

ROCCE SEDIMENTARIE

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graph TD; A[ROCCE SEDIMENTARIE] --> B[TERRIGENE]; A --> C[CARBONATICHE]; A --> D[ALTRE]; B --> B1[•Conglomerati]; B --> B2[•Arenarie]; B --> B3[•Peliti]; C --> C1[•Tessitura particellare]; C --> C2[•Biocostruite]; D --> D1[•Evaporiti]; D --> D2[•Ferrifere]; D --> D3[•Silicee]; D --> D4[•Fosfatiche]; D --> D5[•Organiche]; D --> D6[•Vulcanoclastiche];
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TERRIGENE

- Conglomerati
- Arenarie
- Peliti

CARBONATICHE

- Tessitura particellare
- Biocostruite

ALTRE

- Evaporiti
- Ferrifere
- Silicee
- Fosfatiche
- Organiche
- Vulcanoclastiche

ROCCE TERRIGENE

CONGLOMERATI BRECCE

Composizione

Oligomittici
Polimittici

Provenienza

Intrabacinale
Extrabacinale

Tessitura

Matricesostenuta
Clastosostenuta

Paraconglomerati
Ortoconglomerati



CONGLOMERATI - BRECCIE

Aree di formazione

Falesie e spiagge

Torrenti

Conoidi alluvionali

Modo di formazione

Tettoniche

Sedimentarie



Con
trasporto



MEGABRECCE

BRECCE
VULCANICHE





**CONGLOMERATO
OLIGOMITTICO**

INTRABACINALE

EXTRABACINALE

**CONGLOMERATO
POLIMITTICO**



ORTOCONGLOMERATO (BRECCIA)



PARACONGLOMERATO (BRECCIA)



Apricena - Gargano

ROCCE TERRIGENE



ARENARIE

Composizione

- Quarzareniti
- Arcose
- Litareniti
- Grovacche
- Arenarie ibride

Provenienza

- Intrabacinale
- Extrabacinale

Contesto geotettonico

- Arco
- Basamento
- Cratone



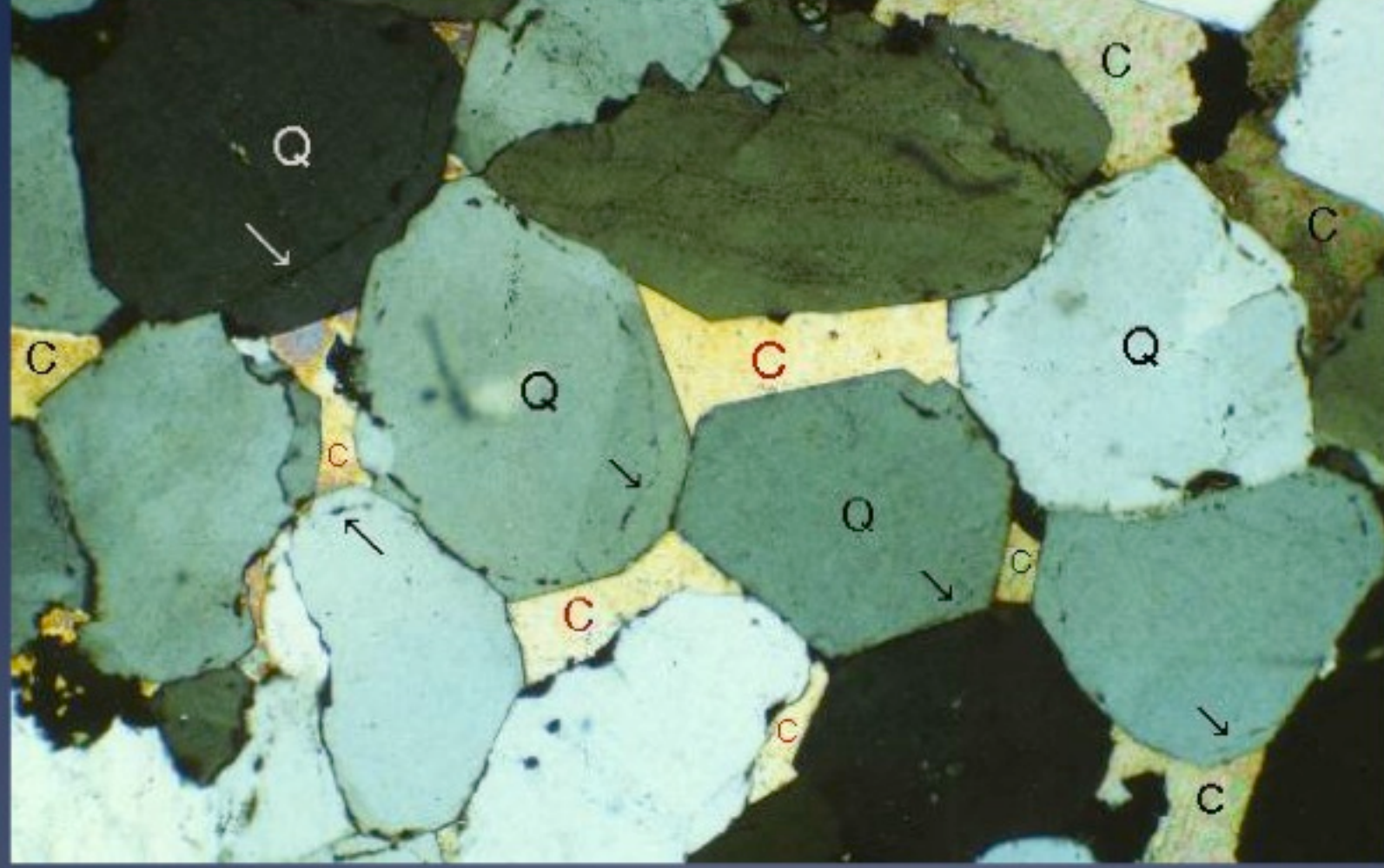


CLASSIFICAZIONE ARENARIE

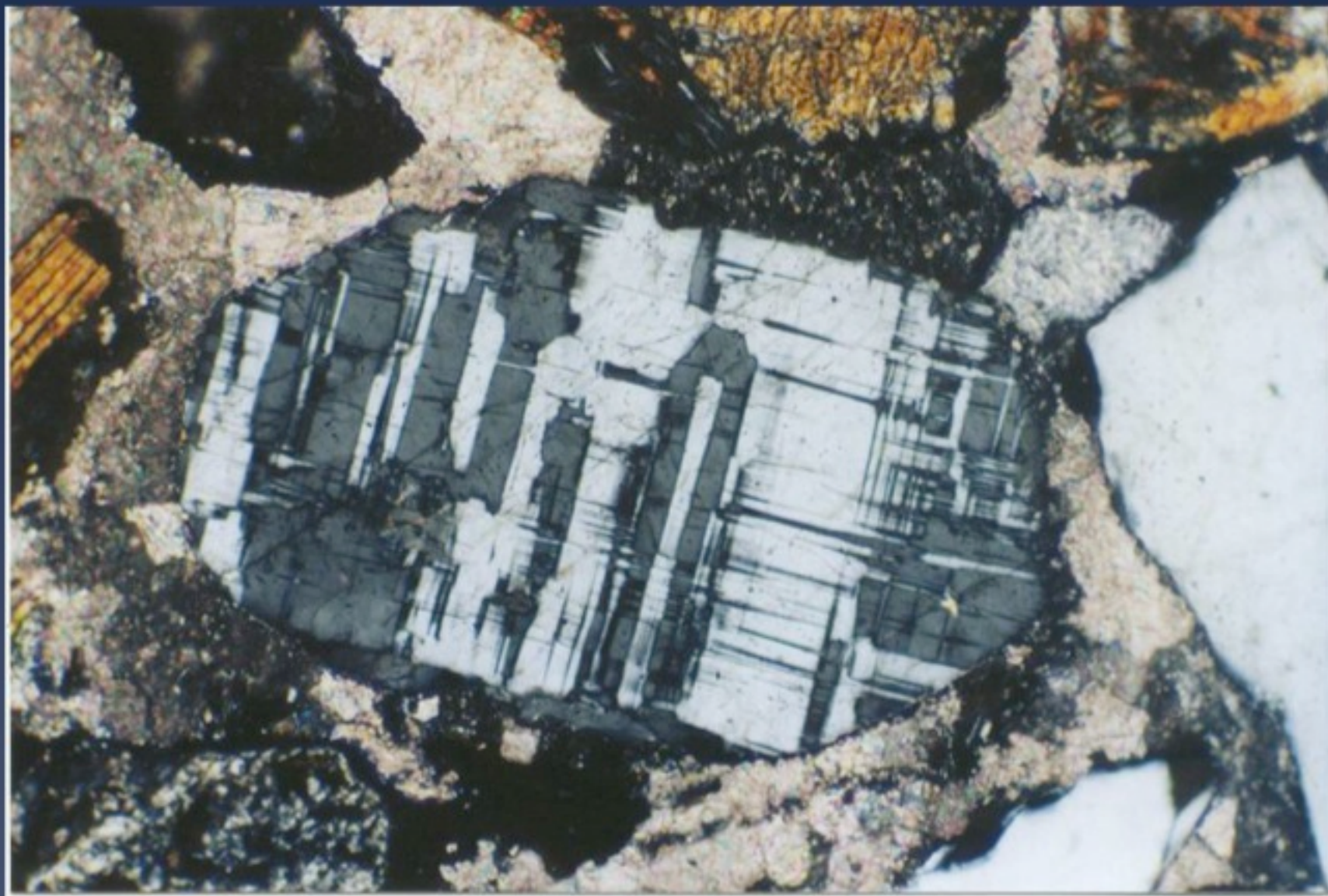


Fig. 2.24 – Classificazione composizionale delle arenarie.

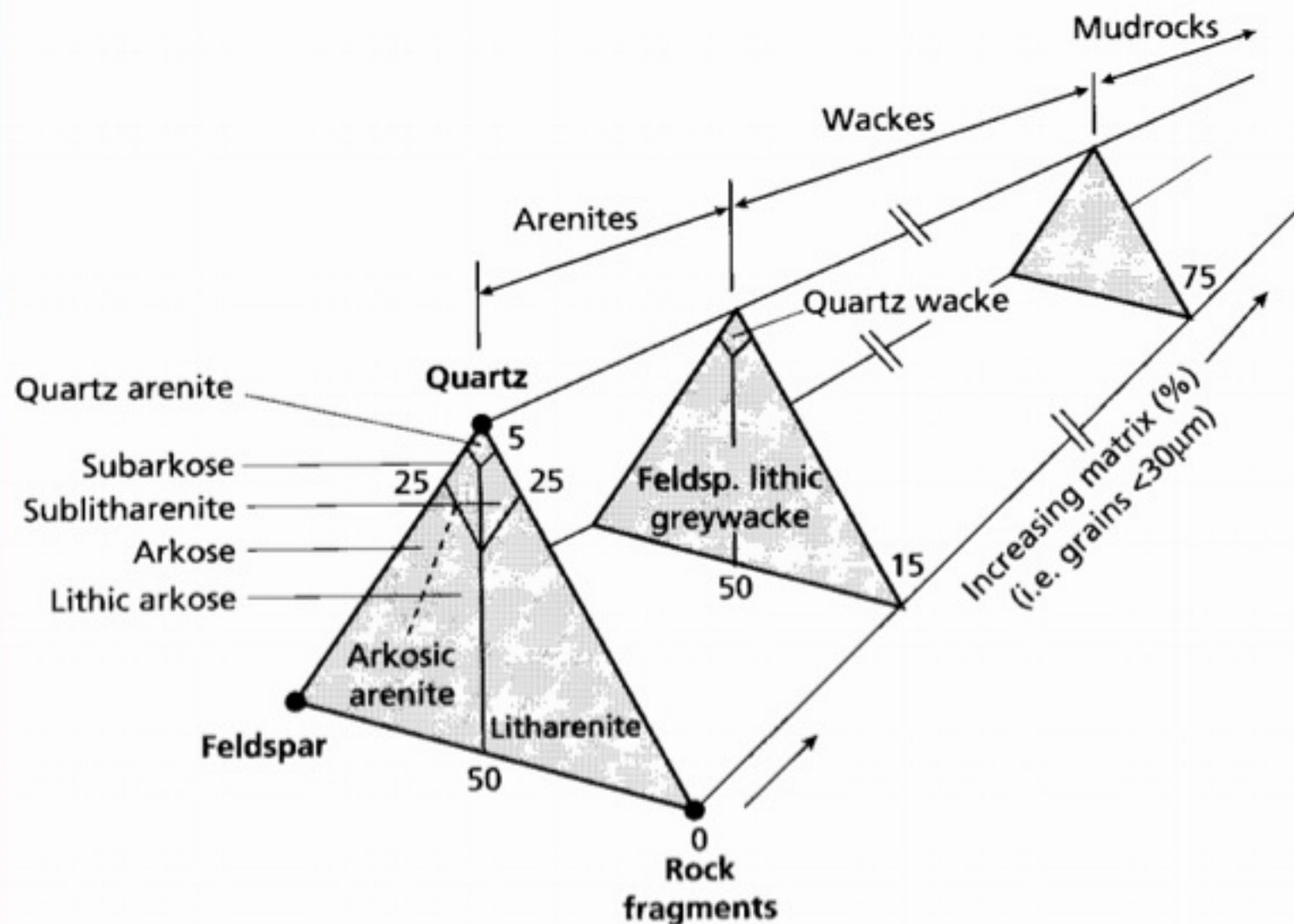
Bosellini et al., 1989



CLASSIFICAZIONE ARENARIE



CLASSIFICAZIONE ARENARIE



Pettijohn et al., 1987

Area di provenienza

Complesso fisiografico che caratterizza il tipo ed intensità di degradazione ed i prodotti finali

1.litologia

2.Tipo di rilievo

3.Clima

4.Attività tettonica

ARENARIE IN CHIAVE GEODINAMICA

Fig. 2.51 Composition of modern deep-sea sands from trailing-edge (TE, also called passive margin), strike-slip (SS), continental-margin arc (CA), back-arc to island-arc (BA) and fore-arc to island-arc (FA) tectonic settings. After Yerino & Maynard (1984).

