

NIEUWS UIT VENLO EN OMGEVING.

BROEDGEVAL VAN DE DUINPIEPER,
ANTHUS CAMPESTRIS (L.).

Br. Agattho schrijft ons dato 29 juni: Op 22 mei van dit jaar nam ik op de Ossenbergh (Schandelo, gem. Arcen en Velden) een duinpieper waar. Ofschoon twijfel uitgesloten was (grootte, ongevlekte onderzijde, effen zandkleurige rug, lange poten, duidelijke oogstreep, het zeer snelle rennen en het kwikstaartachtige gedrag en voorkomen) liet ik de waarneming later bevestigen door de heren van den Hombergh en Spreeuwenberg, terwijl ook de heer de Bruijn hem afzonderlijk waarnam.

Tussen 22 mei en 4 juni nam ik hem drie of vier maal waar, waarvan twee keer twee exemplaren. Het was een echt duinpieperbiotoop: een bijna kale zandverstuiving met veel relief, een echt duinlandschap.

Door de sporen in het zand te volgen vond ik op 4 juni het nest met 1 eitje. 9 juni broedde de vogel op 4 eitejes en vloog vlak boven mij van het nest. De heer Boermans maakt een kleuropname van de eitjes en een overzichtsfoto van het terrein. Zaterdag 20 juni waren er 4 jongen, reeds gedeeltelijk met dons bedekt (als jonge leeuweriken), die door de heer van den Hombergh werden gefotografeerd. Ik legde een kluitje leem op 50 cm afstand van het nest en, van uit een schuilhut de camera instellend op dat kluitje, lukte het mij de oude vogel tweemaal te fotograferen. Ook de heer van den Hombergh heeft hem gefotografeerd. Van uit de schuilhut werden de vogels vele malen van vlak bij gezien.

De Avifauna van P. Hens vermeldt slechts een broedgeval bij Vlodrop.

ADVENTIEVEN LANGS DE MAAS IN LIMBURG
(Een kleine aanvulling).

door S. J. VAN OOSTSTROOM en TH. J. REICHGELT
(Rijksherbarium, Leiden).

In juli 1958 werd de zomerexcursie van de Commissie voor het Floristisch Onderzoek van Nederland van de Kon. Ned. Botanische Vereniging gehouden in Zuid-Limburg, met als standplaats Gronsveld. Tijdens deze excursie werd op 15 juli een tocht ondernomen langs de oever van de Maas ten westen van Gronsveld

en Rijckholt, waarbij evenals in 1955 gelet werd op de daar voorkomende adventieven. Slechts een vijftal soorten werd gevonden en wel: *Brassica juncea* (L.) Czern. & Coss.; Maasoever ten W. van Gronsveld.

Sisymbrium pyrenaicum (L.) Vill.; Maasoever ten W. van Rijckholt.

Medicago minima (L.) L.; Maasoever ten W. van Gronsveld.

Medicago laciniata (L.) Mill.; Maasoever ten W. van Gronsveld.

Trifolium glomeratum L.; Maasoever ten W. van Gronsveld.

Van deze soorten zijn *Brassica juncea* en *Trifolium glomeratum* nog niet vermeld in onze lijst, gepubliceerd in Natuurhist. Maandbl. 47, no. 5—6, 1958, p. 67—70.

FORAMINIFERA FROM THE CRETACEOUS OF
SOUTH-LIMBURG, NETHERLANDS XLIII.GLOBIGERINES AND RELATED FORMS IN THE
CRETACEOUS AND LOWER PALEOCENE OF
SOUTH LIMBURG.

by J. HOFKER

In the Upper Campanian which in South Limburg is found as Cr 3a, and in North Eastern Belgium as Craie blanche, there are three species which occur in the chalk: *Globigerina cretacea* d'Orbigny, *Globigerina aspera* Ehrenberg and *Gumbelina striata* (Ehrenberg).

