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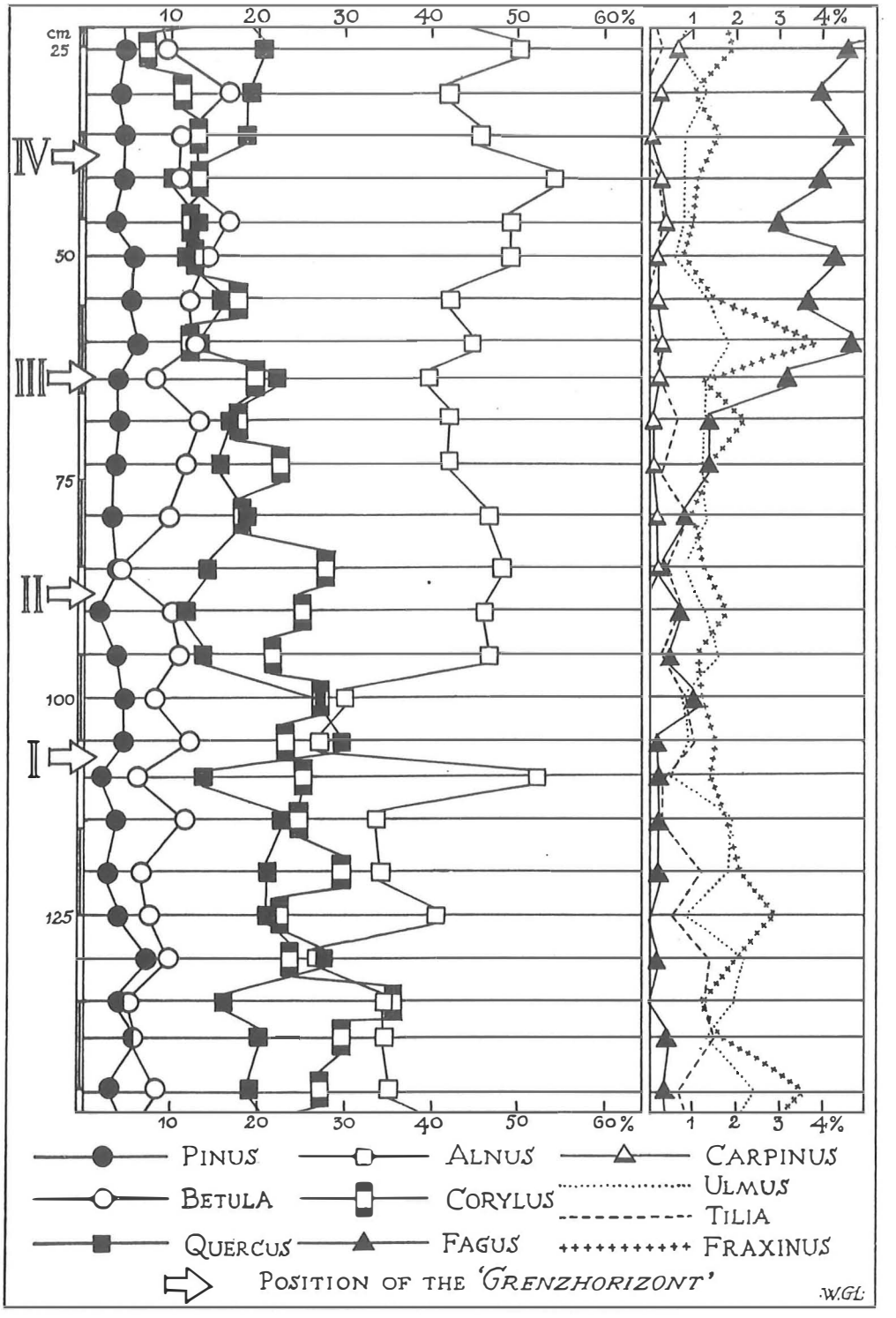
A CONTRIBUTION TO THE PROBLEM OF THE SO-CALLED *GRENZHORIZONT*

In the investigations, carried out by the Institute for Biological Archaeology, much stress is laid on the correlation between archaeological and scientific phenomena (cf. Van Giffen, 1947). It is in this context that for many years special attention was paid to the problem of the so-called *Grenzhorizont* of Weber. A new contribution to this problem will be given in the present paper which is a preliminary account of an investigation into the *Grenzhorizont* in the large raised-bog east of the village of Emmen in the south-eastern part of the province of Drente. This raised-bog forms part of the extensive bog at both sides of the German-Dutch border which for the greater part has vanished on account of intensive peat-digging. In a future paper the author intends to publish a more complete report of this investigation with the diagrams belonging to it, a discussion of literature, etc.

The contact-surface between highly humified and fresh *Sphagnum*-peat described for the first time by Weber (1900) — which is characteristic of the raised-bogs of north-west Europe — has already been the subject of many investigations and discussions. Weber (1926, 1930) dated the beginning of the growth of the younger *Sphagnum*-peat at about 800 B.C. This dating was based on the discovery of a peat burial (*Moorleiche*) and was confirmed by Schubert (1933). In the Swedish raised-bogs Granlund (1932) could distinguish several contact-surfaces, the so-called recurrence-surfaces (RY), and was able to date them on archaeological grounds. The *Grenzhorizont* of Weber was then synchronized with the RY III of Granlund (ca 500 B.C.), a dating that is still accepted by many authors. Waterbolk (1950) did not agree with this dating and asserted that the *Grenzhorizont* was synchronous with the RY II of Granlund (ca 400 A.D.). Nilsson (1948) came to the conclusion that the *Grenz* in the Netherlands and north-west Germany was not a synchronous phenomenon, and that conditions had been favourable for the beginning of the growth of the younger *Sphagnum*-peat at the same times as in Sweden. It has also been pointed out by Overbeck (1950, p. 37) that the conception of the contemporaneity of the transition from highly humified to fresh *Sphagnum*-peat cannot be correct.