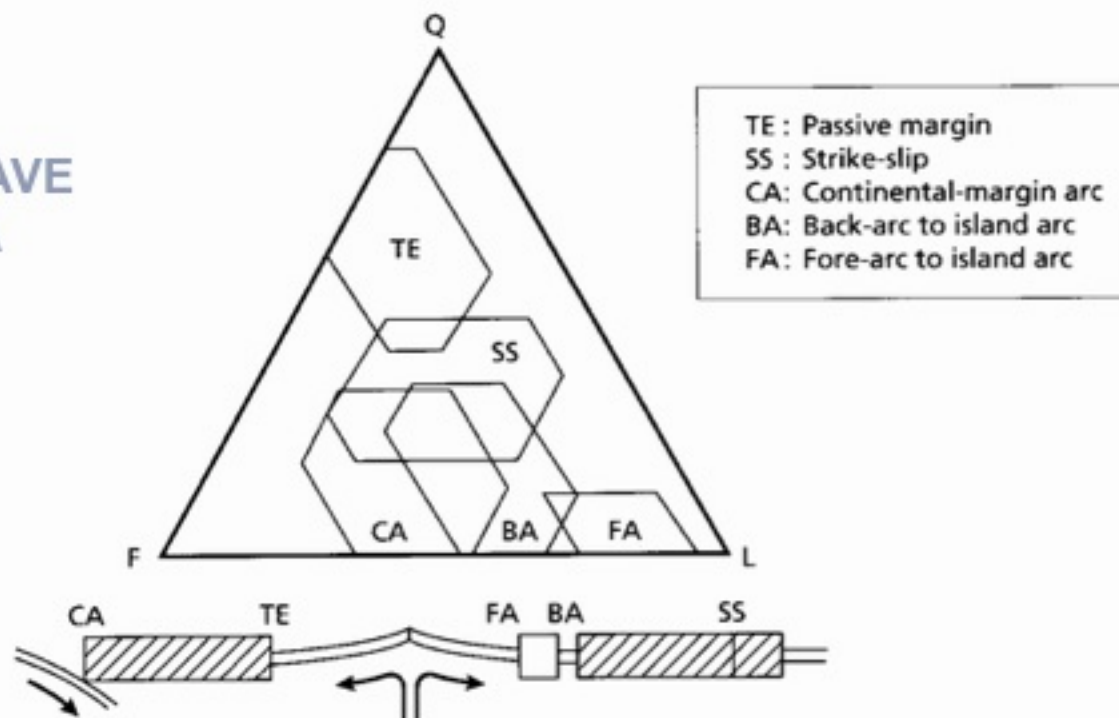


Table 2.11 The major provenance terranes, their tectonic setting and typical sand compositions. After Dickinson (1985)

Provenance type	Tectonic setting	Derivative sand composition
Stable craton	continental interior or passive margin	quartzose sands (Qt-rich) with high Qm/Qp and Fk/Fp ratios
Basement uplift	rift shoulder or transform rupture	quartzo-feldspathic (Qm-F) sands low in Lt with Qm/F and Fk/Fp ratios similar to bedrock
Magmatic arc	island arc or continental arc	feldspatho-lithic (F-L) volcanoclastic sands with high P/K and Lv/Ls ratios grading to quartzo-feldspathic (Qm-F) batholith-derived sands
Recycled orogen	subduction complex or fold-thrust belt	quartzo-lithic (Qt-Lt) sands low in F and Lv with variable Qm/Qp and Qp/Ls ratios

ROCCE TERRIGENE

PELITI

Silt + argilla = fango

Composizione

Illite

Montmorillonite

Caolinite

Clorite

Tessitura

Siltiti

Argilliti

{ Shales
Ardesia
Fillade



Meccanismi di formazione del fango



Mod. da Potter et al., 1984

NOMENCLATURA ROCCE PELITICHE



Rid. da Bosellini et al., 1989

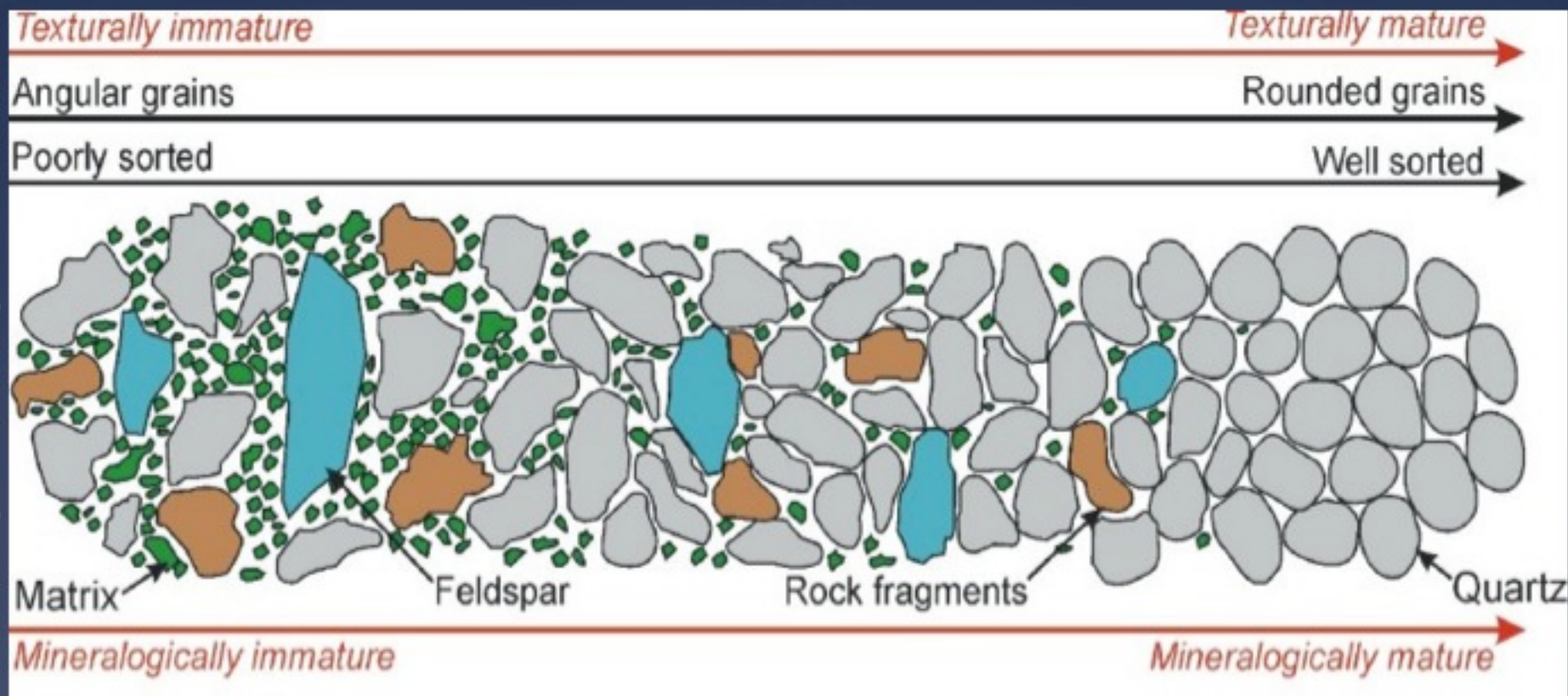
PROPRIETA' SEDIMENTOLOGICHE ARGILLE

- 1. Sospensione** – particelle piccole
- 2. Coesione** – tensione capillare – resistenza erosione
- 3. Flocculazione** – particelle aggregate - decantazione
- 4. Porosità** – struttura cristallina – scarsa permeabilità

Maturità

TESSITURALE

COMPOSIZIONALE



Maturità



Maturità



ROCCE TERRIGENE

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graph TD; A[ROCCE TERRIGENE] --> B[CONGLOMERATI]; A --> C[ARENARIE]; A --> D[PELITI];
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CONGLOMERATI

