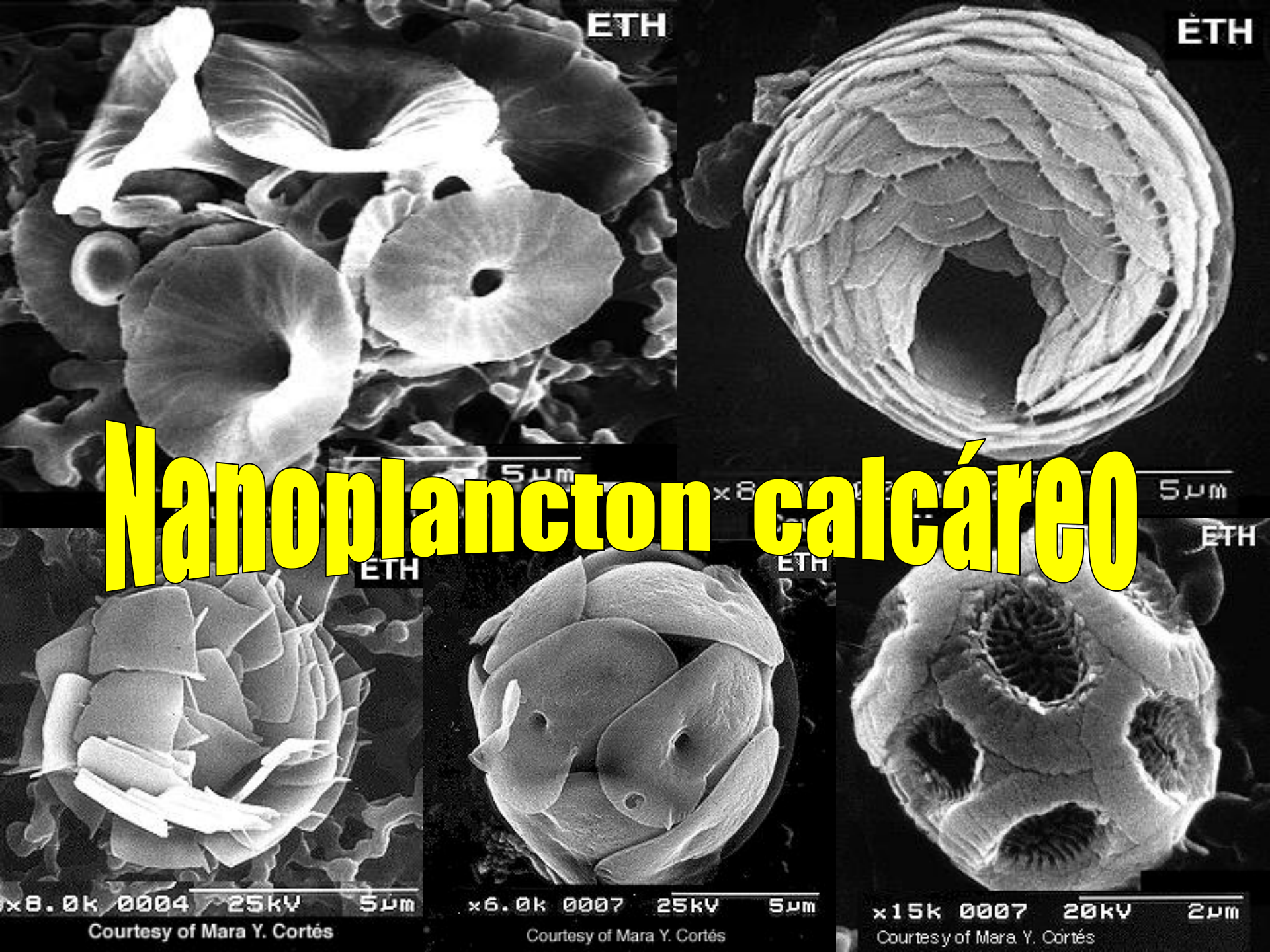
ETH
5µm
ETH
5µm
Nanoplancton calcáreo
ETH
x8.0k 0004 25kV 5µm
Courtesy of Mara Y. Cortés
ETH
x6.0k 0007 25kV 5µm
Courtesy of Mara Y. Cortés
ETH
x15k 0007 20kV 2µm
Courtesy of Mara Y. Cortés

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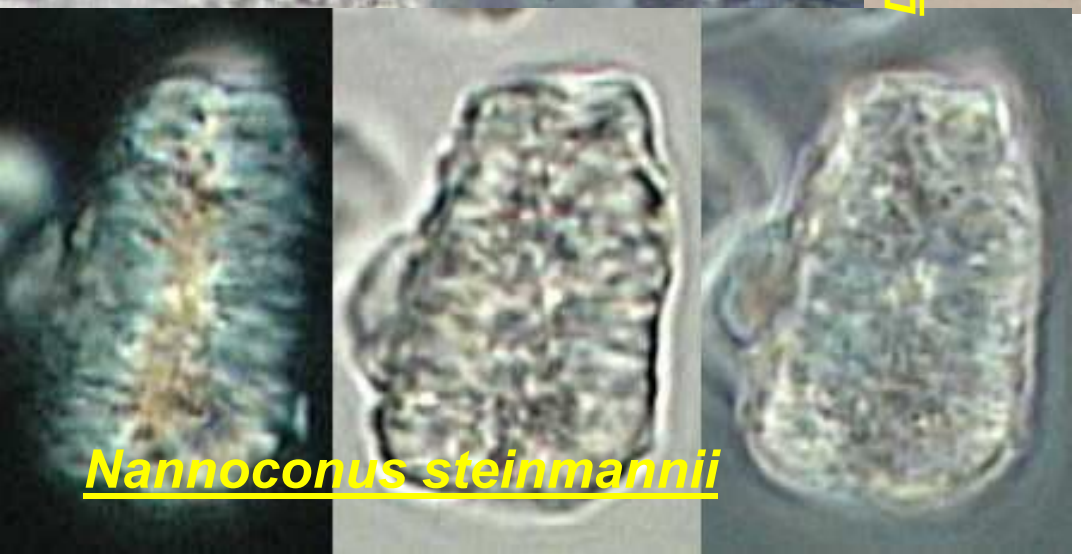
Coccolithus miopelagicus

LOS COCOLITOS SON ELEMENTOS ESQUELETALES PRODUCIDOS POR ALGAS MARRONES, UNICELULARES Y BIFLAGELADAS.

Discoaster kugleri

Discoaster multiradiatus

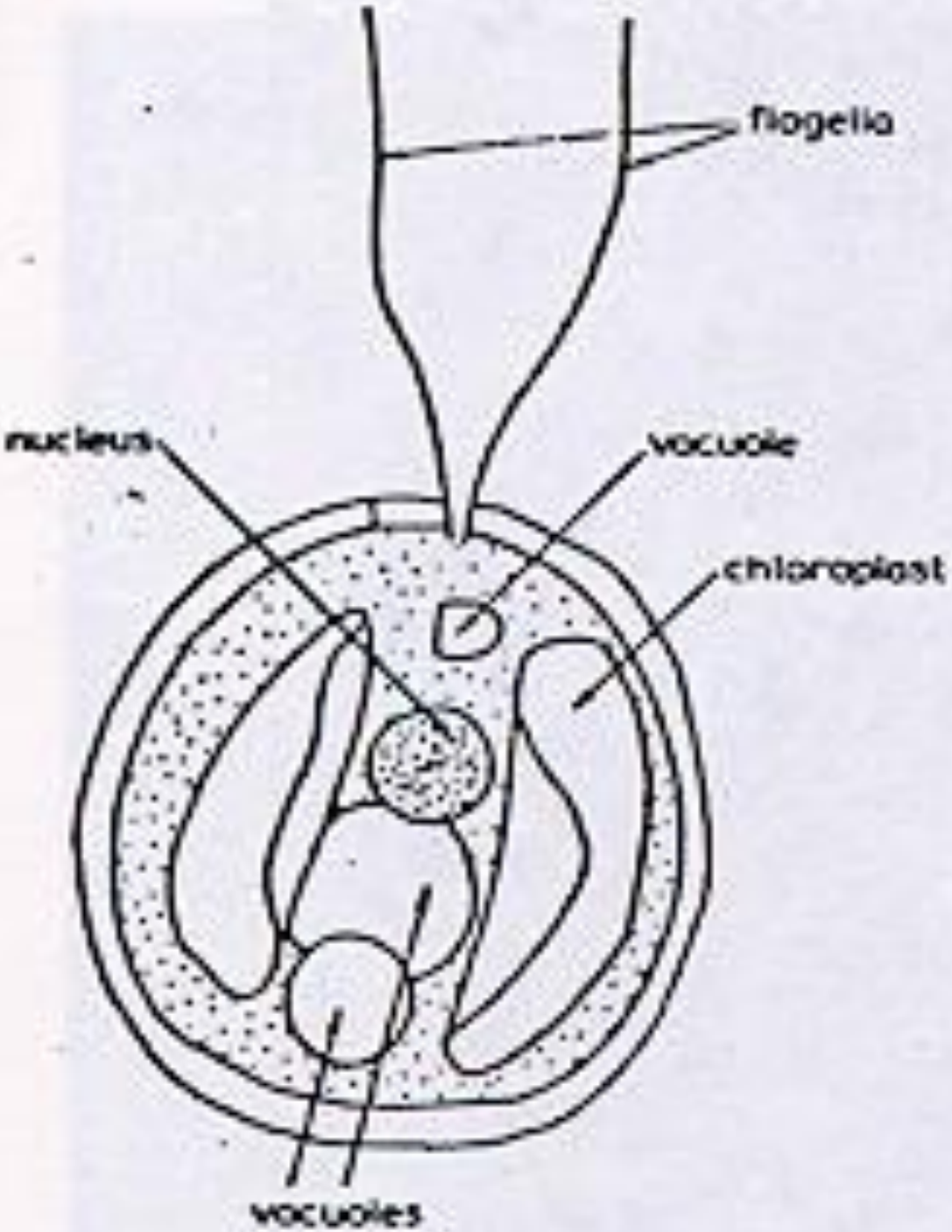


Nannoconus steinmannii

CONSTITUYEN UN GRUPO HETEROGENEO DE FORMAS CALCAREAS QUE INCLUYEN COCOLITOS, DISCOASTERIDOS Y NANOCONOS.

EN LOS ORGANISMOS VIVIENTES LOS COCOLITOS SE ENCUENTRAN FORMANDO UNA ESFERA, LA COCOSFERA.

LOS COCOLITOFORIDOS SON ALGAS DEL GRUPO *Chrysomanadinas*, DONDE LA UNICA CELULA TIENE UN REVESTIMIENTO EXTERNO CONSTITUIDO POR MINUSCULAS PLAQUETAS CALCAREAS QUE SON LOS COCOLITOS.



Corte esquemático de una célula viviente de *Cyclococcolithus leptoporus*, donde se muestran los flagelos, haptonemas, vacuolas, cloroplasto y núcleo.

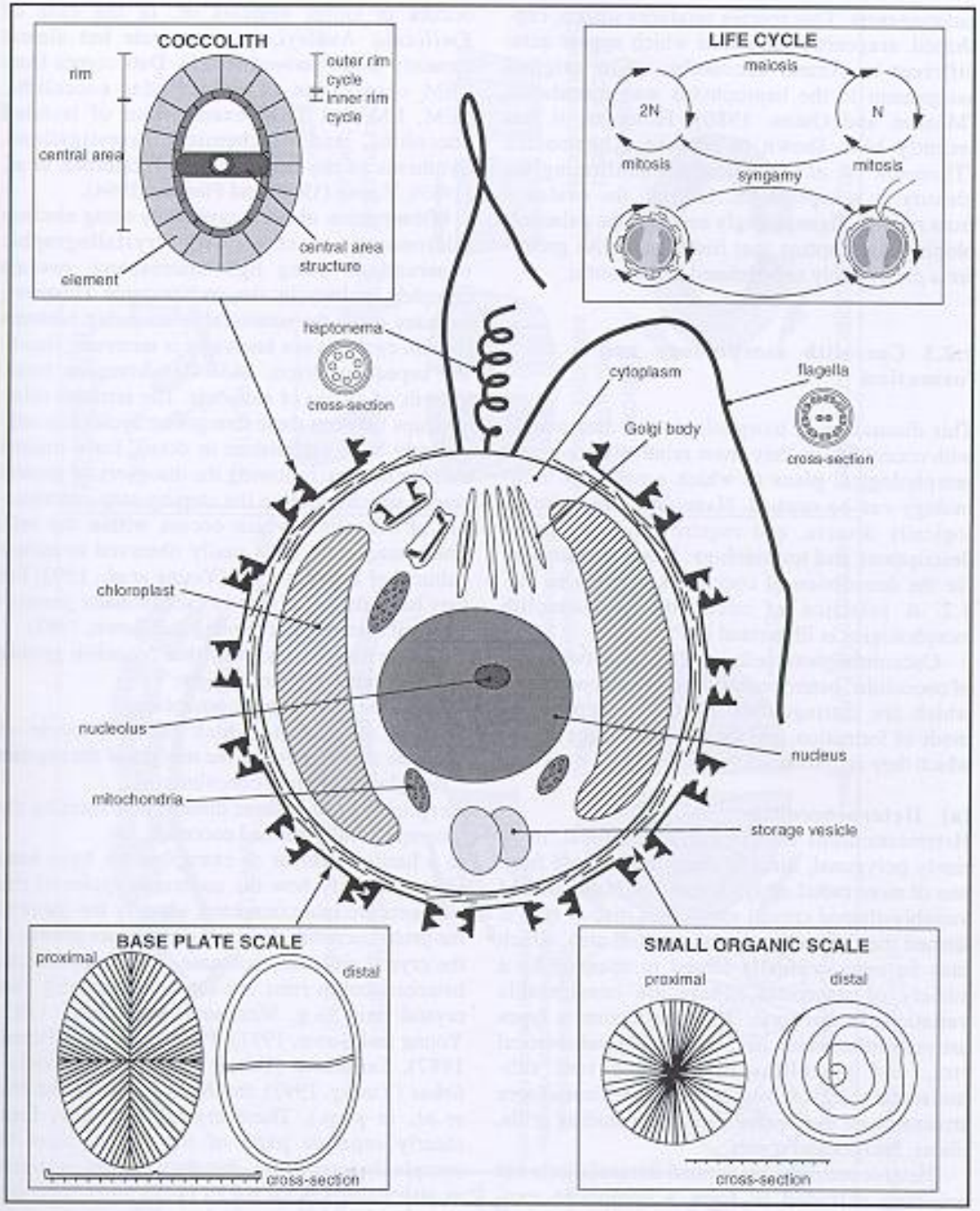


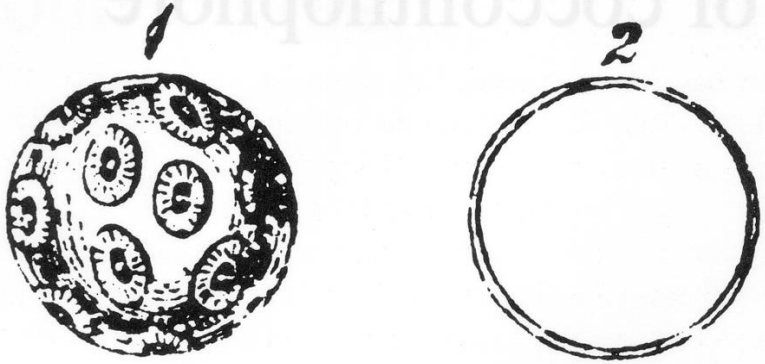
Fig. 1.1 Diagrammatic representation of a coccolithophore cell and cell-wall coverings.

ALGA HAPTOPHYTA QUE SE CARACTERIZA POR CLOROPLASTOS MARRONES Y UNA ESPECIE DE FLAGELO DENOMINADO HAPTONEMA.

LA CELULA ESTA DOMINADA POR UNOS GRANDES CLOROPLASTOS Y UN NUCLEO.

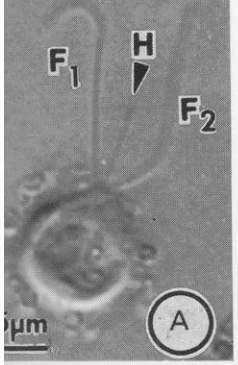
PRESENTA UN CUERPO DE GOLGI Y VESÍCULAS.

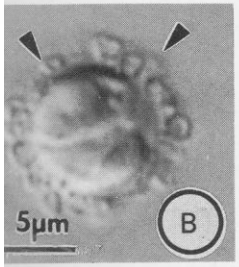
LA CELULA ESTA RECUBIERTA POR PLASMA, TIENE DOS FLAGELOS DE IGUAL TAMAÑO Y UN TERCER FLAGELO MAS ESPECIALIZADO DENOMINADO HAPTONEMA QUE APARENTEMENTE SIRVE PARA ADAPTACIONES FUNCIONALES.

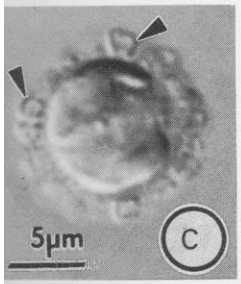


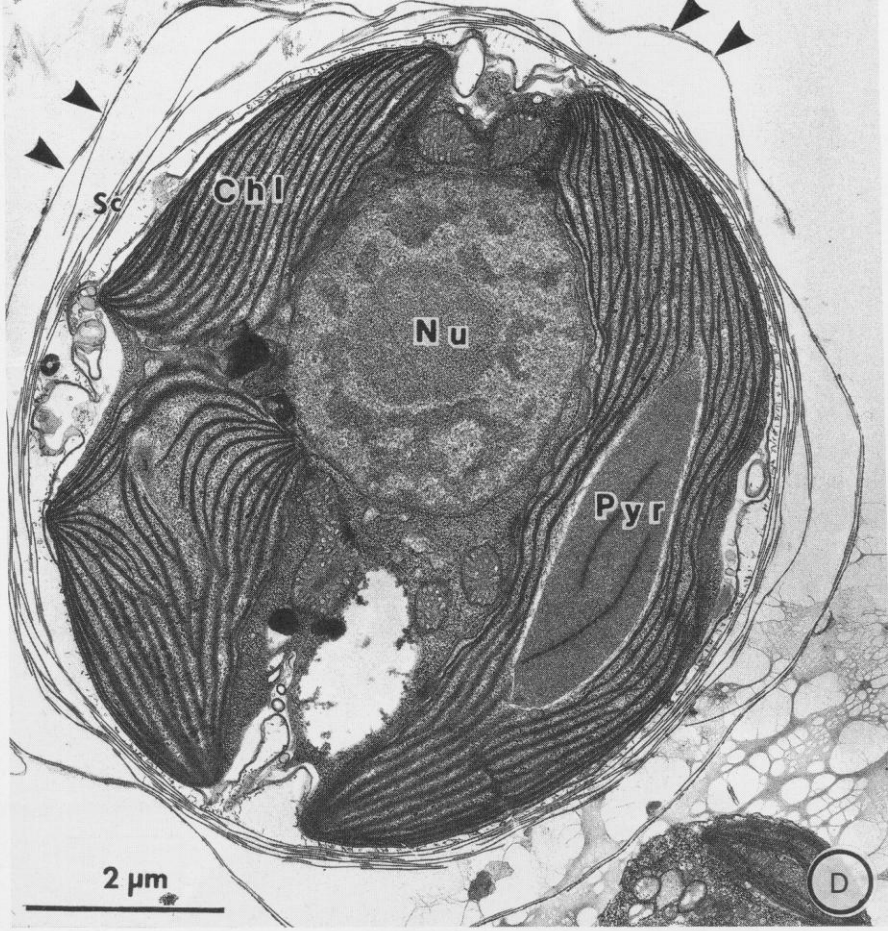
WALLICH, 1961

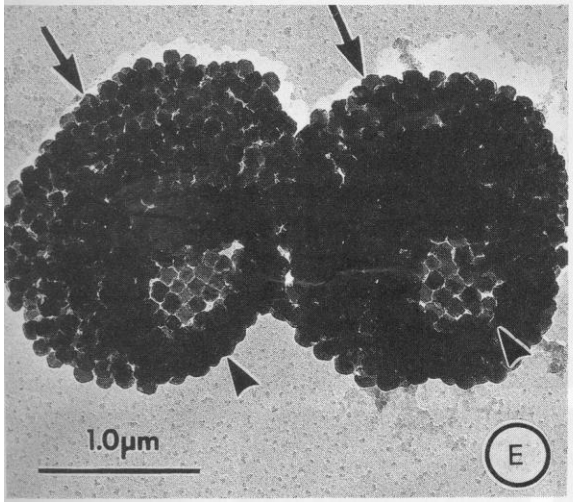
TIENEN NUCLEO, VACUOLAS, CLOROPLASTOS, FLAGELOS, HAPTONEMA.

