Confidential to Aug. 28, 197

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A

STRATIGRAPHIC CORRELATION
BIOSTRATIGRAPHIC ZONATION

SUN BVX ET AL PELLY B-35

69° 34' 14" N. LAT.; 135° 23' 45" W. LONG.
NORTHWEST TERRITORIES

AUSTIN & CUMMING EXPLORATION CONSULTANTS
CALGARY, ALBERTA
FEBRUARY, 1978

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BY

L. W. CUMMING, P. GEOL.

SUN BVX PELLY B-35

SUMMARY AND CONCLUSIONS

Biostratigraphic analysis of Sun BVX Pelly B-35 comprises a microfloral study carried out by Dr. G. Norris and a microfaunal analysis by Drs. Braun and Brooke. Integration of biostratigraphic data with stratigraphy and mechanical logs, correlation and interpretation was carried out by L. W. Cumming, P. Geol.

Microfloral analysis of 97 palynological slides, provided by the Operator, indicates a sequence of Neogene-Paleogene with the well bottoming in beds of probable Upper Eocene age (*tetrad*-1 zone

One hundred and seventy three (173) micropaleontological slides were examined for microfossils yielding good recoveries except through the interval 4,000±-8,000 feet where samples were effectively barren of fauna.

Possible contamination of samples through recycling of older palynological material in the interval 2300-3300 possibly masks the zonation. Therefore, an alternate zonation honouring lithological correlations and microfaunal analysis is presented.

The following summary of zonation (Table 1) integrates the palynological and micropaleontological zonation and presents an alternate interpretation that employs the above disciplines in conjunction with stratigraphy and regional correlation.

Table 2, following the discussion of zonation, presents a tentative palynostratigraphic correlation of Sun BVX Pelly B-35 with Imp Netserk B-44

A comparison of the palynological (and alternate) zonation with microfaunal assemblages is illustrated diagrammatically in Table 3 (preceeding the Micropaleontological report).

Microfaunal and microfloral distribution charts (Figs. 1 and 2 respectively, in pocket) tabulate all species identified.

A summary log (Fig. 3, in pocket) relates palynological, alternate palynological and micropaleontological zonation to mechanical logs and lithology at normal reduced log scale of 1 inch = 100 feet.