Composizione

Oligomittici

Polimittici

Provenienza

Intrabacinale

Extrabacinale

Tessitura

Matricesostenuta

Clastosostenuta

ARENARIE

Composizione

Quarzareniti

Arcose

Litareniti

Grovacche

Arenarie ibride

Provenienza

Intrabacinale

Extrabacinale

Contesto geotettonico

Arco

Basamento

Cratone

PELITI

Composizione

Illite

Montmorillonite

Caolinite

Clorite

Tessitura

Siltiti

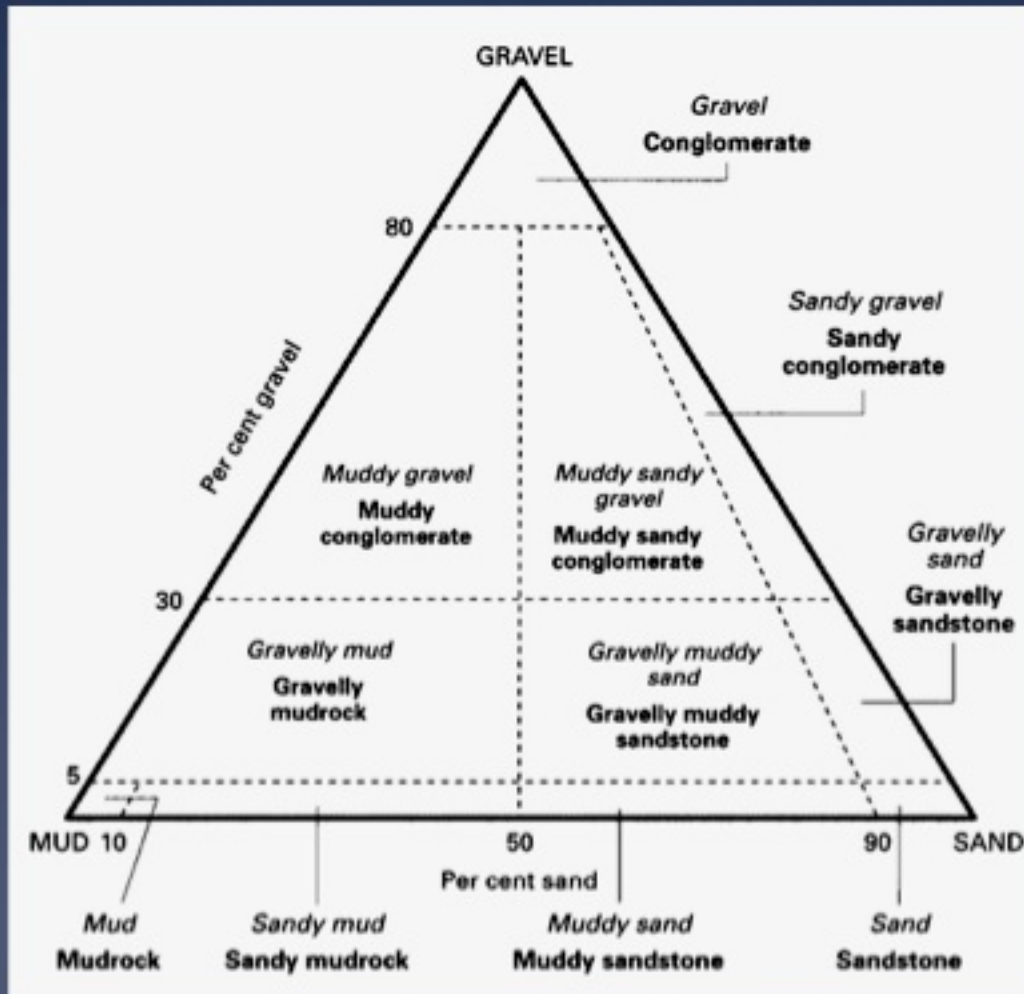
Argilliti

ROCCE TERRIGENE

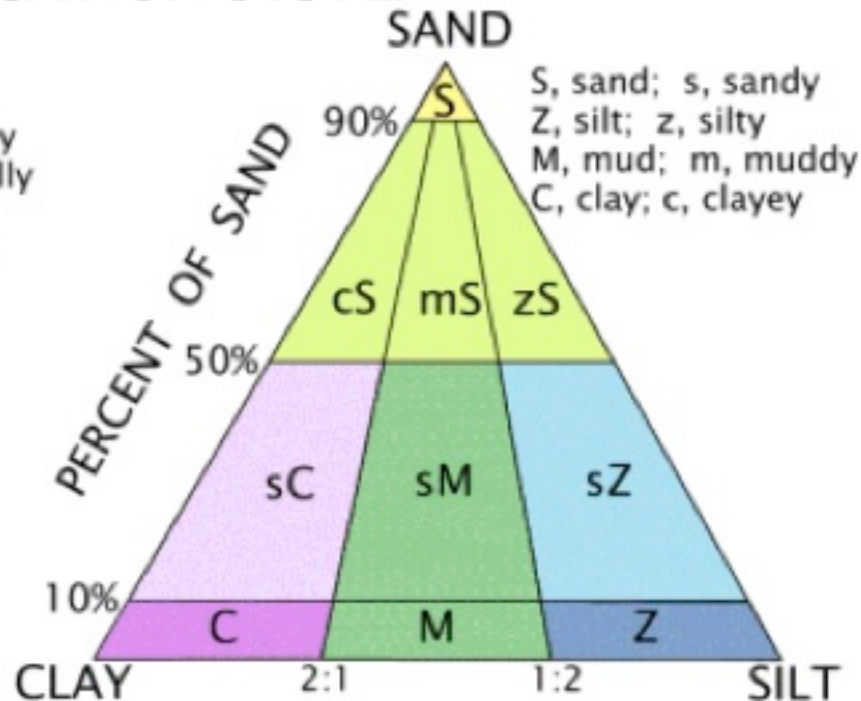
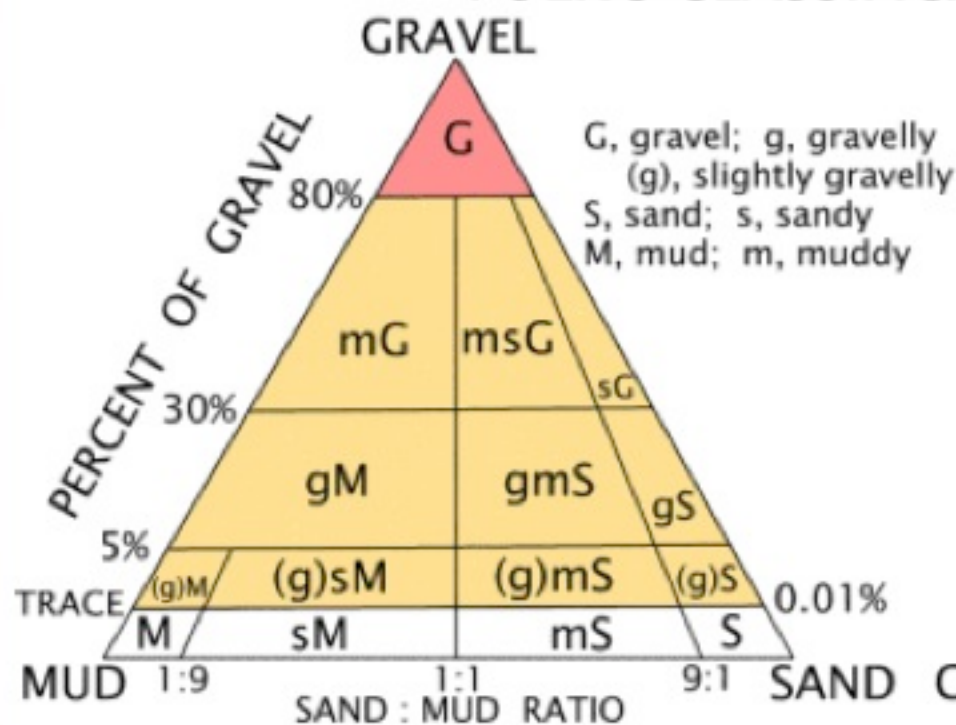
CONGLOMERATI

ARENARIE

PELITI

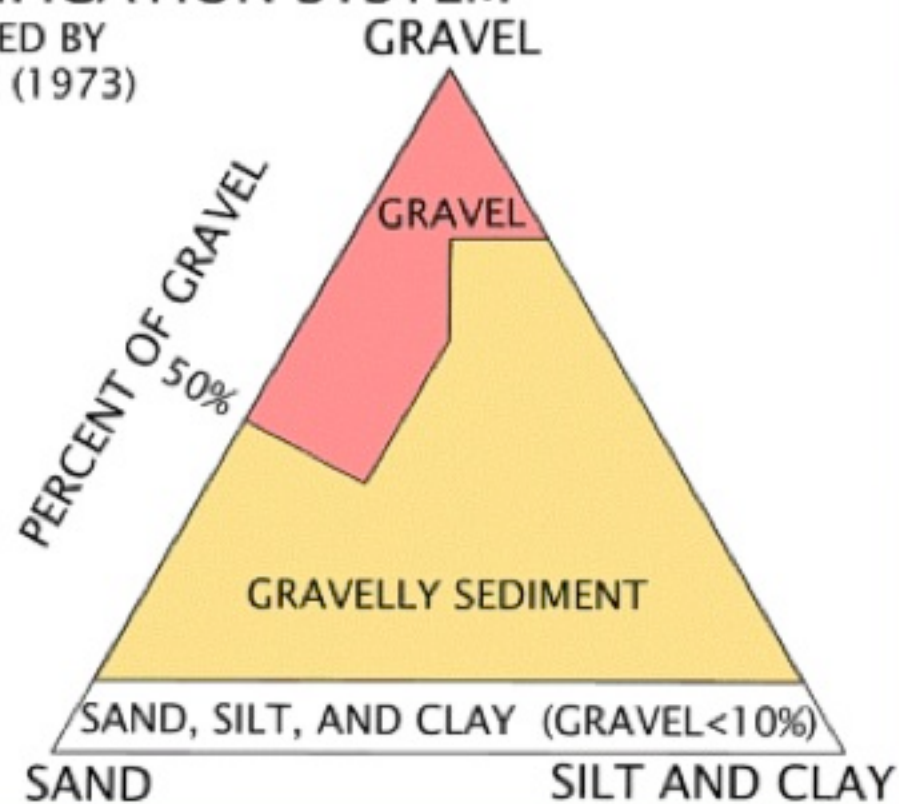
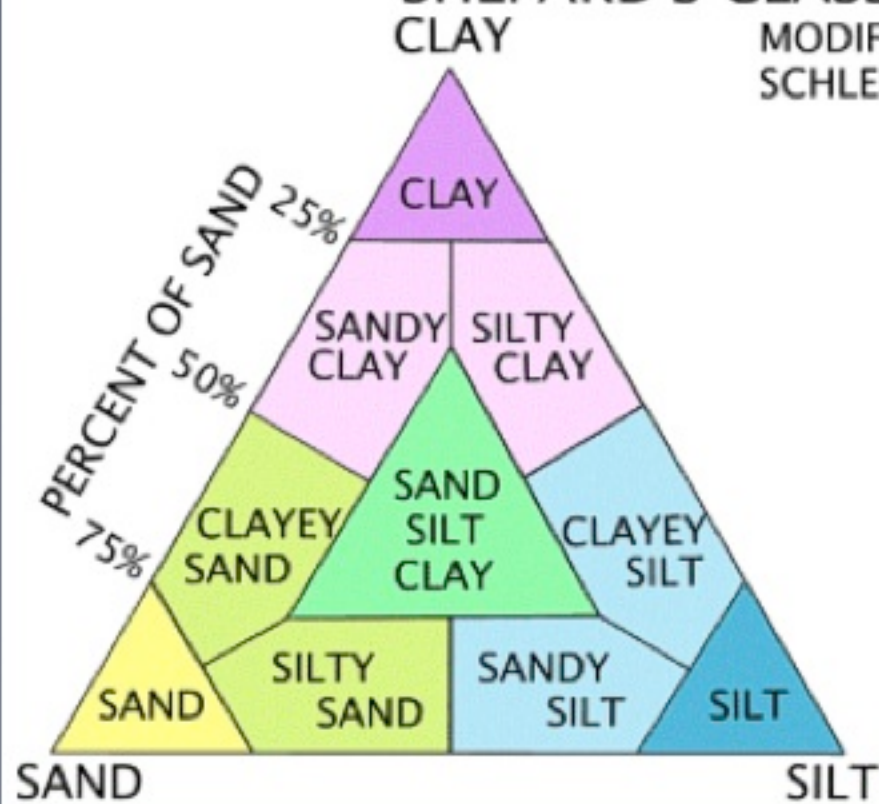


FOLK'S CLASSIFICATION SYSTEM



SHEPARD'S CLASSIFICATION SYSTEM

MODIFIED BY
SCHLEE (1973)