Globigerina cretacea d'Orbigny originally was described in 1840 from the Craie blanche of Paris Basin, which formation also is Upper Campanian and does not differ but in minor features from the Cr 3a or the Craie blanche of Belgium, d'Orbigny described a species with 5 or 6 chambers in the flat whorl, with distinctly inflated nearly globular chambers; in 1941 Marie redescribed it very correctly (Mém. Mus. Nat., N.S., vol. 12, 234, pl. 36, fig. 335). In 1952, Brönnimann identified d'Orbigny's species with an american form from the Upper Cretaceous of Trinidad, but that identification must be an error, since his figures do not correspond with the topotypes of the Paris species at all.

Globigerina cretacea d'Orbigny shows a flattened or slightly conical spiral side, 5 or 6 chambers at the ventral side around a distinct umbilical hollow with these chambers opening

in that cavity; the whole test, also the marginal side, is pierced by fine but distinct pores, between which small tubercles can be seen, so that the whole surface is nearly smooth (it differs from similar *Marginotruncana pura* Hofker by the porous margin). From the apertures often small tena protrude over the umbilical cavity, never closing it totally. Many sediments contain air-filled specimens.

In the white Cr 3 b (identical with the Craie de Spiennes in Southern Belgium) the species becomes more bulky, the dorsal side being more conical, whereas the small tubercles on the surface at the ventral side often become somewhat larger, giving the surface a more roughened character. The covering plates at the umbilical hollow remain short and often are nearly absent. The specimens from the yellow Cr 3 b (identical with the „Kreide ohne Feuerstein“ from the neighbourhood of Aix-la-Chapelle in Germany) do not differ much from those of the white Cr 3 b, but in many cases they are totally lacking in the samples and, when present, can be very large and stout for the species.

In the boundary layers between the yellow Cr 3 b and the Cr 3 c, a layer also found in the quarry Hallembaye (Belgium) just above the hard ground between Campanian and Maestrichtian, and found also in many parts of South Limburg, here often characterised by the occurrence of pebbles and other transgressional remains (the hard layer called Cr 3 gamma) suddenly several species are found which point to a connection with open or Southern sea: *Bolivoides draco* (Marsen), *Spiroplectammina dentata* (Alth), and between normal *Globigerina cretacea* also distinct *Globigerina (Rugoglobigerina)* cf. *rugosa* Plummer. That species always here is characterised by the typical ornamentation consisting of distinct costae running from a point at the margin, over the dorsal and ventral sides of the chambers, whereas the covering plates (tena) over the umbilical cavity are larger, though not totally covering the umbilicus. But this invasion must have been a very short one, since higher on in the Cr 3 c (in Belgium the Craie grise) they are not refound. Here *Globigerina cretacea* remains the only form, now always with distinctly rough surface, though the costae are absent.

Once again a *Globigerina (Rugoglobigerina)* from the *rugosa*-type reappears in the overlying

Cr 4 and is common here up to the top of it, whereas rare *Globigerina cretacea* with rough surface also is found. But here the *rugosa*-form not only often shows the costae, but also is characterised by the very strongly developed tena over the umbilical hollow, which in reality do not fuse together but overlap each other at the centra, as I have shown for the type in the Navarro-Formation of America (Hofker, Micropaleontology, vol. 2, 1956, p. 371, fig. 6). Often, also in the specimens from the top of the Cr 4, large and flaring openings are found at the borders of the covering tena, which openings then serve as apertures.

Suddenly, at the top of the Cr 4, where the base of the Maestrichtian Chalk Tuff is found, which boundary in many places is marked by a regression-transgression zone (Ma), both *Globigerina cretacea* and *Globigerina (Rugoglobigerina) rugosa* disappear; only in the basal layers of the Lower Mb, here and there some, obviously reworked, specimens are found (together with scattered reworked *Globotruncana*).

Loeblich and Tappan (Journal of Paleontology, vol. 31, 1957, p. 1115—1116) when describing their results of an analysis of the Maestrichtian Chalk Tuff, mention the occurrence of rare *Rugoglobigerina* in the Mb, at the top of the Md in the Burgerwacht quarry, in the Mc of Neercanne, in the Mb of the Biebos quarry near Valkenburg.

