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POLLEN SPECTRA FROM NEOLITHIC GRAVE MONUMENTS IN THE NORTHERN NETHERLANDS

(fig. 8)

Soil samples from the old surface below prehistoric barrows can yield useful pollen spectra.¹ The influence of the local anthropogenic vegetation is naturally very strong in such spectra, but the regional vegetational phenomena can also be recognized and a correlation with pollen diagrams from lakes and bogs is generally possible. In Danish pollen diagrams Iversen² and Troels-Smith³ have demonstrated at least two types of land occupation phases ('landnam'), pointing to two different agricultural systems. The first, characterized by small amounts of pollen of such plants as *Plantago major*, *P. lanceolata*, *Sambucus*, *Vitis* and *Allium ursinum*, should point to a semi-farming culture, based on field and animal husbandry, with the livestock fed indoors and food gathering still playing an important part. This type has been found not only in Denmark, but also, and in an even more pronounced way, in Switzerland. In Denmark the Ertebölle culture is held to be responsible for it, in Switzerland the earliest Cortaillod and Michelsberg cultures.

The second land occupation phase, first identified by Iversen, is mainly characterized by larger quantities of pollen of *Plantago lanceolata*, *Rumex acetosella*-type, *Gramineae* and small amounts of *Trifolium repens*, pointing to extensive pasture land, where a large number of livestock grazed at will. Troels-Smith found that Funnel Beaker pottery of C. J. Becker's type B was contemporaneous with this occupation phase. According to Becker^{3a} this pottery belongs to a non-megalithic Early Neolithic group of the Funnel Beaker Culture. Knowing the first results of the Dutch barrow investigations, Troels-Smith assumes that the Single Grave Culture continued this agricultural system. The other type, however, should have been carried on by the megalithic groups of the Funnel Beaker Culture. A few dated axe finds in bogs confirm this hypothesis. It is clear, however, that any differences in agricultural system as suggested by pollen diagrams from lakes and bogs, should manifest themselves more clearly in surface spectra from the actual settlements. Assuming that grave monuments were built in or at least in the neighbourhood of the settlements, samples from humus layers below the monuments might be expected to give important information.

For the present discussion a restricted area in the northern Netherlands has

been chosen (fig. 8). It comprises the Province of Drenthe and its immediate surroundings. This area is nearly completely surrounded by extensive raised bogs but it is accessible along a number of small streams. The soil consists of boulder-clay of Riss age, covered during the last glaciation by more or less thick sheets of so-called coversands. More fertile unweathered boulder-clay outcrops only locally, *e.g.* in brook valleys. A large number of shallow depressions as well as some deeper

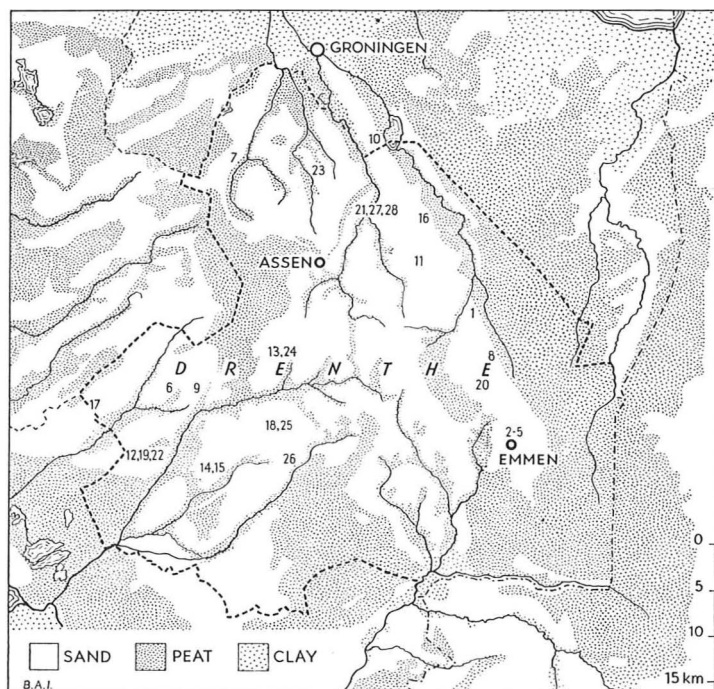


Fig. 8

basins are filled with peat. Raised bogs also occur on flat undrained coversand areas. Already in Subboreal time actual lakes were probably very rare.

