Adl et al., 2012

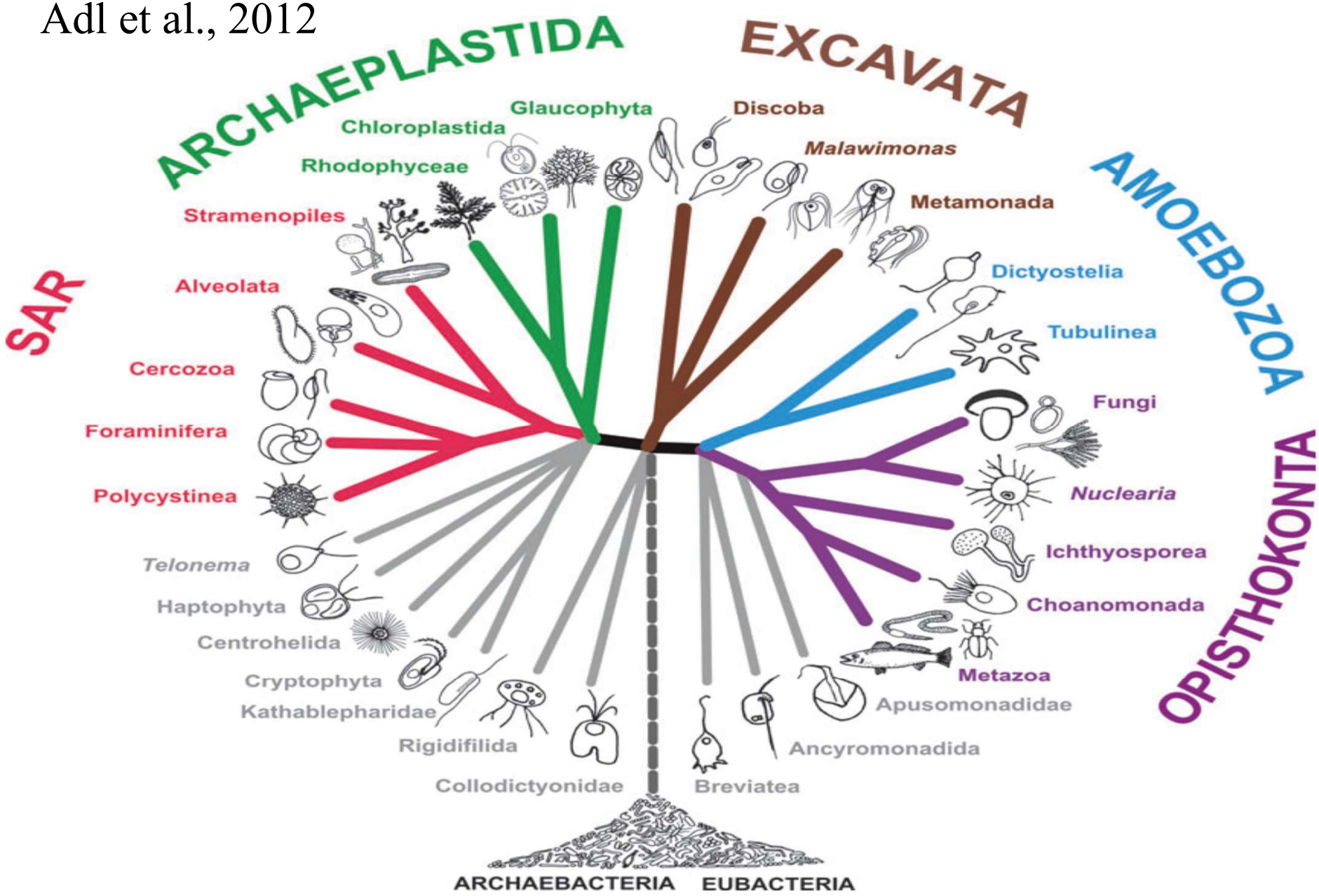


Fig. 1. A view of eukaryote phylogeny reflecting the classification presented herein.

Adl et al., 2012

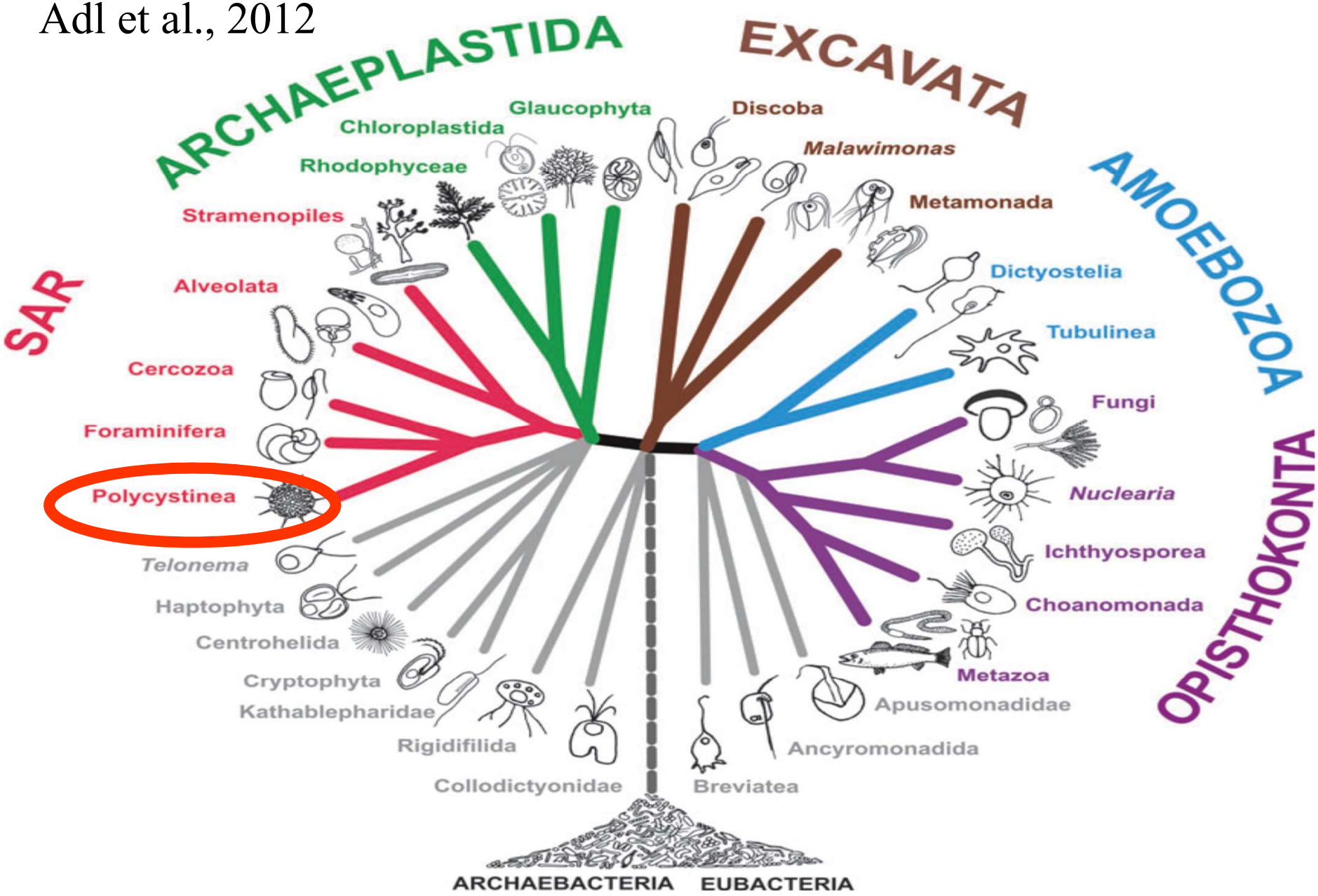
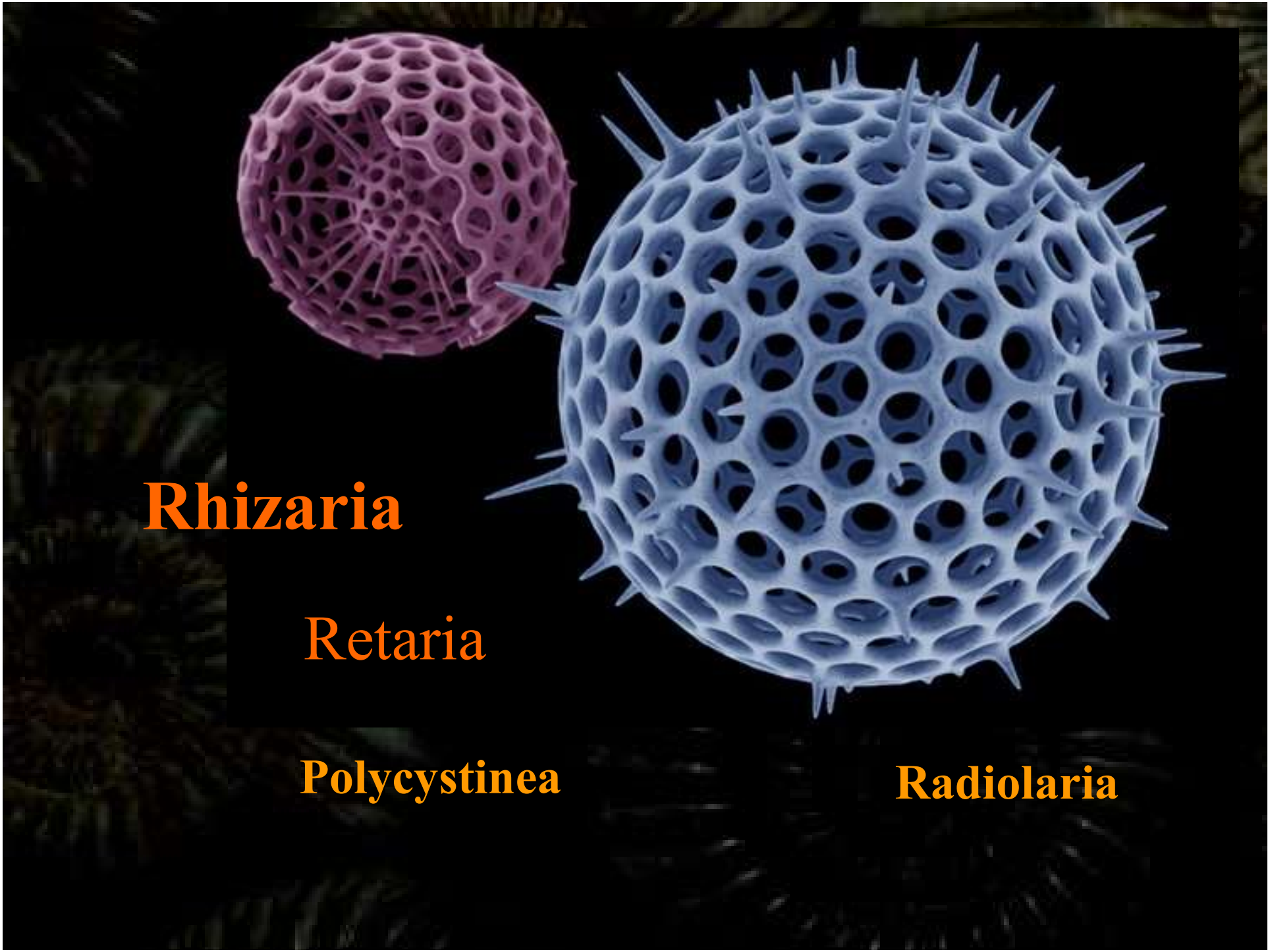


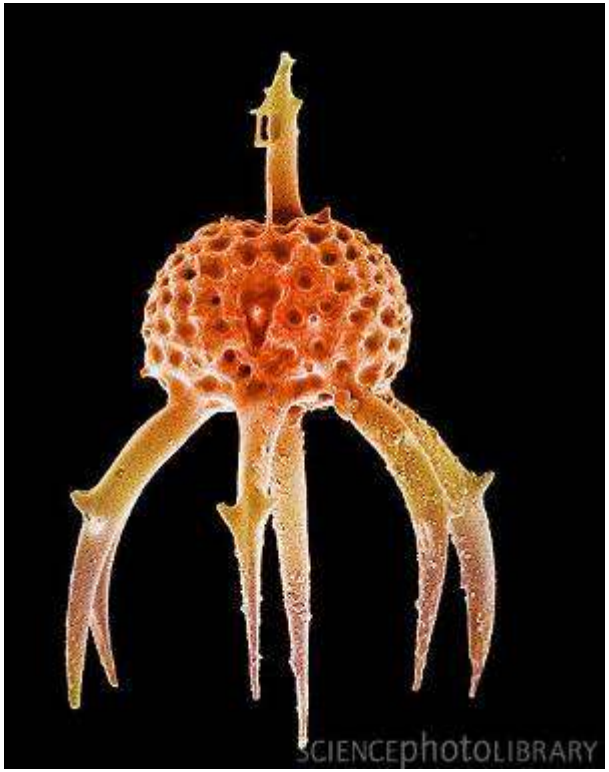
Fig. 1. A view of eukaryote phylogeny reflecting the classification presented herein.


Rhizaria
Retaria
Polycystinea
Radiolaria

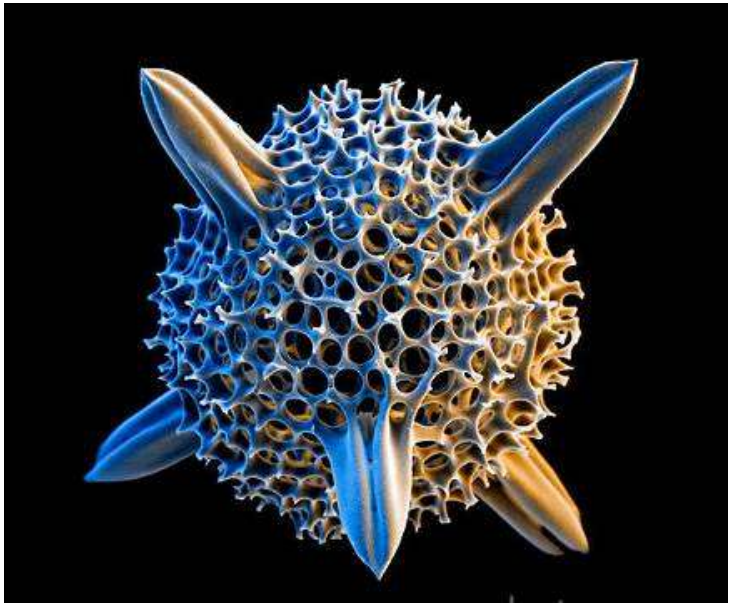
Più comuni ad alte latitudini perché in acque fredde il SiO_2 (opale non quarzo) precipita molto meglio del $CaCO_3$.

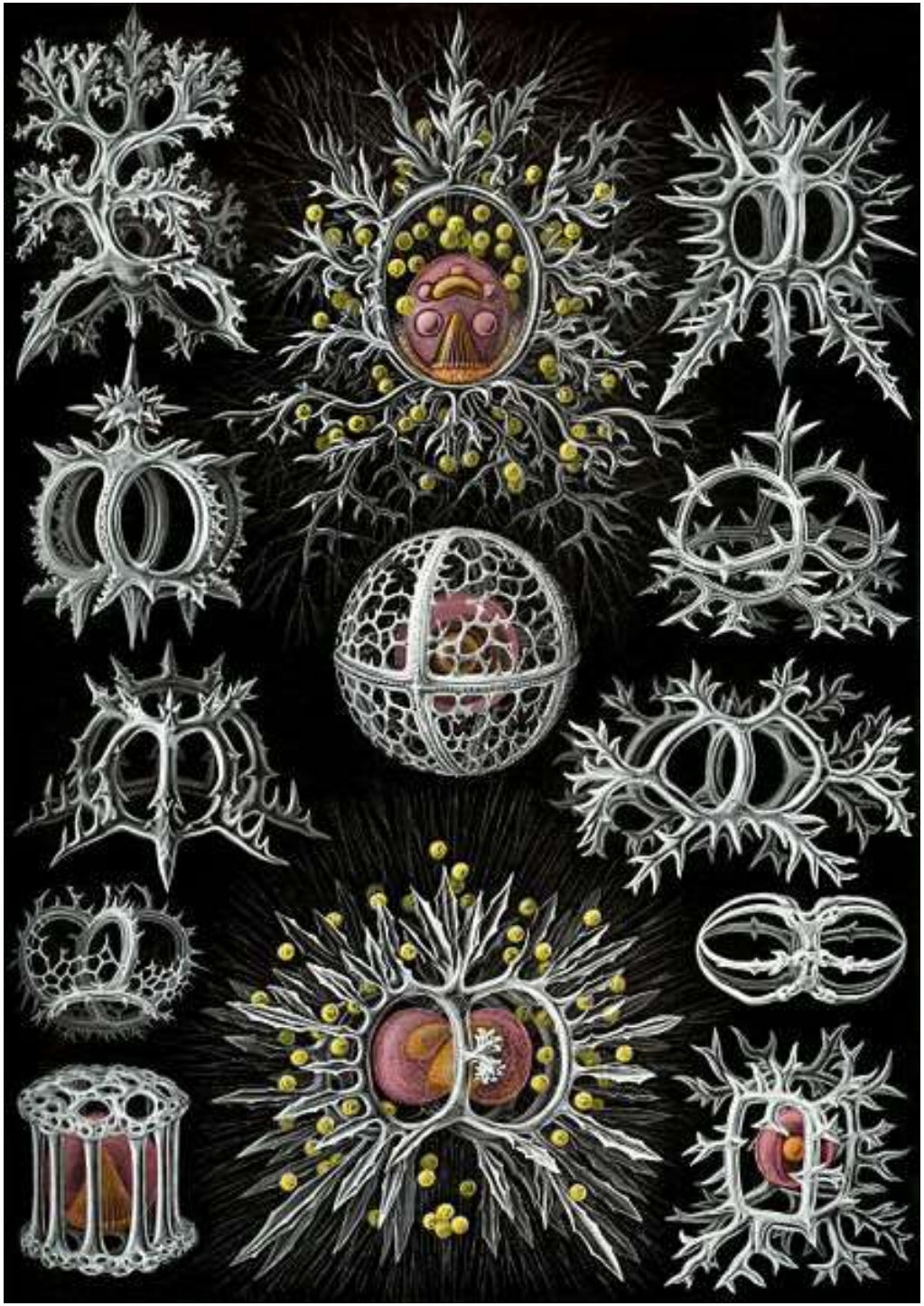
- RADIOLARI: Microfossili silicei

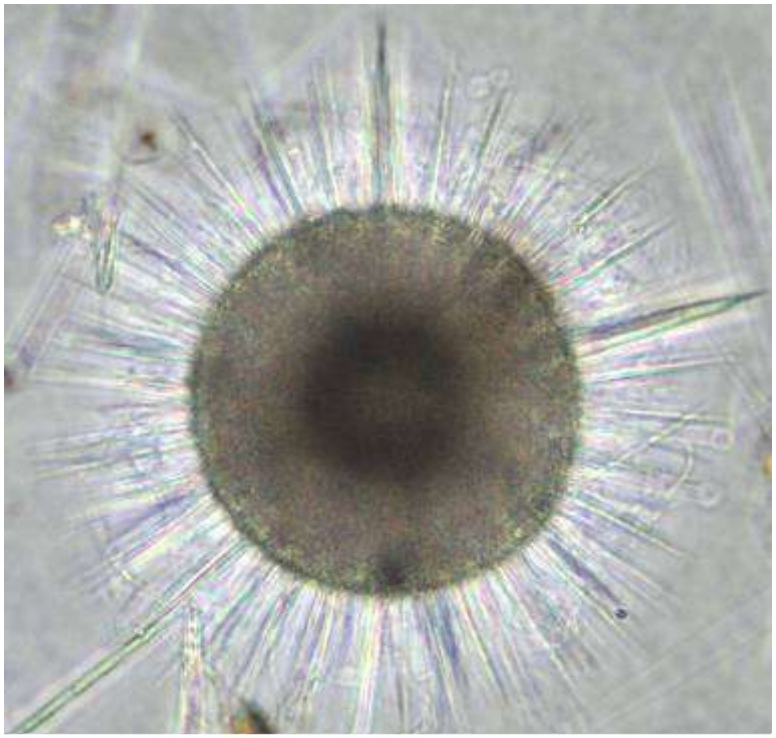
- **Organismi planktonici, olomarini;**
- **I loro resti sono abbondanti a tutte le profondità;**
- **Sono predatori "carnivori";**
- **Comuni dai tropici ai poli;**
- **Più abbondanti in zone più fredde.**

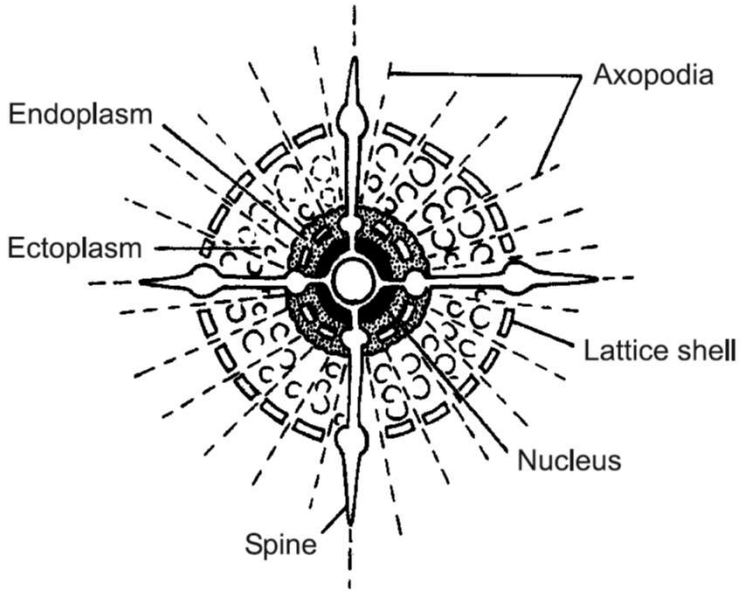


- **Hanno uno scheletro di silice amorfa (opale);**
- **Posso essere disciolti in sediment silicei**

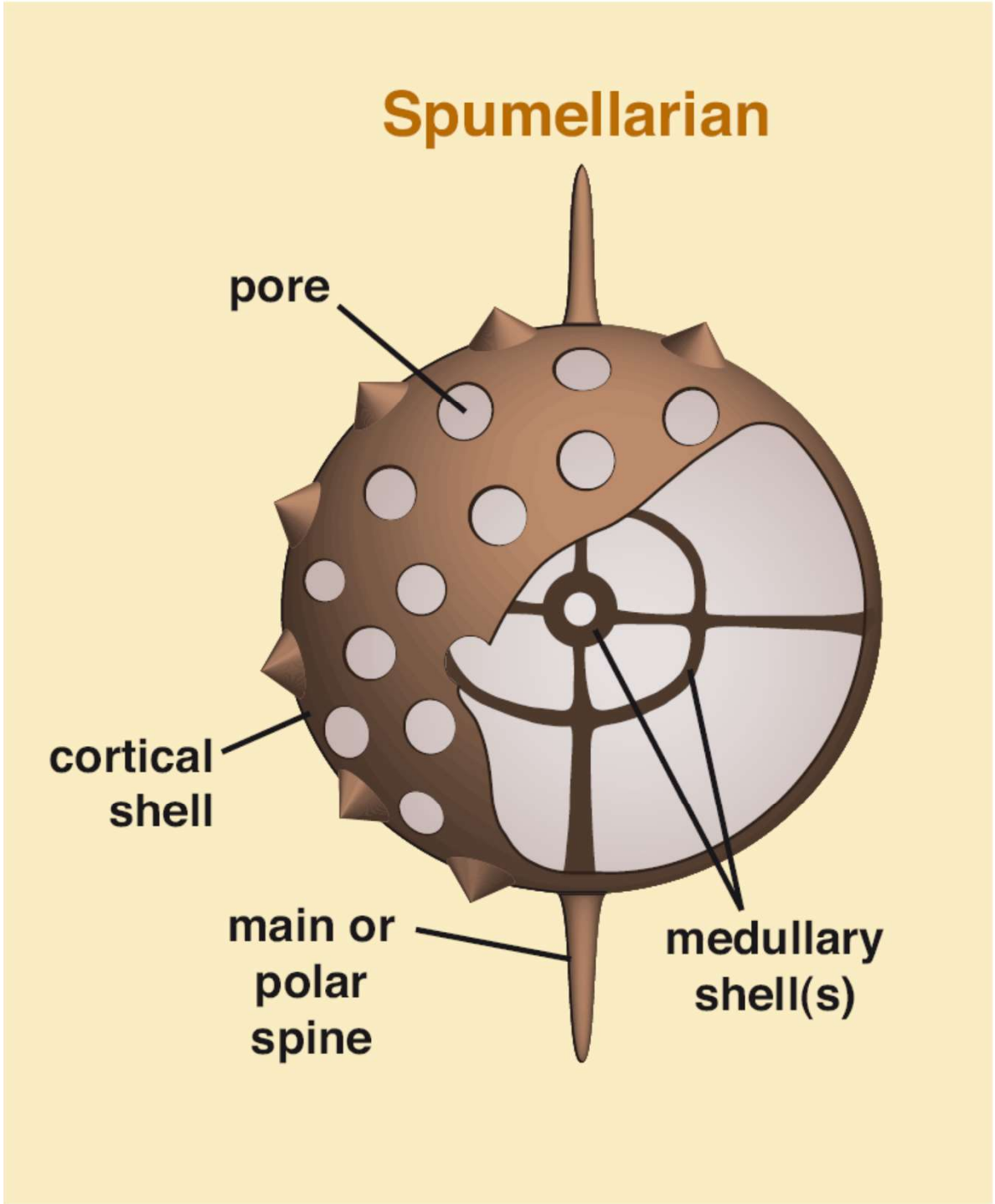


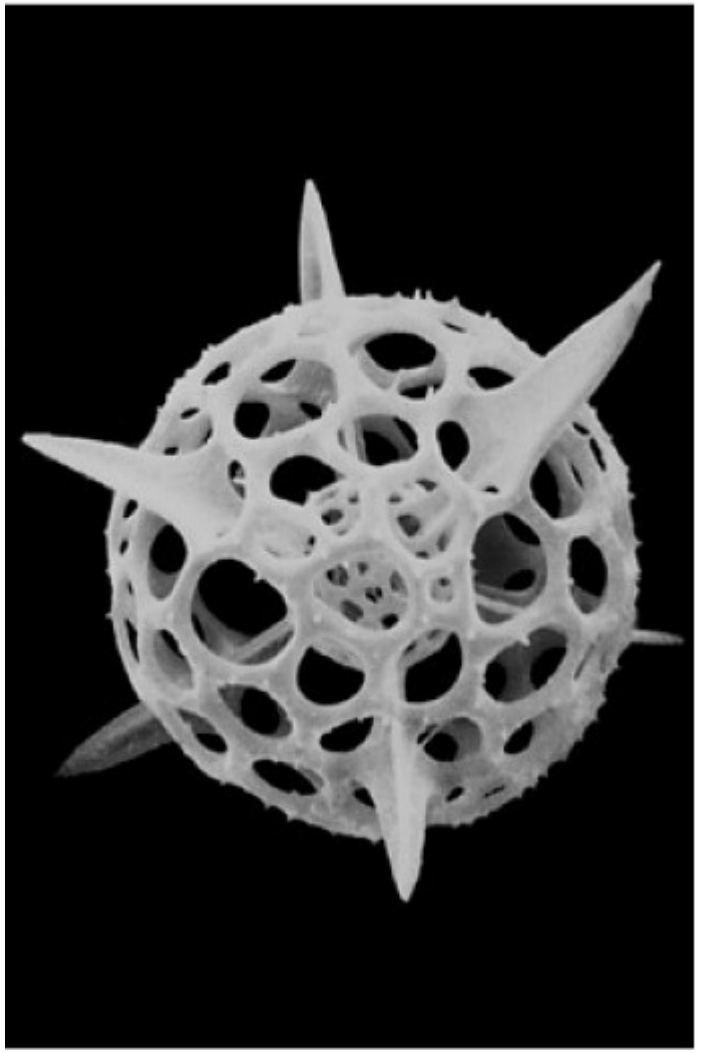





Endoplasm
Ectoplasm
Axopodia
Lattice shell
Nucleus
Spine

Struttura semplice, 90% dei casi sferica con simmetria radiale.





