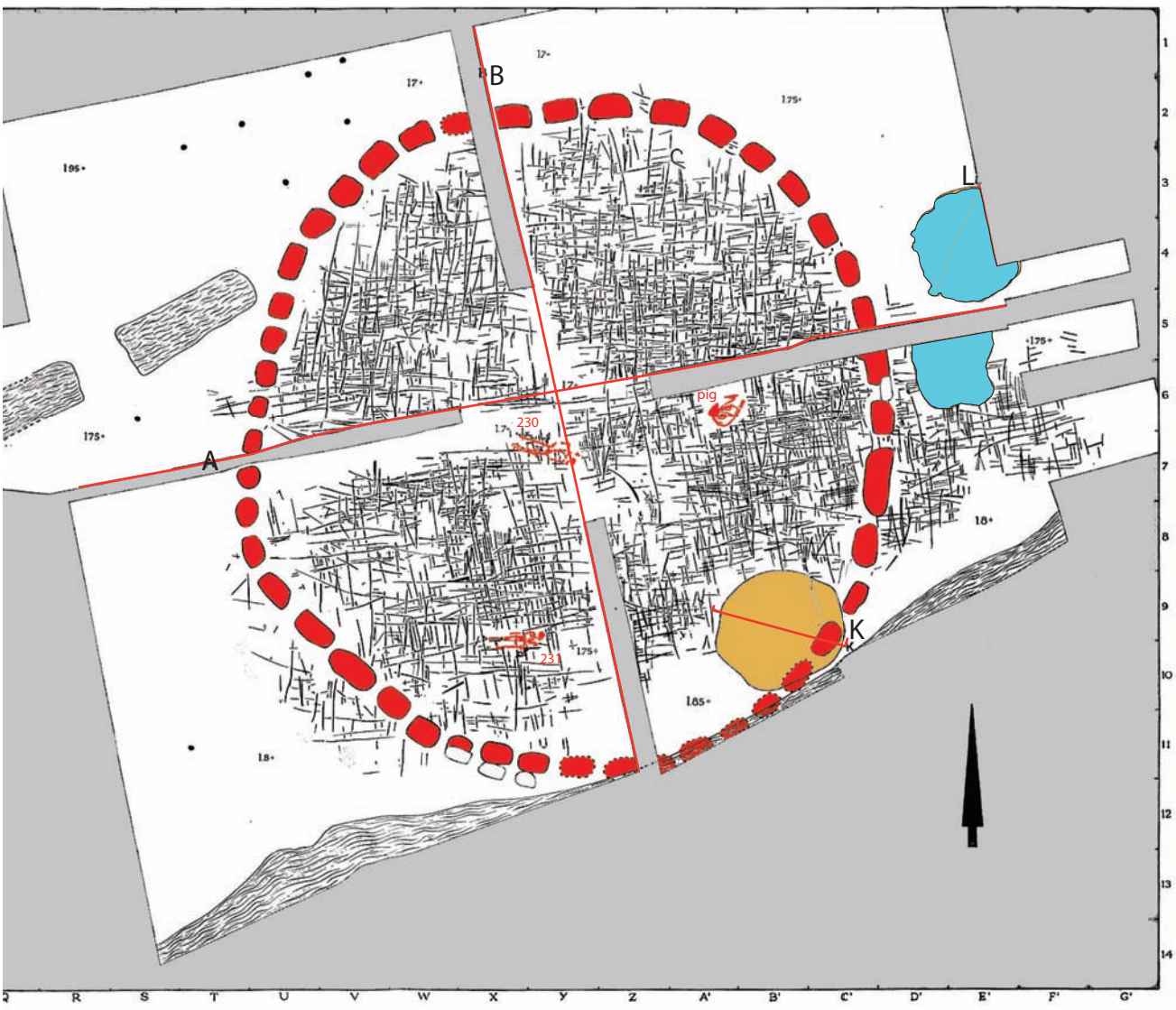


Figure 15 Tumulus II (left) and Figure 15b tumulus I (right) as published after the 1957 campaign (compiled and amended after Van Giffen 1962). Blue: Medieval features; orange: Late Neolithic features; red: Late Neolithic or Early Bronze Age features


A
B
C
K
L
pig
230
231
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Q
R
S
T
U
V
W
X
Y
Z
A'
B'
C'
D'
E'
F'
G'

3.3 The 1963 excavations by De Weerd (29 May – 19 September)

After 1957 no efforts were made to conclude the work in the NW quadrant, which had evidently not been excavated completely. In 1961 Van Giffen was honoured with a *liber amicorum* of the staff of the IPP (*In het Voetspoor van Van Giffen:* Glasbergen *et al*. 1961) in which he published the preliminary results. (Van Giffen 1961b). This may have contributed to the emphasis of the potential of the barrow, both for the skeletal remains as for the arable land underneath the barrows. An opportunity arose when Glasbergen was able to obtain a 7000 guilder grant from the Pieter Langerhuizen Lamberteszoon fund for anthropological research. The proposal was for 'The ecology of the bearers of the earliest phase of the Bell Beaker Culture in Europe', and aimed at another excavation at Oostwoud to recover more skeletons for antropobiological research (report De Weerd 1963). At the time, the general idea was still that the Bell Beaker people were immigrants with typical brachycranic skulls. Van Giffen and Glasbergen were therefore interested especially in skull measurements in order to find out whether the people from Oostwoud were indeed Bell Beaker immigrants. In his well-known 'Voorgeschiedenis der Lage Landen', for instance, he assigns the Oostwoud burials to a 'colony' of immigrants (De Laet and Glasbergen 1959, 95).

Glasbergen assigned the work to his assistant, the doctoral student Maarten de Weerd, who started May 29th with the experienced technician H.N. Donker of the IPP as his second, a student and one workman. This was approximately the entire team. Yet another student (Ph. J. Woltering) occasionally came to help, and sometimes Gijbels, the photographer and P.S.A. Kikkert, the technical assistant who also had been present in the first weeks of the 1956 excavation, also provided assistance. However, De Weerd was also often alone with the workman (G. P. Nes). In the period between 14 June and 19 September he carried out all of the work together with Nes, sometimes assisted by Donker from Amsterdam. De Weerd stayed in a small hotel in Oostwoud and wrote excellent, sometimes very detailed field diaries, especially about the different levels and dating of the plough marks ('I had nothing else to do' he commented December 2016).[6] The plough marks and the extension of the arable land were certainly also part of his mission. He excavated a number of small trenches outside the southern part of the NW quadrant in order to investigate the plough marks as well as the settlement traces (fig. 16). He was convinced they had discovered the posts of a Bell Beaker house (field diary De Weerd).

In August, he realised they were not going to be able to finish everything. New skeletons were found, or at least a pit with human bones (533), and later also skeleton 575. Skeleton 575 was in fact one of the best preserved skeletons of the site and is well documented. On September 17 Glasbergen came to visit, accompanied by an English colleague, Van Giffen and his wife, and S. Jelgersma (fig. 17). They discussed the situation and Van Giffen asked if the skeleton could be lifted *en bloc*. They decided that the burial was older than the plough land because it had not been visible before; the plough land was documented at a higher level than the grave pit (field diary 17 September 1963). Friday the 20th of September, they lifted the skeleton in a wooden case and transported it to the West-Fries Museum at Hoorn. It is now on display in the Provincial depot under the name 'Jan van Oostwoud', initially as a personal loan from Glasbergen. The skull was removed separately and reconstructed by Kikkert in the IPP at Amsterdam. The reason for this was that they wanted to be able to measure

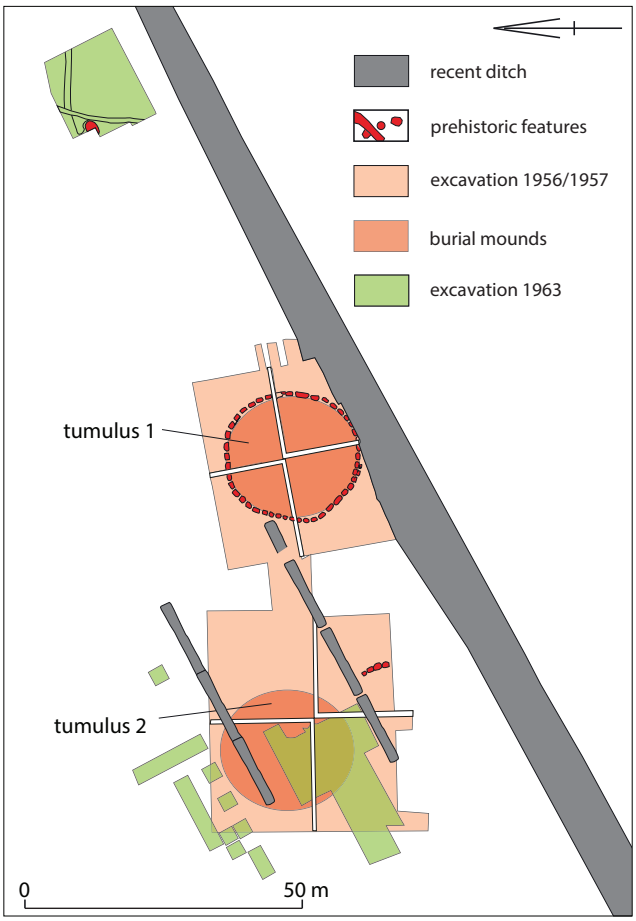


Figure 16 The excavation trenches of De Weerd in relation to the earlier trenches excavated by Van Giffen (compiled and amended after Van Heeringen and Theunissen 2005, 306)

the skull in detail since that was one of the goals of the grant they had obtained to excavate the site.

It was decided that they would continue the excavations in 1964, as the weather deteriorated and pouring rains sometimes made work impossible. However, because the owner of the land could not allow it earlier, De Weerd returned to the site two years later than planned, in 1966, just before the owner levelled the two barrows.

3.4 The 1966 excavation by De Weerd (18-20 October)

The original owner, Mr. Zijp, had always agreed to maintain the two restored barrows, but due to illness he had to sell the parcel. The agreement resting on his land was forgotten and the new owner wanted to level the two barrows. The remains could only be inspected just before the levelling (De Weerd 1967, *31). Only a small part (the centre) of the section

Figure 17 On 17 September 1963 a number of visitors discussed skeleton 575 and the excavation results so far on site. A: M.D. de Weerd, Brailsford jr. J.W. Brailsford, Tertia Veronica Glasbergen, W. Glasbergen, A.E. van Giffen, mw. S. Jelgersma (behind J.A. Bakker); B: M. de Weerd, W. Glasbergen, Brailsford jr., J.W. Brailsford, A.E. van Giffen; C: Glasbergen drawing and De Weerd measuring skeleton 575, resulting – see below – in figure 48; D: G.P. Nes and a young visitor (son of the mayor of Midwoud)

dams had remained intact over the years. De Weerd was able to study just that and discovered one last skeleton, or a large part of it.

De Weerd expected to find a skeleton because in 1963 he had recovered two fragments of a skull that could have belonged to a primary burial in the centre of the barrow (De Weerd 1967, *31). Cultivation of the land between 1963 and 1966 had already removed the top part of the section, so only the last remains were preserved (fig. 18). De Weerd found, in his own words 'an incomplete skeleton, not buried in articulation …..; skull, lower jaw, the majority of ribs and vertebrae, legs, feet, arms, hands were missing. A shoulder bone was broken already in the past.' (translation by the authors; De Weerd 1967, *31). He concluded that this was a skeleton that accidently had been dug up when a new individual was buried, for instance skeleton 229 which was situated nearby (De Weerd 1967, *32). We will discuss this option later.

3.5 The excavation by Van der Waals (24-27 May 1977 / March 1978)

In 1977 re-allotment program '*de Vier Noorder Koggen*' was going to affect the Tuithoorn parcel on which the former barrows had been situated. Since De Weerd had reported settlement remains of the Bell Beaker culture (post pits, possible houses) a final research campaign on the site was deemed necessary. The ROB and the IPP asked J.D. van der Waals to carry out that work, starting in 1977 with a survey with trenches in order to determine whether further research would be necessary. A final excavation would have to be finished before the end of July 1978, when the re-allotment work would start with deep ploughing the field (diary J.D. van der Waals Oostwoud 1977).

Figure 18 The excavation 'trench' of 1966 with the skeleton in the crossing of the section dams, seen from the north

Van der Waals had excavated in West-Frisia before as an assistant of Van Giffen at Amsterdam (Tumulus 'de Ark' at Wervershoof), but was appointed in Groningen and also as extra-ordinary professor at Utrecht University in 1968. There he taught prehistory to History and Physical Geography students. Van der Waals asked the Utrecht Physical Geography students Pieteke Banga and Peter van Dijk to assist him. Both had previously written a doctoral study on the paleogeography of the Kolhorn area, therefore, they were familiar with the genesis and lithology of the deposits at Oostwoud.

On the 24th of May, they met in the field and decided that trenches would have to be dug in September, after the potatoes that were grown on the land were harvested. The field diary ends with a handwritten note by Van der Waals, documenting that they planned to excavate the trenches on September 26. These trenches were indeed dug, but the weather prevented good documentation. Therefore, the trenches were partly covered with plastic to be documented after the winter season.

That documentation was the aim of a campaign in March 1978 (14-17th of March). Van der Waals brought together a few Groningen students (Annelou van Gijn, Harry Fokkens, Bernard Wubbels, Menno Sijpkens Smit, Vincent van Vilsteren) and Pieteke Banga and Peter van Dijk to clean out and document the 1977 trenches.[7] It was extremely cold and wet, the first day a force 9 gale made working virtually impossible. The trenches A, B and C dug in 1977 (cf. fig. 20) were cleaned and a little enlarged (2 x 12 m), resulting in a good view of the plough marks which were also present in the extreme west part of the area excavated since the 1950's (fig. 19).[8]

The conclusion of this investigation was that further research was necessary in the summer period before the re-allotment would start.

3.6 The excavation by Lanting (29 May – 19 July 1978)

The 1978 summer campaign was carried out by J.N. Lanting. It was summarily published with a focus on the dates of the skeletons in 2002 (Lanting and Van der Plicht 2002, 86-89) and there is a detailed field diary by Lanting. The team consisted of Lanting, Meijer, Zwier, and students H. Fokkens and A. van Gijn (29 May - 19 June). P. Banga and P. van

Dijk were also the team to continue their work on the geology. Lanting tried to get workmen from the social service to assist in the digging. Basically, the same system as in 1956 was still intact in the nineteen seventies. However, no free workmen were available. In his field diary Lanting explains that these 'extremely cheap workmen (only 60 guilders per person a week overhead!) seem to work predominantly in the greenhouse industry; a remarkable form of public subsidy for the greenhouse industry.'

The entire area of the two barrows was uncovered and the trenches of previous excavators were drawn in when they were visible as disturbances (fig. 20). Van Giffen's section dams were visible as straight deep cuts filled with dark soil. Those were the remnants of one spit deep lines in front of the sections that were dug when the sections were drawn to get the natural soil in view. One of the new discoveries in the area of tumulus II was that De Weerd had overlooked an 8 meter wide ditch that surrounded his burial 575 (fig. 21). He had recognised the southern part, but not as a ditch around the burial. His trenches were just not wide enough. Van Giffen had not recognised it either because in 1957 the NW quadrant was not yet excavated deep enough. Both burial 575 and the ditch were overlain by the Neolithic plough marks. Since skeleton 575 is well dated between 2580 and 2234 cal BC (cf. table 1), the first plough marks are younger than that.

Plough marks were encountered everywhere, but recorded only by means of photography. The western end of the

Figure 19 Impression of the March 1978 campaign. Top left: J.D. van der Waals (left) and B. Wubbels (right) in the van of M. Sijpkens Smit we used as shed. Top right: V. van Vilstern (left) and P. Banga (right) standing on the west end of trench A. Below: plough marks visible in the extension of trench A (photos by the first author)

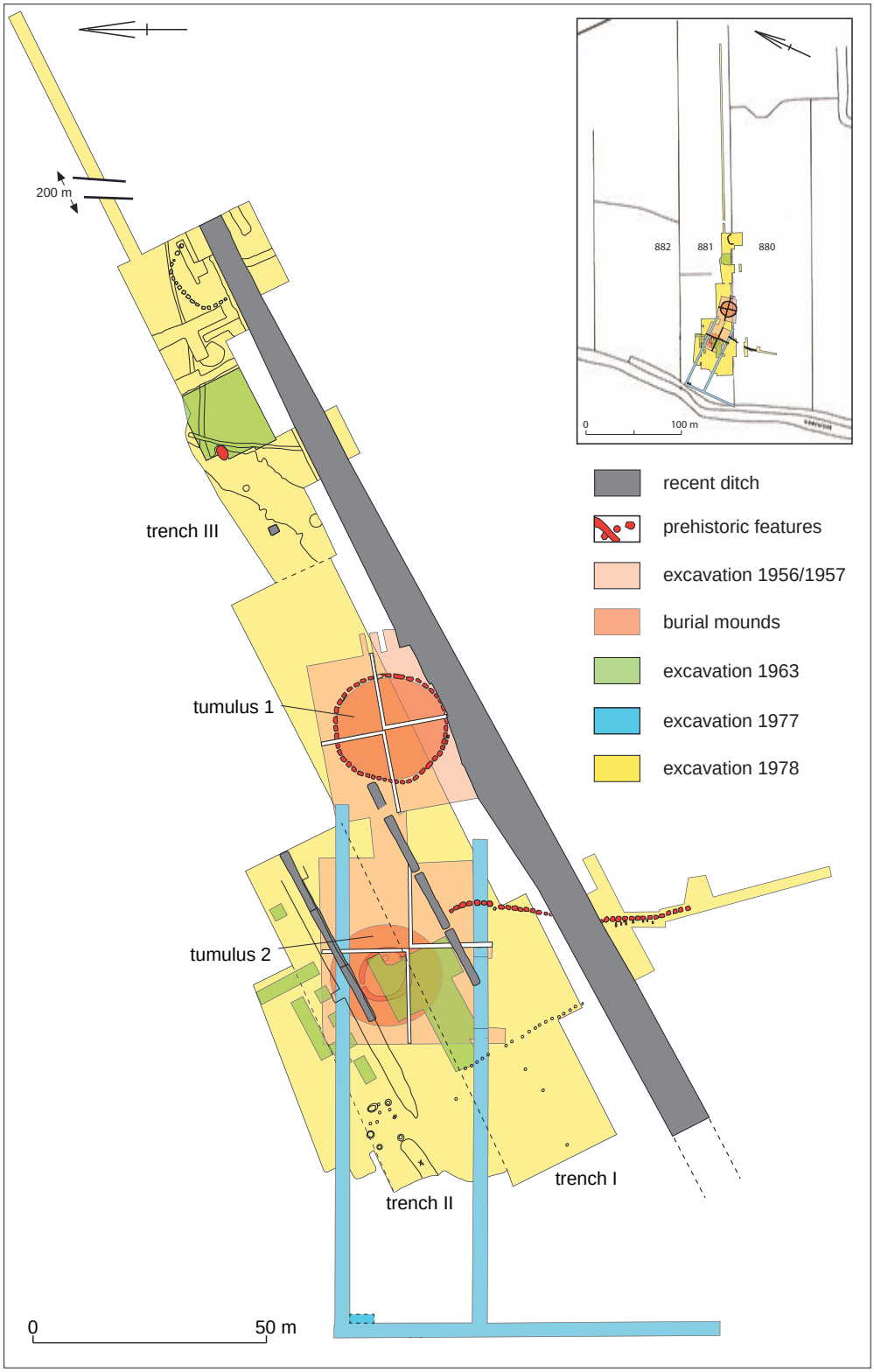


Figure 20 Plan of the different excavation phases and a selection of prehistoric features (modified and updated after Van Heeringen & Theunissen 2005, 306)

	gender	age	state	completeness	length	labcode	^{14}C	+/-	$\delta^{13}C$	$\delta^{15}C$	cal BC	2 σ	dated matter
Tumulus I													
Skeleton 230	male	26-49	reasonable	50-75%		GrA-17225	3440	40			1881-1658	0.997	collagen
											1648-1646	0.003	
Skeleton 231	male	36-49	reasonable	50-75%		GrA-17226	3450	40			1883-1665	1.000	collagen
Tumlus II													
Skeleton 127	n.a.	13-18	reasonable	50-75%		GrA-15602	3500	50	-20.89	14.40	1945-1692	1.000	collagen
Skeleton 228	male	26-35	good	50-75%	169.9								
Skeleton 229	male	26-35		25-49%		GrA-6477	3640	50			2188-2183	0.005	collagen
											2141-1887	0.995	
Skeleton 230 *extra*	male		good	(gender based on DNA evidence)									
Skeleton 232				50-75%		GrN-8801	3530	25			1934-1771	1.000	collagen
Skeleton 233	male		good	<25%									
Skeleton 235	male	26-35	very good	50-75%	161.4								
Skeleton 236	male	36-49	good	50-75%		GrA-15598	3660	50	-20.01	13.10	2196-2170	0.036	collagen
											2146-1903	0.964	
Skeleton 239			reasonable	50-75%	181.4	GrA-15601	3520	60	-20.09	14.70	2018-1994	0.026	collagen
											1981-1692	0.974	
Skeleton 242 / 533	male	26-35	good	25-49%	179.2	GrA-15597	3690	60	-20.16	14.00	2278-2251	0.026	collagen
											2211-1914	0.969	
Skeleton 243	female	36-49	reasonable	>75%	163								collagen
Skeleton 247	female	26-35	good	25-49%	167.3								collagen
Skeleton 575 "Jan"	male	26-35	very good	>75%	176.1	GrN-6650C	3945	55			2579-2284	0.992	collagen
											2247-2234	0.008	
Pit underneath plough soil t.p.q. mound 2						GrN-25316	3805	25			2336-2323	0.020	charcoal
											2308-2193	0.874	
											2178-2143	0.105	
Charcoal from plough soil underneath mound 1						GrN-797	3025	80			1395-1192	0.926*	charcoal
											1439-1027	1.000	

Table 1 Survey of skeletal and ^{14}C data from Oostwoud-Tuithoorn. Skeletal analysis according to Veselka; ^{14}C data from Van Heeringen and Theunissen 2001, and Van der Plicht 2002

trench was documented with vertical photography (Hasselblad). After 40 years, however, the colour quality of the prints of these photographs is not good enough to reproduce. The negatives probably still reside in Groningen.