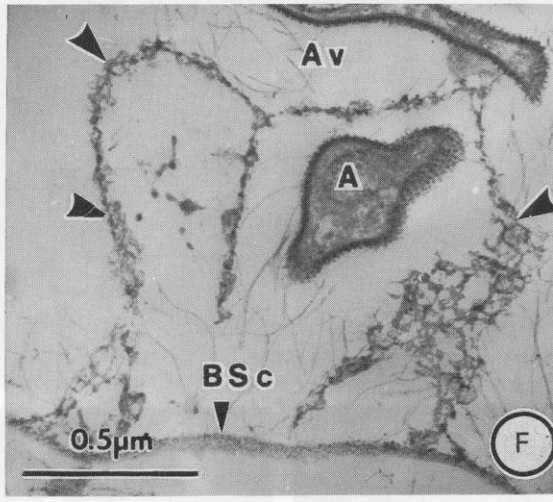


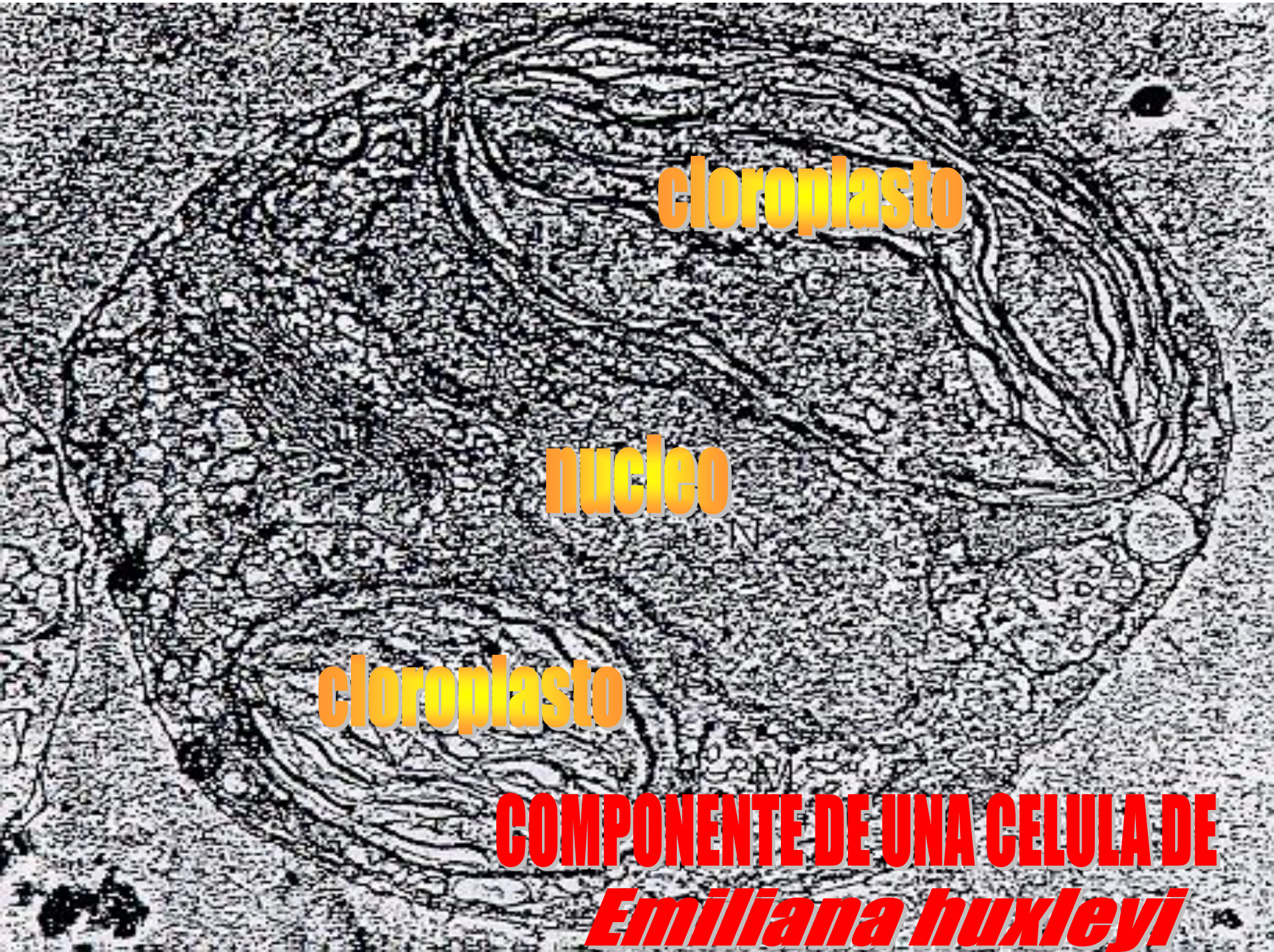




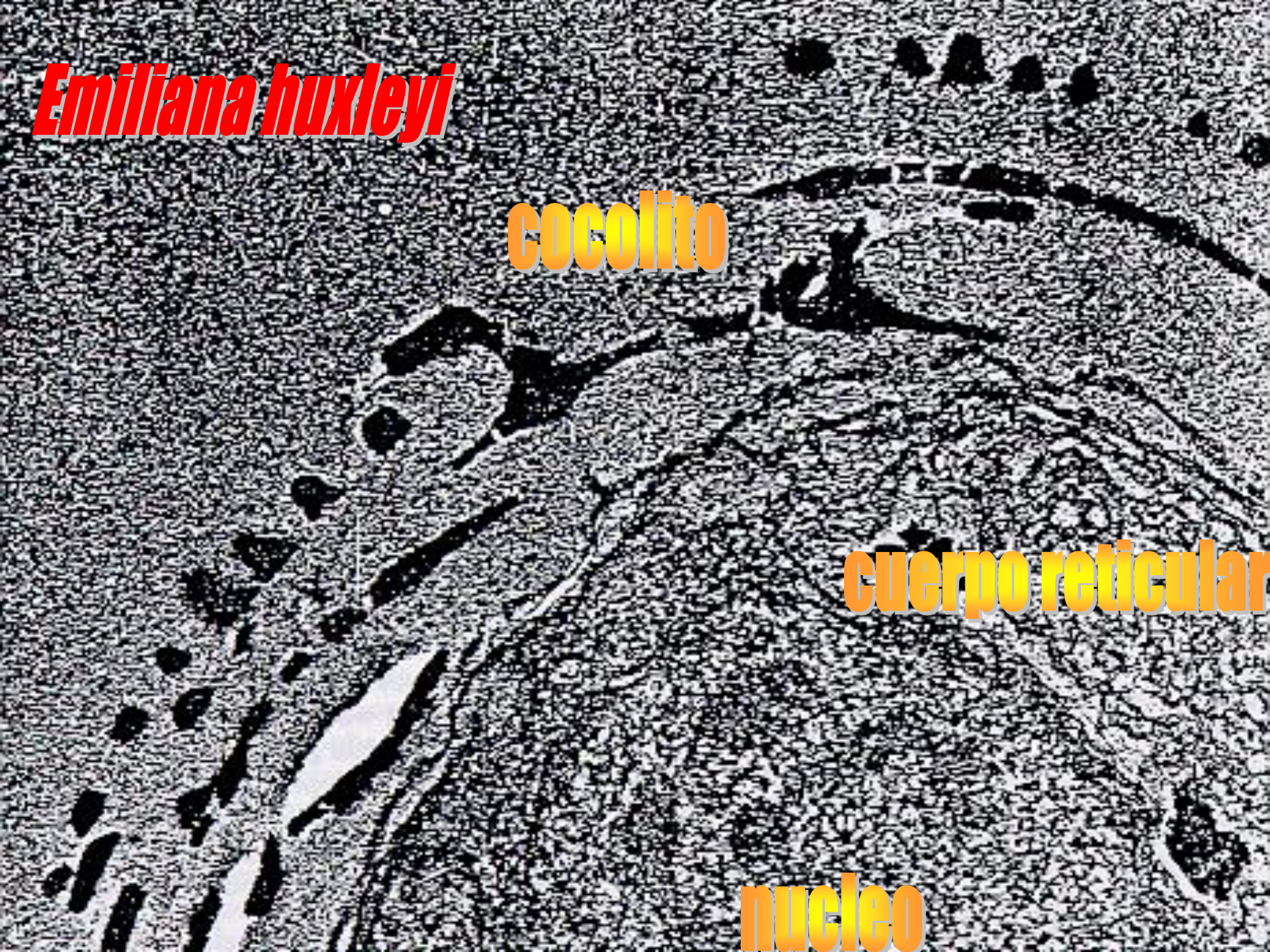


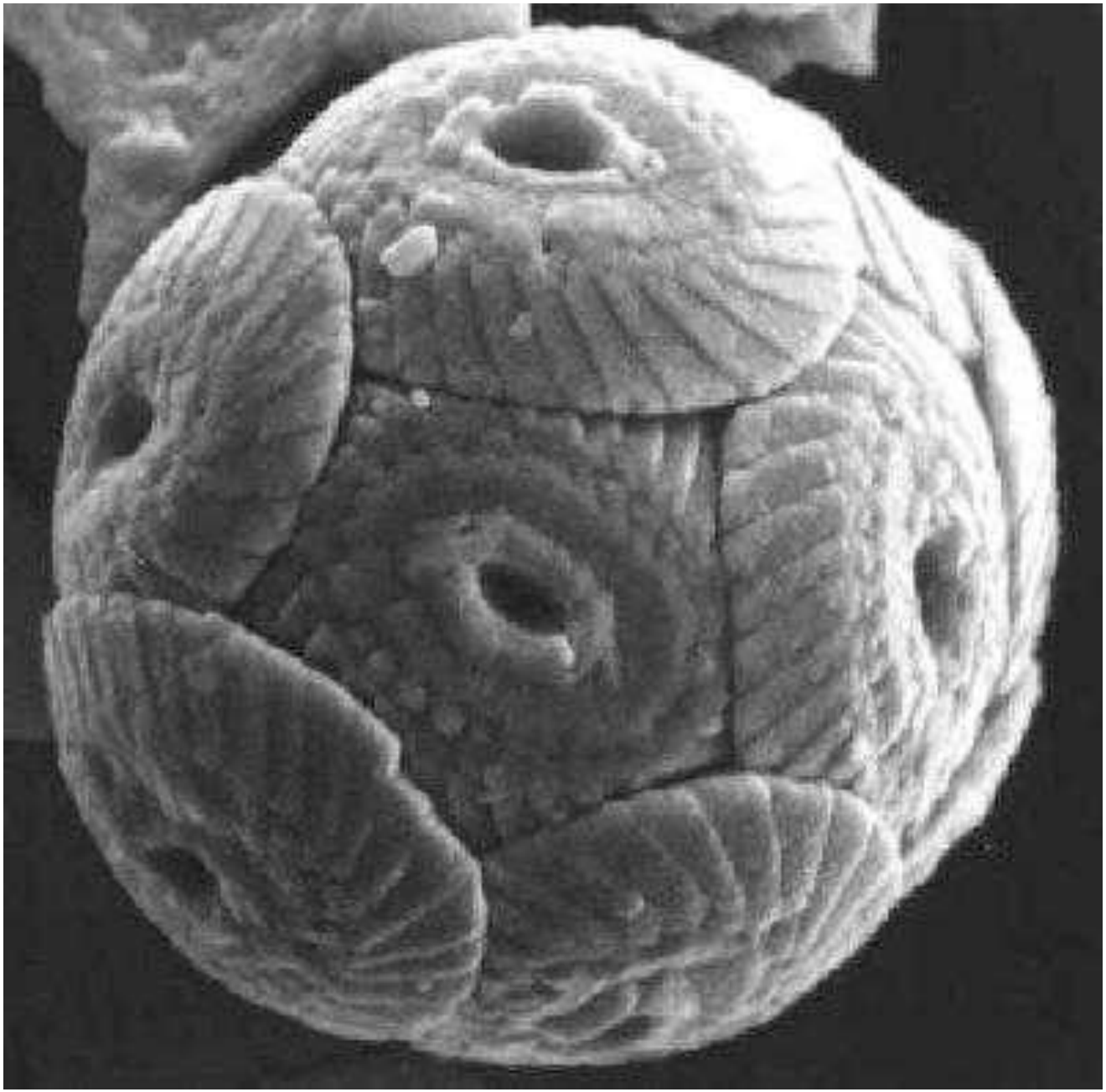






COMPONENTE DE UNA CELULA DE *Emiliana huxleyi*


Emiliana huxleyi
cocolito
cuerpo reticular
nucleo



Watznaueria barnesae

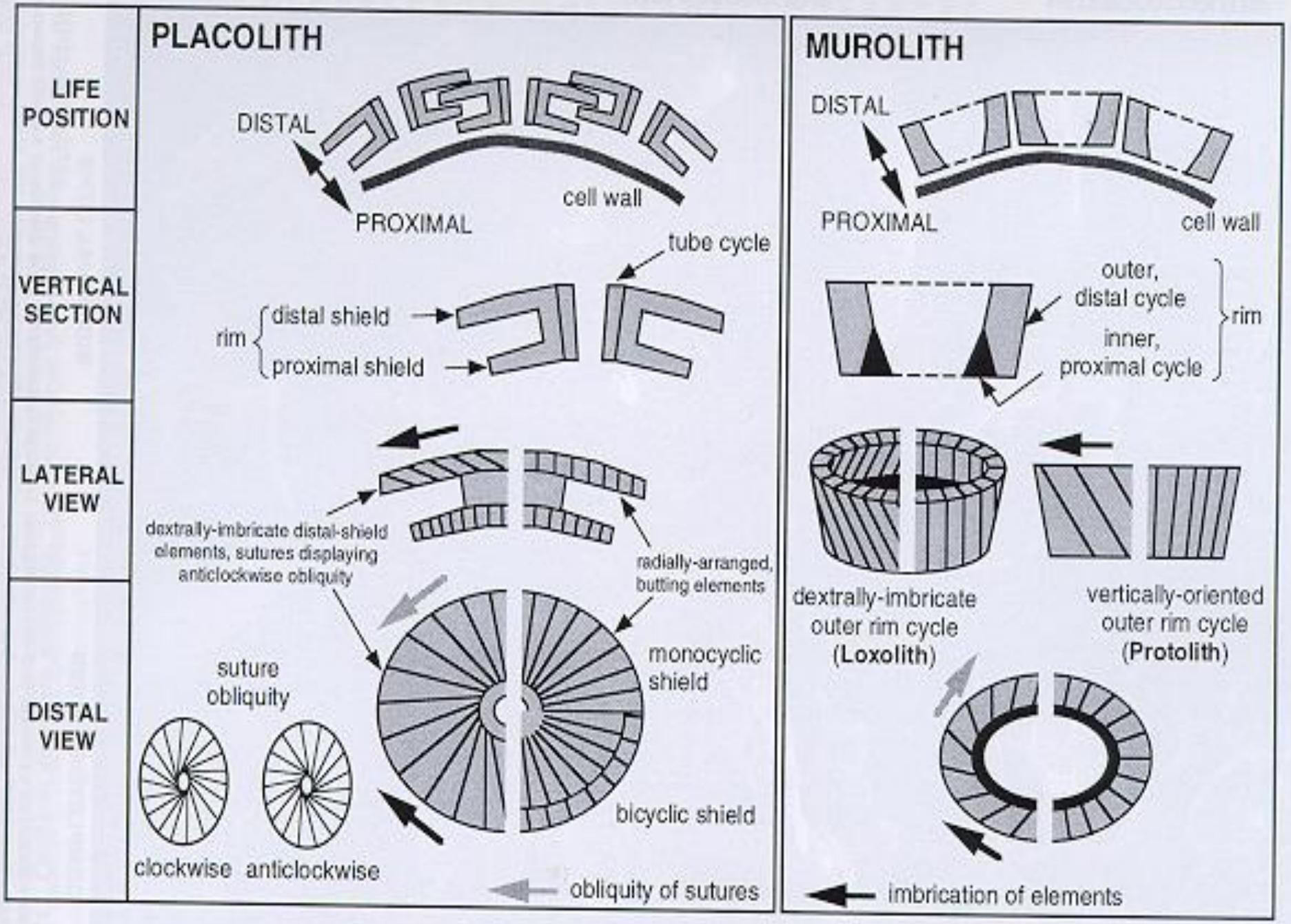
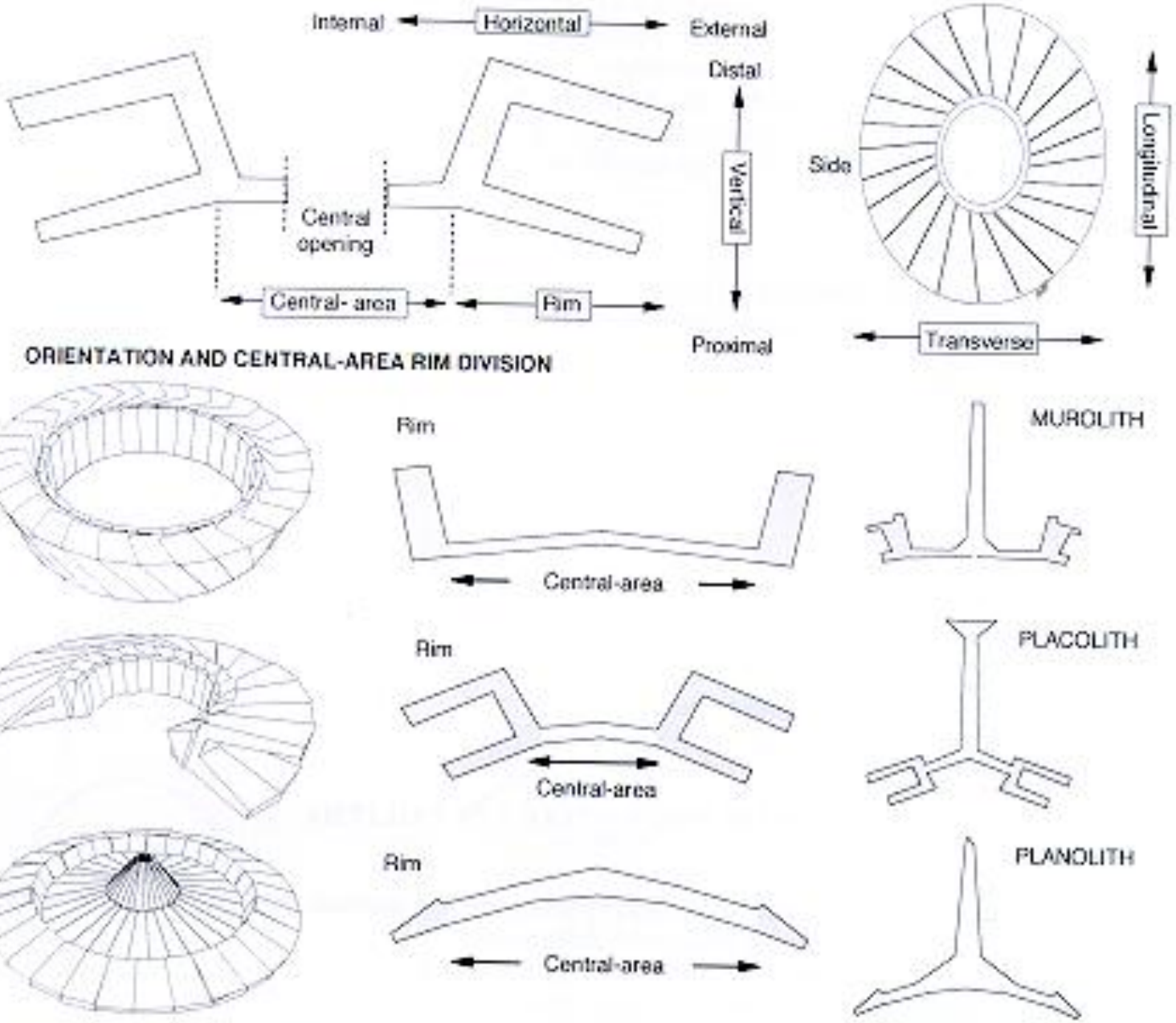
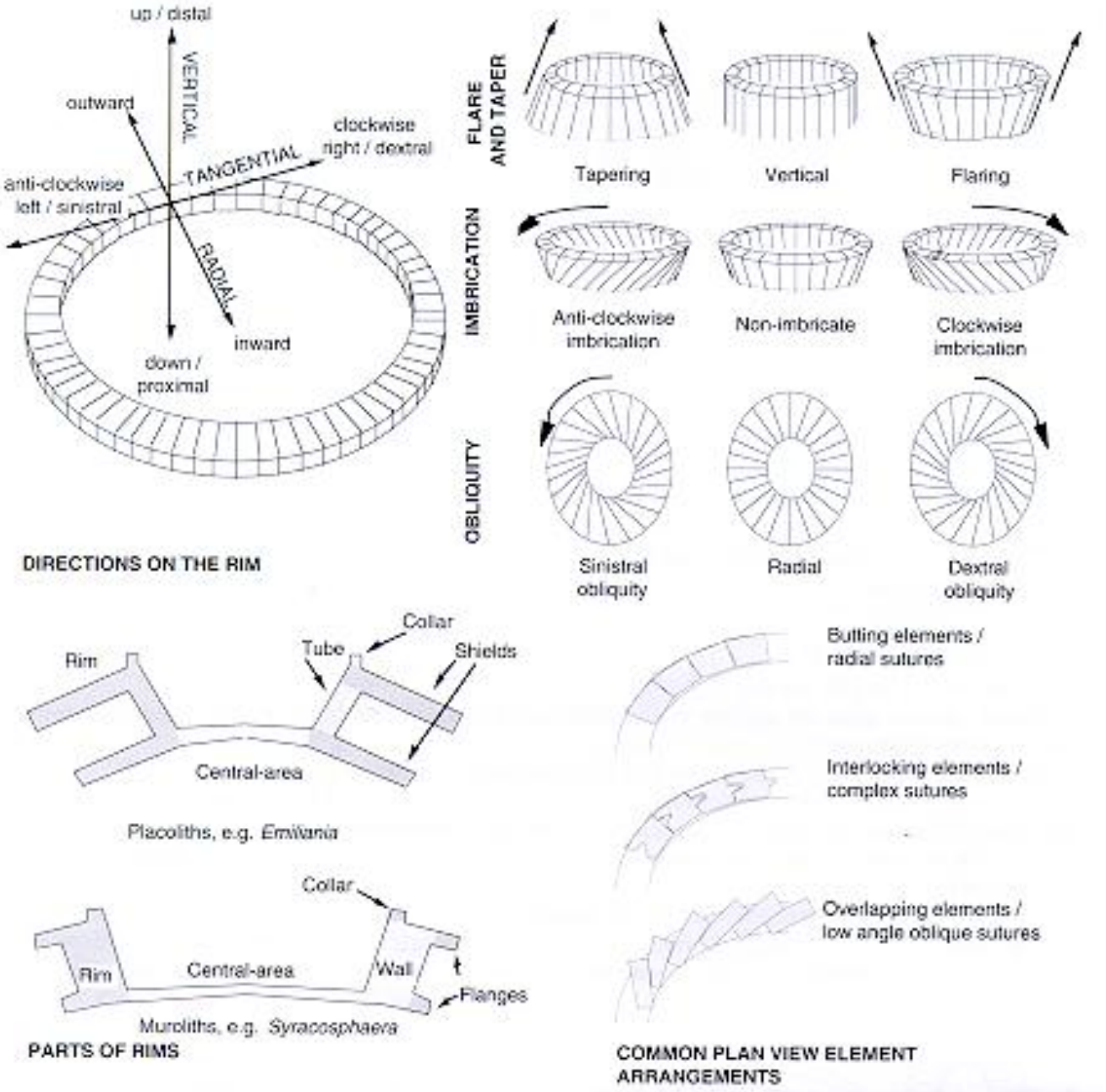


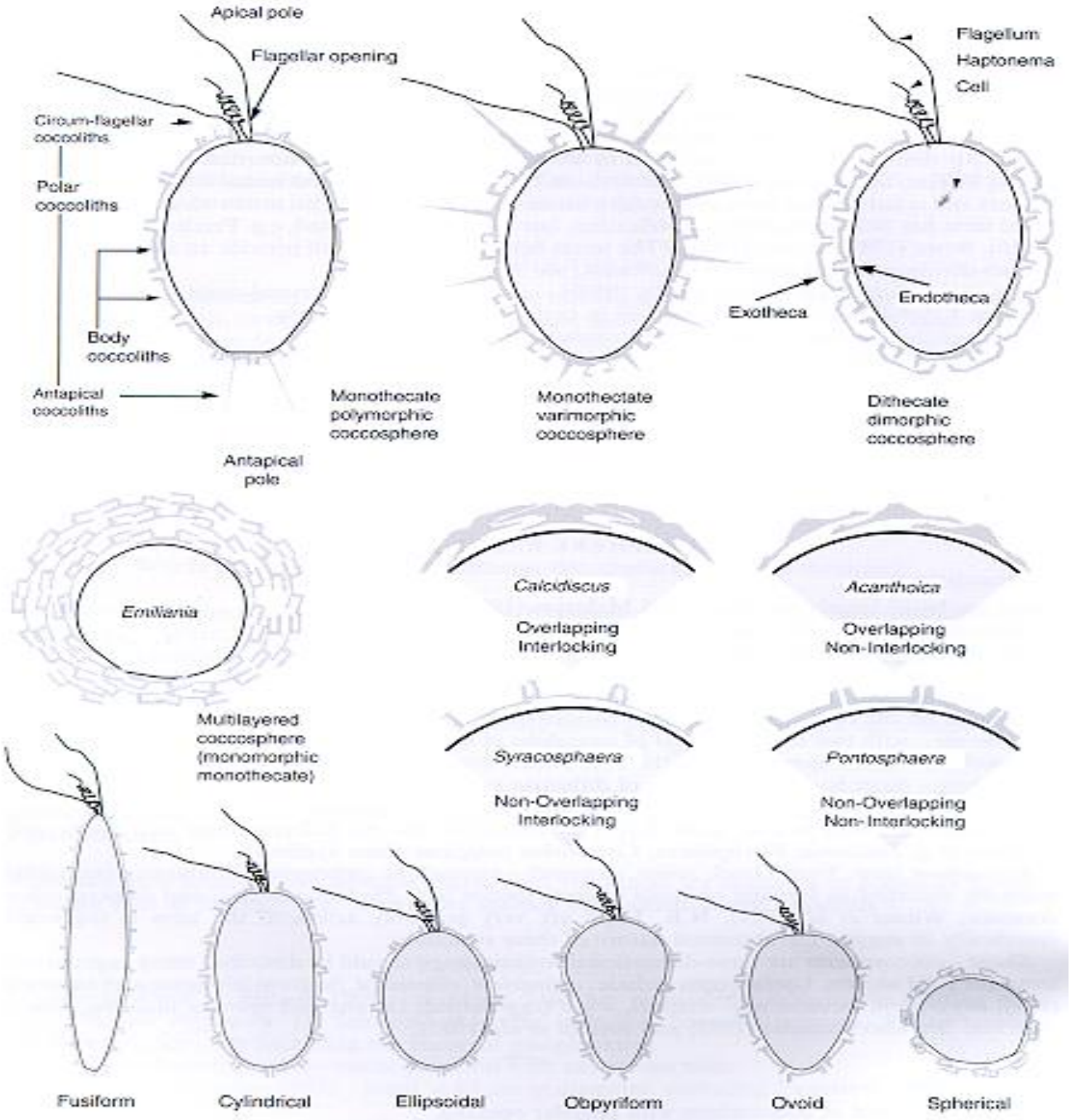
Fig. 1.2 Coccolith rim morphologies.



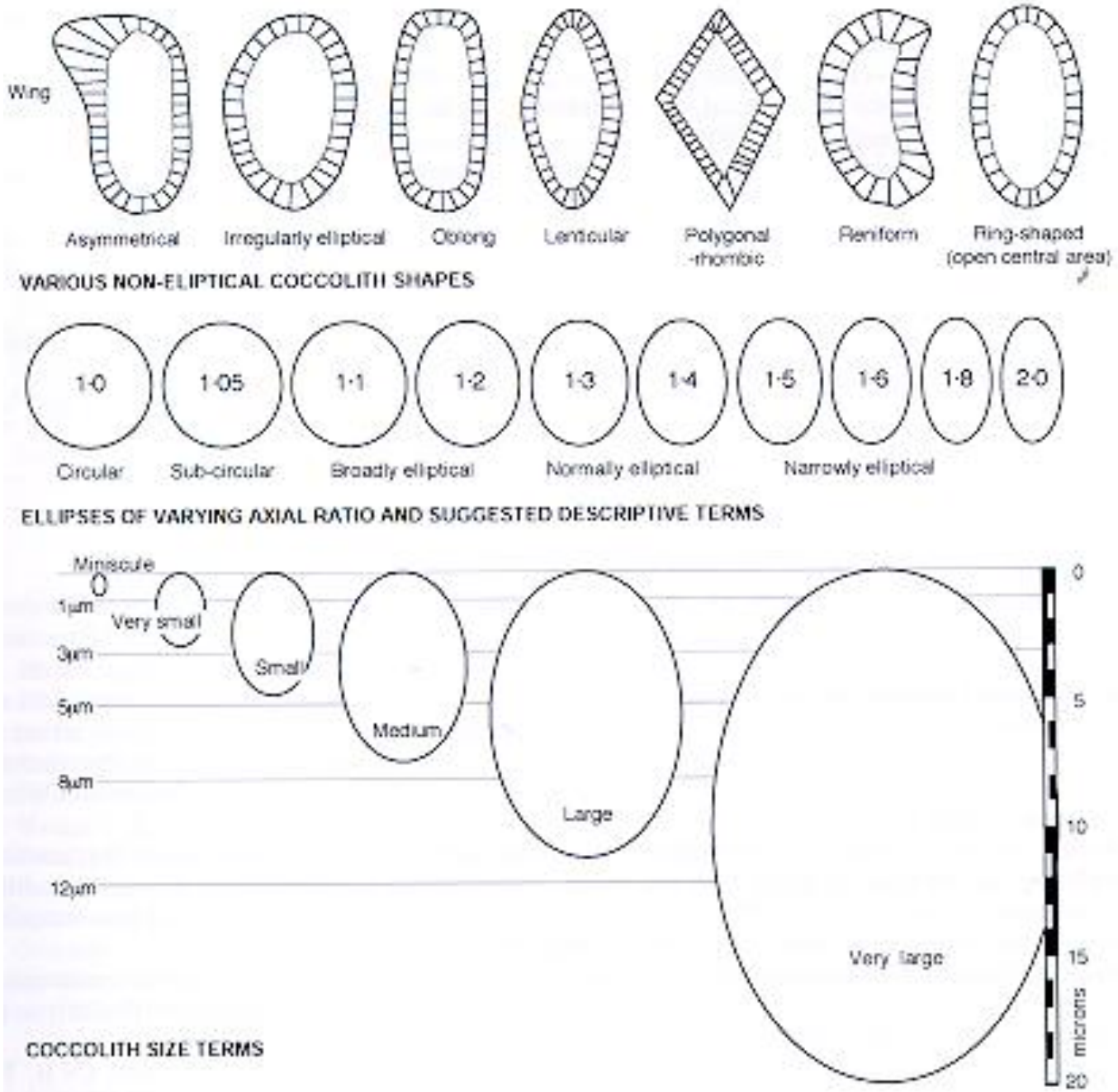
TEXT-FIG. 2. Coccolith orientation, basic parts and shape in profile.



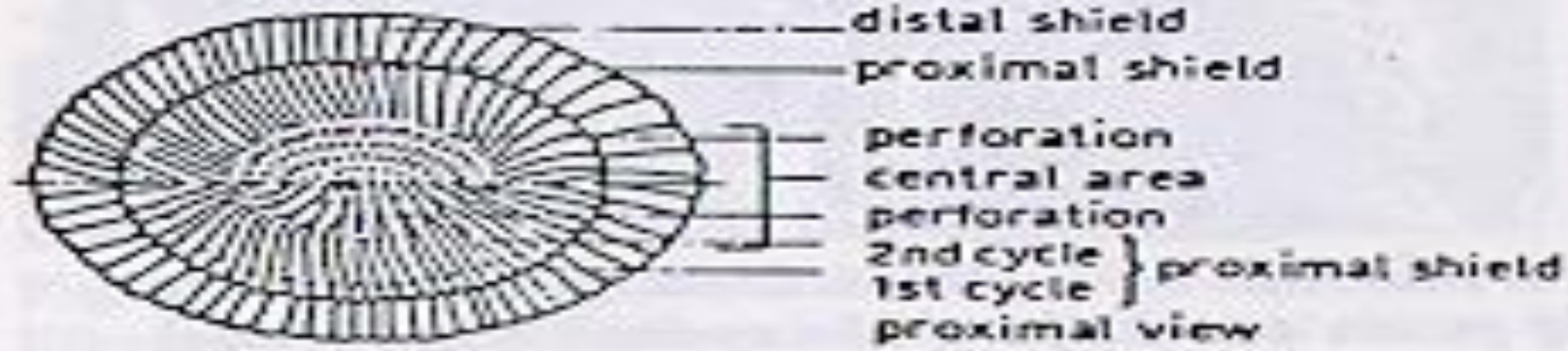
TEXT-FIG. 5. Terms for describing rim structures.



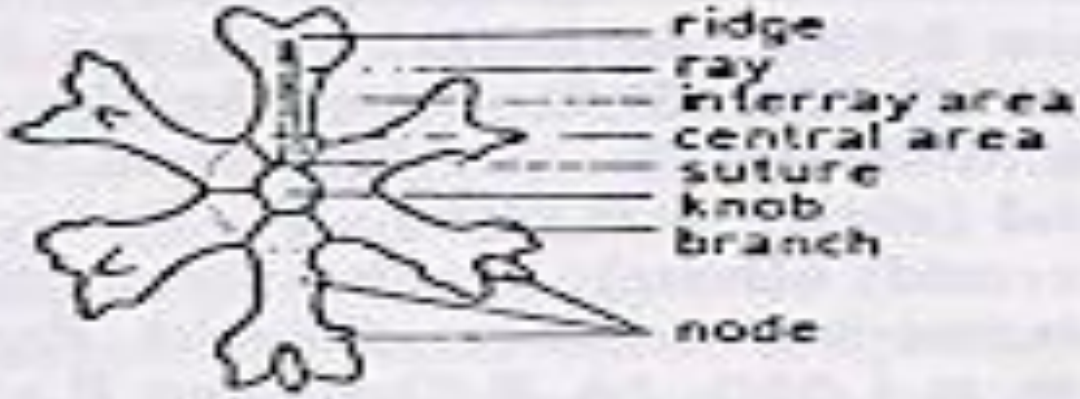
TEXT-FIG. 1. Coccosphere related terms.



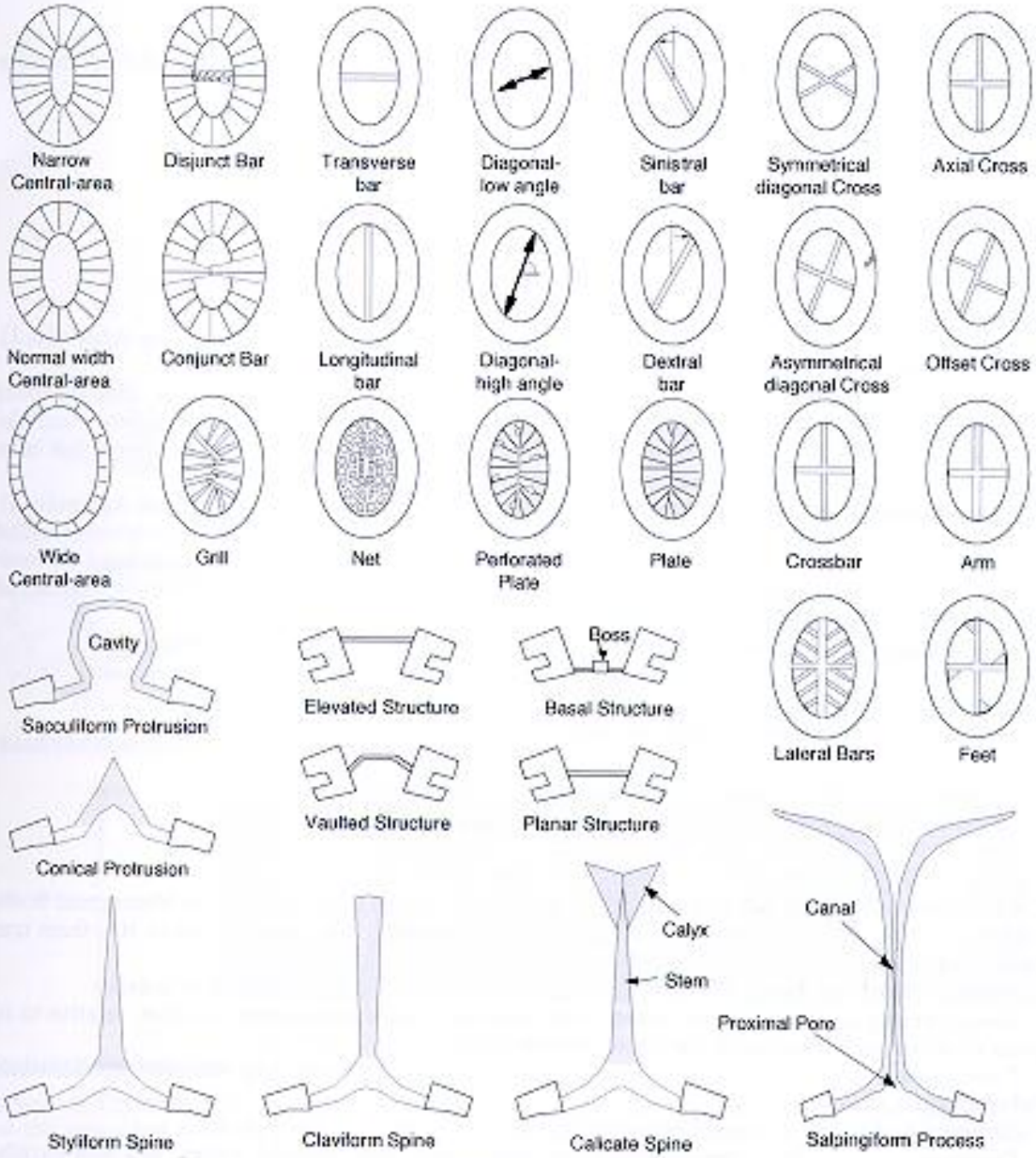
TEXT-FIG. 3. Coccolith sizes and shapes.



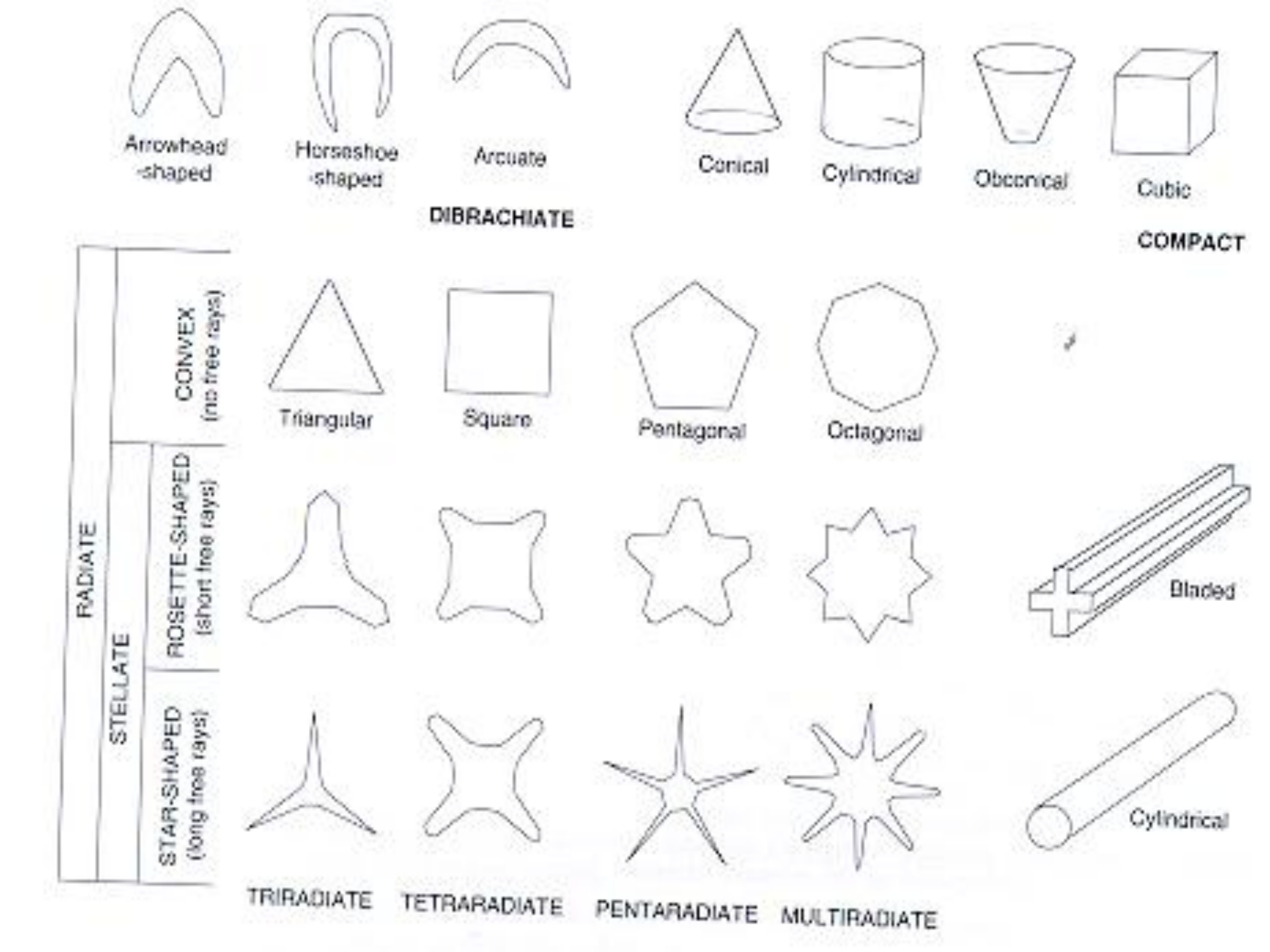
Coccolith

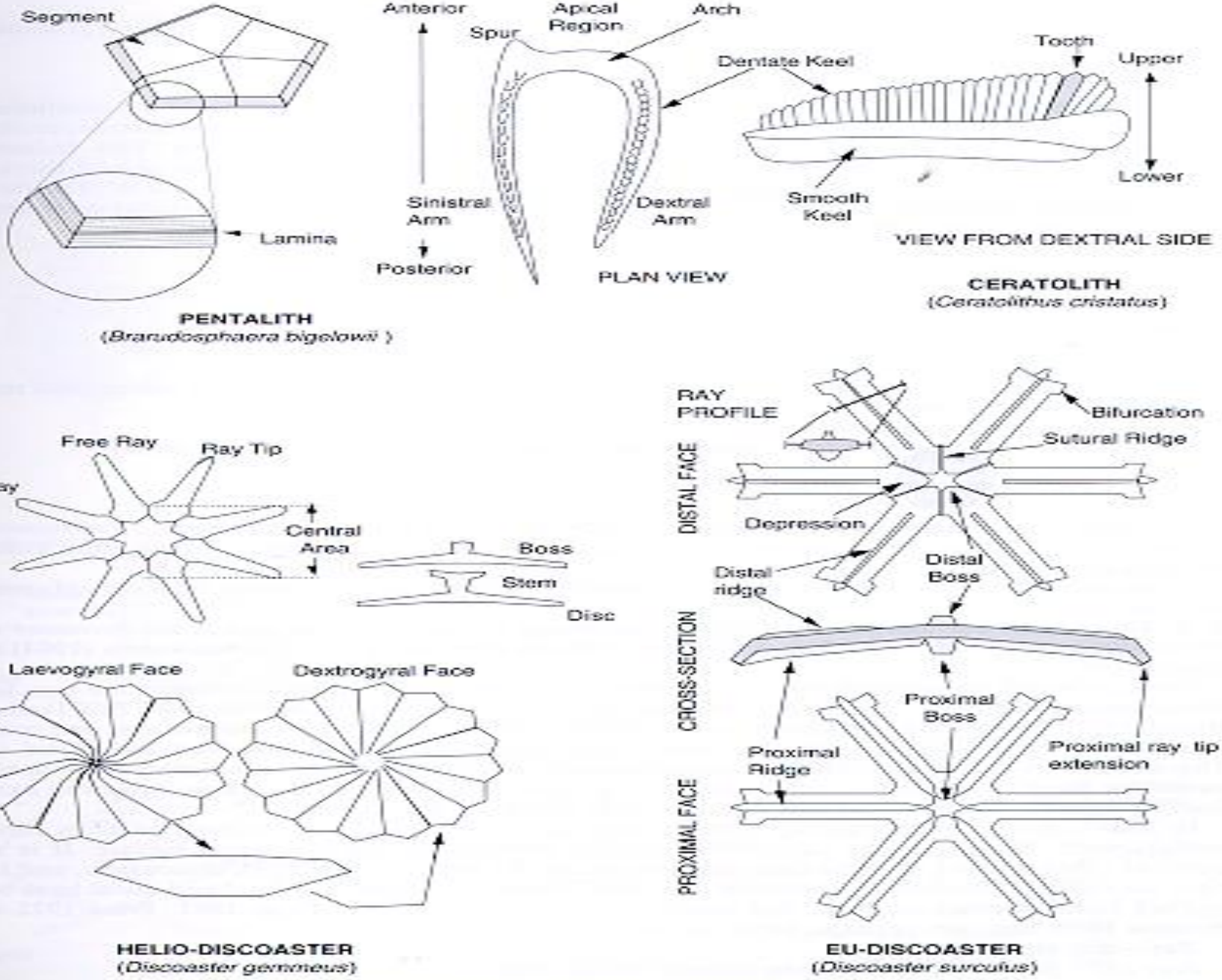


Discoaster

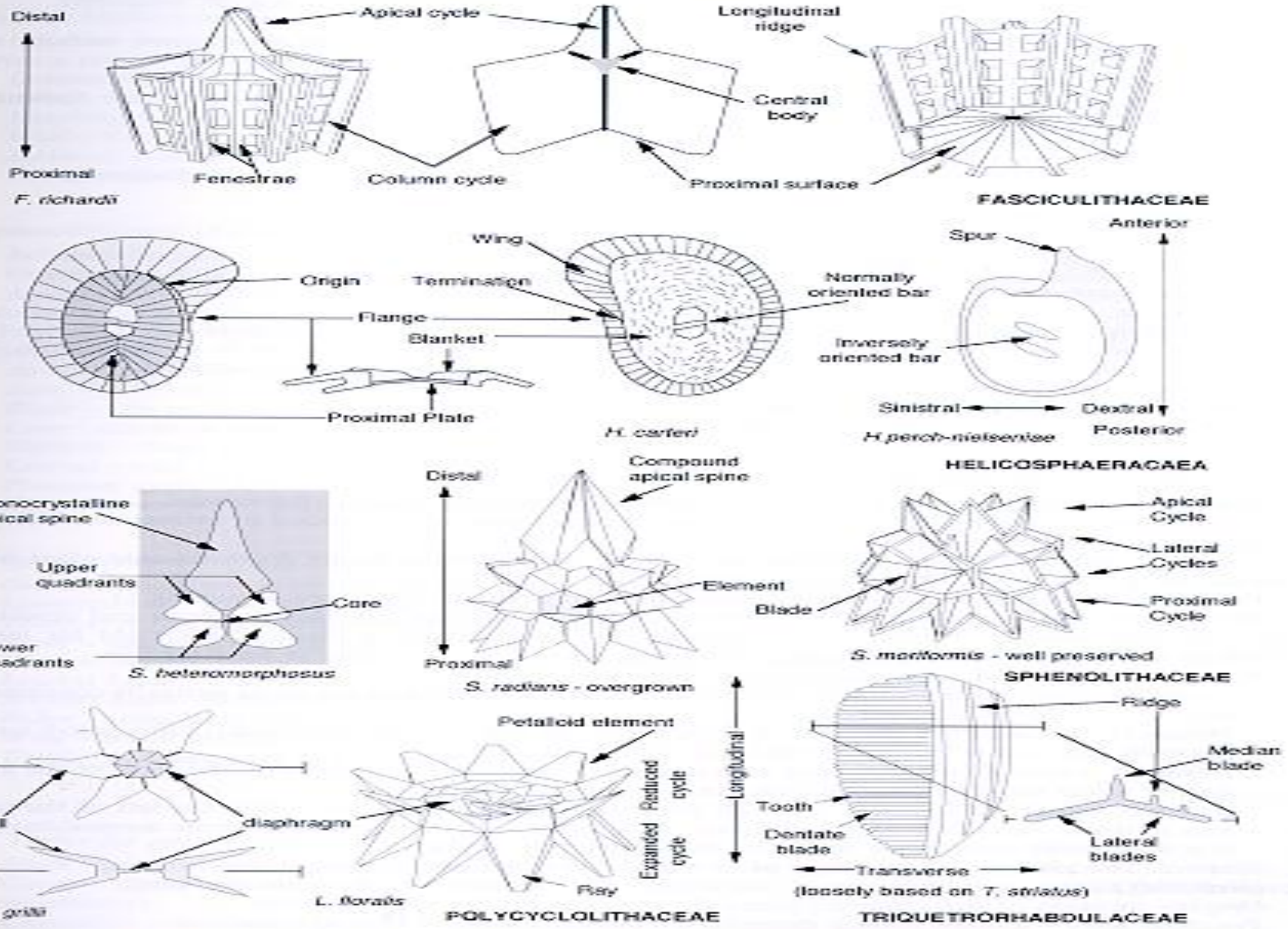


TEXT-FIG. 7. Central area structures.