Spumellarians (radially-symmetrical)

Middle-Late Cambrian to Recent

Spumellaria

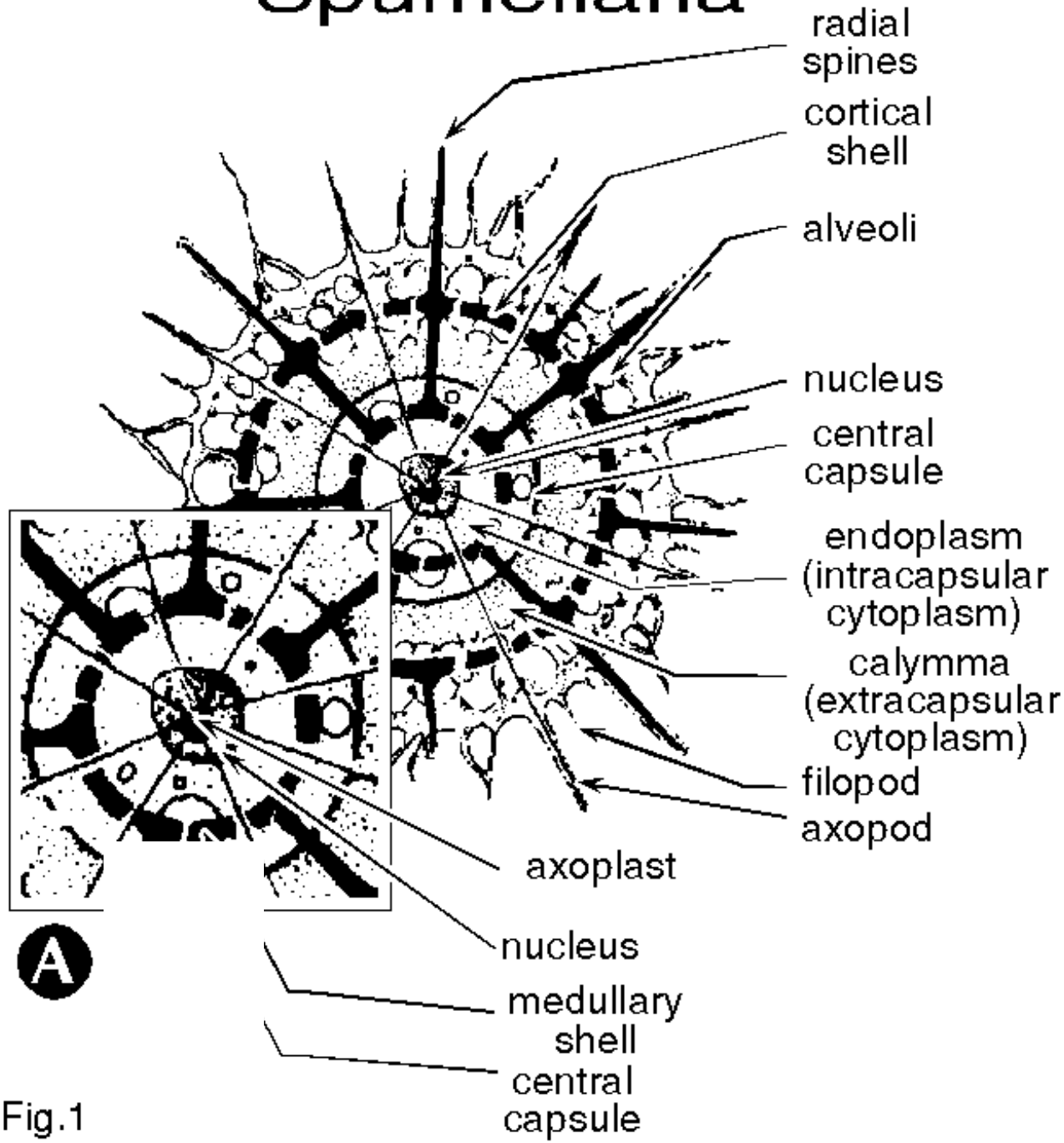
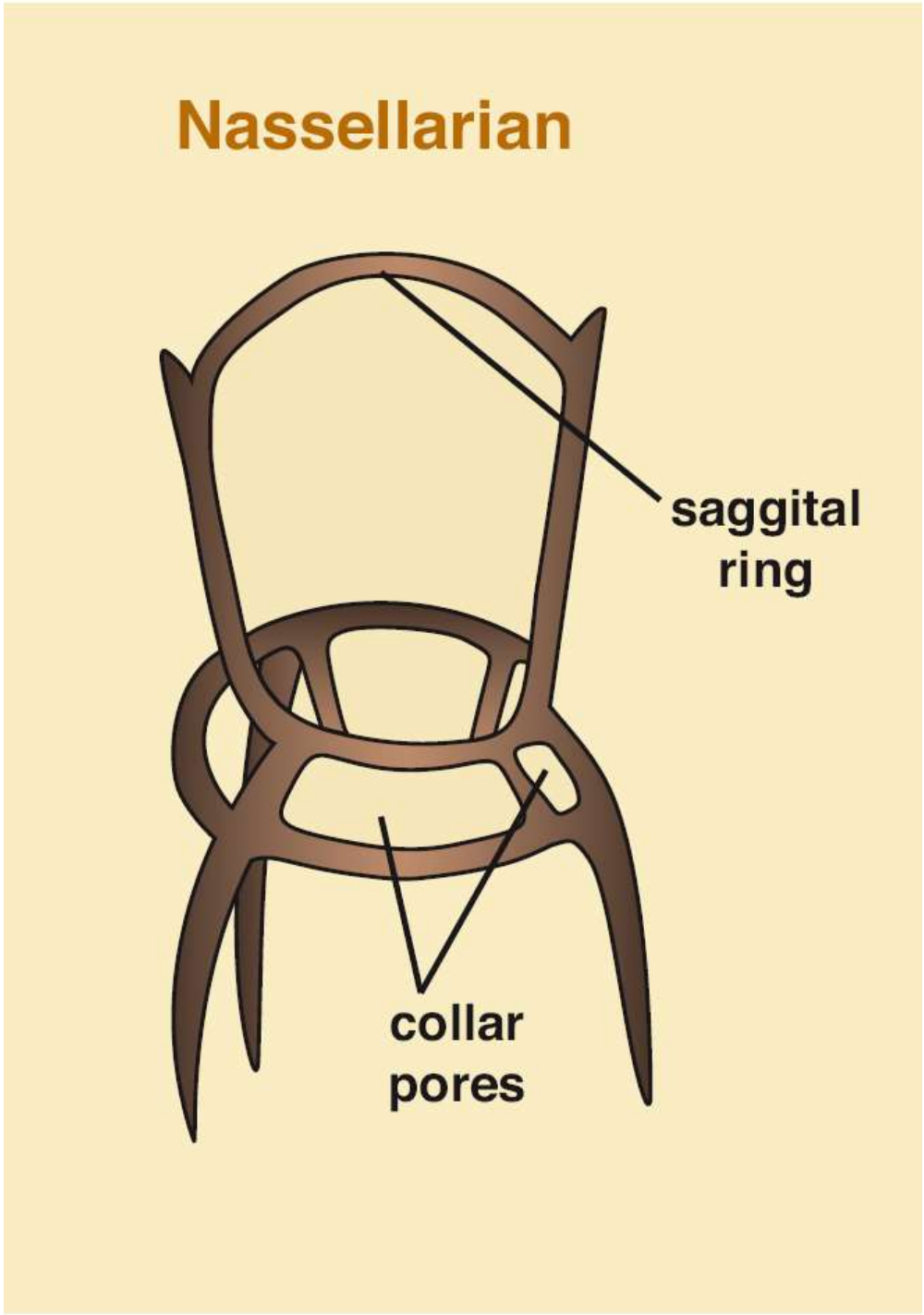


Fig.1



Nassellarians (helmet-shaped)
Triassic to Recent
most nassellarians are characterized by axial symmetr

B

Nassellaria

Nassellarians (helmet-shaped forms) — Triassic to Recent

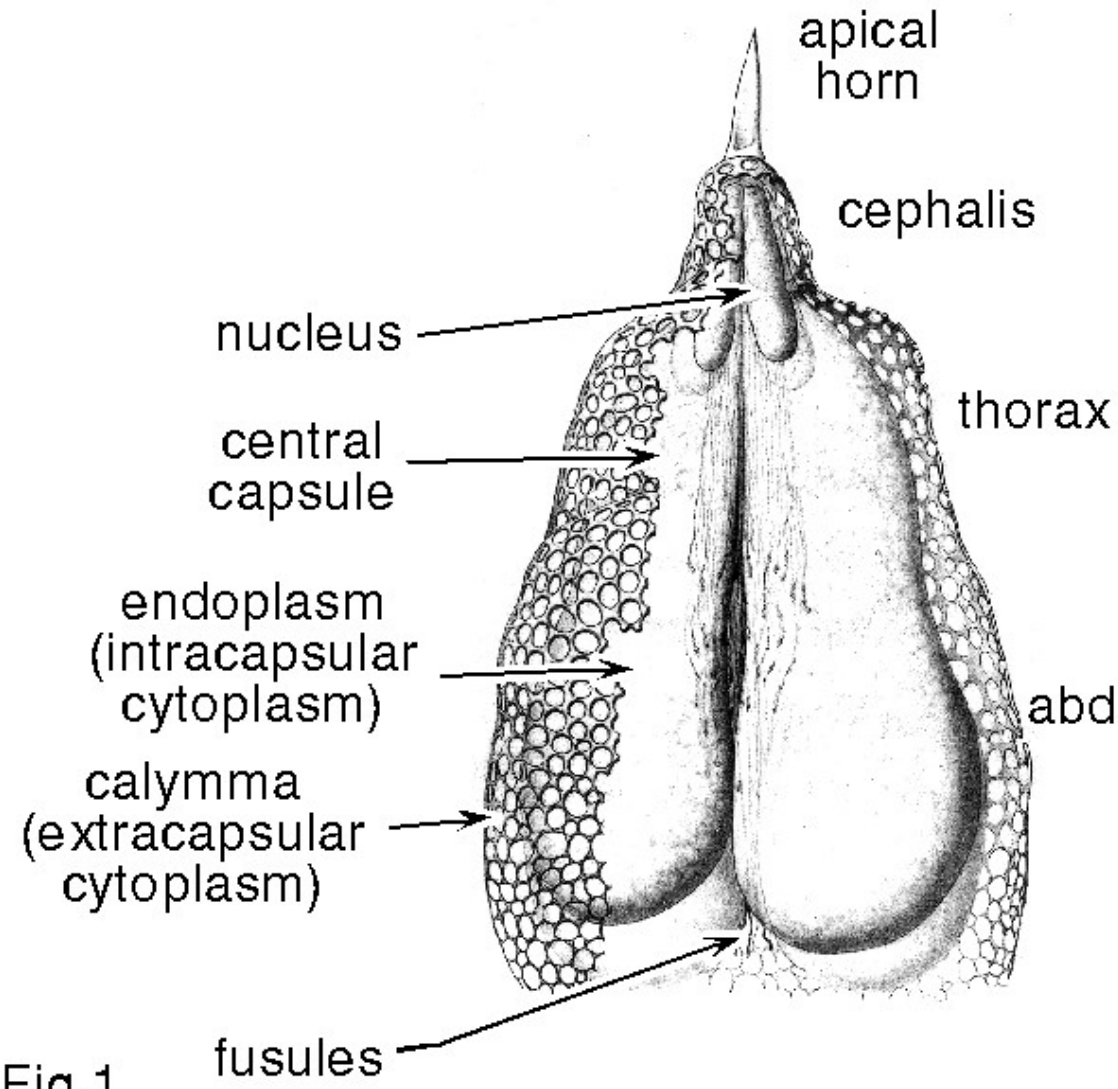
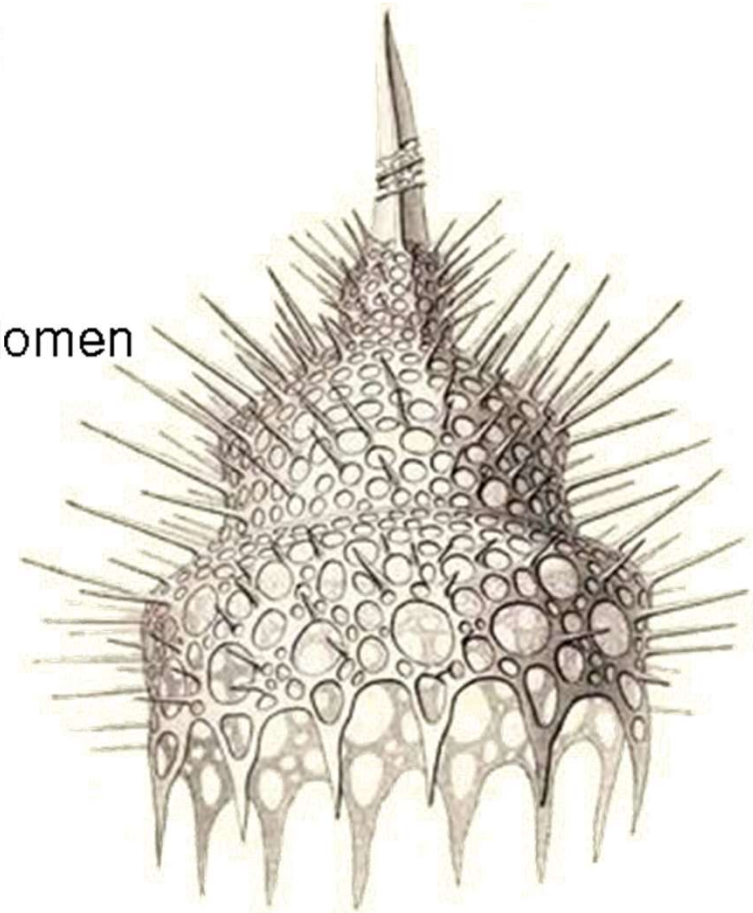
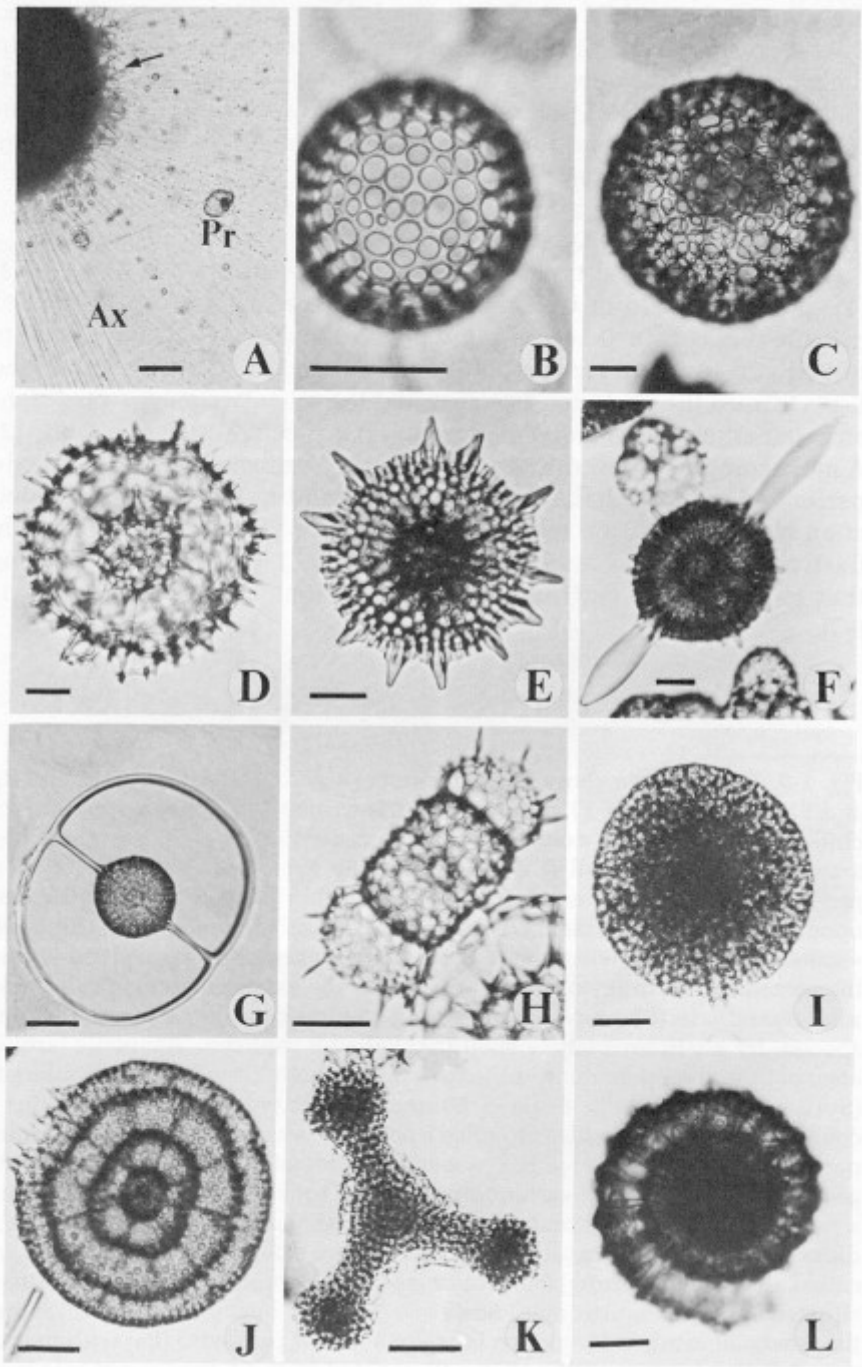


Fig.1

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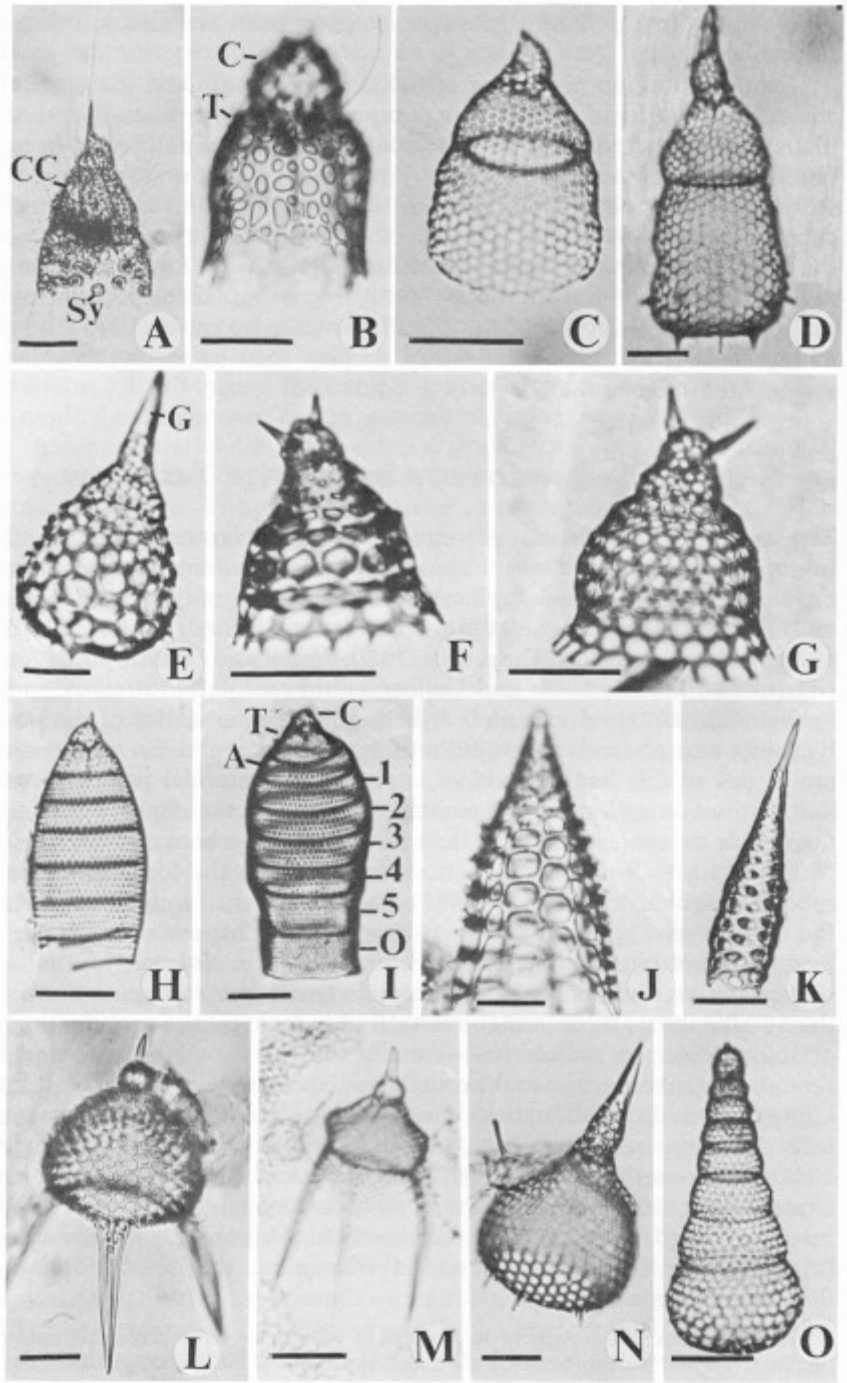
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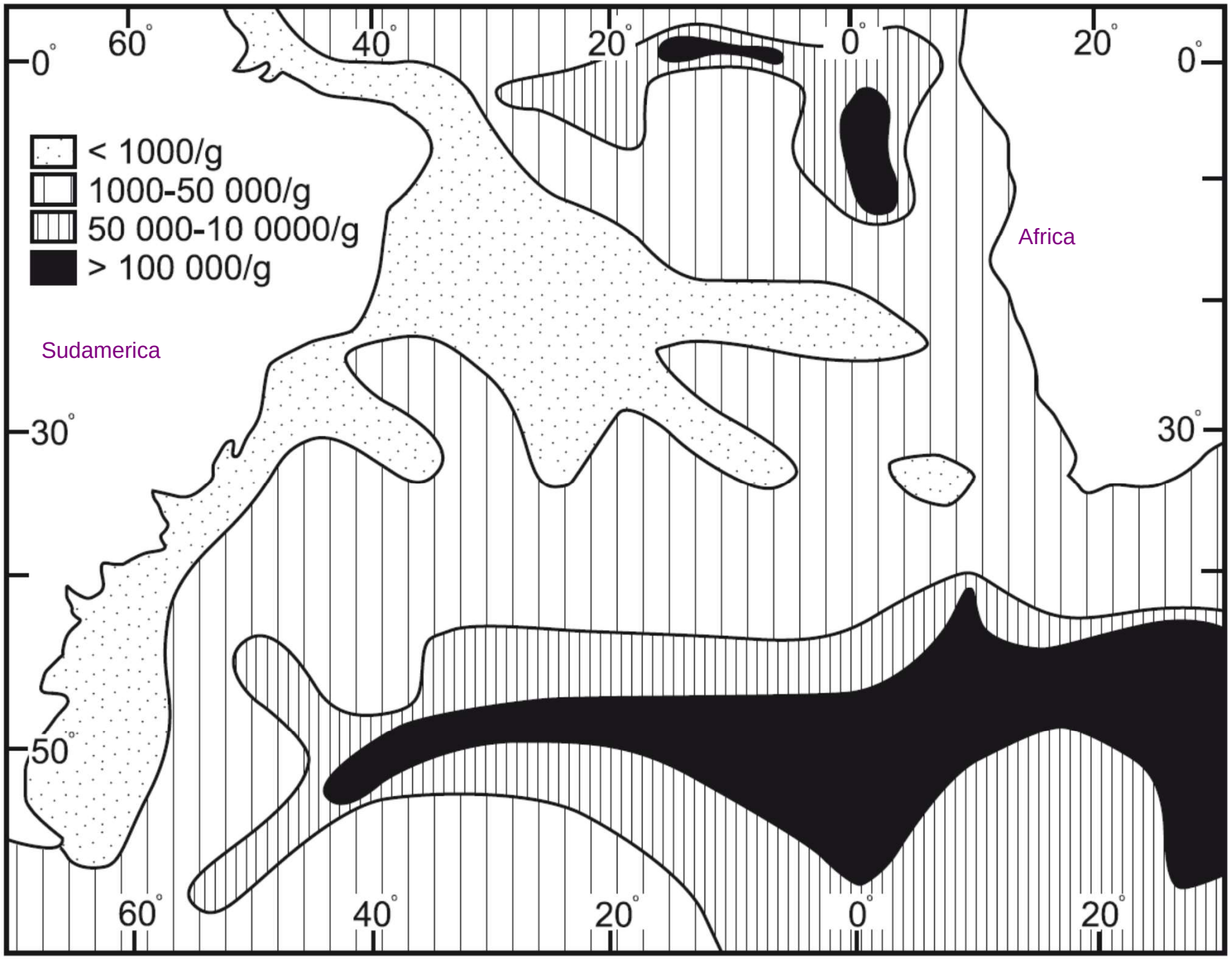
DISTRIBUZIONE DEI RADIOLARI SU FONDO DELL'OCEANO ATLANTICO