TABLE 1

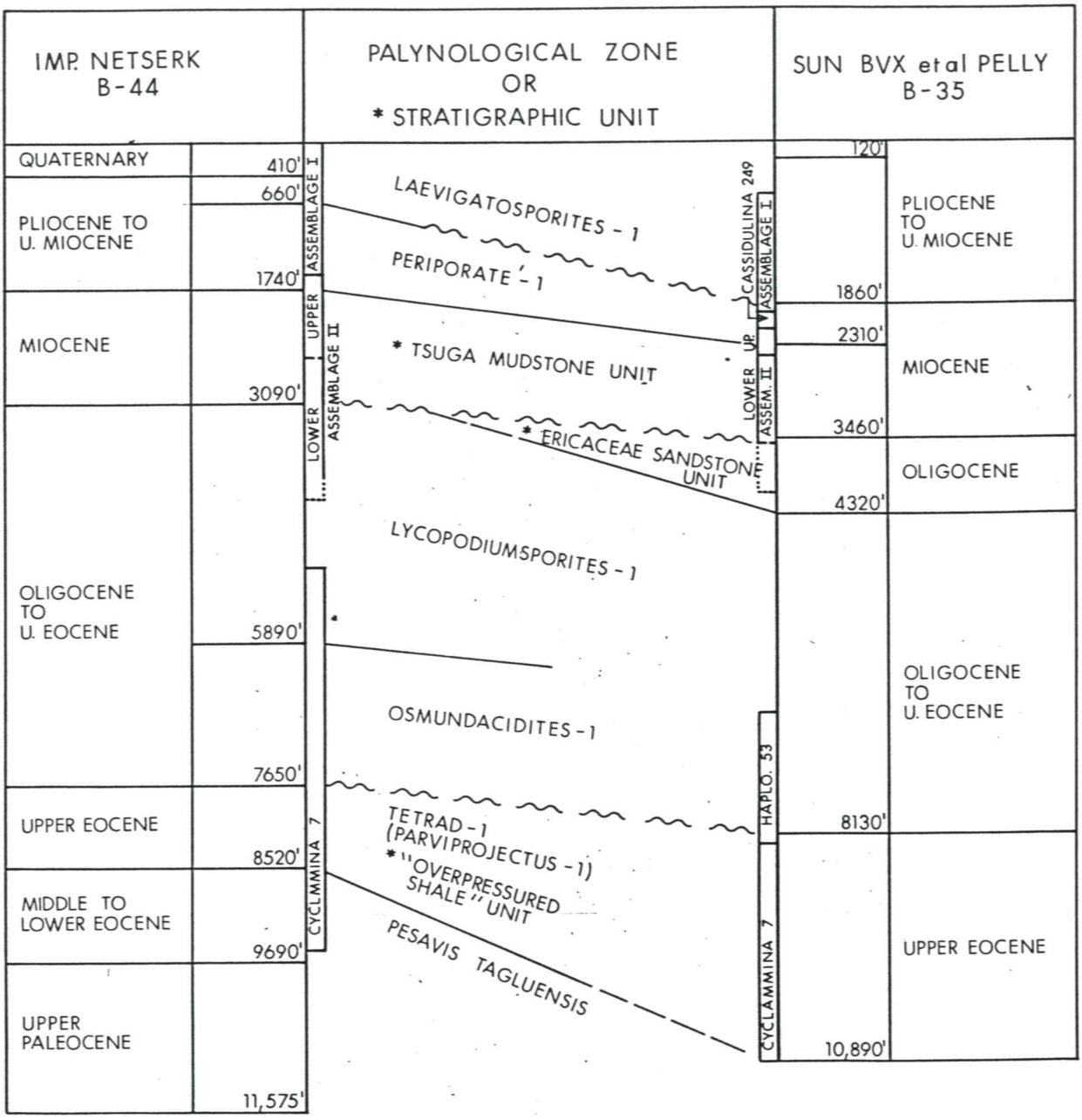
SUN BVX PELLY B-35

SUMMARY OF ZONATION

AGE	PALYNOLOGICAL ZONE Norris	ALTERNATE ZONE Cumming	MICROPALEONTOLOGY Braun & Brooke
NEOGENE			
U. Miocene-Pliocene	*Laevigatosporites*-1 (120-2310)	*Laevigatosporites*-1 (120-1860)	Assemblage I (585-2000±)
Mid.-Upper Miocene	-	*periporate*-1? (1860-2310±)	Cassidulina 249 (2000±-2190)
L.-Middle Miocene	-	*Tsuga*-1 (2310±-3460)	Assemblage II Upper 2190-2475 Lower 2475-4150 (or 2475-3550?)
PALEOGENE			
Oligocene	*Ericaceae*-1 (2310-4320)	*Ericaceae*-1 (3460-4320)	Not Diagnostic (3550-6750)
U. Eocene-Oligocene	*Lycopodiumsporites*-1 (4320-8130)	*Lycopodiumsporites*-1-*Osmundacidites*-1 (4320-8130)	Haplophragmoides 53 Bathysiphon 52,153 (6750-8300±)
U.Eocene	*tetrad*-1 (8130-10,890)	*tetrad*-1 (*Parviprojectus*-1) (8130-10,890 TD)	Alveophragmium 154 ("Cyclammina" 7) (8300±-10,890 TD)

TABLE 2

PALYNOSTRATIGRAPHIC CORRELATION
IMP. NETSERK B-44 - SUN BVX et al PELLY B-35



INTERPRETATION BY: L. W. CUMMING

DISCUSSION OF ZONATION

(Tables 1 & 2)

Palynological zonation of Sun BVX et al Pelly B-35 as presented by Norris, is based on the uppermost occurrences of characteristic microfloral species found consistently throughout the Mackenzie Delta. The first or uppermost occurrences of zone species are often misleading due to recycling of older (Oligocene?) species into beds of probable Miocene age. Consequently, an alternate zonation is presented using microfaunal analysis and lithology as a guide for choosing zone boundaries.

Correlation of this well with Imp. Netserk B-44 (Table 2) is based on the alternate zonation which is strongly influenced by the micropaleontological interpretation.

NEOGENE

Upper Miocene-Pliocene

Laevigatosporites-1 (120-2310 feet)

Common occurrences of *Laevigatosporites*-1, *Pinus*-1 and *Stereisporites antiquasporites* throughout this interval suggests the presence of the *Laevigatosporites* zone.

Alternate Zonation (120-1860 feet)

The base of this zone is alternately chosen at 1860 feet to coincide with marked lithological change from predominantly sandstone lithofacies above 1860 to mudstones below. Uppermost occurrences of *Corylus*-1 and *Betulaceaepollenites*-1 at 1920 feet (indicated as recycled by Norris) tend to support the presence of the *periporate*-1 zone through the lower portion of this zone (1920-2310 feet).

Miocene

Middle-Upper

Alternate Zonation

periporate-1 (1860-2310 feet)

The extinction of *Corylus*-1 and *Betulaceaepollenites*-1 within this interval may signify the presence of the *periporate*-1 zone.

The abundant presence of the sub-fauna Cassidulina 249 (2000-2190) supports this placement. However, this faunal species does extend upwards into the base of the *Laevigatosporites*-1 zone at Imp. Netserk B-44.

Miocene - cont'd.

Lower-Middle

Alternate Zonation

Tsuga-1 (2310-3460 feet)

The uppermost occurrence of *Tsuga*-1 microflora at 2400 feet is believed indicative of the *Tsuga*-1 palynozone. The presence of *Ericaceae*-1 flora above the extinction level of *Tsuga*-1 is believed to result from recycling of the older (Oligocene) flora into the *Tsuga*-1 mudstone beds.

Diverse and abundant species of the Assemblage II fauna is present through the interval 2190-3550 feet followed by a marked reduction of species through the interval 3550-4150. This assemblage appears to be commonly associated with the "Tsuga Mudstone Unit" found in surrounding wells. The interval 2310-3460 is composed primarily of mudstones, with the exception of a sandy interval, not uncommon for this unit, near the top (2490-2770). Regional correlations support a *Tsuga*-1 placement for the interval 2310 to 3460 feet.

PALEOGENE

Oligocene

Ericaceae-1 (2310-4320 feet)

Based on the uppermost occurrence of *Ericaceae*-1 and related flora, Norris interprets this interval as the *Ericaceae*-1 palynozone. The extinction of the *Tsuga*-1 species at 2400, below the uppermost occurrences of the *Ericaceae* flora, tends to contradict this placement. Consequently, it can be argued that the *Ericaceae* flora present through the interval 2310-3460 results from recycling of material derived from earlier beds and redeposited in the Tsuga Mudstone Unit. A marked increase in recycled Tertiary flora above 3510 feet also tends to support an unconformable break at this level.

Alternate Interpretation (3460-4320 feet)

Lithological examination indicates a pronounced change from predominantly mudstone above 3460 feet to primarily sandstone through the interval 3460 to 4320 feet. Floral recoveries from this unit are poor and are accompanied by a sharp reduction in faunal species and abundances below 3550 feet. Consequently, the interval 3460 to 4320 is interpreted as a terrestrial sequence with a gradual tailing out of marine faunal species through the interval 3550 to 4150 feet. Faunal recoveries from this interval are tentatively interpreted as caved from the overlying mudstone unit.

Upper Eocene-Oligocene

Lycopodiumsporites-1 Zone (4320-8130 feet)

The extinction of several fern species through this interval indicates the presence of the *Lycopodiumsporites*-1 palynozone. The lower portion of this unit, as shown in Table 2, is believed to include the *Osmundacidites*-1 palynozone that commonly occupies a similar stratigraphic position in other wells. The Haplophragmoides 53 and Bathysiphon 52 and 153 sub-fauna, commonly associated with the *Osmundacidites*-1 palynozone in other wells, is present through the interval 6750-8300 feet, suggesting the lower portion of the *Lycopodiumsporites*-1 zone in this well is equivalent to the *Osmundacidites*-1 zone of other wells. A well developed sandstone at the base of this palynozone (8090-8130) is interpreted as a basal sand deposit laid down on the unconformable surface of the Upper Eocene "tetrad" shales.