The discussions about geology were manifold, but nevertheless inconclusive. It is clear that a pathway that De Weerd thought might have been a small path (field diary De Weerd 1963), was in fact a residual gully filled with very heavy clay.

4 The arable land and settlement remains

One of the aspects that made the barrow excavations at Oostwoud-Tuithoorn interesting was the discovery of plough marks and a plough soil that, based on the pottery and flint found in it, dated to the Late Neolithic Bell Beaker culture. This arable land, its meaning, the several phases in it, and its relation to the barrows or a possible settlement, has been the focus of all excavations at Oostwoud. Especially in 1963 and in 1978, the arable land was leading in the excavation strategy but the plough marks were a special research object in 1956 and 1957 as well. This had several reasons. The discovery of Late Neolithic or Bronze Age arable land was a rare find and therefore interesting in and of itself. In 1956, but even in later years, sites with Neolithic plough marks, let alone with a preserved prehistoric plough soil were scarce. The plough marks provided information on various aspects of prehistoric life. Firstly, the excavations at Oostwoud could provide insight into the extension of the arable land and the size of Neolithic plots. Secondly, the plough marks could be used as relative dates for features underneath the burial mounds. Lastly, the ceramics, bone, and flint fragments in the prehistoric plough soil gave insight into waste behaviour, and material culture of the prehistoric inhabitants.

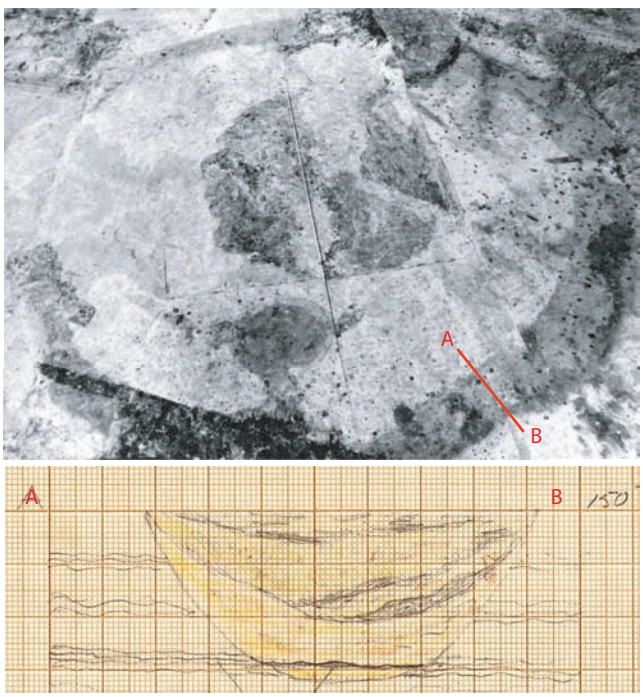


Figure 21 The ditch around burial 575 as was discovered in 1978. The disturbance in the centre is the pit dug to extract skeleton 575 in 1963. Below that a round feature is a pit with charcoal layers dated between c. 2300 and 2200 cal BC. The straight line with dark fill cutting the ditch on the underside of the photograph is the remains of the mid-north section dam of Van Giffen (photo H. Fokkens). Below: detail of the section drawing by J.H. Zwier (BAI) of the ditch, location of the section indicated with A-B

4.1 Extent and phasing of the arable land

The various excavators have explicitly explored the extension of the arable land. The question of whether different plots were visible was also a specific issue in the 1978 excavations. Trench III, which is the 40 meter long extension east of the barrows, was aimed at finding out the size of the arable land and whether parcel ditches could be found (field diary Lanting 16 June). Indeed, the plough marks continued, 'locally even in two levels, one of marks filled with black soil in a brown plough soil, and below marks filled with brown soil in the yellow subsoil'. This is in accordance with what De Weerd also had documented (fig. 22). There was also a ditch-like north-south oriented feature in this area that was first considered to have been a plot division (visible in figure 20 on the eastern side of the trenches). Lanting made a small trench south of the recent ditch to study its trajectory, but found that it ended. On the 21st of June, Lanting describes how they discovered that the vague feature traversing this end of the trench (trench III) was in fact a residual gully filled in, and that the 'ditch' is probably a natural feature associated with it. In any case, Lanting writes 'Now this "residual gully" has been found, it is not remarkable that to the west of the "parcel ditch" no plough marks occur' (field diary Lanting 21 June 1978).[9] After a discussion with J.A. Bakker on the phone, he decided to extend trench III 200 m further to the east 'without looking for plough marks' in order to look for parcelling ditches (fig. 20). 'This yields, to our relief, nothing' he remarks (field diary 27th of June), probably because finding parcelling ditches would have meant that further research might have been necessary, which time and money did not allow.

When all data is combined, the different observations show that the arable land stretched over a distance of at least 500 meters in east-west direction and about 70 meters in north-south direction. Parcelling ditches were not found. The

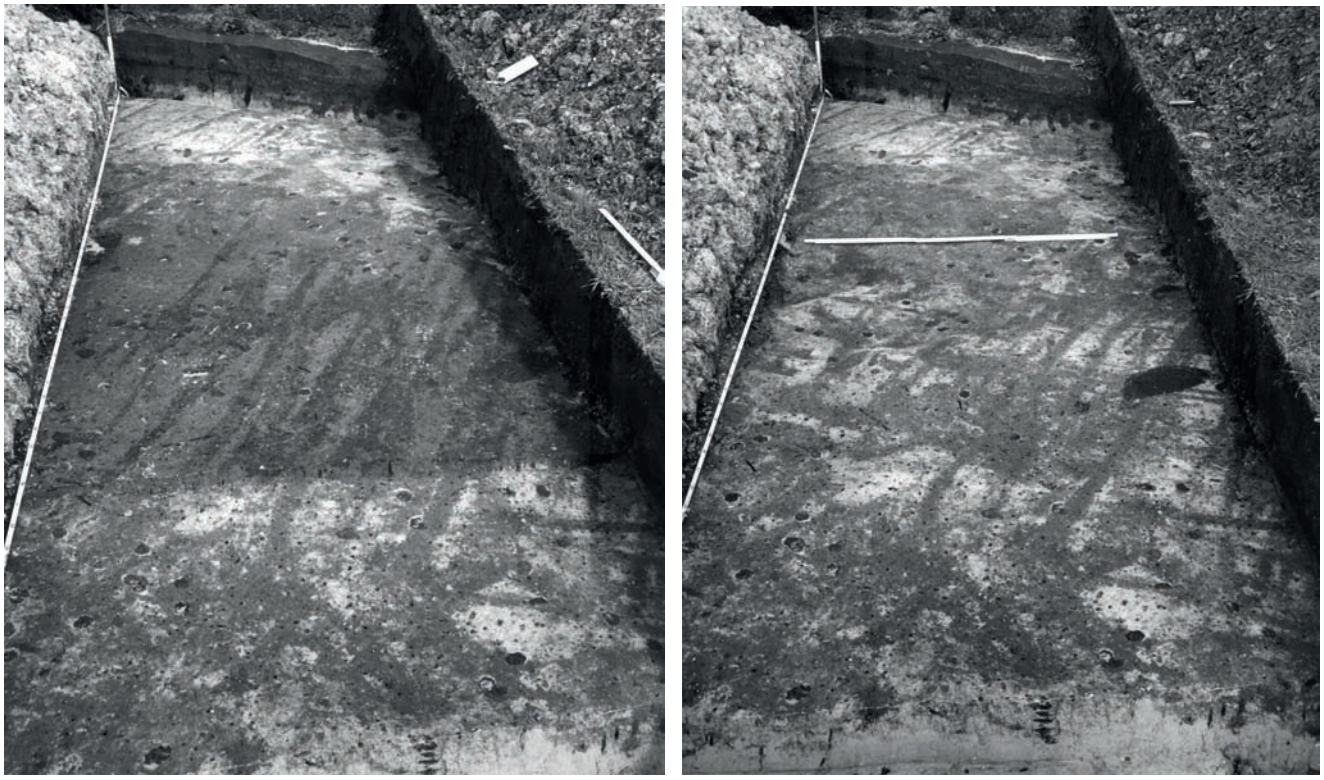


Figure 22 Two levels of plough marks in the same trench photographed by De Weerd in 1963

orientation was more or less the same in the entire excavated area. This implies that we are dealing with a large plot of arable land. This does not necessarily mean that the entire area was in use at the same time, but it is clear that both in the east and in the centre of the excavated area, which are over 300 meters apart, there were two layers of plough marks visible in a very similar fashion (fig. 22). The two levels were not far above each other. The easiest way to describe the situation is that there was a dark stained 'Bell Beaker' plough soil as it was called by the subsequent researchers. In the section drawings made by Praamstra it is clearly marked, including the plough marks 'hanging' under it (fig. 24). These were visible as dark lines in the yellow subsoil (fig. 23 left).

The top layer of plough marks was not visible everywhere, but where it was present; it was manifested as relatively wide marks filled with dark soil against the dark background of the older plough soil. Underneath tumulus II the two layers became particularly visible because the younger, wider marks were curved and indicated the outlines of the actual barrow (cf. fig. 15a). Underneath tumulus I, they were wider and sometimes curved (field diary Van Giffen).

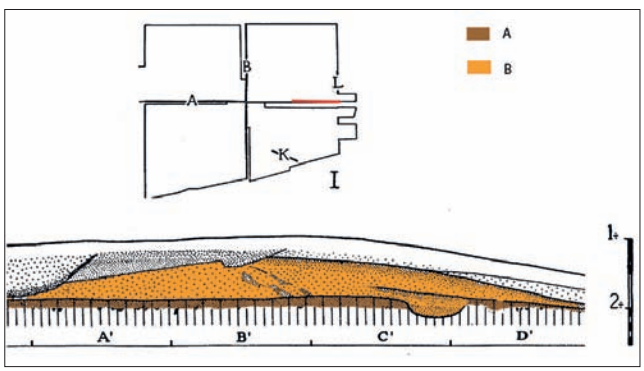


Figure 23 Detail of the ink drawing made by Praamstra of the eastern part of the w-e section through tumulus I. A: burial mound; B: plough soil with in black plough marks hanging underneath. Plough marks are visible also outside the mound on the right side. The limits of the mound are marked by the pit between C and D that cuts through the ancient plough soil (modified after Van Giffen 1962)

4.2 Time depth of the arable land

The plough marks underneath tumulus II gave rise to a discussion about dating. Van Giffen consistently talked about Bronze Age arable land, but others also about Bell Beaker arable land. One of the factors contributing to a solution was provided by the discovery of burial 575 in 1963. It is clear that this burial was not yet visible on Van Giffen's plan (fig. 15a, see also fig. 13). The plough marks continue over that grave, so it must be older. The grave itself dates between 2580 and 2234 cal BC (at 95.4% probability), therefore this burial provides a *terminus post quem* for the arable land. Lanting adds to this that the ditch around grave 575 was (unknowingly) drawn by Praamstra in section C and D of tumulus II, in which the arable is seen to continue over the ditch undisturbed (Lanting and Van der Plicht 2002, 87; fig. 24). In addition a 1 m wide pit was discovered east of the burial that had not been noted by Van Giffen and apparently was covered with plough marks as well. De Weerd has documented it, but left it unexcavated. It was most probably dated to the period between 2337 and 2143 cal BC (Lanting and Van der Plicht 2002, 87; Table 1). Combining both dates as a *terminus post quem* for the arable layer indicates that the arable layer must date to or after the period between 2284 and 1994 cal. BC (at 95.4% probability).

When the area was ploughed, the 'coffin' must have been completely covered by and filled in with soil. Even though burial 575 appears to have been a 'flat grave' the place may have been marked or otherwise remembered. This is demonstrated by the fact that other burials were placed in the close vicinity after the area had been ploughed, but possibly also before. The reason we suggest this is skeleton 242/533 – which now has been proven to constitute one skeleton – was torn apart in Prehistory and partly re-buried when it had not yet been decomposed. We suggest this was the result of ploughing over this grave one or two generations later, when the exact location was forgotten. This would imply it was a flat grave too, inserted before a barrow was built over the area. De Weerd, however, has noted that some of the bones of skeleton 533 were lying on and in the plough soil, so ploughing already had occurred when the grave was dug (field diary De Weerd 31 July 1963).[10] We will discuss this in more detail in section 5.

Most of the other skeletons were found on a higher level than the arable land, of which the top had an elevation of 140-145 cm below Dutch datum (NAP). Most burials lay higher according to the field diary. Skeleton 235, 239, and 242 were found at an elevation between 138 and 133 cm below Dutch Datum or in a pit cutting through the plough marks (243). We have projected the known elevations in the section drawing of tumulus I and 2 which demonstrates this (fig. 25), in addition the images of the SW quadrant show that the skeletons were situated above the level in which the skeletons became visible (fig. 11 and fig 13, fig 26). In 1957, only a few blurry photographs were taken of insufficiently prepared surfaces, so of those skeletons we know little more than what the find list in the field diary indicates.

How often the arable was ploughed is not clear from the drawings. This is a matter of discussion anyway. What can be observed may be the result of occasional (deep) ploughing, rather than the yearly sequence. The latter then must have entered the plough soil less deep. Especially in the case of tumulus II, a second and a third set of plough marks is visible (fig. 15a; fig. 39). These are the bundles of curved marks that seem to demarcate a circular area within which all skeletons are located (fig. 27; fig. 39). This has led to the idea that at some point a (low) burial mound was erected over the burial area that was subsequently avoided during

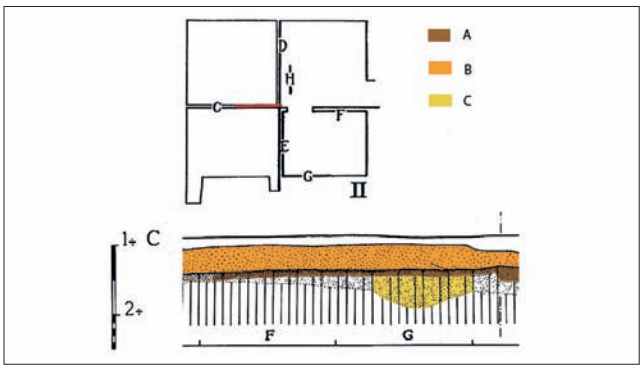


Figure 24 Detail of the ink drawing made by Praamstra of the western part of the w-e section through tumulus II. A: burial mound; B: plough soil with in black plough marks hanging underneath; C: probable ditch around burial 575 (modified after Van Giffen 1962)

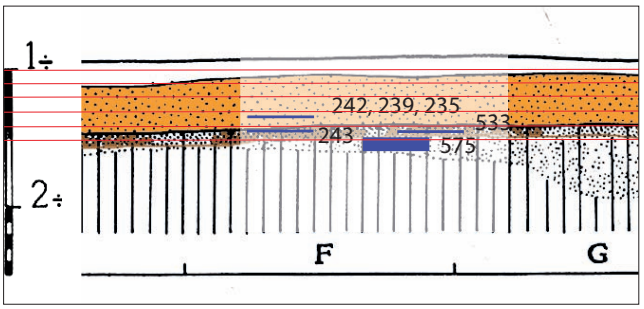


Figure 25 Known elevations on which the skeletons were found plotted on the section drawing of Praamstra

Figure 26 The SW quadrant of tumulus II, photographed from the west, showing on the foreground skeleton 228, against the section 229, and to the right 127

ploughing (*e.g.* Lanting and Van der Plicht 2002, 87). We subscribe to that idea and suggest that bundles of plough marks like the ones visible in figure 27 are the result of one plough event parallel to the mound. Cross ploughing would be difficult as that would infer that the team of draught animals would have to draw 'up-hill' when ploughing towards the mound. The result is indeed bent bundles of plough marks on either side of it, rather than sets of plough marks around the mound. The mound itself should projected at *c.* 2 meter distance of the last mark, as the team of draught animals would otherwise have had to walk on the mound, while the other was still on level terrain. That is not impossible, but less plausible (cf. fig. 39).

Lanting thinks that a third set of plough marks demonstrated that the mound was enlarged to the south by *c.* 4 meters (m (fig. 15a; fig. 39). Since all burials date to the end of the Late Neolithic or the Early Bronze Age (table 1), the extension of the barrow should, logically, also have occurred also in that period. Moreover, the same kinds of plough marks, in two different phases, are present underneath tumulus I according to Van Giffen (field diary). As the burials in that barrow date to the Early Bronze Age, the second phase of arable land must antedate those burials. In addition, the pits surrounding tumulus I clearly cut through the plough land. Our conclusion therefore is that the second phase of plough land must date to the very end of the Late Neolithic or to the Early Bronze Age as well, somewhere between 2200 and 1900 cal BC. This contradicts a date of the plough soil sampled by Van Giffen, which yielded a date between 1439 and 1027 cal BC. This is far too young. The pit from which this sample was taken must have been dug in the Middle or Late Bronze Age, but we conclude that it does not date the arable land proper (cf. table 1).

4.3 Settlement evidence

The argument for an early date of the plough land is completely in accordance with the finds from the arable: many very small potsherds, all with a clear Bell Beaker signature typology, some with Early Bronze Age decoration techniques, but still with Bell Beaker decorative motives. Middle Bronze Age pottery was not recognised. The Early Bronze Age decorative motives include barbed wire stamp

Figure 27 Detail of a bundle of plough marks in the sw part of the sw quadrant (see also fig. 13)

impressions and circular impressions made with a hollow stamp (bird bone or reed), characteristic for the Early Bronze Age. Van Giffen's selection of material also shows the presence of potbeaker material (fig. 28a and b). The complex is what one would expect on a Bell Beaker or Early Bronze Age settlement site. Comparable settlement complexes were present at for instance Schokland-P14 (Ten Anscher 2012), Molenaarsgraaf (Louwe Kooijmans 1974), Barendrecht-Carnisselande (Moree *et al*. 2011), Houten-Vleugel 20, and Oldeboorn (Fokkens *et al*. 2016). Flint artefacts have been found as well, such as button shaped scrapers (fig. 28a). The material, especially the flint, should be studied in more detail, but so far it has not been possible to study all finds discovered in the various campaigns in coherence. The pottery is indicative for an early dating of the prehistoric plough soil in which it was found for a date between 2000 and 1900 cal BC (Fokkens *et al*. 2016, 286 ff.).