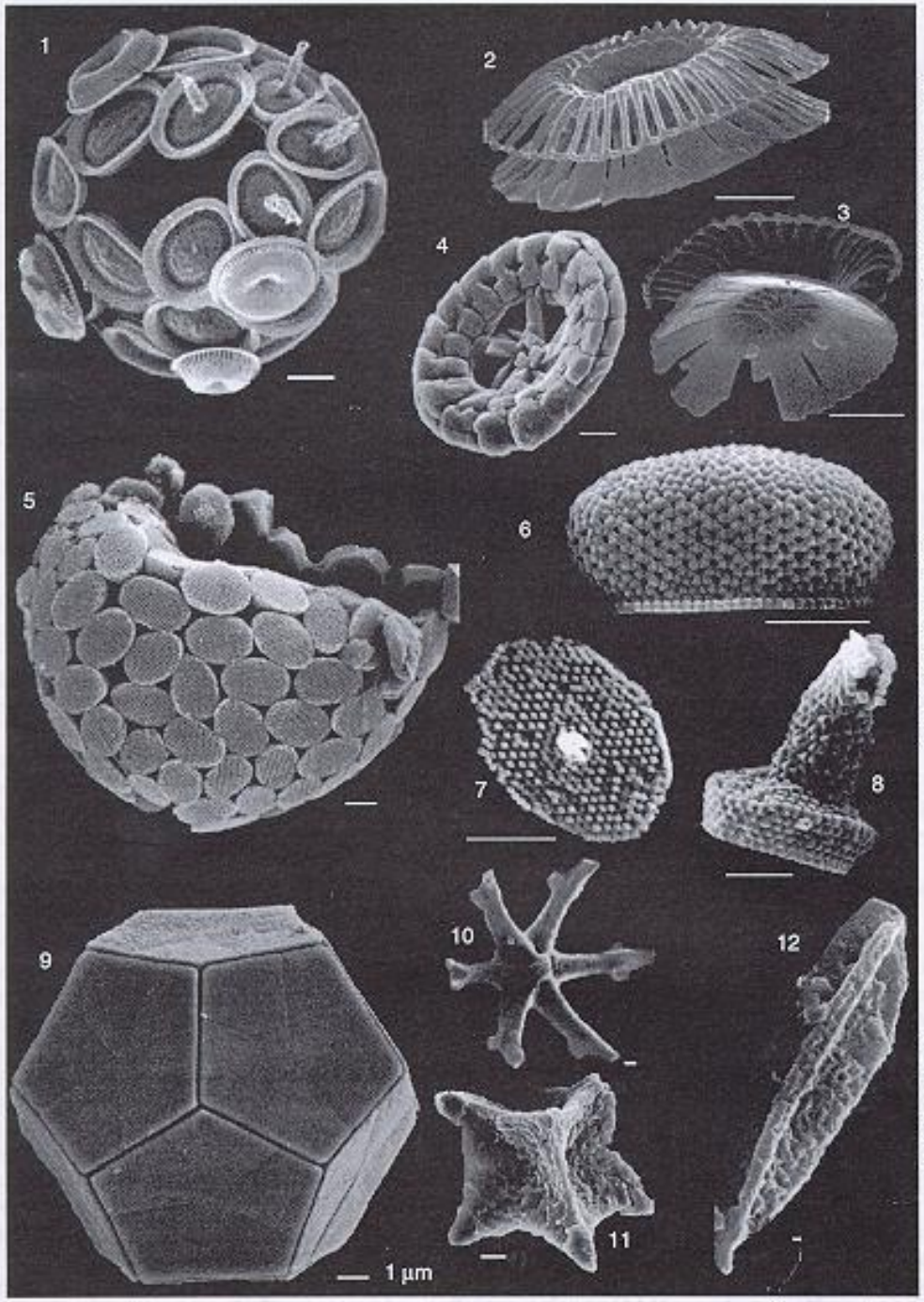

Arrowhead -shaped
Horseshoe -shaped
Arcuate
DIBRACHIATE
Conical
Cylindrical
Obconical
Cubic
COMPACT
RADIATE
STELLATE
CONVEX (no free rays)
ROSETTE-SHAPED (short free rays)
STAR-SHAPED (long free rays)
Triangular
Square
Pentagonal
Octagonal
Bladed
Cylindrical
TRIRADIATE
TETRARADIATE
PENTARADIATE
MULTIRADIATE



TEXT-FIG. 11. Special terms applied to Braarudosphaeraceae, Ceratolithaceae and Discoasteraceae. N.B. The terms applied to the description of heterococcoliths may also, where appropriate, be applied to these groups, and *vice versa*.



TEXT-FIG. 12. Special terms applied to Fasciculithaceae, Helicosphaeraceae, Polycyclolithaceae, Sphenolithaceae and Triquetrorhabdulaceae. N.B. The terms applied to the description of heterococcoliths may also, where appropriate, be applied to these groups, and *vice versa*.



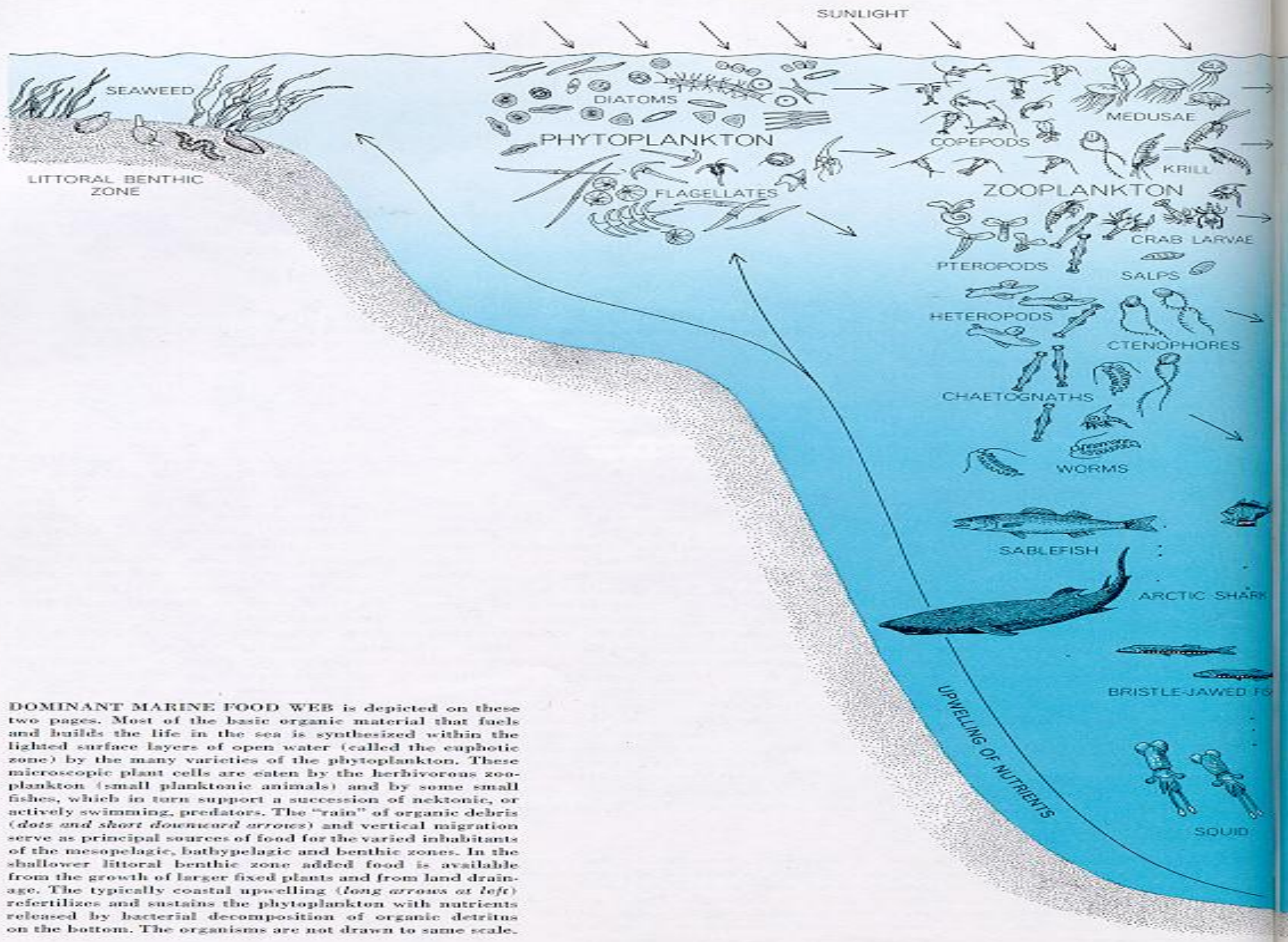
FORMADOS POR UN CONJUNTO DE UNIDADES MORFOLOGICAMENTE DIVERSAS TALES COMO LAMINAS, ELEMENTOS PETALIFORMIS, INDIVIDUALES, COMPLEJOS....

FORMADOS EN SU TOTALIDAD POR UN CRISTAL UNIFORME

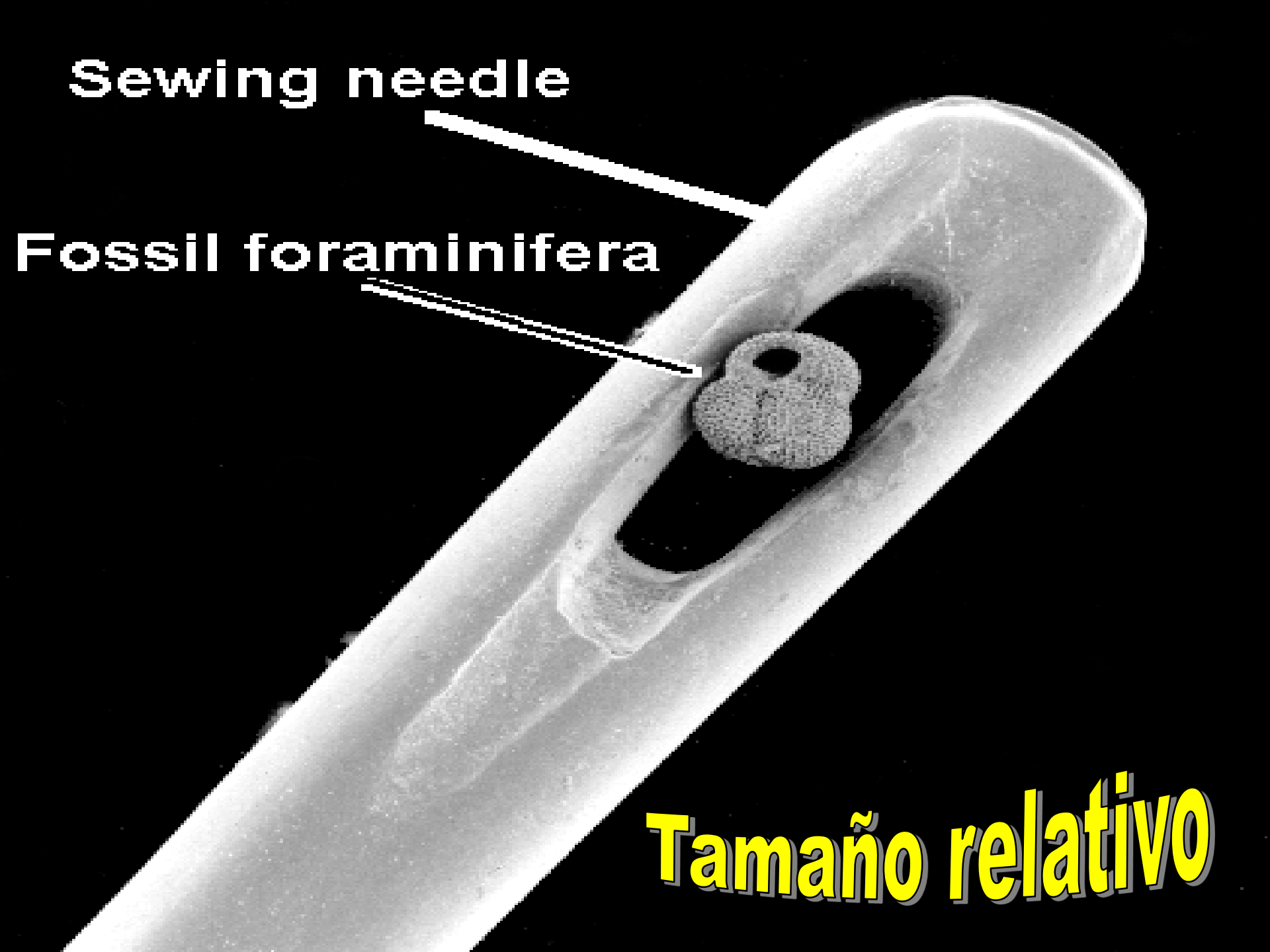
CIRTOLITOS----GORRA
CRICOLITOS----ANILLOS
CANEOLITOS----CESTA
PLACOLITOS----PLACAS
ESCAFOLITOS----NAVE
PENTALITOS--CINCO UNIDADES

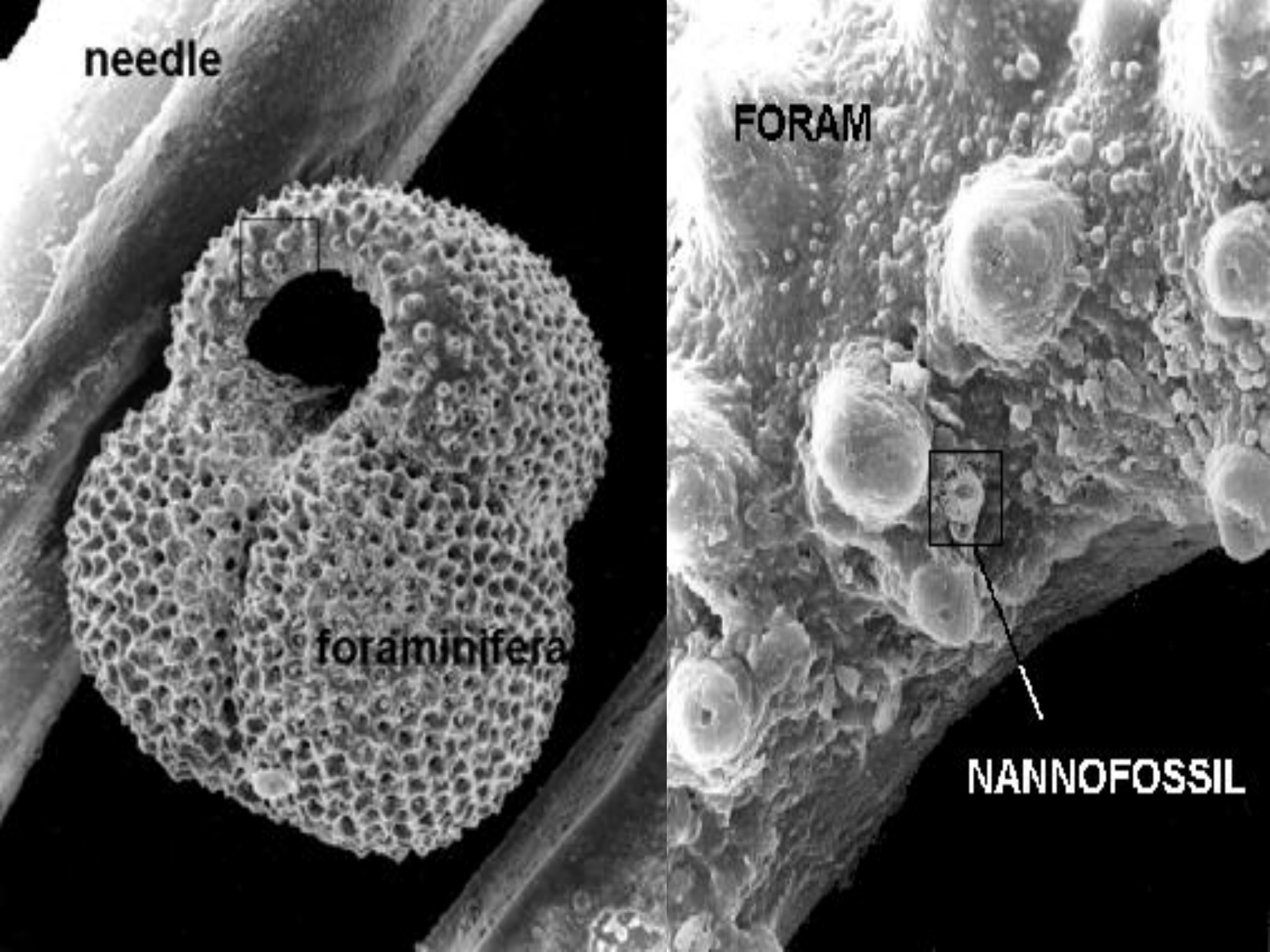
SE ENCUENTRAN EN TODOS LOS MARES ACTUALES CON TEMPERATURAS COMPRENDIDAS ENTRE 5 Y 25 GRADOS CENTIGRADOS. SU TEMPERATURA IDEAL SE SITUA EN 20 GRADOS CENTIGRADOS. LA SALINIDAD MINIMA ES DE 16 A 17 PARTES POR MIL, PERO UNA SALINIDAD DE 20 PARTES POR MIL O MAS ASEGURA UN BUEN DESARROLLO

REQUIEREN DE TEMPERATURAS CALIDAS, AGUAS RICAS EN OXIGENO, CON BUENA CIRCULACIÓN, pH SUPERIOR A 8,05, CON BUENA CANTIDAD DE NUTRIENTES.

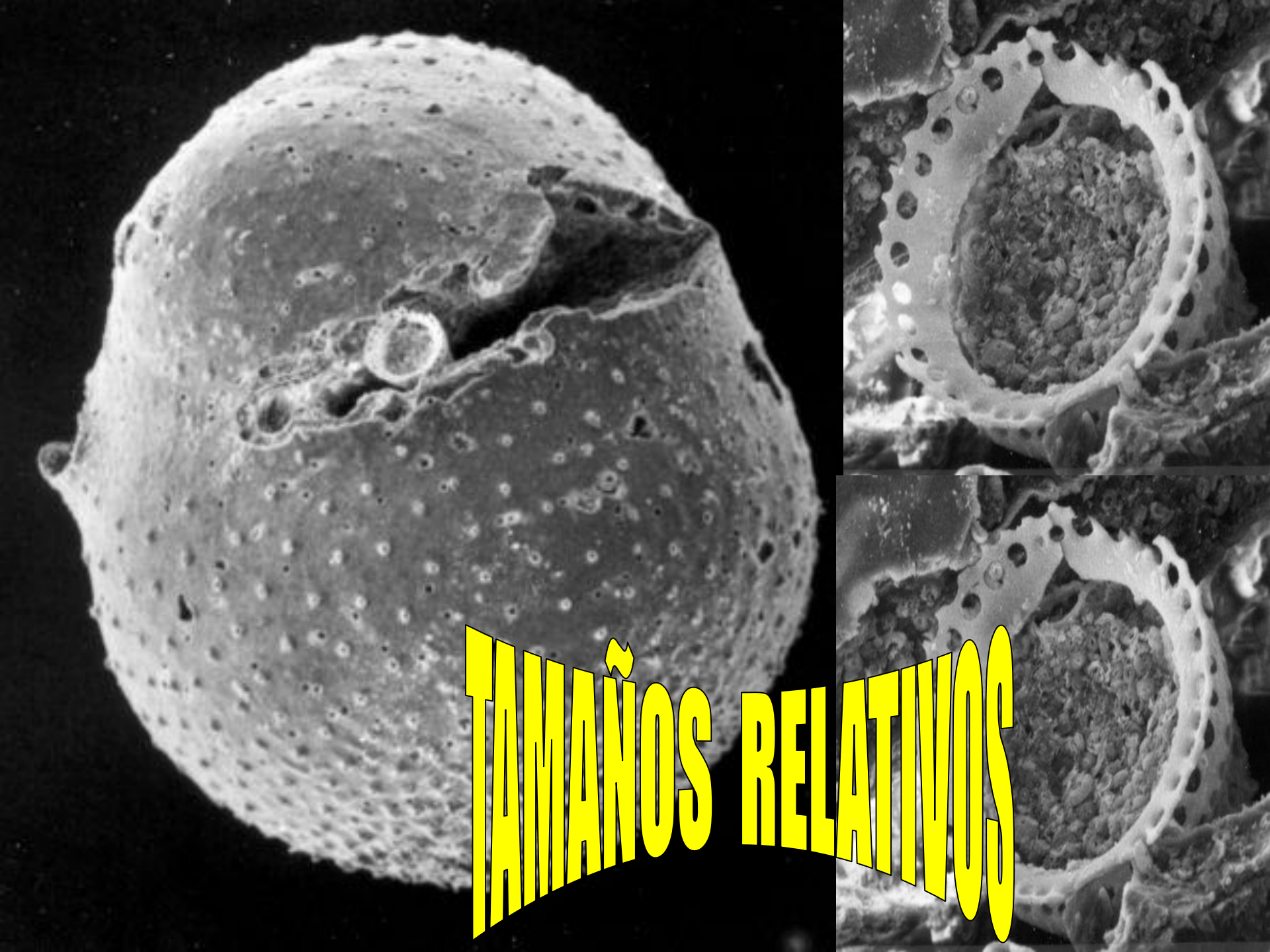


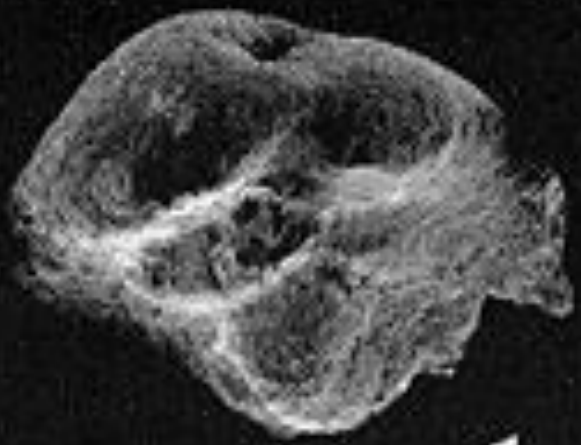
DOMINANT MARINE FOOD WEB is depicted on these two pages. Most of the basic organic material that fuels and builds the life in the sea is synthesized within the lighted surface layers of open water (called the euphotic zone) by the many varieties of the phytoplankton. These microscopic plant cells are eaten by the herbivorous zooplankton (small planktonic animals) and by some small fishes, which in turn support a succession of nektonic, or actively swimming, predators. The "rain" of organic debris (*dots and short downward arrows*) and vertical migration serve as principal sources of food for the varied inhabitants of the mesopelagic, bathypelagic and benthic zones. In the shallower littoral benthic zone added food is available from the growth of larger fixed plants and from land drainage. The typically coastal upwelling (*long arrows at left*) refertilizes and sustains the phytoplankton with nutrients released by bacterial decomposition of organic detritus on the bottom. The organisms are not drawn to same scale.