Censimento mondiale dei radiolari

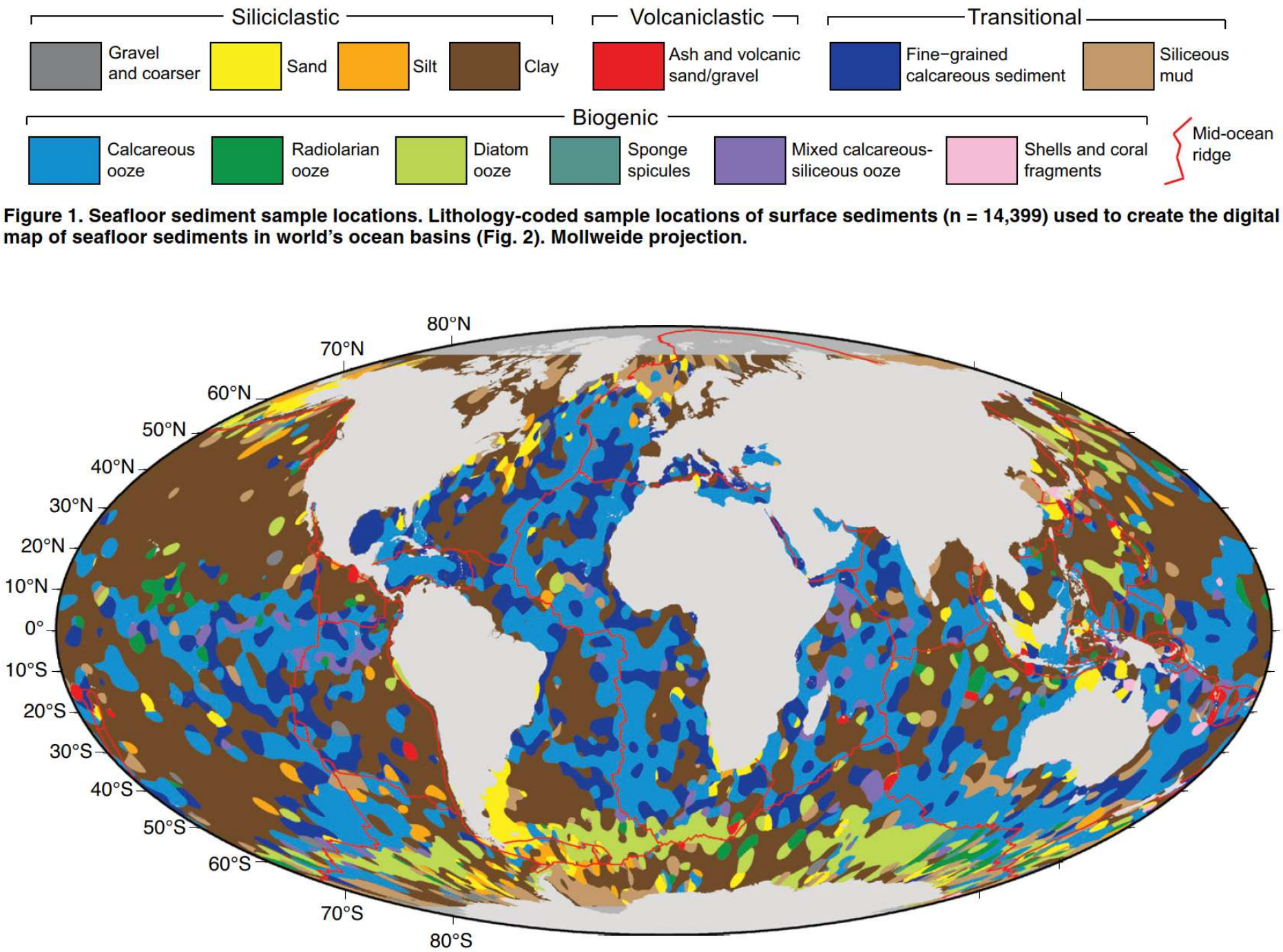
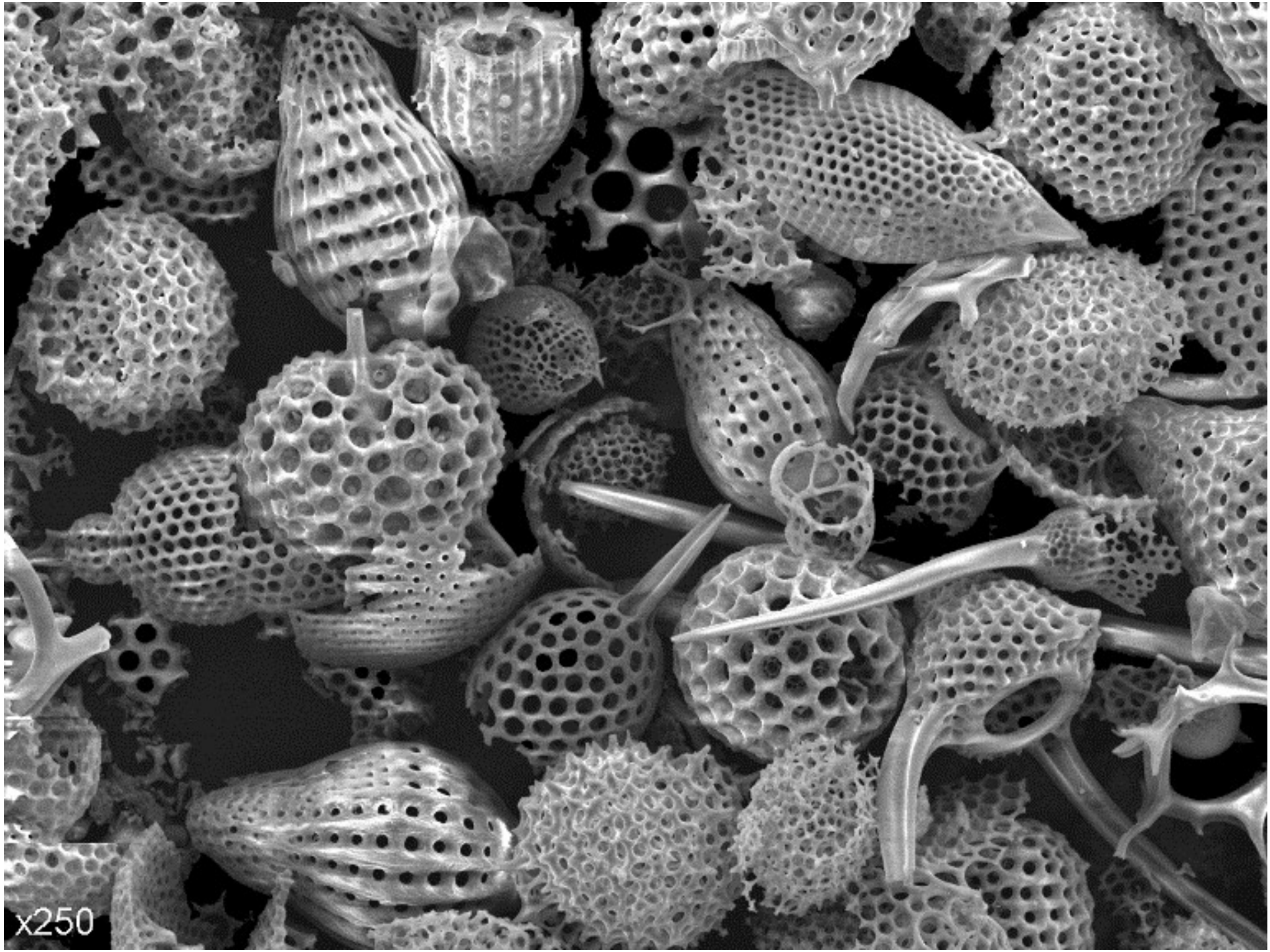
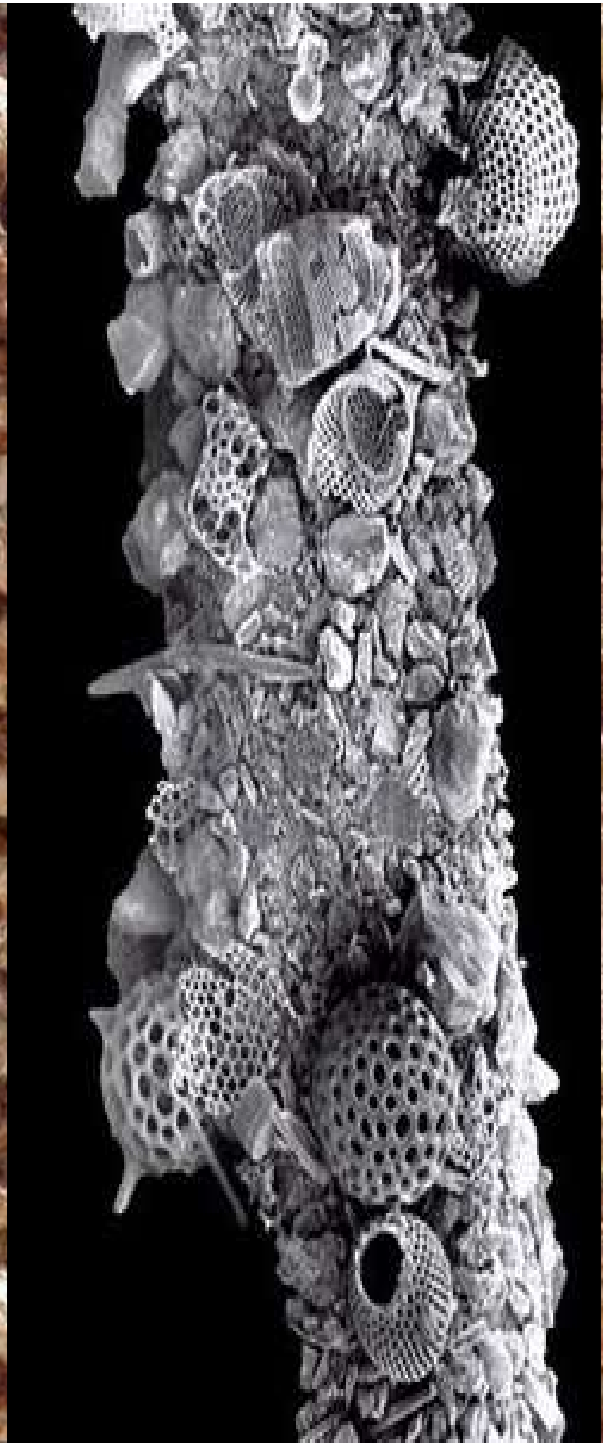


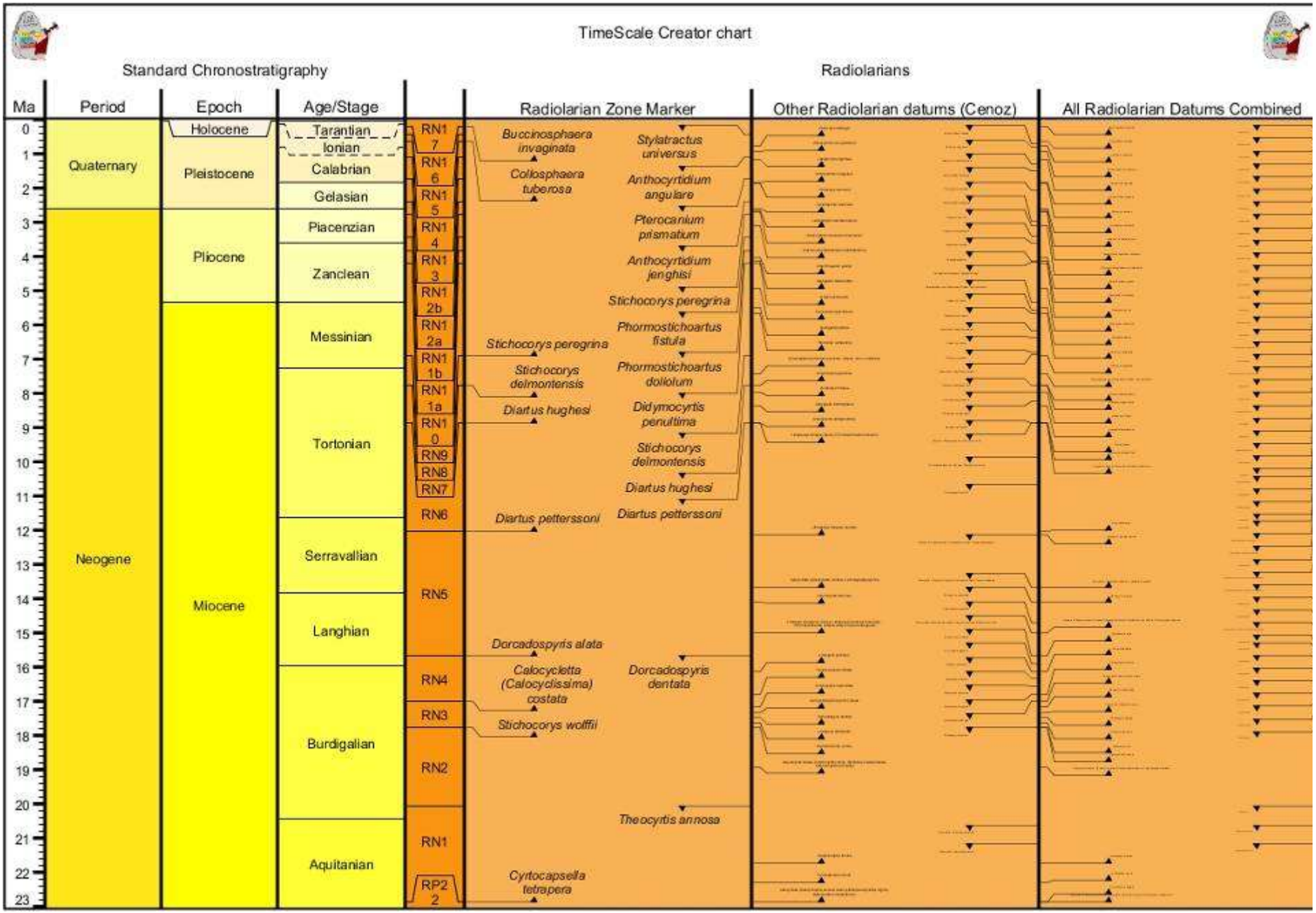
Figure 1. Seafloor sediment sample locations. Lithology-coded sample locations of surface sediments (n = 14,399) used to create the digital map of seafloor sediments in world's ocean basins (Fig. 2). Mollweide projection.


x250

RADIOLARITI = diaspri

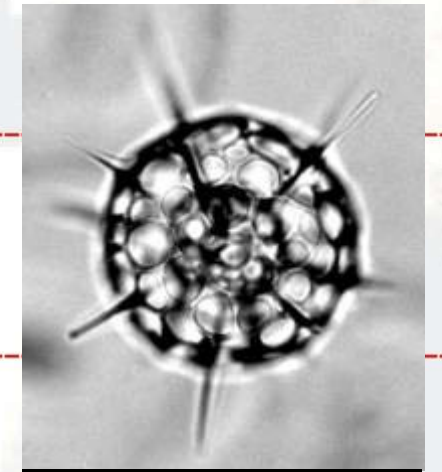


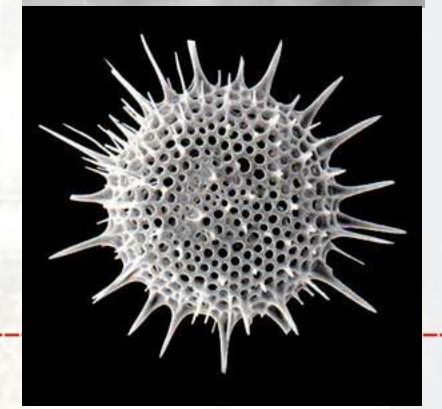
Biozonazione a radiolari da 0 a 23 Ma



Radiolaria

EON	ERA	PERIOD		EPOCH		Ma
Phanerozoic	Cenozoic	Quaternary		Holocene		0.01
				Pleistocene	Late	0.8
					Early	1.8
		Tertiary	Neogene	Pliocene	Late	3.6
					Early	5.3
				Miocene	Late	11.2
					Middle	16.4
					Early	23.7
				Oligocene	Late	28.5
					Early	33.7
			Paleogene	Eocene	Late	41.3
					Middle	49.0
					Early	54.8
				Paleocene	Late	61.0
					Early	65.0
	Mesozoic	Cretaceous		Late		99.0
				Early		144
		Jurassic		Late		159
				Middle		180
				Early		206
		Triassic		Late		227
				Middle		242
				Early		248
	Paleozoic	Permian		Late		256
				Early		290
		Pennsylvanian				323
		Mississippian				354
		Devonian		Late		370
				Middle		391
				Early		417
		Silurian		Late		423
				Early		443
		Ordovician		Late		458
				Middle		470
				Early		490
		Cambrian		D		500
				C		512
				B		520
				A		543
Precambrian	Proterozoic	Late				900
		Middle				1600
		Early				2500
	Archean	Late				3000
		Middle				3400
		Early				3800?





Adl et al., 2012

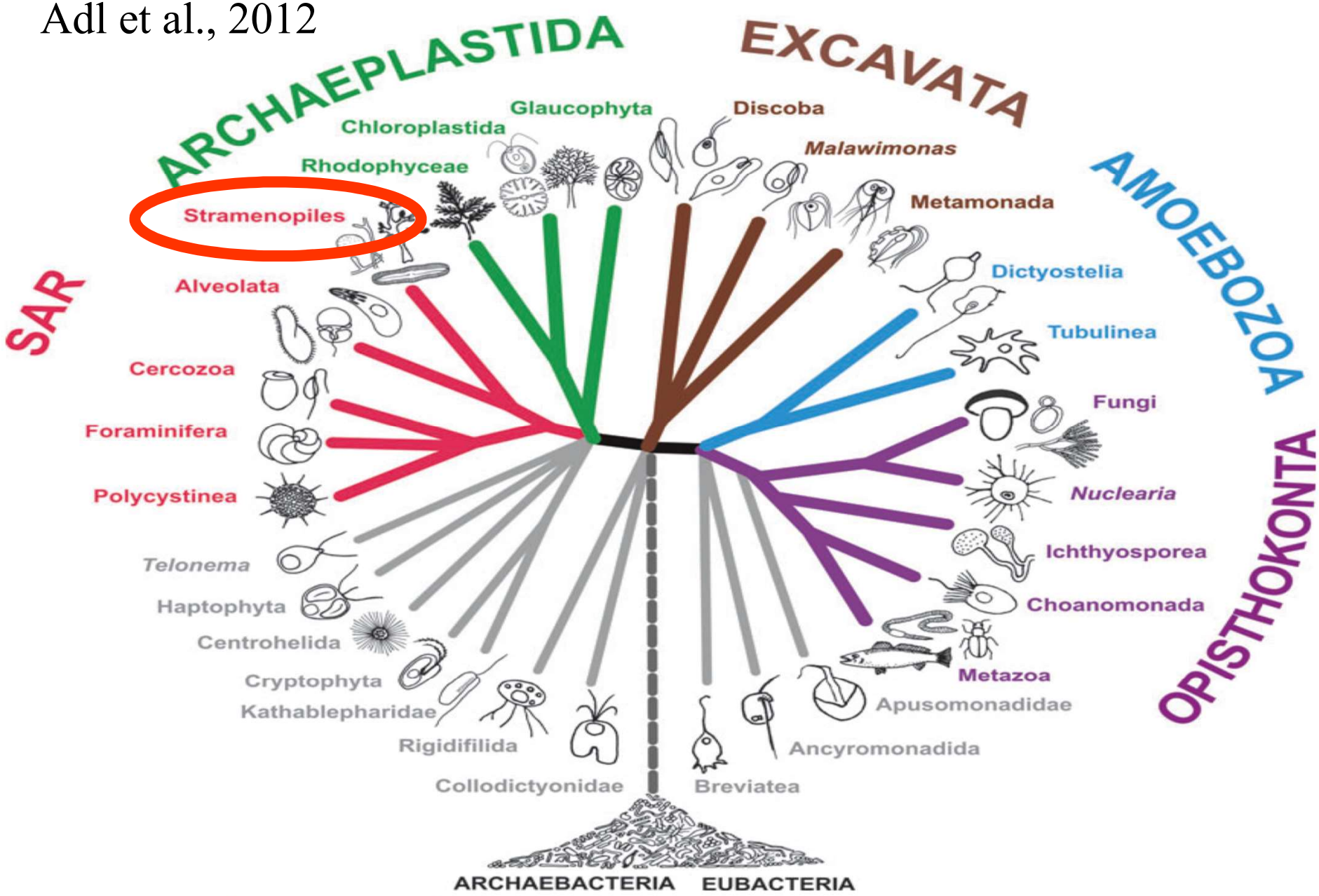


Fig. 1. A view of eukaryote phylogeny reflecting the classification presented herein.

Stramenopiles:

- Opalinata;
- Bicosoecida;
- Placidida;
- Labyrinthulomycetes
- Hyphochytriales;
- Peronosporomycetes;
- Actinophryidae;
- Chrysophyceae;
- Dictyochophyceae;
- Eustigmatales;
- Phaeothamniophyceae;
- Pinguiochrysidales;
- Raphidophyceae;
- Synurales;
- Xanthophyceae;
- Phaeophyceae;
- Diatomea.

Motile cells typically biciliate, typically with heterokont ciliation – anterior cilium with tripartite mastigonemes in two opposite rows and a posterior usually smooth cilium; tubular mitochondrial cristae; typically 4 microtubular kinetosomal roots.

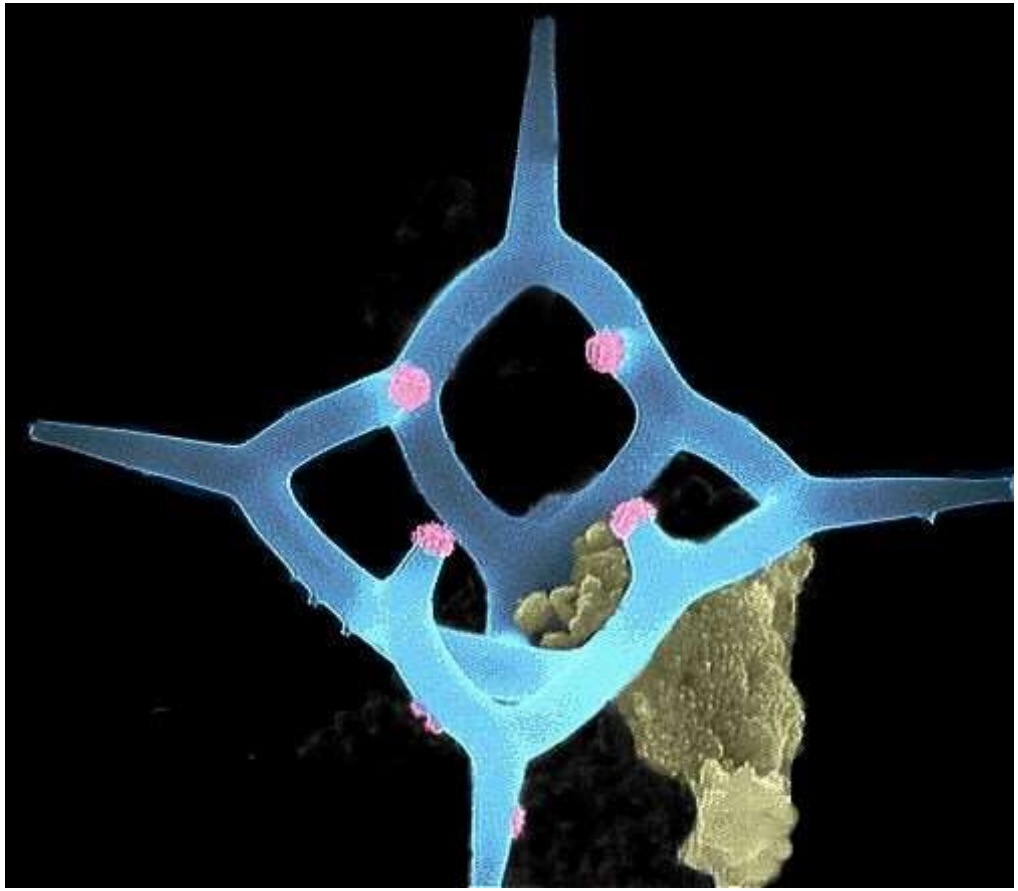
Single cells, colonial ciliated cells or amoebae; swimming cells usually with one cilium, anteriorly directed […]
cells naked, with organic scales or with siliceous skeleton.