None of the excavators discusses why these potsherds were present in the arable land. Generally, it is assumed that these represent household waste that was brought over the arable to fertilise it, possibly mixed with manure. Recently research has started to actually study this assumption (Bakels in prep.).

Apart from sherds in the plough soil, a few large pits have been documented. One of those has already been discussed: it was located next to burial 575 and was probably not much younger. Lanting has excavated this feature and states it to contain layers of charcoal (Lanting and Van der Plicht 2002, 87; cf. fig. 21). Whether or not this feature is a normal settlement pit is hard to determine. We know more of such charcoal filled pits in Late Neolithic and Early Bronze Age settlement context, but in general these are larger. On the other hand, at Schokland-P14 a small cemetery from the same period also contains two of such pits, similar in size

and dating to the exact same period (Ten Anscher 2012; Fokkens *et al*. 2016, 107). There we suspect that these pits are related somehow to the burial ritual or to the ancestor rituals that may have been carried out after the burial. The large feature in the n-e quadrant is a younger pit (cf. fig. 15a). Praamstra states that it was filled with 'knikklei', which at the time was the name for heavy clay that was thought to be of medieval or later date.

The pits visible near and underneath tumulus I (cf. fig. 15b) are not all of the same age. The pit underneath the barrow is clearly cut by the pits surrounding the barrow, but it is dug into the arable layer (fig. 29). Therefore it must be younger than the pit near burial 575, but it is still an Early Bronze Age or Late Neolithic pit.[11] The two pits outside the barrow are of a much later date. Van Giffen discussed them in his field diary in the context of Medieval Pingsdorf pottery. Initially he thought they may have been the remains of sunken huts, but later he states they were just pits (field diary Van Giffen 8th of May 1956).

De Weerd discussed a Bell Beaker house, Bell Beaker post pits and a possible path (with a layered fill) in his field diary. However, these claims have never been substantiated. Lanting did not refer to the posts of De Weerd either. The drawings that De Weerd made of these features do not support such a claim. The 'path with layered fill' that De Weerd (field diary 20th of June 1963) documented, almost certainly was a small residual gully; Lanting explicitly stated in his diary (field diary Lanting 14th of June 1978). The conclusion is that a settlement must have been in the neighbourhood, which is attested by many potsherds and flint in the arable land. What the function of the pits that were dug near grave 575 and the one present underneath tumulus I was, is impossible to determine. The row of pits that was found south of tumulus II, is discussed in relation to that barrow.

5 The burial mounds

When the excavations started, two mounds were recorded, both of about 20 meters in diameter. Section dams were positioned over their centres and they were excavated in quadrants. The plans and sections show that for tumulus I the construction type was unmistakeable: the barrow was built of sods and surrounded by a circle of 'post' pits or 'pseudo post pits' as Van Giffen started to call them because post shadows were invisible (fig. 29, 30, 31).

For tumulus II the situation is different. In the sections a barrow is difficult to indicate, even if the area is clearly elevated. We must assume that over the ages the top has been eroded and as a result, the mound 'moved' to the southeast. This can be deducted from the position of the sections that Van Giffen has projected on tumulus II. The place where the sections meet must have been in the centre of the mound that was visible in 1956, but this actually is completely off centre in relation to burial 575 and to the mound indicated by the plough marks. On 2 May 1956 Van Giffen writes 'until now no barrow limits, other than in the bending of the plough marks.'[12]

5.1 Tumulus I

Tumulus I appears to have been surrounded by a pit circle of 20 meters in diameter (figs. 15b; 34). The pits were substantial (50 × 50 cm) and preserved 15 – 30 cm deep. At a slightly higher level of the excavation, individual pits connected in a circular ditch (fig. 31). Praamstra describes them as having a laminated fill near the bottom. He thinks they were left open for a while. Van Giffen says that the posts had probably been extracted, after which the pits were filled in (cf. Van Giffen 1962, 199). The fact that the fill of these pits had the same homogenous consistency and colour indicates this was not the result of a long natural process. Rather, we assume they were all filled in by hand after extraction of posts, if indeed there were any; the west Frisian Bronze Age is known for many pit circles that possibly never contained any posts (Roessingh in prep.).

According to Van Giffen, a primary central grave was absent in this burial mound. Since in the West-Frisian clays organic material should preserve well and since the original plough soil was still present, Van Giffen concluded that the monument must have been a cenotaph in origin (Van Giffen 1962, 199). Even so, a burial was found in the centre of the mound, but in the top part of it (skeleton 230; fig. 41). This was considered a later interment belonging to a second period of use of the mound (Van Giffen 1962, 201). In the southwestern part of the barrow another internment was found, which was also considered to have been a later burial (skeleton 231; fig. 41). Finally, in Tumulus I, the skeleton of a pig was discovered (cf. fig. 9).[13]

The photographs taken show that both skeletons (230 and 231) were laying stretched on their backs, a typical position for Bronze Age burials in NW-Europe (fig. 41). Charcoal present in the plough soil underneath the burial mound was dated to between 1400 and 1000 cal BC, but analysis of the skeletons showed that both were much older than the charcoal date of the plough soil appears to indicate. The centrally placed skeleton (skeleton number 230) probably dates between 1881 and 1658 cal BC, the other (skeleton number 231) between 1883 and 1665 cal BC (table 1). Both skeletons therefore date to the Early Bronze Age, suggesting that the charcoal collected by Van Giffen somehow must have been intrusive. There were no grave gifts that can support or contradict an Early Bronze Age date.

Theoretically there is a possibility that the skeletons are younger due to the reservoir effect: they most certainly had fish in their diet in addition to grain and meat. This effect

Figure 28a Finds from the arable land underneath and around the burial mounds. A: 'true' Bell Beaker material (drawings: Van Giffen 1962; photographs from the protocolboek of M.D. De Weerd); B: Early Bronze Age sherds; C: flint artefacts; scale as indicated in fig. 28b

Figure 28b Unpublished potbeaker and Early Bronze Age potsherds drawn on behalf of Van Giffen by H. Praamstra (from documentation at the BAI, now transferred to the Provincial Archaeological Depot Noord-Holland at Castricum)

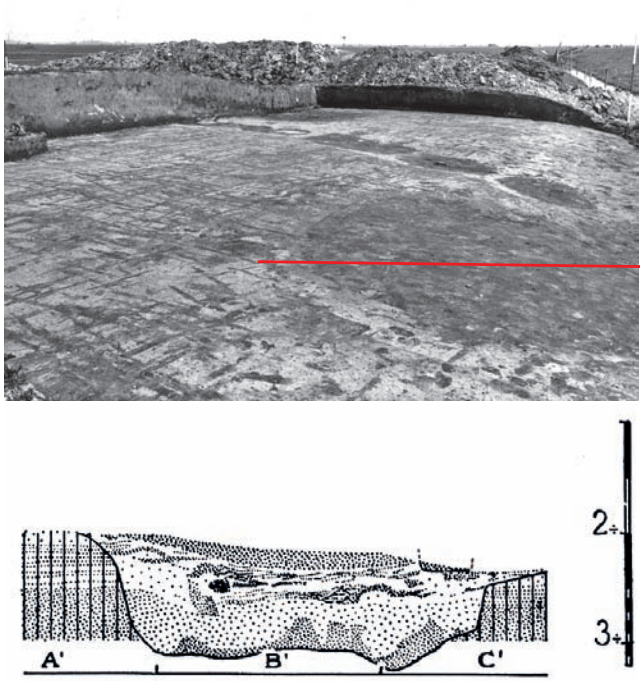


Figure 29 Large features in the se quadrant of tumulus I cut by a pit belonging to the pit circle around the barrow. The profile drawn by Praamstra is projected underneath (drawing from Van Giffen 1962); position indicated by the red line

Figure 30 Van Giffen presenting north section in the SW quadrant of tumulus I to his audience. In the barrow sods are visible, placed in an angle of about 45 degrees on a dark layer which is the Neolithic plough soil

can to some extent be estimated by looking at the $\delta^{13}C$ and $\delta^{15}N$ values of the collagen. The $\delta^{15}N$ values normally range between +13,2 - +16,3 and the $\delta^{13}C$ values between -18.2 and -19.5 (Cook *et al*. 2001, 457). Lanting and Van der Plicht (1998, 155) have analysed 81 prehistoric humans from the Netherlands; these yielded an average of -20 ± 0.86 pro mille. Humans that largely live on marine food show $\delta^{13}C$ values of -13 ± 1 pro mille (Lanting and Van der Plicht 1998, 155). In Table 1 these values have been listed for some of the skeletons of Oostwoud-Tuithoorn. These show $\delta^{13}C$ values of -20.01 to -20.89, which is in line with the average values cited by Lanting and Van der Plicht. Therefore it is unlikely that the reservoir effect contributed significantly to an older date (see also Lanting and Van der Plicht 2002, 87).

It is possible that different phases of use were present in this barrow. A photograph taken of an excavated pit in front of the section of the south quadrant seems to show that the barrow at some point had extended over the already filled-in pits (fig. 31, 32). This may indicate a second phase of barrow building, possibly related to the burials high up in the mound. The section drawings also appear to indicate, at least on the north side of the barrow, several layers that point to soil formation at different levels. However, these cannot be followed over the entire mound (fig. 33).

5.2 Tumulus II

5.2.1 The sequence

Tumulus II had no post setting or ditch that surrounded the mound. Instead, the original burial mound has become visible because the Bronze Age people ploughed around it (fig. 15a). We have already discussed the history of discovery; here we focus on the sequence of the burials, as far as it can be reconstructed on the basis of the presently available data. The radiocarbon dates that are mentioned in the text are obtained from a Bayesian model that has been derived from the stratigraphy and the sequencing of the events at the site (for the Bayesian model and the keywords that define it (see fig. 36; *cf.* Bourgeois and Fontijn 2015).

From the combined evidence it has become clear that the oldest burial in the area was burial 575, excavated by De Weerd in 1963 (fig. 34, 35). The individual was interred in a chamber-like structure, lying on its left side with the head facing southeast.

A narrow ring ditch with a diameter of about 8 m surrounded the grave (cf. fig. 21; fig. 34). Lanting notes that it had a laminated fill and therefore has remained open for a while (field diary Lanting 28th of June 1978). This happened between 2556 and 2204 cal BC (Table 1; fig. 36). What happened to the soil that came out of the ditch is not clear, but there is evidence that it cannot have formed a low mound of any kind (cf. below). A round pit was possibly dug near

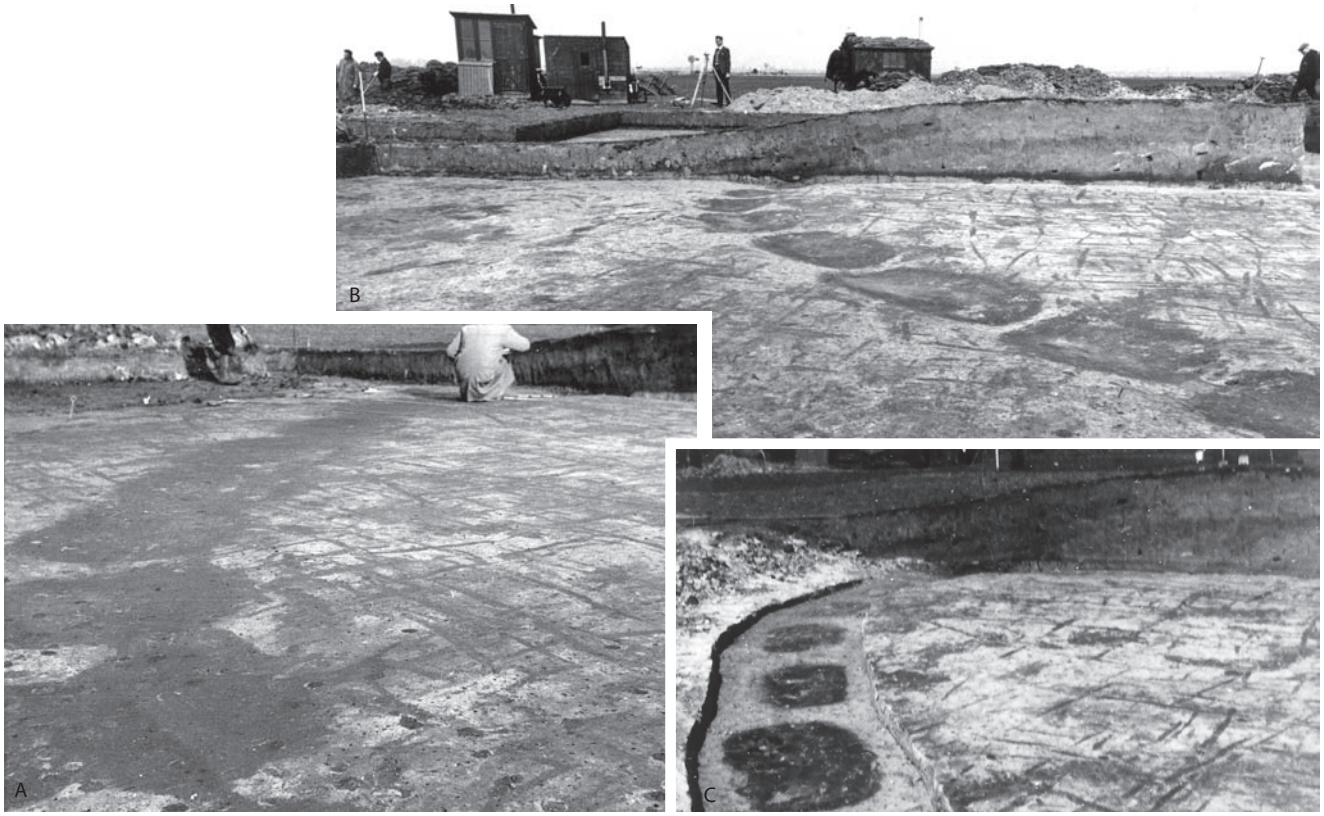


Figure 31 The pit circle around tumulus I at three different levels. A: at a higher level it resembled a wide ditch; B: at a slightly lower level individual pits appeared; C: these pits were of a regular rounded rectangular form. Note that the section clearly shows how the mound in a later stage (or stages) extends over the pit circle

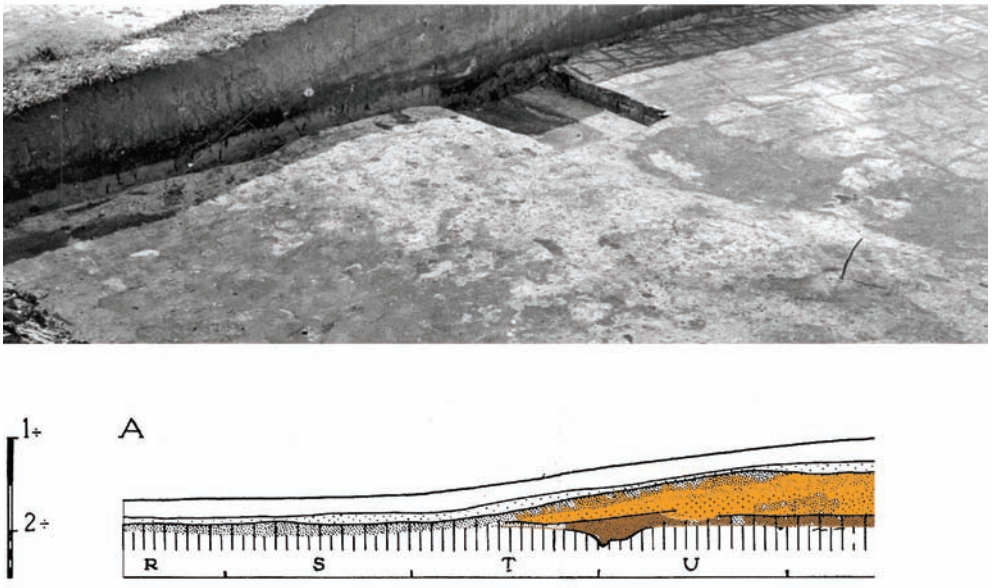


Figure 32 SW section of the south-west quadrant of tumulus I seems to indicate several barrow phases also on top of the already filled-in pit circle