The author described a new species from the Mb, also found in the identical basal layers of the Tuffeau de Saint Symphorien near Mons, *Globigerina supracretacea* Hofker. The species first was described as *Globigerina esnehenensis* Nakady from the *Pseudotextularia*-zone of Maasbühl, Germany, with which it has many characters in common (see Hofker, Natuurhist. Maandbl., vol. 45, 1956, p. 53, fig. 8). It shows more chambers in the last formed whorl as *G. cretacea* (6—7) and the last formed chambers strongly protrude at the ventral side. It may be the last form of the *cretacea*-series. Moreover, *Globigerines* of the *cretacea*-type now and then occur in the samples of the Mc and Md, but only in the transgressional layers or in layers which undoubtedly are beach-formations (transgressional layers between Mb and Mc, Bryozoic bancs in the Md — not the typical hard grounds at its base — and the so-called echinid-layer in the Mc); a thorough

analysis of all specimens gathered showed, however, that firstly many of them show a brighter colour than the other Foraminifera of the sample, and, moreover, all belong to the *cretacea* type which is found in the Cr 3 a, with smooth surface only covered by very minute chalk buds. Never they show the typical large chalky pustules as found in the specimens from the Cr 3 b or Cr 3 c, and never they show the typical costae from the *rugosa*-type. Moreover, when the umbilical tena are preserved, they always are very short as in the Campanian species. In all cases observed, these *Globigerines* are hollow, airfilled, and thus form, with their thin walls, objects which likely could get reworked from the surrounding chalk rocks which certainly were found at the border of that Maestrichtian Chalk Tuff sea (Cr. 3 a-rocks).

During the whole post-Cretaceous of Holland we find those tests, often in marked quantities, (Paleocene, Eocene, Oligocene, Miocene, Pliocene and Pleistocene; even in recent sediment in the North and in Zeeland they often are common). But never, in all the thousands of samples analysed from the Maestrichtian Chalk Tuff from many localities, *Rugoglobigerines* with the typical costae were found by the author, so that an error from the side of Loeblich and Tappan is certain; they have determined those Campanian *G. cretacea*, reworked, as *Rugoglobigerina*.

A second group of *Globigerines* is formed by the *Globigerina (Globigerinella) aspera* (Ehrenberg) series. This series has been described by the author up till the lower part of the Upper Maestrichtian (Basbeck, Germany) in his work on the Foraminifera from North Western Germany and Holland (Geol. Jahrb., Beiheft 27, 1957, pp. 414—418); from that series only the later part is found in South Limburg, *Globigerina aspera* forma *plana* Hofker. That form is common in small specimens in the Upper Campanian (Cr 3 a), not so common in the Cr 3 b, and slightly more common in the Cr 3 c, rare in the Cr 4. Scattered specimens are found in the lowest layers of the Mb, and higher on, in the same layers as mentioned for *Glob. cretacea*, in other words in all layers which were sedimented in turbulent water. Loeblich and Tappan (l.c.) mention not *Globigerinella*, but always a *Biglobigerinella*, from the Maestrichtian Chalk Tuff. Yet, in se-

veral samples true *G. aspera plana* were found, often in considerable quantities, and always together with *G. cretacea* and always from the forms which are typical for the Cr 3 a; *Biglobigerinella* never was found by the author in Mc and Md.

In the Lower Maestrichtian (white Cr 3 b) another group of forms appears, obviously derived from *Globigerina aspera*, which group I have called *Globigerina biforaminata* Hofker. Loeblich and Tappan give it the generic name *Biglobigerinella*. That form is common in the Cr 3 b, more rare in the Cr 3 c and once again very common in the Cr 4. Here it attains its highest development, and it is remarkable that Geroch described it from the highest Cretaceous of the Flysch of Przemyśl in Southern Poland, where it occurs together with many forms, also met with in the *Pseudotextularia*-zone of Maasbühl, from which it was first described.