The greater part of the spectra have been published and discussed before,⁴ but a few new ones have been added since. The attribution of the barrows to the different cultures has been greatly facilitated by Van der Waals' and Glasbergen's paper on Beaker types.⁵

The English text has been improved by Jay J. Butler.

In the pollen diagrams an *Ulmus* decline marks the beginning of the Subboreal period. In older Dutch investigations this decline was rather obscure, but some recently published diagrams are unambiguous.⁶ For the last high *Ulmus* value three radiocarbon dates are available at about 3000 B.C. (Emmen, GRO 431,

4965 $\pm$ 135; Vriezenveen, GRO 484, 4985 $\pm$ 140; Tannenhausen, GRO 231, 4985 $\pm$ 120).⁷

Samples from Bronze Age barrows generally show a somewhat higher percentage of *Fagus* pollen than those from Neolithic barrows.⁸ A corresponding sudden increase of *Fagus* from ca 0.2% to ca 1.0% was found by Van Zeist⁹ in a number of detailed pollen diagrams. In the Emmen standard diagram a radiocarbon date of about 1400 B.C. was obtained¹⁰ for this increase. This date agrees with the traditional archeological date for the beginning of the Bronze Age in the Netherlands. Soon after the elm decline some very few pollen grains of cultivated plants and weeds are found. It thus seems probable that certain neolithic communities reached Drenthe at that early date. The Neolithic period therefore falls between the elm decline and the first beech increase.

About half-way between the elm decline and the beech increase the Emmen diagrams show a marked increase of *Plantago lanceolata*.¹¹ Much more pronounced, however, is the apparently corresponding increase of this pollen type in a few pollen diagrams of small bogs in the inner part of Drenthe.¹² Here *Plantago lanceolata*, *Rumex acetosella*-type, *Gramineae*, show a maximum quite comparable to that found by Iversen in his 'landnam' diagrams.

In the area under consideration at least three neolithic cultures are present, namely the Funnel Beaker, the 'Standvoetbeker' and the Bell Beaker Cultures.

a. More than 50 megalithic tombs ('hunebedden'), plus some 20 destroyed ones, as well as a few flat graves and barrows attest the presence of the Funnel Beaker Culture. To these graves can be added quite a number of scattered finds of axes, flint artefacts, settlement pottery, etc. The eastern edge of the area, the so-called *Hondsrug*, had a fairly dense population.

This megalithic group does not differ essentially from that in the nearby districts of northwest Germany. It has been considered as being rather late, but recently evidence for a much earlier date, even Early Neolithic (E.N.C.) in the Scandinavian sense, has been put forward.¹⁴

b. Of the two non-megalithic cultures, the 'Standvoetbeker' Culture¹⁵ has to be considered first. It is known mainly from graves beneath barrows, but flat graves also occur. Characteristic are slender Beakers with Protruding Foot, ornamented with horizontal cord impressions or otherwise. The lower part of the beaker is undecorated. Further grave goods are battle-axes, small flint or stone axes and flint knives. Only rarely is the grave inventory complete. Often only a beaker is found, or a battle-axe, a flint axe or a flint knife, or a combination of two or three of these objects.

The graves are often surrounded by an intermediate foundation trench of small diameter. In a few cases so called bee-hive graves have been found.