Vegetative cells cylindrical with a circular, elongate or multipolar cross-section, lacking any trace of cilia […]
cell wall complete, composed of tightly integrated silicified elements and comprised of two valves, […]

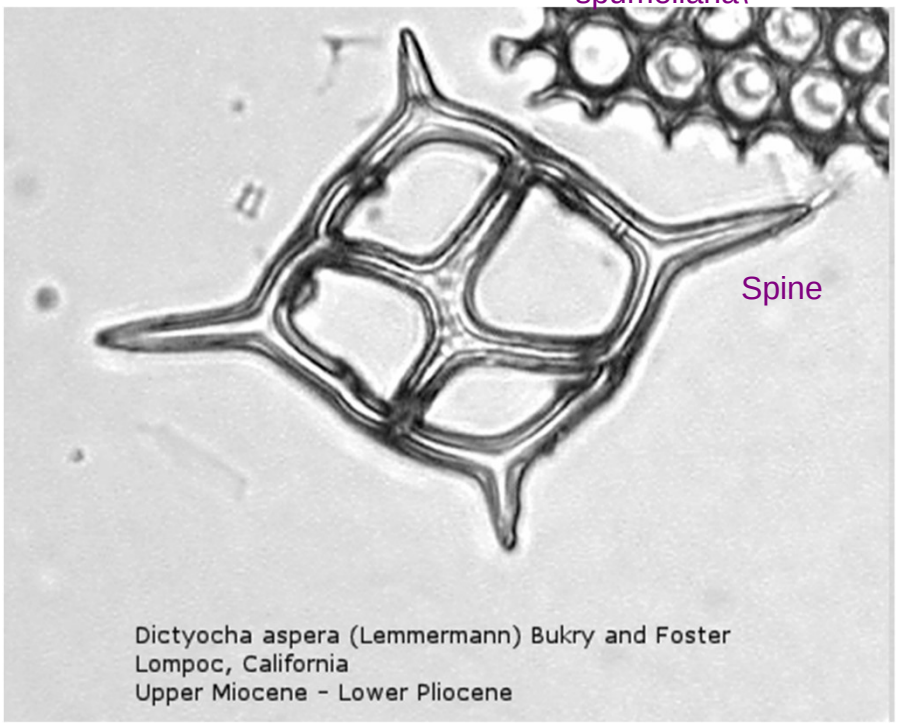
L'unico coso interessante

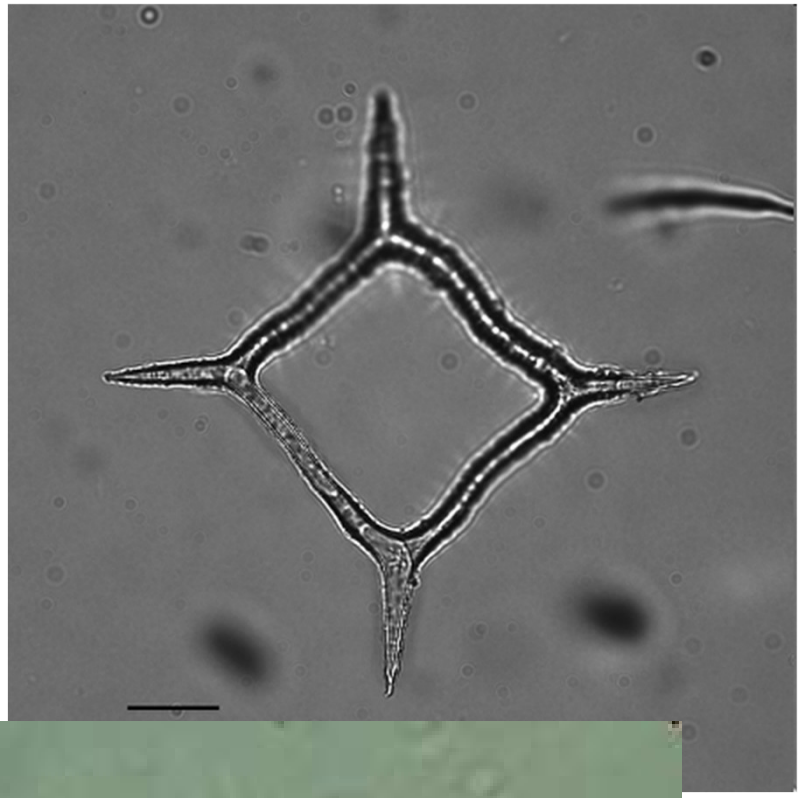
Silicoflagellati

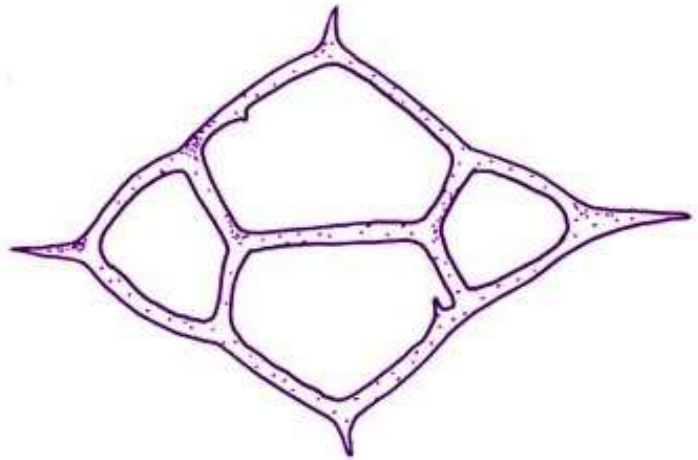
Chlorofilla a, c1, c2 e Fucoxanthin

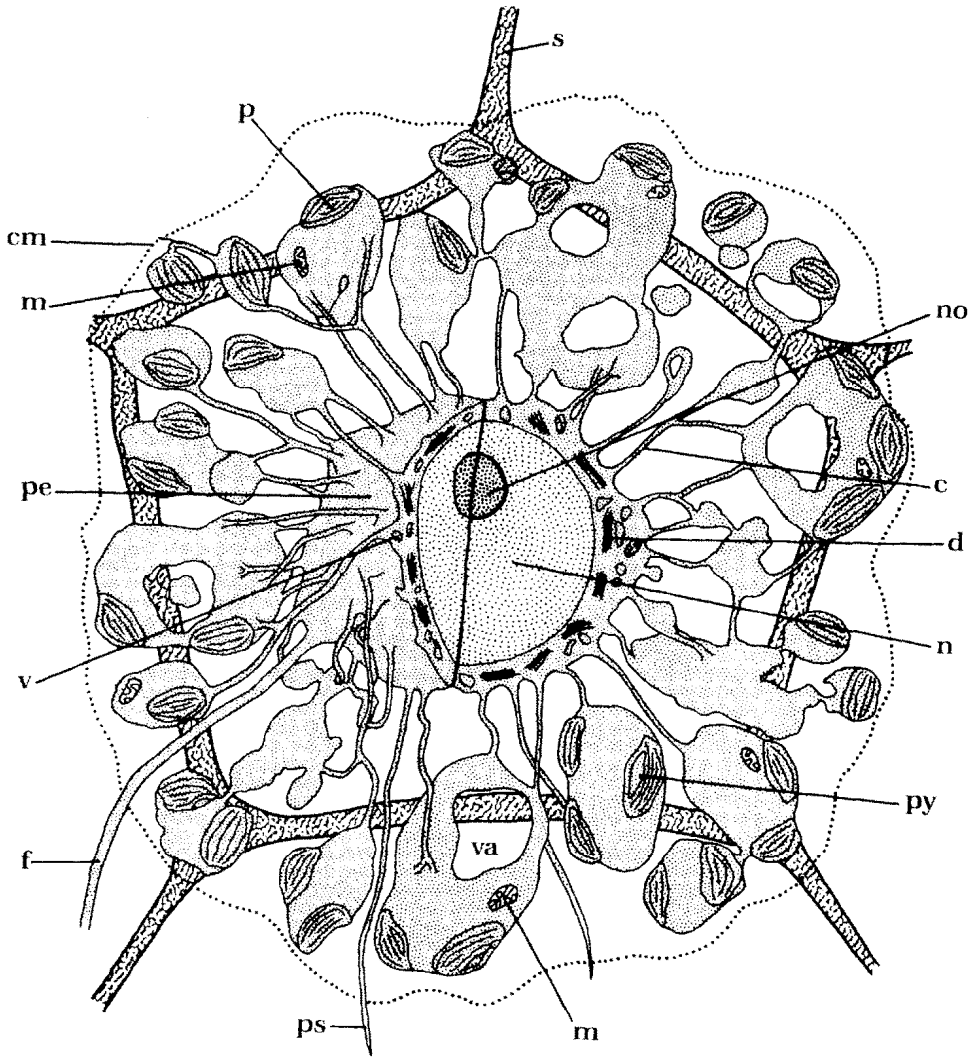


spumellaria\









Dictyocha fibula, diagrammatic sketch of sectioned "sunburst" form, showing system of fine cytoplasmic strands (c) connecting the perikaryon (pe) with the peripheral cytoplasm; silica skeleton (s) incompletely shown; nucleus (n) with nucleolus (no), surrounded by perikaryon of dense cytoplasm with dictyosomes (d) and vesicles (v); outer vacuolated cytoplasm with vacuoles (va), mitochondria (m), plastids (p) containing a lenticular pyrenoid (py); cell membrane (cm), pseudopodium (ps), flagellum (f). Redrawn and slightly modified from Van Valkenburg, 1971b.

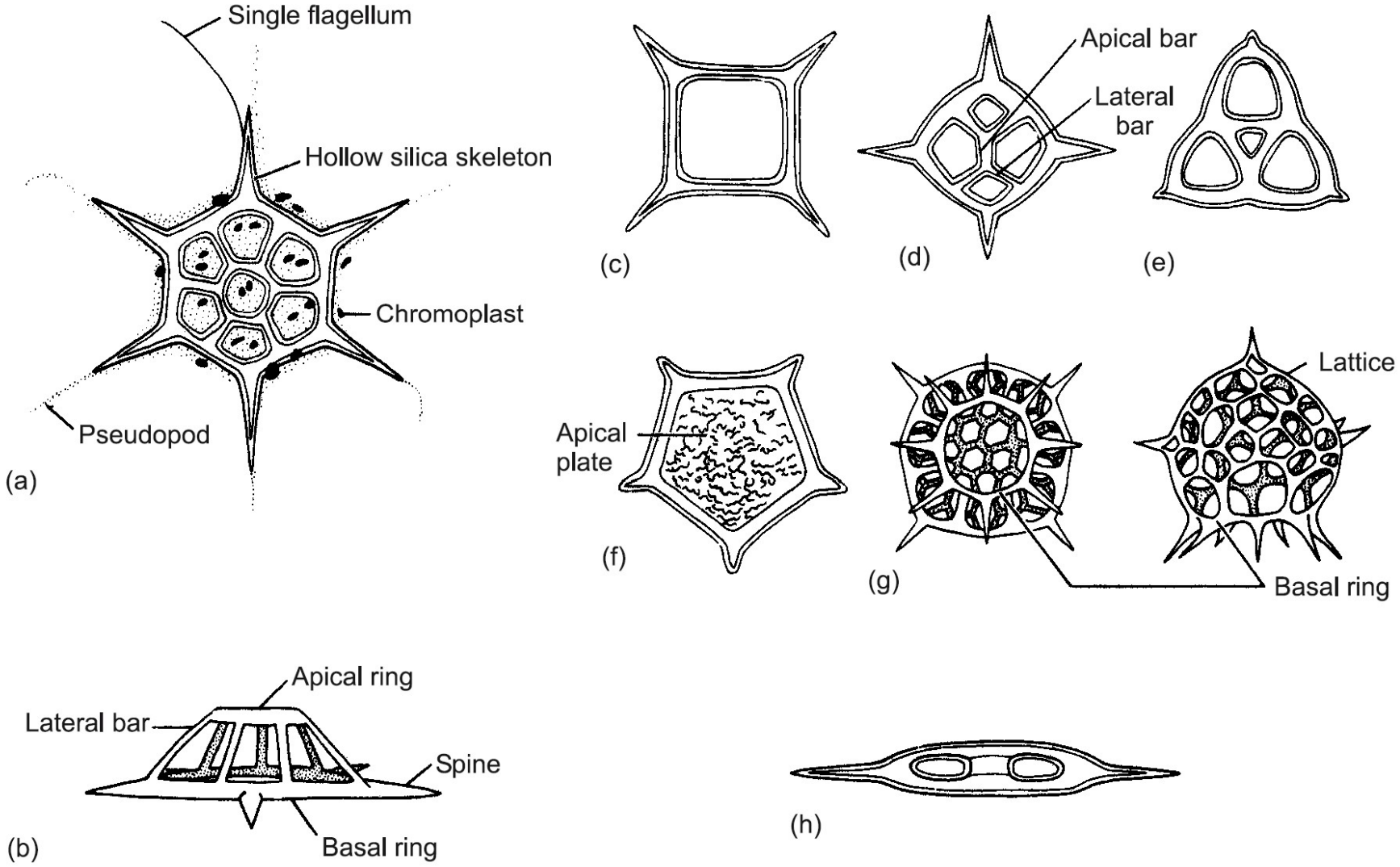
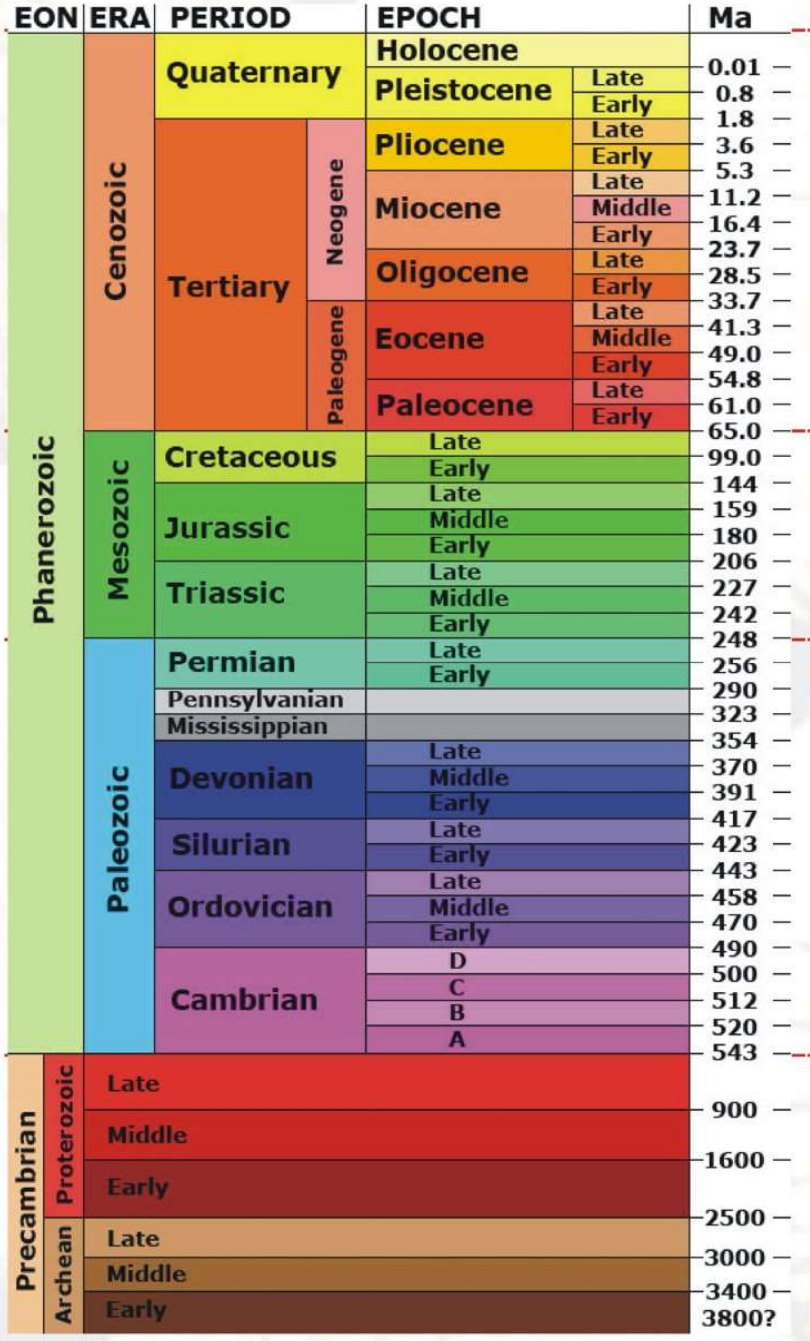
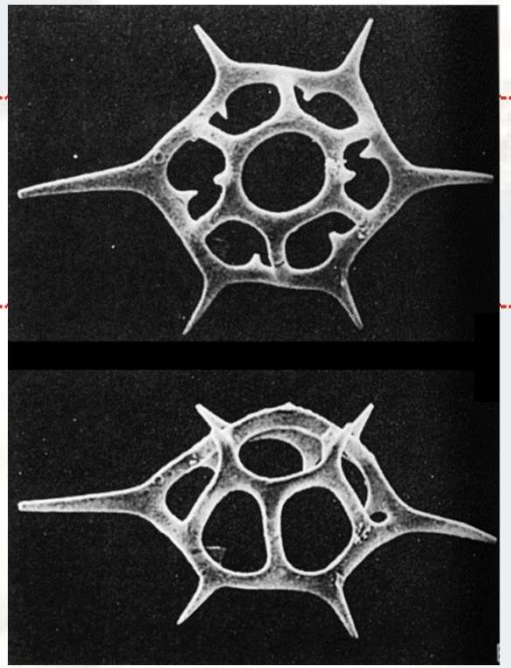
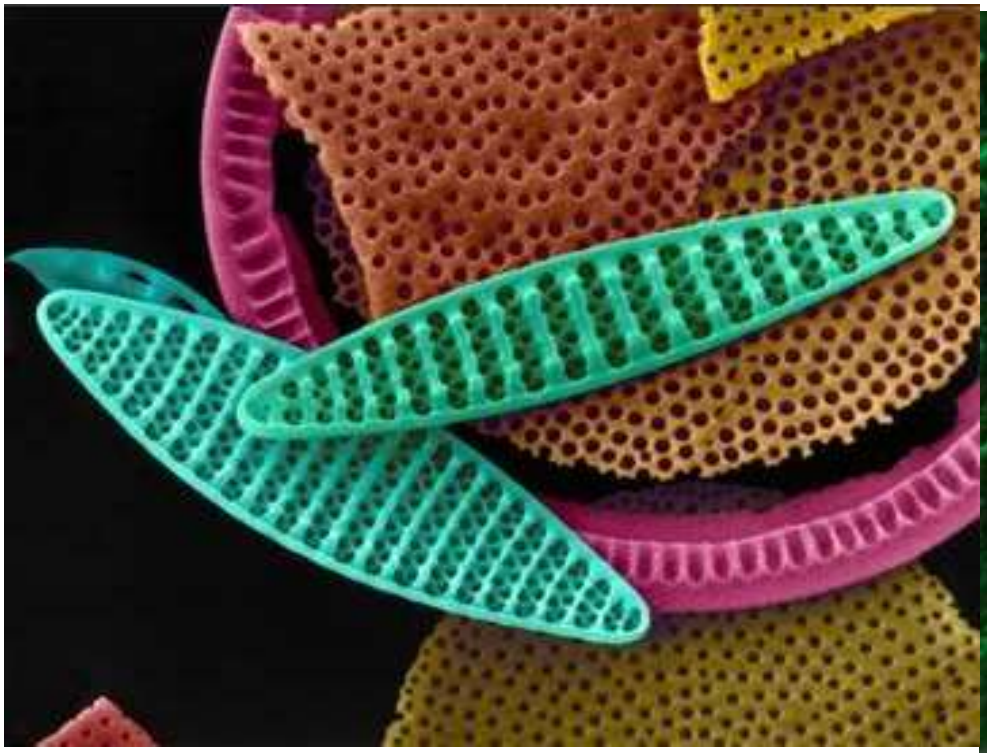


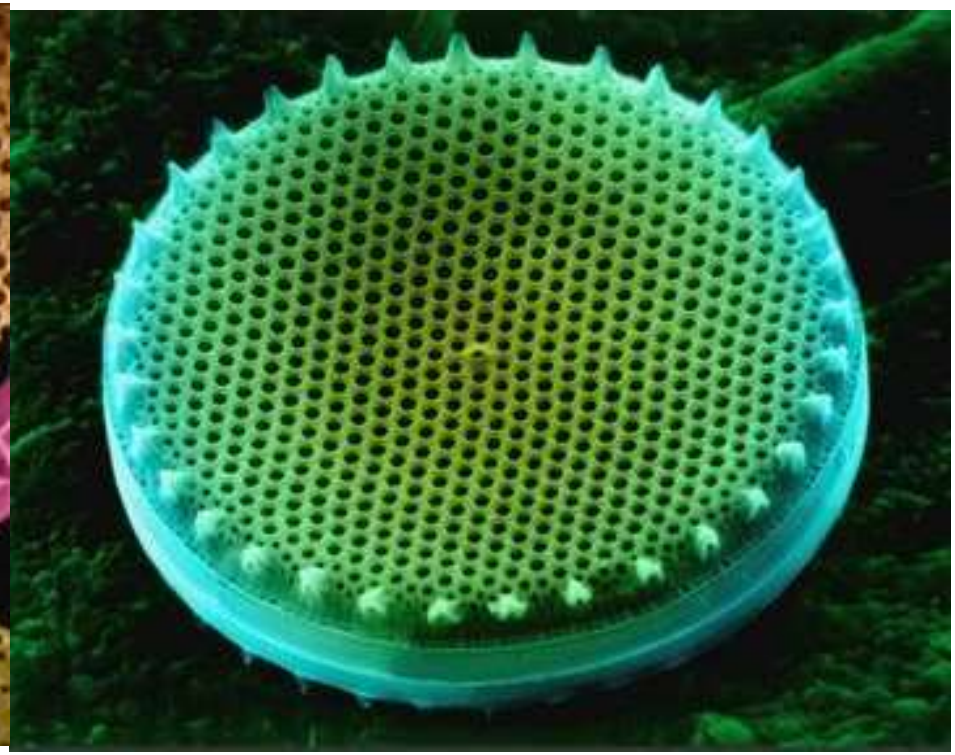
Fig. 18.1 Silicoflagellates. (a) Living cell and skeleton of *Distephanus* ×267. (b) Side view of *Distephanus* skeleton ×267. (c) *Mesocena* ×533. (d) *Dictyocha* ×400. (e) *Corbisema* ×533. (f) *Vallacerta* ×446. (g) *Cannopilus* ×500. (h) *Naviculopsis* ×375. ((a) Modified from Marshall 1934.)