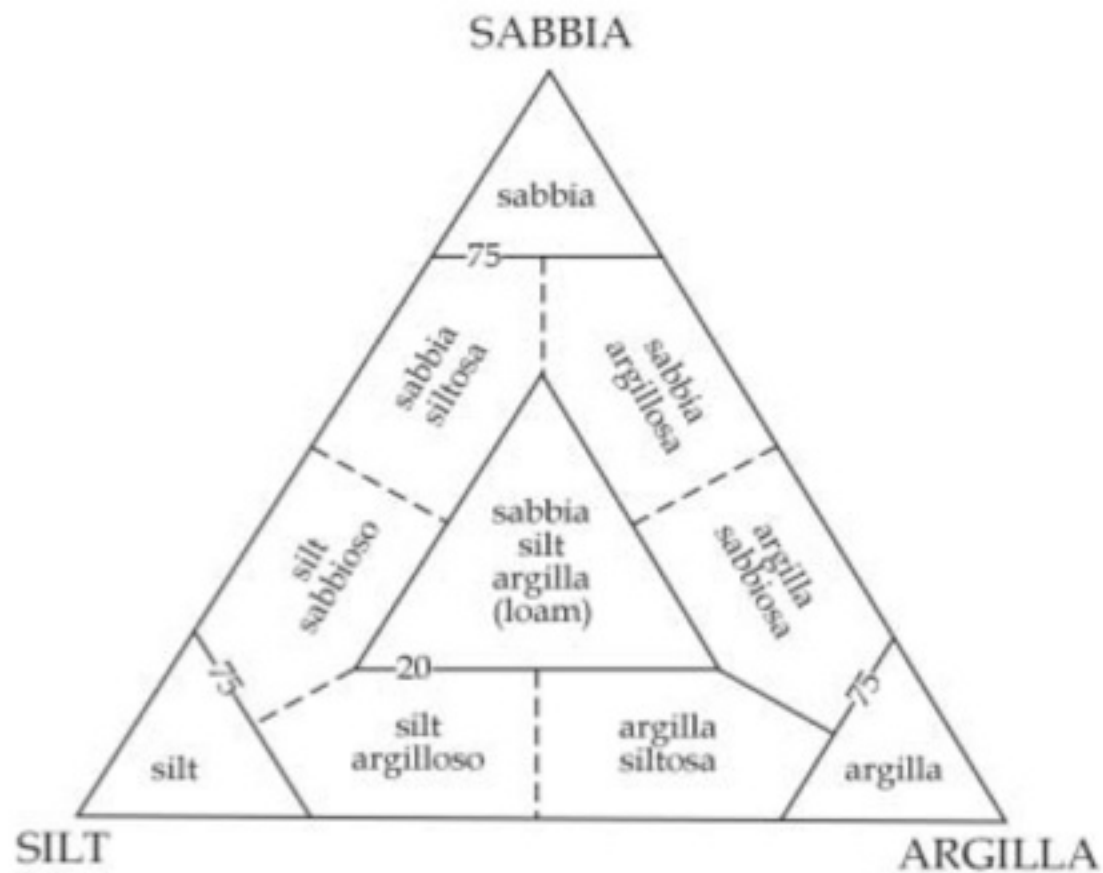
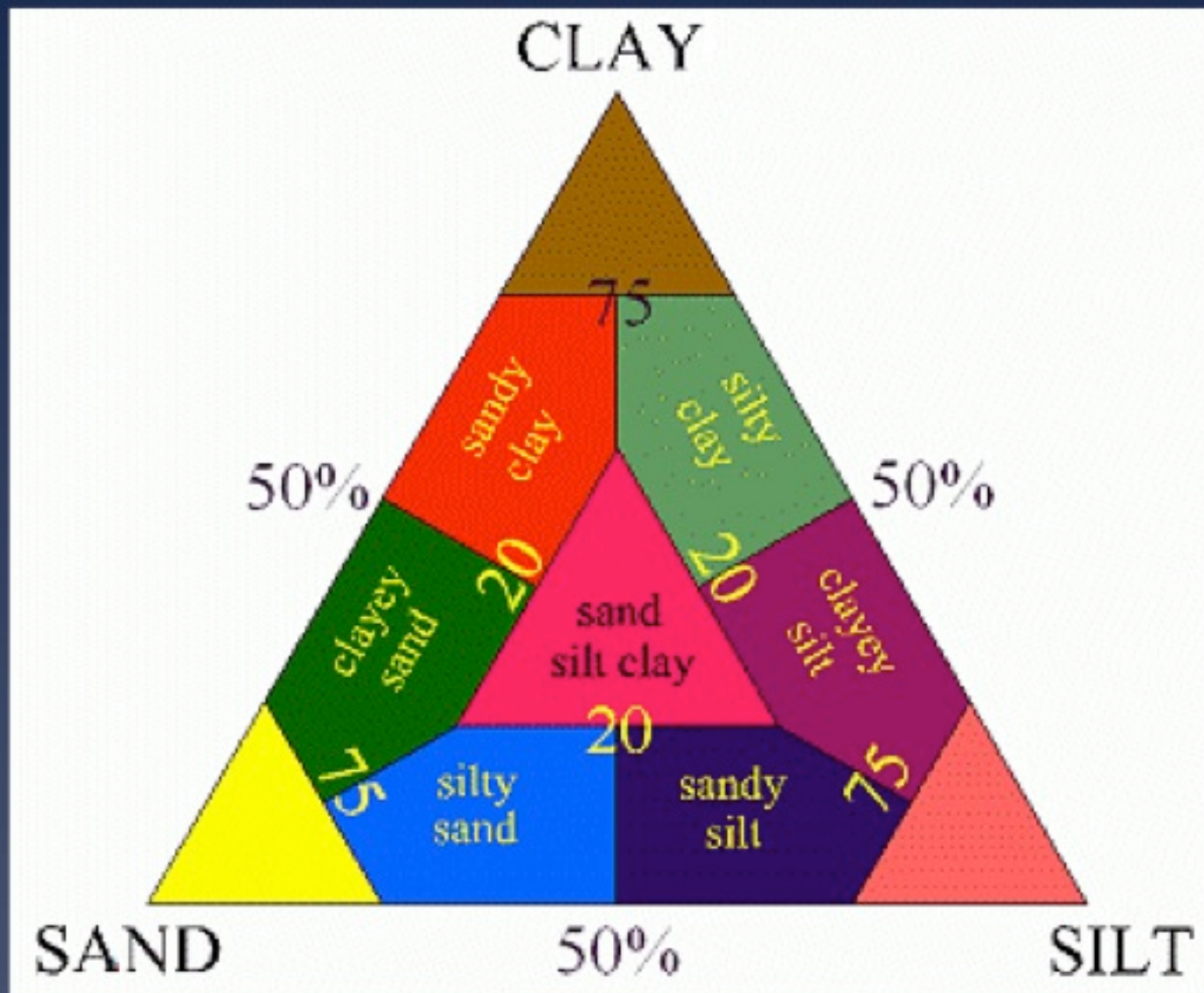


Figura 2.1.1 - Diagramma triangolare di Shepard (1954)

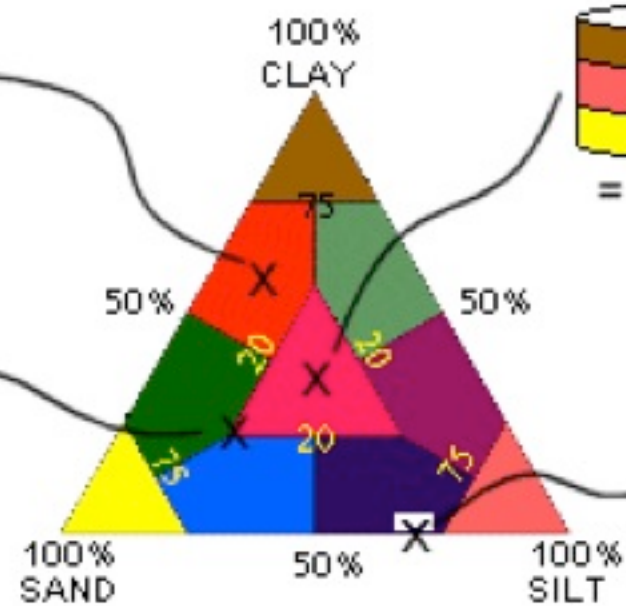


clay 60%
silt 10%
sand 30%
= sandy clay

clay 20%
silt 20%
sand 60%
= clayey sand
or
silty sand

33% clay
33% silt
33% sand
= sand/silt/clay

0% clay
70% silt
30% sand
= sandy silt

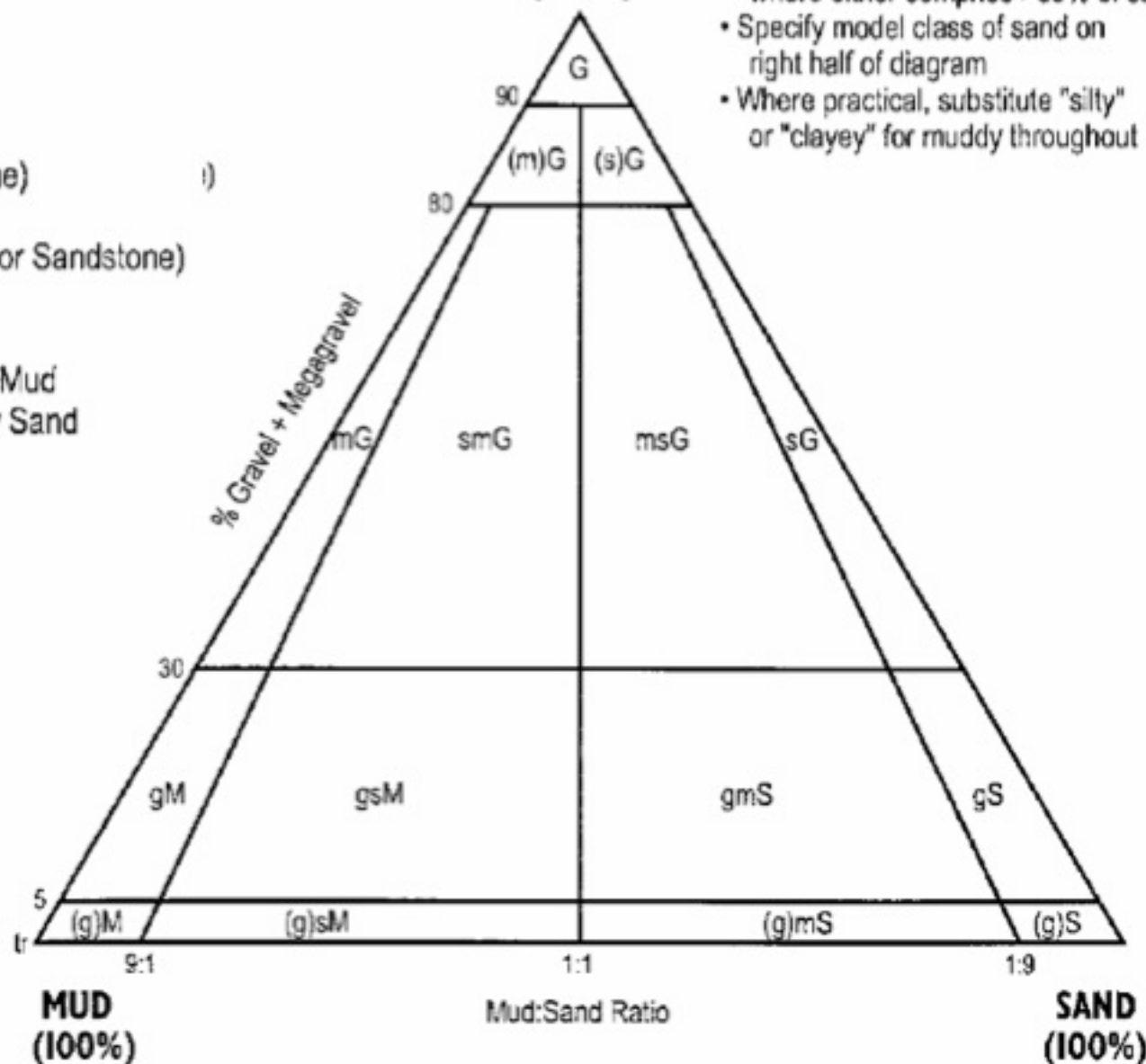


KEY

G	Gravel (Conglomerate)
(m)G	Slightly muddy Gravel
(s)G	Slightly sandy Gravel
mG	muddy Gravel
smG	sandy muddy Gravel
msG	muddy sandy Gravel
sG	sandy Gravel
gM	gravelly Mud (Mudstone)
gsM	gravelly sandy Mud
gmS	gravelly muddy Sand (or Sandstone)
gS	gravelly Sand
(g)M	slightly gravelly Mud
(g)sM	slightly gravelly sandy Mud
(g)mS	slightly gravelly muddy Sand
(g)S	slightly gravelly Sand

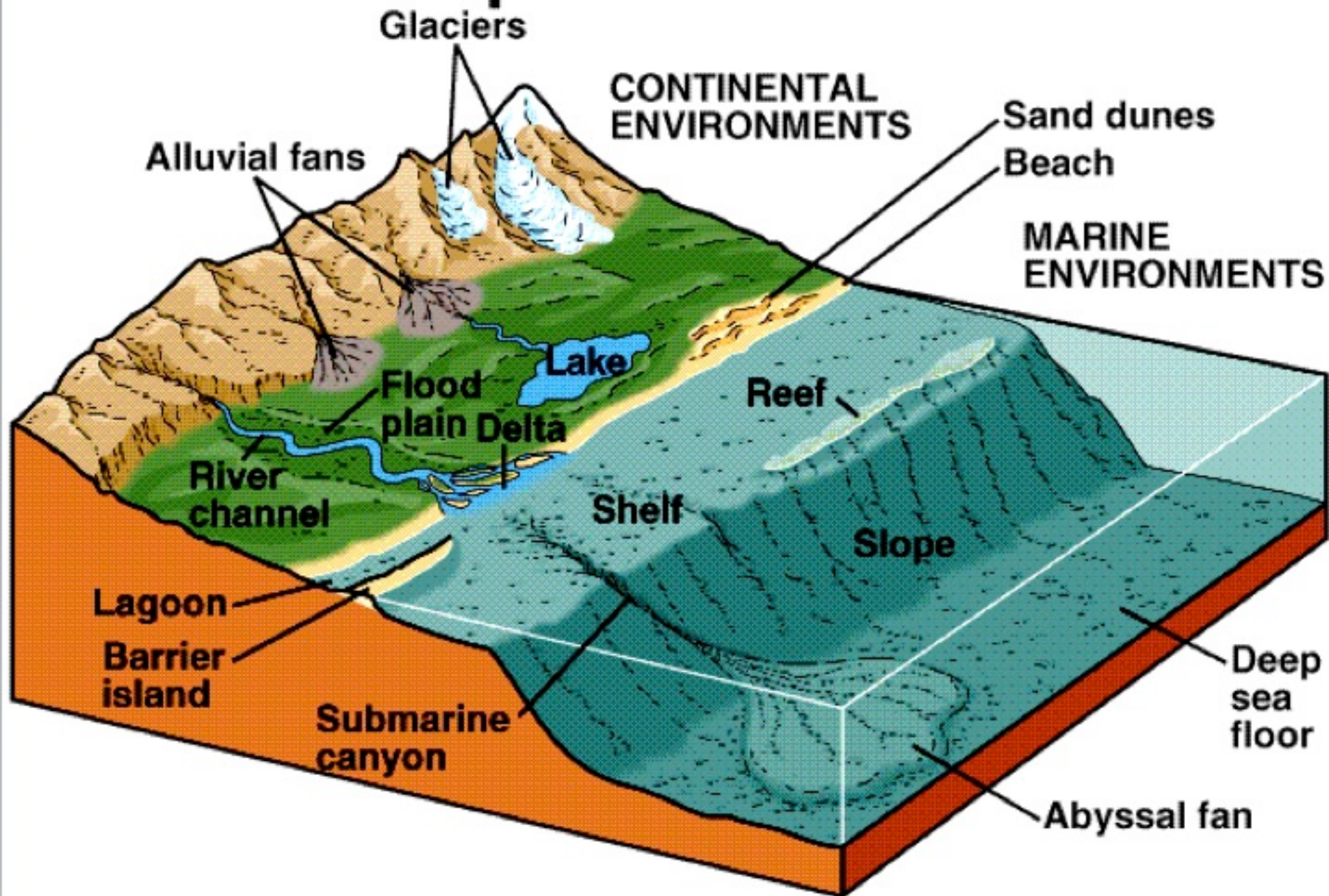
GRAVEL & MEGAGRAVEL (100%)