At the top of the Cr 4 the species is very common, then, suddenly, it disappears, but for some scattered specimens in the lowest Mb. All specimens of that character (*aspera*-character) found in the higher levels (even all those found in the levels mentioned by Loeblich and Tappan, Mb, Mc, Md) after analysis showed to belong to *G. aspera plana*, and not at all to *G. biforaminata*. Here also Loeblich and Tappan must have made an error. *G. aspera* is commonly found in all formations of the Tertiary in Holland, often very abundantly, always reworked from the Campanian, as their characters prove.

A third group of forms around *Globigerina* is *Gümbelina* (with *Gümbelitria*); the author maintains his view about the taxonomic status of these genera in the vicinity of *Globigerina* and not in the group rejected by the author „*Heteronelicinae*”. In 1957 (Nordwestdeutschland, Geol. Jahrb., Beih. 27, pp. 418—426) the author has given an analysis of the series *Gümbelina striata* (Ehrenberg); in the Upper Cretaceous of South Limburg only the part of the series called there *G. striata* forma *supracretacea* Hofker is found, with some scattered specimens of other forms in the mentioned more Southern zone between Cr 3 b and Cr 3 c. Specimens are abundant in the Upper Campanian, moreover in the white Cr 3 b, more rare in the yellow Cr 3 b and slightly commoner in the Cr

3 c. They are extremely common in the Cr 4. Suddenly they disappear at the top of the Cr 4, but for some, often scattered, and very small specimens in the Lower Mb, and rarely in the layers from turbulent water in the Maestrichtian Chalk Tuuff, though they also, very rarely, are found in other levels. But all those specimens show the characters of *Gümbelina striata supracretacea*, mostly the small specimens from the Upper Campanian; some very rare specimens showed the characters of *Gümbelina ultimamida* White with its very rapid increase of the volume of the last formed chambers. So we may conclude with certainty, that at least most of the specimens found in the Maestrichtian Chalk Tuuff are reworked specimens, mostly from the Campanian. *Gümbelina striata* is common as a reworked species in all Tertiary to recent formations in Holland.

In the Mc, and much more commonly in the Md, *Gümbelitria* is found, in a form which may be the typical uppermost-cretaceous form, but already shows characters pointing to the form *G. mauriciana* Cole. *Gümbelitria* also is mentioned by Loeblich and Tappan from Mc and Md, and the author described it from the Md (Natuurhist. Maandbl., vol. 46, 1957, p. 57—58). True *Gümbelitria* is found through the whole Tertiary and is living in the Pacific where it does not differ from the Cretaceous form. So, its occurrence is not at all characteristic for the Cretaceous; its more narrow aperture is by no means that of a Bulminid, as Gallitelli suggests (U.S. Nat. Mus., Bull. 215, 1957, p. 135).

We come to the conclusion, that the occurrence of *Globigerina* of the *cretacea*-type („*Rugoglobigerina*”), *Globigerina* from the *aspera*-type („*Biglobigerineilla*”), *Gümbelina* from the *striata*-type („*Heterohelix*”) and *Gümbelitria* of the *cretacea*-type, in the Maestrichtian Chalk Tuuff are not at all conclusive for the age of that Tuuff Chalk; they are either reworked, or already show a more Tertiary character (*Gümbelitria*); that reworking of those species is a common feature for all post-Cretaceous Sediments in Holland and Belgium.

On the other hand, in the layers from the boundary Cr 4-Mb on, many species have been detected by the author which show a remarkable Danian type; in the Maestrichtian Chalk tuuff itself specimens of the *triloculinoides* and

pseudobulloides-type (though not identical with these species), of the *hornibrooki* and *primitiva*, *turgida* and *linaperta*-types, are found, always in very fine marls, such as those of the quarry Zevensprong (Upper Mb), in the marls at Ransdaal (Upper Mb), in the layers just underneath the Mc in the quarry Schiepersberg (Upper Mb), moreover in the fine fillings in the hollows of the typical hard grounds at the base of the Md. In all cases mentioned the deposits strongly point to not turbulent water, since the Foraminifera found together with these *Globigerines* with Tertiary type do not have the eroded and rolled characters of the transgressional layers or the Bryozoic bancs, but always are very well-preserved. Just in such sediments all these Tertiary-forms have been found, pointing to the true (obviously Danian) age of the sediment. At the top of the Md (so-called Md 4) below the hard grounds or their equivalents separating the Md from the higher levels, and in the Me, with its fauna with forms leading over to the Lower Paleocene above, even types appear which strongly point to typical *Globigerina daubjergensis* with its rough surface and its dorsal sutural openings.