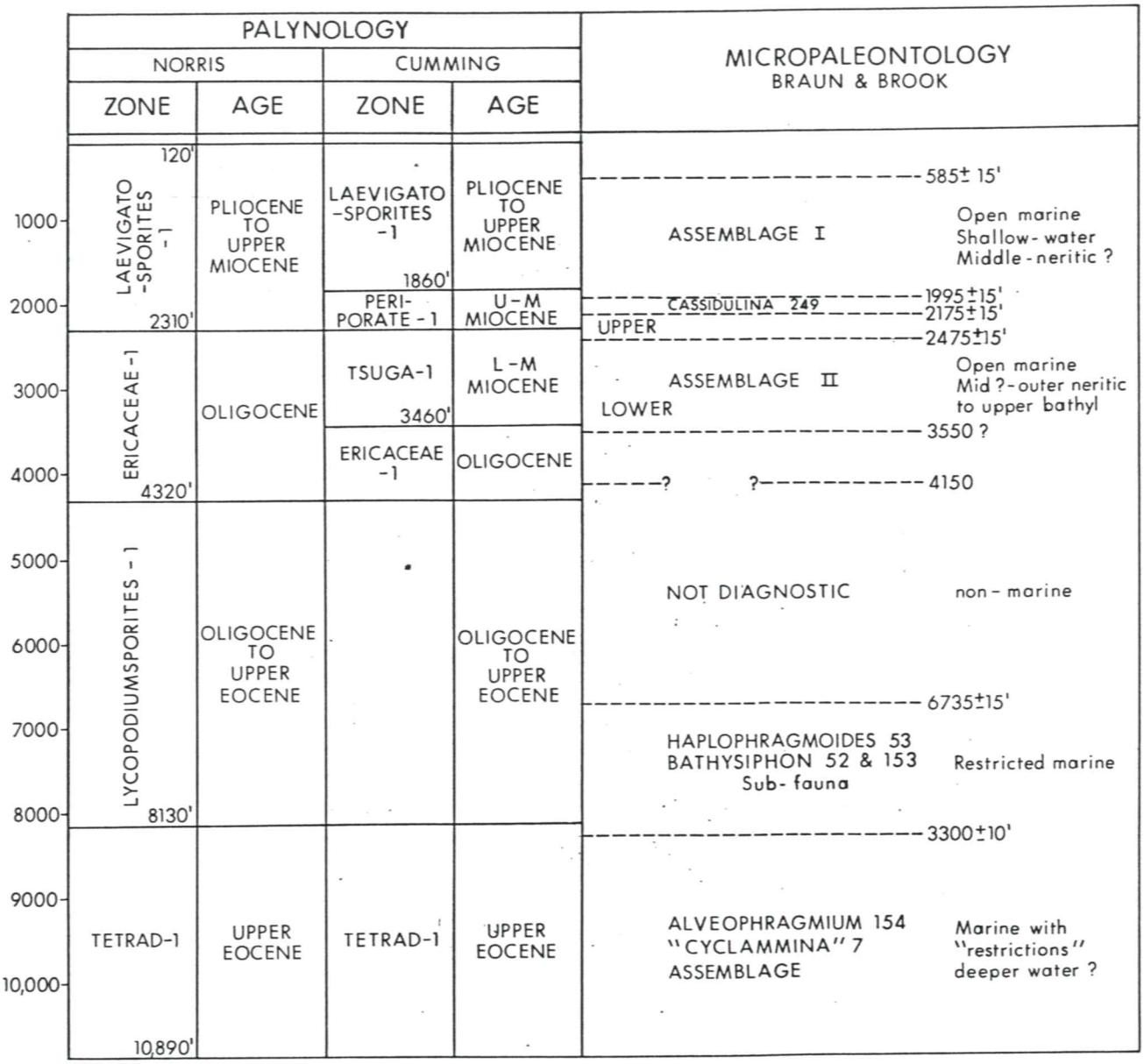
Upper Eocene

tetrad-1 zone (8130-10,890 feet, T.D.)

The presence of *Parviprojectus*-1, *tetrad*-1, *Pluricellaesporites*-1, etc. through this interval strongly indicates the presence of the *tetrad*-1 (*Parviprojectus*-1) palynozone. Common occurrences of the Alveophragmium 153-"Cyclammina" 7 faunal assemblage (8300 to T.D.) supports this placement. The absence of the Wetzeliella dinoflagellate species suggest this well bottoms within the "*tetrad*-1" palynozone or "overpressured shale unit" that overlies the Taglu Sandstone Unit encountered in the Taglu field to the south.

TABLE 3

SUN BVX ET AL PELLY B-35



PE

MICROPALEONTOLOGICAL STUDY

BY

DR. W. BRAUN
DR. M. BROOKE

SUN PELLY B-35

SUMMARY OF MICROPALEONTOLOGICAL STUDY

GENERAL REMARKS

One hundred and seventy-three (173) micropaleontological slides were submitted for study, yielding in places a well-preserved and abundant microfauna. Unfortunately, about 4,000 feet of section, between 4,000 feet to 8,000 feet approximately proved to be poorly fossiliferous or unfossiliferous. In terms of fauna, 15 species of ostracodes and 112 species of Foraminifera could be identified; fragments of other fossils or unidentifiable forms were also recorded.

On basis of distinct breaks in the faunal spectrum and marked differences in faunal contents, three major assemblages or faunas and two "sub-faunas" were recognized, with Assemblage II further divisible into a lower and upper part. The composition of the fauna is controlled by water temperature and "depth" (with associated environmental factors), and in part by evolutionary changes. It is difficult, however, to argue convincingly which of these factors exerted the greater control on the distribution and composition of these faunas at any time and place of deposition in the Mackenzie Delta and adjoining regions. Not enough is known, as yet, about the overall ranges of the many species that compose the assemblages, or about the ranges of the index species used for correlations.

The microfaunal sequence of Pelly is closely comparable with that of Netserk B-44 which is used, therefore, as the main yardstick for correlation and for comparison.