- Specify gravel or megagravel mode throughout
- Substitute megagravel for gravel in textural classes if it is the mode
- Specify gravel or megagravel grade in classes where either comprise >30% of sample
- Specify model class of sand on right half of diagram
- Where practical, substitute "silty" or "clayey" for muddy throughout



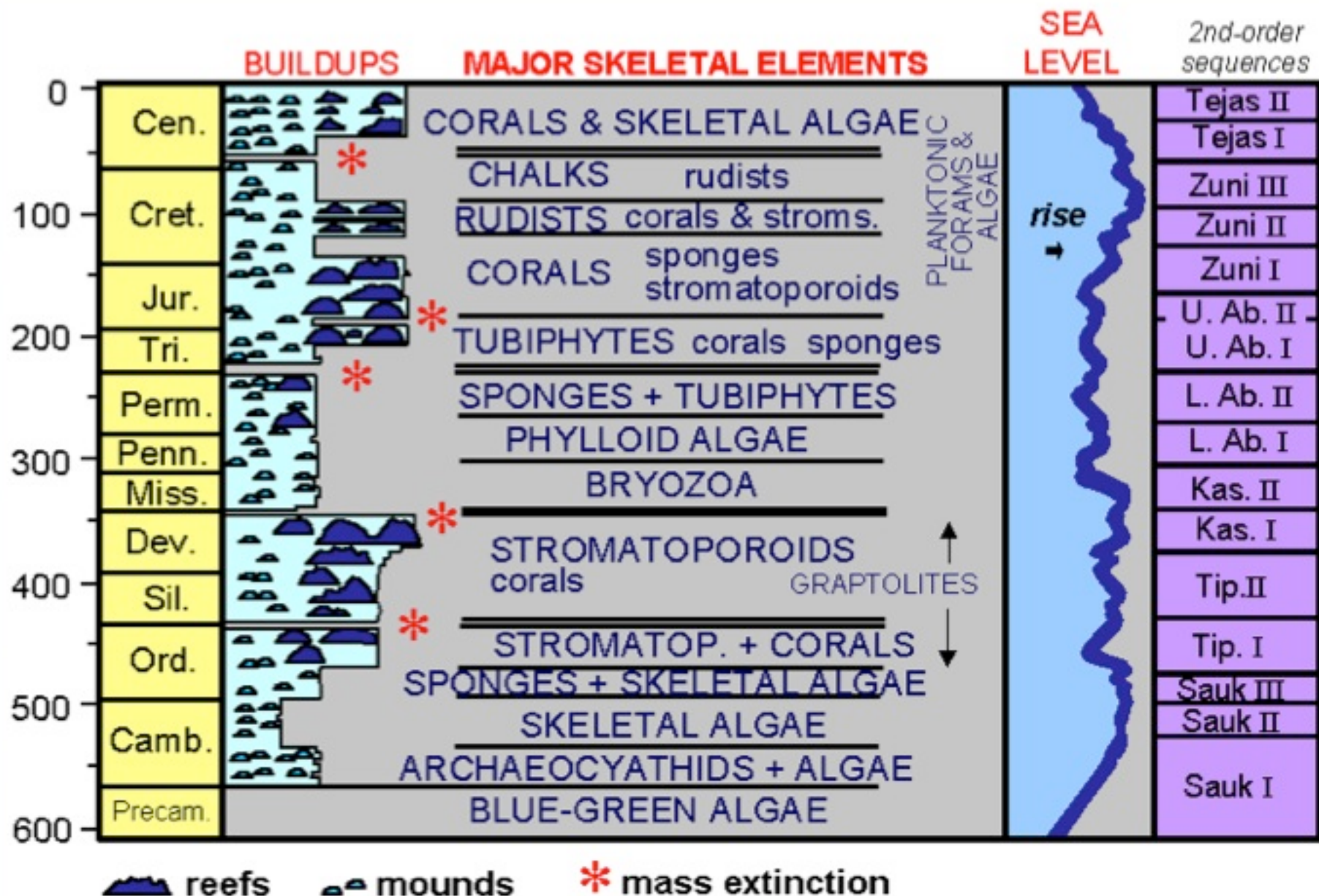
Blair & McPherson, 1999

Common Deposition Environments

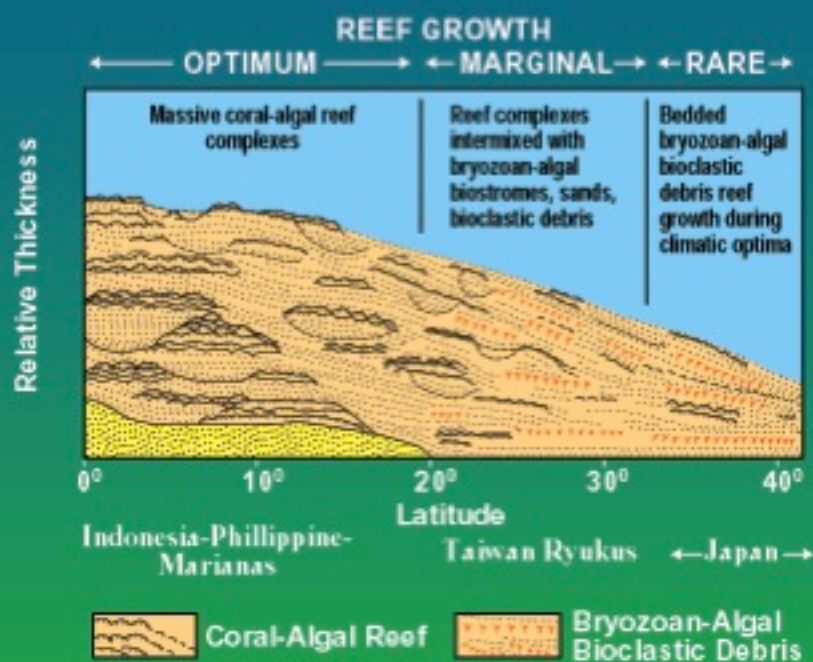
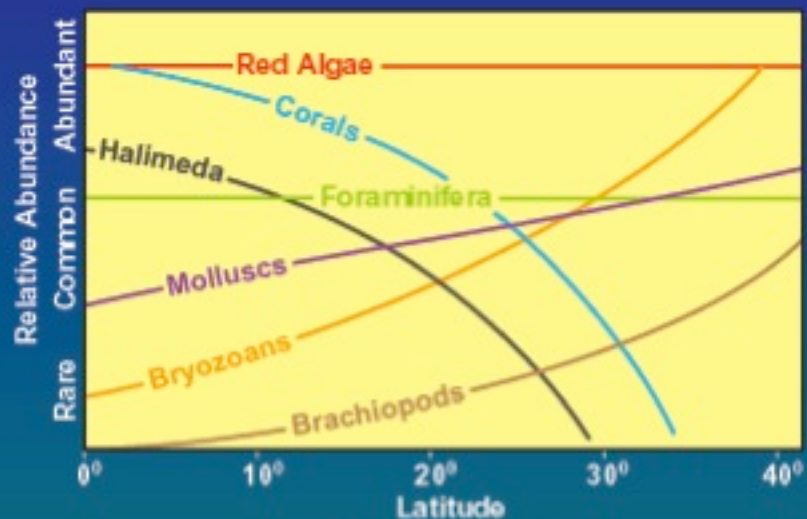


ROCCE CARBONATICHE

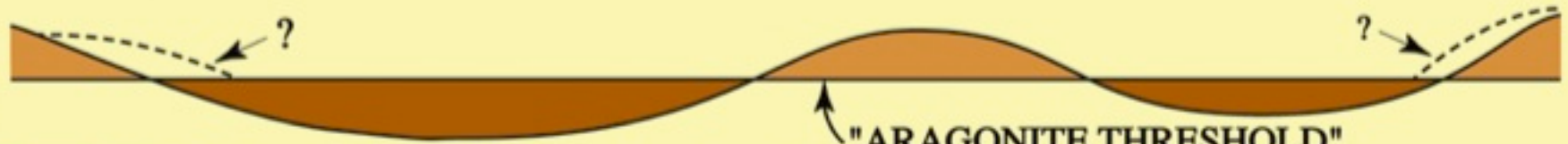
- *connessione con il mondo biologico*
- *produzione e deposizione in situ*
- *labilità diagenetica*



Drafted by Waite 99, after James 1984)



SANDBERG CURVE



- High-Mg calcite and, less abundantly, aragonite
- Calcite, Mg content generally lower, increasing near "threshold"

PC	CAM.	ORD.	SIL.	DEV.	CARB.	PM.	TR.	JUR.	CRET.	CEN.
ICEHOUSE	GREENHOUSE	GREENHOUSE	GREENHOUSE	GREENHOUSE	ICEHOUSE	ICEHOUSE	ICEHOUSE	GREENHOUSE	GREENHOUSE	ICE.