Silicoflagellata



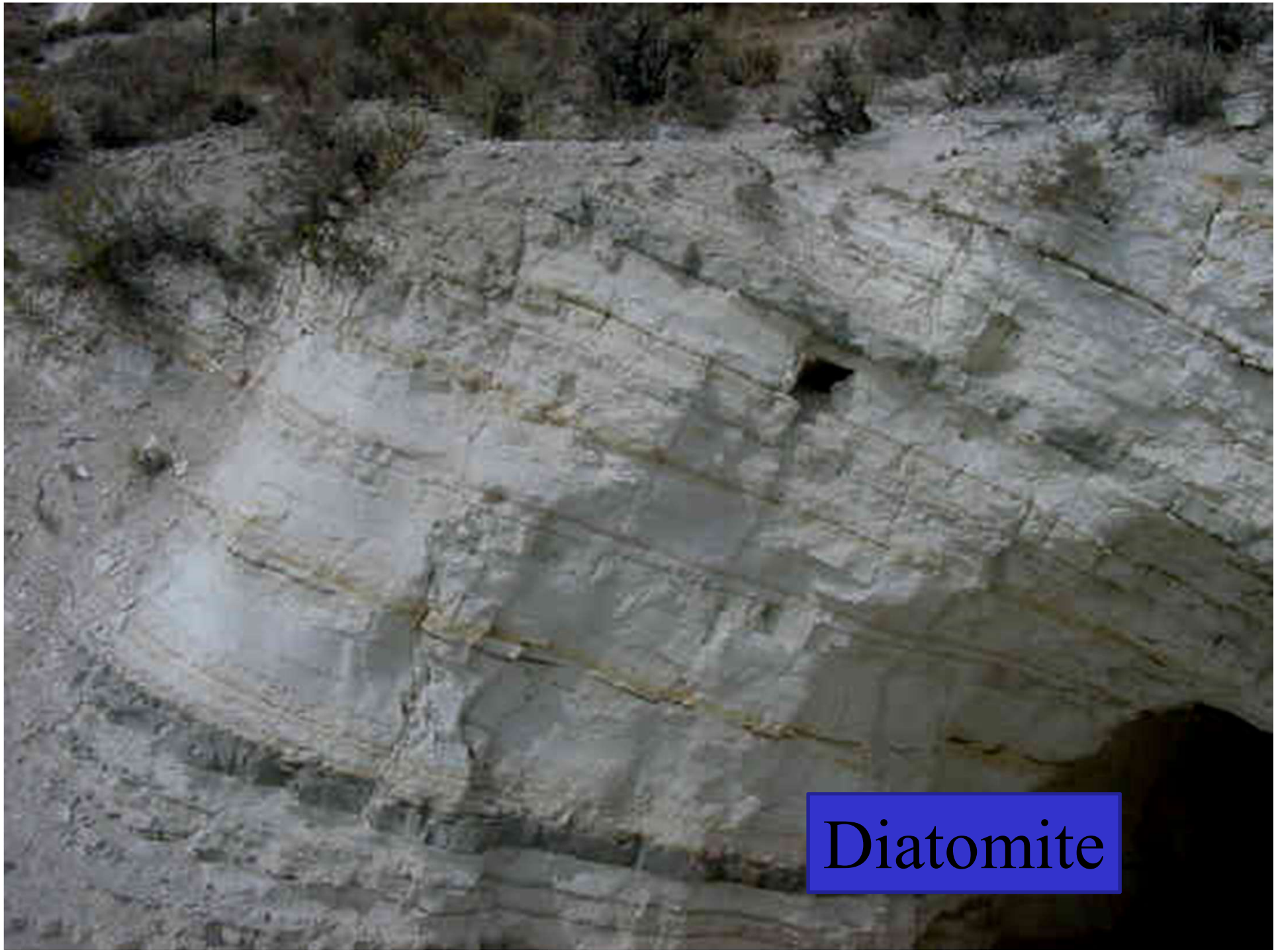


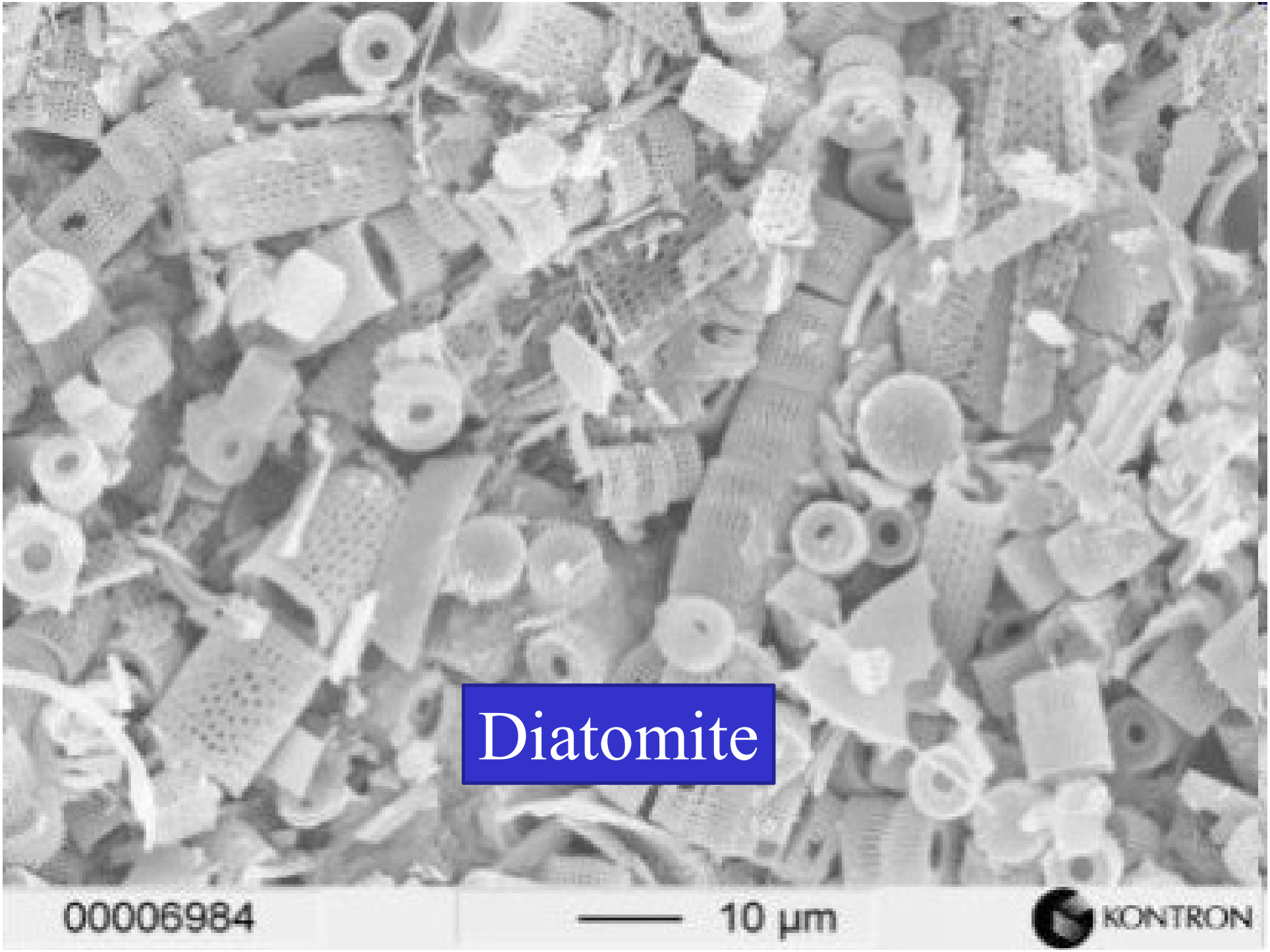


Bacillariophyta (Diatomee)

Sempre presenti insieme ai radiolari

Phytoplankton fotosintetico
Planctonici o bentonici (semisessili)
Da acque dolci a marine
Abbondanti alle alte latitudini, acque profonde, equatore.


Diatomite


Diatomite
00006984
10 µm
KONTRON

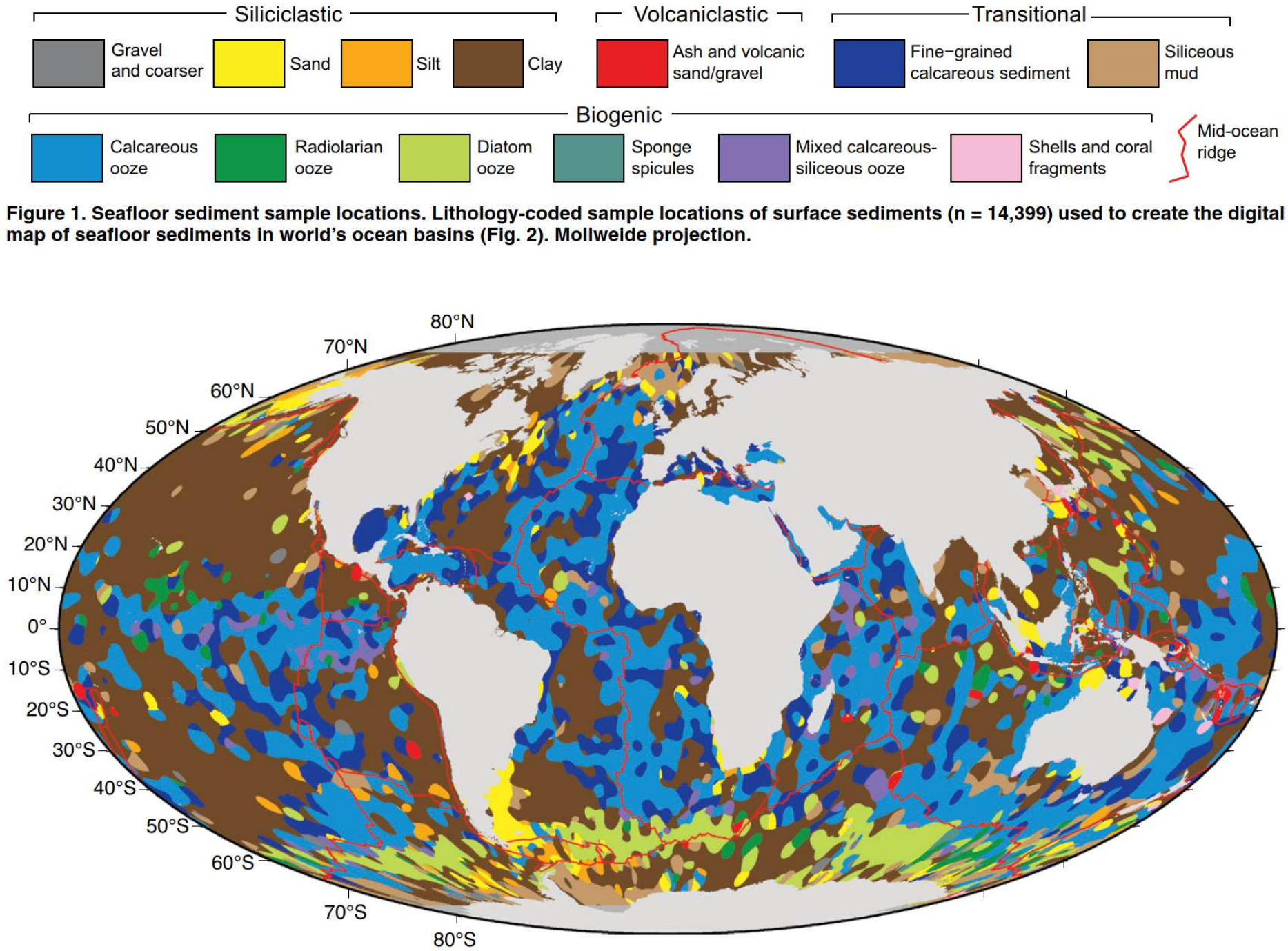


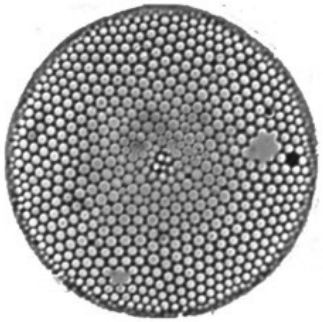
Figure 1. Seafloor sediment sample locations. Lithology-coded sample locations of surface sediments (n = 14,399) used to create the digital map of seafloor sediments in world's ocean basins (Fig. 2). Mollweide projection.

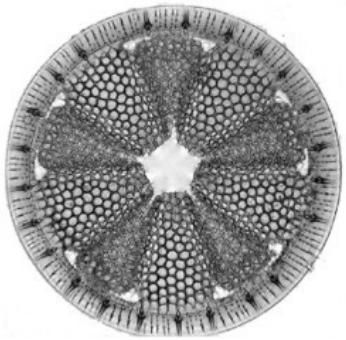
SIMMETRIA CIRCOLARE

Più galleggianti

Centrales

marine, planktic forms



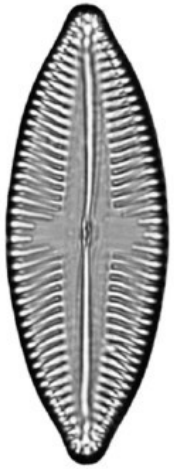


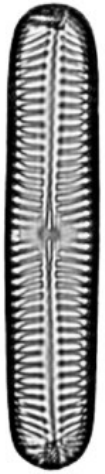
Bidhulfia

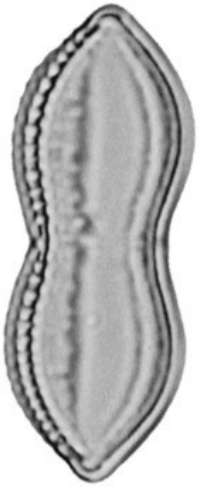
Bentoniche

Pennates

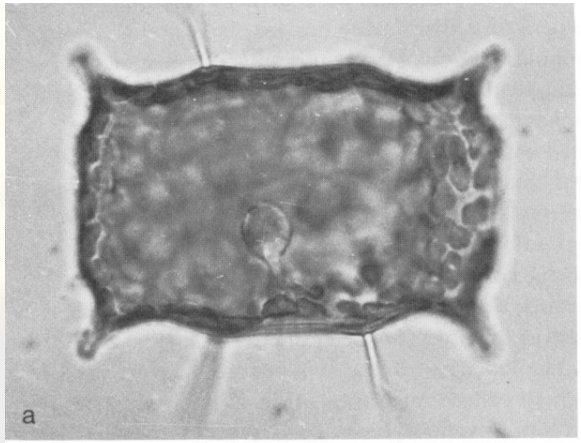
motile benthic forms that live in coastal to lacustrine settings.







SIMMETRIA BILATERALE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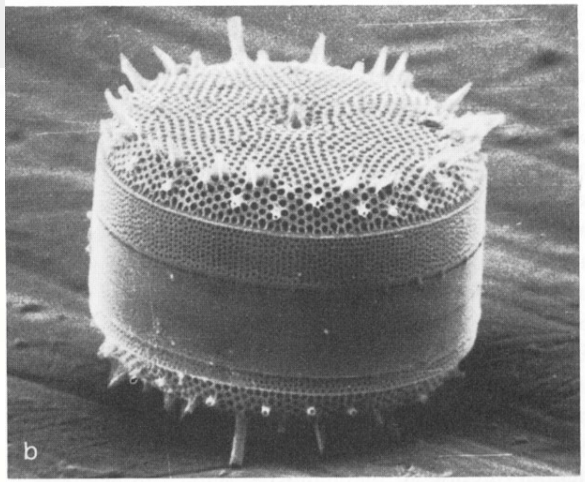
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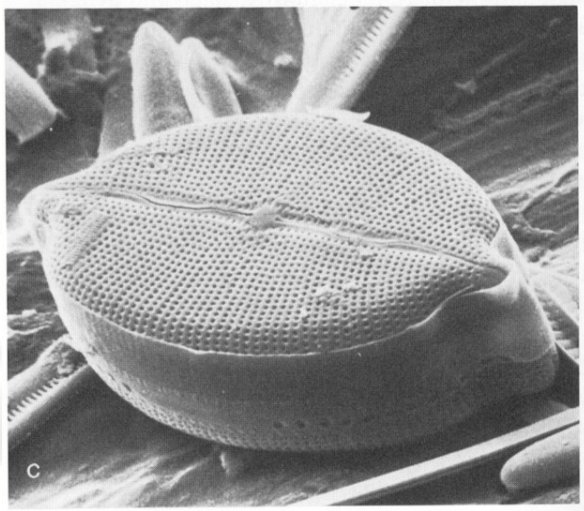
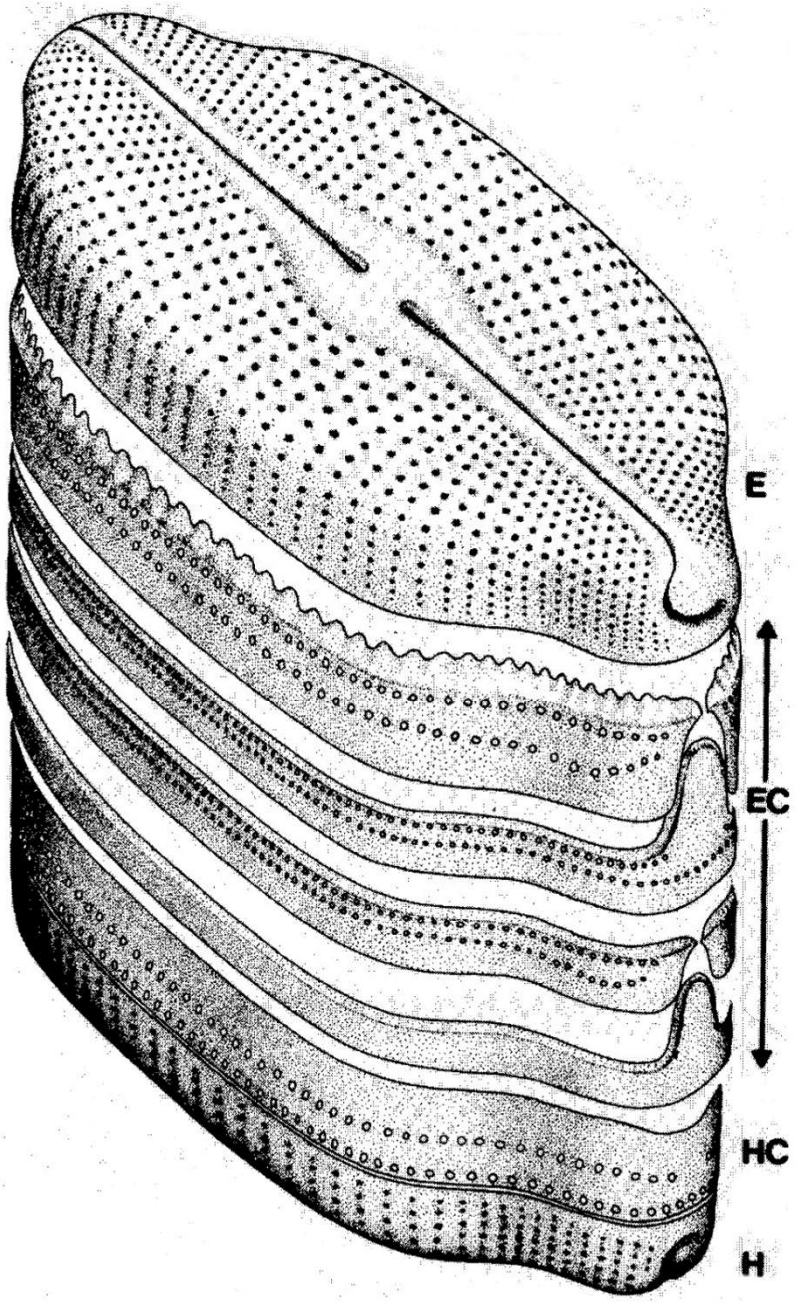
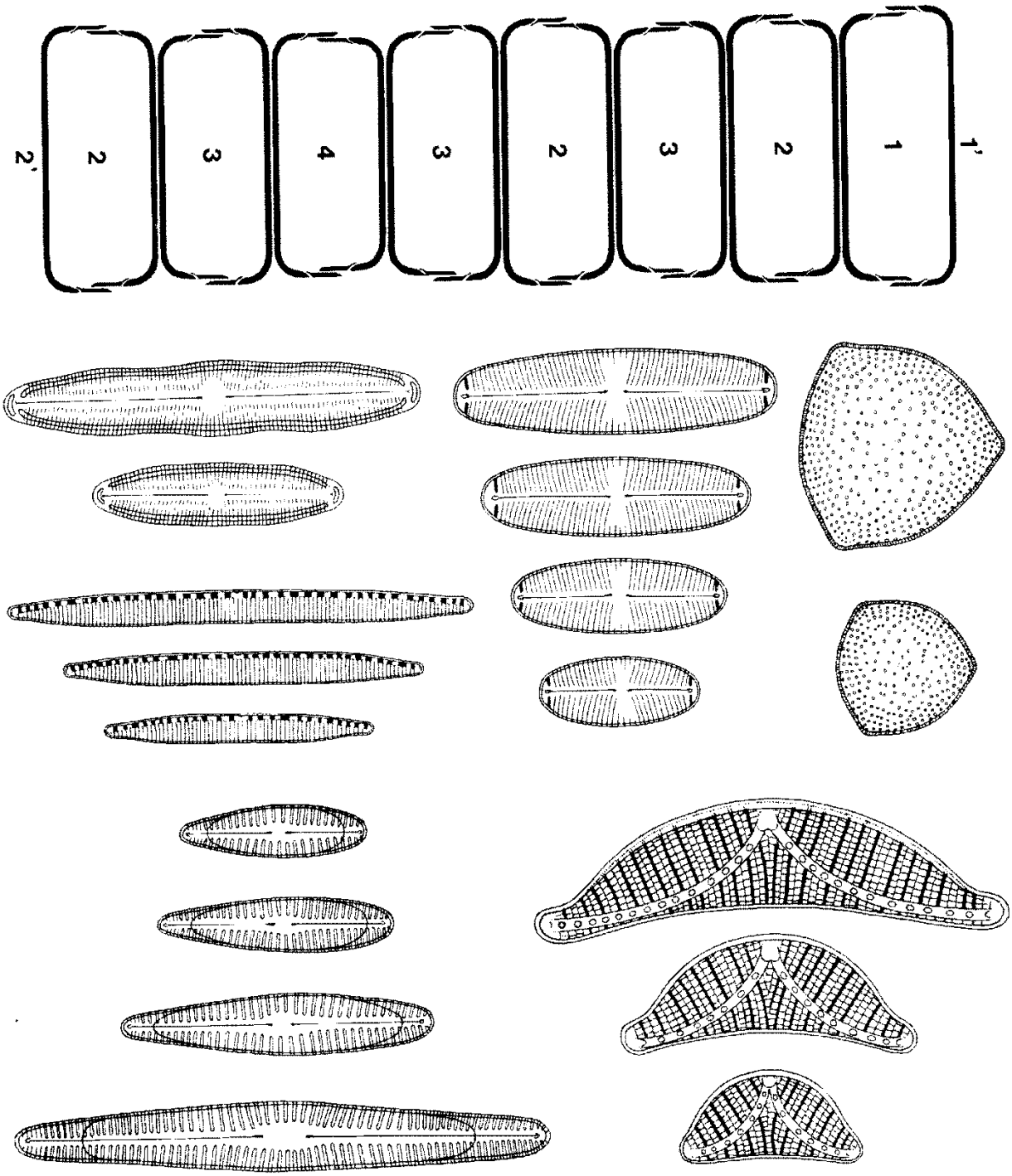