ASSEMBLAGE I

(585' to approx. 2,000')

Assemblage I of Pelly B-35, like that of Netserk, is characterized by a relatively high number (12) of ostracode species of shallow-marine origin, except for specimens of two freshwater forms which occur sporadically. Present also are the clacareous Foraminifera of the Elphidium-Cribrononion group which seem to be prevailing in the upper third of the zone, but which become overshadowed or replaced by agglutinated-arenaceous Foraminifera through the lower two-thirds of the faunal zone. Although some of these latter specimens may be re-worked older and even Mesozoic forms, others are considered to be indigenous to the sequence. The shift in faunal combination may reflect on slight changes in the environment of deposition; but minor changes in age also may be involved, as will be discussed later.

The composition of the microfauna in general, and in particular the absence of typical near-shore indicators such as the miliolids which are more abundant and varied in Assemblage I of other boreholes, indicates that the fauna most likely developed in about the middle neritic zone and not in the shallowest part of the inner neritic zone as is the case with the faunas of many other boreholes studied, except for Netserk.

Assemblage I is in part or wholly equivalent to what Staplin and co-workers refer to as the "Sigmopollis-Ostracod-Elphidium Assemblage" which is shown to occupy the highest part of the Neogene section in Taglu C-42, and to represent the youngest microfauna and flora of the Mackenzie Delta region. It is the most widespread and most persistently occurring one also of all Mesozoic to Recent faunas. As a rule of thumb, the variety and number of freshwater ostracodes associated with the shallow-marine ostracodes and Foraminifera increases in a "southerly" direction, whereas such forms disappear rapidly in a "Northly" direction. The freshwater ostracodes occurring in the Pelly section attest either to intercalation(s) of some minor lacustrine deposits or, more likely, to transportation of these forms from the nearby land areas.

Assemblage I in Pelly spans the greater part of Norris' *Laevigatosporites*-1 zone which he considers to indicate an Upper Miocene to Pliocene age. At Netserk B-44, the nearly identical microfaunal sequence spans his *periporate*-1 and *Laevigatosporites*-1 zones of the same age, but continues into the overlying Quaternary sequence. Commonly, this microfauna characterizes the Pleistocene to Recent sequences and, in these cases, the ostracodes are accompanied by many speciments of species of the Elphidium and miliolid groups of calcareous Foraminifera. The change to a more agglutinated-arenaceous microfauna in Pelly and Netserk may, therefore, be reflecting not only on slightly differing environmental conditions, but more so on the fact that in these boreholes, the fauna characterizes slightly older sequences.

It may be possible in future to divide Assemblage I into a lower and upper part to express this difference. However, for the time being and until the same "trend" has been observed in a number of other boreholes, Assemblage I is left undivided. Many of its Foraminifera are known to be still living in the boreal waters off the northern coast of Alaska, and most of its ostracode species were reported from Pleistocene deposits of Alaska. It may well be that a number or even the majority of Assemblage I species extend as far bask as the Upper Miocene-Pliocene, a short time interval still if compared to the time span that other fossil assemblages represent.

The level of diversification of both the ostracodes and the Foraminifera is about the same in both the Pelly and the Netserk boreholes, with 46 and 44 species respectively representing Assemblage I. However, individual abundancies are not as high in Pelly as those encountered at Netserk, reflecting either on differences in living (bottom) conditions or on laboratory procedures.

CASSIDULINA 249 Sub-fauna

(2,000' to 2,190' approx.)

From about 2,000 feet to 2,190 feet approximately, a few specimens of Cassidulina 249 and Heterolepa? 167 were found. The latter species appears at about the same position at Netserk, and Cassidulina 249 was previously found either confined to the section immediately overlying Assemblage II, or ranging from the upper Assemblage II into Assemblage I forming a sort of link between both faunas. Not much can be said at this stage about the possible usefulness of these species in correlations; their appearance may be due to slightly differing environmental conditions, yet for local purposes, they may eventually prove useful also in correlations.

ASSEMBLAGE II

(2,190' to 4,150' approx.)

All essential components of Assemblage II appear at the 2,175±15'-foot level at Pelly B-35, and Turrilina 166 and Trifarina 168 at about 2,475±15' which were used in Netserk and other boreholes to denote the boundary between a lower and upper sub-assemblage. The upper sub-zone, therefore, seems to be about 300 feet thick at Pelly, with the lower sub-zone more thickly developed, as seems to be the general rule. The greatest diversity and individual abundance occurs in about the upper third of the Assemblage II zone, whereas the lower half contains few species in small individual numbers, indicating the influence of "restrictive conditions" such as shifting and unstable bottom conditions, or the increase in sand contents, but not necessarily in changes in the overall environment. The lower boundary of Assemblage II is tentatively drawn above a barren interval and about at the 4,150-foot level. The barren section underneath is probably of non-marine origin.

The composition of Assemblage II and its richly diversified nature suggests the fauna to have developed mainly within the outer Neritic to upper bathyal zone.

Assemblage II is equivalent to Staplin's "Asterigerina-Fauna" which is shown to occur in the lower Neogene sequences at Taglu C-42. At Netserk, it spans Norris, NE-4 or *Ericaceae* zone of supposedly Oligocene age, and continues into the upper half of the NE-5 or *Lycopodium-sporites*-1 zone of Upper Eocene-Oligocene age. An alternative zonation, based on floral and other combined evidence by Cumming shows the upper part of Assemblage II to occur in the *Tsuga*-1 zone of Lower to Middle Miocene age at Netserk B-44, an interpretation more consistent with Staplin's lower Neogene age determination. At Adgo F-28 and Pelly B-35, Assemblage II occurs within Norris' *Ericaceae* zones although the same re-interpretation may be applied to the Pelly sequence as was done for Netserk. In this case- the rather undifferentiated Ericaceae unit would have to be plit into an upper Tsuga interval and the lower Ericacea unit s.str., extending the age of the fauna from the Oligocene (Upper Eocene?) to about the Middle Miocene.

Without exhaustive and, for this reason, very time-consuming paleontologic-systematic studies, it is futile to argue age-stage relationships in terms of the microfauna recovered at this stage of knowledge. Some species of Assemblage II could be readily identified or related to species described from Oligocene, Miocene and up to Recent assemblages, dependent on the preference or the bias of the investigator involved. Planktonic Foraminifera, commonly used in dating Late Cretaceous to Recent foraminiferal assemblages are absent in the cold-water faunas of the north, and the benthonic species present have not been studied long and thoroughly enough to be used for age identifications with any degree of reliability. An undifferentiated Oligocene to Miocene age is attached, therefore, to Assemblage II for the time being. This by no means impairs its usefulness in biostratigraphic studies, for the fauna is richly diversified and so characteristic that it cannot be overlooked or be mistaken for another fauna. It is an excellent biostratigraphic marker!