'Standvoetbeker' Culture									Bell Beaker Culture		Unknown							
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28a	28b
52	55	65	57	59	43	45	66	54	60	56	51	53	76	41	51	59	54	58
30	33	25	29	33	44	31	18	38	34	30	46	31	15	34	37	33	35	28
15	7.2	7.8	11	4.1	7.3	17	13	4.4	4.0	11	1.6	8.6	4.5	22	8.5	5.3	8.1	11
—	0.6	—	0.1	0.4	0.4	0.8	0.5	1.0	—	0.6	—	0.6	—	—	—	—	—	—
1.6	3.1	0.9	1.9	1.0	3.3	2.6	2.3	1.5	2.0	0.8	0.6	4.7	4.5	1.7	1.9	1.1	1.5	1.7
0.3	0.6	0.6	0.4	0.3	—	0.8	0.9	—	—	0.5	—	—	—	—	0.3	0.5	0.2	—
0.3	—	—	—	0.4	0.2	—	—	1.0	0.3	0.2	0.6	—	—	0.3	—	—	0.4	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.6
1.0	—	0.6	0.2	1.8	1.7	2.4	—	—	0.3	1.1	0.3	2.1	0.4	0.3	0.3	0.5	0.4	0.6
—	—	—	—	—	—	—	—	—	—	—	—	0.3	—	—	—	—	—	—
0.3	—	—	—	—	0.2	0.3	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	0.2	—	—	—	—	—	—	—	—	0.1	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
312	321	934	829	782	480	623	219	206	354	876	310	339	247	297	680	190	519	173
29	33	7.1	21	7.5	14	20	44	36	34	14	10	19	26	105	20	10	31	17
61	34	51	34	36	150	120	5.0	36	29	123	76	89	6.4	24	50	44	76	100
52	34	25	65	27	42	44	69	32	3.4	24	9.0	11	47	31	32	16	8.3	10
0.3	—	0.3	1.7	3.6	2.1	0.3	0.5	0.5	—	1.9	—	0.3	1.6	—	0.7	—	—	—
36	33	5.8	9.3	4.0	12	13	89	13	0.8	1.0	6.5	7.1	18	34	6.2	23	0.9	1.2
3.9	13	3.4	6.1	0.4	3.7	6.3	11	1.9	—	3.5	1.3	0.6	—	—	1.6	7.9	0.4	4.0
0.3	0.9	0.1	0.1	0.3	0.4	0.5	2.3	1.0	—	0.1	—	0.9	—	—	—	0.5	—	—
—	—	—	0.2	0.3	0.2	—	0.9	1.5	—	0.2	—	0.3	0.4	—	0.1	—	0.6	0.6
—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.6	1.9	0.4	1.1	1.9	2.7	1.8	5.9	1.5	+	0.5	2.6	1.5	11	0.3	0.4	4.2	4.2	—
1.4	1.9	0.2	0.4	0.3	0.4	0.2	—	—	0.3	0.1	0.9	—	0.8	0.3	0.6	3.2	—	0.6
3.5	5.3	0.4	1.3	0.4	0.6	—	4.1	4.4	1.1	0.9	12	0.9	92	—	0.3	3.2	1.0	2.9
—	0.3	0.1	—	0.1	0.2	—	—	0.5	—	—	—	—	—	0.3	0.1	—	—	—
4.8	4.4	0.3	3.9	0.9	0.2	0.2	6.8	2.4	0.6	0.8	1.3	1.2	2.4	1.3	1.5	1.6	0.6	—
3.2	5.9	1.6	6.3	4.4	0.6	5.3	4.6	0.5	0.6	3.5	3.2	0.9	17	1.0	0.3	4.2	1.0	1.7
—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.6
—	—	0.2	—	—	—	—	0.5	—	—	—	—	—	—	—	—	—	—	—
—	—	0.2	—	—	—	0.2	—	—	—	—	—	—	—	0.3	—	—	—	—
—	—	0.1	0.1	—	—	—	—	—	—	—	—	—	—	0.3	0.9	—	—	—
—	—	—	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	0.2	0.1	—	—	3.0	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—	—
12	17	12	24	11	11	11	67	17	5.9	5.4	18	1.8	105	2.4	17	14	1.2	2.9
—	—	5.6	6.5	300	2.5	1.9	3.2	3.9	0.6	3.7	0.6	4.7	15	6.1	1.2	—	1.0	6.9
1.0	0.3	0.4	0.1	0.6	0.2	0.2	2.3	—	0.3	0.1	0.6	—	2.4	0.7	0.1	0.5	—	—
—	—	0.1	—	0.1	—	—	—	—	—	—	—	0.9	—	—	—	—	—	1.2
—	5.3	1.5	4.0	5.0	3.1	1.6	32	2.4	4.8	1.3	1.0	1.2	11	1.0	8.8	1.6	1.2	0.6
—	—	—	—	—	—	—	1.5	—	—	—	—	1.8	—	—	—	—	—	—

The 'Standvoetbeker' Culture is related to the South Scandinavian Single Grave Culture and the Central European *Schnurkeramik*.

c. The Bell Beakers¹⁶ have a broader base, without protruding foot, and are decorated on the lower part as well as on the upper, often by means of a dentated spatula. Mostly the ornamentation is arranged in horizontal zones.

Among associated finds may be mentioned stone wrist-guards, amber beads, copper tanged daggers (very rarely) and objects of gold (also very rarely). Both the 'international' Bell Beaker class and locally imitated and evolved types are present. The 'Veluwe' type sporadically occurs in the Drenthe area.