It is now very remarkable, that in the Danian of Denmark, all those transitional stages leading from *linaperta* or *primitiva*-forms up to typical *daubjergensis* (which here appears in its typical form only in the upper Danian (Daubjerg, Hjerm, Hvallose, and in Sweden, Ostra Thorp) are found in the same sequence as found in the Maestrichtian Chalk Tuuff. Forms, as found by the author in the upper Mb, together with *G. compressa* Plummer (Nat. Maandbl., vol. 47, 1958, p. 43) are found in the Lower Danian; forms as found in the Lower Md by the author (Nat. Maandbl. vol. 46, 1957, p. 58) are also common in samples from the Middle Danian of Denmark, or are found in Upper Danian as well (viz. the *Globorotalia* fig. 9, l.c.); forms from the Upper Md, such as *Glob. compacta* Hofker are not found in the Danian of Denmark, but are common in samples the author studied from Western Australia, Giralia Anticline, where they are found in a sediment considered there as being of Danian age.

We come to these conclusions:

a. Reworked typical Cretaceous *Globigerines* and *Gümbelines* are found in all those sedi-

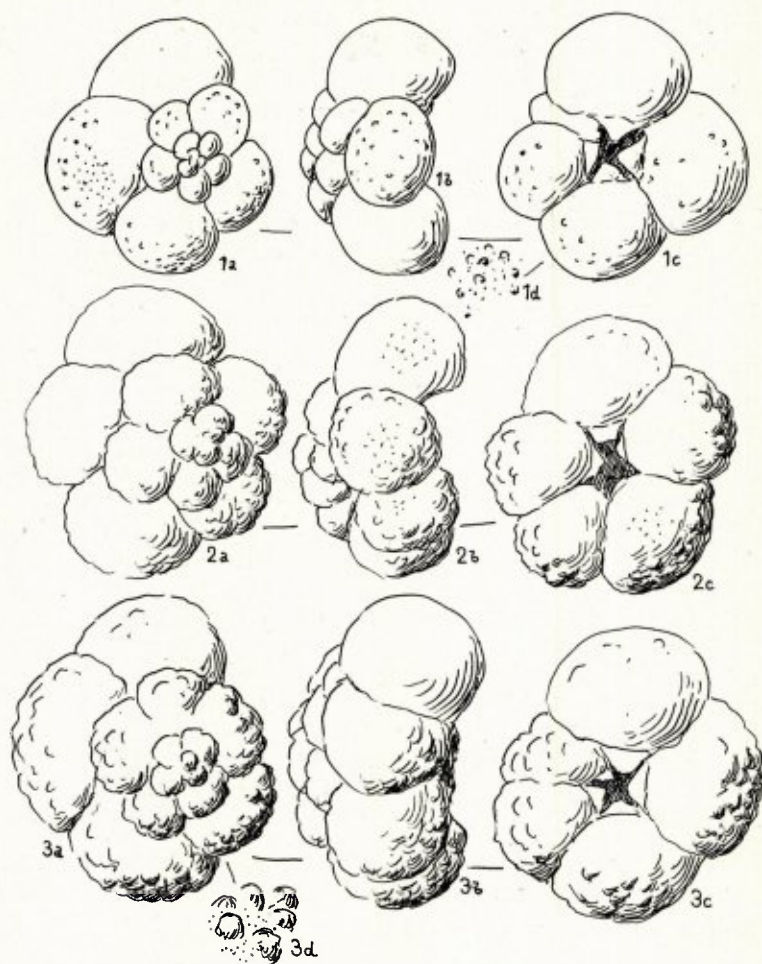


Fig. 1. *Globigerina cretacea* d'Orbigny. a, dorsal side; b, from aside; c, ventral side; Cr. 3a, Upper Campanian, from Bovenste Bos, South Limburg; $\times 85$; d, part of surface. $\times 240$.