Undiagnostic Interval

(4,150' to 6,750' approx.)

Except for a few specimens of a very few species, which all are considered to be caved forms, this interval is barren of microfossils and mostly likely of non-marine origin.

HAPLOPHRAGMOIDES 53 AND BATHYSIPHON 52 and 153 Sub-fauna

(6,750' to 8,300' approx.)

At about the 6,750-foot level, specimens of Bathysiphon 52 and 153, and Haplophragmoides 53 appear as main and for the most part only constituents of an impoverished and low-diversity microfauna, indicating the return of weak marine influences. These species become very abundant from about 8,300 feet to total depth at 10,890 feet, although in this lower part, they occur together with a variety of other species forming the "Cyclammina" 7 - Alveophragmium 154 Assemblage. The subfaunal interval is for this reason confined to that part of the section where Haplophragmoides 53 and the Bathysiphon 52 and 153 species are nearly the only constituents.

The occurrence of Haplophragmoides 53 and Bathysiphon 52-153 in a low-diversity assemblage is reminiscent of the microfaunal sequence at Nuktak C-22 where this fauna spans an interval from about the Middle Eocene to the Lower Oligocene, according to palynological evidence. At Pelly, these species range from the lower third of Norris' *Lycopodium-sporites*-1 zone into and throughout the *tetrad*-1 zone, or from the Upper Eocene to Lower Oligocene, a placement compatible with previous findings.

ALVEOPHRAGMIUM 153 - "CYCLAMMINA" 7 ASSEMBLAGE

(8,300' approx. to total depth at 10,890')

There is a marked change in the microfauna at about the 8,300-foot level, brought about by the appearance of a number of "new" species and by the rather conspicuous increase in abundancies of the constituent species. Alveophragmium 154 is the most eye-catching microfaunal element by virtue of its large size; it occurs throughout the zone in contrast to "Cyclammina" 7 (most likely a species of Haplophragmoides) which appears about 500 feet below the faunal boundary and which does not continue to the base of the section. The background fauna is composed of Haplophragmoides 53 and 348, the Bathysiphon 52-153 groups, and other agglutinated-arenaceous forms. Interspersed are a few calcareous species and specimens such as bolivinid 367, rotaliid 351, and Praeglobobulimina? 375.

This assemblage is characterized by the dominance of agglutinated forms, among them many larger-sized specimens. As such, it stands in stark contrast to Assemblage II where calcareous Foraminifera and small-sized forms dominate. In addition, the assemblage is only moderately diversified, in contrast to the richly diversified Assemblage II. It is suspected, therefore, that certain "restrictive conditions" influenced its composition, conditions such as may have prevailed in the deeper waters and beyond the outer neritic zone, or beyond the areas where Assemblage II developed. It should be kept in mind, however, that identical conditions, except for the depth of the water, may have occurred in shallower waters also, producing the same results in terms of faunal characters. Other criteria, therefore, should be used in addition in deciding on the depth of water, or such factors as closeness or greater distance from shore.

"Cyclammina" 7 and Alveophragmium 154 were previously recorded in a number of wells, either associated with each other or being mutually exclusive. At Nuktak C-22 and Ivik K-54, Alveophragmium 154 characterizes sequences that were dated on palynological evidence to range from the Upper Eocene to the Oligocene, and to span Norris' *tetrad*-1, *Osmundacidites*-1 and the lower third of the *Lycopodium-sporites*-1 zones. At the base, it may extend into the upper ranges of the *Pesavis tagluensis* zone. "Cyclammina" 7 was found at Taglu C-42 within Norris' *tetrad*-1 zone, and at Umiak J-37 from the *tetrad*-1 well into the *Pesavis tagluensis* zone. Staplin and co-workers reported the same species as Haplophragmoides 504 in their cross-section, and they regarded it as a useful marker within Paleogene sequences. At Netserk B-44, both species occur together, as in Pelly, ranging from the lower part of Norris' *Lycopodiumsporites*-1 into the *Pesavis tagluensis* zone, indicating a span from the Middle Eocene into the Upper Eocene to Lower Oligocene sequences. At Pelly, the Alveophragmium 154 - "Cyclammina" 7 Fauna spans Norris' *tetrad*-1 zone of Upper Eocene age - a placement overall consistent with the occurrences in other wells.

The fauna could be readily divided into a lower and upper part, as a number of agglutinated Foraminifera appear throughout the lower part of the zone, among them Haplophragmoides 67, used previously as a marker in other wells. However, not enough is known about the ranges of these species to decide if their appearance does not reflect on slight changes in the environment of deposition, as is suspected to be the case, rather than on evolutionary changes.

The occurrence of questionable specimens of Cyclammina 71 (arctica-borealis complex) in the upper half of the zone needs explanation, for the presence of this older form in younger assemblages has been the source of major confusion and some arguments. The problem first surfaced in discussion and evaluation of the Pullen E-17 microfaunal sequence where Cyclammina 71 was reported to be present in association with "Cyclammina" 7. At Taglu C-42, both species occur distinctly separated from eath other; Staplin et al. show Cyclammina arctica-borealis (our Cyclammina 71) to occur in the basal part of the section, and consider it to be of "probable Eocene" age, an interval that Norris would regard to belong to the Paleocene. "Cyclammina" 7, however, belongs to the younger Upper Eocene to Oligocene assemblages.

In a number of boreholes, these two species were found separated, but in an equal number, a few questionable specimens of the 71-form were found in the "Cyclammina" 7 assemblage. They never could be identified with any degree of certainty, as is the case also with the Pelly specimens, and indeed they could be readily referred to other Haplophragmoides species. The exact identification of these specimens in discussion is therefore very difficult and subject to errors. The problem of re-working of these older forms into the younger assemblage was also considered a possibility in explaining the mixture at Pullen, but we also kept an open mind as far as the ranges of these species are concerned, acknowledging that they might overlap. However, having encountered the mixture in a number of boreholes and after having gained firsthand experience, we lean more and more towards the idea that we are dealing with a closely related but not identical species 71. When dealing with well-preserved specimens of Cyclammina 71 and 7, there should be no problem separating them, but it is the marginally preserved or the transitional forms that cause the problems. In dealing with such cases, the whole fauna should be taken into consideration as well as palynologic and other evidence to derive at a "meaningful" age determination.