This culture is mainly known from graves beneath barrows, but recently a flat grave has been found (at Holsloot, municipality of Sleen).

The barrows are generally surrounded by a ringditch. Intermediate foundation trenches with large diameter and heavy posts seem to be rather characteristic. Bell Beaker sherds occur fairly regularly in 'hunebedden'.

The distribution¹⁷ of the finds of the beaker cultures is not even in the area. Early Beakers with Protruding Foot are to be found only in the Western part of the area, where megalithic monuments are rare. The Bell Beakers, however, have a center in the Emmen area, where there are many megalithic tombs. They are, however, by no means restricted to this area.

The question has to be considered whether still other neolithic groups could be present in the area. At a few places in the coastal area of the Netherlands neolithic settlements have been found of a completely different character.¹⁸ They are situated on strand-ridges or creek banks which suggest an adaptation to a seaside life, such as is known in the Ertebölle Culture. In fact, there are some points of agreement in pottery and flint types between such a settlement as Hekelingen and the Ertebölle Culture as recently defined by Troels-Smith.²⁰ But if the views of this author are right, one might expect inland settlements of the same people as well in an area like Drenthe. From the Hekelingen settlement a radiocarbon date of about 2300 B.C. is available (GRO 254, 4200 $\pm$ 120).

There is one more reason to expect other neolithic communities to be present in Drenthe. Mrs Kaelas^{20a} assumes a local origin of the megalithic civilisation in the Netherlands and northwest Germany. She wonders, whether there should not have been a preceding non-megalithic Funnel Beaker Culture just as in Denmark. In this connection a vessel from Eibergen, Prov. Gelderland is mentioned, the shape of which resembles danish pre-megalithic pottery.

In the following list particulars are given of the barrows and the grave finds. They are arranged in four groups: Funnel Beaker Culture, 'Standvoetbeker' Culture, Bell Beaker Culture, unknown. The last group comprises neolithic barrows without

significant finds or grave types. Their neolithic age is deduced from the humus content of the barrow sand, the presence of Early Bronze Age covering mounds, the grave type and the pollen spectrum.

In table I the spectra are given in the usual way. *Corylus* is included in the pollen total, but *Betula* is excluded from it.

FUNNEL BEAKER CULTURE²¹

1. *Buinen* Old surface under 'hunebed' mound D 28, excavated by van Giffen.²² Anal. Waterbolk, 1954, p. 68 and table 2.
- 2-5. *Emmen* Old surface under 'hunebed' mounds D 38, 39, 40, 41. D 40 was excavated by van Giffen.²³ Anal. Waterbolk 1954, p. 72 and table 2.
6. *Wapse* Sod in destroyed mound of hunebed D 42a, excavated by van Giffen.²⁴ The old surface did not contain any pollen. The presence of both *Fagus* and *Carpinus* and the high *Calluna* value might give rise to some doubt as to the sod actually belonging to the primary 'hunebed' mound. Anal. van Zeist, 1955, p. 43 and table VI.
7. *Steenbergen* Old surface under 'hunebed' mound D I. Anal. van Zeist 1955, p. 45 and table VII.
8. *Exlo* Old surface under 'hunebed' mound D 31. Anal. van Zeist, 1955, p. 45 and table VII.
9. *Diever* Old surface (a) and sod (b) under barrow with stone cist containing characteristic grave goods of the Funnel Beaker Culture. Excavated by van Giffen.²⁸ Anal. van Zeist, 1955, p. 43 and table VI.
10. *Noordlaren* Old surface under 'hunebed' G 1, excavated by van Giffen. Anal. Waterbolk.
From a number of other megalithic tombs samples were collected but these proved to be either sterile or very poor in pollen. Some pollen grains were found by the author in samples from Drouwen (D 19), Spier (D 54a) and Buinen (D 29), and by van Zeist in a sample from D 52 (Diever).