Sewing needle
Fossil foraminifera
Tamaño relativo

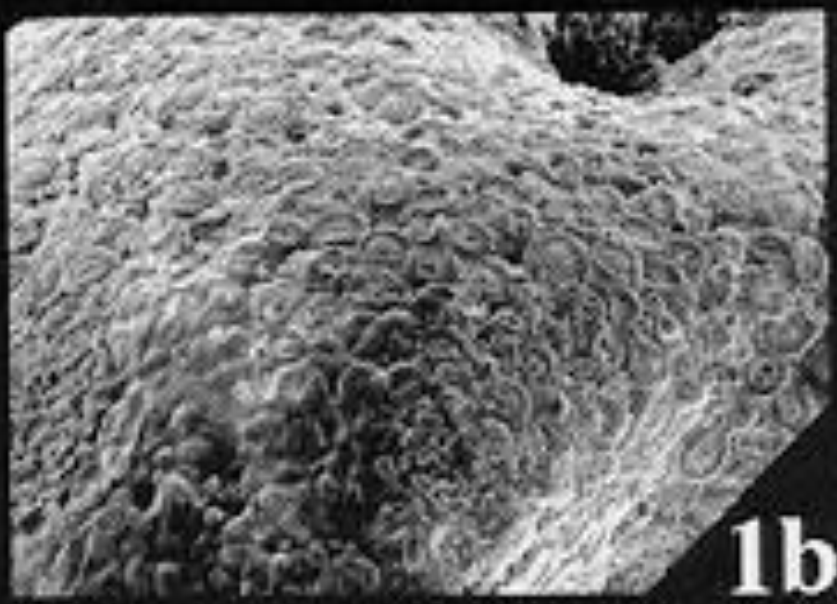

needle
foraminifera
FORAM
NANNOFOSSIL


NANNOFOSSIL
Emiliania huxleyi
1 micron


TAMAÑOS RELATIVOS

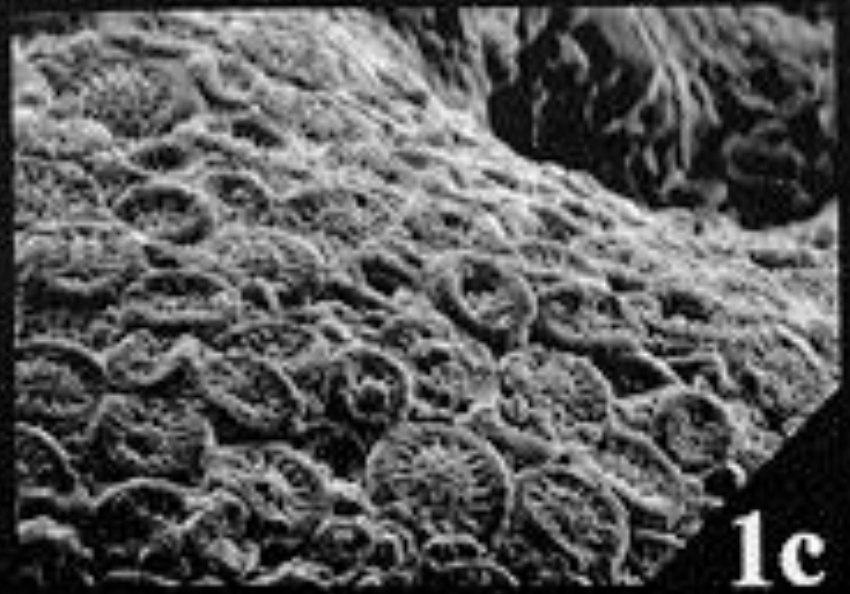


1a

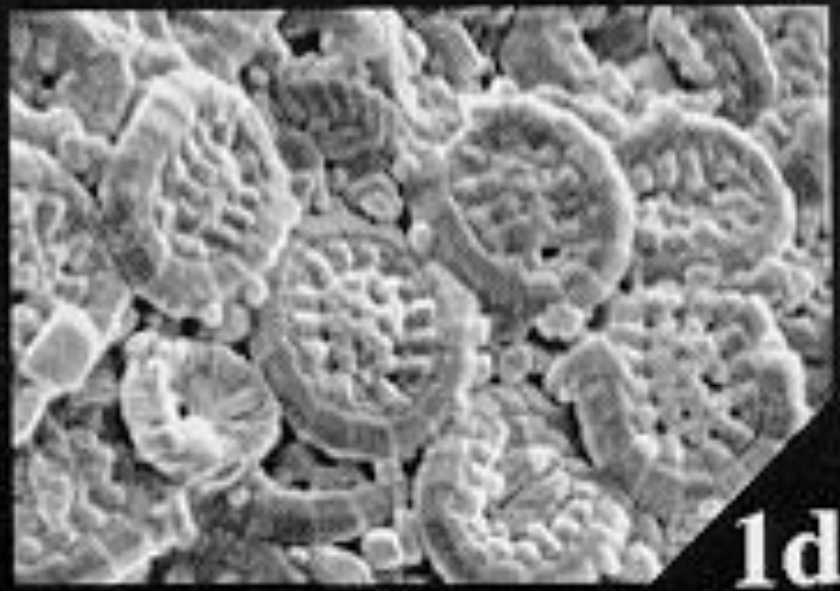


1b

TIENEN UN TAMAÑO ENTRE 0.25 Y 30 MICRAS



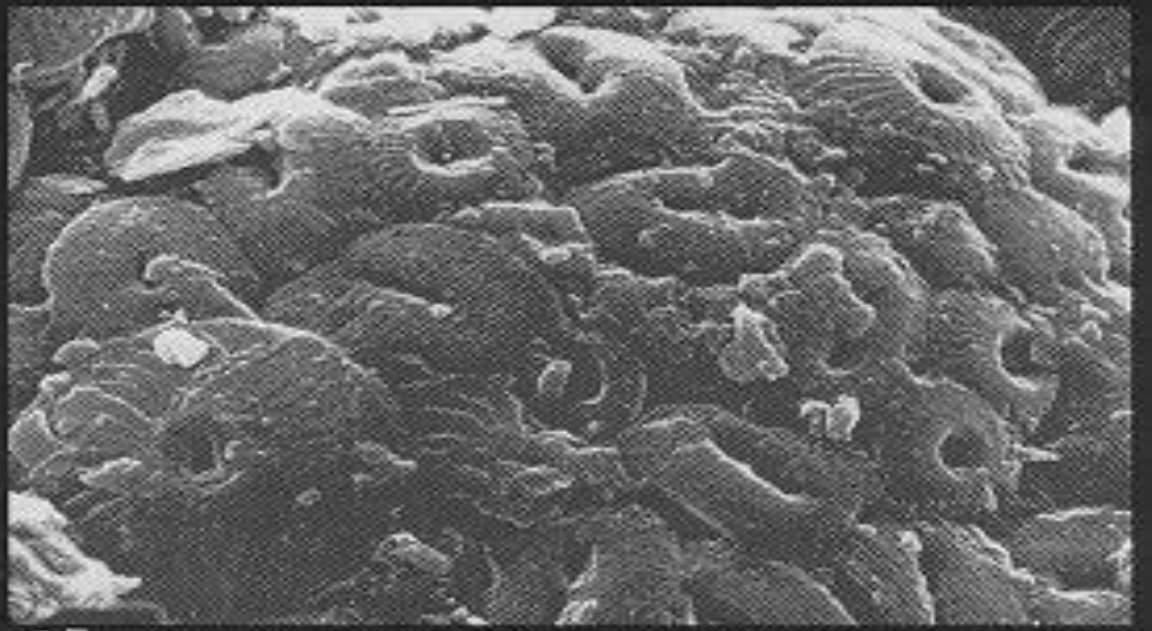
1c



1d

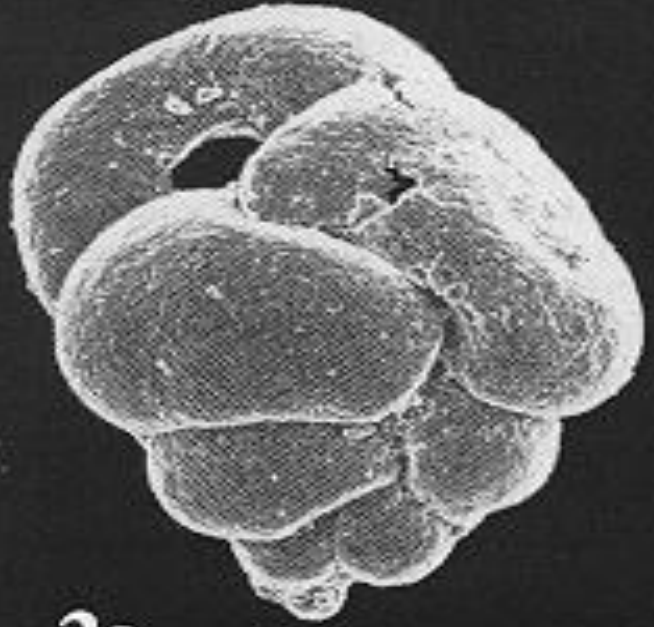
1a

30μm



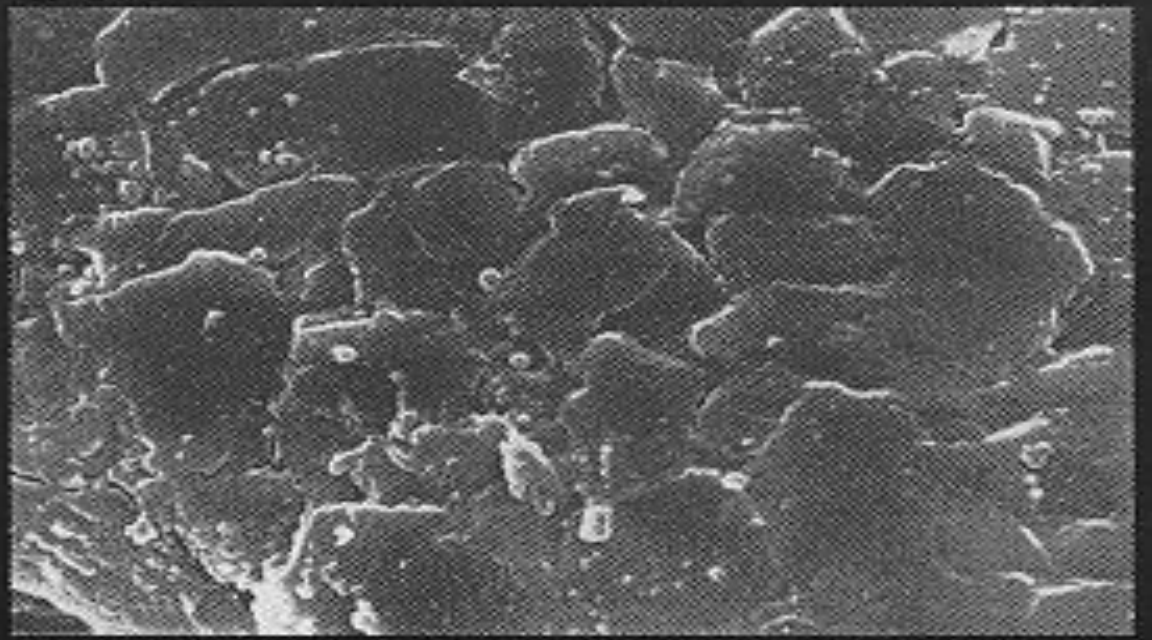
1b

3μm



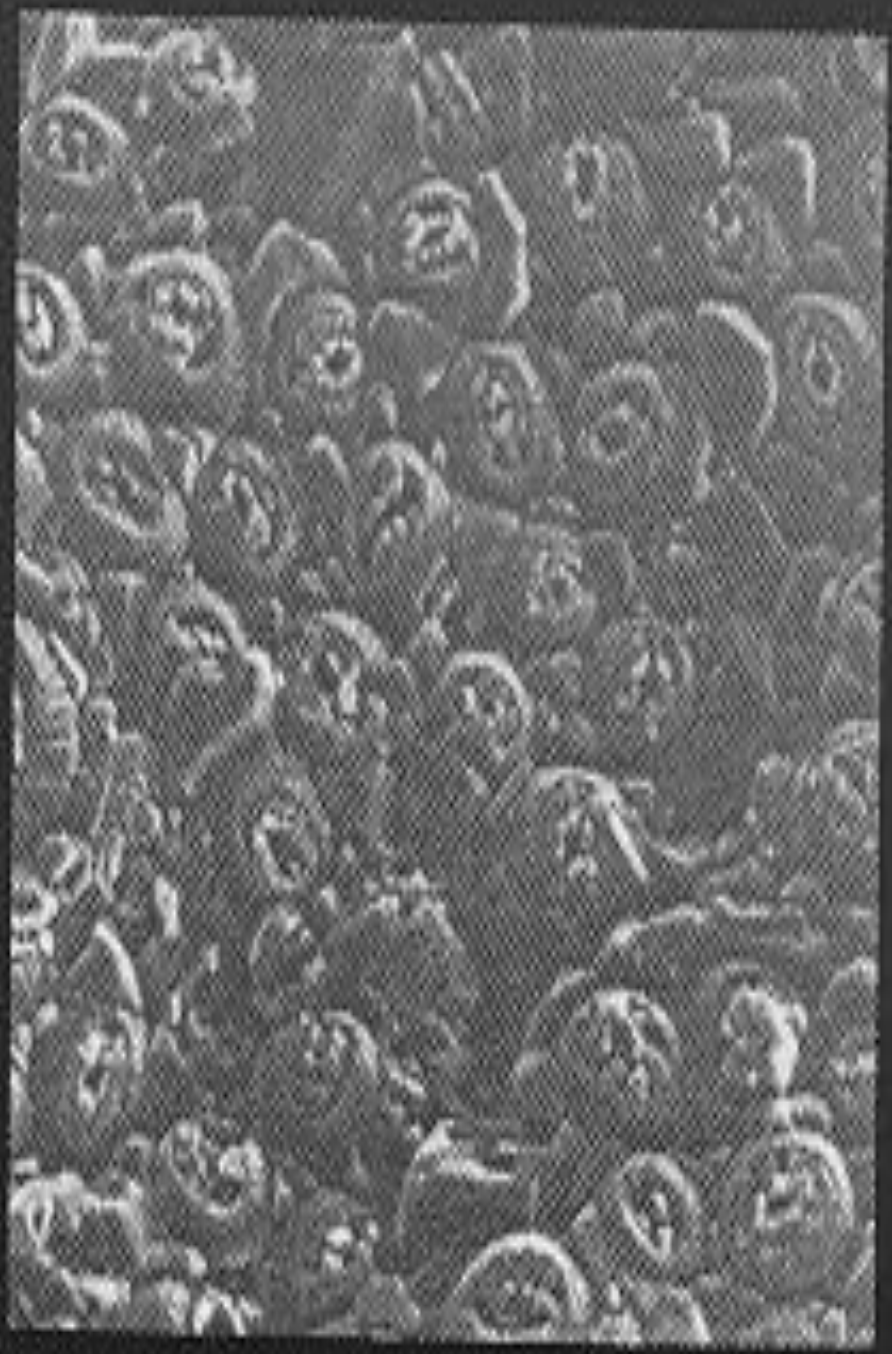
2a

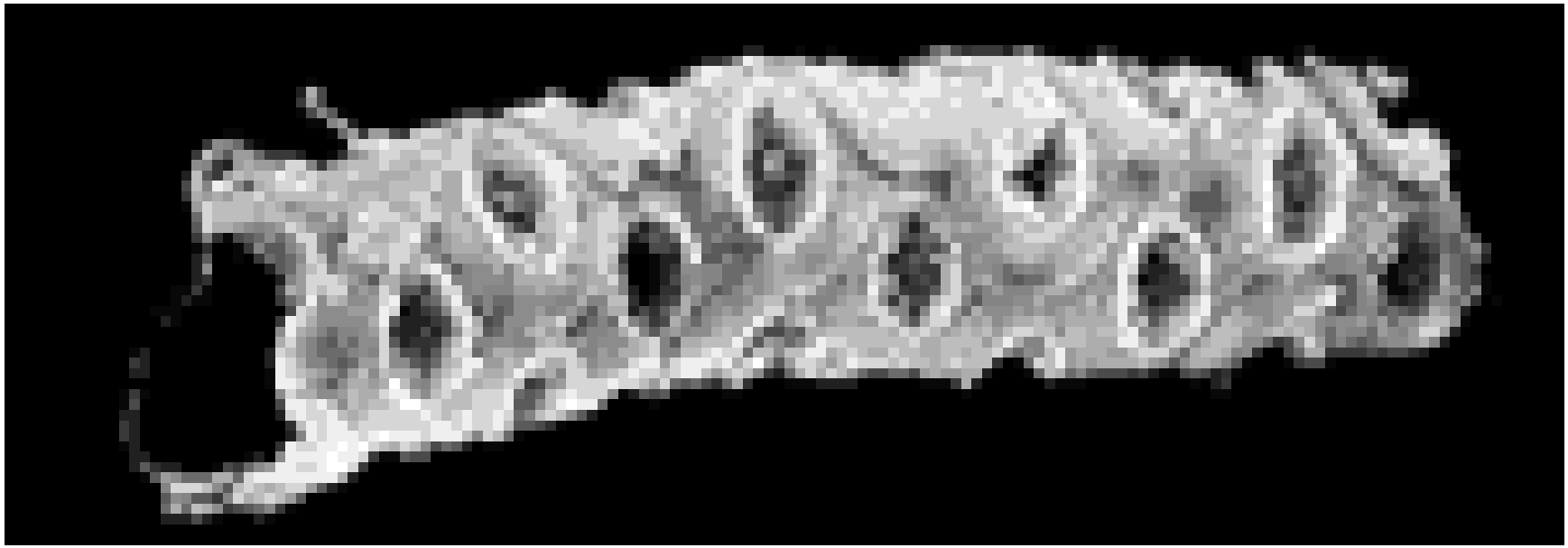
100μm



3μm

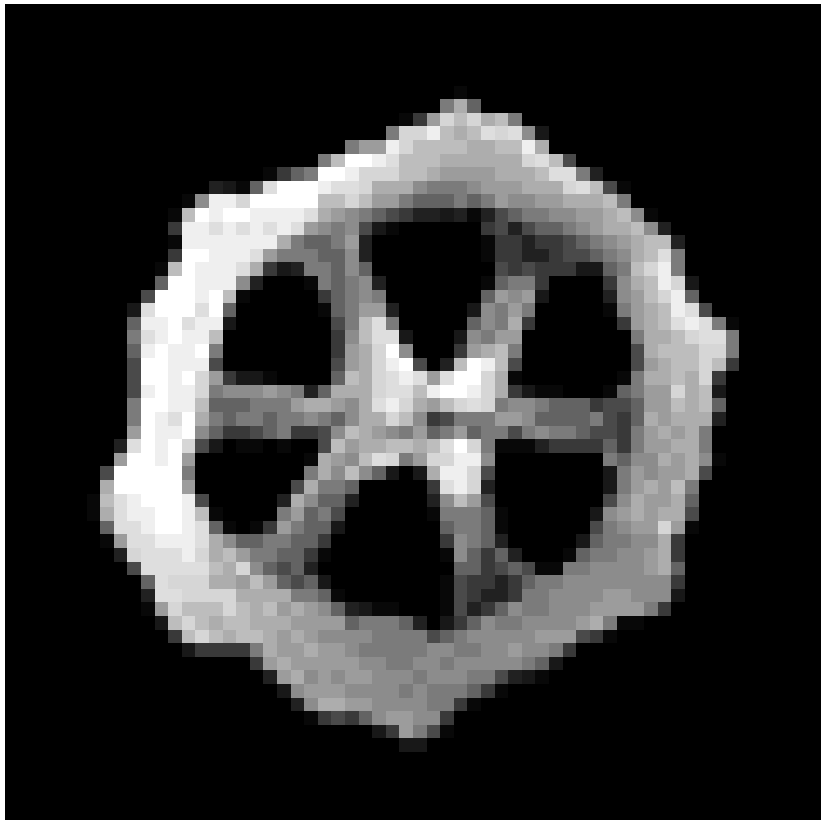
2b





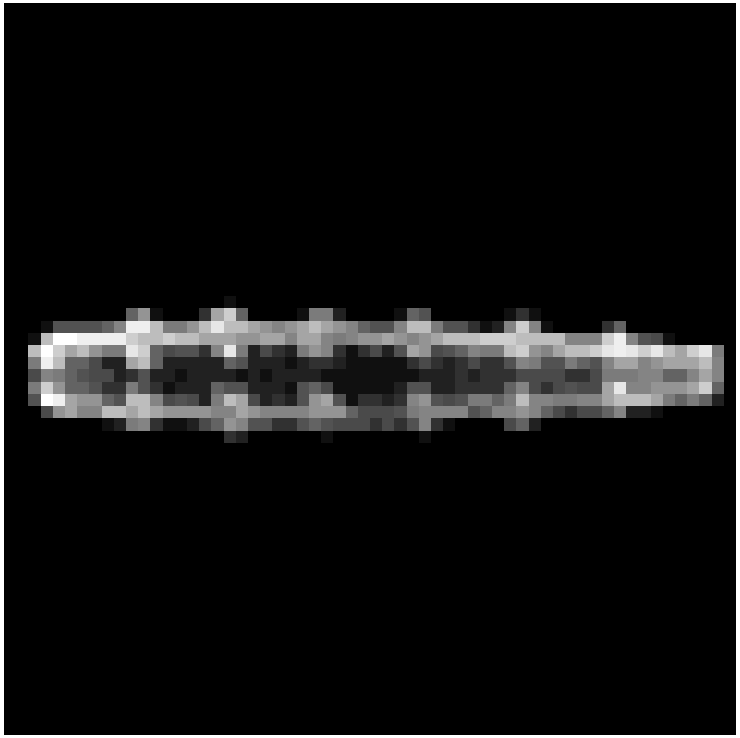
Biscutum zulloi

CRETACICO. ARKANSAS,USA.



Corolitium exiguun

Microrhabdulus belgicus



LOS DISCOASTERIDOS TIENEN FORMA ESTRELLADA O DE ROSETA, HAN SIDO CONSIDERADOS POR ALGUNOS AUTORES COMO CRISTALES INORGANICOS. SE HA SUGERIDO QUE SEAN TAMBIEN ESPICULAS DE CIERTOS ALCIONARIOS BENTONICOS MUY ESPECIALIZADOS.

LOS COCOLITOS POSEEN DOS TIPOS DE ESTRUCTURA CRISTALINA:
HOLOCOCOLITOS.- formados en su totalidad por un cristal uniforme
HETEROCOCOLITOS.- formados por un conjunto de unidades morfológicamente diversas tales como láminas, elementos petaliformis o elementos individuales complejos

GEOLOGOS

SE CLASIFICAN EN BASE A LOS CARACTERES DE LOS ELEMENTOS DE LA COCOS-FERA QUE ES LO QUE NOS BRINDA UNA UTILIDAD INME-DIATA DENTRO DE LA IN-DUSTRIA PETROLERA.
LA ESCUELA ESTRATIGRAFICA DEFINE LA FAMILIA POR LA ES-TRUCTURA DE LA CORONA, LOS GENEROS POR EL EJE CENTRAL Y LAS ESPECIES POR LA VARIACION DE LA ESTRUC-TURA DEL AREA CENTRAL.

BIOLOGOS

PARA LOS BIOLOGOS, LA CLASIFICACION SE DEBE HACER EN BASE A LAS CARACTERISTICAS DE LAS CELULAS, ES DECIR, LA FORMA, PRESENCIA O AUSENCIA DE ABERTURA, ETC.

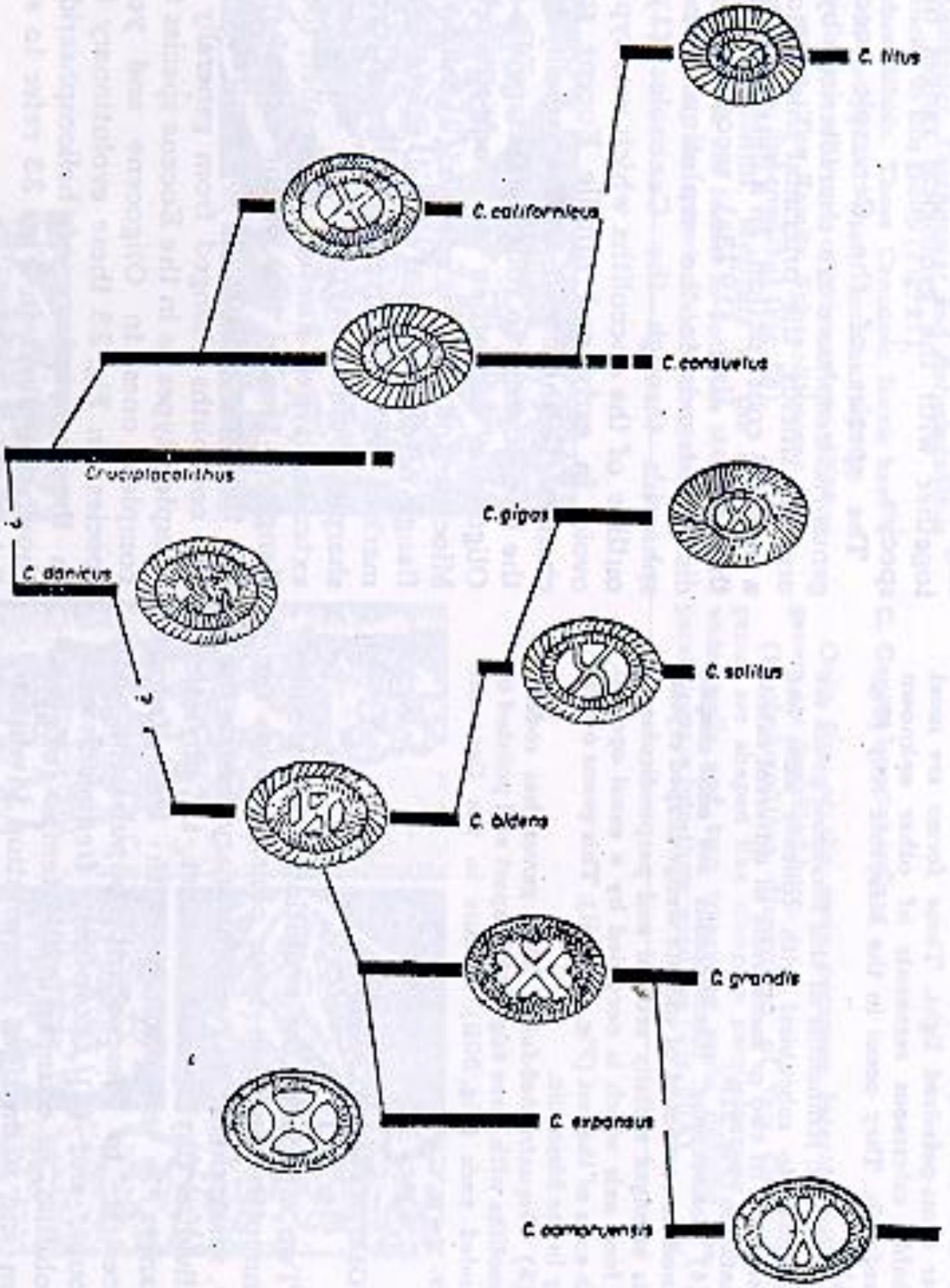
INDUSTRIA PETROLERA

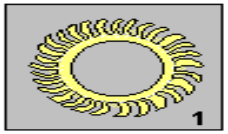
LOS NANOFOSILES TIENEN UN ENORME POTENCIAL BIOESTRATIGRAFICO, PUES POR SER ORGANISMOS PLANCTONICOS, SON EXCELENTES INDICADORES DE EDAD.

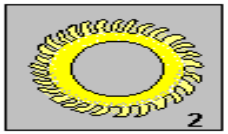
POR OTRA PARTE, SU PEQUEÑO TAMAÑO, SU AMPLIA DISTRIBUCION, SU RAPIDA EVOLUCION Y LA FACILIDAD CON QUE SE REALIZAN LAS PREPARACIONES PARA SER OBSERVADAS BAJO EL MICROSCOPIO, A PARTIR DE UN PEQUEÑO FRAGMENTO DE MUESTRA, HACE DE ELLOS LOS ORGANISMOS IDEALES PARA LA SUBDIVISION BIOESTRATIGRAFICA DE LOS ESTRATOS MARINOS.

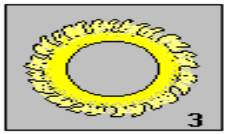
DIVERSOS ESTUDIOS REALIZADOS, HAN DEMOSTRADO, QUE AL ESTABLECERSE UNA COMPARACIÓN ENTRE LA EDAD BRINDADA POR LOS NANOFOSILES CALCAREOS, LA EDAD ABSOLUTA Y LA MAGNETOESTRATIGRAFIA, SE OBTIENEN RESULTADOS QUE DAN A LA NANOFLORA CALCAREA UNA RESOLUCION DE PRIMER ORDEN.

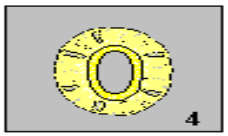
PALEOCENE		EOCENE			OLIGOCENE	
EARLY	LATE	EARLY	MIDDLE	LATE	EARLY	LATE

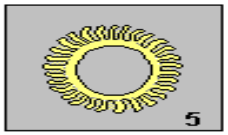


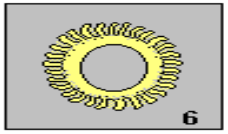


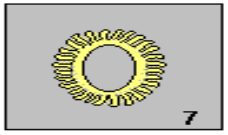


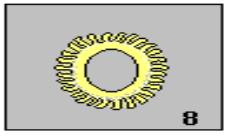


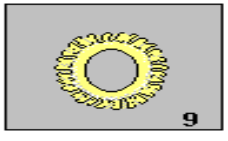








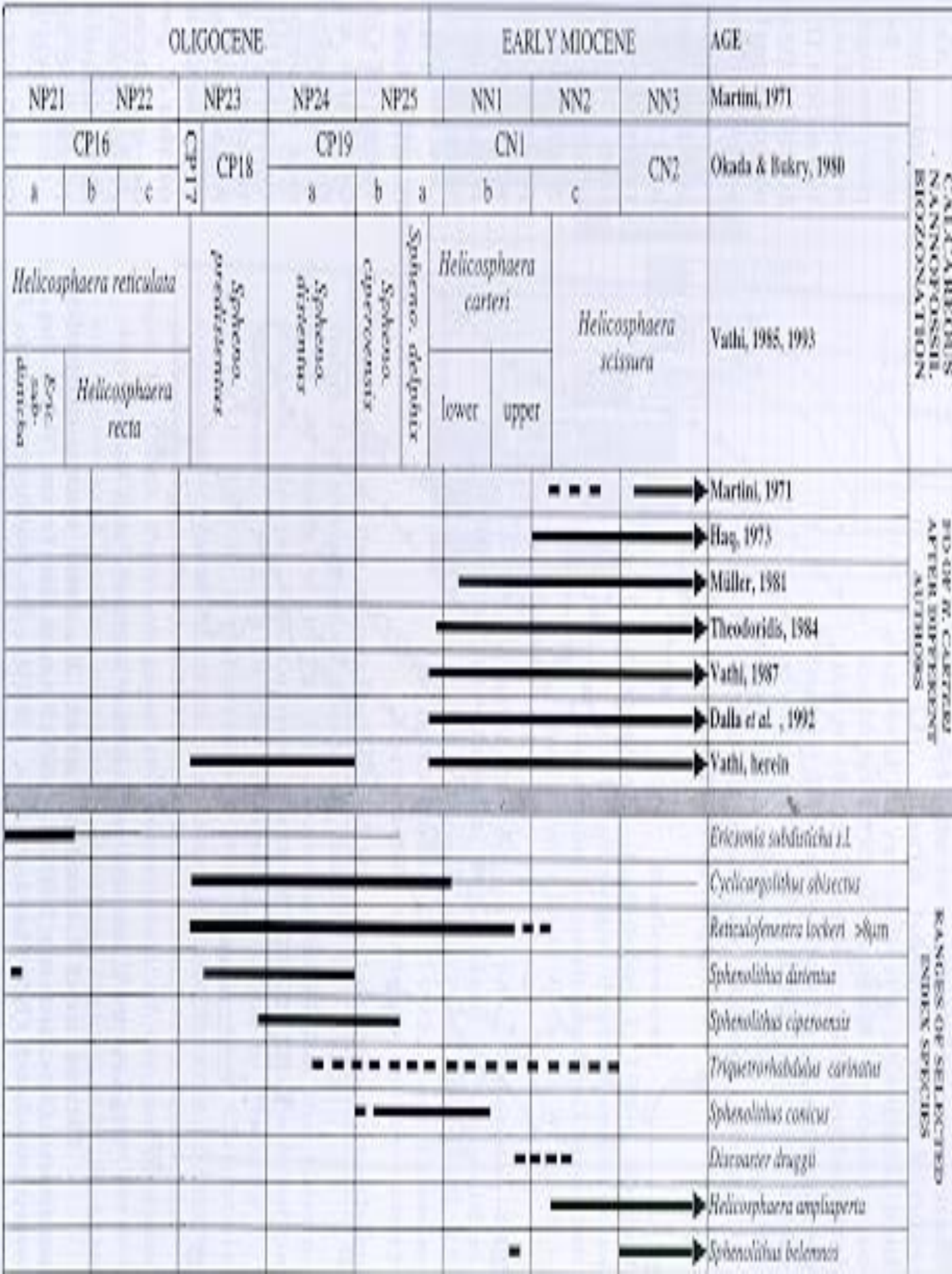




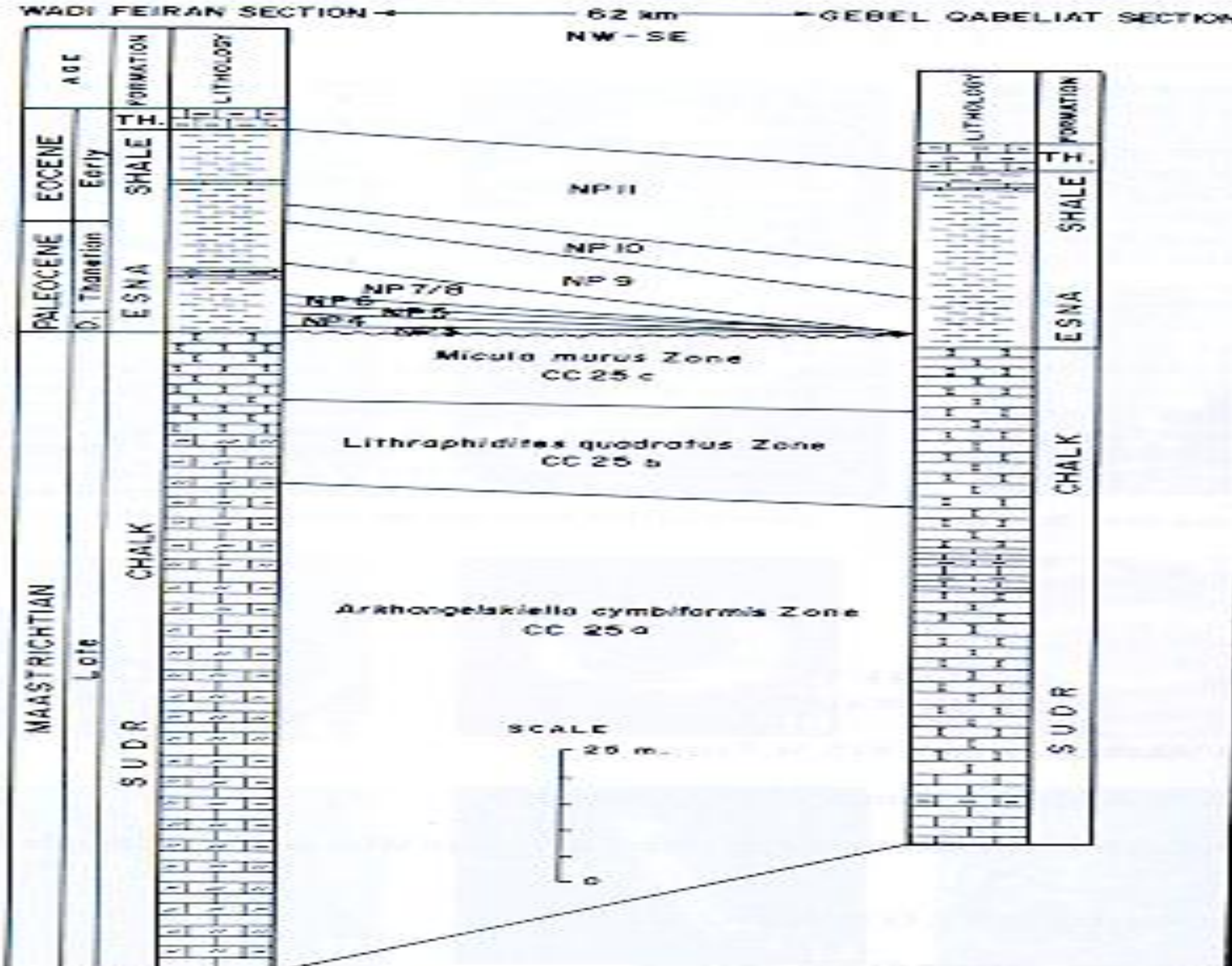
Joe	*Ron*	*Marlene*	*Art*	*Rich*	*Shell Terry Laura*					
Grp 1 Grp 2 (increase) (Top Yar)	Pem 5	P 1		A	Ps 1 (extinct)					
	Pem 10	P 2	Lac B	P lac	Ps 1					
	Pem 20	P 3 (increase)								
			Lac var	P lac large						
Grp 1 Grp 2 (increase) (Top Yar)			Lac A	P lac ovata	Ps 2 (extinct)					
Grp 3 (Mid Yar)			Lac A	P lac ovata	Ps 2					
Grp 1 Grp 2 (increase) (Top Yar)			Lac A	P lac ovata	Ps 2					
			Lac C (increase)	P lac ovata	Ps 2					
				P lac ovata						