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PE

PALYNOSTRATIGRAPHIC STUDY

BY

G. NORRIS, PH.D.

SUN PELLY B-35

SUMMARY

Ninety seven (97) samples from the subject well yielded 63 spore species and 10 microplankton species. Neogene rests on thick Oligocene-Eocene sediments at 2300 feet approximately, as indicated by 4 palynozones. The well does not penetrate belwo the probable Upper Eocene. A marine interval occurs between 1,320 feet and 2,100 feet in the Neogene. Scattered marine or brackish horizons occur throughout the Paleogene interval. Correlations, possible ages, and environments are indicated on the accompanying diagrams.

ZONATION

The following zones are characterized by the extinction of the species indicated:

PE-1 - 120-2310 feet (*Laevigatosporites*-1 zone)

2	*Taxodiaceaepollenites hiatus*
326	*Pinus*-1
619	*Compositae*-2
1	*Stereisporites antiquasporites*
229	*Sigmopollis hispidus*
407	*Laevigatosporites*-1
332	*Pediastrum* (possibly recycled)
324	*Carpinus subtriangula*
M242	*Korojonia*-1

PE-2 - 2310-4320 feet (*Ericaceae*-1 zone)

409	*Stereisporites*-2 (recycled above)
395	*Corylus*-1 (recycled above)
220	*Betulaceaepollenites*-1 (recycled above)
287	*Alnipollenites*-1
377	*Ericaceae*-1
371	*Tsuga*-1
323	*Pterocarya levis*
401	*Picea*-1
612	*Corylus*-2
34	*Laevigatosporites ovatus*
52	*Biretisporites potoniaei*
320	*Ulmus*-1
19	*Osmundacidites wellmanii*
389	*Nyssapollenites*-1 (possibly recycled)
394	*Corylus granilabrata*
M296	*Eisenackia*-1
M297	*Lingulodinium*-1
M295	*Aptoomorphidium*-1
M237	*Svalbardella*-1

PE-3 - 4320-8130 feet (*Lycopodiumsporites*-1 zone)

36 *Lycopodiumsporites reticulumsporites*
22 *Cyathidites minor*
370 *Tiliapollenites*-1
418 *Polypodiisporites*-1
525 *Typha*-1
381 *Psilatricolpites*-1
625 *Triorites*-2
597 *Tsuga igniculus*
526 *Granatitricolpites*-3
603 *Pluricellaesporites*-4
282 *Caryapollenites paleocenicus*
411 *Abies*-1
383 *Laricoidites*-1
414 *Triatriopollenites*-1
626 *Pellypollis*-1
M211 *Crassosphaera*-1
M298 *Trithyrodinium*-1
M300 *Aptoomorphidium*-2

PE-4 - 8130-10,980 feet (*tetrad*-1 zone)

422 *Parviprojectus*-1 (recycled above)
419 *tetrad*-1 (recycled above)
330 *Pistillipollenites mcgregori* (possibly recycled here & above)
382 *Tricolporopollenites*-5
412 *Lycopodiumsporites*-1
378 *Pluricellaesporites*-1
552 *Stephanocolporopollenites*-1
183 *Baculatisporites comaumensis*
416 *Osmundacidites*-1
399 *Castanea*-1
627 *Triorites*-3
239 *Sequoiapollenites paleocenicus*
384 *Retitricolpites*-1
621 *Psilatricolpites*-2
624 *Tricolporopollenites*-10
524 *Ilexpollenites*-1
567 *periporate*-3
387 *Tricolporopollenites*-6
390 *Salix*-1
628 *Liliacidites*-2
M299 *Crassosphaera*-2

PALEOENVIRONMENTS

The common to dominant presence of M242 *Korojonia*-1 between 1,320 feet and 2,100 feet suggests a marine interval. Below this, marine or brackish microplankton species occur scattered in several horizons, between 2,310 feet and 10,890 feet, but their general rarity indicates only weak marine influence.

AGE AND CORRELATION

A correlation with previously established zones is indicated in the accompanying diagrams. Pliocene rests on thick Oligocene and Upper Eocene at approximately 2,300 feet, but the well does not penetrate below the Upper Eocene *tetrad*-1 zone. All ages are provisional as justified by the evidence available so far, and discussed in previous reports.

ORGANIC MATURATION

Maceration and staining techniques used in preparing the slides provided have obscured natural spore colours, making estimates of organic maturation impossible.

APPENDIX

New palynomorph taxa.

terrestrial

625 *Triorites*-2
626 *Pellypollis*-1
627 *Triorites*-3
628 *Liliacidites*-2

marine

M296 *Eisenackia*-1
M297 *Lingulodinium*-1
M298 *Trithyrodinium*-1
M299 *Crassosphaera*-2
M300 *Aptoomorphidium*-2

APPENDIX

PALYNOLOGICAL

PHOTOGRAPHS

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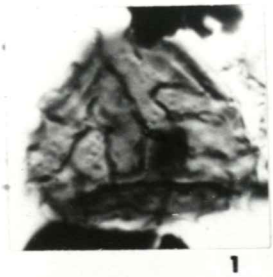
All photographs on same scale - 100 micron scale in top left.