'STANDVOETBEKER' CULTURE

11. *Eext* Old surface under primary mound of the 'Ketenberg', excavated by van Giffen.³⁰ The grave contained a beaker of type Ia, a battle-axe, a flint knife and a small flint axe. Anal. Waterbolk, 1955, p. 66 and table 2.
12. *Havelte* Old surface under primary mound of tumulus 4, excavated by van Giffen.³¹ The grave contained a beaker of type Ib. Anal. Waterbolk, 1955, p. 81 and table 6.
13. *Hijken* Old surface of primary mound of tumulus 8, excavated by van Giffen. The grave contained a beaker of type Ib. Anal. van Zeist, 1955, p. 33 and table II.
- 14, 15. *Ruinen* Old surface under primary (14) and secondary (15) mounds of barrow 'Galgenberg', excavated by W. Glasbergen. Owing to earlier digging the center of the barrow was destroyed. In all, remnants of two beakers (types Ib and Ic) and a small amphora were found. In the mound three periods could be clearly distinguished. On the basis of van Zeist's analysis, the first two are neolithic. As more than one vessel is only very rarely found in one grave, it is highly probable that both the primary and secondary phase can be attributed to the 'Standvoetbeker' Culture. Anal. van Zeist, 1955, p. 45 and table VII.
16. *Eext* Old surface under barrow c, excavated by the author.³² The grave contained a beaker of type Ic. Anal. van Zeist.

17. *De Eese* Sod-like filling of temporary foundation trench of primary mound of barrow, excavated by the author.³³ The central grave was destroyed, but the presence of a battle axe, a flint knife and a flint axe in the disturbed soil, and the find, long ago, of a since lost vessel, probably a beaker, points definitely to the 'Standvoetbeker' Culture. Anal. van Zeist.
18. *Spier* Old surface under tumulus 5, excavated by van Giffen. The grave was for the greater part destroyed, but the remnants showed characteristic features of the bee-hive grave type, which so far has been found only with the 'Standvoetbeker' Culture. Anal. Waterbolk 1954, p. 75 and table 5.
19. *Havelte* Old surface under secondary mound of the heavily damaged tumulus 21, excavated by van Giffen.²⁵ Samples from the primary mound were barren. In earlier digging a battle-axe was found in the barrow, apparently from one of the graves. Although it is not sure that the spectrum belongs to this grave find the presence of the 'Standvoetbeker' Culture at the site is certain. Anal. Waterbolk, 1954, p. 110 and table 6.

BELL BEAKER CULTURE

20. *Odoorn* Sod-like material in foundation trench of the well-known barrow excavated by van Giffen.³⁷ Among the grave-finds can be mentioned a beaker of type 2Ib and a tanged dagger. The barrow was sampled in 1929. At that time a sample from the grave filling was also taken. It proved to contain pollen, but the spectrum is omitted here, since grave samples are not reliable. In a parallel case van Zeist³⁸ was able to take samples from a sod and from the old surface under a barrow from which the author had previously analyzed a grave sample. The pollen content of the new samples was very different. Anal. Waterbolk, 1954, p. 71 and table 2.
21. *Oudemolen* Old surface of primary mound of tumulus 13, excavated by van Giffen. The grave contained a bell beaker of type 2Ic. Anal. van Zeist, 1955, p. 47 and table VII.

UNKNOWN

22. *Havelte* Sod of secondary mound of tumulus 4 (see above, sub. 11). In the grave, a stone cist, no objects were found. Anal. Waterbolk, 1954, p. 81 and table 6.
23. *Vries* Old surface under primary mound of tumulus III, excavated by van Giffen.³⁹ The central grave was a stone cist, which did not contain any finds. Anal. Waterbolk, 1954, p. 50 and table 2.
24. *Hijken* Old surface under primary mound of tumulus I, excavated by van Giffen. The inhumation grave did not contain finds. Anal. van Zeist, 1955, p. 33 and table II.
25. *Spier* Old surface under primary mound of tumulus 1, excavated by van Giffen. No objects were found in the grave. Anal. Waterbolk, 1951, p. 75 and table 5.
26. *Drijber* Old surface under barrow, 'Otterberg', excavated by Glasbergen. The grave contained a hybrid beaker. Anal. van Zeist, 1955, p. 41 and table V.
27. *Oudemolen* Old surface under primary mound of tumulus 6, excavated by van Giffen. No grave was found. This barrow is probably very late. It is covered and surrounded by Early Bronze Age barrows. Anal. Waterbolk, 1954, p. 60 and table 4.
28. *Oudemolen* Old surface (a) and sod (b) of primary mound of tumulus 12, excavated by van Giffen. The grave did not contain any finds. The spectra closely agree with that from tumulus 13 (see sub 20). Since in the Oudemolen area no 'standvoetbekers' are known and the number of Bell Beakers is considerable, there is a good reason to believe that tumulus 12 belongs to the Bell Beaker Culture. Anal. van Zeist, 1955, p. 60 and table 4.