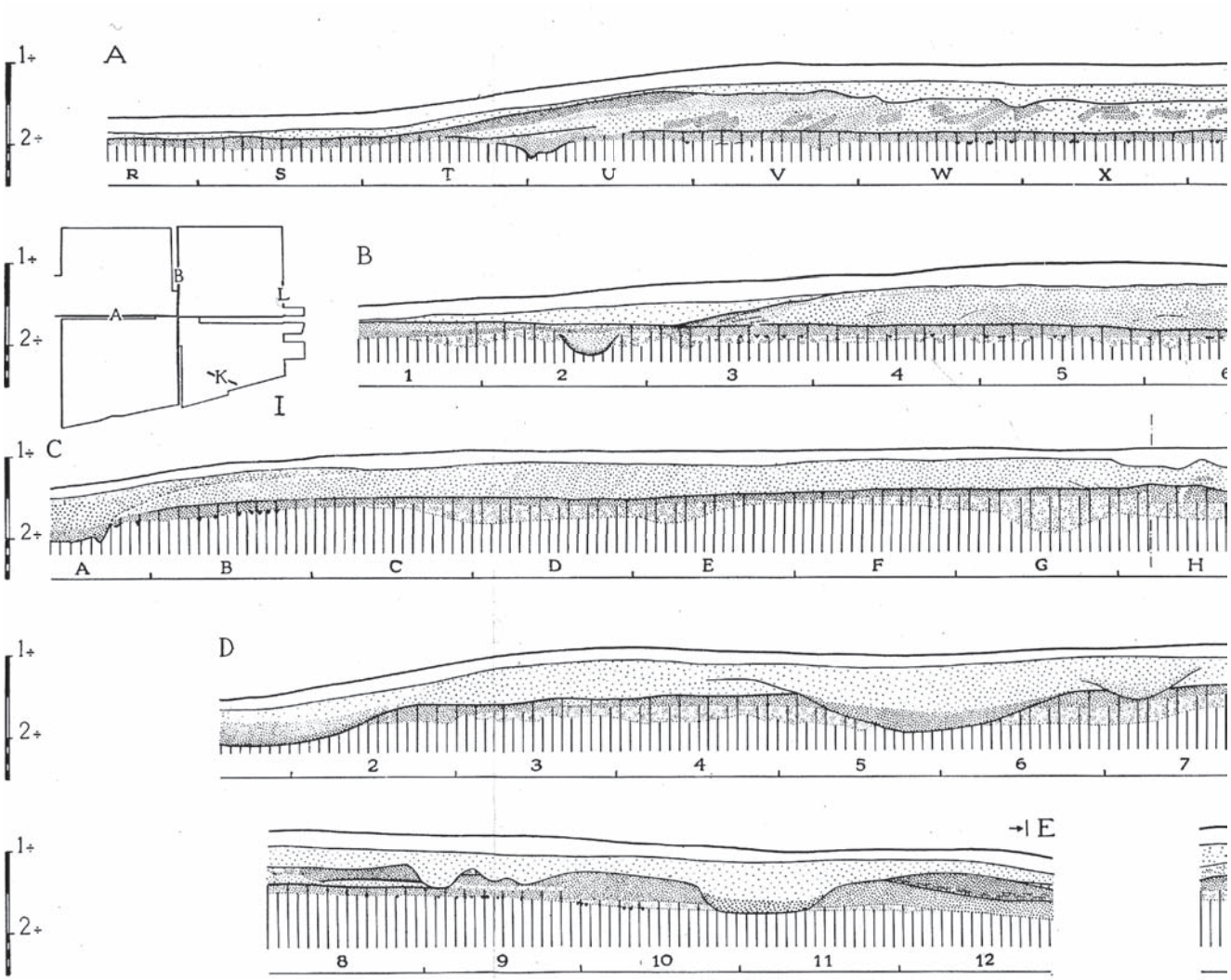
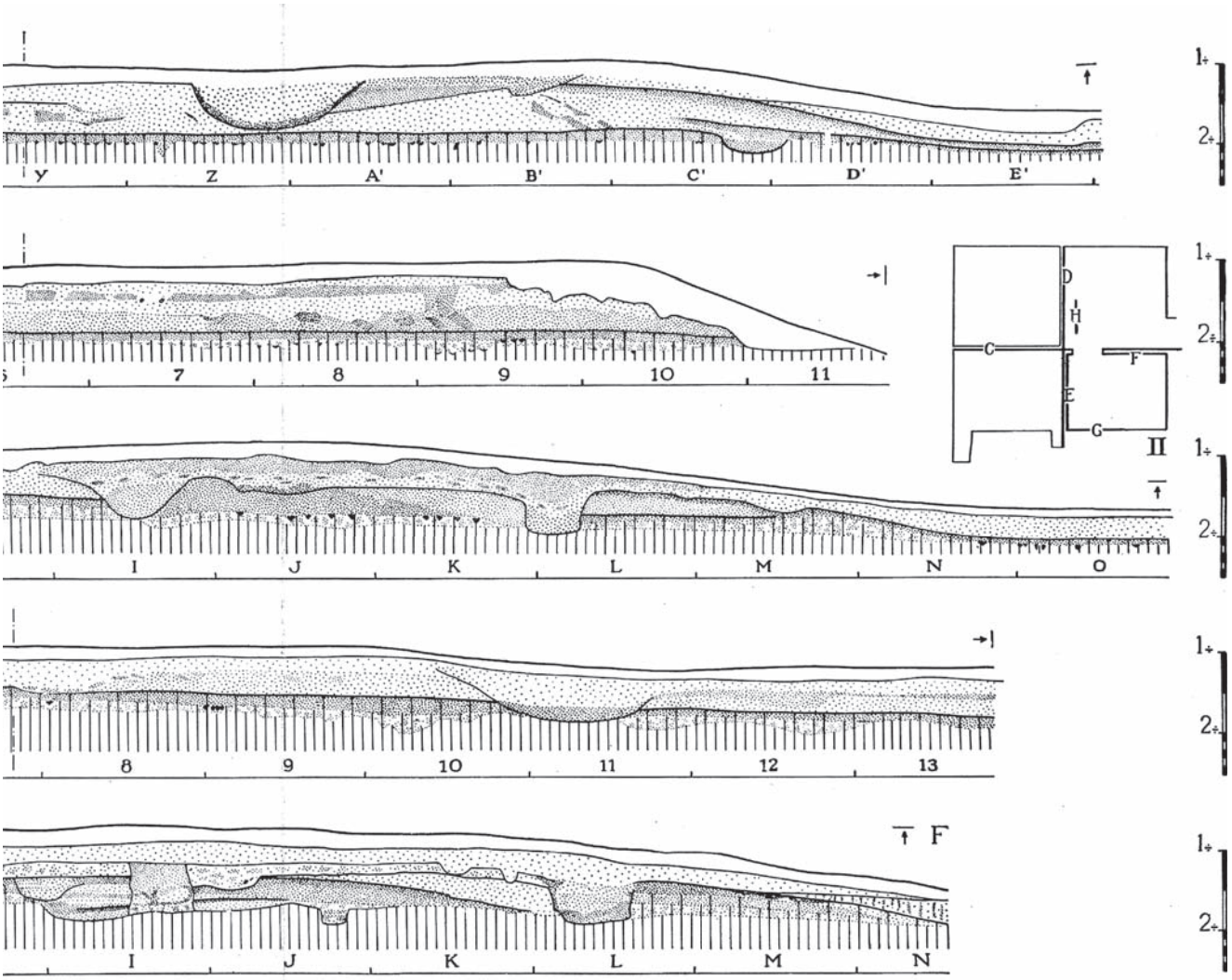


Figure 33 Sections through tumulus I and 2 published by Van Giffen (1962). These drawings are 1:1 copies of idealised field drawings made by Praamstra. These idealised versions were produced in order to make the present ink-drawings possible


Y
Z
A'
B'
C'
D'
E'
7
8
9
10
11
D
H
C
F
E
G
II
I
J
K
L
M
N
O
8
9
10
11
12
13
F
I
J
K
L
M
N
1
2
1
2
1
2
1
2

the grave, in which several times fires burnt, somewhere between 2341 and 2149 cal BC.

After the burial event, the area was converted into arable land and a plough soil formed over the grave (fig. 37). This does not mean that the place was forgotten, because it is quite clear that this very area was covered by a low mound of *c.* 15 m in diameter (in its first stage) and eventually became a cemetery. We do not know the exact sequence in which the different graves were inserted, but we do know that most of them were situated above the arable land. It is not clear which of the graves were covered by the burial mound, or which were actually dug into a mound as a later interment. The latter is unlikely for at burial 242/533 at least, as this burial may have been disturbed by ploughing, and that can only have occurred when no mound was covering the cemetery yet. This hypothesis is the result of a complex set of observations by different people and therefore not the most reliable proof. In order to properly explain how our conclusion was reached, we have to tell the discovery story of skeleton 242 in 1957, and subsequently of skeleton 533/529 in 1963.

Skeleton 242 was discovered in 1957. Knotnerus described it in the find list as 'badly damaged' (field diary Van Giffen 5th of June 1957). The skull is present, as are parts of the arms and ribs, and one part of the leg, but otherwise it is incomplete (fig. 38C). In 1963 De Weerd re-excavated this part of the NW quadrant. In the same area, a little further south, he first observed a peat layer in the 'annex' that is attached to the east side of the mediaeval pit west of 242 (fig. 15A). This pit was already drawn by Praamstra in 1957. It was apparently a relatively shallow pit that had been dug in the Middle Ages or later, and had gradually filled with peat. In the annex, the peat layer rested on the old arable land in which the bones were scattered (fig. 38A). De Weerd first thought this to be the 'discarded remains of a meal', but the photographer (Gijbels) was certain they were human and belonged to a skeleton. De Weerd was confused, because the bones are displaced ('*verrommeld'*) and a clear anatomical position could not be observed. Some of them were concentrated in 'a pit' in which a heap of bones appears 'to have been thrown' according to Glasbergen, who observes this on the 10th of September 1963. De Weerd addressed the bones as a construction 'à la Zadkine' (fig. 38B; field diary De Weerd 11th of September 1963), referring to the famous sculpture by Ossip Zadkine depicting the destroyed city of Rotterdam (after the bombing in 1940). They did not see the contours of a pit; the bones appeared to have been dumped. One of the large bones had already been broken in the past: the distal end had broken off. He expressed his 'surprise' about the fact that the bones occurred just one centimeter underneath the old surface of Van Giffen's excavation six years earlier. This tells us that in fact 242 and the bone found in 1963 were found nearly on the same level (see fig. 13).

But the situation is even more complicated. When excavating these bones in a larger area in order to register the position related to each other (fig. 38D), they discovered that these bones were on top of a complete older skeleton (skeleton 575). It became clear to De Weerd that the scattered bones did not belong to 575, but to 'someone else'. This is why they have recorded this find meticulously (fig. 38D).

A few years later part of the mystery was solved, when Runia took isotope samples of the skeletons. Runia suggested skeletons 242 and 533 to be the same because the remains were complementary and the isotope signatures 'conclusively proved' this (Runia 1987, 39). This has now independently been confirmed by DNA analysis. So, the conclusion is that the soil above 575 was converted into arable land, and that at some point after that, probably between 2284 and 1994 cal BC (table 1; fig. 36), skeleton 242/533 was buried a little south of 575, or possibly laid down on the plough soil and covered with a low mound. We think ploughing continued, and that at some point 242/533 was hit by the plough and torn apart while the ligaments were still intact. This resulted in dispersal of body parts near their original location, but damaged and maybe even trodden into the soil. The chamber around burial 575 must have been filled-up by then, because there is no sign that the plough sank into the chamber; the bones of 242/533 were found on a level just above skeleton 575, not inside the chamber. Lanting suggested that the bones may have been dispersed by a fox because fox bones were found mixed with the bones of 533 (Lanting and Van der Plicht 2002, 86). However, this appears to be unlikely: no gnaw marks were visible, and the body parts appear to have been displaced only one or two meter from each other resulting in parts that were still in articulation. That suggests 'brute' force, such as could be the result of an ard drawn by oxen or cattle. However, conclusive evidence for either of the explanations is lacking.

Our conclusion is that skeleton 242/533 originally was located directly near skeleton 575, on top of the plough soil covering the older burial. According to the model the interval of time between the first events prior to the arable layer and the subsequent burials is between 5 and 181 years (at 95.4% probability). DNA gives us another clue towards dating: skeleton 236 appears to have been a second or third degree relative of 242/533. This means they were probably two or three generations apart: about 30-40 years.

Skeleton 242 was dated to (most probably) 2193-1941 cal BC (95.4% probability), skeleton 236 to 2146-1925 cal BC (table 1). Both were placed close together on top of the arable land covering skeleton 575. Lanting thought that

Figure 34 Two of the 'dream pictures' made by the photographer of the IPP, Fred Gijbels, before skeleton 575 was lifted

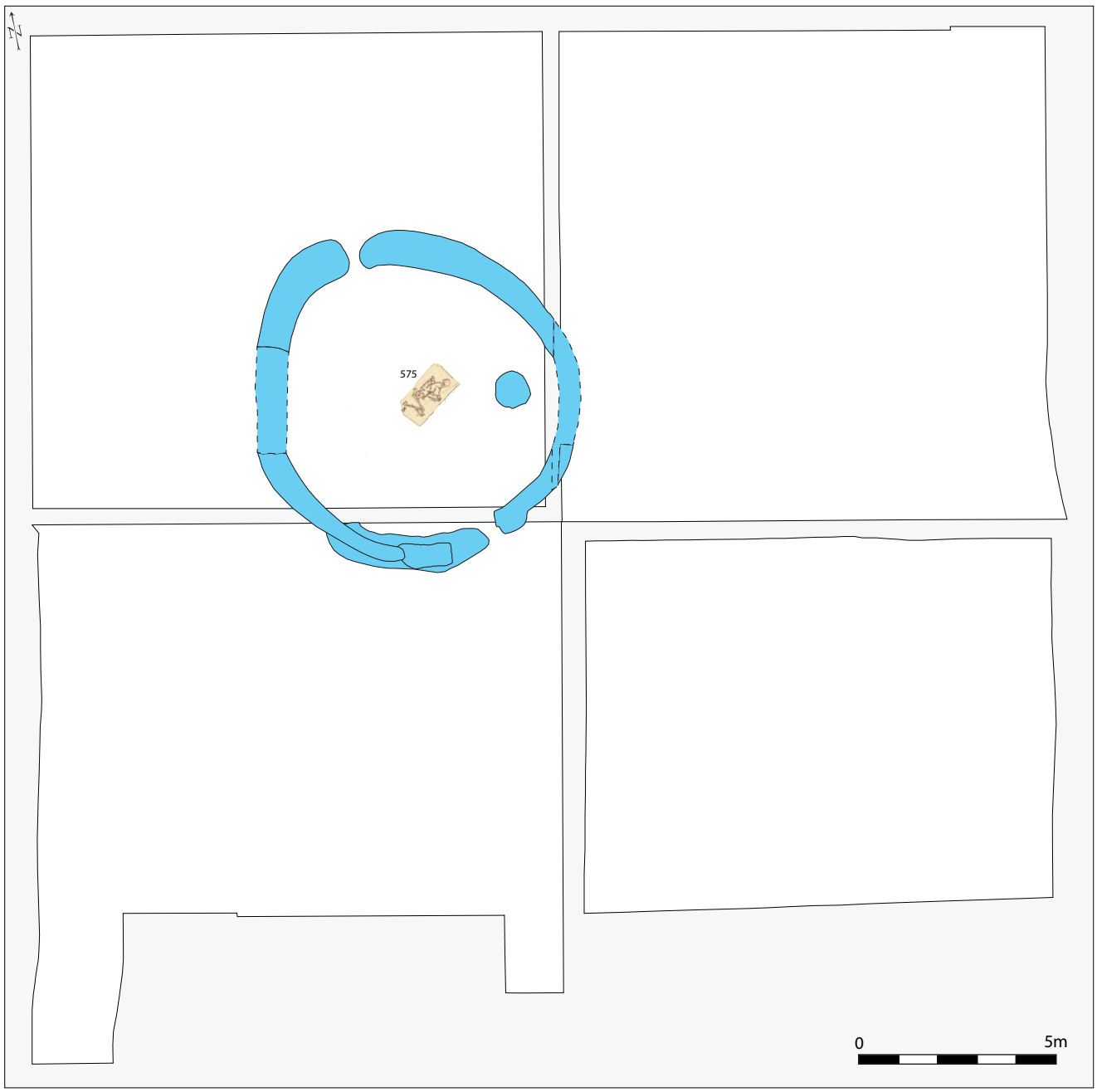


Figure 35 The first burial: a flat grave surrounded by a shallow ditch, the pit nearby was as dug a little later probably

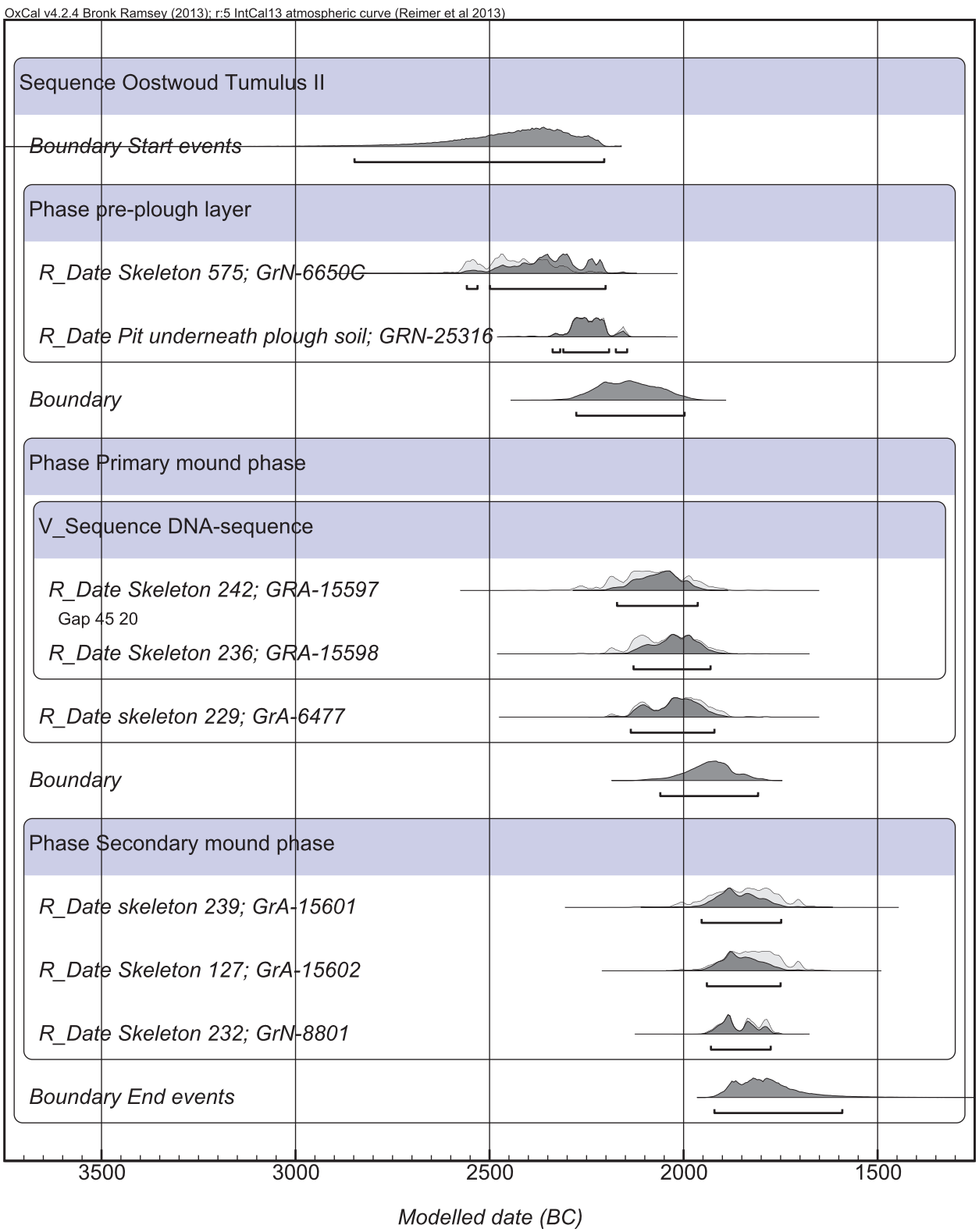


Figure 36 Probability distributions of dates from the burials of Tumulus II at Oostwoud. The model has been constructed with OxCal v 4.2. The square brackets on the left and OxCal keywords define the model exactly

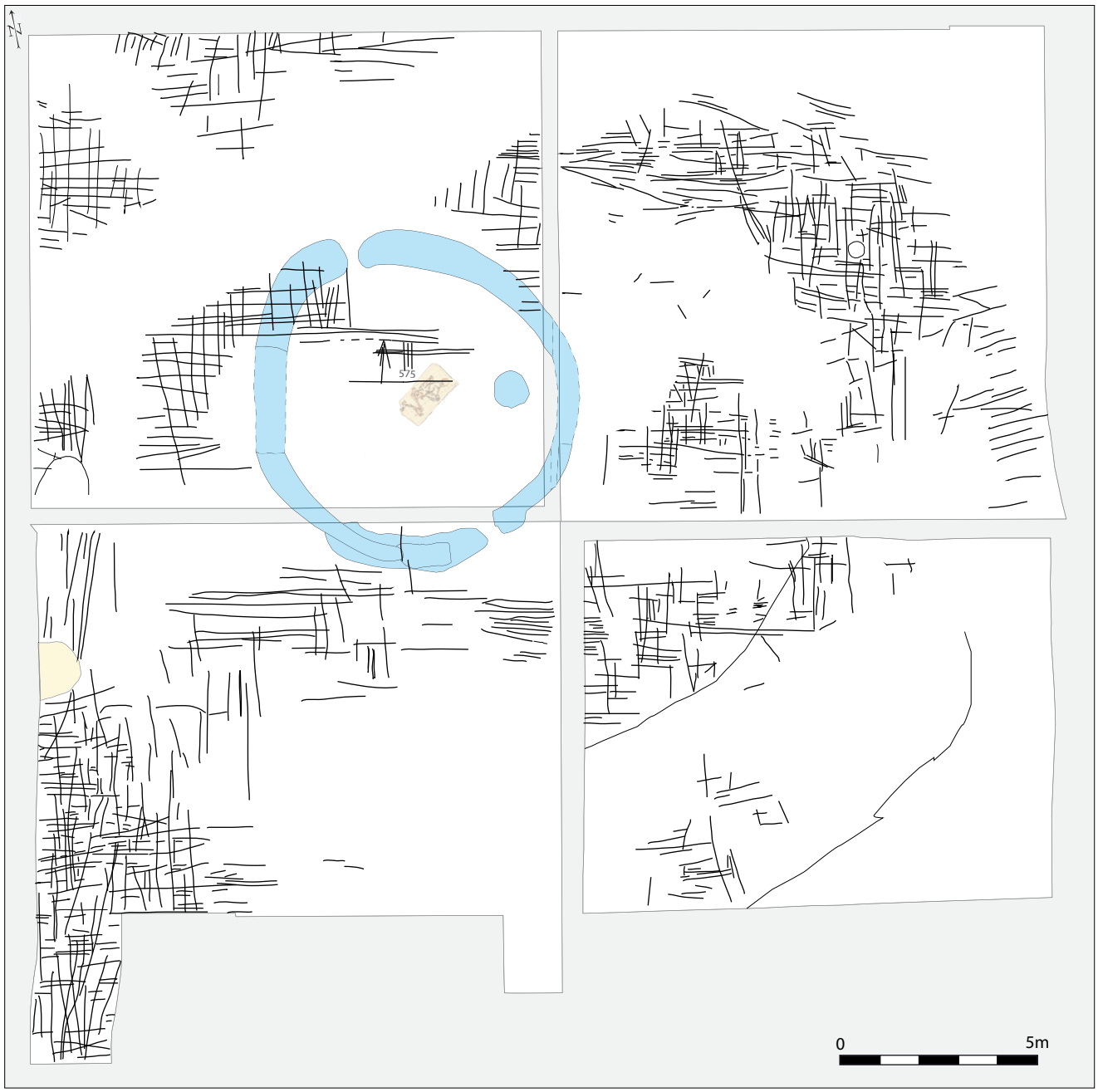


Figure 37 The second phase of events around tumulus II: the flat grave (in a central position within a circular ditch: blue) was covered by arable land, but somehow remained visible or at least remembered.