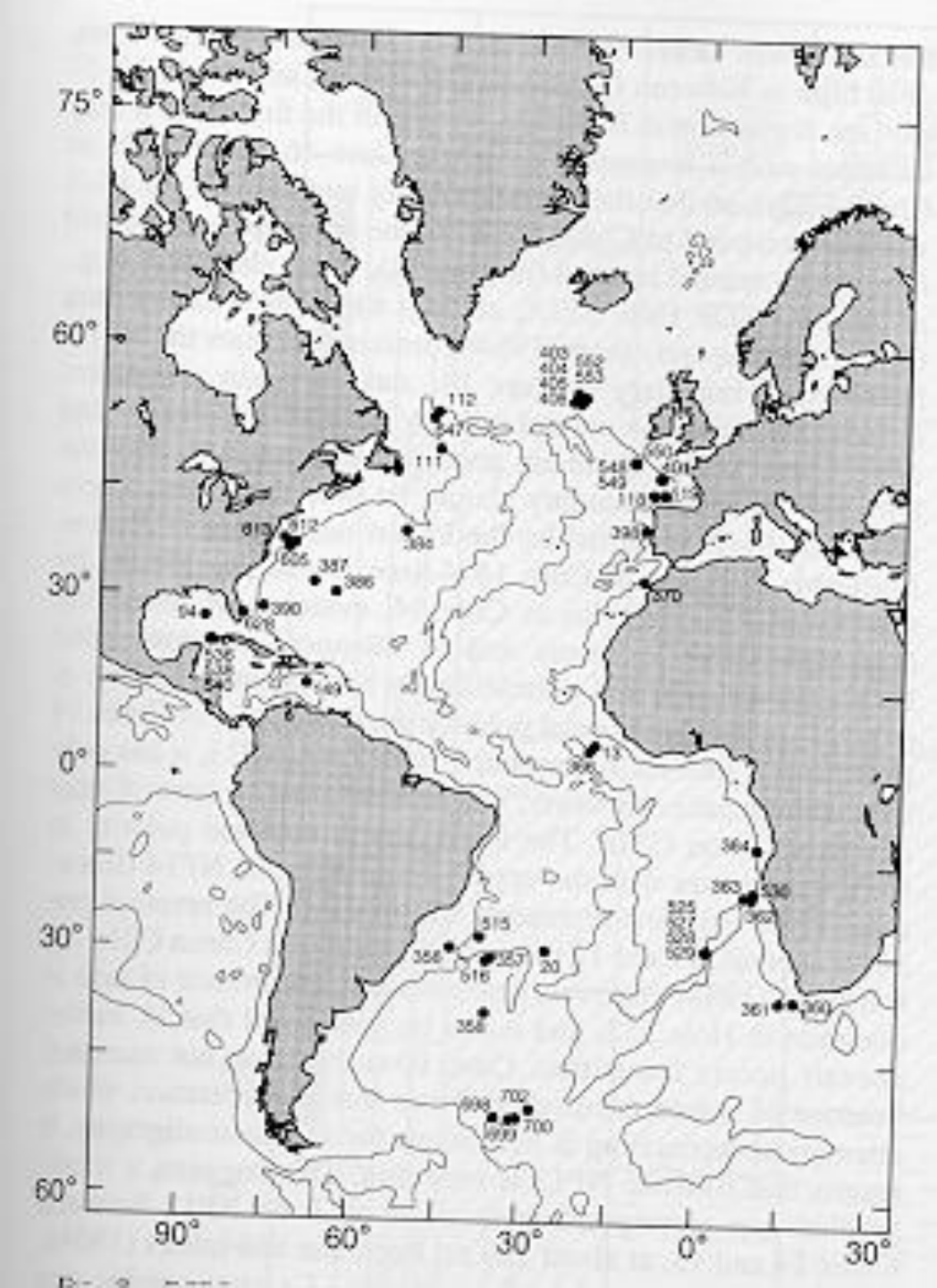
Pseudoemiliania

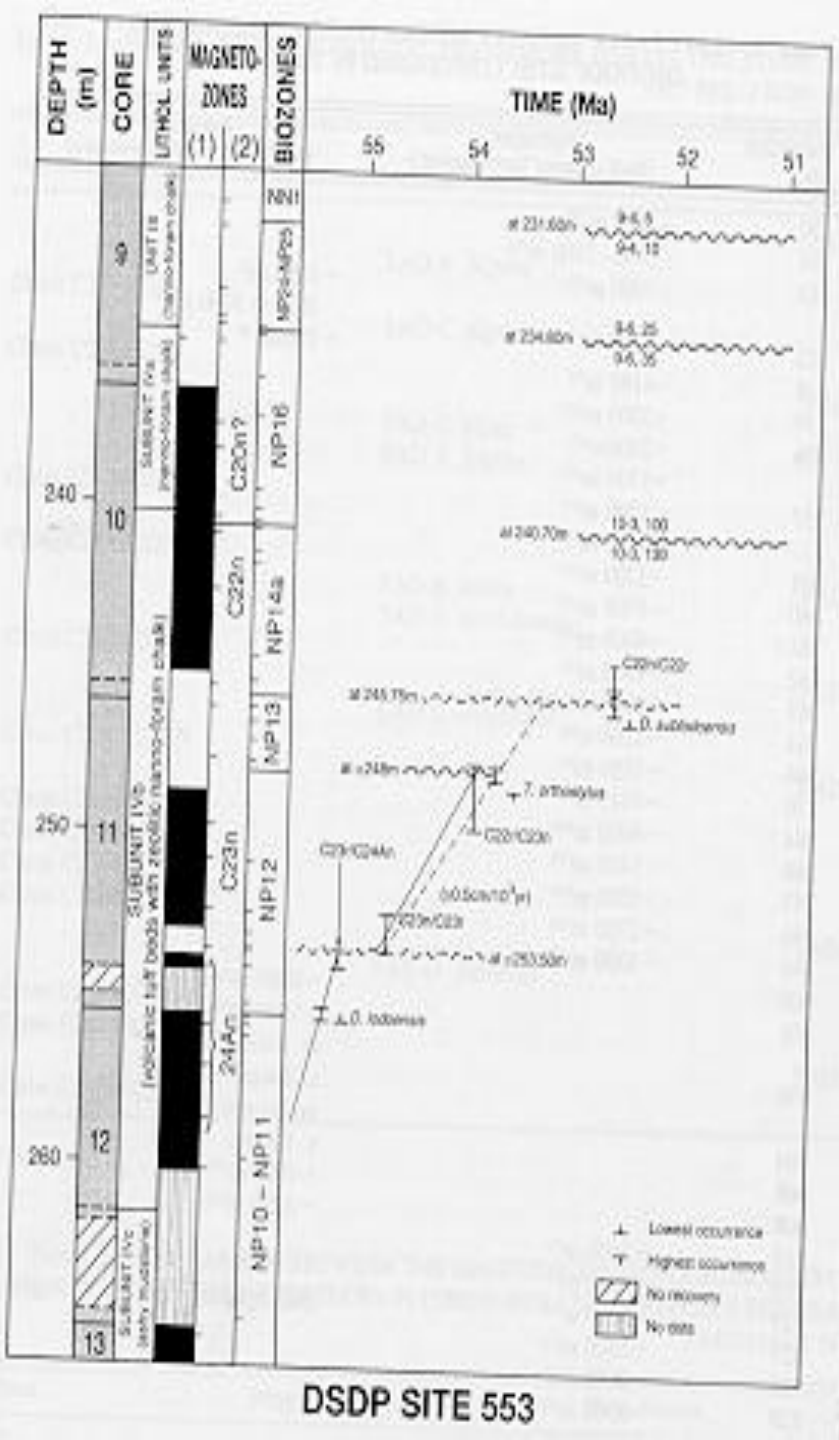
LRR 9/8/97


OLIGOCENE
EARLY MIOCENE
AGE
NP21
NP22
NP23
NP24
NP25
NN1
NN2
NN3
Martini, 1971
CP16
CP17
CP18
CP19
CN1
CN2
a
b
c
Okada & Bukry, 1980
CALCAREOUS NANNOFOSSIL BIOZONATION
Helicosphaera reticulata
Sphenolithus predistentus
Sphenolithus distentus
Sphenolithus ciperoensis
Sphenolithus delphix
Helicosphaera carteri
Helicosphaera scissura
Sphenolithus disbelemnos
Sphenolithus belemnos
Helicosphaera recta
lower
upper
Vathi, 1985, 1993
Martini, 1971
Haq, 1973
Müller, 1981
Theodoridis, 1984
Vathi, 1987
Dalla et al. , 1992
Vathi, herein
BASE OF H. CARTERI AFTER DIFFERENT AUTHORS
Ericsonia subdisticha s.l.
Cyclicargolithus abisectus
Reticulofenestra lockeri >8µm
Sphenolithus distentus
Sphenolithus ciperoensis
Triquetrorhabdulus carinatus
Sphenolithus conicus
Discoaster druggii
Helicosphaera ampliaperta
Sphenolithus belemnos
RANGES OF SELECTED INDEX SPECIES

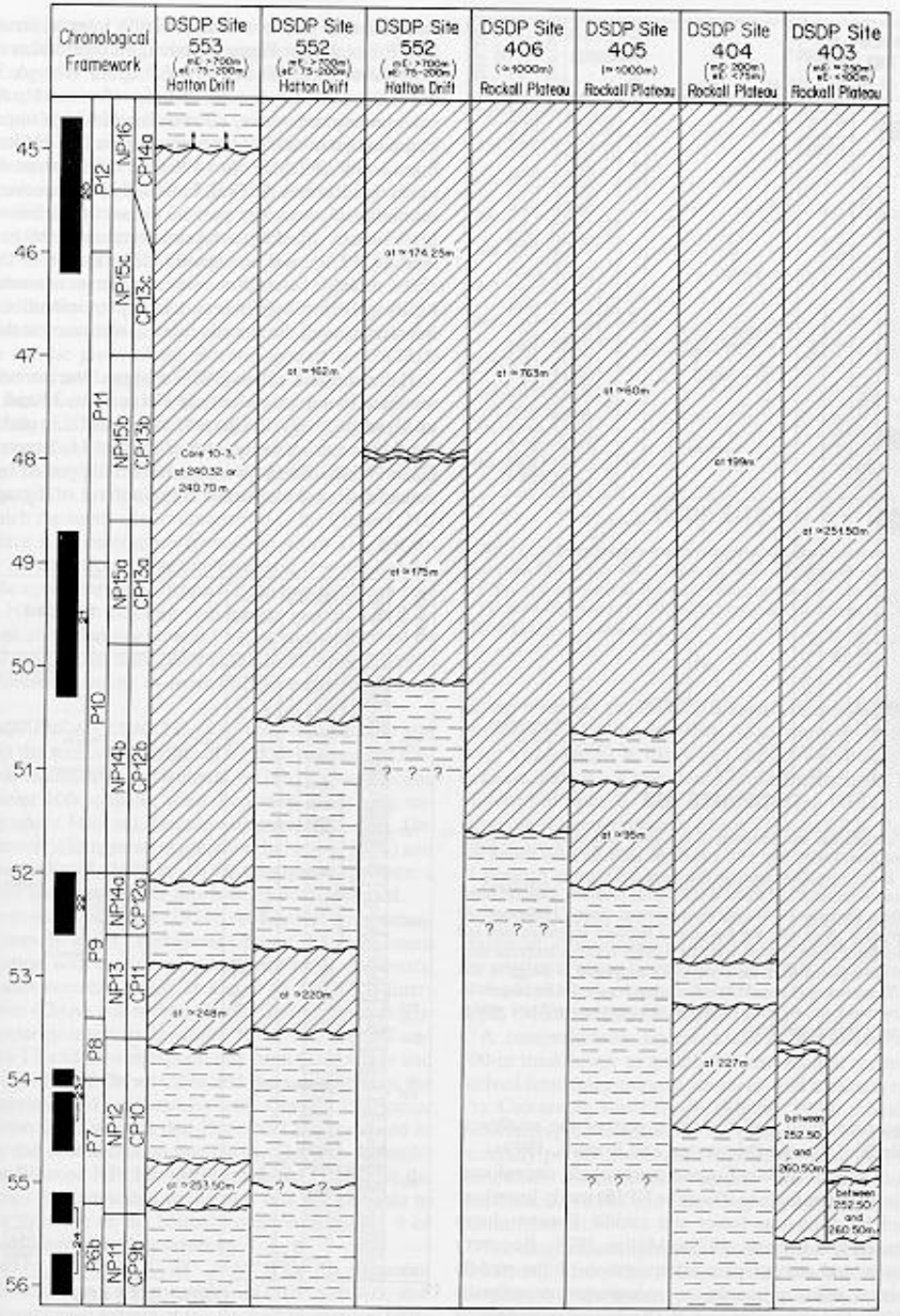
Fossil group	Age range	Geography	Average resolution (million years)	References
Planktonic Foraminifera	Neogene	Tropical	1.2	1
Planktonic Foraminifera	Neogene	Subtropical	1.4	1
Planktonic Foraminifera	Palaeogene	Tropical	1.7	2, 3, 4
Planktonic Foraminifera	Palaeogene	Southern temperate	3.0	5
Nannofossils	Neogene	Undifferentiated	1.0–1.3	6, 7
Nannofossils	Palaeogene	Undifferentiated	1.3–1.6	6, 7
Radiolaria	Neogene and Palaeogene	Undifferentiated	1.9–2.0	8
Diatoms	Neogene and Palaeogene	Undifferentiated	1.4–2.4	9, 10
Dinoflagellates	Neogene and Palaeogene	Undifferentiated	5.7	11
Dinoflagellates	Neogene	North Sea	3.3	
Dinoflagellates	Palaeogene	North Sea	1.1	
Planktonic Foraminifera	Cretaceous	Tropical	2.5	12
Planktonic Foraminifera	Cretaceous	Temperate	4.0	13
Nannofossils	Cretaceous	Undifferentiated	3.0	14
Radiolaria	Cretaceous	Undifferentiated	10.0	15
Palynomorphs	Cretaceous	Undifferentiated	6.5	11
Palynomorphs	Late Jurassic	North Sea	1.0	
Palynomorphs	Early–Middle Jurassic	North Sea	2.0–2.5	


WADI FEIRAN SECTION
62 km
NW - SE
GEBEL QABELIAT SECTION
AGE
FORMATION
LITHOLOGY
EOCENE
Early
PALEOCENE
Thanetian
D.
MAASTRICHTIAN
Late
TH.
SHALE
ESNA
CHALK
SUDR
NP11
NP10
NP 9
NP 7/8
NP6
NP5
NP4
NP3
Micula murus Zone
CC 25 c
Lithraphidites quadratus Zone
CC 25 b
Arkhangelskiella cymbiformis Zone
CC 25 a
SCALE
25 m.
0





DSDP SITE 553



8.—Temporal interpretation of 7 DSDP hiatus and middle Eocene sections measured from the Hatton-Rockall Basin

OLIGOCENE TIME SCALE

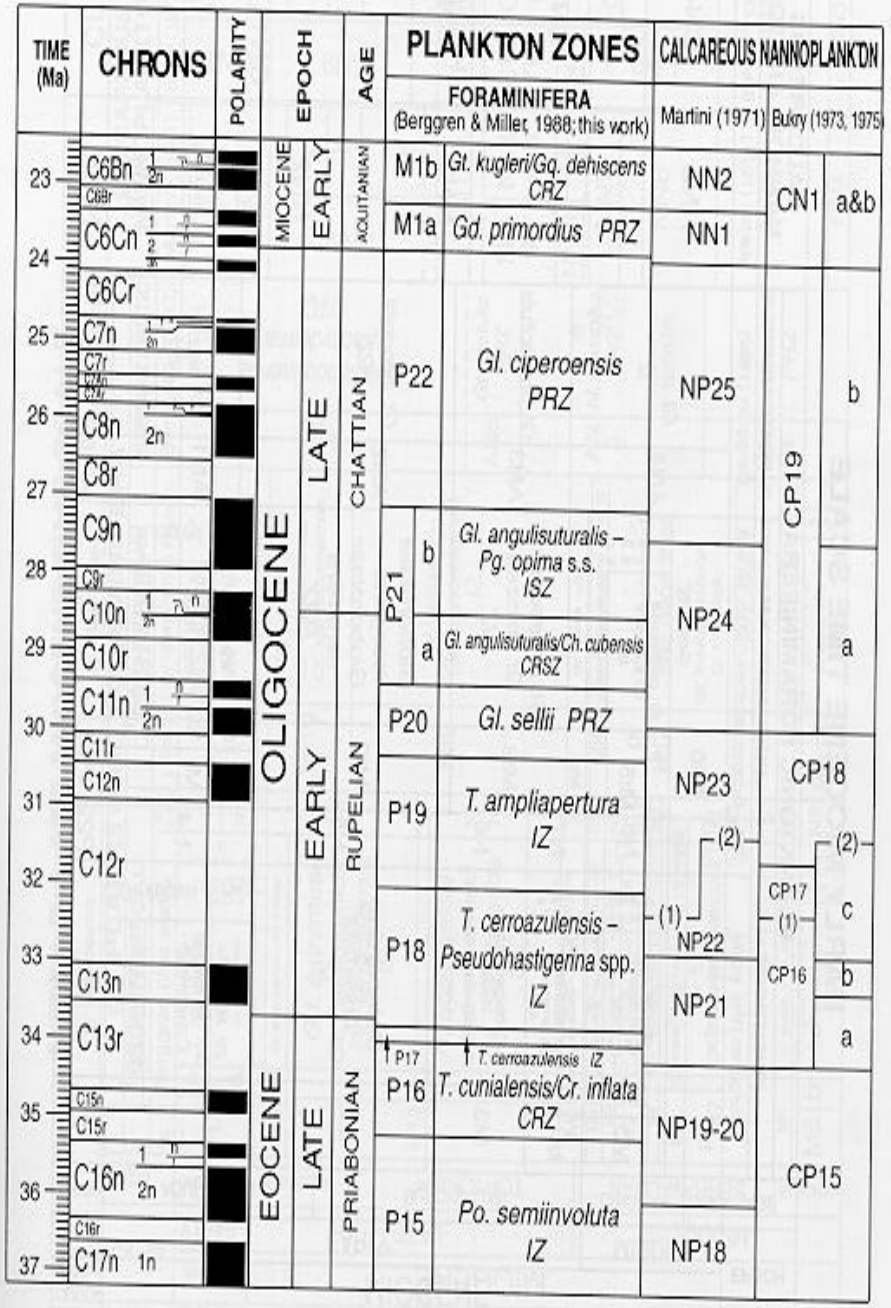


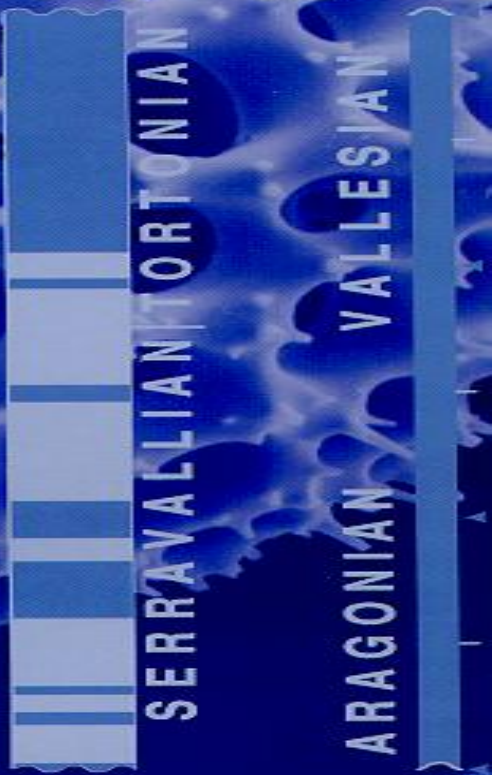
FIG. 3.—See Figure 1 for further explanation.

SEPM Special Publication #54

GEOCHRONOLOGY, TIME SCALES AND GLOBAL STRATIGRAPHIC CORRELATION

Editors
William A. Berggren
Dennis V. Kent
Marie-Pierre Aubry
Jan Hardenbol

SEPM
(Society for
Sedimentary
Geology)

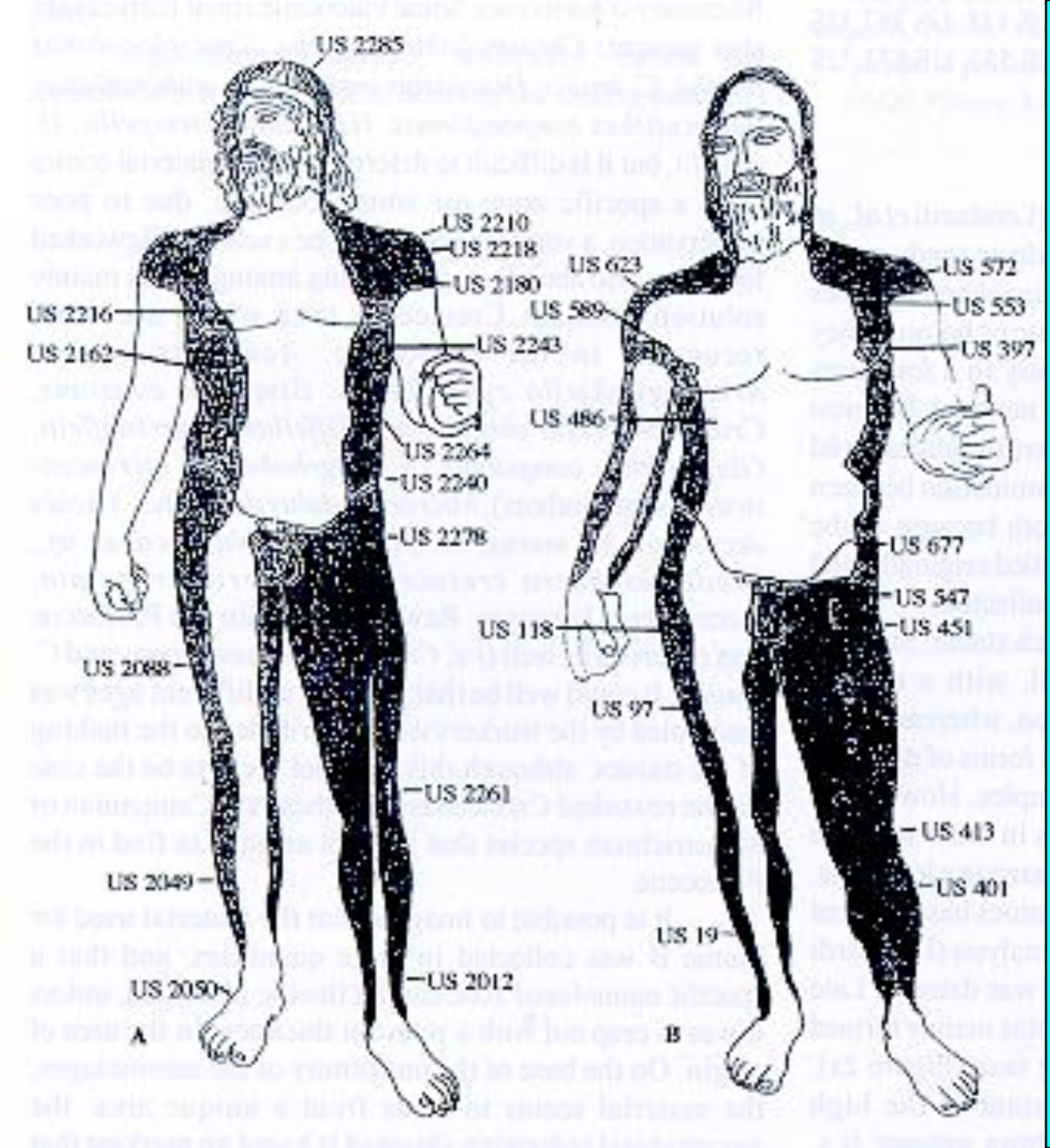


OTROS USOS....

Arte

Estudios históricos

Medicina forense



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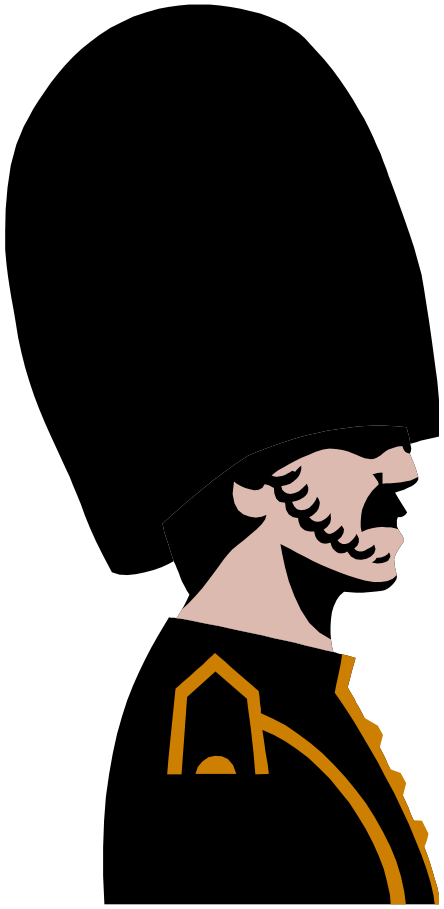
ARTE



MEDICINA FORENSE

INVESTIGACIONES POLICIALES

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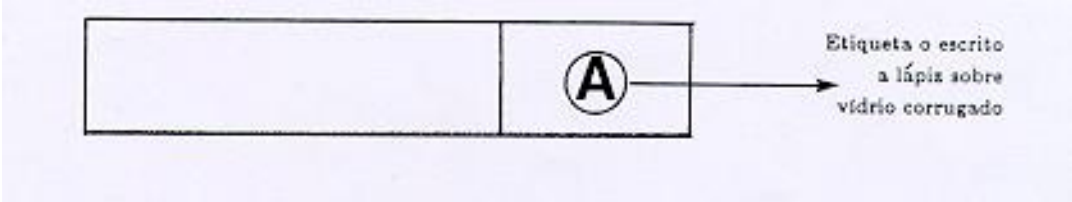
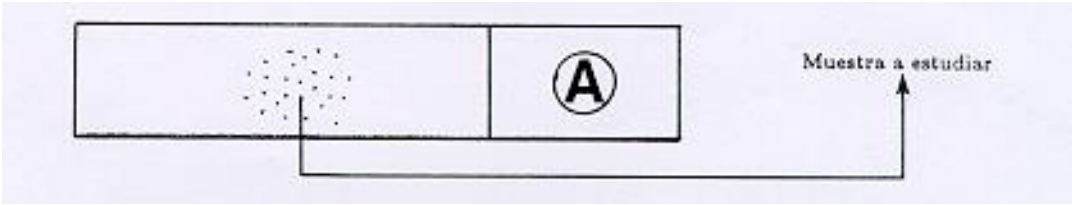
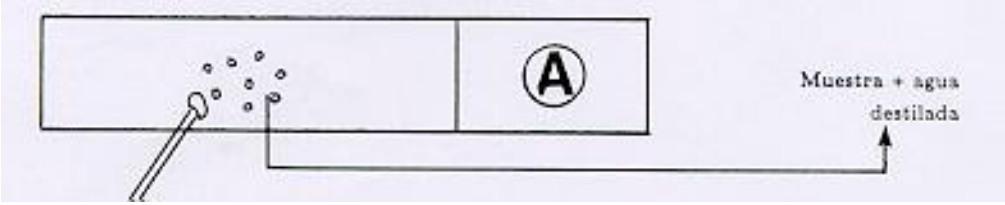
METODOS DE PREPARACION

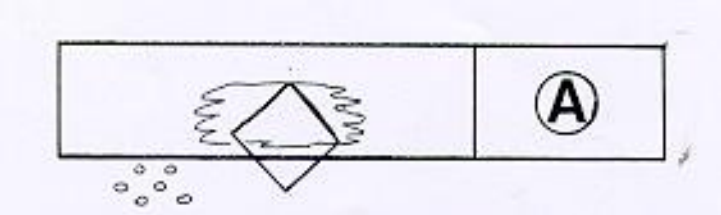
MICROSCOPIO OPTICO

T O T A L









I

N

T

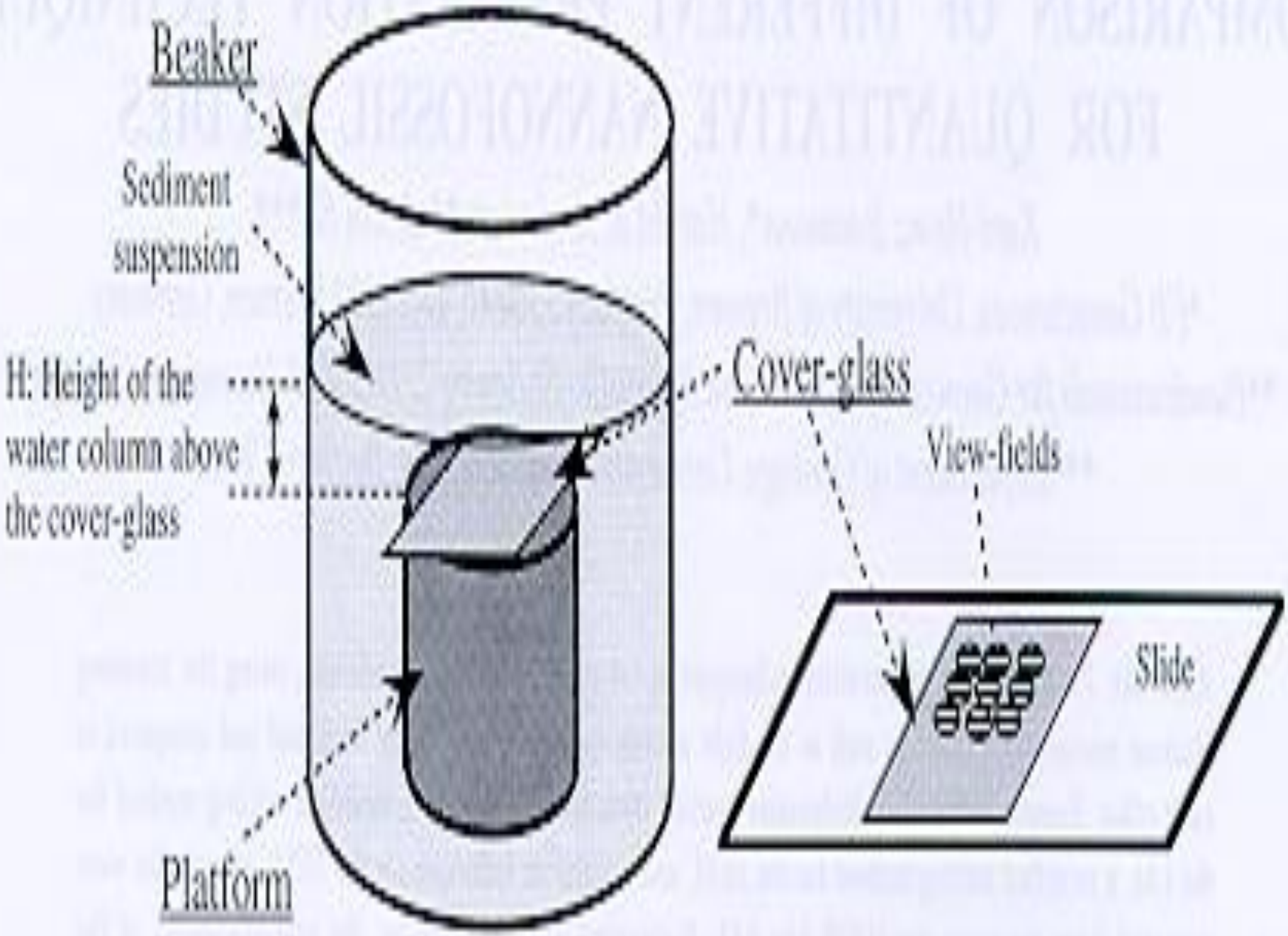
E

V

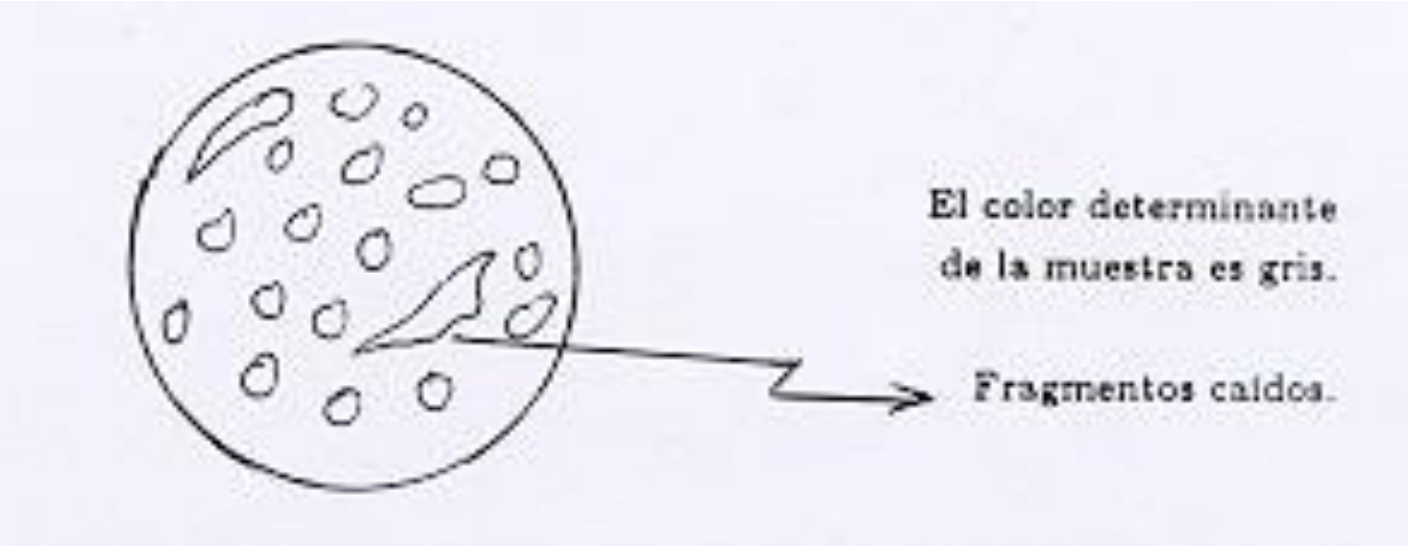
E

P

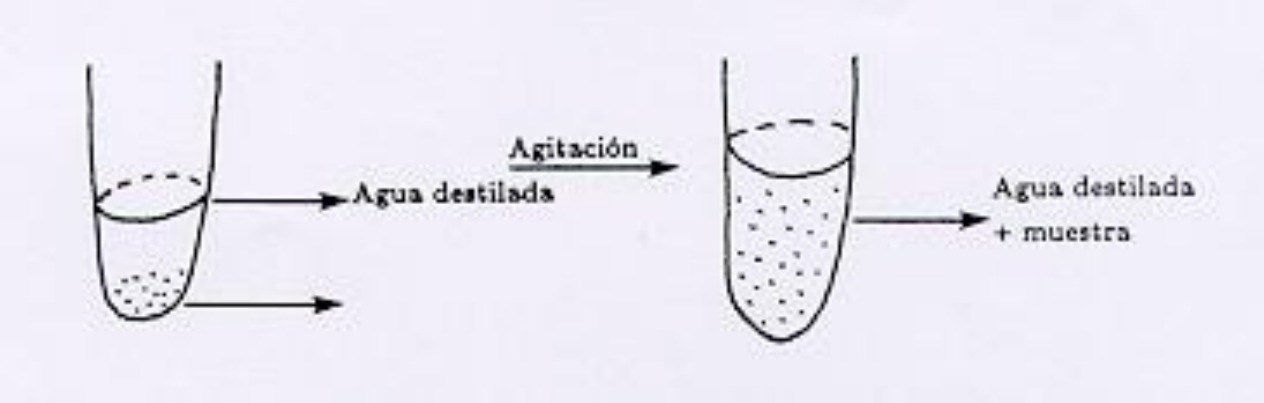
SE DISGREGA UNA PEQUEÑA CANTIDAD DE MUESTRA Y SE DILUYE EN AGUA DESTILADA. DE ESTA SOLUCION CON UNA PIPETA SE TOMA CIERTA CANTIDAD QUE SE EXTIENDE DE MANERA UNIFORME SOBRE EL PORTA-OBJETOS. SE COLOCA A SECAR Y SE LE AGREGAN DOS GOTAS DE PEGAMENTO NORLAND OPTICAL AD-HESIVE. SE COLOCA EL CUBRE Y SE DEJA SECAR CON LUZ ULTRAVIOLETA.