CLIMATIC EPISODES - FISCHER (1982)

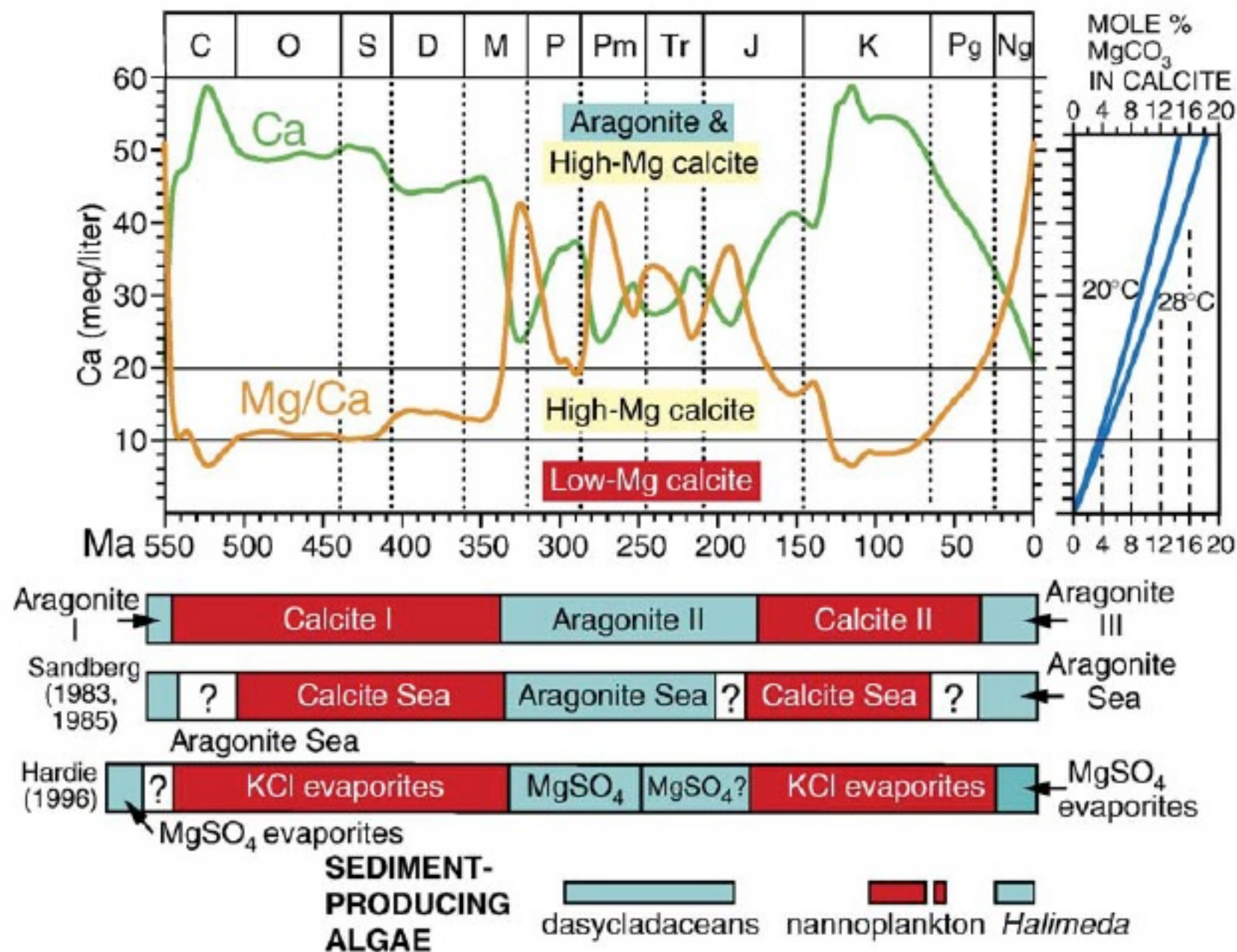
SEA LEVEL CURVES

HALLAM
(1977)

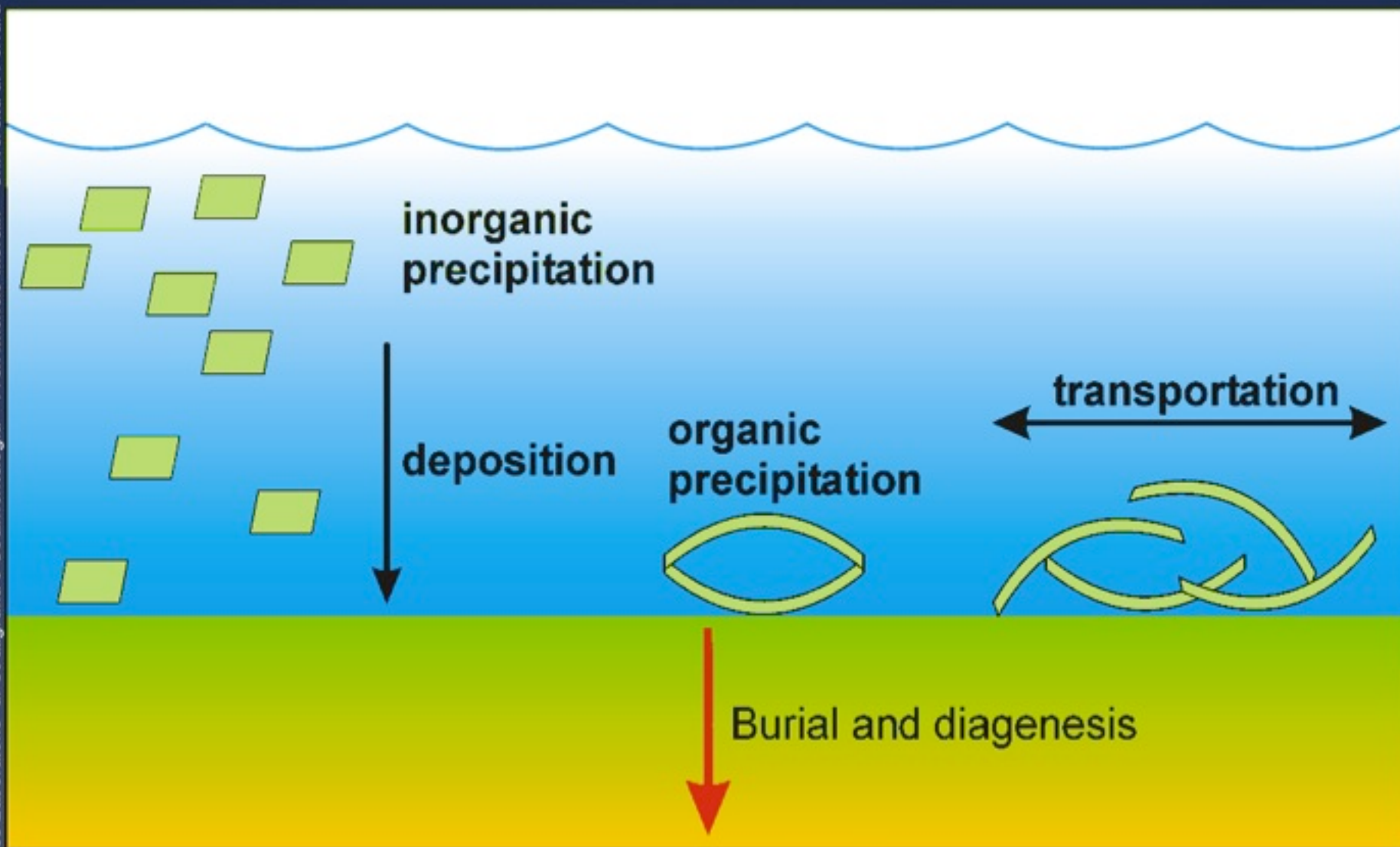
VAIL ET AL
(1977)

NORTH AMERICAN
GRANITE EMPLACEMENT
ENGEL & ENGEL (1964)

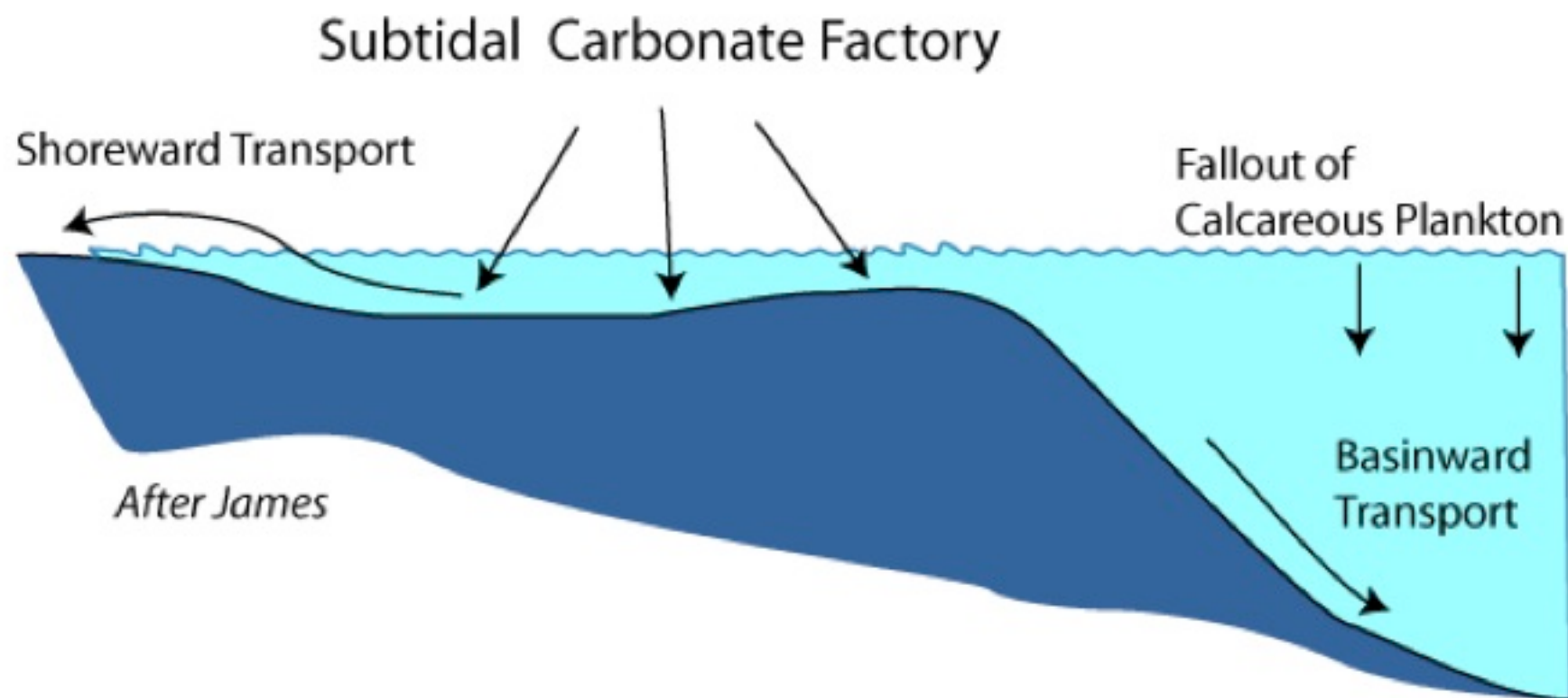
From Scholle, 2002



ROCCE CARBONATICHE



Principal Zones of Carbonate Production and Accumulation



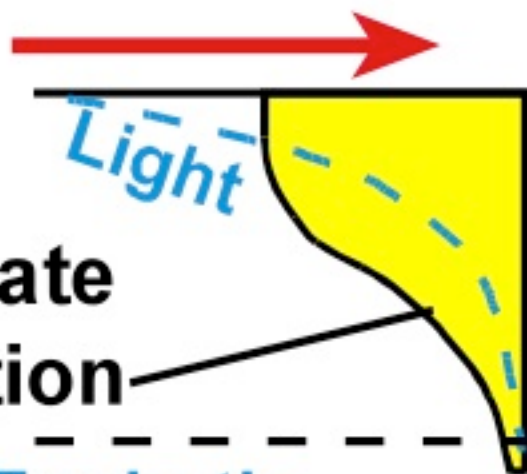
+/-100 m
(depends on
clarity of water)