Fig. 2. *Globigerina cretacea* d'Orbigny. a, dorsal side; b, from aside; c, ventral side; Cr. 3b, Cosberg, South Limburg; $\times 85$.

Fig. 3. *Globigerina cretacea* d'Orbigny. a, dorsal side; b, from aside; c, ventral side; $\times 85$; d, part of surface, $\times 240$; Wahlwylre, about 5 m below the Cr. 3 gamma, upper Cr. 3b, South Limburg.

In this plate the increase of roughness of the surface is shown during the Upper Campanian and the Lower Maestrichtian; the same increase is found in the samples from Upper Campanian and Lower Maestrichtian in Belgium and in Lüneburg, Germany. Reworked specimens of this species thus clearly prove the level from which they derived.

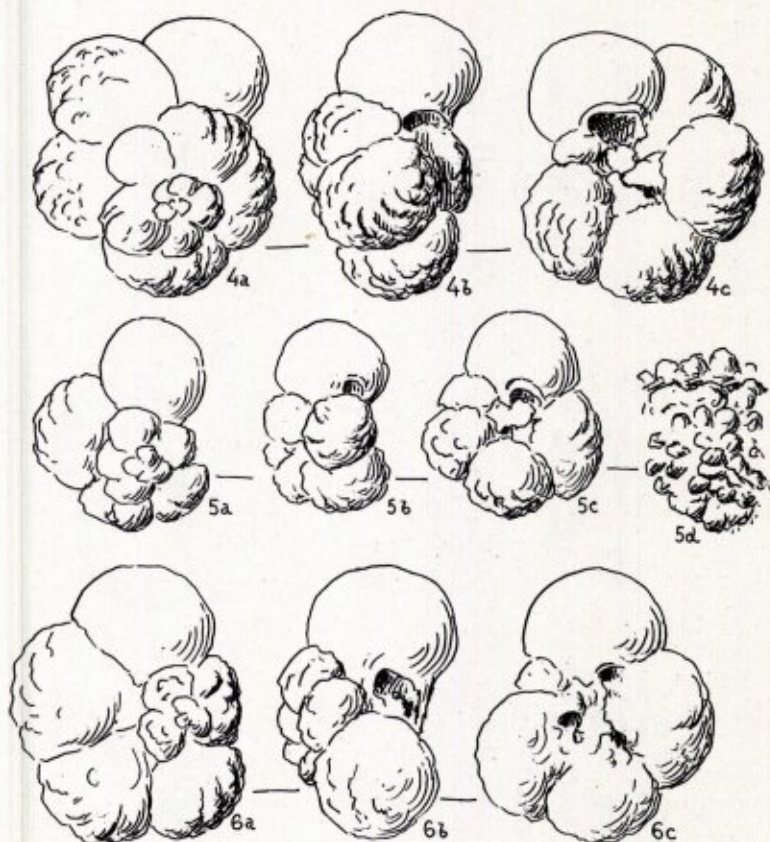


Fig. 4. *Globigerina* (*Rugoglobigerina*) cf. *rugosa* Plummer, a, dorsal side; b, from aside; c, ventral side; $\times 85$; top of Cr. 4, Canal Albert, sample Hofker 628, in hollow horizontal flint bancs.

Fig. 5. *Globigerina* (*Rugoglobigerina*) cf. *rugosa* Plummer, a, dorsal side; b, from aside; c, ventral side; $\times 85$; d, part of surface, $\times 240$; same locality.

Fig. 6. *Globigerina* (*Rugoglobigerina*) cf. *rugosa* Plummer, a, dorsal side; b, from aside; c, ventral side; $\times 85$; same locality.