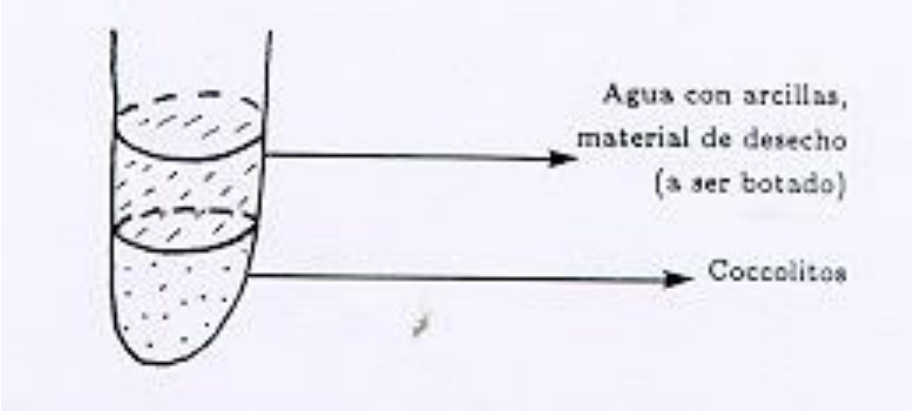

Beaker
Sediment suspension
H: Height of the water column above the cover-glass
Cover-glass
View-fields
Slide
Platform

MUESTRAS DE CANAL

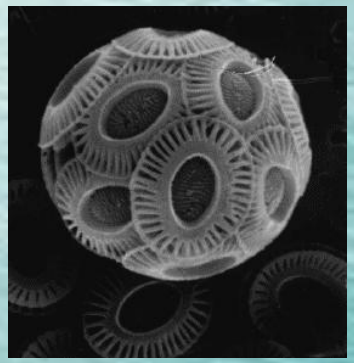


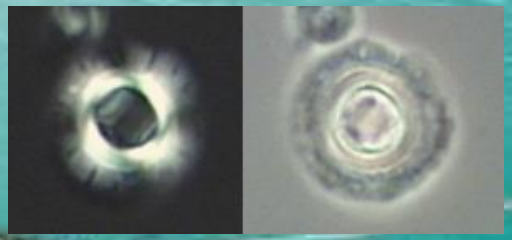
MICROSCOPIO ELECTRONICO

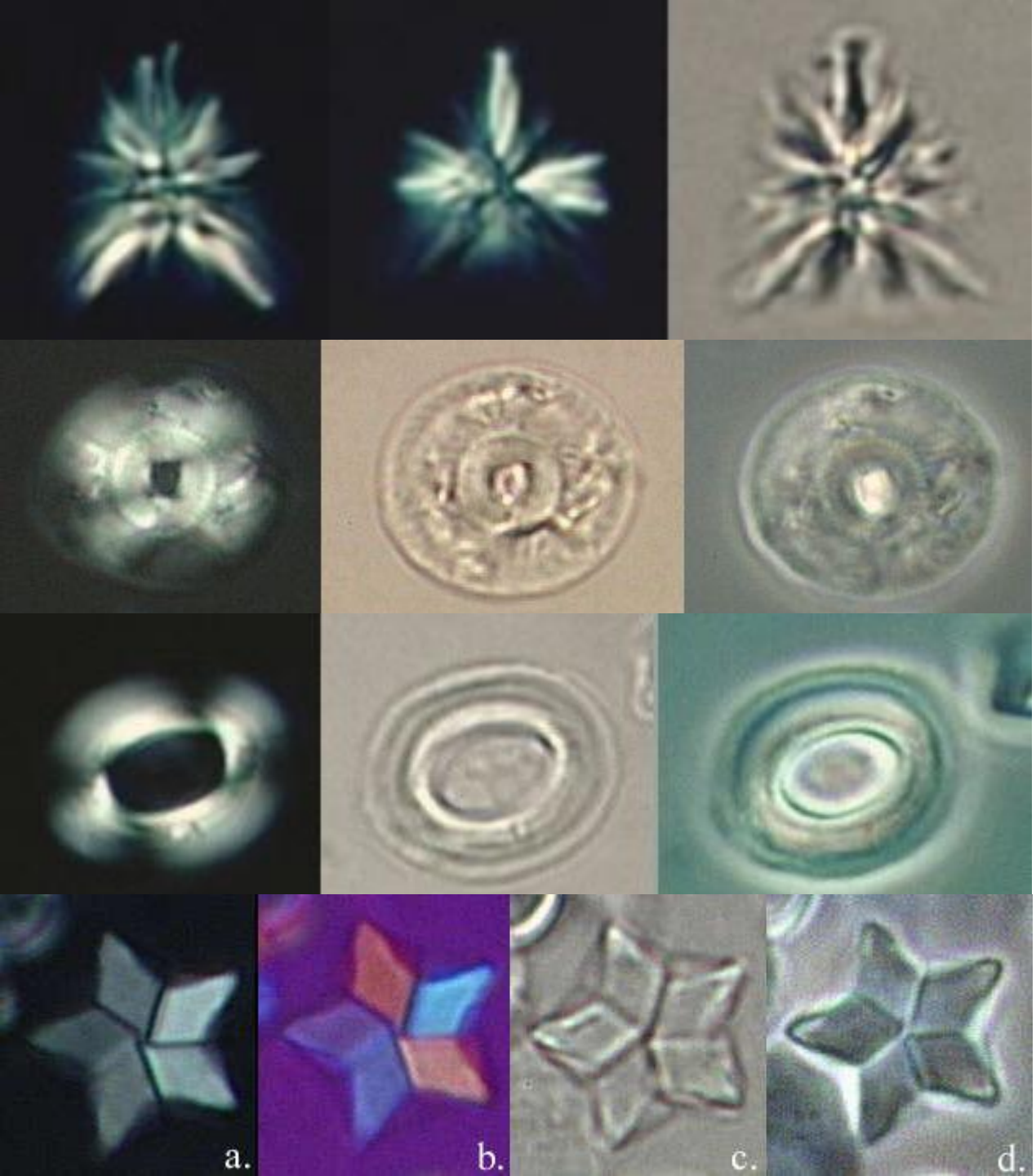





TECNICAS
DE
OBSERVACION







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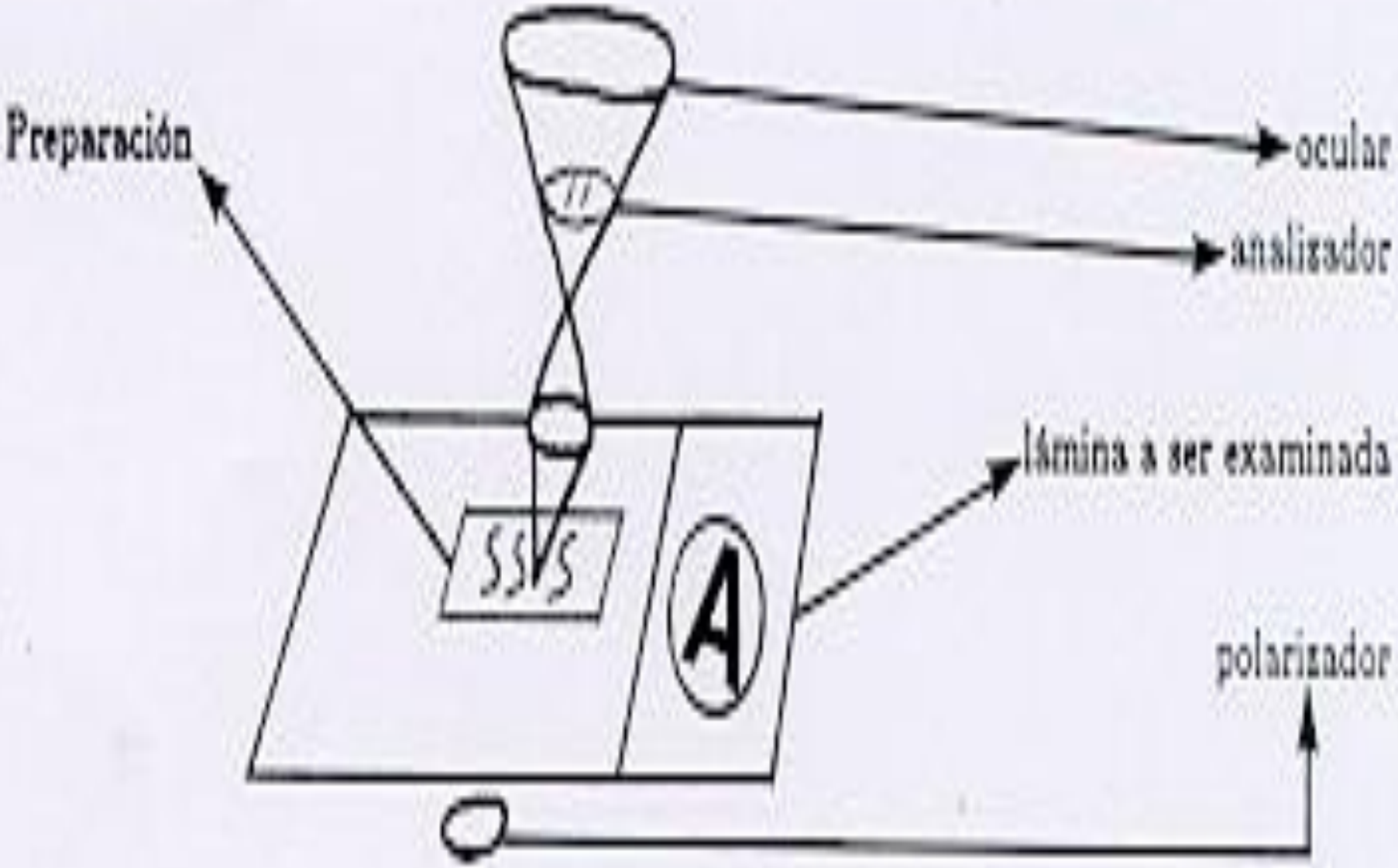
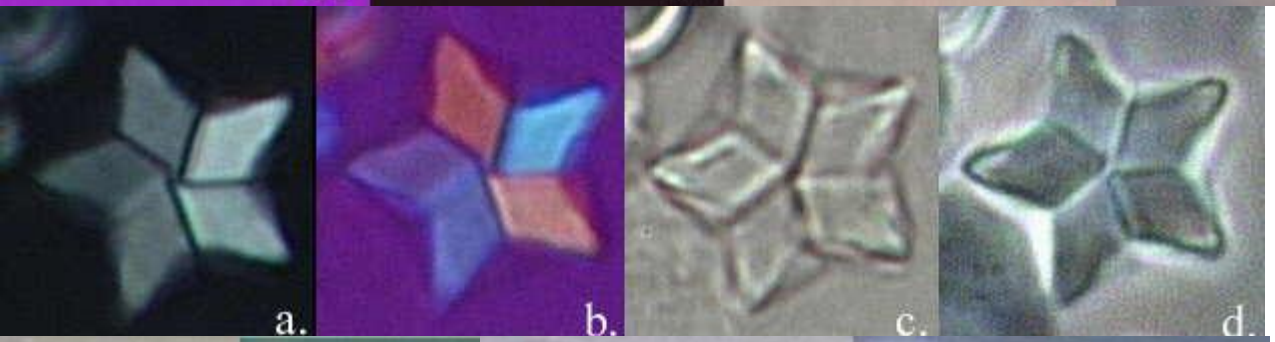
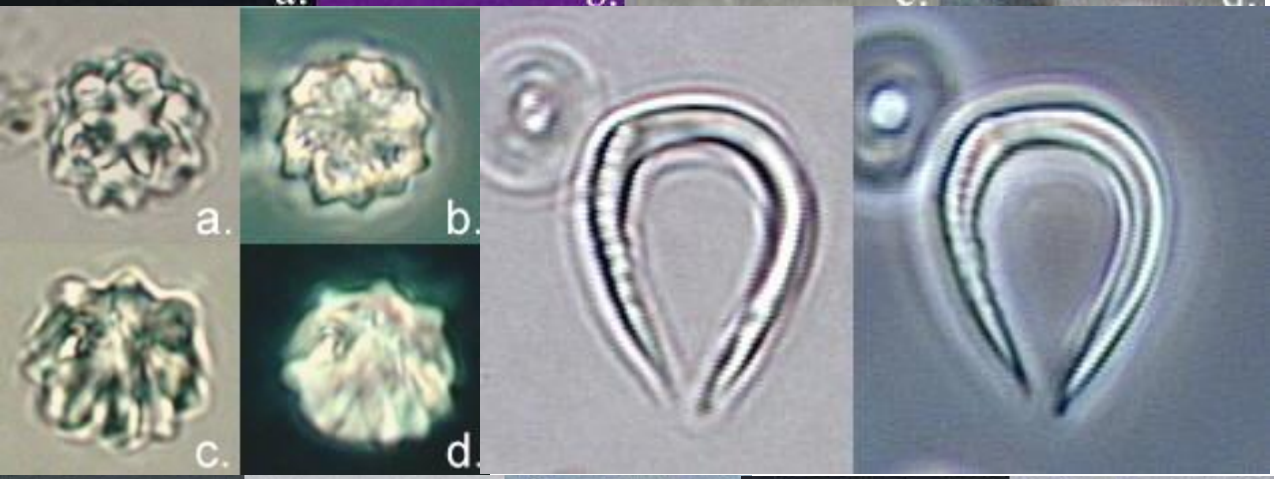
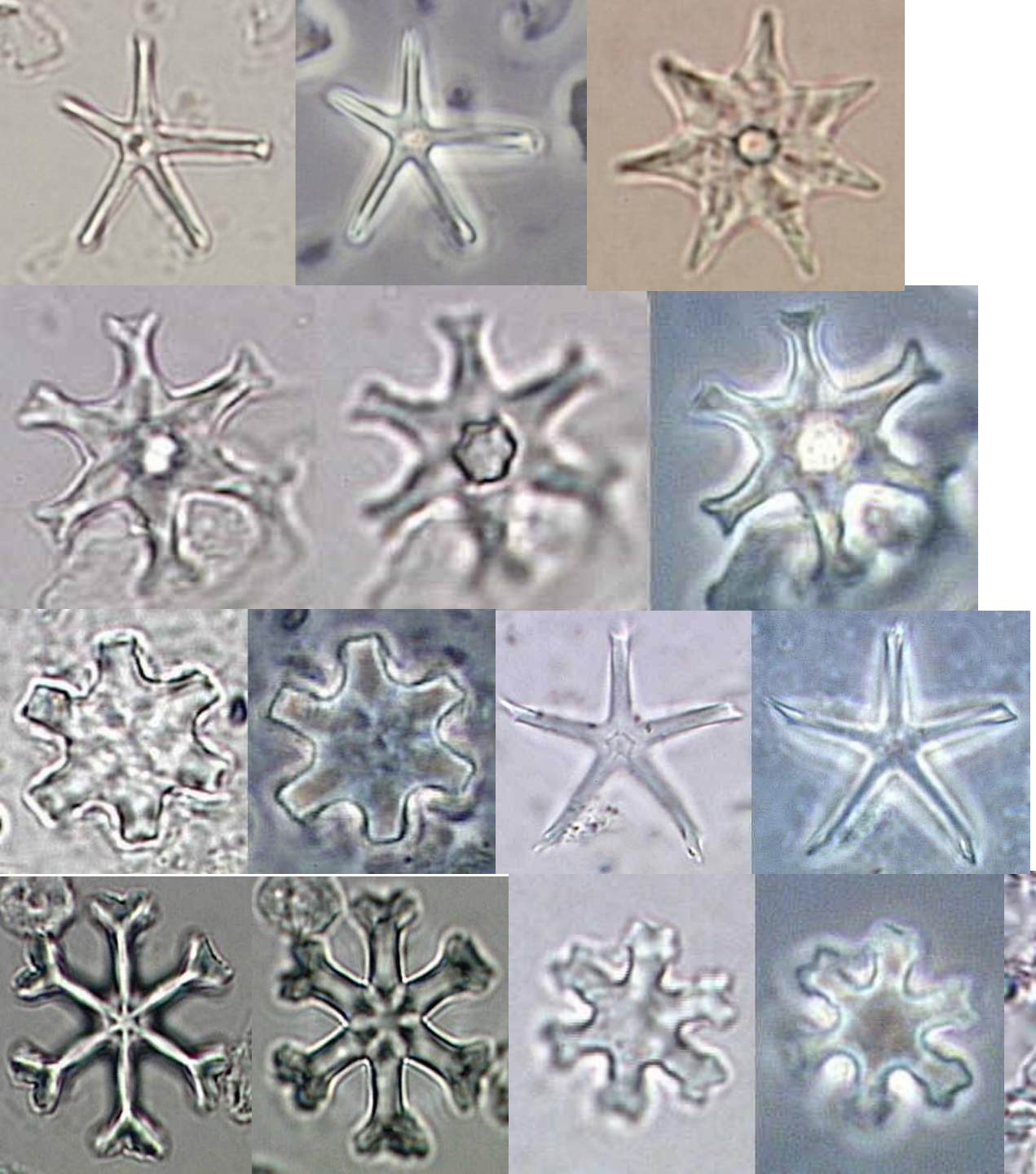
TECNICAS DE OBSERVACION EN EL MICROSCOPIO OPTICO


Preparación
ocular
analizador
lámina a ser examinada
polarizador
A





TECNICAS DE OBSERVACION EN EL MICROSCOPIO OPTICO



TECNICAS DE OBSERVACION EN EL MICROSCOPIO OPTICO

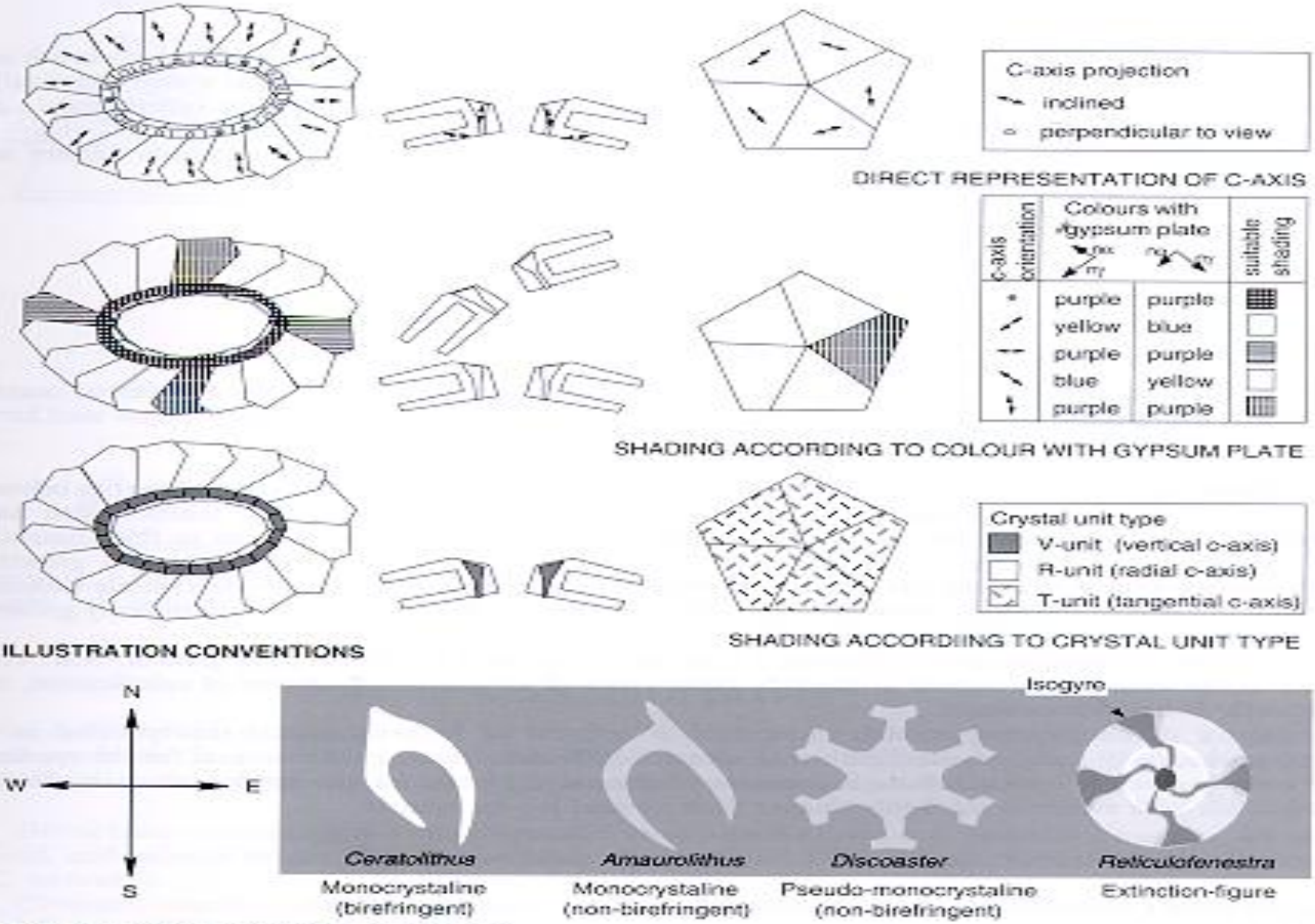
TECNICAS

DE OBSERVACION

EN EL

MICROSCOPIO

OPTICO



TEXT-FIG. 8. Crystallography: the diagrams showing illustration conventions are based on *Watznaueria* (plan and side views) and *Braarudosphaera*; the figures in the dark box represent the appearance of nannofossils in the light microscope, with cross-polarized light.

RETICULOFENESTRA MINUTA

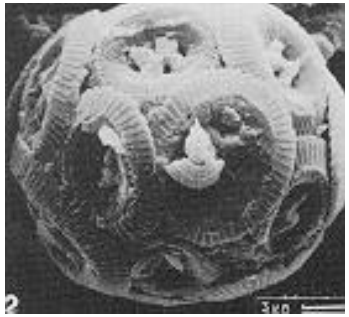
ES UNA FORMA PEQUEÑA, CON UN TAMAÑO MAXIMO DE 3 MICRAS. TIENE UN RANGO DE VIDA DESDE EL OLIGOCENO TEMPRANO HASTA EL PLEISTOCENO EL TAMANO RELATIVO DE LA APERTURA DEL AREA CENTRAL ES VARIABLE, PERO ABIERTA. HAQ ET.AL. 1977CONCLUYEN QUE ESTA ESPECIE ES UN ELEMENTO IMPORTANTE DE LA NANOFLORA TROPICAL, POR LO TANTO ES DE AGUAS CALIDAS.

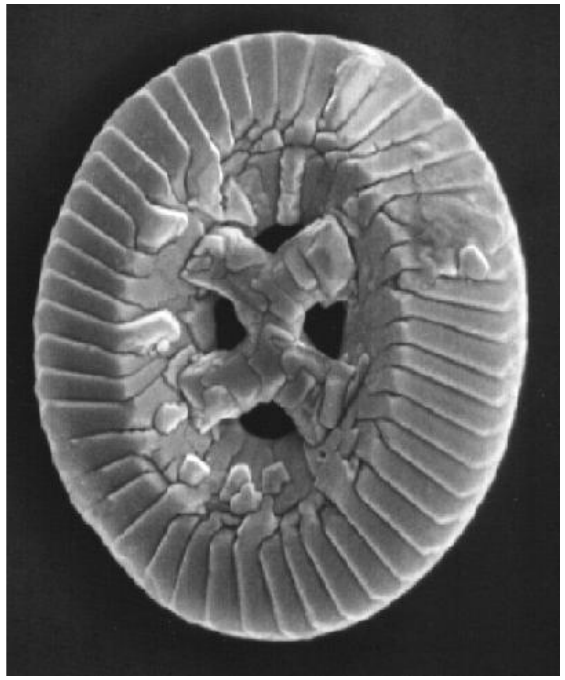
RETICULOFENESTRA MINUTULA

TIENE UN TAMAÑO COMPRENDIDO ENTRE 3 Y 5 MICRAS. TIENE UNA APERTURA CENTRAL PEQUEÑA Y CERRADA

Chiasmolithus consuetus- californicus

NP15-NP19



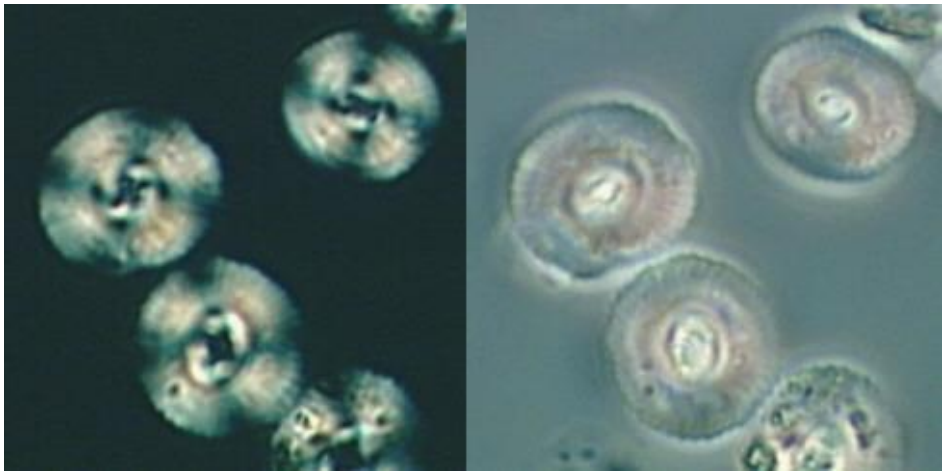


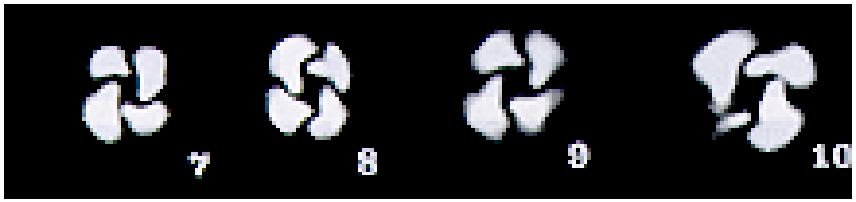
PERCH-NIELSEN 1985, indica que Chiasmolithus consuetus presenta una "X" simétrica en el área central y Chiasmolithus californicus es una forma más grande.

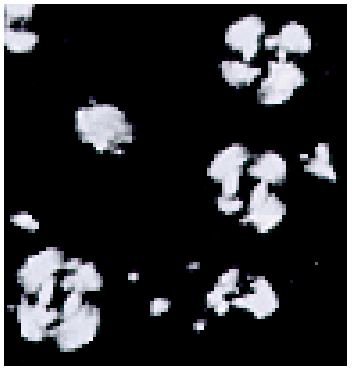
VAROL 1992 describe un nuevo género Sullivania, en donde incluye Sullivania consueta y Sullivania californica. Sullivania consueta es una forma elíptica con una placa distal, constituida por elementos imbricados dextralmente, una pequeña placa proximal con dos ciclos y el área central con una cruz diagonal compuesta de elementos transversales. El doble ciclo que se presenta en la placa proximal, el tubo y la cruz diagonal son birrefringentes bajo luz polarizada. Los tramos que componen la cruz en diagonal aparecen como unidades sencillas, simples, bajo nícoles cruzados. La diferencia entre Sullivania y Chiasmolithus son visibles mayormente bajo el microscopio electrónico, sin embargo, al microscopio de luz, Sullivania tiene una cruz central en la cual los brazos que la componen aparecen como unidades simples y una fuerte birrefringencia en el ciclo del tubo sin sobrelaparse con la placa distal que no es birrefringente bajo luz polarizada. En Chiasmolithus, los brazos que componen la cruz diagonal aparentan estar divididos en dos mitades longitudinales. Sullivania difiere de Cruciplacolithus por tener una cruz diagonal donde el último tiene una cruz axial.

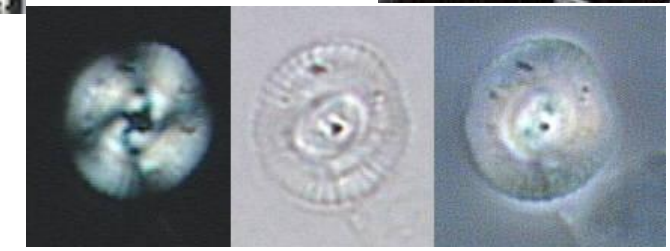
Cyclicargolithus floridanus

NP15- NN6



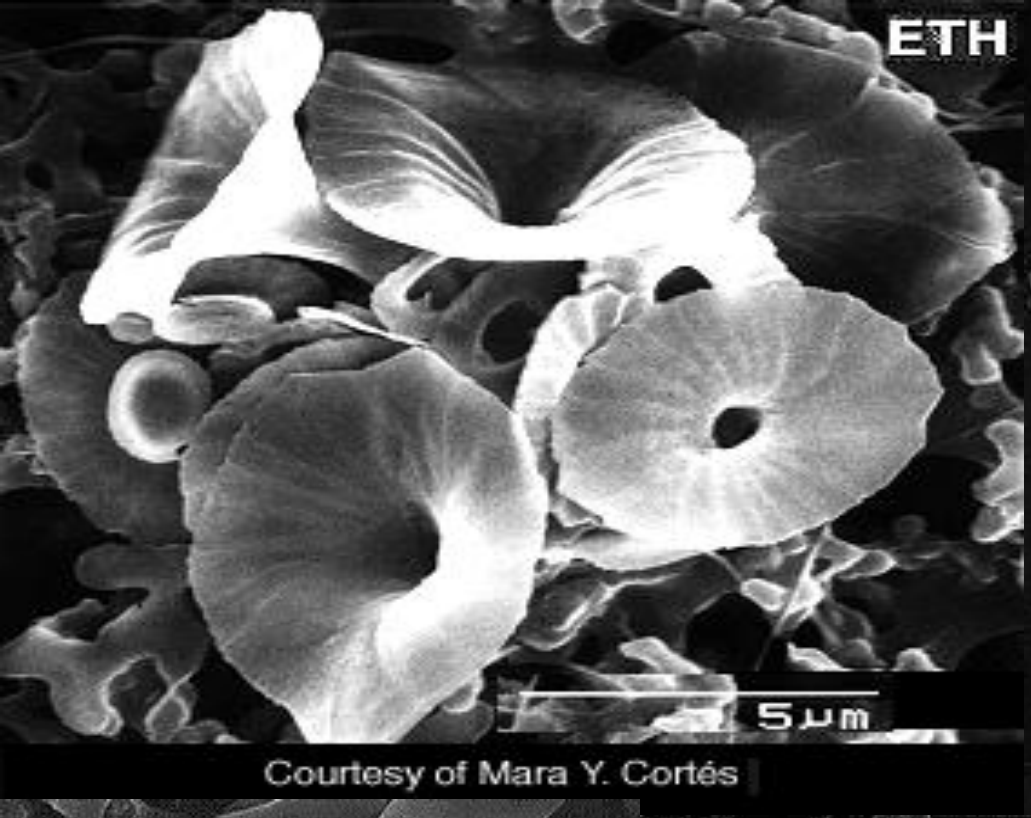






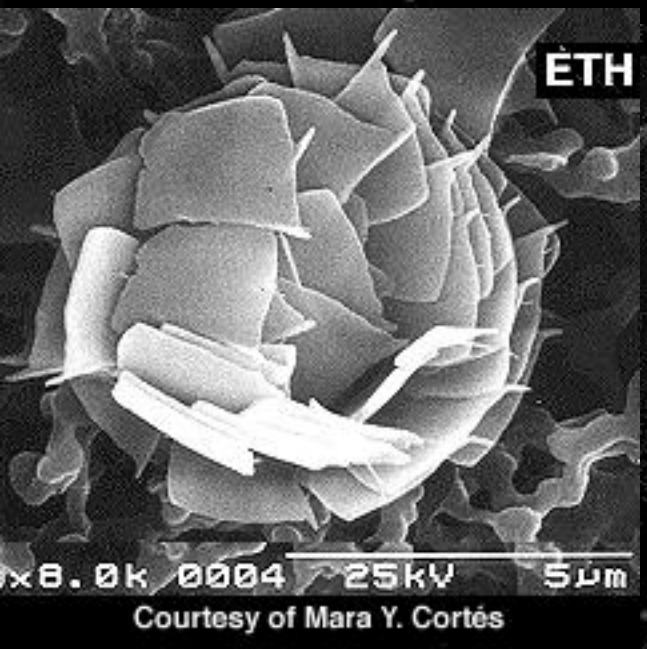
SE CARACTERIZA POR SU AREA CENTRAL SUBCIRCULAR, BUBIK 1992, LOS DIVIDE EN TRES MORFOTIPOS DEPENDIENDO DEL TAMAÑO, A SABER : MORFOTIPO "A" DIAMETRO MENOR O IGUAL A CINCO (5) MICRONES,MORFOTIPO "B" DIAMETRO MAYOR DE CINCO (5) Y MENOR DE NUEVE (9) MICRONES, MORFOTIPO "C" DIAMETRO MAYOR O IGUAL A NUEVE MICRONES.