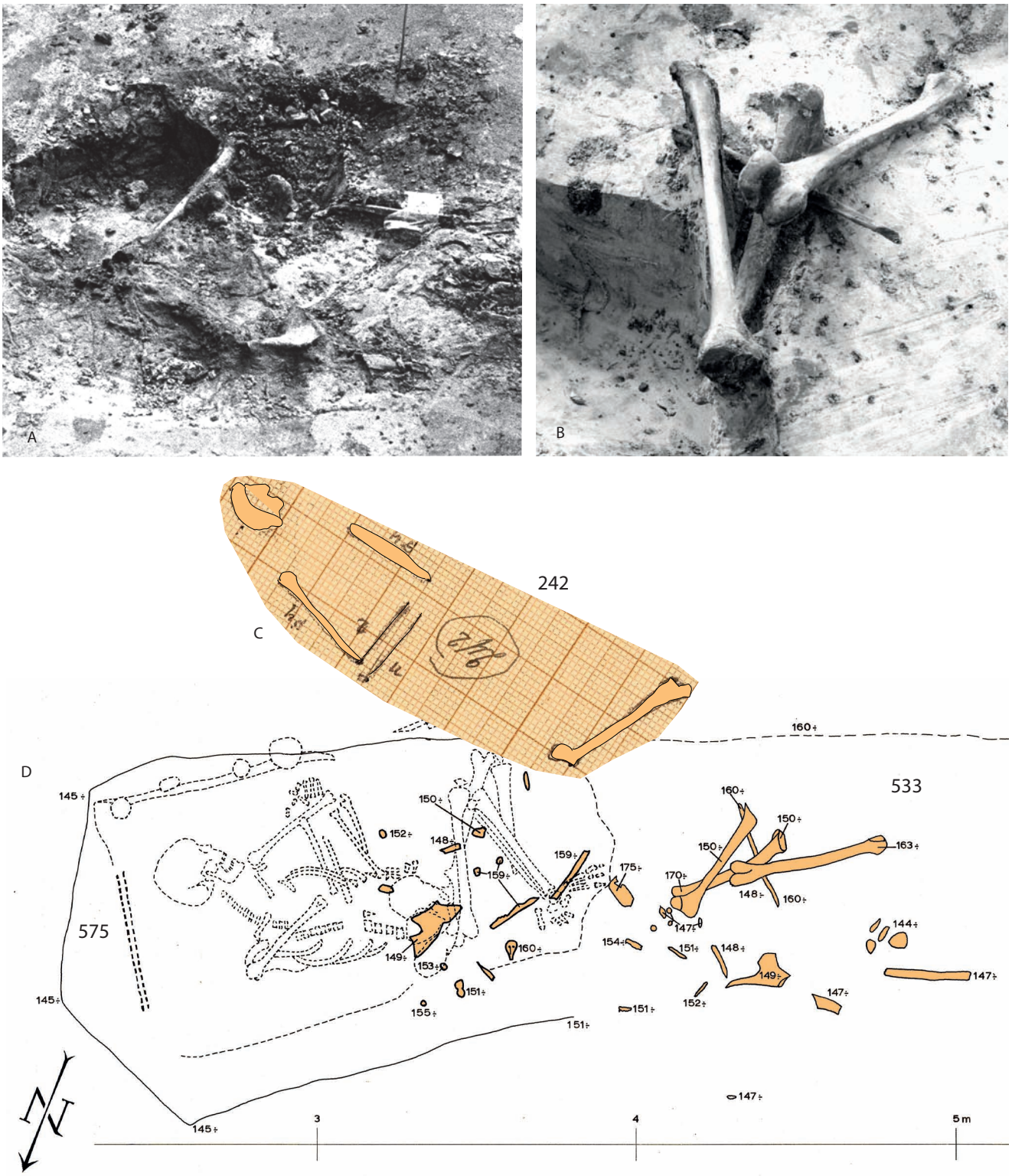


Figure 38 Various images of skeletons 533/242 in relation to the older skeleton 575. A: view of the peat-filled 'annexe' underneath which bones start to appear; B: the construction `à la Zadkine' cleaned before lifting them on 11 September 1963; C: part of the 1957 field drawing of Praamstra with the remnants of skeleton 242 indicated. It is projected on the drawing of the dispersed bones of 533 (and 529) as it was drawn by De Weerd. The numbers indicate depth measurements underneath Dutch Datum (NAP)

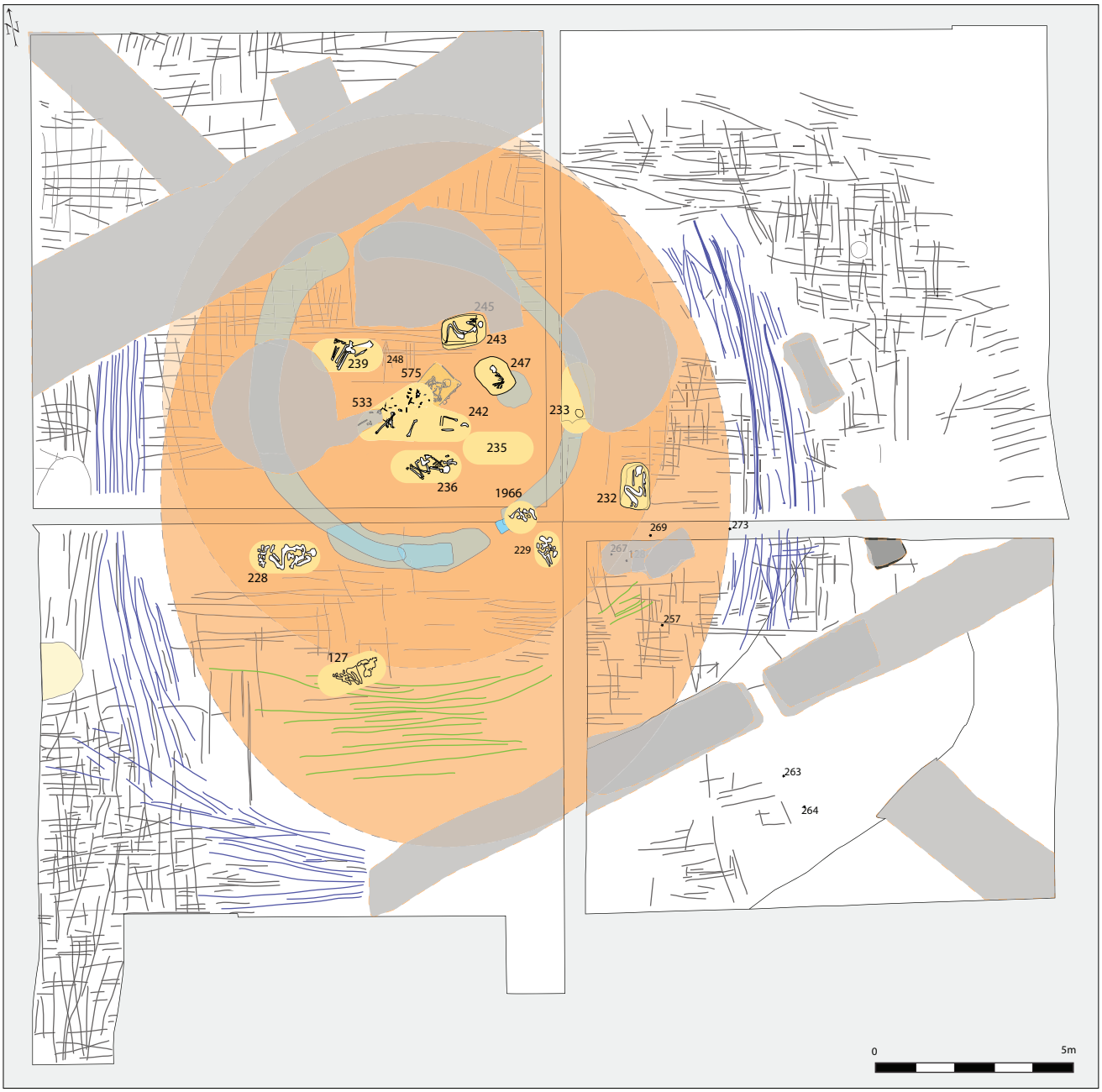


Figure 39 Phase two and three of tumulus II, indicated by series of blue (phase 2) and green (phase 3) plough marks. The grey features indicate relatively recent ditches and pits. The two phases of the mound have been projected at least 1 m within the plough mark bundles because we suggest that a team of draught animals would keep such a distance from the mound

242/533 was the primary grave underneath the first burial mound and that 236 underneath represented a second phase (Lanting and Van der Plicht 2002, 87). This is indeed a possibility, but in this case it might not be realistic to think in terms of primary graves *underneath* a barrow phase, and later interments *in* the burial mound. Since neither tumulus contained a primary grave, we may have to think in terms of a burial platform in which burials were inserted.

The plough marks do indeed suggest two phases. The first phase would have been 15 meters in diameter (fig. 39 blue series), the second phase about 19 meters (fig. 39 green series). Skeleton 127 appears to have been placed just on top of the blue series, which according to Lanting means it just may have been inserted in the first phase of the mound (Lanting and Van der Plicht 2002, 87). In our view this is impossible: it would have been on the very edge of that barrow and have been damaged by subsequent ploughing. Therefore, we suggest that it was inserted in the extended second phase of the mound. In terms of ^{14}C-dates, skeletons 127, 239, and 232 are the youngest (table 1; fig. 36), and probably indeed have been inserted in a mound that had already been in existence for one or two hundred years. According to the Bayesian model all three of these burials can be dated to the period between 1957 – 1752 cal. BC. They were not dug in very deep and were laid down on, or only one decimeter above, the arable soil underneath the mound. It is probable that the graves were all relatively shallow when they were dug.

6 The skeletal evidence, a preliminary report

In this paper we only present the data regarding sex, age, and position of the burials.[14] Most of the bodies underneath tumulus II had been laid down in a crouched position, in a more or less east-west orientation, with the heads facing south (this is true for skeletons 575, 236, 242/533, 239, 228, and 127). This is considered the normal posture for skeletons in Late Neolithic burials. Skeletons 247 and 232 were oriented north-south with the head towards the north and facing towards the west. Only skeleton 243 was facing north. In Tumulus I only skeletons stretched on their back were found, a normal position for the Bronze Age. This probably means that this transformation of burial position took place somewhere in the Early Bronze Age.

Of most of the skeletons 50-75% was preserved, and these remains were in a reasonable or good state. Only two skeletons were more than 75% complete (skeleton numbers 243 and 575), the others were less complete. There is no indication of why body parts may have been missing. In cases where the preservation is good, such as for instance skeleton 236, this incompleteness is hard to comprehend. It is difficult to relate it to selective or careless excavation since all skeletons were supposedly lifted by the same person, Mr. Bijlsma of the Antropobiological Laboratory of Amsterdam University (cf. fig. 13). It is possible that the excavators were predominantly interested in the skulls, and that less care was taken with the other parts of the skeleton. However, it must also be noted that the skeletons were all found by inexperienced workmen, who were taking large spits of soil from the ground. In case of, for instance, skeletons 236 and 229 this probably caused loss of body parts (see below). In the case of skeleton 247, we know that not the entire skeleton was excavated, as De Weerd found additional parts a few years later underneath the original location of the burial. Alternatively, secondary burial rituals may also have been practiced.[15] In some instances, only skulls were found, or skulls were entirely missing, like in the case of skeleton 235. We will discuss this in more detail below.

In the following we present the data on position, age, and sex as has become evident from studying the original documentation and the skeletal remains. In this we follow the skeletal numbers from low (127) to high (575).

Individual 127 was buried on the left side, body crouched, and head facing south (cf. fig. 26). Hands, feet, and axial skeleton were missing. It appears to have been the youngest person buried: age-at-death was estimated to be 15 years ± 1 year. A difference in age estimation was observed between age based on dental development and eruption (Moorrees *et al.* 1963; Ubelaker 1979) and age based on long bone length and epiphyseal fusion (Maresh 1970; Schaefer *et al.* 2009). This could be indicative of stunted growth which may have been caused by illnesses and/or malnutrition in his or her earlier years of life. Individual 127 probably was the last interment in tumulus II. The reason we think this is discussed above: the plough marks around the last phase of the burial mound pass just under the grave.

Skeleton 228 was well preserved (fig. 40). This individual was estimated to be a male aged 26-36 year old, buried on his right side, head facing south. His length was estimated to be 169.9 cm ± 3.27 cm. Curiously one of the hands is situated just below the feet (fig. 40). This was already noted by Bijlsma of the Anthropobiological Laboratory when he lifted the skeleton. Numerous photographs were taken to document this. The reason for the unusual position of the right arm is unclear. The hand appears to have been attached to the distal part of both the radius and the ulna. Based on similar morphology, the right hand appears to belong to 228, but there are no signs that the hand was somehow cut off, or that the manubrium, that was found with it, was forcefully removed. The difference in colour and the sharpness of the edges of the fracture surface suggests the fractures of the radius and ulna to be the result of recent activities. As shown on the photograph, a sharp line is visible in the soil where the radius and ulna are cut off (fig. 40C). Most likely, the

fracture of the right ulna and radius was caused by the excavators. We should remember that these quadrants were excavated in 'spits' by ground workers, not archaeologists. They removed the soil by cutting into the ground vertically with their shovels and then shoveling the soil onto carts drawn by horses (fig. 39D). The arm easily could have been cut then and the remaining part, including the scapula, could have been 'shoveled' onto the spoil heap.

Since the right clavicle, scapula, and humerus are missing, it is possible that the entire right upper limb including the shoulder was removed and placed at the feet. Possibly the manubrium, which is attached to the clavicle, was removed in that same action. The hand and distal parts of the lower arms were still in articulation, suggesting the arm was removed when most of the ligaments were still intact. This could have happened during life, shortly after death or just before the connective tissue decomposed. Unfortunately, the bones from the shoulder are missing. Therefore it was not possible to assess whether the removal of the right upper limb was done with force. The rest of the skeleton was also in articulation, suggesting that the removal of the limb did not disturb the other bones. The position of the bones of the skeleton implies that the grave pit was filled in before decomposition could cause the bones to move from their original position. Most likely, the right arm was removed after death and before the connective tissue was decomposed, although the possibility of the removal of the arm during life cannot be ruled out. The reason why the entire right upper limb was placed near individual 228's feet remains unclear.

Skeleton 229 was partially preserved, with part of the cranium, left torso, left arm, both legs and part of the left foot present. Sex was estimated to be male and age-at-death 25-36 years. His burial position is not indicated on the field drawing, but there is a photograph showing some of his remains very close to the section dam (cut loose from it, actually), being lifted *en bloc* (fig. 41A). This photo and the

Figure 40 Different views of skeleton 228. A: the complete view taken from the north; B: view taken from the east; C. close-up of the arm and hand showing also the cut in the soil possibly made by a modern shovel; D: the practice of removing spoil with horse-carts. On the foreground Mr. Bijlsma near skeleton 228

view of the bloc on which it was preserved (fig. 41B) suggest that a considerable part of the body was cut by the excavators. On the photo the cranium is not visible.

This contributed to the idea that skeleton 229 is part of the same individual as the skeleton that was recovered ten years later by De Weerd in the remains of the m-w section dam (fig. 41C). Unfortunately, the location of remains from '1966' is unknown and therefore could not be analysed. Judging from the photograph of this skeleton, the remains appear to be complementary to 229. If that indeed is the case, it remains unknown why various parts of the same individual were retrieved apart from each other. Unless the remains obtained in 1966 can be located, it will not be possible to improve our understanding of both burials.

Individual 230 and 231 were both estimated to be males of 36-49 years old, buried in a stretched position on their backs in tumulus I (fig. 42).The right arm of individual 230 appears to have been moved and was placed near the surface of the mound. This most likely was the result of a later disturbance. These are in fact the youngest of all skeletons (dated between *c.* 1880 and 1650 cal BC cf. Table 1). They were inserted high in tumulus I, some 40-50 cm above the plough soil underneath the barrow.

Individual 232 was lifted *en bloc* in 1957 (May 17th) and presently is located in the Provincial Depot of Noord-Holland in Castricum (fig. 43). Its state is deplorable, however, and does not allow extensive osteoarchaeological analysis. Bones are glued in the matrix and cannot be taken out. This already was the condition in the 1980's. Runia (1987, 218) describes 232 as: 'Incomplete skeleton, removed *en bloc* in a fixed position. Individual bones cannot be taken out. Ribs, sternum and almost all hand- and foot bones missing. Skull fractured and pressed together. Pelvis broken and only partly visible. Most of long bones broken. Exact measurements cannot be made due to fixation and fractures. Length of femur *c.* 43 cm, tibia *c.* 37 cm, suggesting body

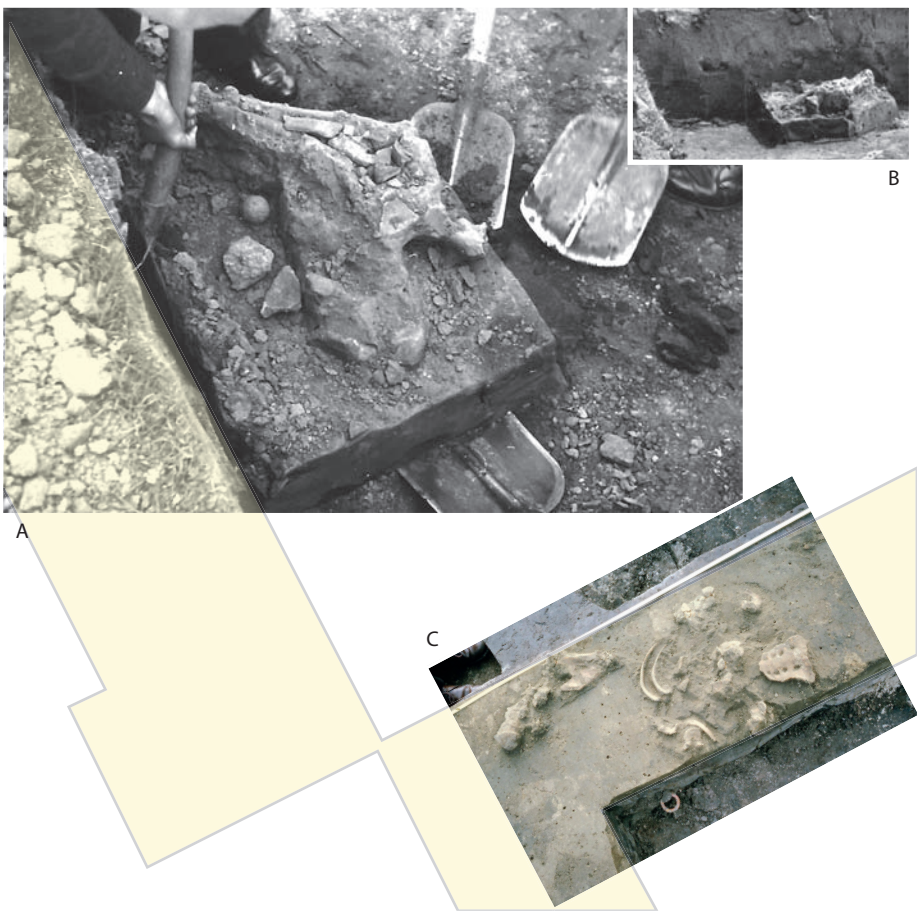


Figure 41 Reconstruction of the positions of 229 and the skeleton remains in 1966 in relations to the section dams of Van Giffen (in yellow). A: Some of the remains of skeleton 229 being lifted in a block to be cleaned elsewhere. B: detail of the sw quadrant showing the bloc of 229 and the gap between the bloc and the m-w section. C: possible location of the remains found in 1966