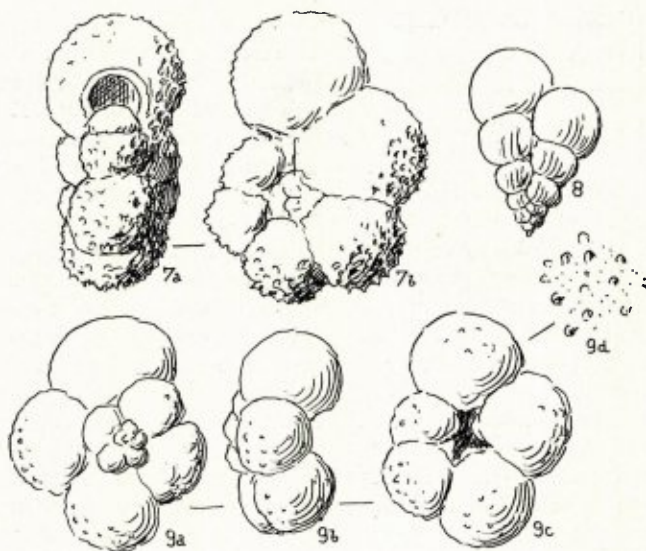
Globigerina (*Rugoglobigerina*) from the South Limburg area as well as from Belgium always shows a much rougher surface than *Globigerina cretacea*; and often shows the rugosities in parallel costae on the surface.

ments of the Maestrichtian Chalk Tuff which were formed in turbulent water (transgressional zones, beachy sediments); they do not account for a Cretaceous age of the sediment.

b. In all those sediments of the Maestrichtian Chalk Tuff, in which the other fossils or particles do not conclude to turbulent water (remains in the hollows of the hard grounds, sediments consisting of very fine material), only species are found which point to a Danian age

of the sediment, having the features of the *linaperta-primitiva-daubjergensis* series or of some species characteristic of Southern small Globigerines of Danian age. At the top of the Maestrichtian Chalk Tuff (Upper Md) in the fine marls and hard grounds, specimens are found which in many respects resemble those of the Upper Danian of Denmark (typical *daubjergensis*).

A remarkable fact remains; in the Me, and



Reworked specimens of planctonic Foraminifera in the soft parts of the highest Bryozoic banc of the Md in the quarry Van der Zwaan (outcrop 1), Saint Pietersberg, near Maastricht, sampled by M. Meyer.

Fig. 7. *Globigerina (Globigerinella) aspera* (Ehrenberg) of the type, commonly found in the Cr. 3a; a, apertural face; b, from aside; $\times 240$.

Fig. 8. *Gumbelina striata* (Ehrenberg) in a type, commonly found in the Cr. 3a of South Limburg; $\times 240$.

Fig. 9. *Globigerina cretacea* d'Orbigny, in a type commonly found in the Cr. 3a, but not in higher levels. a, dorsal side; b, from aside; c, ventral side; $\times 85$; d, part of surface, $\times 240$. Compare for this figure: fig. 1.

This plate proves that typical Cretaceous planctonic Foraminifera found in the Maastrichtian Chalk Tuff are reworked specimens from the Cr. 3a, Campanian, and thus do not indicate a Cretaceous age of the Chalk Tuff.

more so in the Lower Paleocene covering the Me, and in the similar sediment found in holes in the Poudingue de la Malogne in the Basin of Mons, *Globigerina daubjergensis* shows much more developed and distinct (always present) sutural dorsal openings than in the specimens found in the highest Md and in the highest Danian of Denmark. This fact would suggest, that those specimens form a yet more developed stage in the series, which certainly begins with roughened forms without any dorsal openings (*primitiva-linaperta*-group) as found in the Mb, Mc and the Lower Danian of Denmark. Such

forms with closed dorsal sutures even occur in the higher Danian of Denmark, together with the more advanced (but not highly advanced) forms; those forms have been mentioned by Brönnimann from Daubjerg and Hjerm as *G. linaperta*, *G. hornibrooki* and *G. stainforthi* (Brönnimann, Egl. geol. Helvet., vol. 48, 1952, pp. 339—441). All these transitional forms leave no doubt, together with the fact that only in the Lower Paleocene the extreme form of *G. daubjergensis* is found, to the identity in age of the Maastrichtian Chalk Tuff with the Danske kalk of Denmark.