In order to avoid confusion it must be emphasized that in this paper the name *Grenzhorizont* has been used for the distinct contact-surface between both types of *Sphagnum*-peat, independent of possible dating or contemporaneity. [1]

[1] Overbeck (1952, p. 40) has proposed to confine the name *Grenzhorizont* to the contact-surface that can be dated at about 500 B.C.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FRAXINUS
POSITION OF THE 'GRENZHORIZONT'
W.GL.

Fig. 1

In the raised-bog of south-east Drente, where one marked contact-surface is present, the behaviour of the *Grenz* has been investigated. In that raised-bog very often a so-called *Vorlaufstorf* — a rather fresh *Sphagnum cuspidatum* peat-layer that forms the base of the younger *Sphagnum*-peat — can be distinguished. The contact-surface of the *Vorlaufstorf* with the underlying highly humified *Spagnum*-peat thus constitutes the *Grenzhorizont*. In the absence of a *Sphagnum cuspidatum* layer the *Grenzhorizont* does not always show distinctly, but at a somewhat closer examination it is nearly always possible te recognize the contact-surface.

At various sites of the raised-bog samples have been collected from the peat section immediately below and above the *Grenzhorizont*. Moreover, one complete profile has been analysed. Figure 1 shows part of the diagram of that profile. In each sample a number of about 1000 tree pollen has been counted, *Corylus* being included in the treepollen-sum (Faegri & Iversen, 1950, pp. 68, 86–8; Jonker, 1952). As the pollen grains of the herbaceous plants are not of much interest for our purposes these have been omitted.

The *Corylus*-maximum at a depth of 135 cm agrees with the C_3 of Overbeck & Schneider (1938). In the lower part of the diagram the *Fagus* percentages are still low (0.2% on an average) and show a slight increase at a depth of 100 cm. This first — although very small — increase of *Fagus* is characteristic of the diagrams of south-east Drente. Above the last *Corylus* maximum (C_4), at a depth of 85 cm, *Corylus* gradually decreases to about 10%. In all diagrams of the area there is a correlation between this decline of *Corylus* and the second, more significant increase of *Fagus* which in this diagram reaches a value of nearly 5%, at a depth of 60 cm. *Carpinus* is constantly low in the published part of the diagram. As in nearly all diagrams of this part of Europe, the *Alnus* percentages are high in the later post-glacial stages.

Although it appears that the pollen rain must have been somewhat different at the various sites of the same raised-bog, it was yet possible to compare the diagrams of the various profiles, and to indicate in one diagram the pollenanalytical position of the *Grenz* of the various profiles. The result is shown on left in Fig. 1 where the position of the stratigraphical *Grenzhorizont* of four profiles (I–IV) has been located; whence it appears that even in the same raised-bog the *Grenzhorizont* is not a synchronous phenomenon. Whereas at one site of the raised-bog the formation of fresh *Sphagnum*-peat took place, highly humified *Sphagnum*-peat was still formed at another site at the same time. It is not yet possible to give an accurate dating for the period of time which elapsed between the formation of the *Grenz* in the cases I and IV, but it must be over 1000 years. It must be emphasized that in the case of the 'late' *Grenzhorizont*, too, there was no indication whatev

This behaviour of the *Grenzhorizont* can also be demonstrated in other raised-bogs. In those cases where two or more diagrams are available from one raised-bog it is to be noted that the stratigraphical *Grenzhorizont* in such a raised-bog is not synchronous. We may here refer to the diagrams of the raised-bog near Vriezenveen (Florschütz & Wassink, 1935), to the two diagrams of the raised-bog near Oldenbrook (Overbeck & Schmitz, 1931), and the diagram 'Worpswede' in the raised-bog near Worpswede (Schroeder, 1930).

Local factors must have been responsible for the formation, at the same time and in one raised-bog, of both highly humified and fresh *Sphagnum*-peat. It appears that while the formation of younger *Sphagnum*-peat started at the centre of the raised-bog, the growth of highly humified *Sphagnum*-peat still continued over a long time in the relatively well-drained borderzone. In this context it is of interest that according to the investigation of Waterbolk (1950) in a small raised-bog, the 'Bolleveen' near Zeijen, the formation of younger *Sphagnum*-peat cannot have started before 400 A.D.

As even in a single raised-bog the beginning of the growth of the younger *Sphagnum*-peat is not a synchronous phenomenon, one cannot expect much contemporaneity in the position of the *Grenzhorizont* of the various published diagrams. By locating the pollen analytical position of the *Grenz* in a number of profiles from north-west Germany (Overbeck & Schmitz, 1931; Schubert, 1933) in one diagram it can easily be demonstrated that this position is not confined to one or a few pollenanalytical levels, but that the *Grenzhorizont* can occur over a long range of the diagram.

Summarizing one must come to the conclusion that the *Grenz* — at least in the Netherlands and north-west Germany — cannot be a synchronous phenomenon or that only at some few times conditions for *Grenzhorizont* formation were favourable. There is, however, sufficient evidence for the supposition that the transition from highly humified to fresh *Sphagnum*-peat could take place at nearly every moment of a long period. This must be ascribed to the fact that besides climatological factors the local conditions which can differ greatly in a restricted area were of much influence on the type of peat formation.

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