PLATE 1

1	412	*Lycopodiumsporites*-1
2	416	*Osmundacidites*-1
3	628	*Liliacidites*-2
4	621	*Psilatricolpites*-12
5	624	*Tricolporopollenites*-10
6-9	627	*Triorites*-3
10-11	625	*Triorites*-2
12-13	619	*Compositae*-2
14-16	419	*tetrad*-1
17	414	*Triatriopollenites*-1
18-22	422	*Parviprojectus*-1
23-25	M296	*Eisenackia*-1
26-27	M242	*Korojonia*-1

PLATE 1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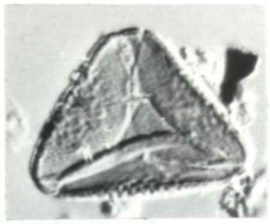
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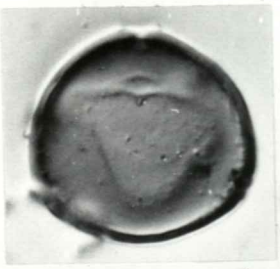
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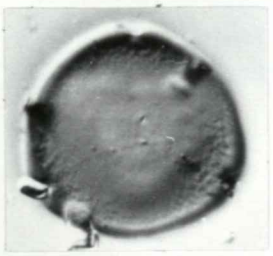
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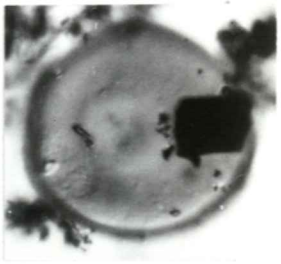
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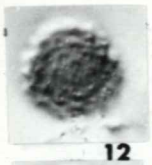
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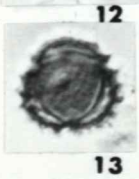
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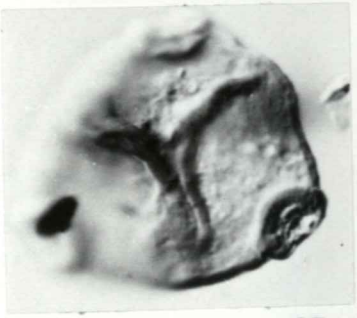
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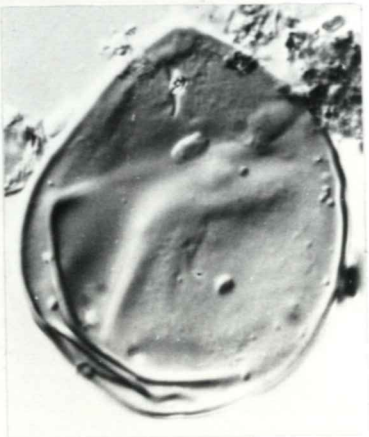
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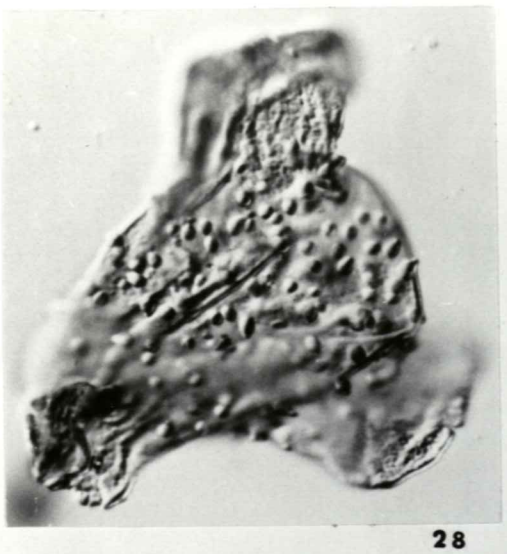
All photographs on same scale - 100 micron scale in top left.

PLATE 2

28-29	626	*Pellypollis*-1
30-31	M299	*Crassosphaera*-2
32-36	M295	*Aptoomorphidium*-1
37-41	M300	*Aptoomorphidium*-2



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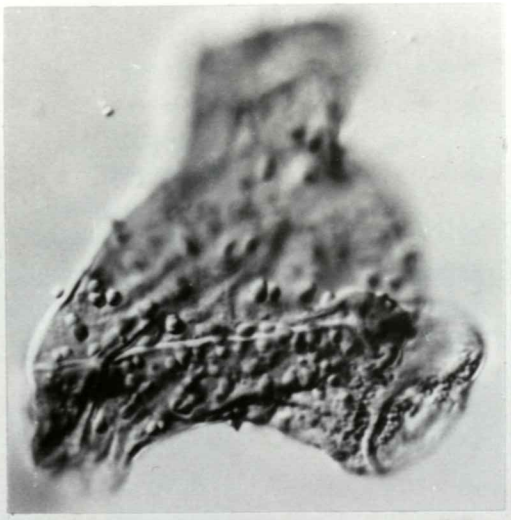

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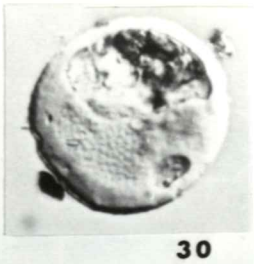

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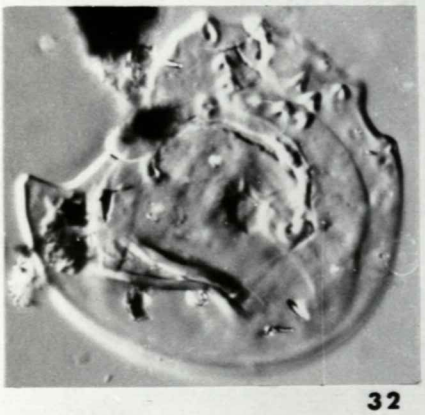

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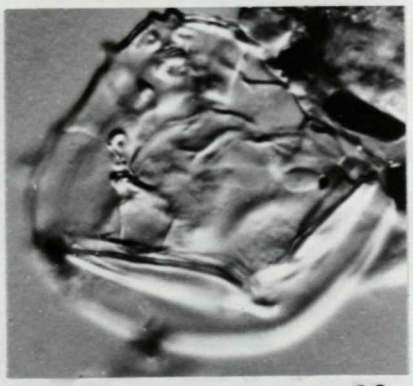

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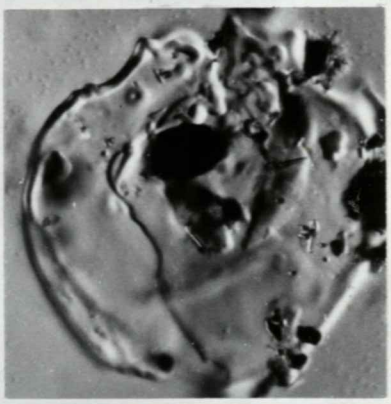