**Carbonate
production**

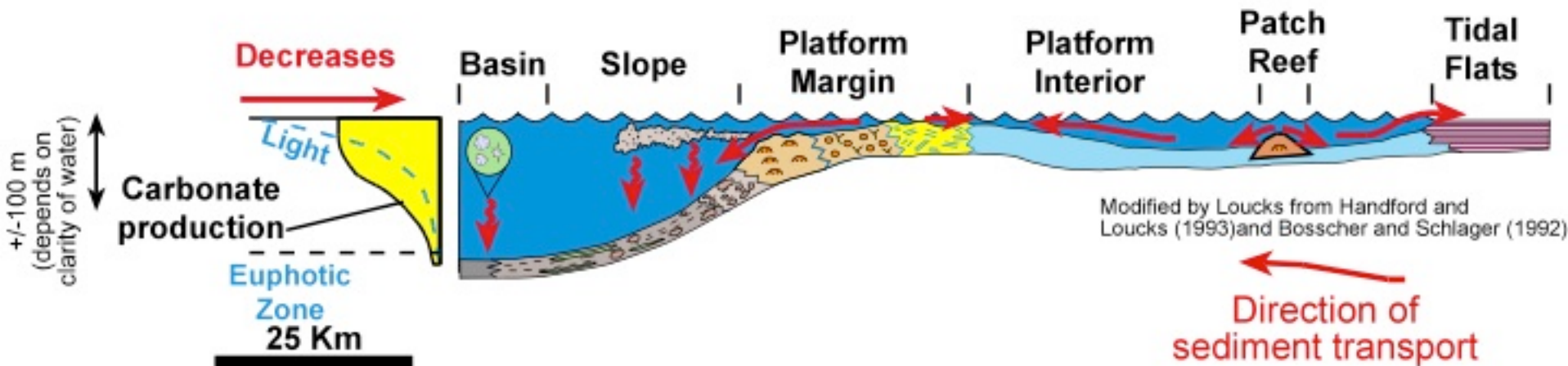
**Euphotic
Zone**

**Carbonate
Production
Decreases**

Sea level

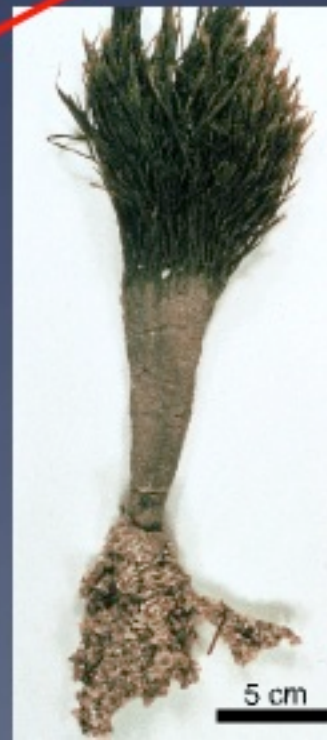
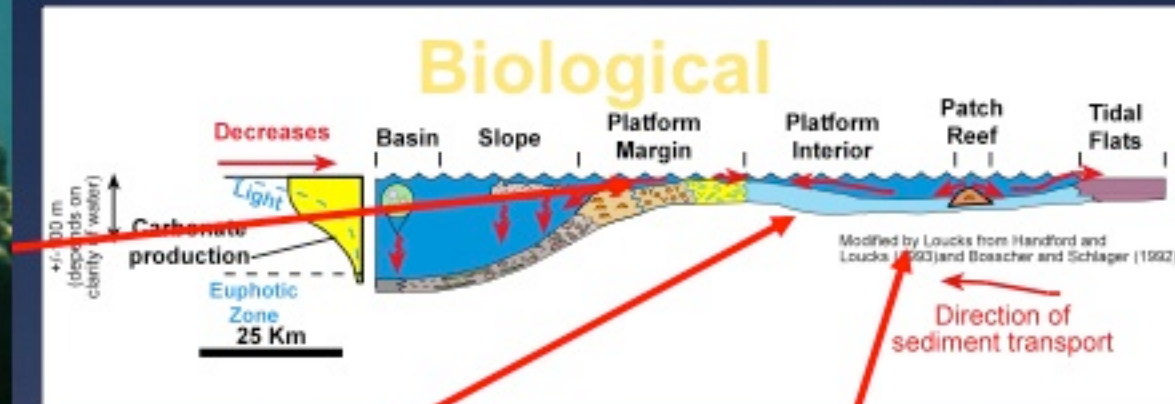


Carbonate Factory

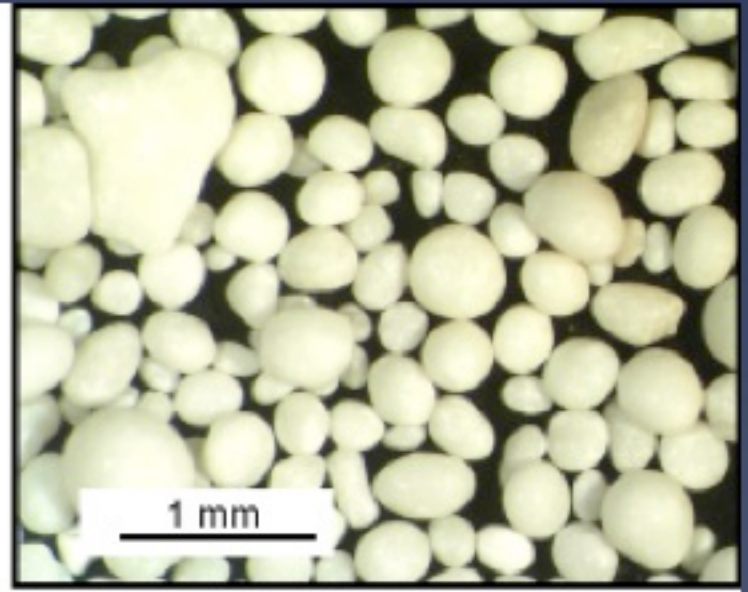
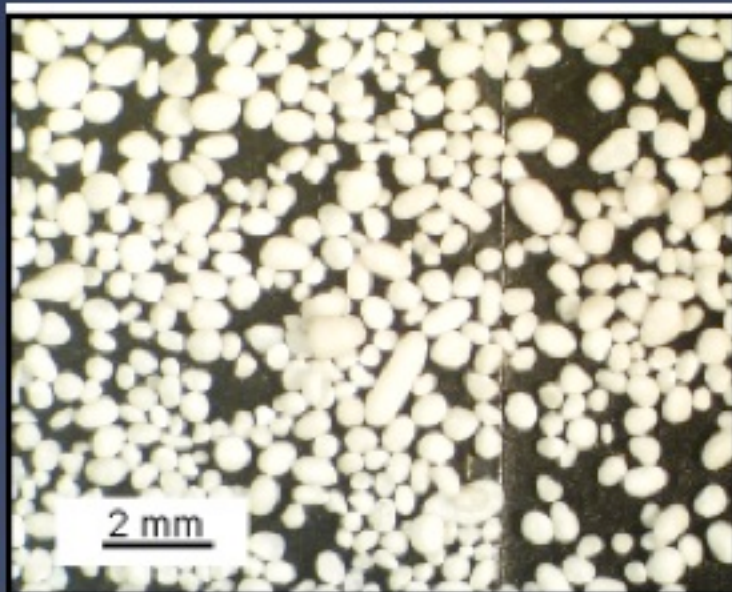
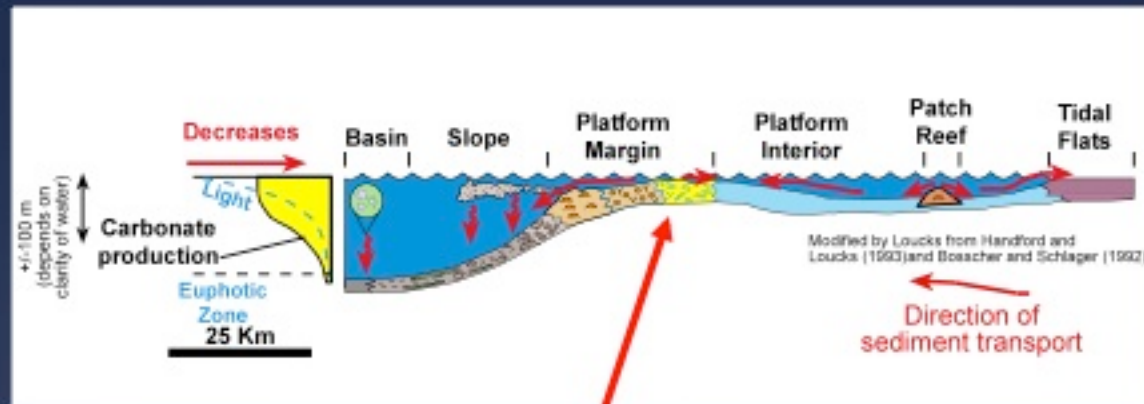


Kendall

Carbonate Factory

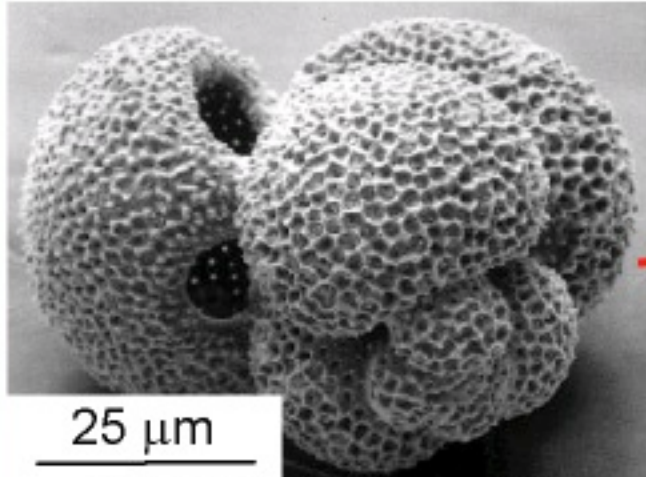


Carbonate Factory

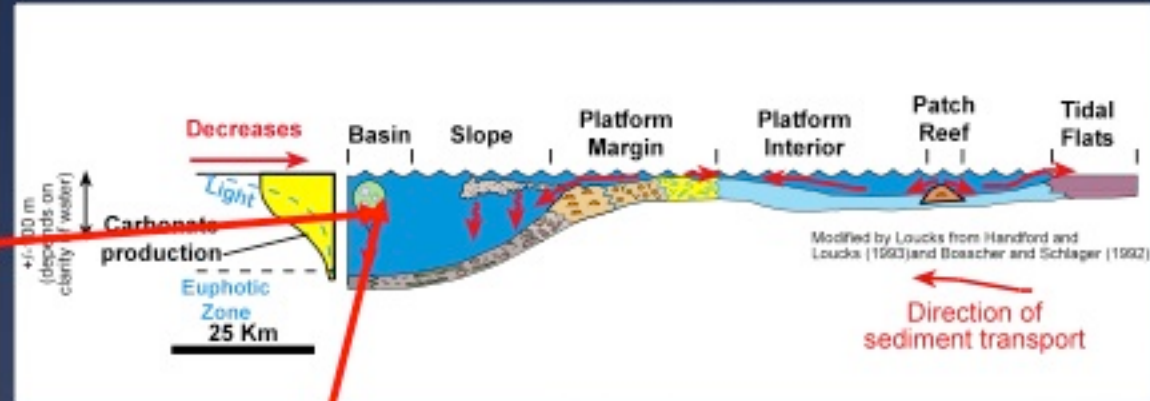


Chemical precipitates: ooids

Carbonate Factory



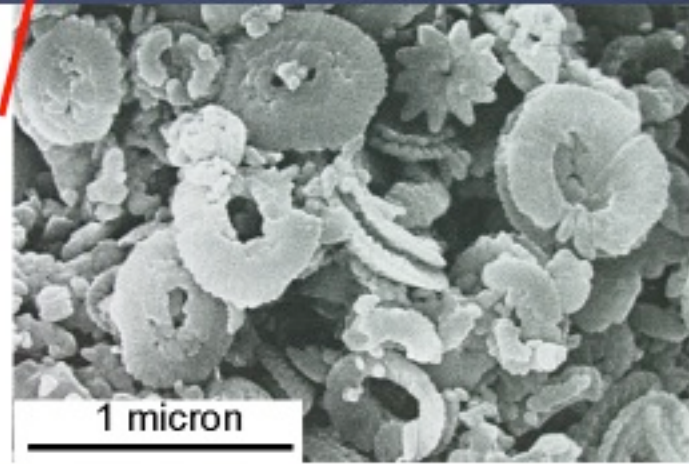
Großgenseoides ruber - fossil shell of a planktonic foraminifera, photo courtesy Christa Farnon of Columbia University



Planktonic foraminifera



Coccospheres



Coccoliths

COMPOSIZIONE ROCCE CARBONATICHE

- ***CALCITE* - (CaCO_3) - trigonale**
- ***Low Mg-CALCITE* - < di 4 moli % di MgCO_3**
- ***High Mg-CALCITE* - > di 4 moli % di MgCO_3**
- ***ARAGONITE* - (CaCO_3) - ortorombico**
- ***DOLOMITE* - $\text{CaMg}(\text{CO}_3)_2$**