c


E
EC
HC
H


2'
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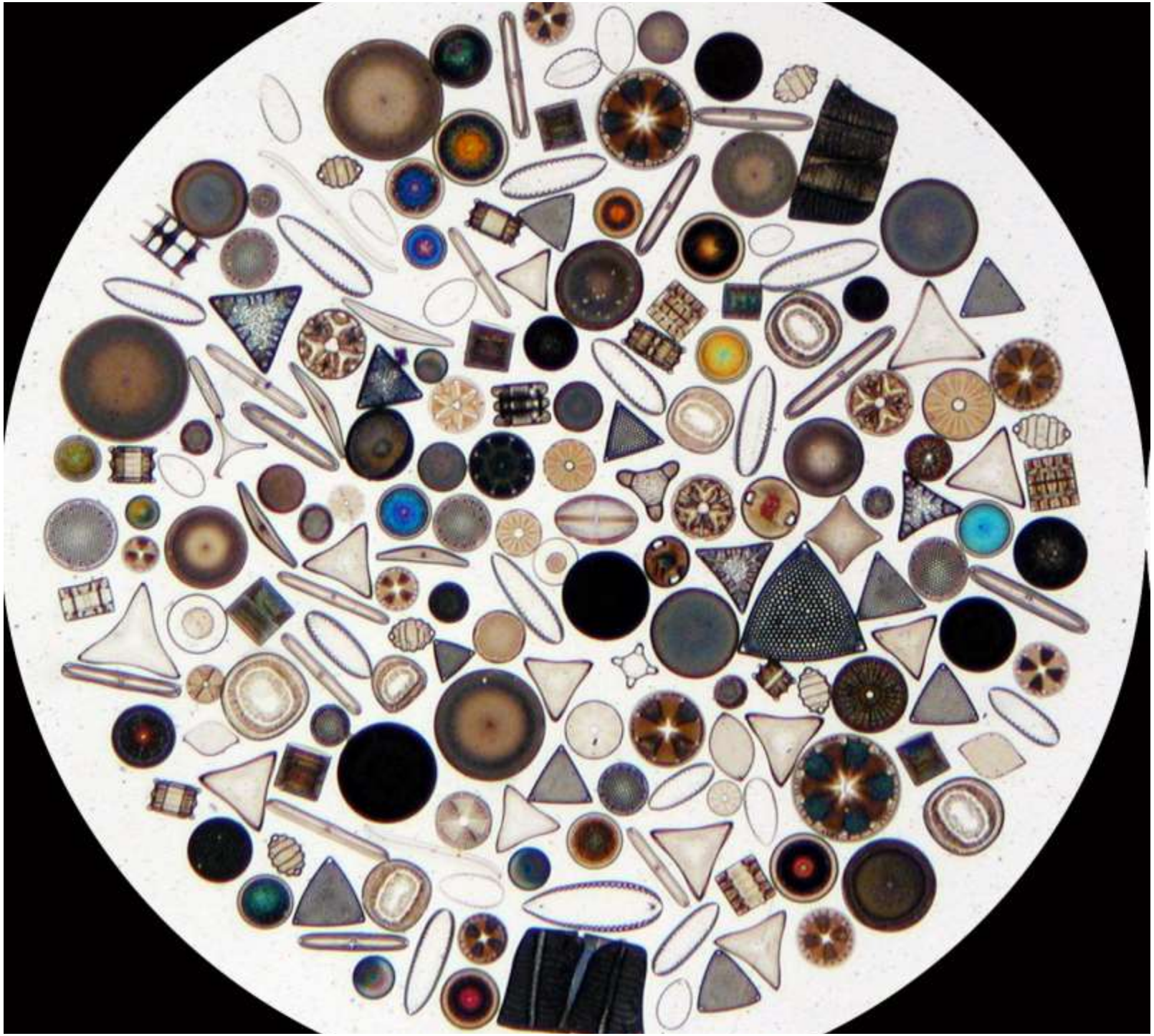
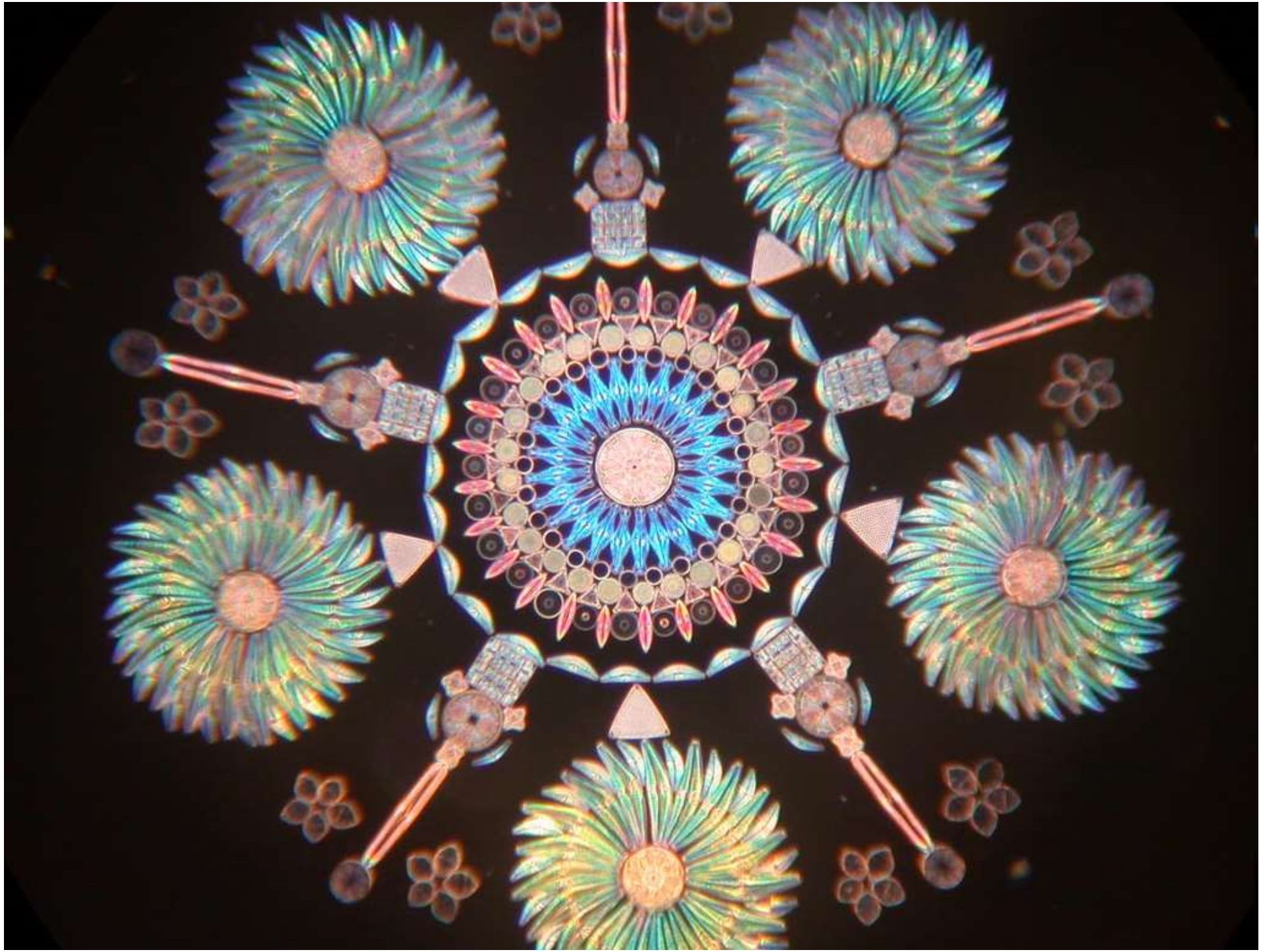
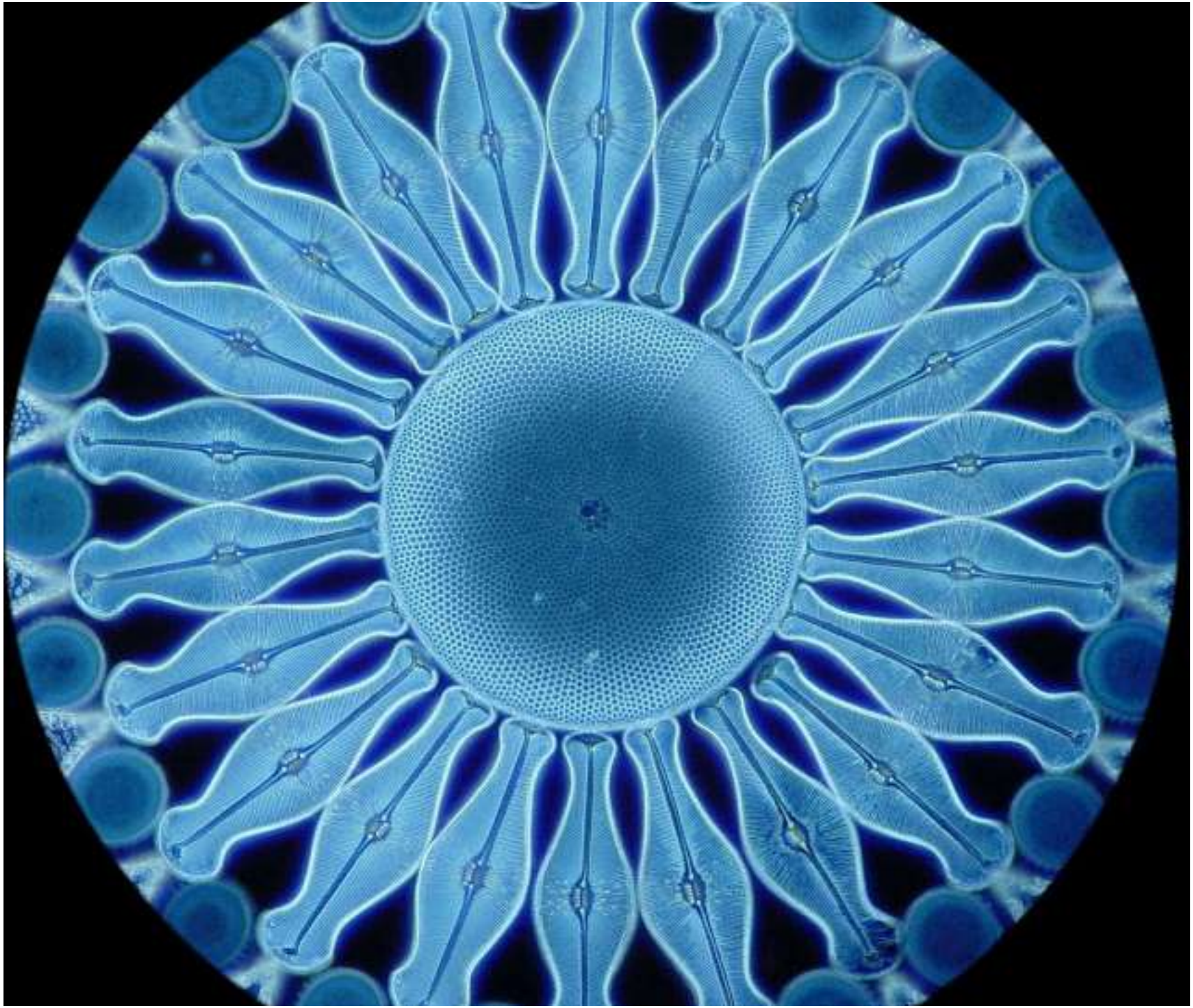
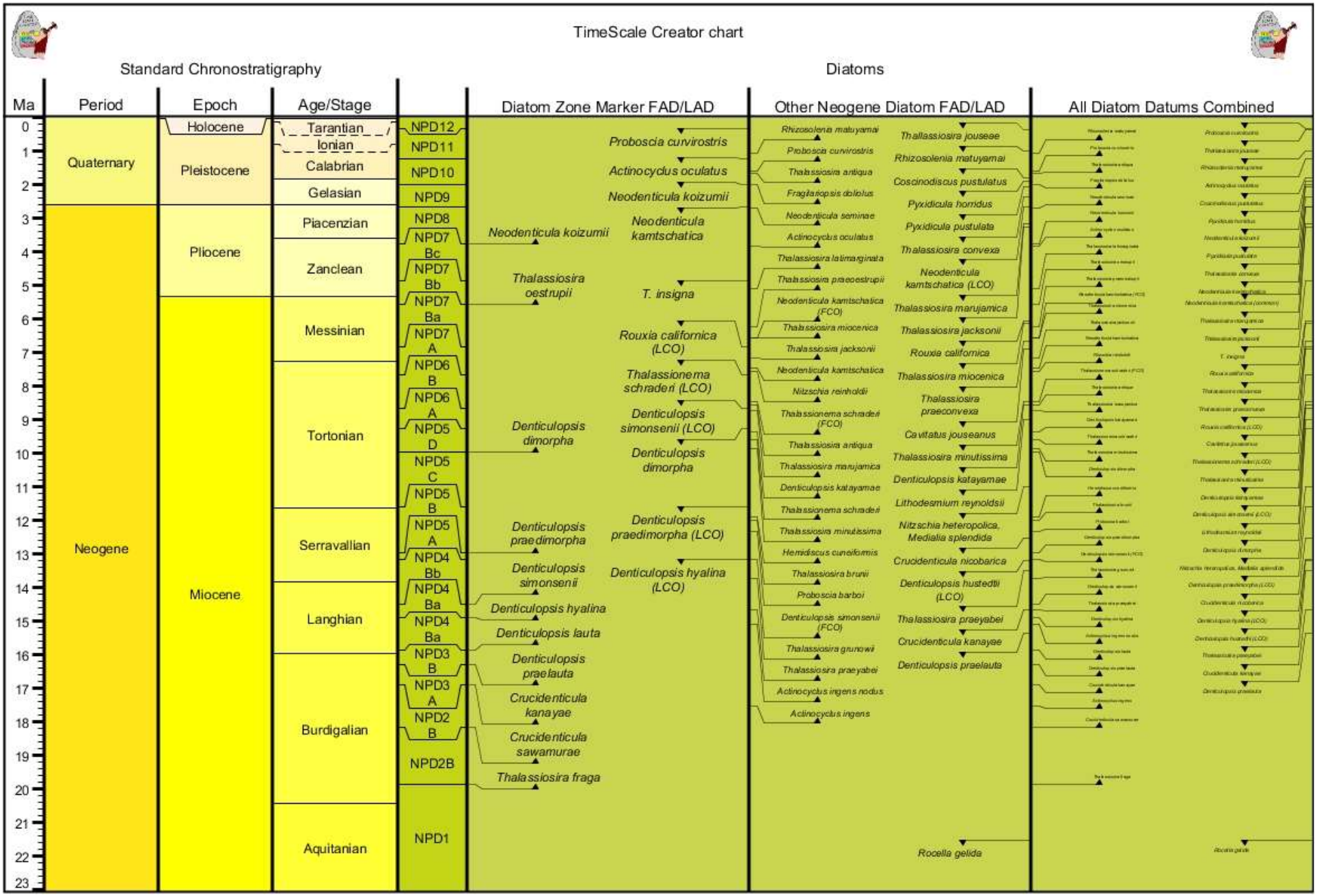
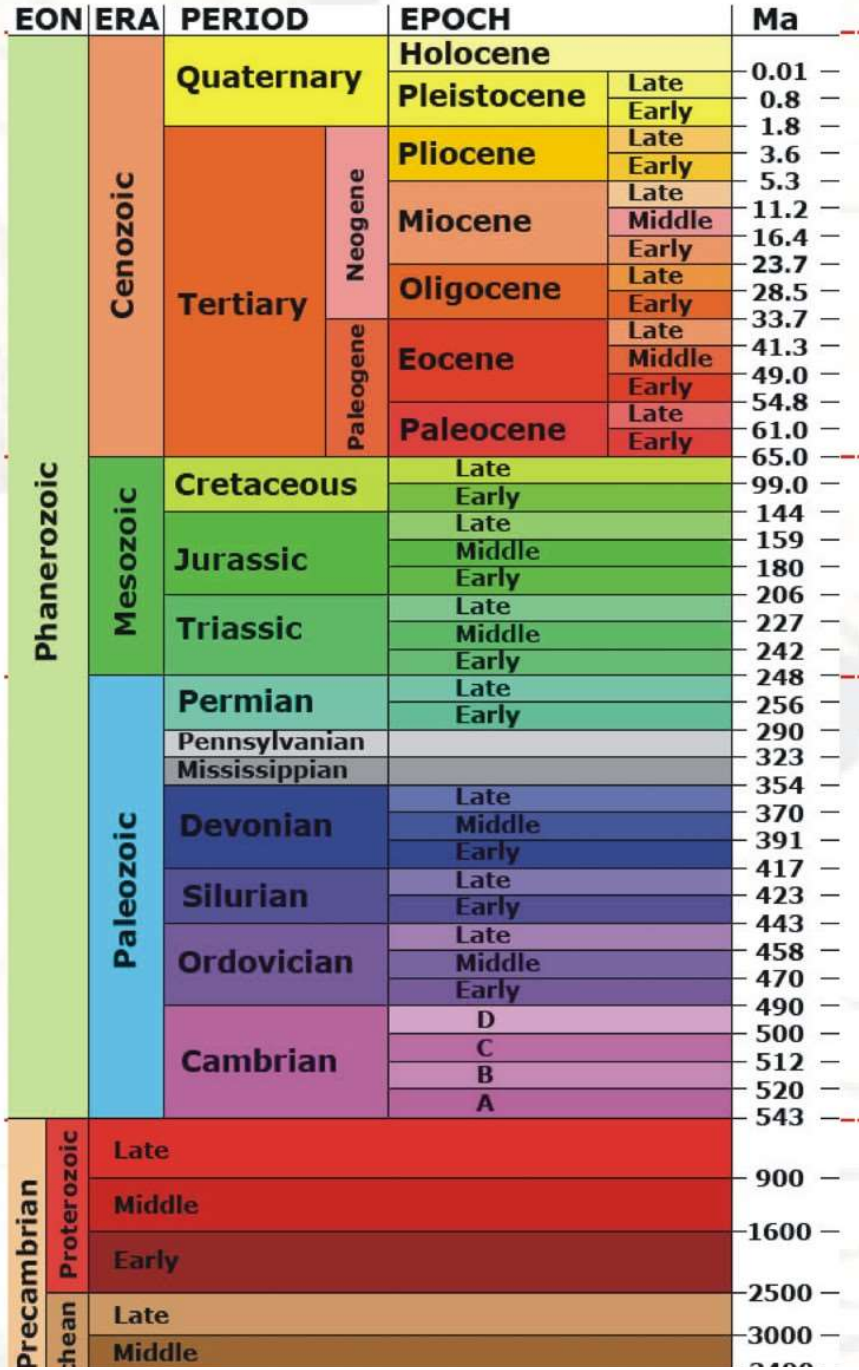
4
3
2
3
2
1
1'



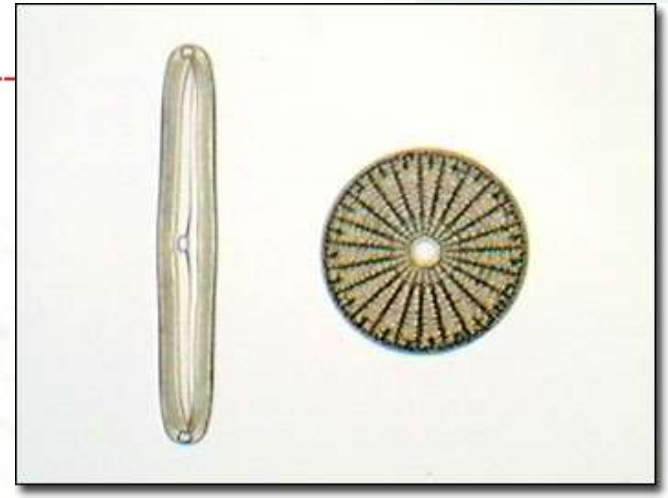





TimeScale Creator chart
Standard Chronostratigraphy
Diatoms
Ma
Period
Epoch
Age/Stage
Diatom Zone Marker FAD/LAD
Other Neogene Diatom FAD/LAD
All Diatom Datums Combined
Quaternary
Neogene
Holocene
Pleistocene
Pliocene
Miocene
Tarantian
Ionian
Calabrian
Gelasian
Piacenzian
Zanclean
Messinian
Tortonian
Serravallian
Langhian
Burdigalian
Aquitanian
NPD12
NPD11
NPD10
NPD9
NPD8
NPD7 Bc
NPD7 Bb
NPD7 Ba
NPD7 A
NPD6 B
NPD6 A
NPD5 D
NPD5 C
NPD5 B
NPD5 A
NPD4 Bb
NPD4 Ba
NPD4 Ba
NPD3 B
NPD3 A
NPD2 B
NPD2B
NPD1
Neodenticula koizumii
Thalassiosira oestrupii
Denticulopsis dimorpha
Denticulopsis praedimorpha
Denticulopsis simonsenii
Denticulopsis hyalina
Denticulopsis lauta
Denticulopsis praelauta
Crucidenticula kanayae
Crucidenticula sawamurae
Thalassiosira fraga
Proboscia curvirostris
Actinocyclus oculatus
Neodenticula koizumii
Neodenticula kamtschatica
T. insigna
Rouxia californica (LCO)
Thalassionema schraderi (LCO)
Denticulopsis simonsenii (LCO)
Denticulopsis dimorpha
Denticulopsis praedimorpha (LCO)
Denticulopsis hyalina (LCO)
Rhizosolenia matuyamai
Proboscia curvirostris
Thalassiosira antigua
Fragilariopsis doliolus
Neodenticula seminae
Actinocyclus oculatus
Thalassiosira latimarginata
Thalassiosira praeoestrupii
Neodenticula kamtschatica (FCO)
Thalassiosira miocenica
Thalassiosira jacksonii
Neodenticula kamtschatica
Nitzschia reinholdii
Thalassionema schraderi (FCO)
Thalassiosira antigua
Thalassiosira marujamica
Denticulopsis katayamae
Thalassionema schraderi
Thalassiosira minutissima
Hemidiscus cuneiformis
Thalassiosira brunii
Proboscia barboi
Denticulopsis simonsenii (FCO)
Thalassiosira grunowii
Thalassiosira praeyabei
Actinocyclus ingens nodus
Actinocyclus ingens
Thalassiosira jouseae
Rhizosolenia matuyamai
Coscinodiscus pustulatus
Pyxidicula horridus
Pyxidicula pustulata
Thalassiosira convexa
Neodenticula kamtschatica (LCO)
Thalassiosira marujamica
Thalassiosira jacksonii
Rouxia californica
Thalassiosira miocenica
Thalassiosira praeconvexa
Cavitatus jouseanus
Thalassiosira minutissima
Denticulopsis katayamae
Lithodesmium reynoldsii
Nitzschia heteropolica, Medialia splendida
Crucidenticula nicobarica
Denticulopsis hustedtii (LCO)
Thalassiosira praeyabei
Crucidenticula kanayae
Denticulopsis praelauta
Rocella gelida



Bacillariophyta



Adl et al., 2012

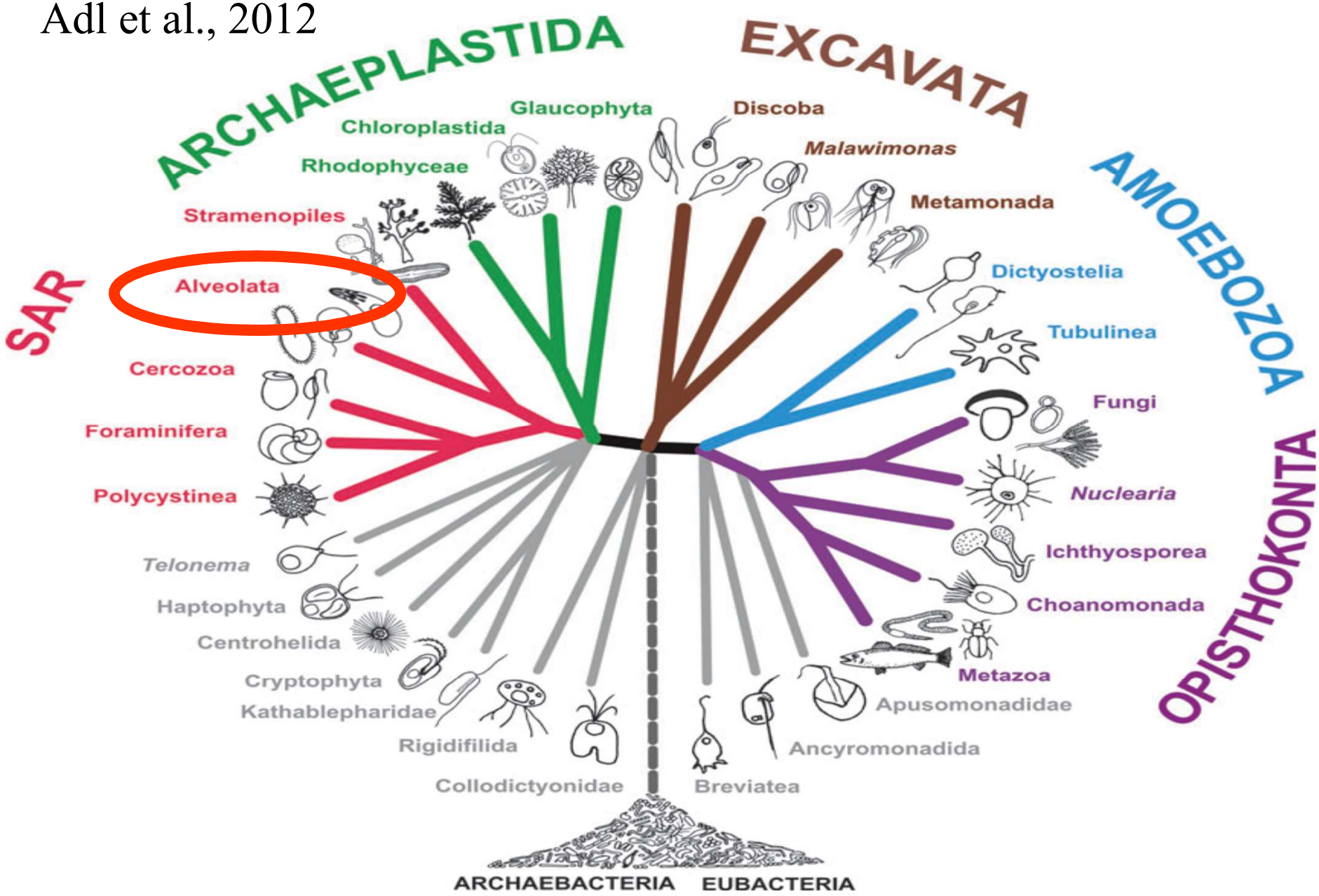
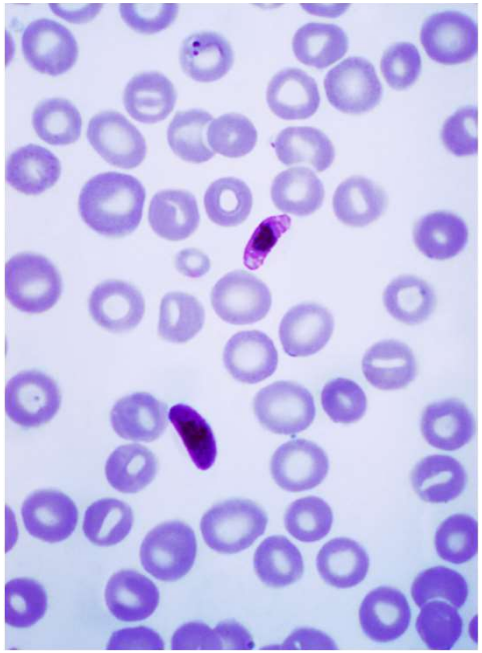
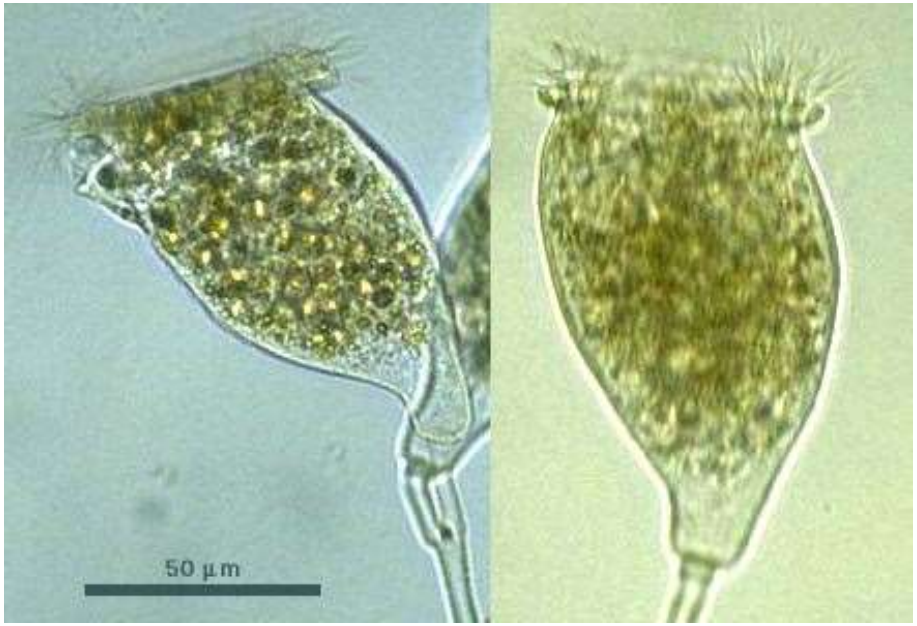


Fig. 1. A view of eukaryote phylogeny reflecting the classification presented herein.

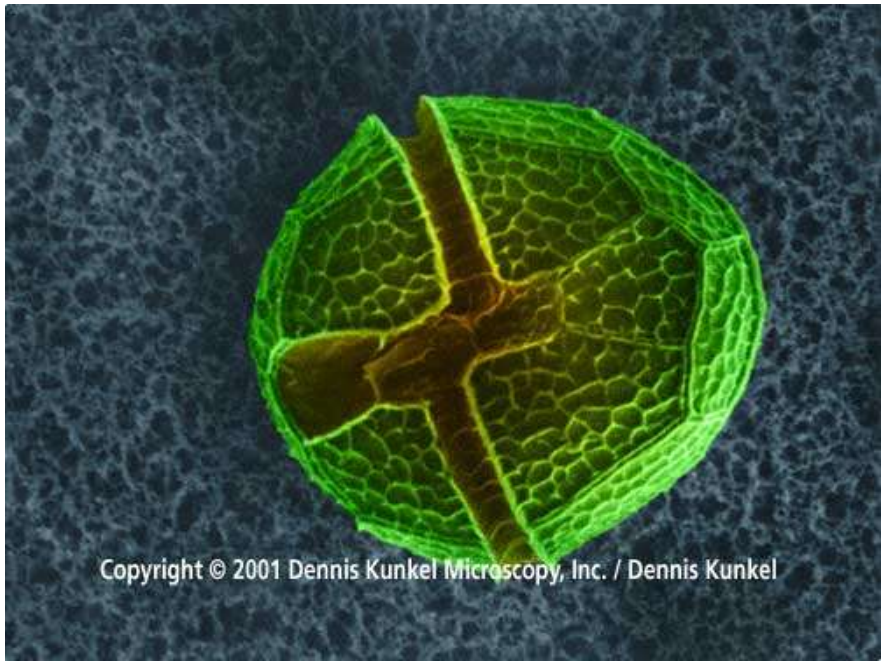
ALVEOLATA:
Apicomplexa
Ciliophora
Dinoflagellata

Plasmodium falciparum





Campanella sp.