According to expectation all spectra show very low *Ulmus* values, whilst *Fagus* never exceeds 1%. The agreement with peat spectra is also satisfactory for the other tree pollen types.

A comparison of the tree pollen values for the three barrow groups does not show differences of importance. One might only note somewhat higher percentages of *Tilia* and *Pinus* with the Funnel Beaker Culture. The mean percentages⁴¹ are for *Tilia* 4.0, 2.0, 1.4 and for *Pinus* 2.2, 1.9, 0.7.

Very pronounced, however, are the differences with some non-arboreal pollen types. In table 2 the mean percentages for the important herbs are given for the first two groups of barrows.

Table 2. Mean percentages of some herb pollen types for the Funnel Beaker and 'Standvoetbeker' Cultures

	Funnel Beaker Culture	'Standvoetbeker' Culture
<i>Calluna</i>	56	59
<i>Gramineae</i>	16	43
<i>Cerealìa</i>	0.4	1.0
<i>Plantago lanceolata</i>	0.9	24
<i>Rumex acetosella</i> -type	1.3	5.6
<i>Artemisia</i>	0.6	0.7
<i>Chenopodiaceae</i>	0.3	0.3
<i>Caryophyllaceae</i>	1.4	2.2
<i>Ranunculaceae</i>	0.4	0.5
<i>Succisa</i>	1.4	2.3
<i>Tubuliflorae</i>	1.1	2.7
<i>Liguliflorae</i>	3.8 ⁴³	3.4
<i>Pteridium</i>	6.9	3.0 ⁴²

We see that the 'Standvoetbeker' barrows are characterised by high values of *Plantago*, *Gramineae*, *Rumex* and, to a less degree, *Succisa* and *Compositae*. On the other hand there are no important differences for *Artemisia*, *Chenopodiaceae*, *Calluna* and *Pteridium*. Very interesting is the regular occurrence with both cultures of *Cerealìa*.

It is much to be regretted that for the Bell Beaker Culture only two spectra are available. Still, it is remarkable that these spectra agree with those of the megalithic barrows. The same holds good for the spectra of Oudemolen, tum. 12 (no 28) which might well belong to the Bell Beaker Culture. Although this paper deals only

with barrows in the northern Netherlands, it is of interest to note that a recently examined Bell Beaker barrow in the southern part of the country, at Witrijt,⁴⁴ produced spectra with less than 0.1 % *Plantago*. The grave contained an all-over herring-boned Bell Beaker (type 2^{IIc}), and a dagger of Grand Pressigny flint.

The other spectra of unidentified barrows mostly resemble those of the 'Standvoetbeker' Culture. Some are not very typical, but this may be due to the fact that findless graves generally seem to be rather late, and very close to the Early Bronze Age. Some might actually belong to this period.

It is clear that there is a significant difference in botanical environment between at least two of the cultures present in the area, the Funnel Beaker and the 'Standvoetbeker' Culture. Although the evidence is meagre it seems that the environment of the Bell Beaker Culture is related to that of the Funnel Beaker Culture. It is interesting that the distribution of the Bell Beakers in the area points in the same direction. Also in other areas, the Bell Beaker people seem to be attracted by the presence of megalithic monuments.

Troels-Smith's suggestion that the megalithic people in Denmark continued the type of 'landnam' of the Ertebölle Culture is fully supported by the present evidence. Admittedly, pollen of *Plantago major*, *Allium ursinum* etc. was not found in the barrow spectra, but this may partly be due to the very different type of soil, partly to the unfavourable state of preservation. The important point, however, is the fact that pasture plants are only weakly represented in the 'hunebed' spectra.

On the other hand, the rather high *Calluna* values show that there was rather much breckland around the settlements. This must have originated on fields, which, on the sandy soils, were probably soon exhausted. *Gramineae*, *Pteridium*, *Succisa* and some *Compositae* and *Caryophyllaceae* apparently grew on these heaths as well.

Since *Calluna* grows on raised bogs, the heather increase is not reflected in bog diagrams. The only traces of the Funnel Beaker Culture in pollen diagrams, then, are a few pollen grains of *Cerealia*⁴⁵ and some odd grains of *Plantago lanceolata* and *P. major*.⁴⁶ Apparently the natural forest was only very locally opened by the 'hunebed' people.