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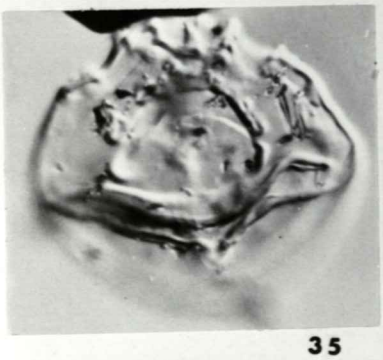

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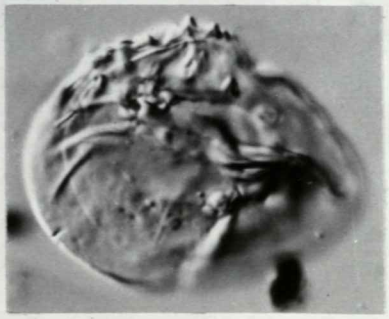

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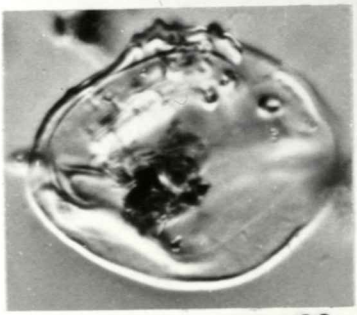

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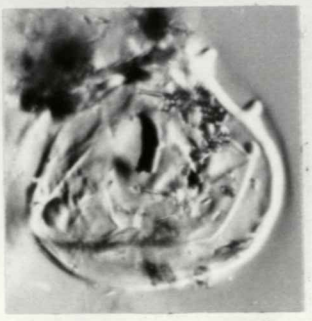

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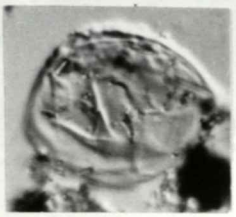

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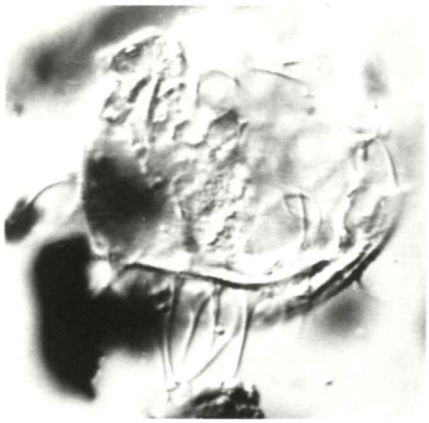
All photographs on same scale - 100 micron scale in top left.

PLATE 3

42-43	M297	*Lingulodinium*-1
44	M201	*Crassosphaera*-1
45	M298	*Trithyrodinium*-1
46	M237	*Svalbardella*-1
47	M201	*Crassosphaera*-1
48	M298	*Trithyrodinium*-1



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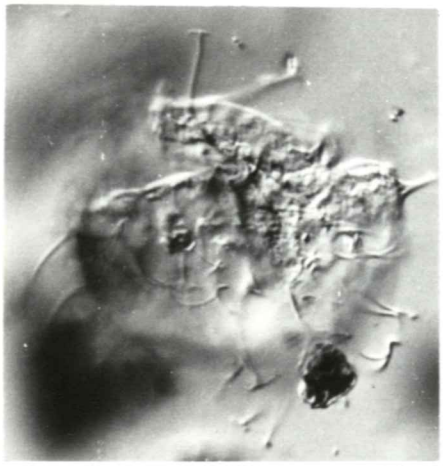

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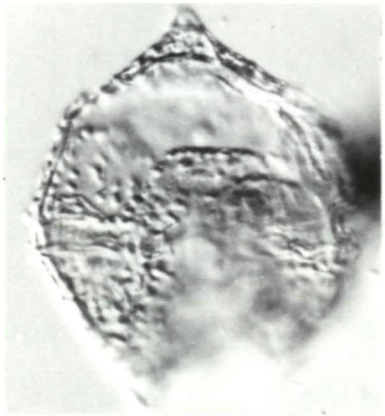

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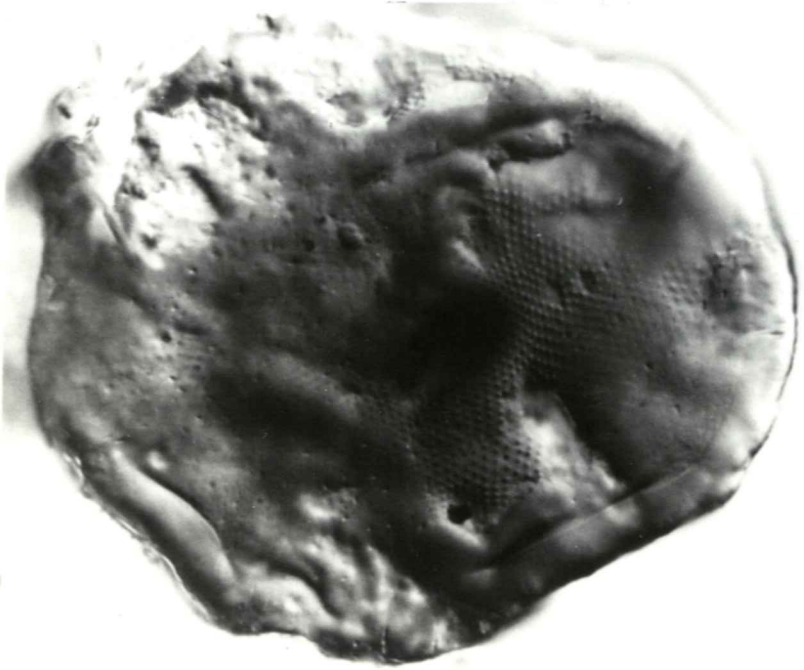

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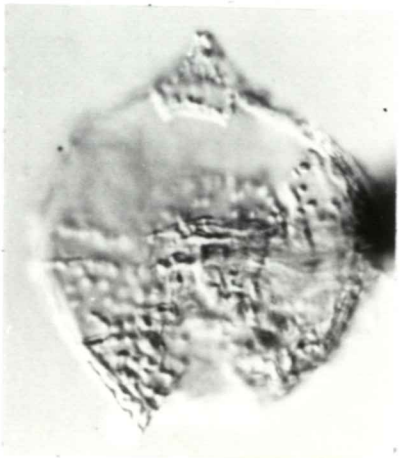

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