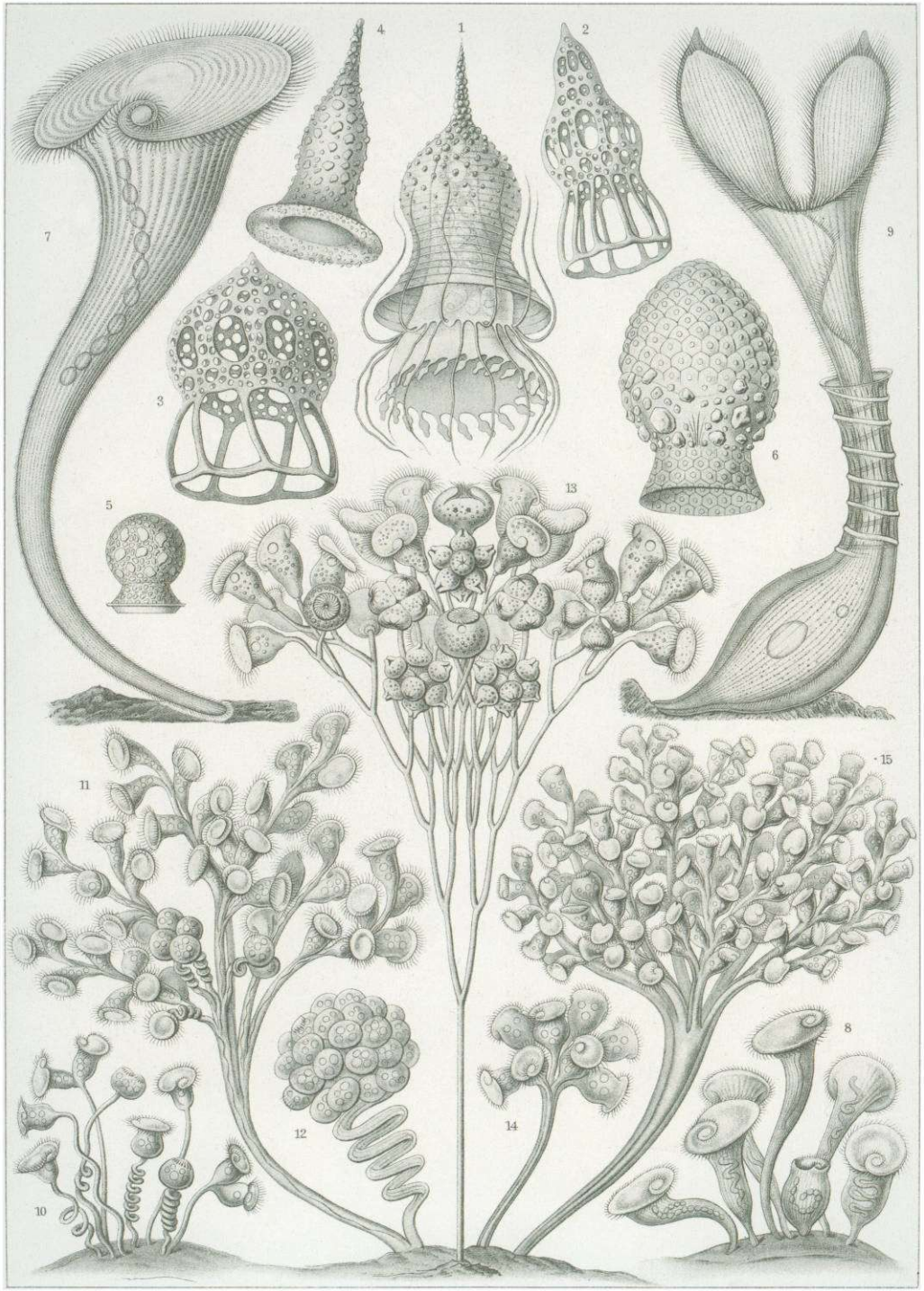


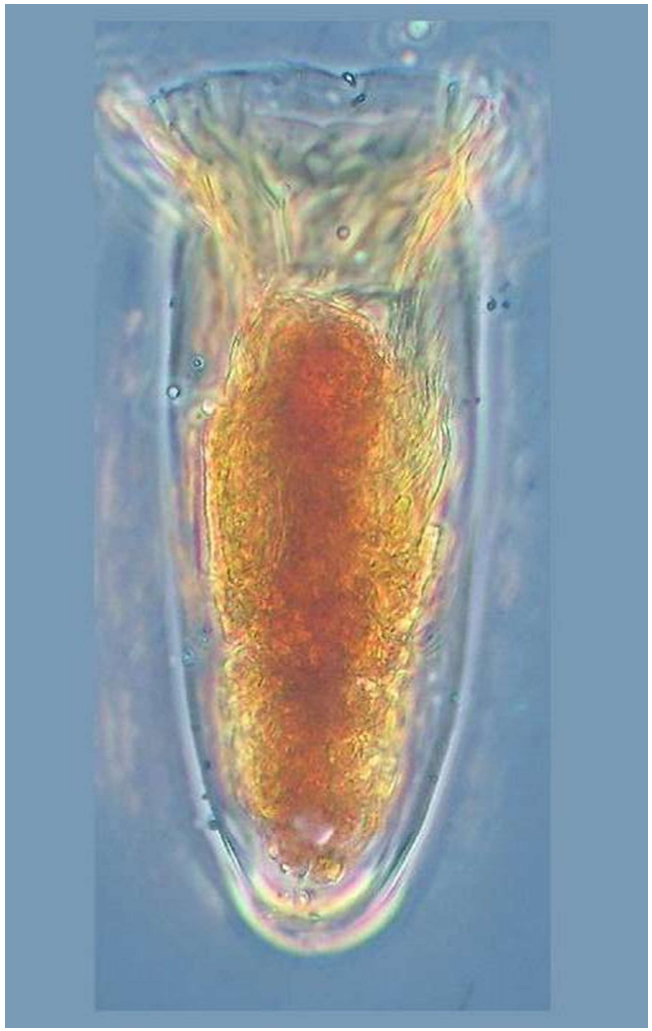
Peridinium sp.

Piccoli cristalli di quarzo chiamati ciglia (da cui ciliophora)

Ciliophora

- Marine ciliate protozoans;
- Ciclia for locomotion and food gathering;
- Predatori di batteri, alghe, coccoliti, dinoflagellati
- Guscio (Lorica) fino a 10 volte più grande della cellula;
- Loriche moderne sono agglutinate (quarzo, diatomee, coccoliti);
- Loriche fossili sono carbonatiche





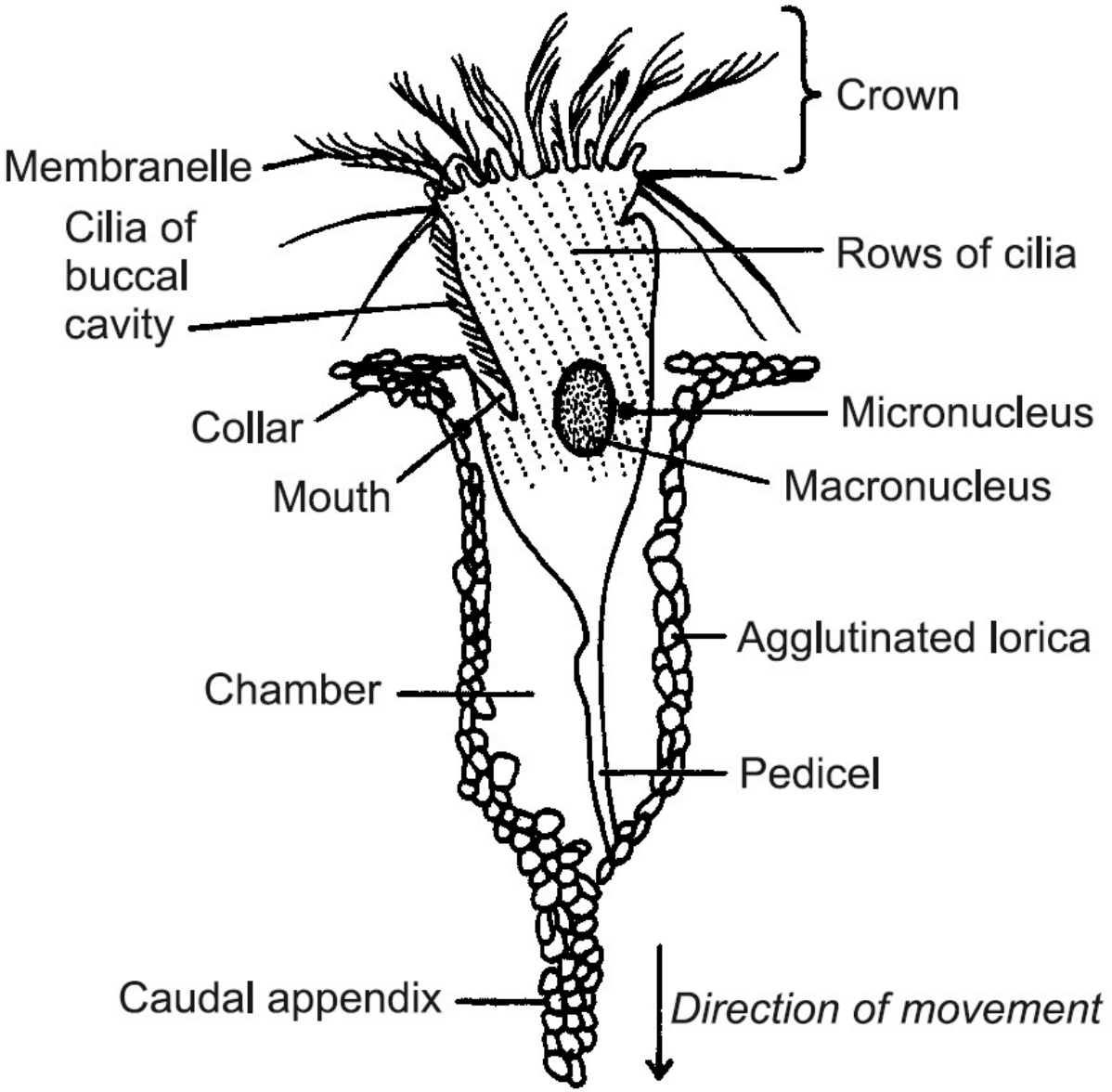
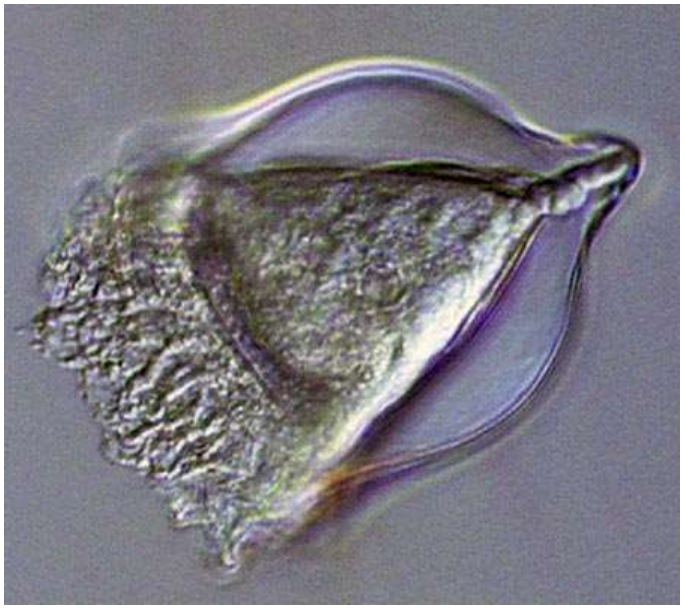
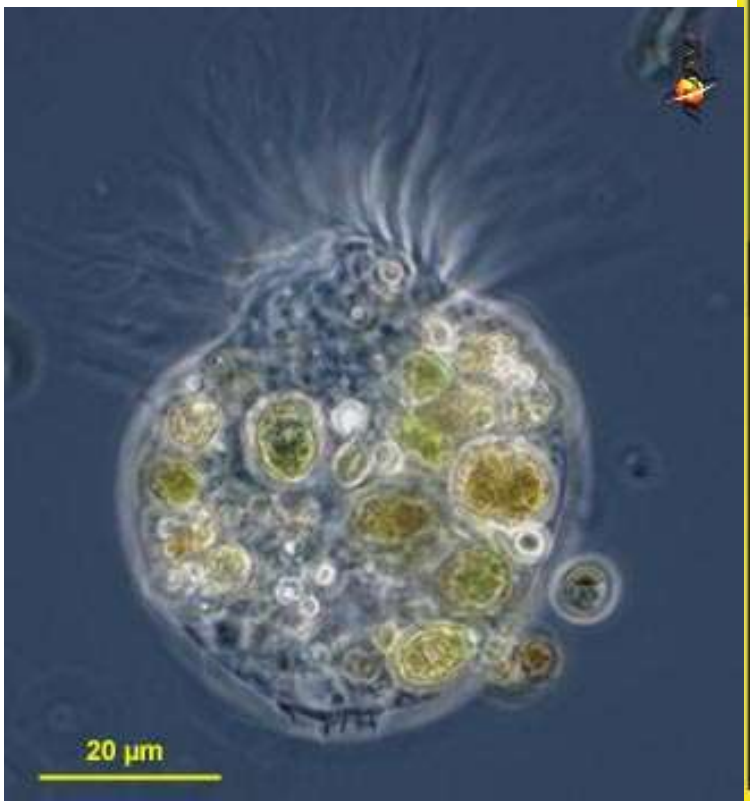
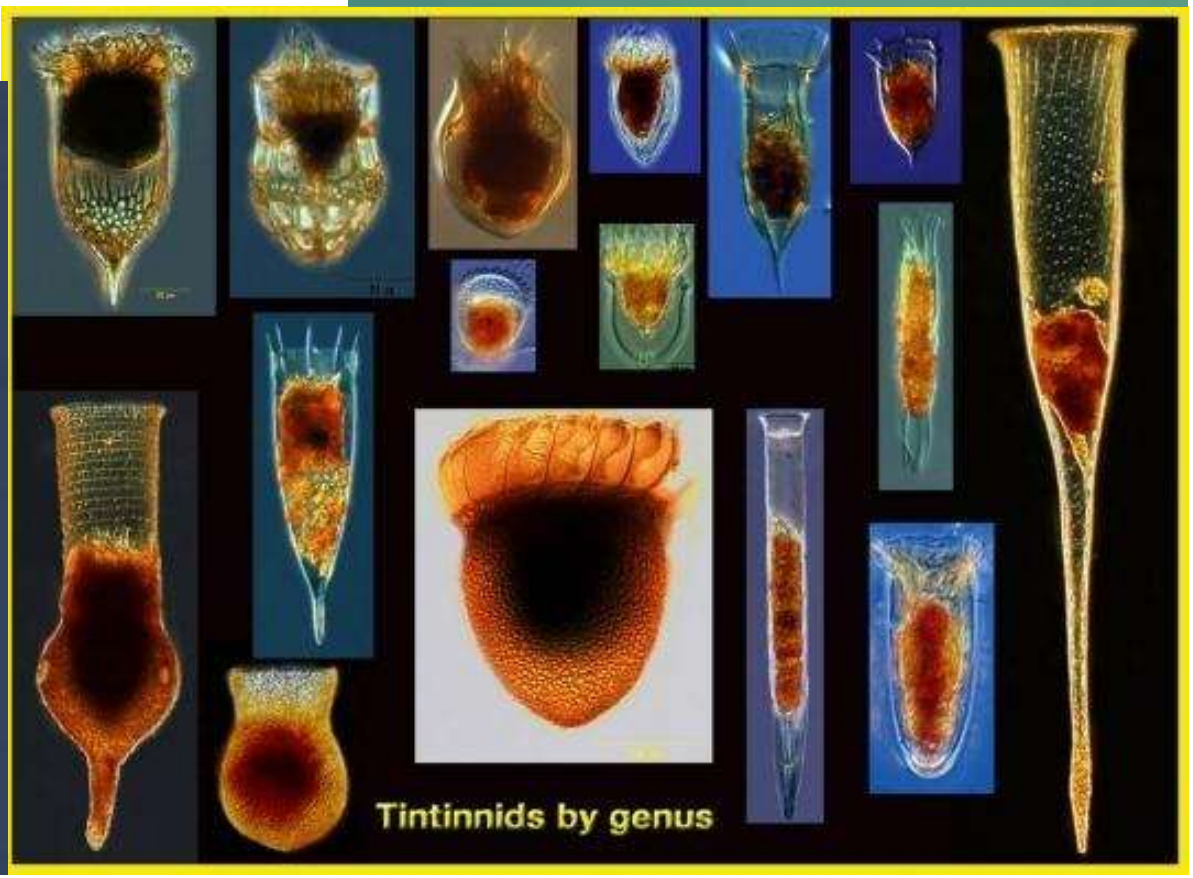


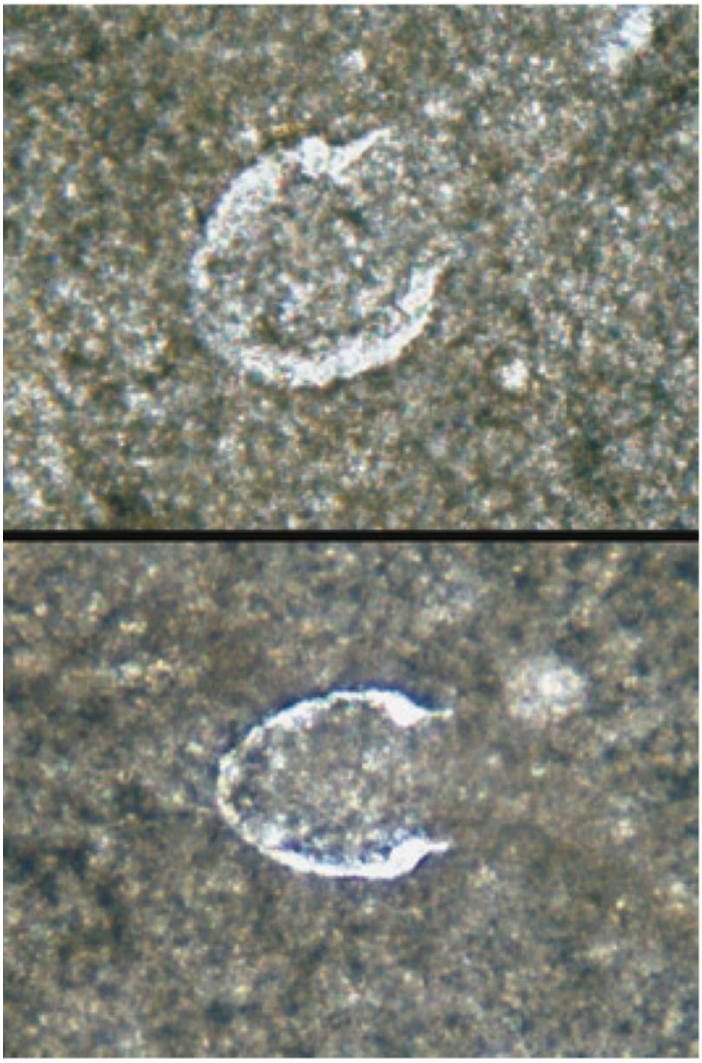
Fig. 19.1 Recent *Tintinnopsis*, about ×400. (Modified from Colom 1948, after Fremiet.)

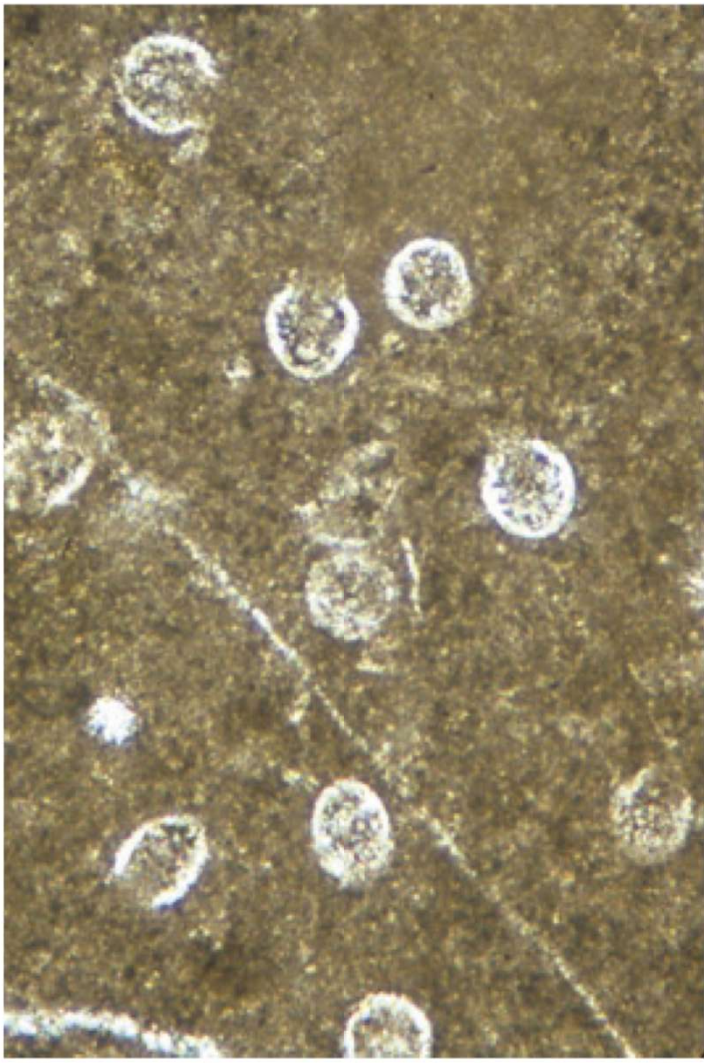


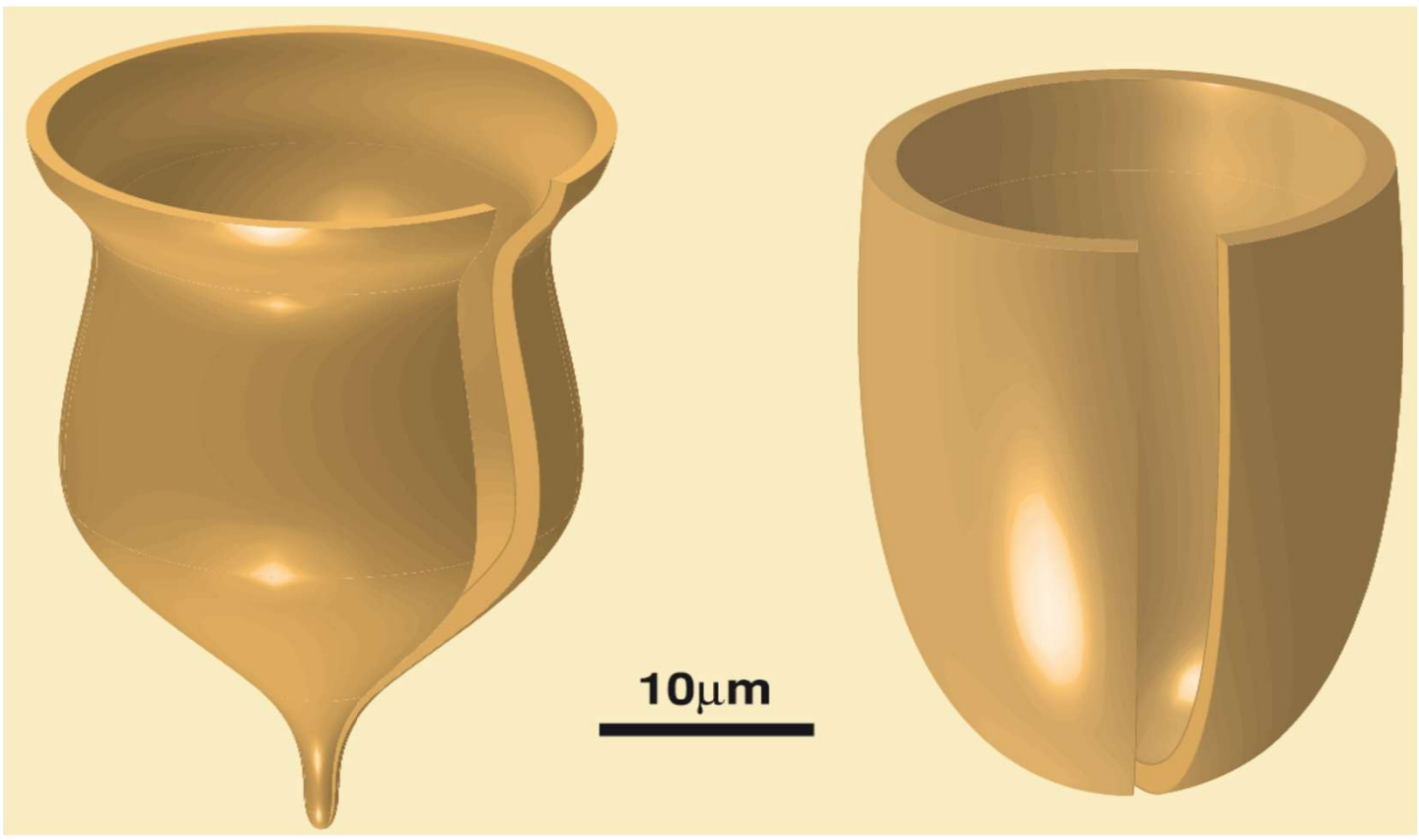


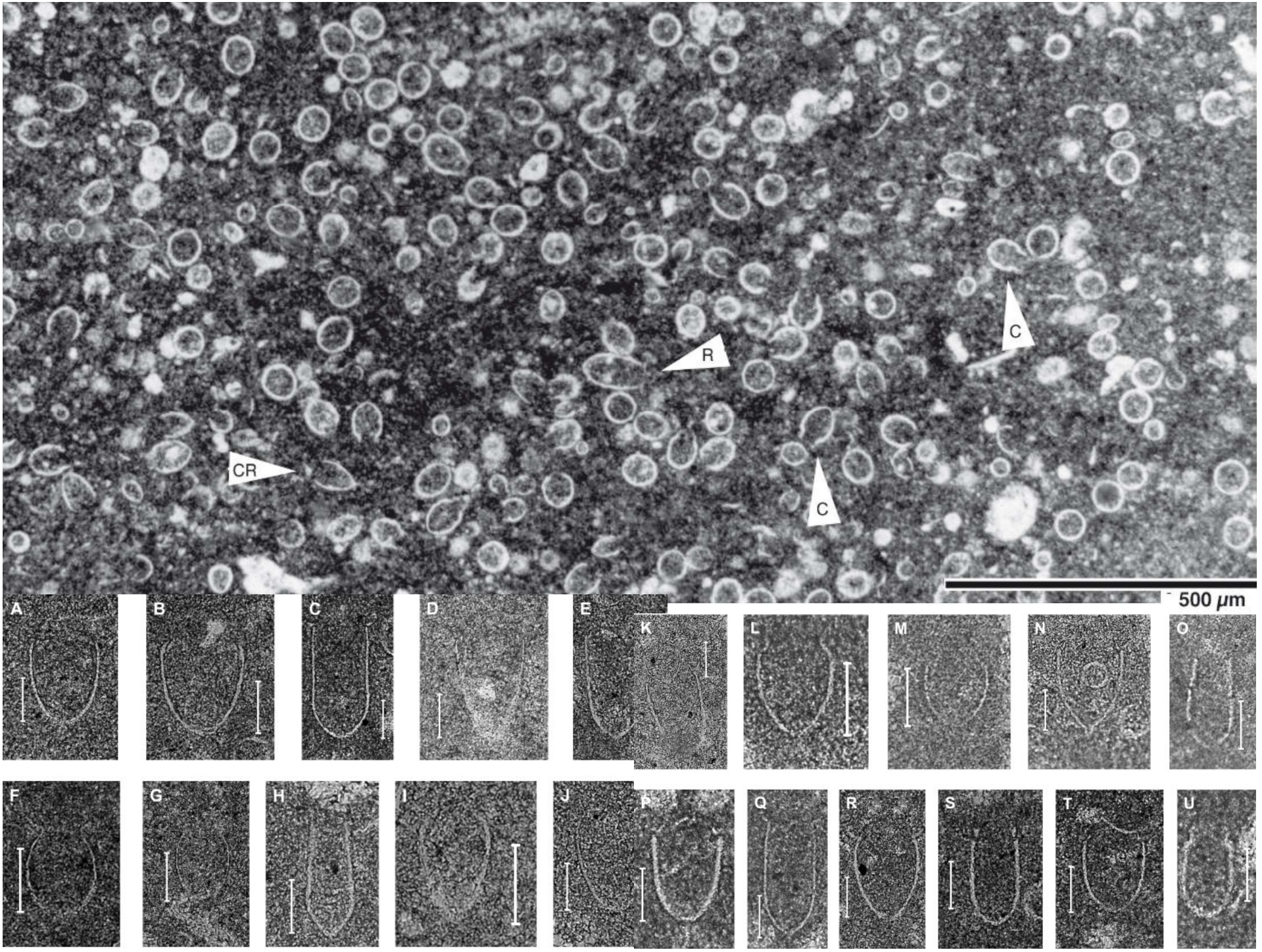


TINTINNIDI (90% dei ciliophora)