There can be no doubt that the 'Standvoetbeker' Culture is responsible for the *Plantago lanceolata*-*Rumex*-*Gramineae* maxima in the neolithic parts of the pollen diagrams of the Netherlands. Although soil conditions are different, Iversen's vivid picture of the land occupation by means of the *Svedje* method fully applies to the 'Standvoetbeker' Culture. The nomadic character of this and the related Single Grave and 'Schnurkeramik' Cultures has often been underlined. On these pastures the heather also soon increased. Spectra no 17 and 23 apparently represent local early stages with only very little *Calluna*.

Much doubt has been expressed⁴⁷ as to the presence of grain cultivation in the Single Grave Culture. Since the *Cerealia* values for the 'Standvoetbeker' barrows are even somewhat higher than for the Funnel Beaker Culture it seems certain that grain growing formed an essential part of the 'Standvoetbeker' people's economy.

In the Netherlands, a date of about 2200 B.C. for the arrival of the 'Standvoetbeker' people seems to be well founded.⁴⁸ In Denmark, however, the date for the *Plantago lanceolata* 'landnam' can, on the base of the Mulbjerg dates⁴⁹ be estimated at 2500 B.C. in the Aamosen area. If we consider the *Ulmus* fall as contemporaneous, it could be even earlier in other areas. The Danish Single Grave Culture, however, is essentially restricted to the sandy areas of Jutland. In Eastern Denmark only a younger offshoot is present, which hardly can be responsible for the early occupation phase. It is of great importance, therefore, to trace the origin of the beakers of Becker's non-megalithic group B, which Troels-Smith found to be contemporaneous with the *Plantago lanceolata* increase. These non-megalithic groups apparently introduced a new economy into northwestern Europe, which was able to flourish alongside that of the megalithic Funnel Beaker people. In view of Troels-Smith's results in Switzerland, the new economy could hardly have originated among the western Neolithic cultures.

It remains to seek an explanation of those single occurrences of grains of *Plantago lanceolata*, *Cerealia*, etc., which occur so soon after the elm decline of 3000 B.C. that the megalithic people can hardly be responsible for them.

Long-distance-transport from areas with an early neolithic Danubian or Rössen settlement, though not impossible, does not seem probable, but these occurrences as such can hardly be considered as reliable evidence for the existence of a pre-megalithic neolithic civilization in the Netherlands. More archaeological facts are needed to prove, what for the time being can only be considered as a useful hypothesis.

ABBREVIATED REFERENCES

- Waterbolk, 1954: H. T. Waterbolk, *De praehistorische mens en zijn milieu*, Thesis Groningen, 1954.
- Iversen, 1941: J. Iversen, *Landnam i Danmarks Stenalder*, Danmarks Geologiske Undersøgelse, II. Raekke, 66.
- Troels-Smith, 1954: J. Troels-Smith, *Ertebøllekultur – Bondekultur*, Aarbøger for Nordisk Oldkyndighed og Historie, 1953.
- Van Zeist, 1955: W. van Zeist, *Pollenanalytical investigations in the Northern Netherlands*, *Acta Botanica Neerlandica*, IV, 1955.
- Van der Waals-Glasbergen, 1955: J. D. van der Waals en W. Glasbergen, *Beaker types and their distribution in the Netherlands*, *Palaeohistoria* IV, 1955.
- Van Zeist, 1955a: W. van Zeist, *Some radiocarbon dates from the raised bog near Emmen (Netherlands)*, *Palaeohistoria* IV, 1955.
- Van Giffen, 1927: A. E. van Giffen, *De hunebedden in Nederland*, Part I, II and atlas, Utrecht, 1925, 1927.
- Van Giffen, *Bauart*: A. E. van Giffen, *Die Bauart der Einzelgräber*, *Mannus Bücherei*, 44 & 45, 1930.
- NDV: *Nieuwe Drentse Volksalmanak*.