TECNICAS DE OBSERVACION EN EL
MICROSCOPIO ELECTRONICO



Courtesy of Mara Y. Cortés

Courtesy of Mara Y. Cortés



Courtesy of Mara Y. Cortés

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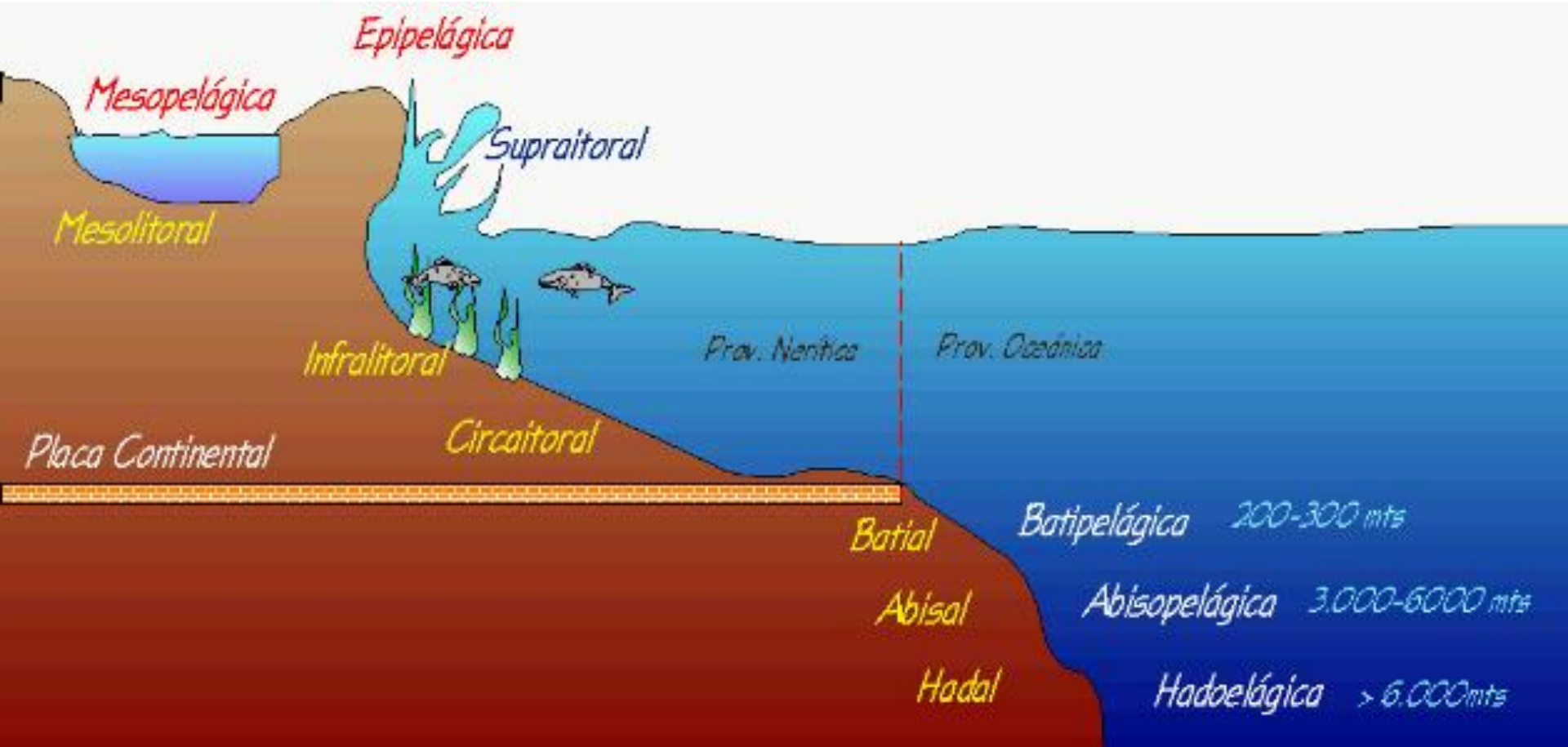
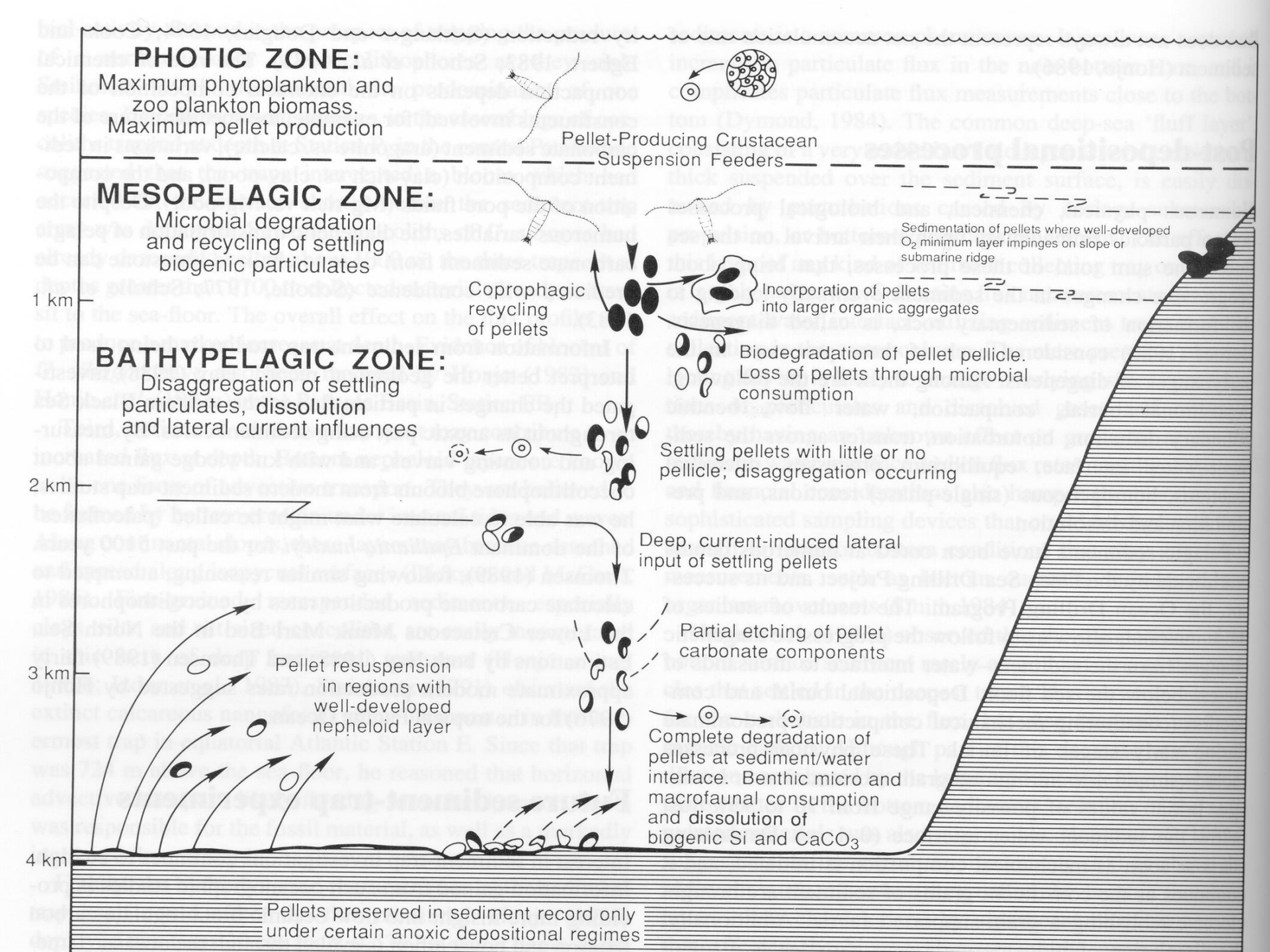
FACULTAD DE CIENCIAS

AMBIENTES




PHOTIC ZONE:
Maximum phytoplankton and zoo plankton biomass. Maximum pellet production
Pellet-Producing Crustacean Suspension Feeders
MESOPELAGIC ZONE:
Microbial degradation and recycling of settling biogenic particulates
Sedimentation of pellets where well-developed O_2 minimum layer impinges on slope or submarine ridge
1 km
Coprophagic recycling of pellets
Incorporation of pellets into larger organic aggregates
Biodegradation of pellet pellicle. Loss of pellets through microbial consumption
BATHYPELAGIC ZONE:
Disaggregation of settling particulates, dissolution and lateral current influences
Settling pellets with little or no pellicle; disaggregation occurring
2 km
Deep, current-induced lateral input of settling pellets
Partial etching of pellet carbonate components
3 km
Pellet resuspension in regions with well-developed nepheloid layer
Complete degradation of pellets at sediment/water interface. Benthic micro and macrofaunal consumption and dissolution of biogenic Si and $CaCO_3$
4 km
Pellets preserved in sediment record only under certain anoxic depositional regimes

DEBIDO A SU MODO DE VIDA PLANCTONICO, EL NANOPLANCTON CALCAREO NO BRINDA UNA CLARA INDICACION DE LA PROFUNDIDAD DE SEDIMENTACIÓN.

EN MUCHOS CASOS, DEBIDO A SU PEQUEÑO TAMAÑO, SON USUALMENTE REMOVIDOS A AMBIENTES DE ALTA ENERGIA, DEPOSITOS CERCANOS A LA COSTA.

AGUAS SOMERAS

Braarudosphaera

Micrantholithus

Pemma

Scyphosphaera

CERCANIA A LA COSTA

Helicosphaera

AGUAS PROFUNDAS TRANQUILAS

Discoasteridos de brazos finos y delicados, son menos resistentes y se desarrollan mejor en aguas profundas y tranquilas, zona pelagica.

LOS CONJUNTOS MONOESPECIFICOS PUEDEN SER ENCONTRA-DOS EN BAHIAS O EN LUGARES CON AMBIENTE RESTRINGIDO, MUY BAJA CIRCULACIÓN DE LAS AGUAS.


AGUAS CALIDAS
Sphenolithus ?
Helicosphaera
Gephyrocapsa oceanica
AGUAS FRIAS
Isthmolithus recurvus
Zygolithus dubius
Coccolithus pelagicus
AGUAS FRESCAS
Gephyrocapsa caribbianica

PARA ALGUNOS AUTORES LOS *SPHENOLITHUS* SE PRESENTAN MAS COMUNMENTE EN BAJAS LATITUDES, QUE EN ALTAS LATITUDES, POR LO QUE ASUMEN QUE PREFIEREN AGUAS TEMPLADAS A FRIAS. SE CONOCE TAMBIEN QUE SE LES ENCUENTRA MAS FRECUENTEMENTE CERCA DE MASAS CONTINENTALES, QUE EN EL OCEANO ABIERTO.
PRESENTAN ALTA RESISTENCIA A LA DISOLUCION.

MUCHAS ESPECIES DE *HELICOSPHAERA*, TIENDEN A ENCONTRARSE MAS COMUNMENTE Y CONSISTENTEMENTE EN SEDIMENTOS HEMIPELAGICOS (CERCANOS A LA COSTA) Y NO EN SEDIMENTOS PELAGICOS (PROFUNDOS, A GRANDES DISTANCIAS DE TIERRA FIRME)
TAMBIEN ES POSIBLE QUE ESTEN RESTRINGIDOS O PREFIERAN AREAS DE UPWELLING.

CON RESPECTO A *COCCOLITHUS PELAGICUS*, SE HA DEMOSTRADO CON GRANDES ESTUDIOS, QUE LOS COCOLITOFORIDOS DE ESTA ESPECIE HAN IDO CAMBIANDO DE HABITAT A LO LARGO DEL TIEMPO.

EN LA ACTUALIDAD *COCCOLITHUS PELAGICUS* SE ENCUENTRA RESTRINGIDO A ALTAS LATITUDES.

RELACION CON PALEOBATIMETRIA DE INGLE (foraminíferos)

	COSTERO	HEMIPELÁGICO	PELÁGICO
Discoaster	1%	1,5%	59%
Helicosphaera	5%	5%	5%
Pentalithus	12%	17%	15%
microforaminíferos	49%	79%	20%
restos vegetales	33%	1%	1%

RESISTENCIA A LA DISOLUCION

RESISTENCIA A LA DISOLUCION

Discoaster

Coccolithus

Reticulofenestra

Dictyococcites

Cyclococcolithina


Materia orgánica amorfa


Restos de materia orgánica

Isbelia Durán

NANNOFACIES I y II Depositos costeros o ambientes fluvio-marinos

Se caracteriza por:

- la ausencia de organismos plancticos
- algo de organismos bénticos
- abundante materia orgánica
- presencia de pirita autigénica y/o pirita detrítica

NANNOFACIES III, IV y V Ambientes marinos (de plataforma, hemi-pelágicos y pelágicos

Se caracteriza por:

- variaciones en los porcentajes de organismos plancticos presentes
- variedad en cuanto a la materia orgánica presente
- presencia de pirita, glauconita

NANNOFACIES

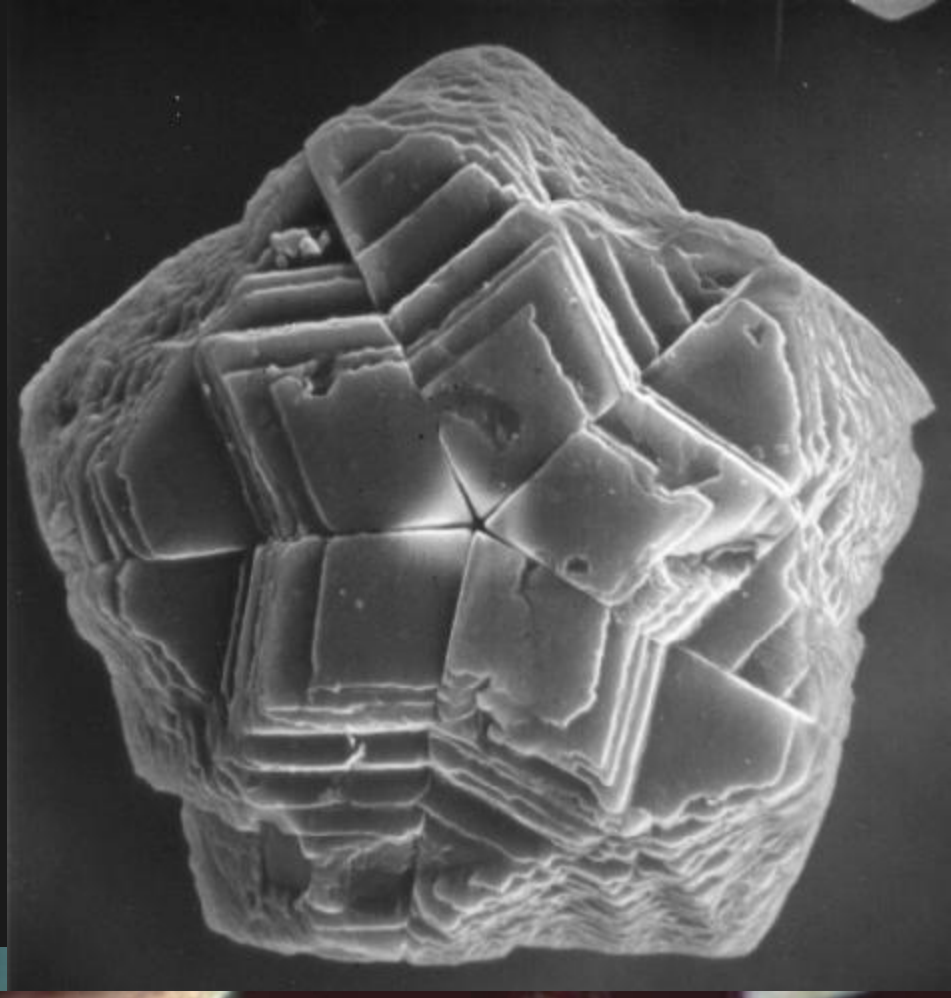
I FLUVIO-DELTAICO esporomorfos, pirita detrítica, materia organica del tipo terrígeno. Presencia de géneros como Braarudosphaera, Micrantholithus, Pemma, Scyphosphaera.

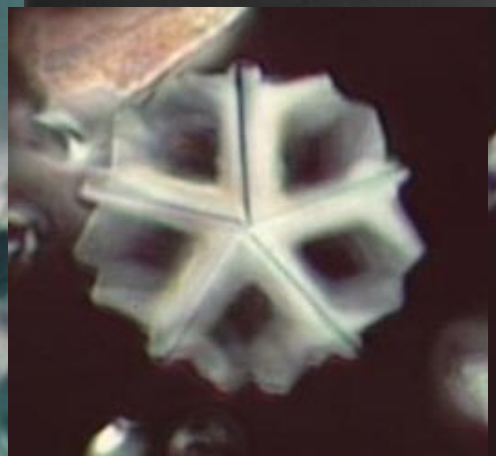
II MARINO SOMERO foraminíferos bénticos

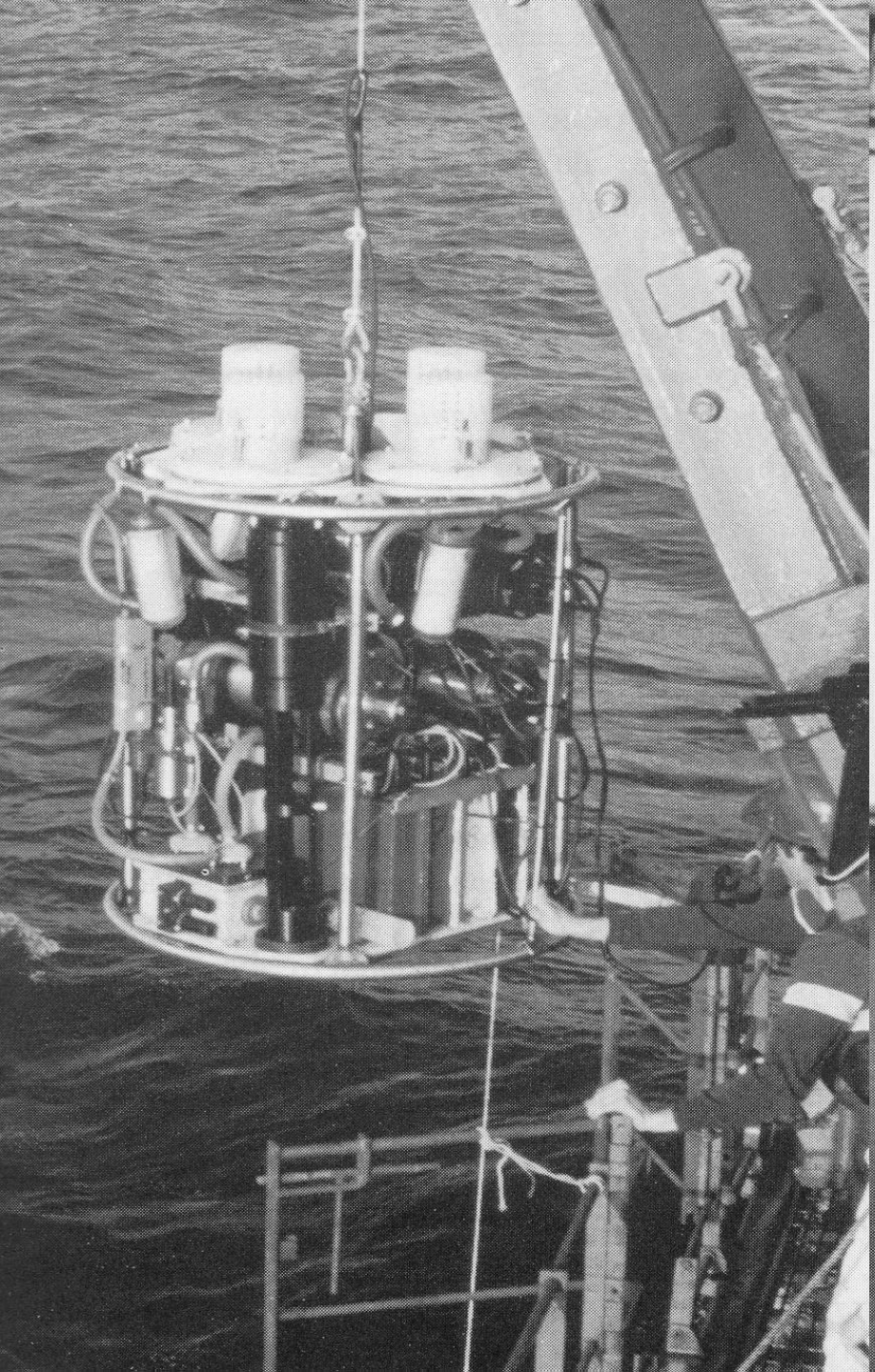
III PLATAFORMA fósiles rotos, mezcla de materia orgánica de tipo terrígeno y algal. Presencia del género Helicosphaera.

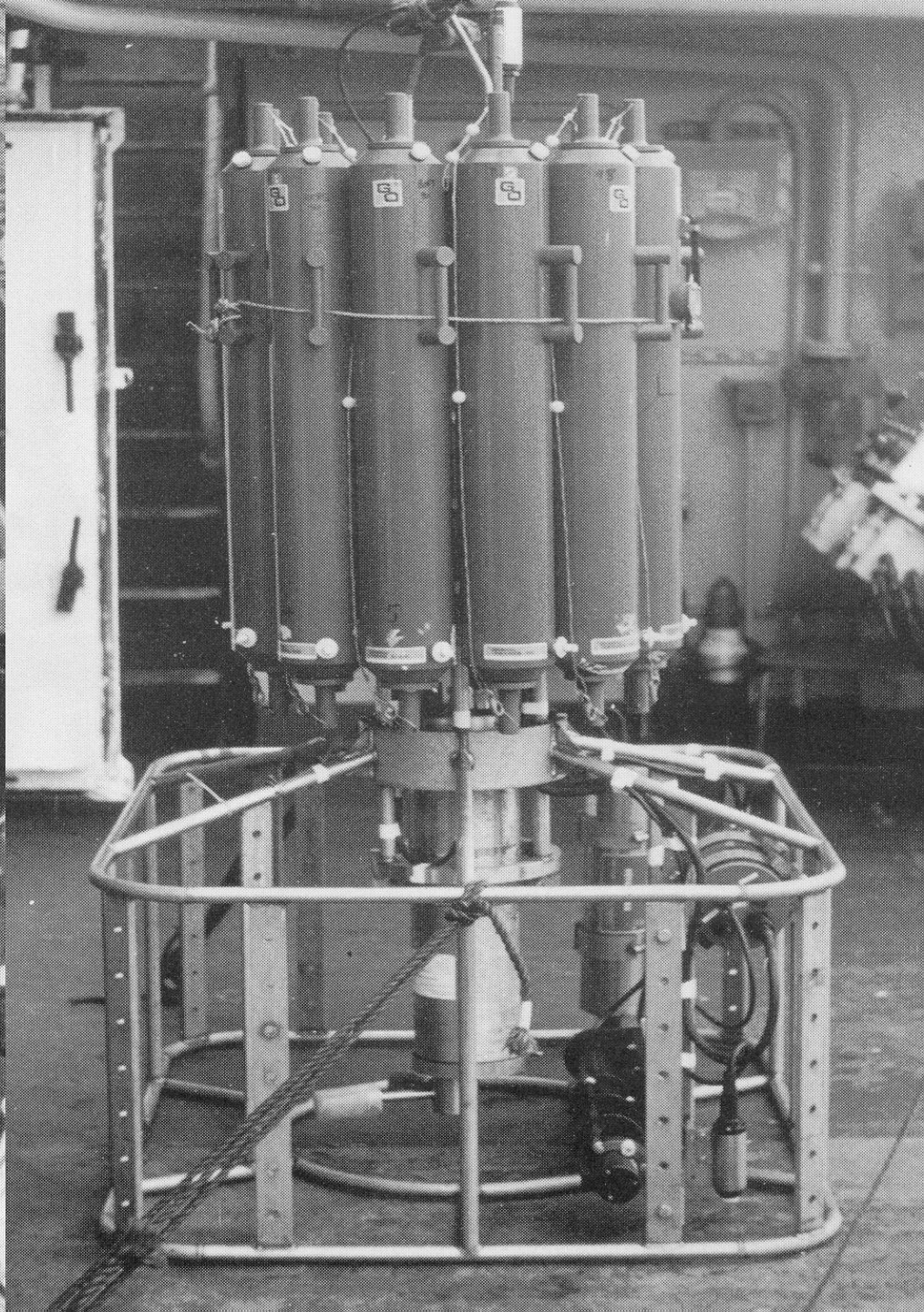
IV HEMIPELAGICO foraminíferos plánctcos, bénticos, materia orgánica de tipo algal. Se observa pirita y glauconita.

V PELAGICO foraminíferos plancticos, materia orgánica de tipo algal, Discoastéridos de brazos finos, delicados y ornamentados. Se observa pirita y glauconita..