10μm


CR
R
C
C
500 μm
A
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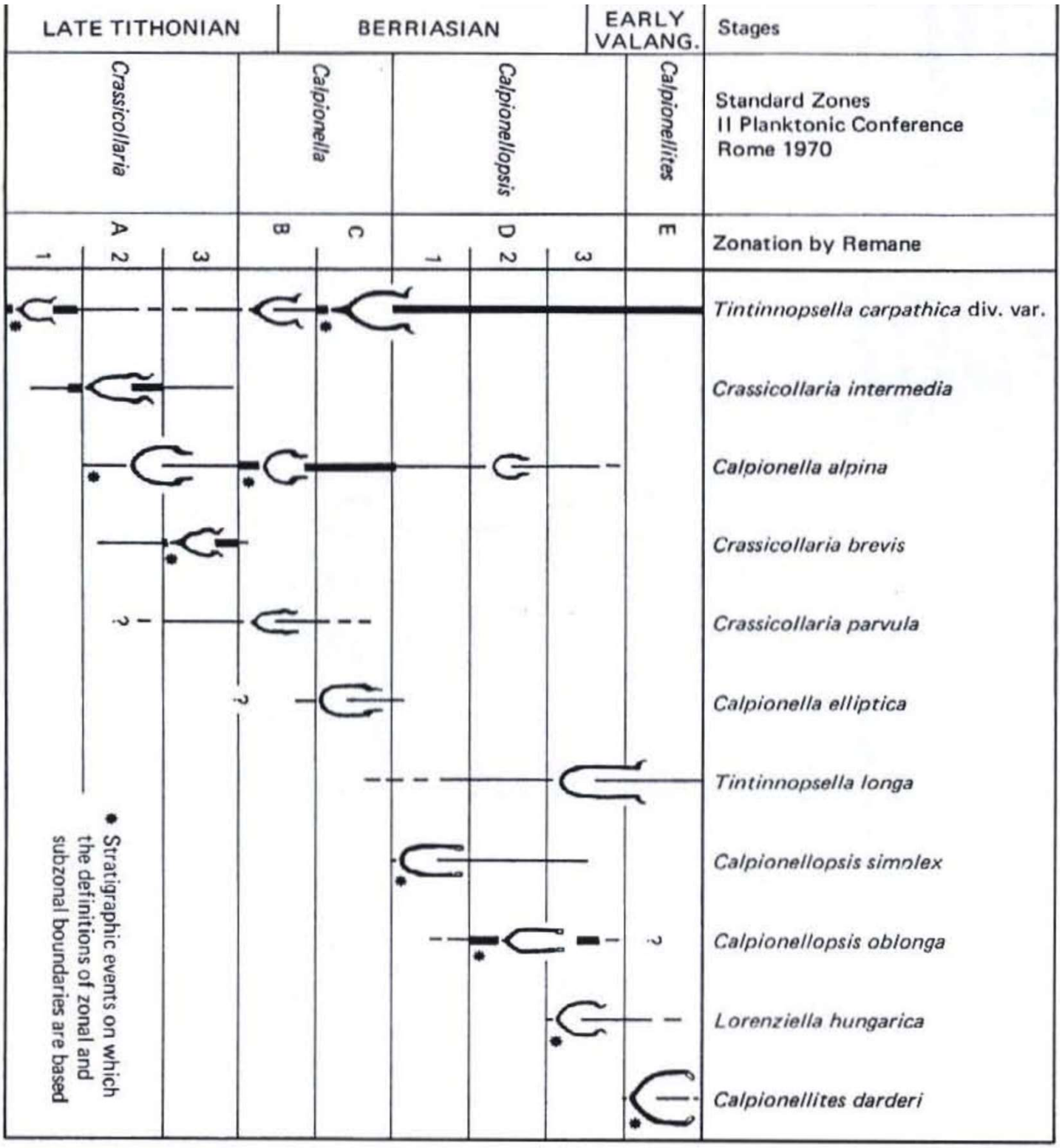

LATE TITHONIAN
BERRIASIAN
EARLY VALANG.
Stages
Crassicollaria
Calpionella
Calpionellopsis
Calpionellites
Standard Zones
II Planktonic Conference
Rome 1970
1
A
2
3
B
C
1
D
2
3
E
Zonation by Remane
Tintinnopsella carpathica div. var.
Crassicollaria intermedia
Calpionella alpina
Crassicollaria brevis
Crassicollaria parvula
Calpionella elliptica
Tintinnopsella longa
Calpionellopsis simplex
Calpionellopsis oblonga
Lorenziella hungarica
Calpionellites darderi
• Stratigraphic events on which the definitions of zonal and subzonal boundaries are based

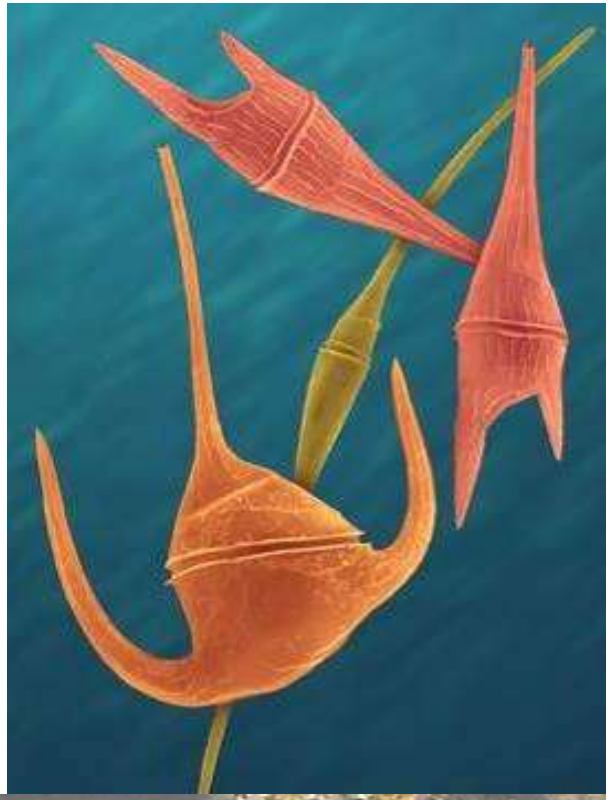
Remane 1971						Grün and Blau 1997	
Cretaceous	Valanginian		E	Tintinnopsella		gr. carpathica	Pl. 77/29-30
						gr. hungarica	Pl. 77/34-35
				Calpionellites		major	Pl. 77/27
						darderi	Pl. 77/25-26
	Berriasian		D 3	Calpionellopsis		dadayi	Pl. 77/24
						murgeanui	Pl. 77/21
			D 2			filipescui	Pl. 77/23
			D 1			oblonga	Pl. 77/16
						simplex	Pl. 77/15
			C	Calpionella		cadischiana	Pl. 77/14
			B			elliptica	Pl. 77/8
						alpina	Pl. 77/6-7
Jurassic	Tithonian		A 3	Crassicollaria		catalanoi	Pl. 77/10
			A 2			intermedia	Pl. 77/2
			A 1			remanei	
				Chitinoidella		andrusovi	Pl. 77/5
						bermudezi	
						boneti	Pl. 77/1
						dobeni	

Dinoflagellates

Organismi fotosintetici, eterotrofi, autotrofi, comunemente simbionti (zooxanthelle)

Tra gl ieucarioti più primitivi

Lasciano una ciste molto resistente nel record fossile



Their **carotenoid** pigments dinoxanthin
and peridinin give to these organisms flame-like colours and produce ‘red tides’ when populations bloom.

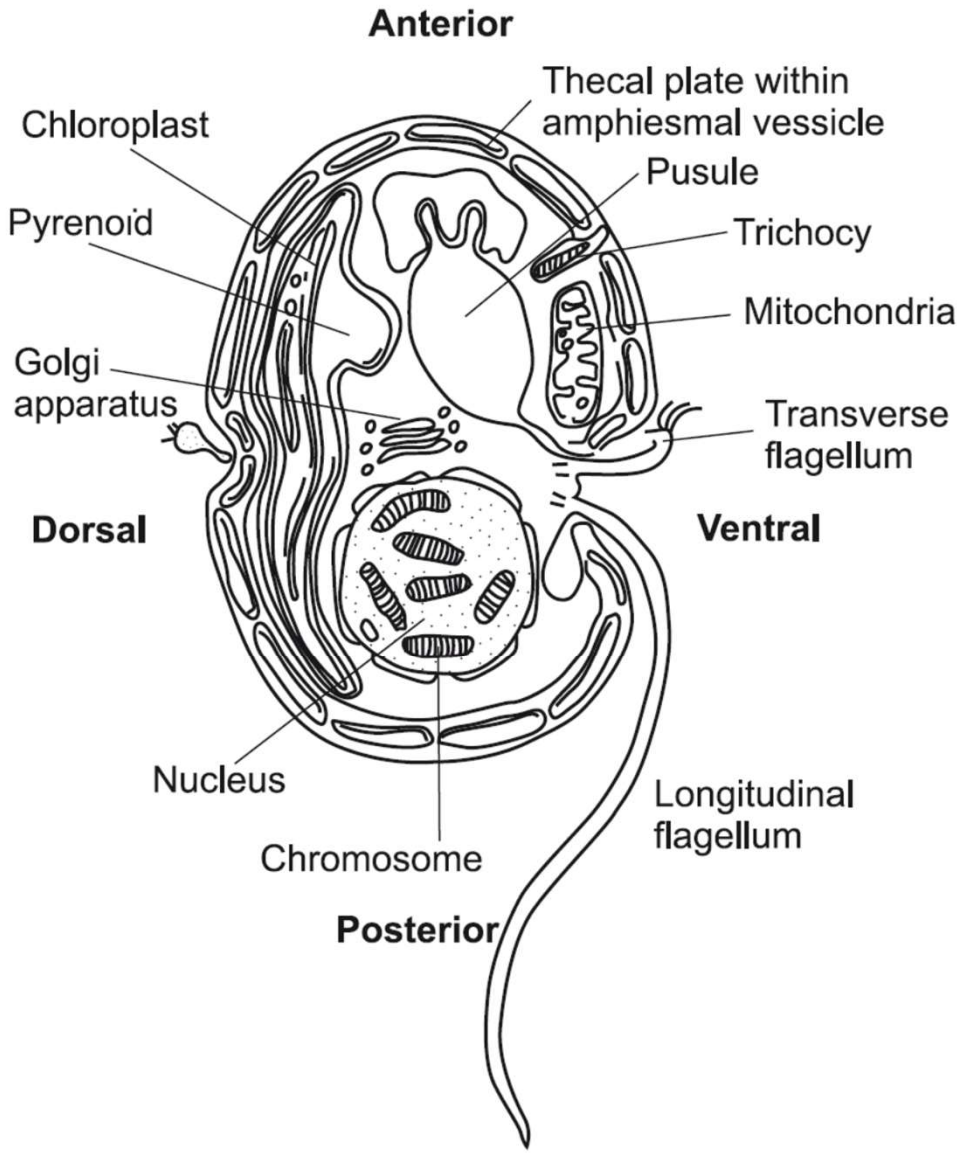


Fig. 10.1 The dinoflagellate cell. (After Edwards in Lipps 1993, pp. 105–127.)

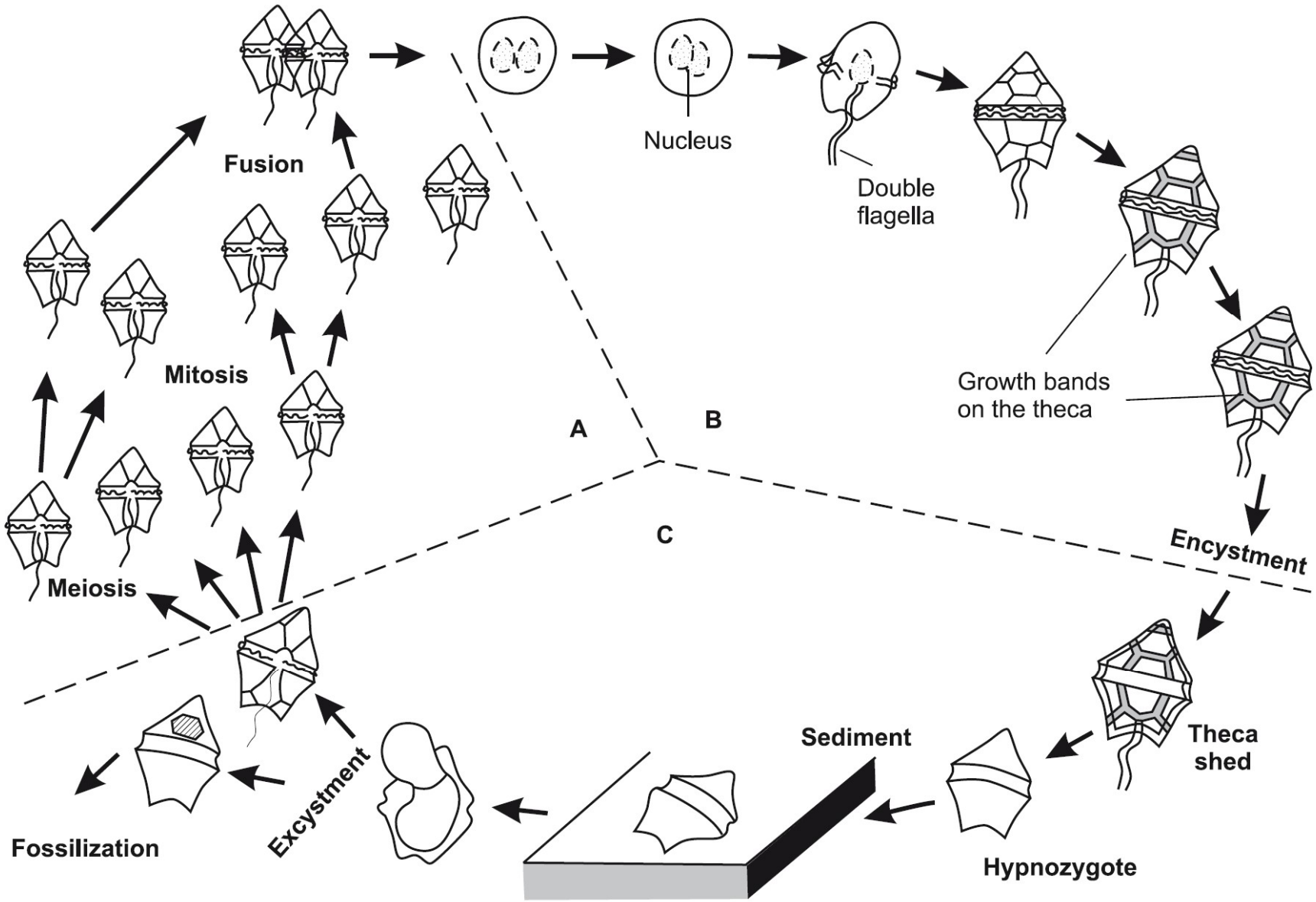
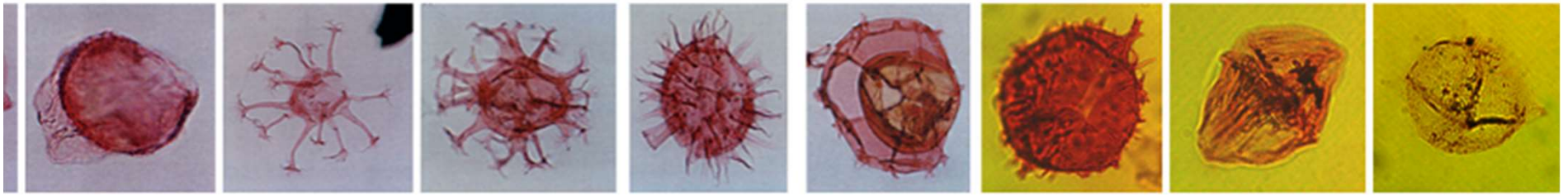
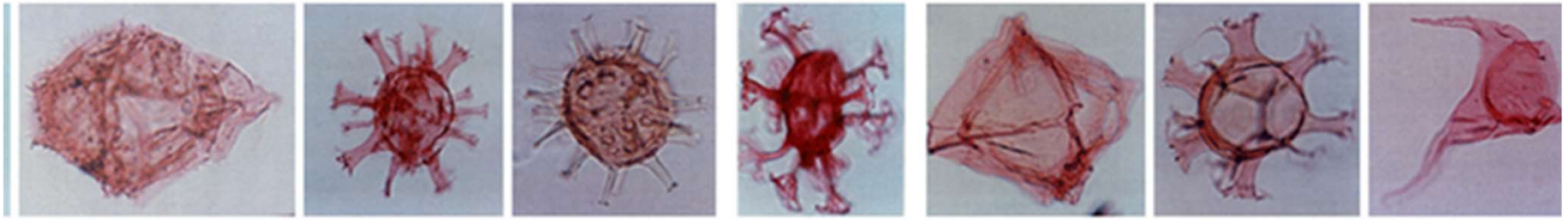
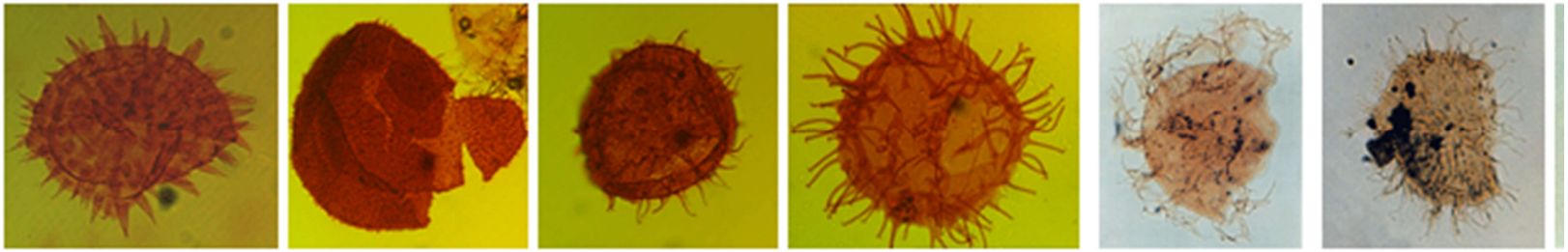
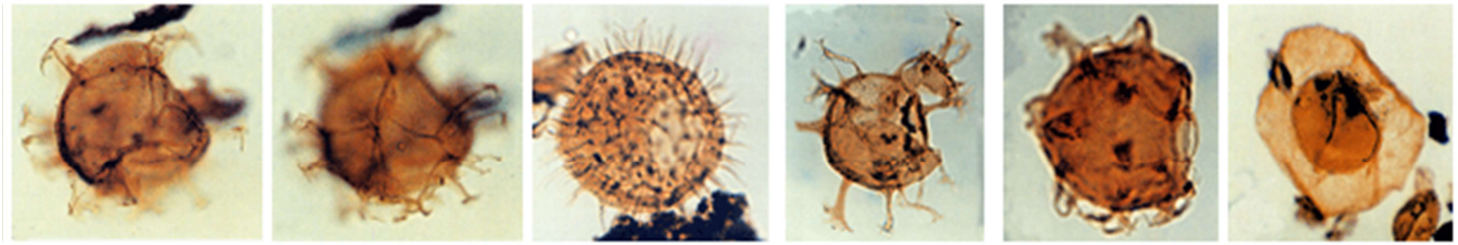


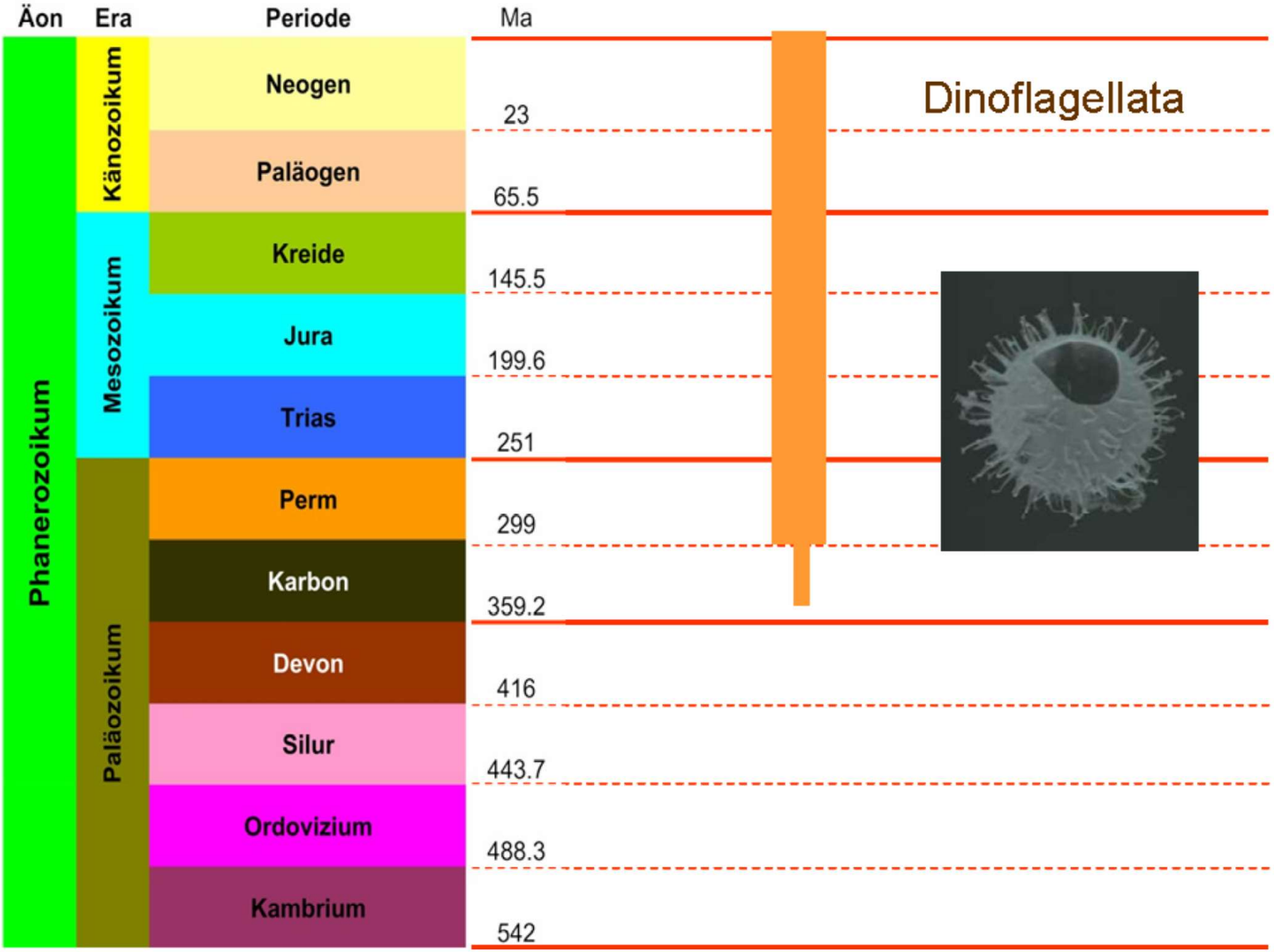
Fig. 10.5 Idealized life cycle involving sexual reproduction and cyst formation. Section A, cells are motile and haploid; section B, cells are motile and diploid; section C, cells are non-motile (except excysted cell on left) and diploid. (Reproduced from Stover *et al.* in Jansonius & McGregor 1996, vol. 2, pp. 641–750 (with the permission of the ASSP Foundation).)










Äon
Era
Periode
Ma
Phanerozoikum
Känozoikum
Mesozoikum
Paläozoikum
Neogen
Paläogen
Kreide
Jura
Trias
Perm
Karbon
Devon
Silur
Ordovizium
Kambrium
23
65.5
145.5
199.6
251
299
359.2
416
443.7
488.3
542
Dinoflagellata