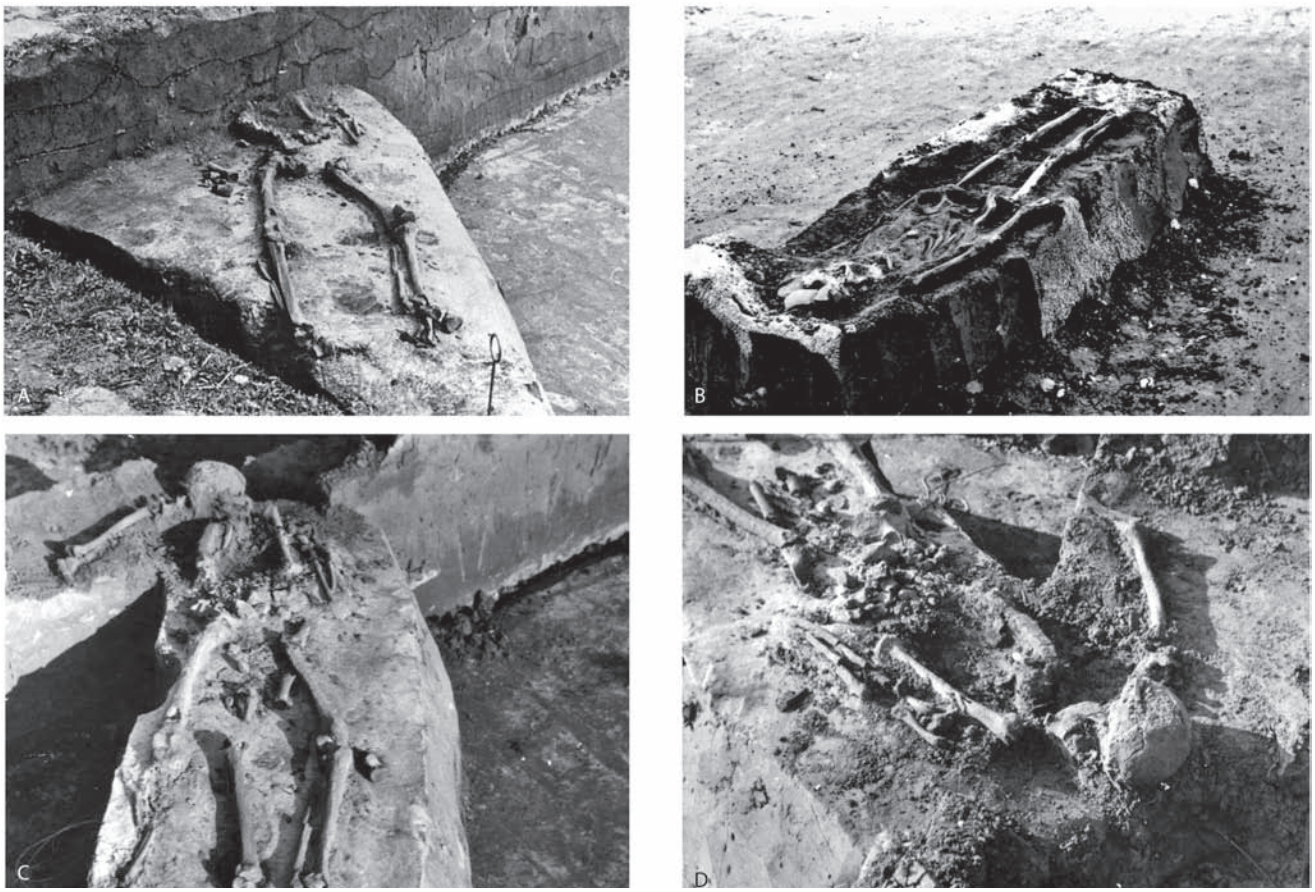


Figure 42 Skeleton 230 and 231 during various stages of the excavation. A: 230 as it was discovered and excavated on April 11, B: 231 as excavated on 19 April. C and D show the excavation of 230 on 19 April when both skeletons were lifted and transported to Amsterdam by Mr. Bijlsma of the Antropobiological Laboratory

length of 160 and 169 cm, respectively. Skull not suitable for sex determination. Pelvis broken and partly covered by soil. L half of pelvis visible from behind. Greater sciatic notch not easily visible, but probably rather wide. Preauricular sulcus appears present. Both characteristics suggest female sex. Age estimation difficult. Ml, M2 and M3 in upper and lower jaw L appear to be present. Occlusal surfaces not visible. Molar wear probably not very extreme, so an age of 25-35 is suggested.'

Van Giffen considered 232 to be the primary grave underneath tumulus II, but why is unclear. The most logical explanation is that it was close to the projected center of the barrow, indicated by the place where the section dams met (cf. 43A). Skeleton 229 was also found near the center, but that was incomplete. Moreover, 232 was laid on a 'mat van biezen', a mat or rather a basket, made of bulrushes (fig. 43C, D), which was the reason that Van Giffen decided to lift the skeleton *en bloc*. The reason we think it was a basket or a least a mat of which the rims protruded upwards, is that the outline of this mat was rather clear (fig. 43D). Unfortunately, no signs of this mat can be observed. Its shape and size (rounded rectangular) were comparable to the pit with a 'double fill' in which 243 was buried (cf. fig. 43A). Therefore we suggest also skeleton 243 was buried in a basket of bulrushes or the like.

Even though sex could not clearly be determined, Runia's suggestion that this is a female is in line with the different orientation of the skeleton. According to the published plan (fig. 15a) it is oriented north-south with the head in the north, facing west. This is in line with orientation of 247. Since all male skeletons are facing south, this orientation may be sex related. 243, the third female, also faces north, but is oriented west-east, like the male individuals.

Near skeleton 232, bones of a hare were found, according to Van Giffen, which was corroborated by Clason (n.d.): The fact that it was found near the skeleton proves, according to

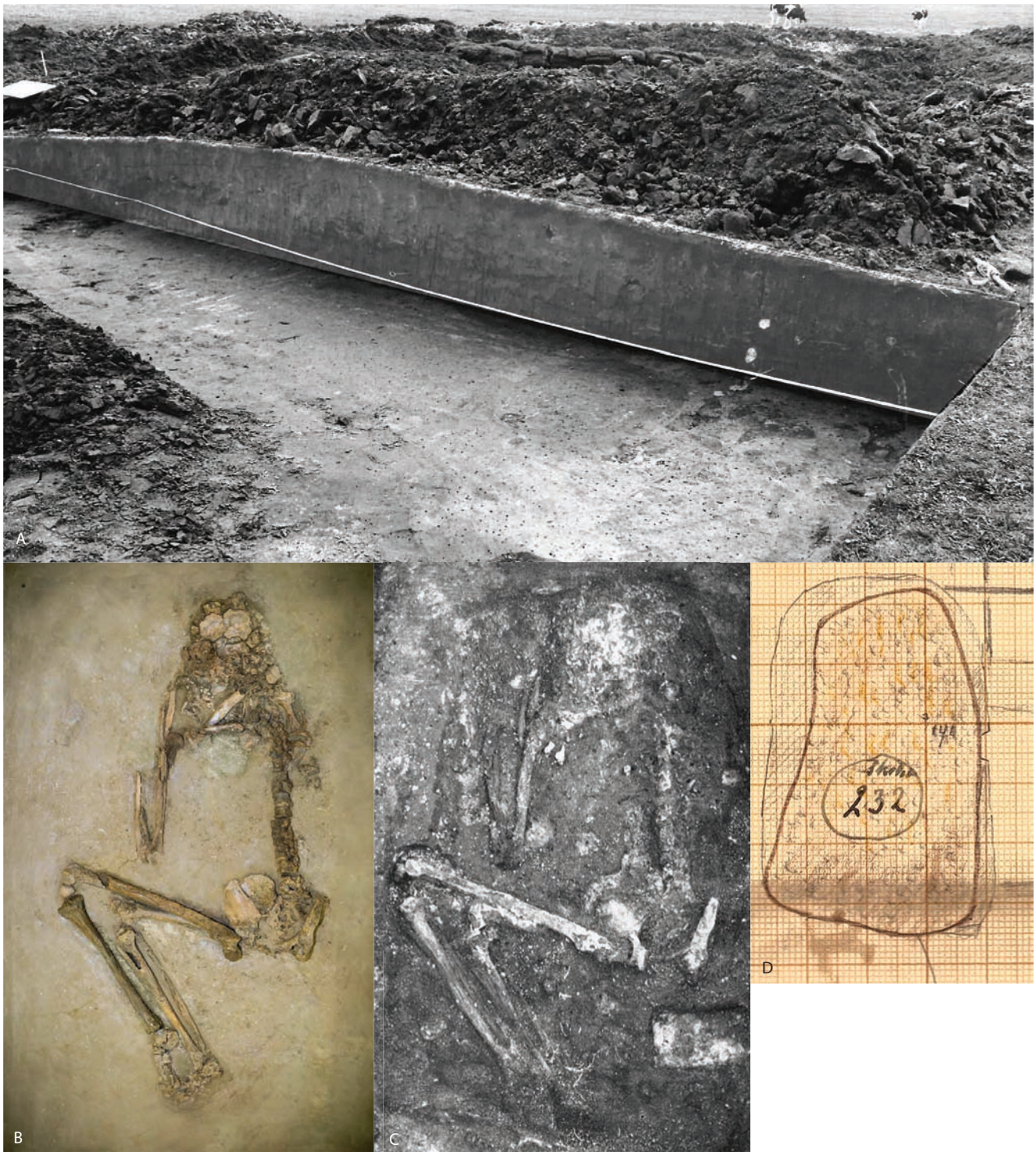


Figure 43 Several images of skeleton 232. A: The ne quadrant with the burial pit before excavation; B: the skeleton as it looks now in its case in the depot at Castricum; C: the skeleton just before it was lifted in a bloc; D: detail of the drawing by Praamstra showing a 'double' fill. The inner fill and its darker limits (see also image C) was interpreted as a 'basket' of bulrushes in which the dead person was buried

Clason, that it was a grave gift, which 'possibly then already had the meaning it has still today, the bringer of new life'. There is no indication where exactly the hare was found. As with the marten near skeleton 236 (cf. below), it may have been an accidental deposition.

Individual 233 was estimated to be male with an age-at-death of 36-49 years, but only a small part of his skeleton was retrieved. The preservation of the bones was good, suggesting other factors than taphonomic damage to the skeleton to be the cause of the incompleteness of his remains. On the field drawing, it appears that the body was laid down in a pit that cuts through a much larger round feature filled with medieval clay. That, however, was not the case according to Lanting (Lanting and Van der Plicht 2002, 86). Skeleton 233 was probably found when the Medieval pit was removed in the 3 meter wide trench that was dug in front of the section dam (cf. Section 3.1; fig. 14). When we compare all data, it appears to have been positioned almost on top of the older ditch surrounding burial 575. Whether this was intentional is uncertain. Probably, this ditch had been filled in and ploughed over long before. According to Lanting the documents of the Anthropobiological Laboratory indicate a north-south position on the right side with the head on the south side, facing east (Lanting and Van der Plicht 2002, 86).

Individual 235 presented us with several difficulties. The preservation of his skeleton was excellent, but we do not know its exact position since that was not recorded. There are two indications in the field diary of the 3rd of June 1957: '*skelet zonder kop in nw kwadrant: a: 2.50 W. M.-N as en 2.30 Ndl. M.-W as; b: 3.30 W. M.-N. as en 2.80 Ndl. M.-W. as opgenomen door de heer Bijlsma'* and 'Zij nemen skelet in N.W. kwadrant op: I (235) beginnen met dat ten Z.Z.W, (236) daarvan.' Both entries indicate a position N.N.E. of

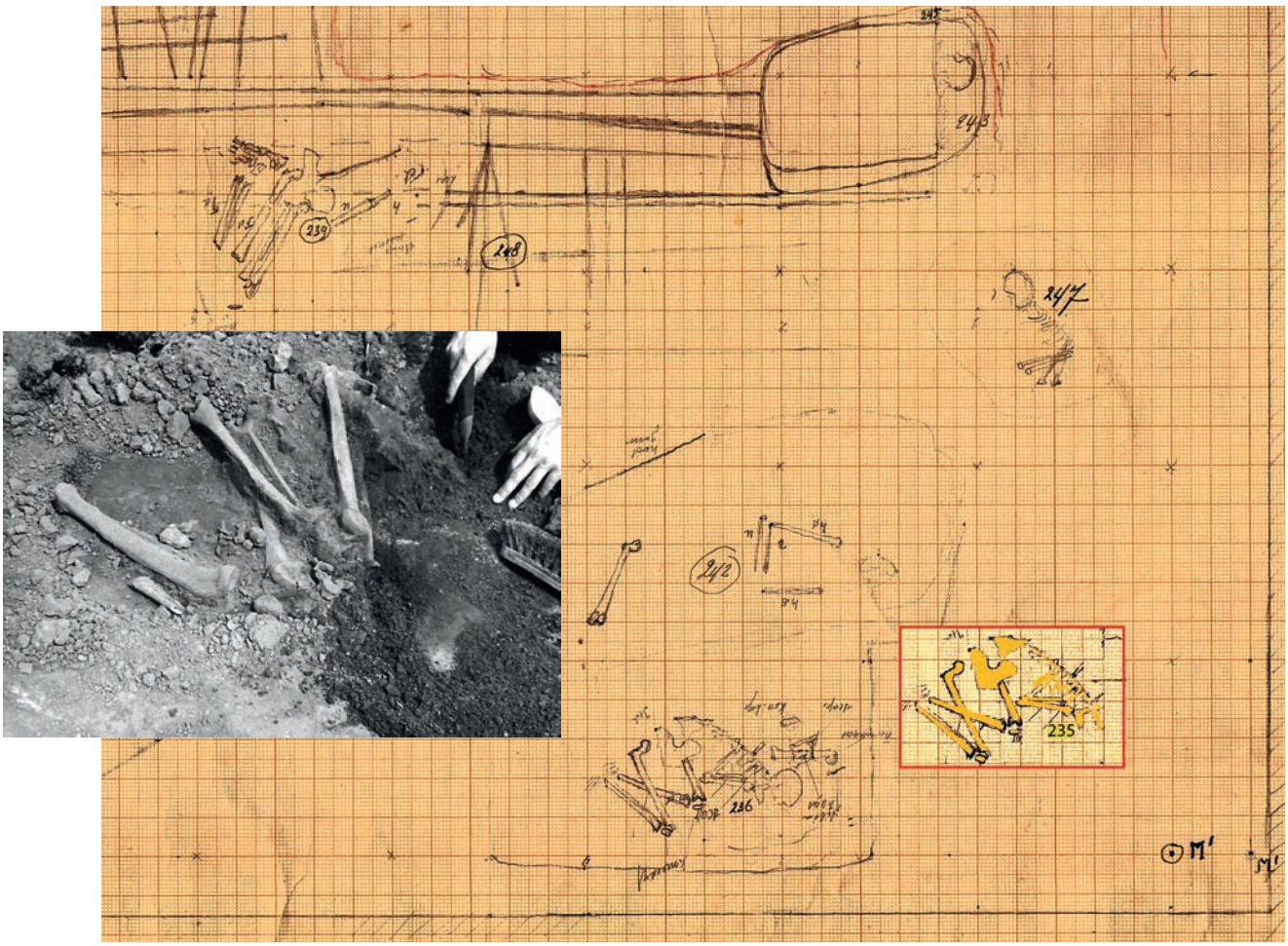


Figure 44 Projection of skeleton 235 (in a hypothetical posture) of the plan of the nw quadrant. Inserted a photo taken by Mr. Emmerik, assistant to the Anthropobiological Laboratory, probably showing some of the remains of 235. From this a crouched position may be deducted

236. That is not the same position as that of 242, which is described on the 5th of June as '*N. van 236'*. That leaves space for a (hypothetical) position as indicated in the plan on figure 44. His skull was absent, which is not due to an excavation error. It must have been taken or not interred at all in the past. His age-at-death was estimated to be between 26 and 35 years old. His stature was estimated to be 161.4 cm ± 3.27 cm, which makes him the smallest man in the sample. In the collection of photographs taken of the skeletons by the Anthropobiological Laboratory in Amsterdam there is one photo that cannot be attributed to one of the other skeletons (fig. 44). It showed the legs and pelvis of a skeleton. On the back was written in pencil 235, but later on changed in ink into '236'. This must indeed be 235, however (fig. 44); the size and form of the bones visible match with the actual remains. It shows that this skeleton was also placed in a crouched position.

The missing skull of skeleton 235 is an enigma. There are no indications the head was somehow severed from the body. It was definitely not an excavation error: from the beginning it was known as the 'skeleton without skull'. However, there may be a solution to the problem: a single well preserved mandibula (lower jaw) was found in the NW quadrant of tumulus II, 85 cm from the m-n section dam. This position is about 1.5 – 2 m. east from the position of skeleton 235 as indicated in the field diary. This mandibula was given number 230. That is confusing because that is the same number as skeleton 230 from tumulus I. We now have labelled it 230 *extra*. In theory that could be part of the missing skull, which then somehow must have become displaced in the Late Neolithic or the Early Bronze Age. The fact that only a mandibula was found indicates that the body already was decomposed when this happened. The DNA results of samples of 235 and 230 *extra* do not contradict that they are from the same person. Skeleton 235 and 230 *extra* have – as the only ones in the skeletal assemblage – the same mitochondrial DNA, and from that data it is also clear that 230 *extra* is the lower jaw of a man. Alas of 235 whole genome data could not be obtained, so there is no certainty.

Why it was not properly documented is unclear. Possibly the hectic situation with so many skeletons, and at the same time not enough skilled supervision of the workmen was one of the reasons that Van Giffen ended the excavation on the 3rd of June, sent home Van Delden and called in Praamstra to save what could be saved (cf. Section 3.2). By then 235 already had been removed undocumented.

Individual 236 had an age-at-death of 36-49 years and was estimated to be male. His skeleton was well preserved (fig. 45). It was photographed several times from different angles, apparently because of its excellent condition and complete state. The body was oriented west-east and facing south, placed on the left side. The body was almost complete, but the lower left arm, the right hand, and both feet were missing according to Runia (1987, 218). In the collection of bones now preserved, the right arm is also missing, even though this is clearly visible on the photographs.

Behind its back, the skeleton of a small rodent was found, indicated by Van Giffen as a rabbit or hare. Runia (1987, 219) states these are the skull, mandibula, and long bones of a marten. Whether or not this is an intentional burial is impossible to say. The fact is that near 232 a rabbit skull was found as well. Here again it could easily be an unintended part of the grave. Burial mounds are an attractive place for burrowing by rodents. This means they will occasionally die there too.

Individual 239 was one of the younger individuals, a man of 19-25 years old. He was more or less placed on his left side. His stature was estimated to be 181.4 cm ± 3.27 cm. Interestingly, the day-notes of the excavation state that it was 'the skeleton of a very large man that had been buried with the legs folded in a 'completely unnatural' way' (field diary 4th of June 1957). This is indeed visible in the photograph taken during excavation (fig. 46). It suggests the legs were bound together or tightly wrapped in a mat or cloth. The feet were still 'sticking out' in a natural position, which seems to imply these were not under the same stress of wrapping. This must have been done after rigor mortis had passed, some time after death when no muscular tension is present and the body is flexible again. This is not entirely unusual in this period, but systematic research is lacking. One other skeleton, excavated at Schokland-P14, buried between layers of oak bark, also appears to have been treated this way (Ten Anscher 2012, 334; Fokkens *et al*. 2016, 109). We cannot make any solid conclusions about the meaning of this burial disposal.

The circumstances of the skeleton of individual 242/533 have already been discussed (Section 5.2, cf. fig. 37). This was a male individual aged 26-39 years with a stature of 179.2 cm ± 3.27. His position was probably originally a crouched position on the left side, head facing south.