NOTES

- ¹ Waterbolk, 1954, p. 27; van Zeist, 1955, p. 32.
- ² Iversen, 1941.
- ³ Troels-Smith, 1954.
- ^{3a} C. J. Becker, *Mosefundere Lerkar fra Yngre Stenalder*, Aarbøger for Nordisk Oldkyndighed og Historie, 1947 (1948).
- ⁴ Waterbolk, 1954; van Zeist, 1955.
- ⁵ See abbreviated references.
- ⁶ Van Zeist, 1955, fig. 4; the same, 1955a, Pl. XXX; W. H. Zagwijn, in: A. J. Pannekoek c.s., *Geologische Geschiedenis van Nederland*, den Haag, 1956, fig. 43.
- ⁷ H. de Vries, G. W. Barendsen and H. T. Waterbolk, *Groningen radiocarbon dates II*, *Science*, in the press.
- ⁸ Waterbolk, 1954, p. 116.
- ⁹ Van Zeist, 1955, p. 74.
- ¹⁰ Van Zeist, 1955a; GRO 424, 3350 ± 140 .
- ¹¹ Van Zeist, 1955, 1955a; radiocarbon date 2230 ± 140 B.C. (GRO 428).
- ¹² Waterbolk, 1954, figs. 18, 19.
- ¹³ Iversen, 1941; cf. also: J. Iversen, *The influence of Prehistoric Man on Vegetation*, *Danmarks Geologiske Undersøgelse*, IV. Raekke, 3, 1949.
- ¹⁴ L. Lüüdik-Kaelas, *Wann sind die ersten Megalithgräber in Holland entstanden? Ein Datierungsversuch*, *Palaeohistoria* IV, 1955.
- ¹⁵ Van der Waals-Glasbergen, 1955, p. 7-17.
- ¹⁶ Van der Waals-Glasbergen, 1955, p. 17-33.
- ¹⁷ Van der Waals and Glasbergen, 1955, figs. 4-8, 10-13.
- ¹⁸ A. E. van Giffen, *Bauart*, p. 160 and Tafel 117 (Zandwerven); P. J. R. Modderman, *Een neolithische woonplaats in de polder Vriesland onder Hekelingen (eiland Putten) (Zuid Holland)*, *Berichten R.O.B.* IV, 1953. In 1957 a settlement on the isle of Schouwen (Prov. of Zeeland) was investigated by the State Archeological Survey (Amersfoort).
- ²⁰ Troels-Smith, 1954.
- ^{20a} See note 14.

- ²¹ All megalithic monuments are described by A. E. van Giffen, 1927.
- ²² A. E. van Giffen, Het Ndl. Hunebed (D XXVIII) te Buinen, gem. Borger, NDV 1943, p. 115.
- ²³ Van Giffen, 1927, p. 165.
- ²⁴ A. E. van Giffen. Een vernield hunebed, D LIIa, het zoogenaamde Pottiesbargien in het (vroegere) Wapserveld bij Diever, gem. Diever, NDV 1946.
- ²⁸ Van Giffen, Bauart, p. 23 and Tafel 9-12.
- ³⁰ Van Giffen, Bauart, p. 45, 128 and Tafel 37.
- ³¹ A. E. van Giffen en medewerkers, De Havelterberg en omgeving bij Havelte, NDV 1951, p. 105.
- ³² H. T. Waterbolk, Grafheuvelopgravingen in de gemeente Anlo. I. Het onderzoek, NDV 1957, p. 32.
W. Glasbergen. Grafheuvelopgravingen in de gemeente Anlo. II. De neolithische grafvondsten, NDV 1957, p. 38.
- ³³ H. T. Waterbolk, Verslag der excursie naar een Saksische hutkom op de Emelang en een samengestelde grafheuvel op de Eese, NDV 1957.
- ³⁵ A. E. van Giffen en medewerkers, NDV 1951, p. 110.
- ³⁷ Van Giffen, Bauart, p. 166, Tafel 113-116; NDV 1947.
- ³⁸ Van Zeist, 1955, p. 43.
- ³⁹ A. E. van Giffen, NDV 1941, p. 115, afb. 13-15.
- ⁴¹ Calculated irrespective of the pollen total.
- ⁴² Sample 14 not included.
- ⁴³ If sample 8 is excluded, the mean percentages would be 2.4.
- ⁴⁴ G. Beex and H. T. Waterbolk, in the press.
- ⁴⁵ A very clear instance of *Cerealia*-occurrence before the *Plantago lanceolata* increase was recently found by van Zeist in a so far unpublished profile from Bargoosterveld.
- ⁴⁶ See, e.g., the diagram Spier II (Waterbolk, 1954, fig. 18).
- ⁴⁸ De Vries, Barendsen and Waterbolk, Science, in the press.
- ⁴⁹ J. Troels-Smith, Neolithic Period in Switzerland and Denmark, Science 124, 1956, pp. 876-881.