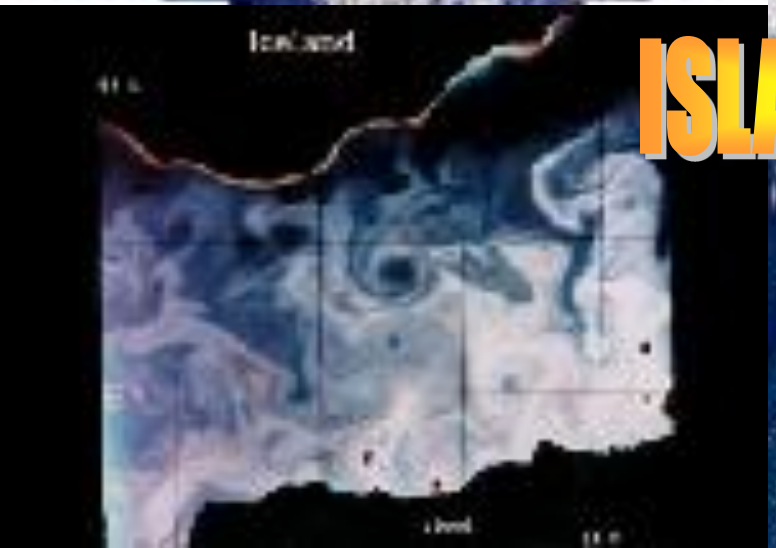


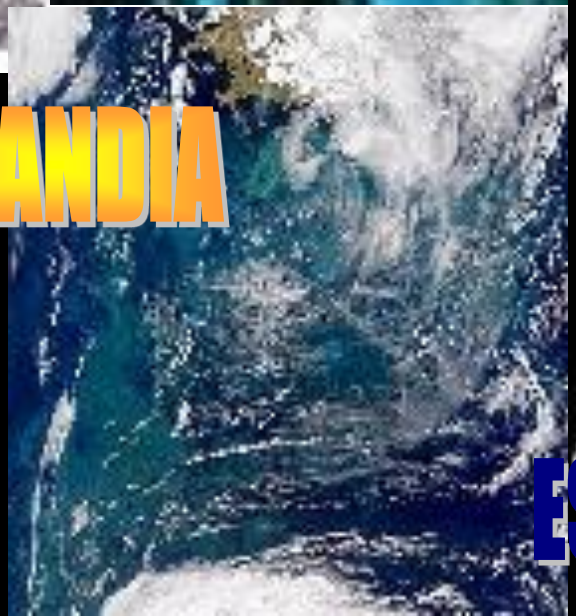




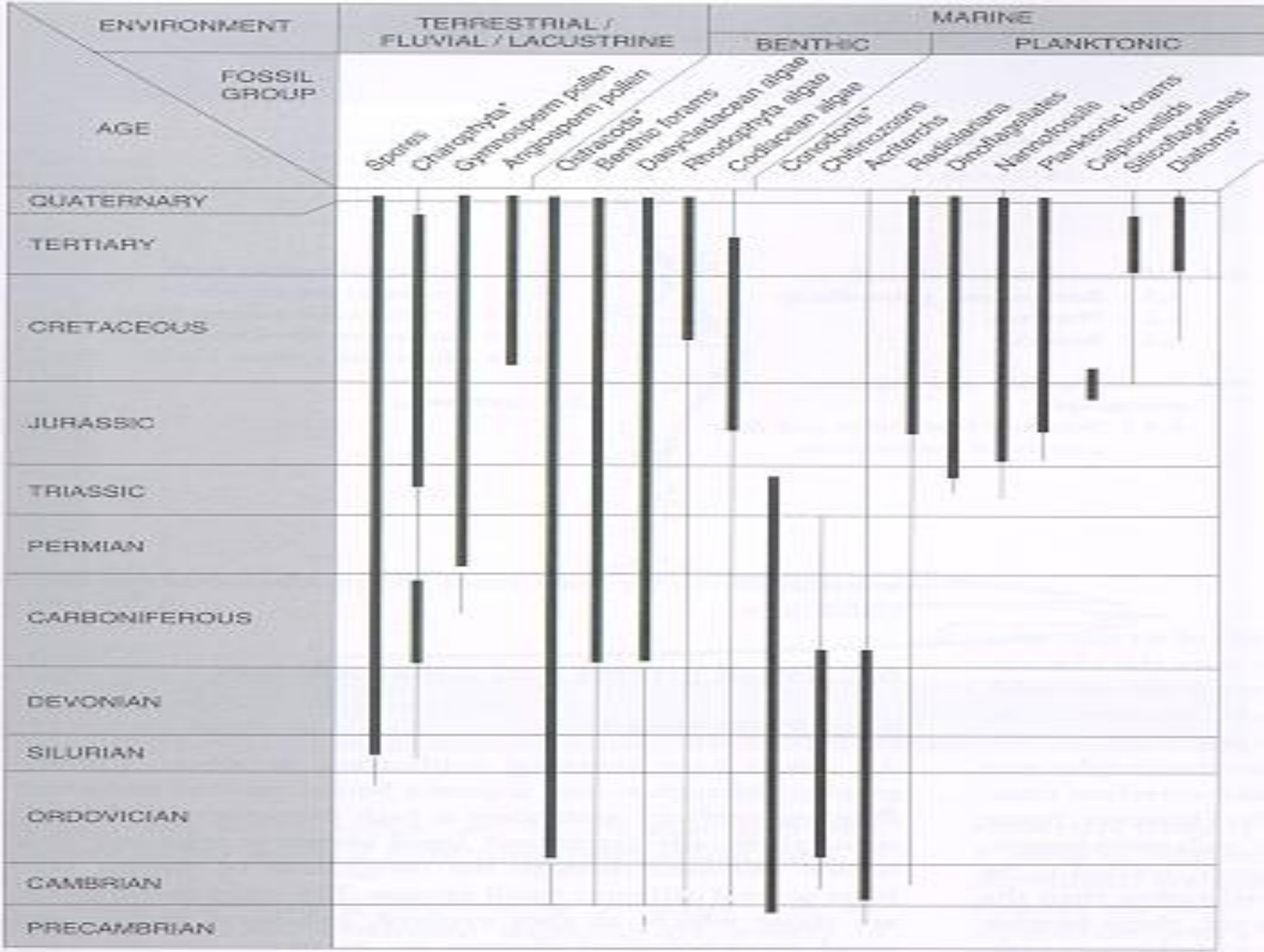

MAR DE BERING

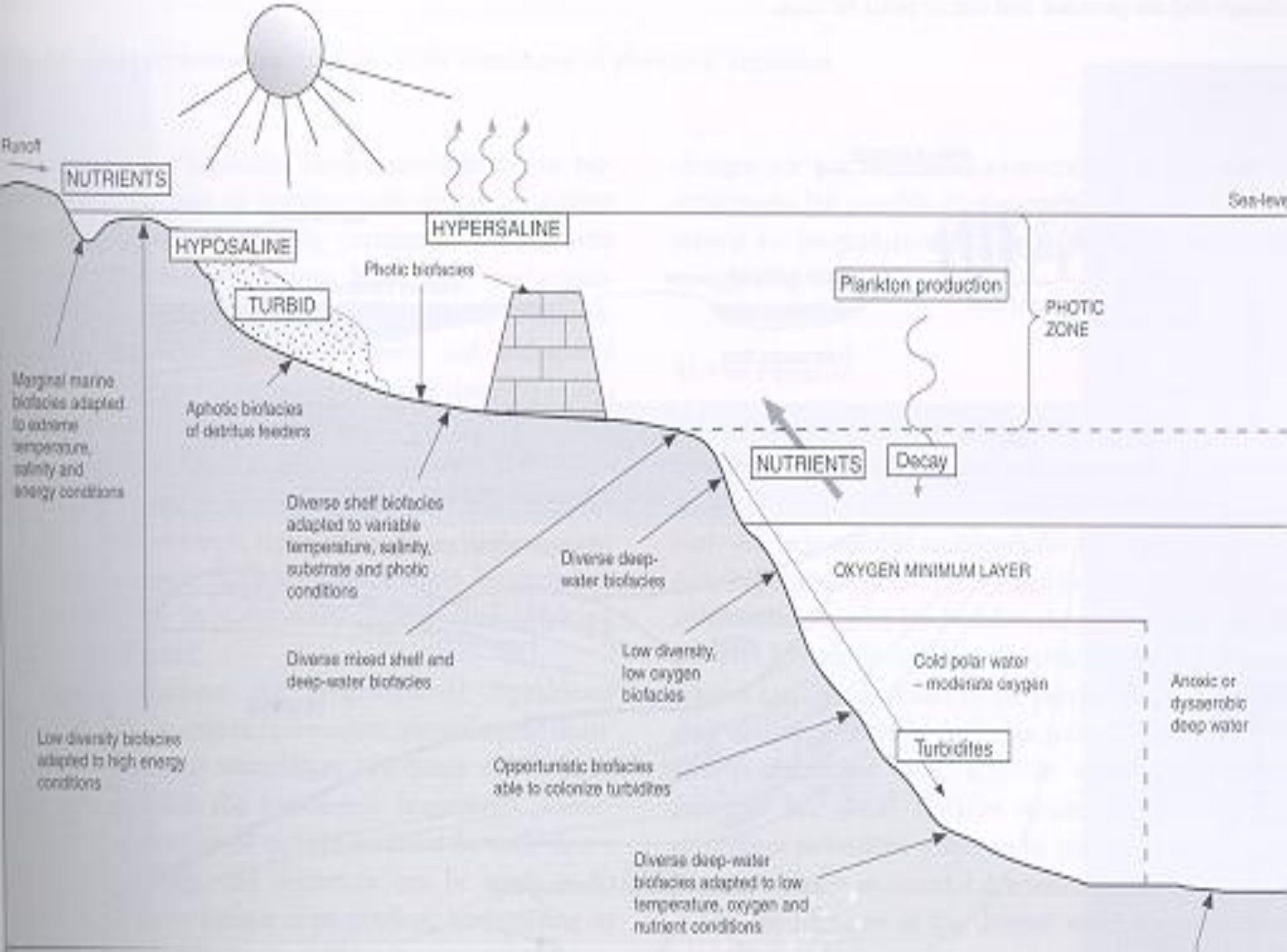

ISLANDIA

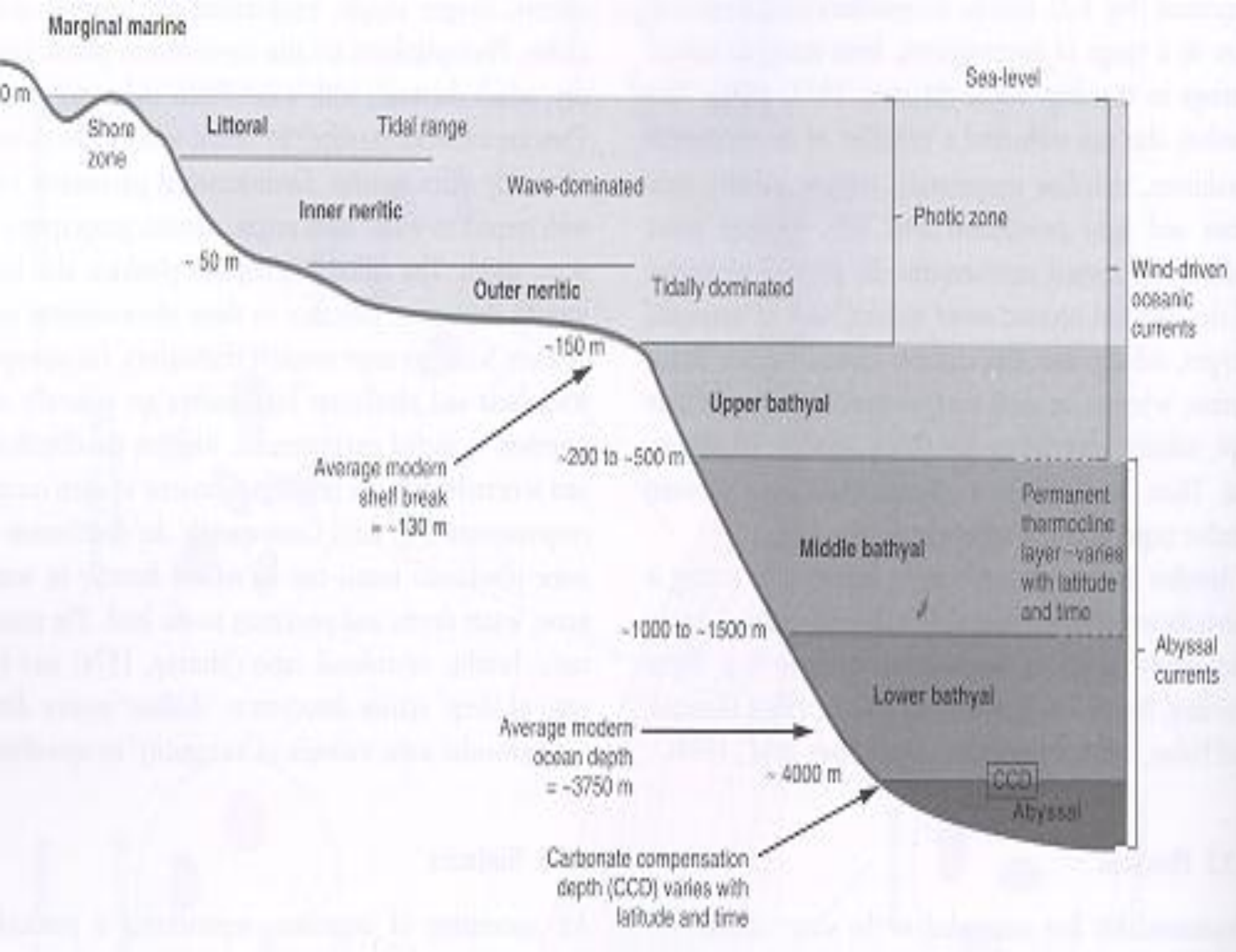

Iceland

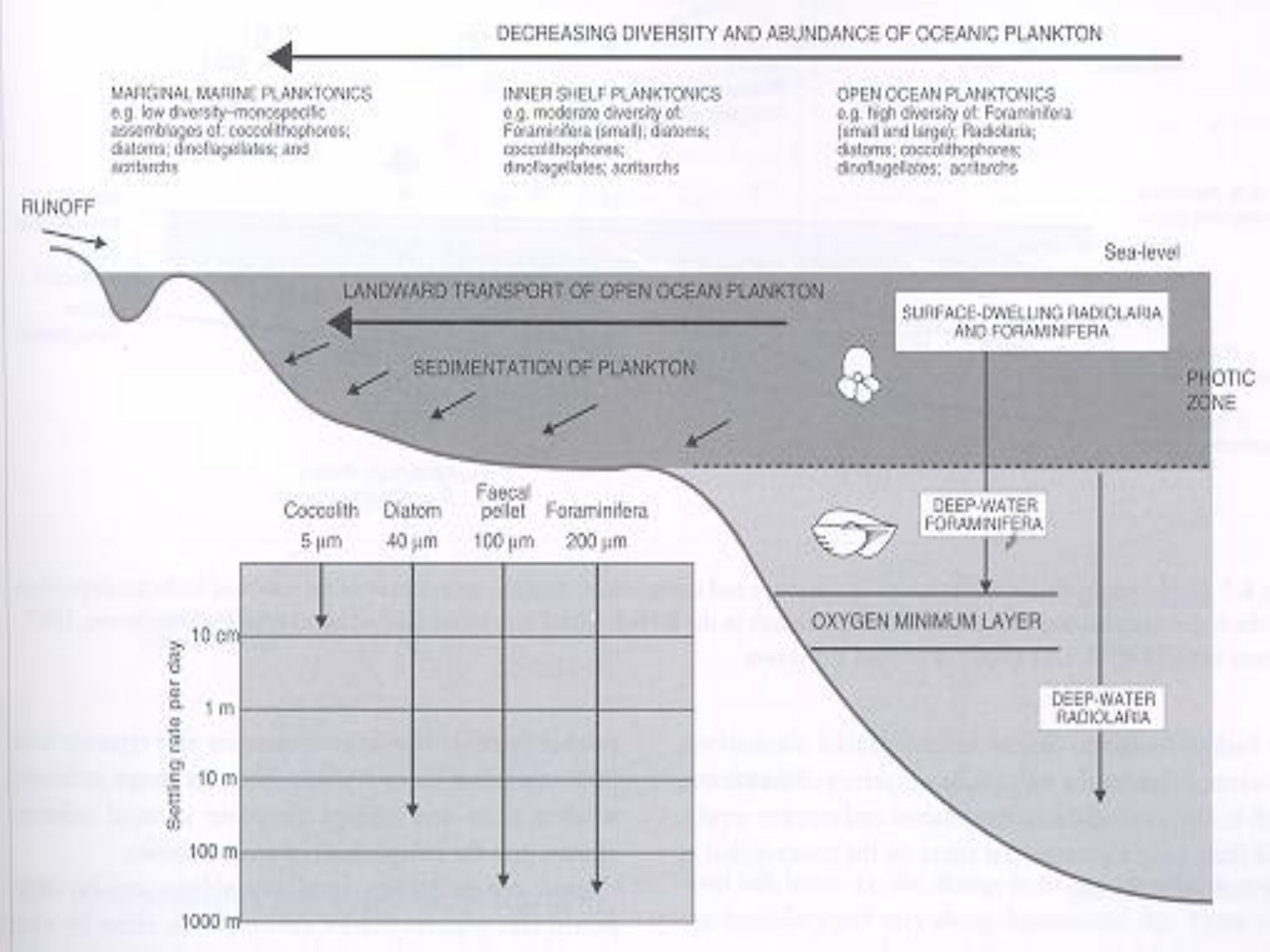

ISLANDIA

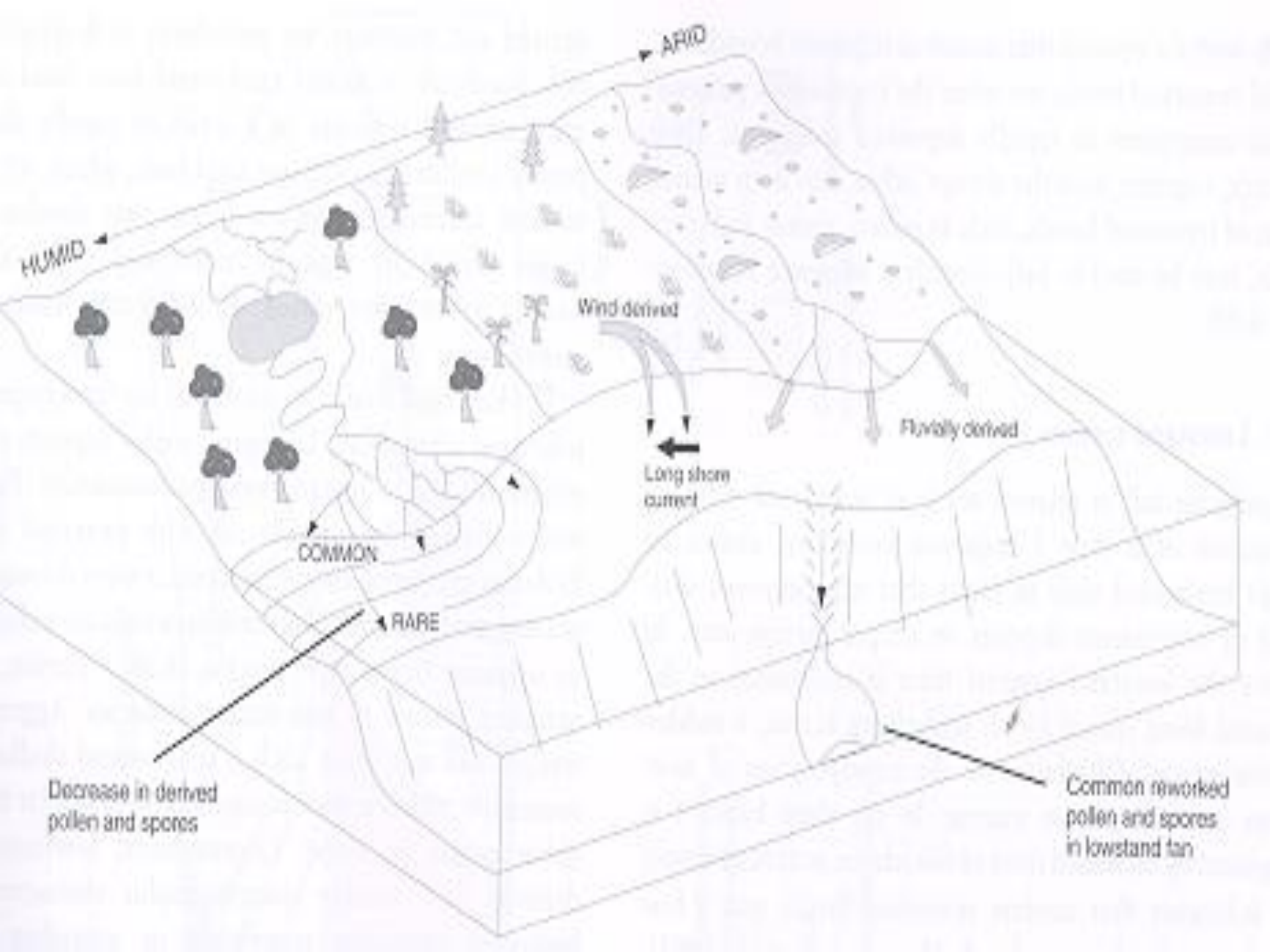

Norway
ESCOCIA-NORUEGA

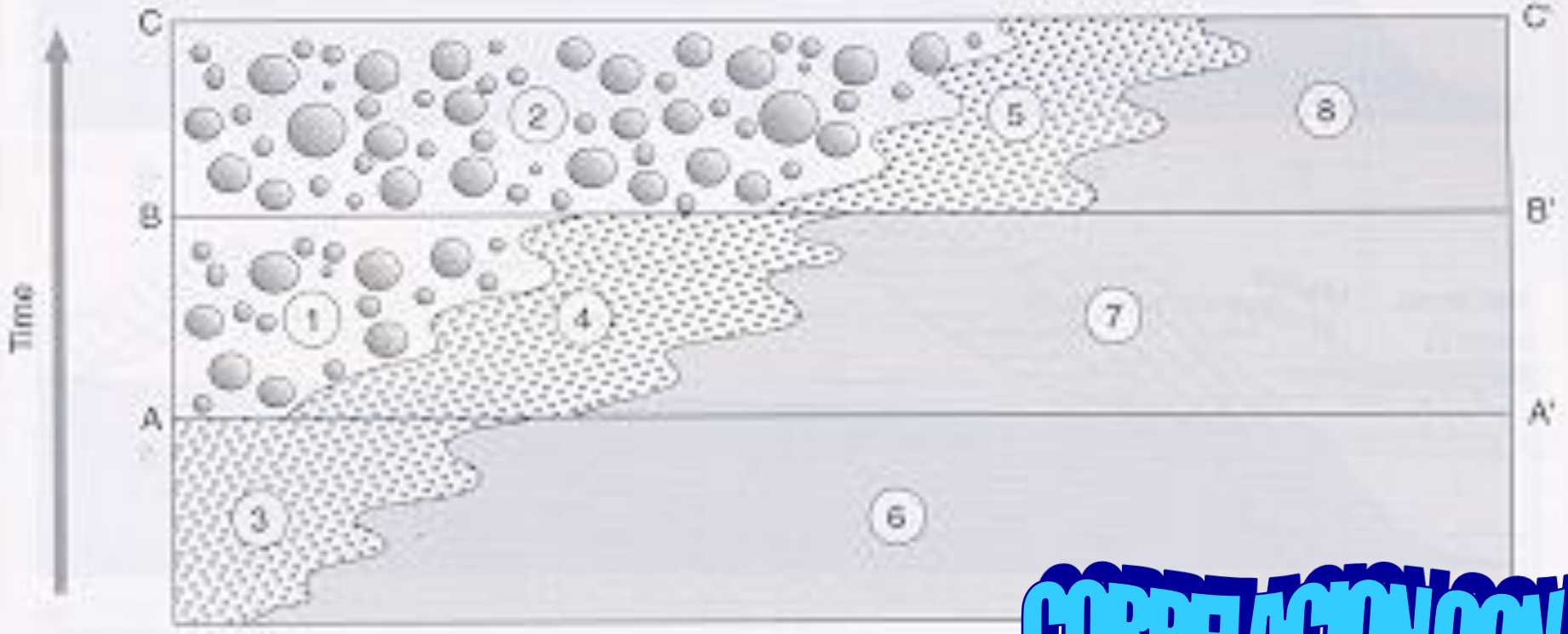

ENVIRONMENT
TERRESTRIAL / FLUVIAL / LACUSTRINE
MARINE
BENTHIC
PLANKTONIC
FOSSIL GROUP
AGE
Spores
Chlorophyta*
Gymnosperm pollen
Angiosperm pollen
Ostracods*
Benthic forams
Dasycladacean algae
Rhodophyta algae
Codiacean algae
Conodonts*
Chitinozoans
Acritarchs
Radiolarians
Dinoflagellates
Nannofossils
Planktonic forams
Calpionellids
Silicoflagellates
Diatoms*
QUATERNARY
TERTIARY
CRETACEOUS
JURASSIC
TRIASSIC
PERMIAN
CARBONIFEROUS
DEVONIAN
SILURIAN
ORDOVICIAN
CAMBRIAN
PRECAMBRIAN


Runoff
NUTRIENTS
HYPERSALINE
HYPOSALINE
TURBID
Photic biofacies
Plankton production
PHOTIC ZONE
Marginal marine biofacies adapted to extreme temperature, salinity and energy conditions
Aphotic biofacies of detritus feeders
NUTRIENTS
Decay
Diverse shelf biofacies adapted to variable temperature, salinity, substrate and photic conditions
Diverse deep-water biofacies
OXYGEN MINIMUM LAYER
Diverse mixed shelf and deep-water biofacies
Low diversity, low oxygen biofacies
Cold polar water – moderate oxygen
Anoxic or dysaerobic deep water
Turbidites
Low diversity biofacies adapted to high energy conditions
Opportunistic biofacies able to colonize turbidites
Diverse deep-water biofacies adapted to low temperature, oxygen and nutrient conditions


Marginal marine
0 m
Shore zone
Littoral
Tidal range
Sea-level
Wave-dominated
Inner neritic
Photic zone
~ 50 m
Outer neritic
Tidally dominated
Wind-driven oceanic currents
~150 m
Upper bathyal
Average modern shelf break = ~130 m
~200 to ~500 m
Middle bathyal
Permanent thermocline layer – varies with latitude and time
~1000 to ~1500 m
Abyssal currents
Lower bathyal
Average modern ocean depth = ~3750 m
~ 4000 m
CCD
Abyssal
Carbonate compensation depth (CCD) varies with latitude and time


DECREASING DIVERSITY AND ABUNDANCE OF OCEANIC PLANKTON
MARGINAL MARINE PLANKTONICS
e.g. low diversity–monospecific assemblages of: coccolithophores; diatoms; dinoflagellates; and acritarchs
INNER SHELF PLANKTONICS
e.g. moderate diversity of: Foraminifera (small); diatoms; coccolithophores; dinoflagellates; acritarchs
OPEN OCEAN PLANKTONICS
e.g. high diversity of: Foraminifera (small and large); Radiolaria; diatoms; coccolithophores; dinoflagellates; acritarchs
RUNOFF
Sea-level
LANDWARD TRANSPORT OF OPEN OCEAN PLANKTON
SEDIMENTATION OF PLANKTON
SURFACE-DWELLING RADIOLARIA AND FORAMINIFERA
PHOTIC ZONE
DEEP-WATER FORAMINIFERA
OXYGEN MINIMUM LAYER
DEEP-WATER RADIOLARIA
Coccolith 5 μm
Diatom 40 μm
Faecal pellet 100 μm
Foraminifera 200 μm
Settling rate per day
10 cm
1 m
10 m
100 m
1000 m


ARID
HUMID
Wind derived
Fluvially derived
Long shore current
COMMON
RARE
Decrease in derived pollen and spores
Common reworked pollen and spores in lowstand fan

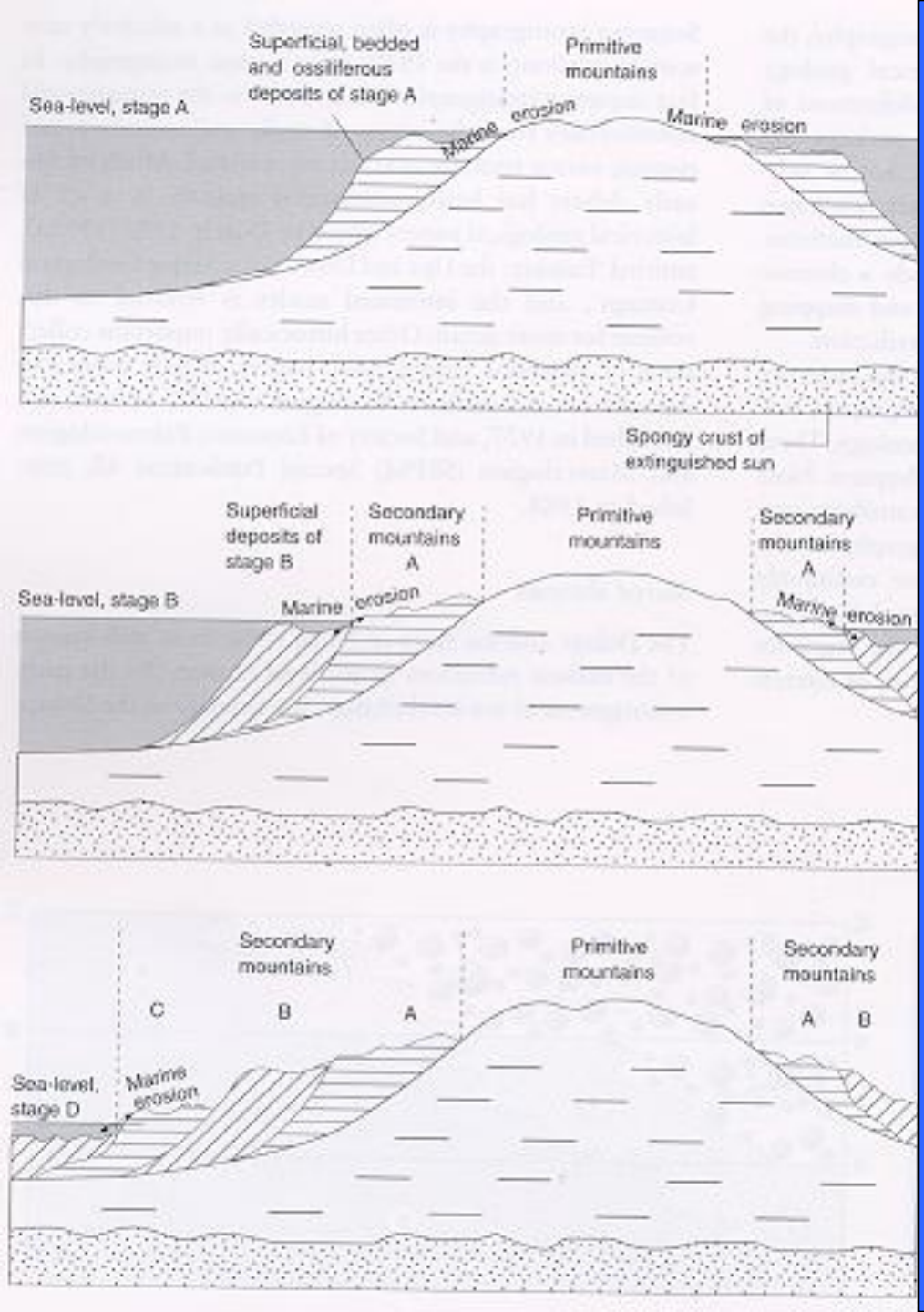


CORRELACION PICO A PICO

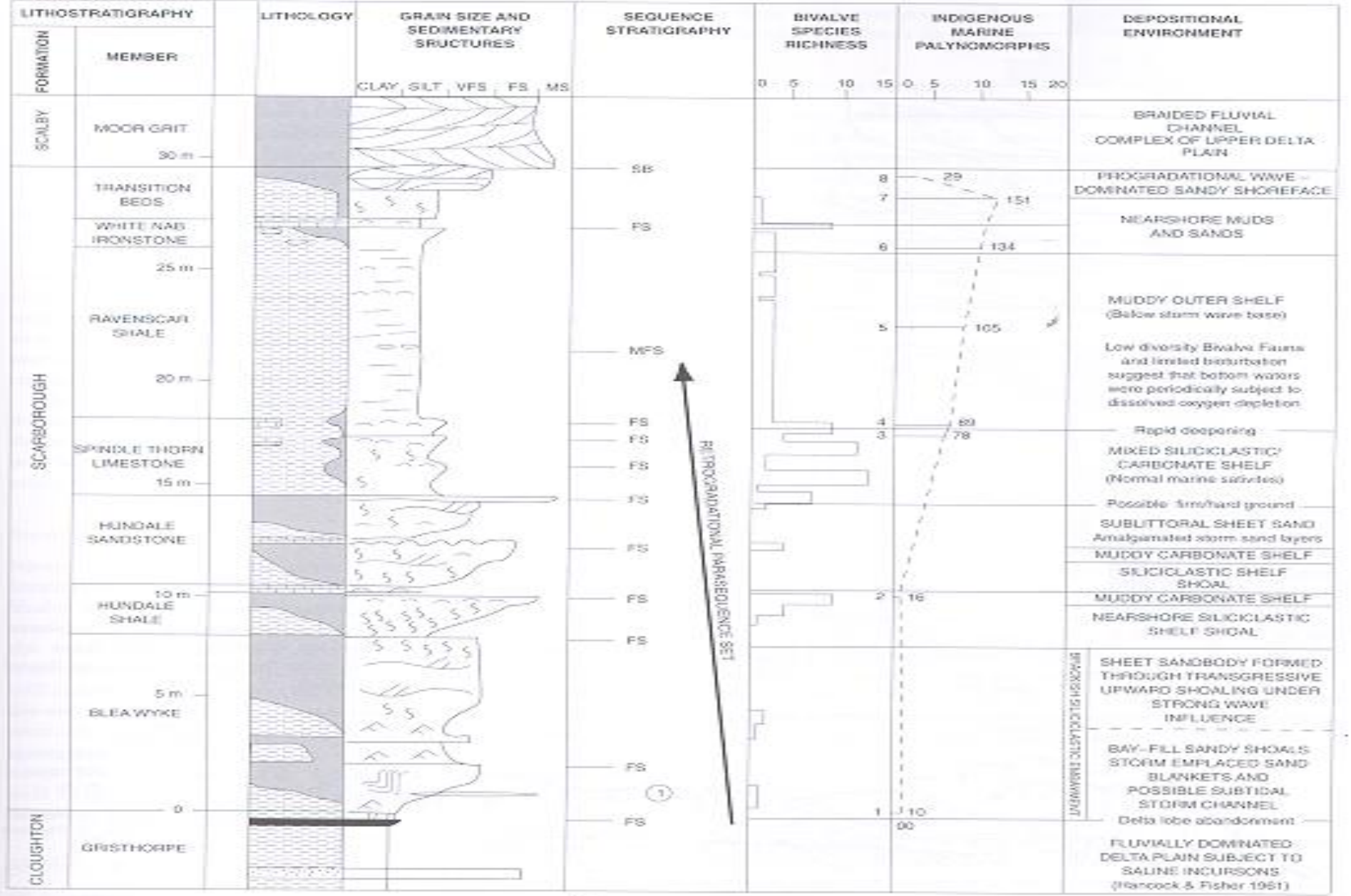
CORREALACIONAN LOS CONGLOMERADOS 1Y2; LAS ARENAS 3,4 Y 5; LAS LUTITAS 6,7,8.0

CORRELACION CON SECUENCIAS ESTRATIGRAFICAS

TIEMPOS CORRELATIVOS A-A'; B-B' Y C-C'.



ILUSTRACION ESQUEMATICA DEL DESARROLLO DE UNIDA-DES SEDIMENTARIAS POR EROSION Y DEPOSITACION DURANTE CONTINUAS CAIDAS DEL NIVEL DEL MAR....


LITHOSTRATIGRAPHY
FORMATION
MEMBER
LITHOLOGY
GRAIN SIZE AND SEDIMENTARY SRUCTURES
CLAY SILT VFS FS MS
SEQUENCE STRATIGRAPHY
BIVALVE SPECIES RICHNESS
0 5 10 15
INDIGENOUS MARINE PALYNOMORPHS
0 5 10 15 20
DEPOSITIONAL ENVIRONMENT
SCALBY
SCARBOROUGH
CLOUGHTON
MOOR GRIT
30 m
TRANSITION BEDS
WHITE NAB IRONSTONE
25 m
RAVENSCAR SHALE
20 m
SPINDLE THORN LIMESTONE
15 m
HUNDALE SANDSTONE
10 m
HUNDALE SHALE
5 m
BLEA WYKE
0
GRISTHORPE
SB
FS
MFS
FS
FS
FS
FS
FS
FS
FS
FS
RETROGRADATIONAL PARASEQUENCE SET
1
8
7
6
5
4
3
2
1
29
151
134
105
89
78
16
10
00
BRACKISH SILICICLASTIC EMBAYMENT
BRAIDED FLUVIAL CHANNEL COMPLEX OF UPPER DELTA PLAIN
PROGRADATIONAL WAVE - DOMINATED SANDY SHOREFACE
NEARSHORE MUDS AND SANDS
MUDDY OUTER SHELF
(Below storm wave base)
Low diversity Bivalve Fauna and limited bioturbation suggest that bottom waters were periodically subject to dissolved oxygen depletion
Rapid deepening
MIXED SILICICLASTIC/ CARBONATE SHELF
(Normal marine salinities)
Possible firmground
SUBLITTORAL SHEET SAND
Amalgamated storm sand layers
MUDDY CARBONATE SHELF
SILICICLASTIC SHELF SHOAL
MUDDY CARBONATE SHELF
NEARSHORE SILICICLASTIC SHELF SHOAL
SHEET SANDBODY FORMED THROUGH TRANSGRESSIVE UPWARD SHOALING UNDER STRONG WAVE INFLUENCE
BAY-FILL SANDY SHOALS STORM EMPLACED SAND BLANKETS AND POSSIBLE SUBTIDAL STORM CHANNEL
Delta lobe abandonment
FLUVIALLY DOMINATED DELTA PLAIN SUBJECT TO SALINE INCURSONS
(Hancock & Fisher 1961)
Key:
Dune cross – beds
Hummocky cross stratification
Wave ripples
Bioturbation
Soft sediment deformation
Sandstone
Shale
Limestone
Coal

SISTEMAS EN EL AREA DE NANOPLANCTON CALCAREO

SIADEN	Realizado en Venezuela
NANNOSTRAT	Programa internacional
SAPIENS	Base de datos
RAGWARE	Graficador

SISTEMAS EN GENERAL

STRATABUGS

IPS (UNOCAL)

BIOLOG (ELF)