Individual 243 was reasonably well preserved, and the most complete skeleton of the assemblage. It belonged to a 36-49 year old woman with a stature of 163.0 cm ± 3.72 cm. Her position was recorded in the 1962 publication of Van Giffen (fig. 15a), but not indicated on the field plan drawn by Praamstra. She appears to have been placed on the left side with the head to the east, facing north. One photograph remains, indicating a rectangular pit, exactly as was indicated on the plan. A second photograph, available as thumbnail only, was glued to a provisional location plan made by the Anthropobiological Laboratory. Scanned with 1200 dpi and enlarged, it shows the vague contours of the body (fig. 47 bottom) in a clear crouched position. Even on this blurry

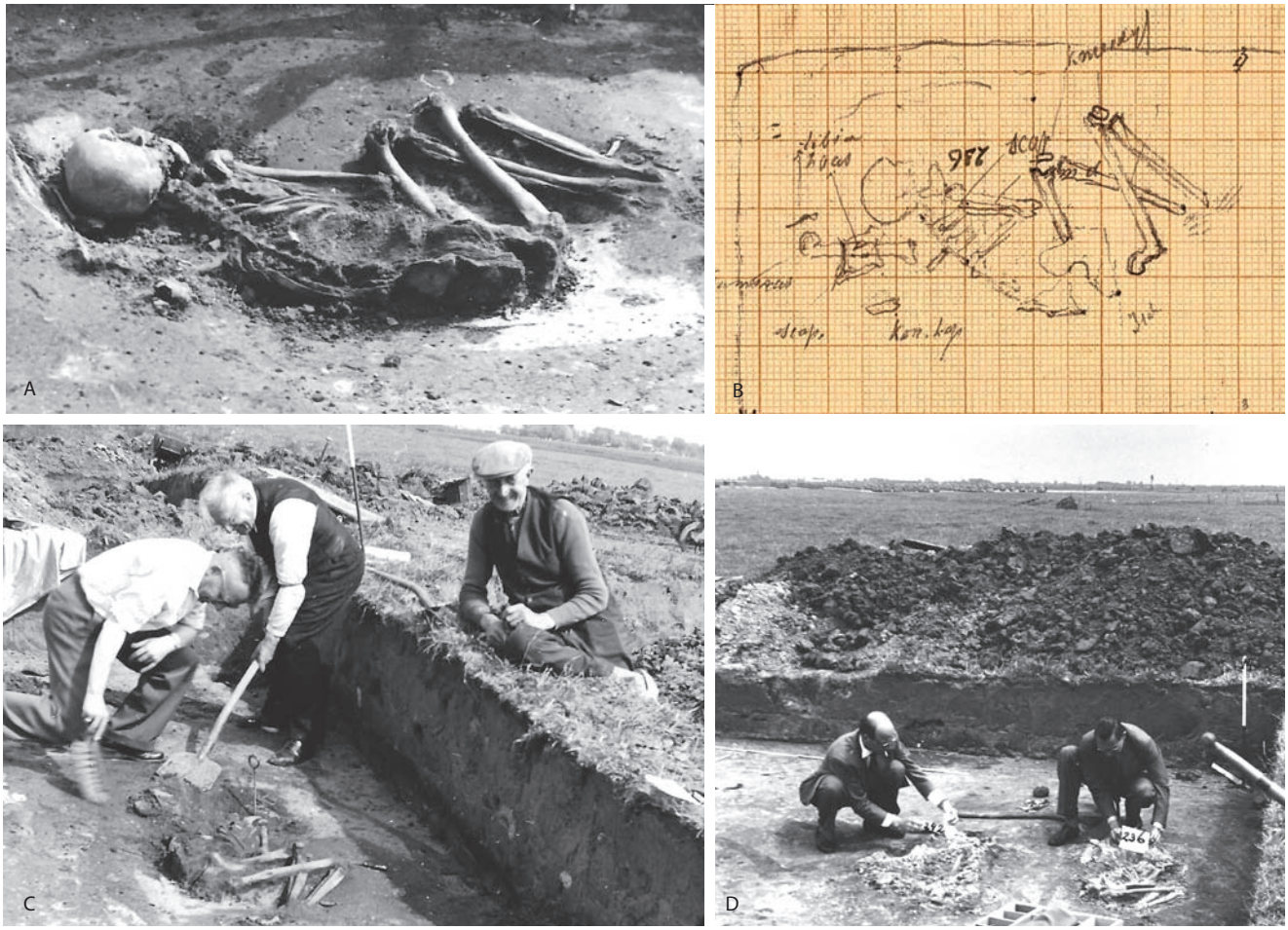


Figure 45 Skeleton 236. A: the skeleton just before removal. The skull had been removed, but was placed back for the photo. Van Giffen (1962) published this photo as well; B: the drawing by Praamstra shows that just behind the skull a long bone is present (indicated as 'tibia haas': tibia hare), and behind the back the skull of a marten (indicated as: 'kon. kop': rabbit skull). Both are indeed visible on the photo (A); C: prof. Van Giffen cleaning the soil after the skull had temporarily been removed; D: the skeleton during excavation by two people of the Anthropobiological Laboratory (Bijlsma and Emmerik). The numbers in ink were added by Praamstra probably

photograph the crooked form of the upper legs is visible. Most likely this can be attributed to vitamin D deficiency in childhood (Rachitis) of which the remnant bending deformities are still visible in adulthood and are referred to as residual rickets (Veselka 2016). Encountered pathological anomalies will be discussed in a different article.

Individual 247 was a female buried on her right side, oriented N-S and facing west. Her length was estimated at 167.3 cm ± 3.72 cm. Her skeleton was only partially present, but the preservation was good. The skeleton was described as a child burial in the field diary; Praamstra drew it as a very small burial (cf. fig. 44). Yet osteoarchaeological analysis of the remains made clear it was not a non-adult, but rather a 25-36 year old female. How this 'mistake' could occur is not clear. Possibly, it is the result of the fact that the skeleton was rather incomplete. Runia describes it as 'Only skull and mandibula, and parts of the upper and lower limbs present' (Runia 1987, 220). When De Weerd excavated the spot where skeleton 247 had been found, he discovered a few other bones that belonged to that skeleton. He recorded them as 465 (field diary De Weerd 3 Sept. 1963). It is also in this spot that a pit was discovered with charcoal layers in 1978, apparently only a few centimeters below the place where 247 was buried. No photographs of this skeleton were taken.

Lastly, there is skeleton 575 (fig. 34, 48), which is in fact the oldest burial, a 'Bell Beaker person' according to the

Figure 46 Skeleton 239 image taken on 5 June 1957. The curious position of its legs is clearly visible

dates. The burial was laid down in a chamber-like structure on its left side, in a crouched position, with the head facing southeast. For this period it is quite common that the dead were placed in a wooden chamber. Wooden bottoms have never been recorded, which is why we speak of covered chambers (Bourgeois *et al*. 2009, 97). According to De Weerd, it indeed did not have a bottom, but it probably did have a lid. This was not observed, but the position of the ribs and other bones of the skeleton suggest an open space (observation Veselka). Where it was more or less preserved, the planks were about 3 cm thick (field diary De Weerd). Two flint blades were deposited near the pelvis (fig. 48, indicated as '2 silices'). Skeleton 575 was partially excavated and lifted *en bloc*. Whereas nowadays it would have been automatically owned by the province, and hence belong to the Provincial Depot, in 1963, it was 'owned' by the excavator. Though De Weerd had excavated it, it was professor Glasbergen who took responsibility and eventually gave it as a 'personal loan' to the Westfries Museum in Hoorn. Eventually, it ended up at the Provincial Depot after all. The discovery of skeleton 575 was important for Glasbergen because it safeguarded the subsidy he had received for the excavation, which was aimed at 'The ecology of the bearers of the earliest phase of the Bell Beaker Culture in Europe' (cf. Section 3.3).

7 Concluding remarks

7.1 Oostwoud in a regional context

The Oostwoud burial mounds, and the skeletons found in it, have been discussed in detail in this paper. We have taken advantage of the opportunity the editors gave us to publish many of the original images and data. Normally, that is not possible in a journal article because of size limits. We felt that an elaborate discussion of data was necessary because of the unique preservation condition of the skeletons, enabling both detailed osteological analysis and DNA analysis. Moreover, since most Late Neolithic burials were discovered in acidic sandy soils, the Oostwoud burials are amongst the few that are actually preserved from this period in the Netherlands. In addition, stratigraphical observations were possible, which was not the case in contemporary cemeteries at Schokland-P14 (Ten Anscher 2012) and Hattemerbroek (Drenth *et al*. 2011).

To a certain extent the Oostwoud burials fit the patterns that we see at these other sites, but there are also quite a few differences. Similar to the Oostwoud skeleton 232 and probably 243 burials, at Schokland-P14, several of the bodies were laid down on mats, layers of bark, or hides supported by sticks (Ten Anscher 2012). In one case there was a chamber-like structure made of bark (burial 11, Ten Anscher 2012, 332, 335; cf. Fokkens *et al*. 2016, 109). The burials of Hattemerbroek showed a more 'conventional' Beaker pattern, although some of these burials were attributed to the Corded Ware Culture. Burial chambers had also been created, for instance for burial 2 at Bedrijventerrein–Zuid (Drenth *et al*. 2011, 235; Fokkens *et al*. 2016, 153). At both sites pits with a layered charcoal-rich fill were also found, like the pit found at Oostwoud next to skeleton 575.

The sequence of events that we were able to reconstruct at Oostwoud is also very reminiscent of patterns that have been observed elsewhere. Intriguingly, the location of Tumulus II was an area where a flat-grave was present, which only decades or even centuries later would become monumentalized and which then became the location for multiple internments. Apparently, the location of the burial remained in memory of the societies at Oostwoud even though the entire grave became ploughed over at some point. And then in two subsequent phases several people were buried within this monument, some of which may well have died within living memory of one another and some of which were part blood-relatives. This pattern has recently been discussed for a few other burial mounds in the central

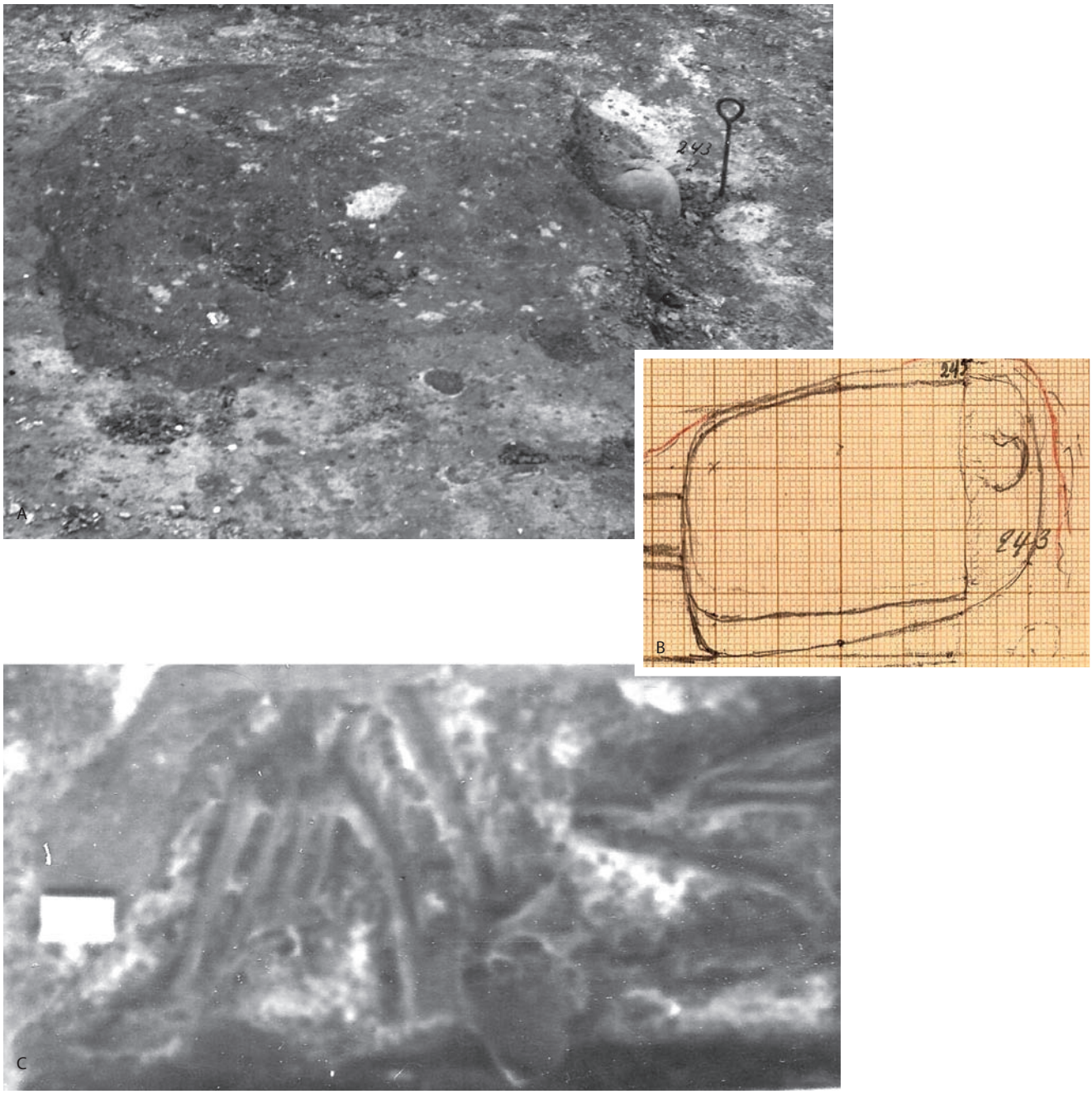


Figure 47 A: Photo showing the burial pit of 243 before excavation. Near the measuring pin the skull has already been exposed; B: fragment of the field drawing showing the same feature and skull. The 'double' fill of the pit is visible in both images, they indicate in our view the rim of a basket or mats. Note that the fill of the area inside this 'basket' is different from the outer fill, indicating a different process of filling; C: a 'digitally remastered' image from a thumbnail on a plan made the Anthropobiological Laboratory. It vaguely shows a skeleton in crouched position with crooked upper-legs

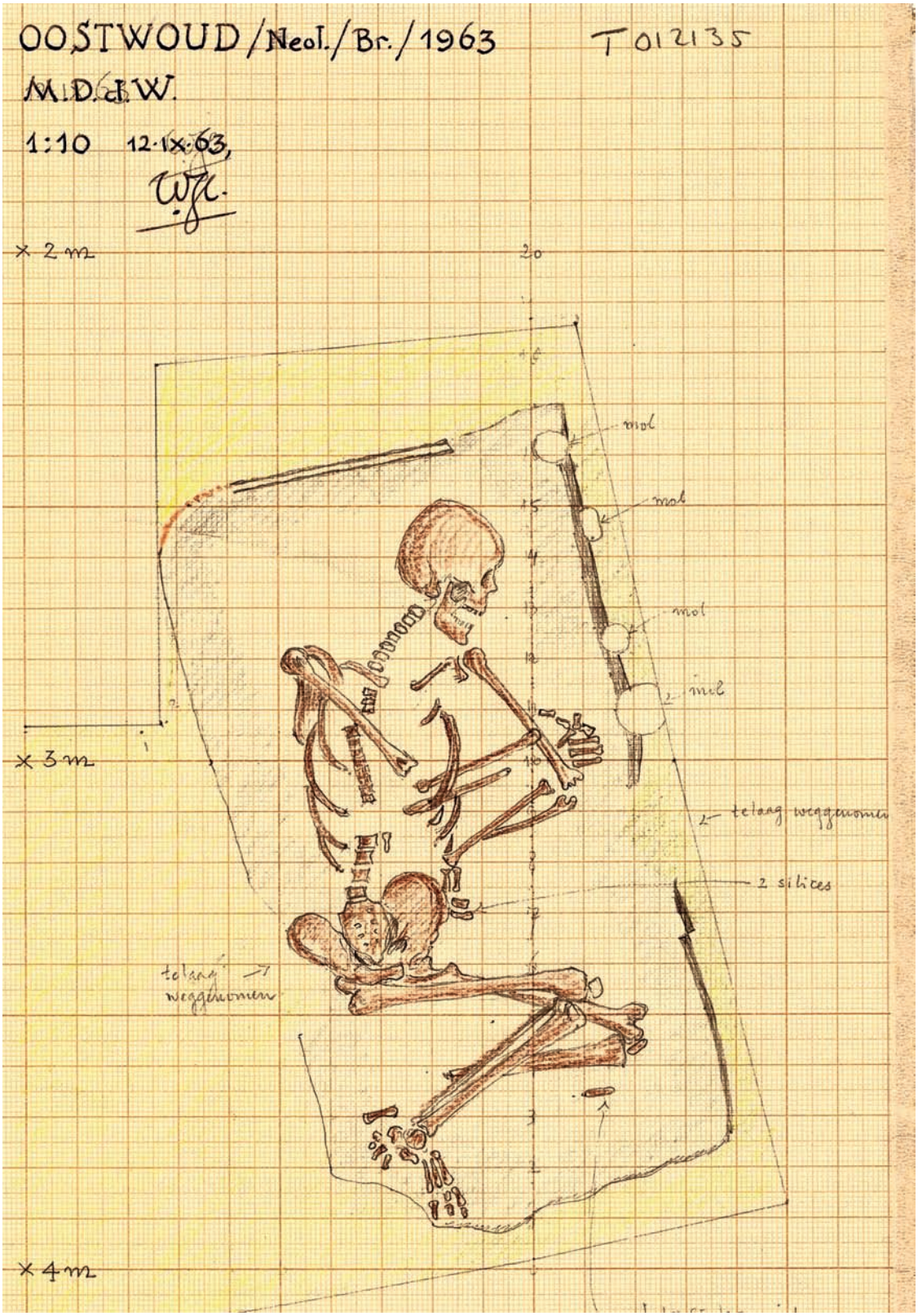


Figure 48 Drawing made in the field of skeleton 575 (see figure 17C: Glasbergen drawing and Maarten de Weerd measuring)

Netherlands (Bourgeois and Fontijn 2015), but highlights the complex interplay of memory and monumentality in later prehistory (Bourgeois 2013).

So the burials at Oostwoud fit a pattern to a certain extent, but they are different as well, as they are concentrated within the context of two burial mounds, which are absent or at least invisible at the other sites in the same area. For Bell Beaker graves, the absence of grave gifts other than flint artefacts is unusual too. At the Veluwe, The Utrechtse Heuvelrug, and the Drents Plateau many Bell Beaker burial mounds have been excavated, but these are generally easily recognised because of the Beakers and other grave gifts. In West-Frisia, there were none. Later interments from the same period are rare for most Bell Beaker barrows (Bourgeois 2013, 164). That is different in Oostwoud. Is this an exception? That is a question for further research. The fact is that most excavations of burial mounds have been carried out like they were in Oostwoud: with unskilled workmen and in spits. That implies that if bones were not preserved and no grave gifts were present, many later interments may have been destroyed unnoticed.

7.2 Treatment of the dead

An issue that is always speculated about in relation to Bell Beaker burials, is the sex-related position and orientation. Drenth and Lohof (2005, 435) for instance, suggest that men were positioned on the left side, facing south, head to the east. Women were placed on the right side, head to the west. At Oostwoud, it seems that there was indeed a difference between men and women. All men were oriented E-W or 'kind of' E-W. One female was also oriented E-W, but the other two were oriented N-S. The men were all placed on the left side and faced south, while the females were all placed on the right side facing west or north. Whether or not these patterns are indeed only related to sex is difficult to substantiate on the basis of this small sample.

The possibility of re-burial is underrepresented in Dutch archaeological reports concerning the prehistoric period. At Oostwoud, most of the skeletons were in relatively good condition, but even so parts of the skeleton are missing. The skull of 235 is absent; other skeletons lack arms or legs. The clearest example seems to be 228, where the entire right upper limb was removed from its original position to be placed at the feet. Although a degree of carelessness and lack of expertise of the workmen may have caused the absence of several skeletal elements, this factor does not entirely explain the lack of bones. The presence of single non-articulated bones cannot be attributed to poor excavation alone.

All in all, there are several indications that the prehistoric Oostwoud people manipulated the human remains after death. The extremely crouched position of 239 demonstrates that individuals were not simply subjected to standard rituals. Probably, there were many rules and taboos related to peoples' functions and expectations of their role after death that determined the way they were deposited. It seems however that a certain standard in burying the deceased did exist: the men all were positioned on their right side facing south, and for all a crouched position.

What is noteworthy at Oostwoud is the shift from a crouched burial position to a supine position stretched on the back that is visible between the two mounds. That change is difficult to date exactly. Both skeletons 230 and 231 were inserted in an existing barrow between 1881-1658 cal BC, which is (at the end of?) the Early Bronze Age (cf. Fokkens *et al.* 2016, 286-287). What inspired the transition in this burial ritual is difficult to determine. It is not a local feature that was restricted to West-Frisia, but this change can be observed in large parts of NW-Europe. It is also something that appears to have been irrevocable. Once it was a custom, crouched positions became very rare indeed.

7.3 A ceremonial landscape?

What makes Oostwoud a special site as well, is the evidence for an Early Bronze Age ceremonial landscape. In figure 15, we see that Van Giffen has recorded four pits in the s-e quadrant of tumulus II. These had the same fill as the pits around tumulus I, an observation that is corroborated by Lanting (field diary Lanting 1978). Two of these pits were excavated in 1977, and in 1978 Lanting re-excavated all of them and tried to follow this alignment in the next field (fig. 49). This proved that we can speak of a true alignment of pits, not in a completely straight line, but nearly so. The length of the alignment is 35 m, and it consists of *c.* 39 pits that on a higher level of excavation nearly formed one continuous ditch, as was the case with the pit circle around tumulus I.[16]

Alignments associated with burial mounds are not unknown to the prehistory of Northwest Europe, but generally these are related to Middle Bronze Age monuments. Here, we seem to be dealing with an alignment that is more or less contemporary with the building of tumulus I, which means it must have been laid out before the date of burial 230 and 231 (*c.* 1880-1660 cal BC). An alignment is also known from Grootebroek (Van Giffen 1953), but in that case it relates to a Middle Bronze Age mound. Whatever these alignments may have meant to the people, one characteristic is clear: they are never oriented on the exact centre of the mound, and appear to have been added later (Fokkens 2013). In West-Frisia, we assume they did not contain posts, because no post shadows were found. Though this may mean the posts were extracted and the pits backfilled, we must certainly consider the option that the act

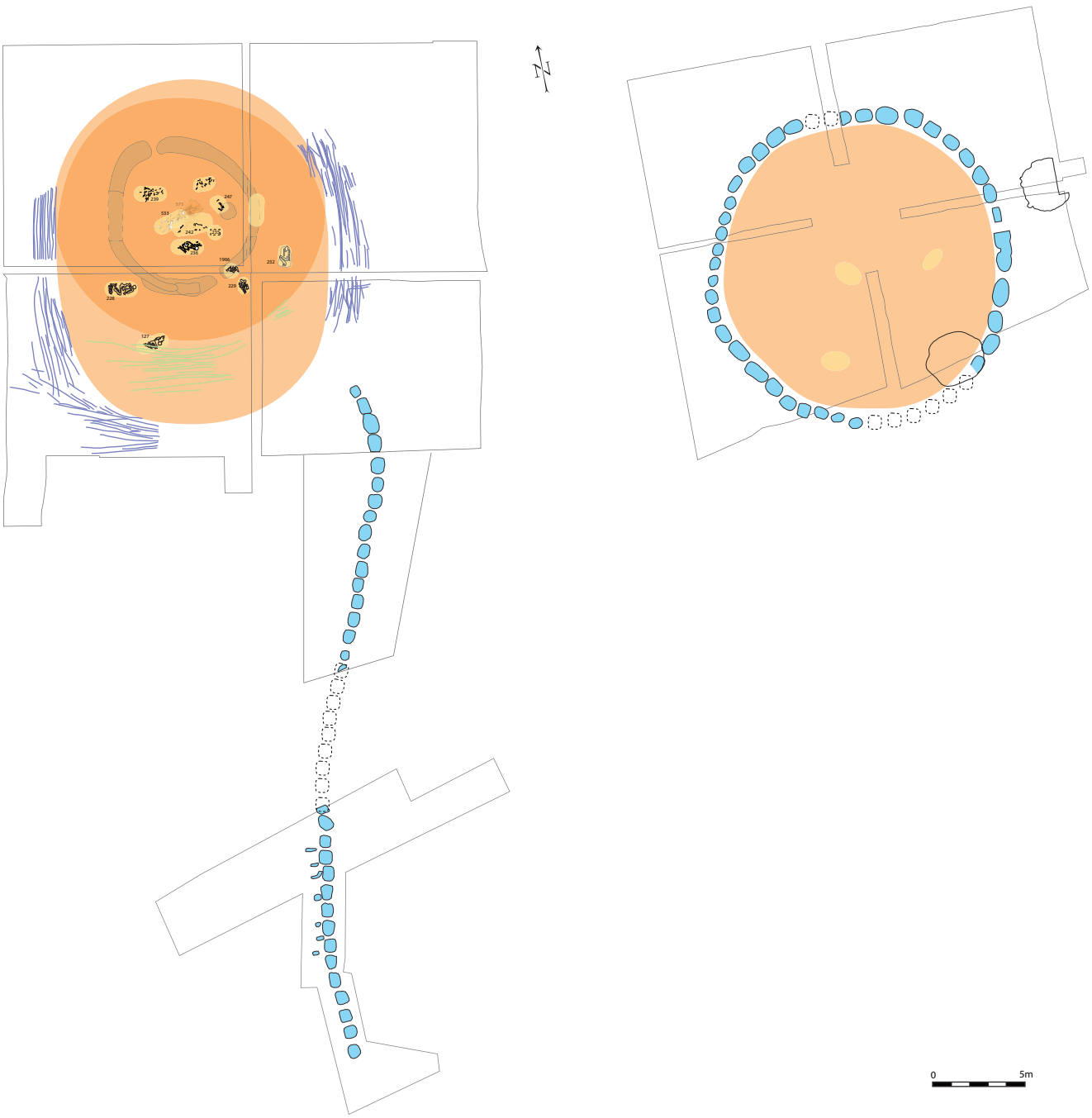


Figure 49 Ceremonial landscape: in the Early Bronze Age, probably at the same time as tumulus I (right) was built around 1800 cal BC, a pit alignment was dug south of tumulus II (left)

of digging was part of the ritual that was probably performed here.

A last observation to be made in this respect is that the pit alignment indicates that that area was not ploughed at the time of digging. Such an alignment would have impeded ploughing. We have no indications of later plough marks, or habitation. It may therefore mean that the area was not used for settlement or arable after the Early Bronze Age. Given the abundance and wide distribution of Middle Bronze Age remains in eastern West-Frisia, one would have noticed at least some features in the extensive 1978 excavations, if Middle or Late Bronze Age habitation had taken place at the site.

Acknowledgments

The present study was made possible by the NWO free competition project 'Farmers of the coast' (NWO 360-60-100; Fokkens). A grant of the Leiden University Fund 'Bakels fonds' enabled DNA sampling by E. Altena (LUMC Leiden). E. Altena prepared the samples for the DNA lab in Harvard to be analysed by Olalde and Reich. A grant of the province of Noord-Holland enabled the osteoarchaeological research of the skeletons. The dating model was devised by Q. Bourgeois in the framework of the NWO Veni project 'Networked Landscapes: Modelling supra-regional communities in the early 3rd Millennium BC' (NWO Veni 275-60-008).

The authors wish to thank especially Mr. M. Veen (Castricum) for answering many questions about finds and documentation stored in 'his' depot at Castricum, and for allowing us to study and sample the skeletons in Leiden. Mrs. K. van der Ploeg (Groningen University) was very helpful in locating documents and in the transfer of this data to the Provincial depot at Castricum. M. de Weerd was a helpful partner in discussion about the 1963 and 1966 excavations and gave valued comments on the manuscript. Mr. R. Eerden (Province of Noord-Holland) kindly provided the funds for studying the skeletons. The English text was revised by J. Palmer.

Notes

1 Fokkens is responsible for the excavation analysis and text, Veselka carried out the skeletal analysis, Bourgois is responsible for the dating model, Olalde and Reich analysed and interpreted the DNA samples.

2 Both sets of notes are combined as type-written transcripts of the handwritten notes in dossier 137 at the Depot in Castricum. The transcription also accounts for some mistakes, for instance of the misspelling of prof. De Froe as prof. De Troc, which occurs several times. The hand-written notebook to date is still part of a collection of documents residing at the town hall of Hoorn to date, in a dossier of De Weerd.

3 http://www.knhm.nl/Wie+we+zijn/Historie/default.aspx visited 15 Jan 2017.

4 Mr. J.P. Bijlsma was a medical doctor attached to the 'Laboratorium voor Antropobiologie en menselijke Erfelijkheidsleer' at Amsterdam.

5 Plans and section drawings did not accompany his English language version of the same article (Van Giffen 1961a) or the publication in 'In het Voetspoor van Van Giffen' (Van Giffen 1961b).

6 In Amsterdam the 'doctoraalstudie' (master) had to be completed with the report on an independently conducted excavation. For Maarten de Weerd that was the Oostwoud excavation in 1963. The combined collection of field notes, photographs, find lists, and other documentation of this excavation was called '*protocolboek'*. In this article we will refer to 'field diary De Weerd' when referring especially to that part of the protocolboek.

7 The Leiden and Utrecht students knew each other from working at the Swifterbant excavations. Fokkens, Banga and Van Dijk (with Robert van Heeringen from Leiden University) had also prospected in the Swifterbant area for settlement layers with a three week auguring campaign. The account of the March 1978 campaign is based on the field diary of the first author.

8 The drawings of this short campaign are now stored in the depot at Castricum.

9 This is difficult to understand; we would expect that he meant the east side of the ditch. On the 16th of June he also writes: 'East of this ditch the prehistoric plough soil is still present as a rather thick layer, and there are plough marks present over the whole surface of the trench, west of the ditch the plough marks are almost completely absent.' (field diary Lanting 16th of June). On the 23rd of June, he clarifies this: in the west side of trench III the modern plough soil rests directly on the yellow natural soil. He suspects that recent use of the land has destroyed the Neolithic arable in this area (field diary 22nd of June).

10 'Dat de botten in en op de klokbekerlaag liggen, wijst er op dat het graf (als het een graf is) is ingegraven in het oud-oppervlak van de heuvel…' (field diary De Weerd 31st of July 1963). (translation: "that the bones are lying in and on a bell-beaker layer, indicates that the grave, if it is a grave, was dug into the old surface of the mound…")

11 Praamstra also describes this in his week notes.

12 'Tot nu geen heuvel-begrenzing, tenzij dan in ombuiging ploegsporen.' (translation: 'as of now no hill-limits, except in the curve of the plough traces').

13 On the 17th of April it was removed and taken to the Antropobiological Lab at Amsterdam (field diary 16 June 1956), but there are no other records of it, nor of were the bones preserved, as far as we know.

14 A more detailed osteoarchaeological study will be presented in a separate paper.

15 Here we should mention that in Dutch archaeological practice makes confusing use of the concept secondary. While in anthropology this means re-burial, in Dutch Archaeology a secondary burial has no connotation of re-burial. Dutch archaeologists distinguish between a primary grave, the first burial *underneath* a burial mound, and secondary burials, which are inserted later *in* the burial mound.

16 32 pits were recorded, but some 7 or 8 were probably present underneath the modern ditch that cuts through the alignment. The circle around tumulus I consisted of *c*. 47 similar pits.

References

Baeteman, C., D.J. Beets and M. Van Strydonck 1999. Tidal crevasse splays as the cause of rapid changes in the rate of aggradation in the holocene tidal deposits of the Belgian coastal plain. *Quaternary International,* 56**,** 3-13.

Beckerman, S. 2015. *Corded Ware coastal communities: using ceramic analysis to reconstruct third millennium BC societies in the Netherlands*. Leiden.

Bourgeois, Q.P.J. 2013. *Monuments on the horizon. The formation of the barrow landscape throughout the 3rd and 2nd millennium BC*. Leiden.

Bourgeois, Q.P.J., L. Amkreutz and R. Panhuysen 2009. The Niersen Beaker burial: A renewed study of a century-old excavation. *Journal of Archaeology in the Low Countries* 83-105.

Bourgeois, Q.P.J. and D.R. Fontijn 2015. The Tempo of Bronze Age Barrow Use: Modeling the Ebb and Flow in Monumental Funerary Landscapes, *Radiocarbon,* 57, 47-64.

Cook, G.T., C. Bonsall, R.E.M. Hedges, K.M. Mcsweeney, V. Boronean and P.B. Pettitt 2001. A freshwater diet-derived 14C reservoir effect at the Stone Age sites in the Iron Gates Gorge. *Radiocarbon,* 43(2A)**,** 453-460.

De Laet, S.J. and W. Glasbergen 1959. *De Voorgeschiedenis der Lage Landen,* Groningen

De Weerd, M.D. 1963. Protocolboek opgraving Oostwoud Instituut voor Prae- en Protohistorie, Universiteit van Amsterdam.

De Weerd, M.D. 1966. Nederzettingssporen van de vroege klokbekercultuur bij Oostwoud (N.H.). Voortgezet onderzoek 1964. In: W. Glasbergen and W. Groenman-Van Waateringe (eds), *In het voetspoor van A.E. van Giffen (2nd ed.).* Groningen 174-175.

De Weerd, M.D. 1967. Medemblik [nabij Oostwoud]. *Nieuwsbulletin KNOB,* 1967, 2e afl. februari, kolom *31-*32.

Drenth, E. and E. Lohof 2005. Mounds for the dead. Funerary and burial ritual in Beaker period, Early and Middle Bronze Age. In: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens and A.L. van Gijn (eds), *The Prehistory of the Netherlands*. Amsterdam 433-458.

Drenth, E., L. Meurkens and A.L. van Gijn 2011. Laat-neolitische graven. In: E. Lohof, T. Hamburg and J. Flamman (eds), *Steentijd opgespoord. Archeologisch onderzoek in het tracé van de Hanzelijn-Oude Land.* Alblasserdam (Archol Rapport 138 and ADC Rapport 2576), 209-230.

Fokkens, H. 2013. Post alignments in barrow cemeteries of Oss-Vorstengraf and Oss-Zevenbergen. In: D.R. Fontijn, A.J. Louwen, S. van der Vaart and K. Wentink (eds), *Beyond barrows, Current research on the structuration and perception of the prehistoric landscape through monuments*. Leiden 141-154.

Fokkens, H., B.J.W. Steffens and S.F.M. van As 2016. *Farmers, fishers, fowlers, hunters. Knowledge generated by development-led archaeology about the Late Neolithic, the Early Bronze Age and the start of the Middle Bronze Age (2850 - 1500 cal BC) in the Netherlands,* Amersfoort (Nederlandse Archeologische Rapporten 53).

Knippenberg, S. 2014. Evaluatieverslag Archeologisch onderzoek N23 – Westfrisiaweg, Noorderboekert (locatie 18-1 en 21), gemeente Medemblik. *intern Archol Rapport*. Leiden: Archol bv.

Glasbergen W. and W. Groenman-Van Waateringe (eds) 1961. *In het voetspoor van A.E. van Giffen*. Groningen.

Lanting, J. N. and J. Van Der Plicht 1998. Reservoir effects and apparent 14C ages. *Journal of Irish Archaeology,* 9**,** 1-8.

Lanting, J. N. and J. Van Der Plicht 2002. De ^{14}C Chronologie van de Nederlandse Pre- en Protohistorie III: Neolithicum. *Palaeohistoria,* 41/42**,** 1-110.

Louwe Kooijmans, L.P. 1974, *The Rhine/Meuse Delta; four studies on its prehistoric occupation and Holocene geology*, Leiden (Analecta Praehistorica Leidensia 7).

Maresh, M. M. 1970. Measurements from roentgenogramst. In: R.W. Mccammon (ed.) *Human growth and developmen*. Springfield 157- 200.

Moorrees, C.F.A., E.A. Fanning and E.E. Hunt 1963. Age variation of formation stage for ten permanent teeth. *Journal of Dental Research,* 42 1490- 1502.

Moree, J.M., C.C. Bakels, S.B.C. Bloo, D.C. Brinkhuizen, R.A. Houkes, P.F.B. Jongste, M.C. van Trierum, A. Verbaas and J.T. Zeiler 2011. Barendrecht-Carnisselande: bewoning

van een oeverwal vanaf het Laat Neolithicum tot in de Midden-Bronstijd, *BOORbalans* 7, 15-154.

Roessingh in prep. Farmers of the coast. Bronze Age West-Frisian settlement analyses. Leiden University.

Runia L.T. 1987. *The chemical analysis of prehistoric bones: a paleodietary and ecoarcheological study of Bronze Age West-Friesland*. British Archaeological Reports.

Schaefer, M., S. Black and L. Scheuer 2009. *Juvenile osteology: A laboratory and field manual,* San Diego

Ten Anscher, T.J. 2012. *Leven met de Vecht. Schokland-P14 en de Noordoostpolder in het Neolithicum en de Bronstijd,* Zutphen

Theunissen, E.M., O. Brinkkemper, R.C.G.M. Lauwerier, B.I. Smit, I.M.M. van der Jagt 2014. *A Mosaic of Habitation at Zeewijk (the Netherlands). Late Neolithic Behavioural Variability in a Dynamic Landscape,* Amersfoort (Nederlandse Archeologische Rapporten 47).

Uebelaker, D.H. 1979. *Human Skeletal Remains: Excavation, Analysis and Interpretation,* Washington, D.C.

Van Giffen, A.E. 1953. Onderzoek van drie bronstijdgrafheuvels bij Grootebroek. Gem. Grootebroek, Noord-Holland, vermeerderde en verbeterde overdruk uit West-Friesland's Oud en Nieuw 20. *Westfrieslands Oud en Nieuw,* 20**,** 34-40.

Van Giffen, A.E. 1961a. Settlement traces of the Early Bell Beaker Culture at Oostwoud (N.H.). *Helinium,* 1**,** 233-228.

Van Giffen, A.E. 1961b. Nederzettingsporen van de vroege klokbekercultuur bij Oostwoud (N.H.). In: W. Glasbergen and W. Groenman-Van Waateringe (eds), *In het voetspoor van A.E. van Giffen*. Groningen 66-71.

Van Giffen, A.E. 1962. Grafheuvels uit de Midden-Bronstijd met nederzettingssporen van de klokbekercultuur bij Oostwoud. *Westfrieslands Oud en Nieuw,* 29**,** 199-209.

Van Heeringen, R.M. and E.M. Theunissen 2001. *Kwaliteitsbepalend onderzoek ten behoeve van duurzaak behoud van neolithische terreinen in West-Friesland en de Kop van Noord-Holland,* Amersfoort (Nederlandse Archeologische Rapporten 21).

Van Zijverden, W.K. 2017. *After the deluge, a palaeogeographical reconstruction of bronze age West-Frisia (2000-800 BC)*. Leiden, Sidestone Press.

Veselka, B. 2016. Fysisch antropologische analyse van het menselijk skeletmateriaal uit Oostwoud. Leiden.

Vos, P., and S. De Vries 2013. *2e generatie palaeogeografische kaarten van Nederland (versie 2.0)*. Deltares, Utrecht, the Netherlands.

Harry Fokkens, Quentin Bourgeois and Barbara Veselka
Faculty of Archaeology
Leiden University
PO Box 9514
2300 RA Leiden
The Netherlands
h.fokkens@arch.leidenuniv.nl
q.p.j.bourgeois@arch.leidenuniv.nl
b.veselka@arch.leidenuniv.nl

Iñigo Olalde
David Reich
Department of Genetics
Harvard Medical School
77 Avenue Louis Pasteur
New Research Building, Room 260
Boston, MA 02115, USA
inigo_olalde@hms.harvard.edu
reich@genetics.med.harvard.edu