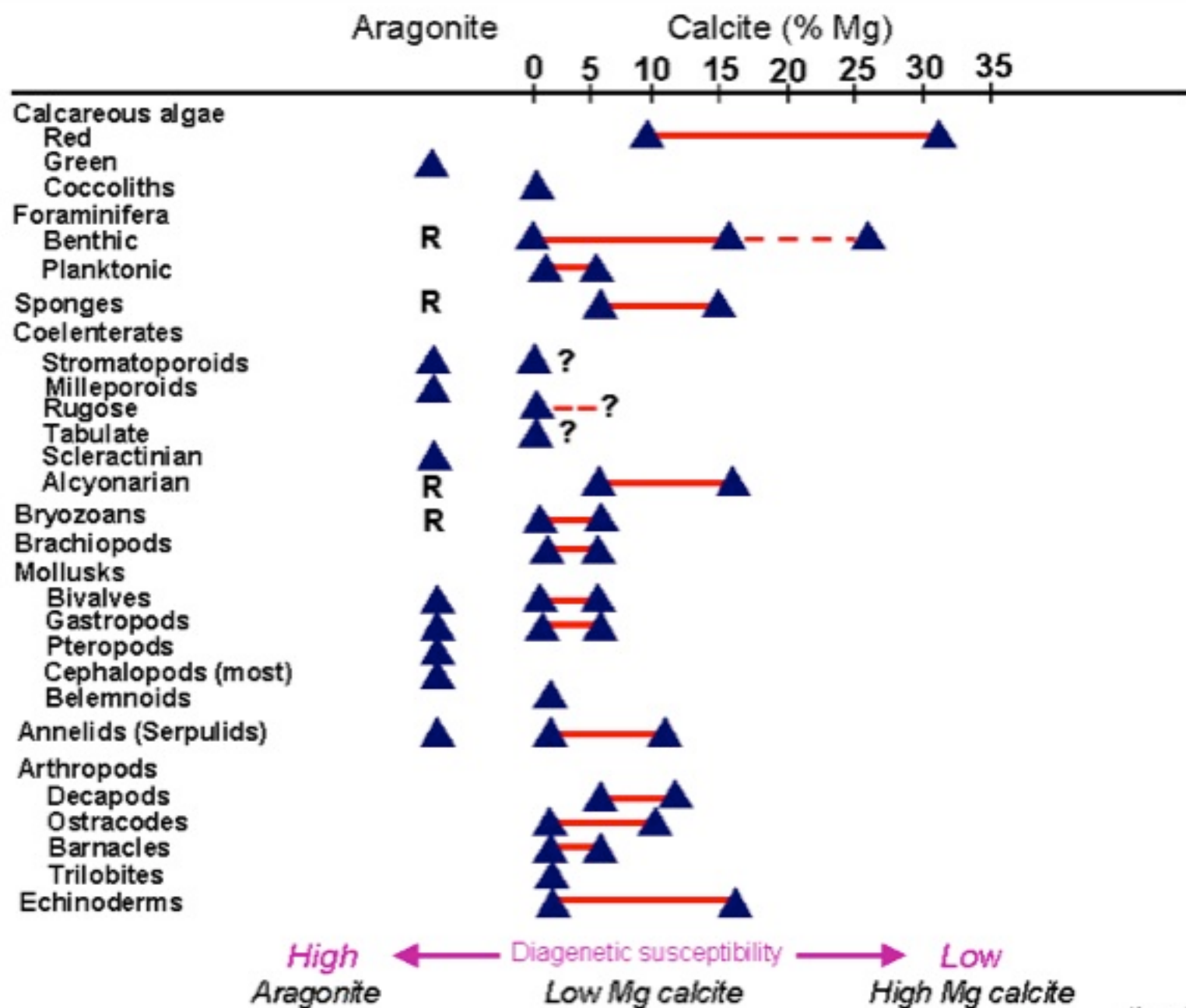
Mineralogia gusci-scheletri carbonatici

● mineralogia comune ○ meno comune o rara

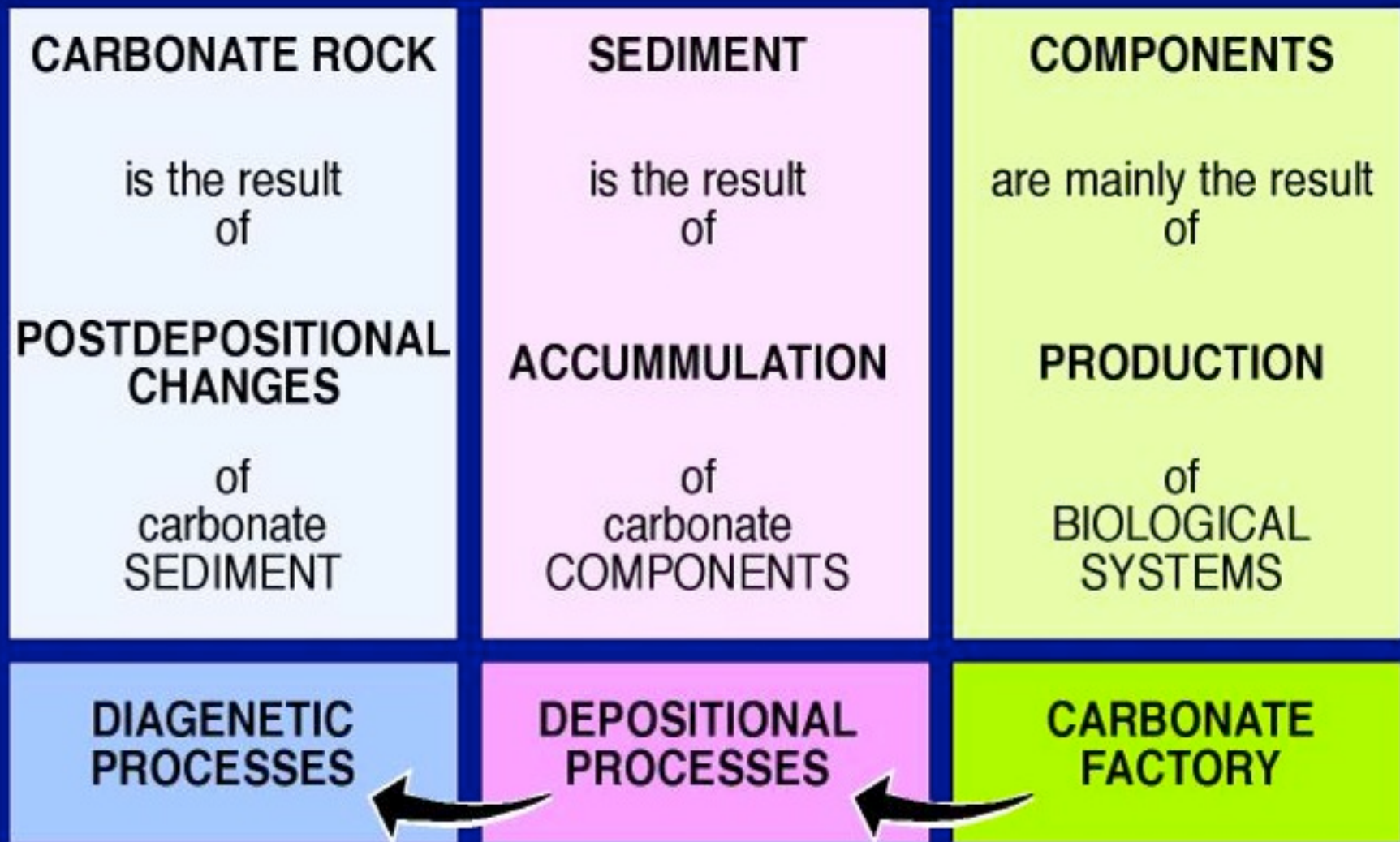
ORGANISMO	MINERALOGIA				
	ARAGONITE	ARAGONITE E CALCITE	CALCITE	Mg-CALCITE	Mg-CALCITE E ARAGONITE
Molluschi					
Gasteropodi	●	●			
Bivalvi	●	●	●		
Pteropodi	●				
Cefalopodi	●			○	
Brachiopodi			●	○	
Coralli					
Sclerattini	●				
Rugosi e tabulati			●	●	
Spugne			●	●	
Briozoi	●			○	●
Echinodermi				●	
Anellidi	●			●	●
Artropodi					
Decapodi				●	
Ostracodi			●	○	
Cirripedi			●	○	
Foraminiferi					
bentonici	○			●	
planctonici			●		
Alghe					
Rodoficee	●			●	
Cloroficee	●				
Carofite			●		
planctoniche (Coccoliti)			●		

Da Bosellini, 1991

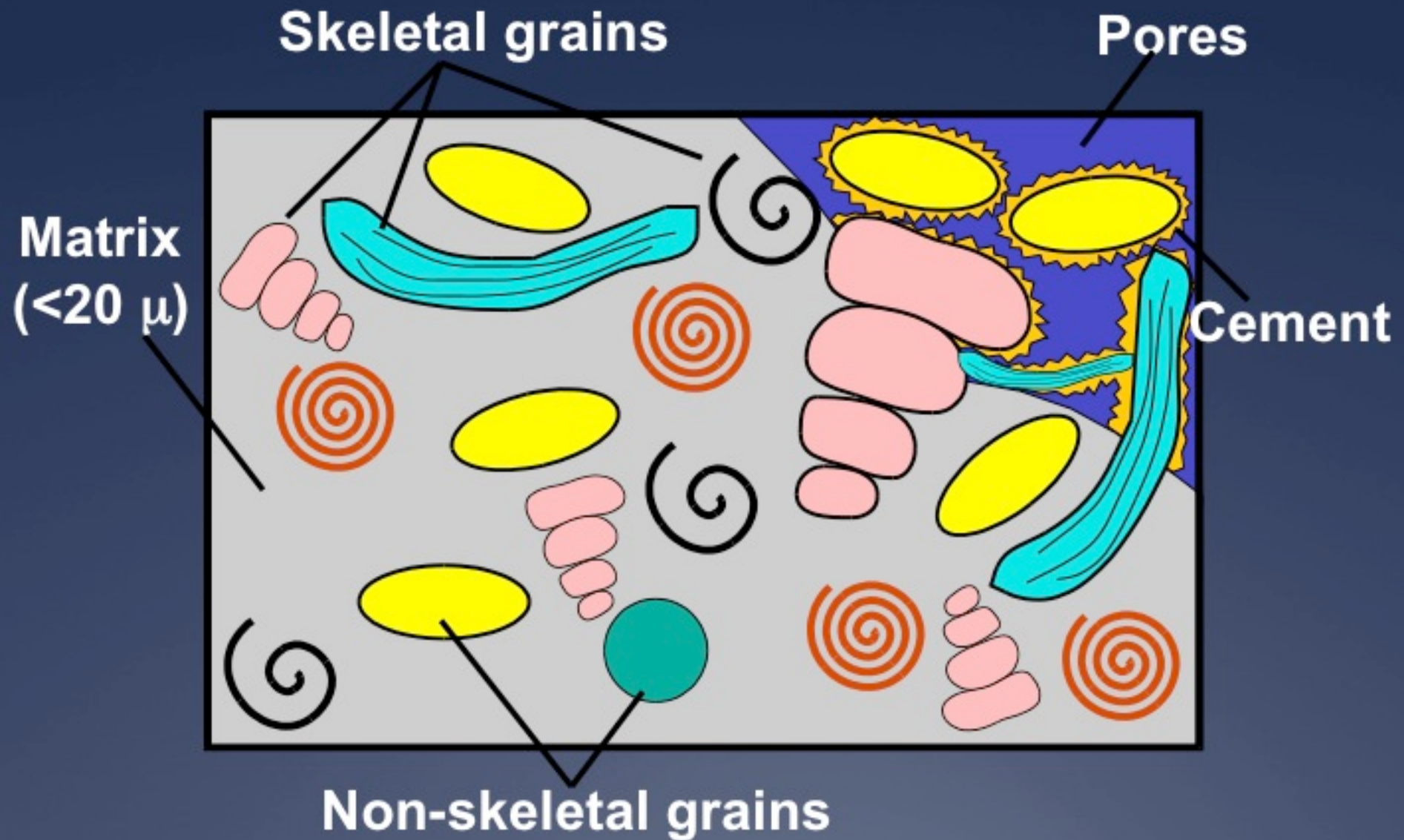
Common skeletal components and their mineralogy



CARBONATE ROCKS



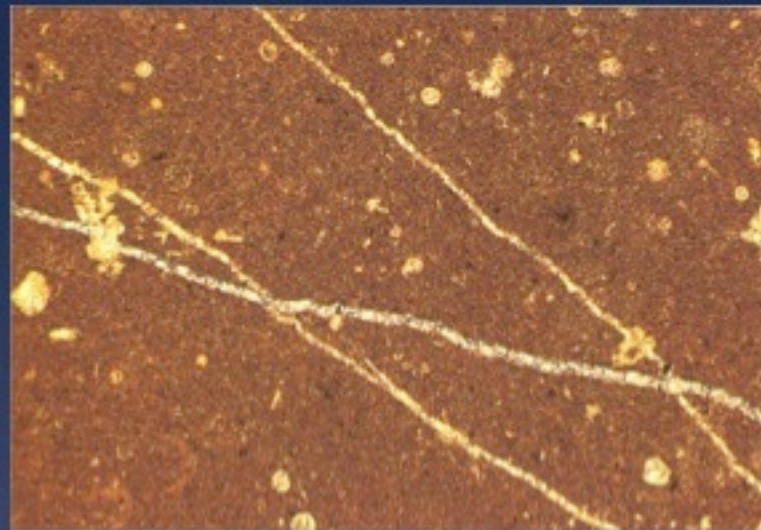
COMPONENTI ROCCE CARBONATICHE



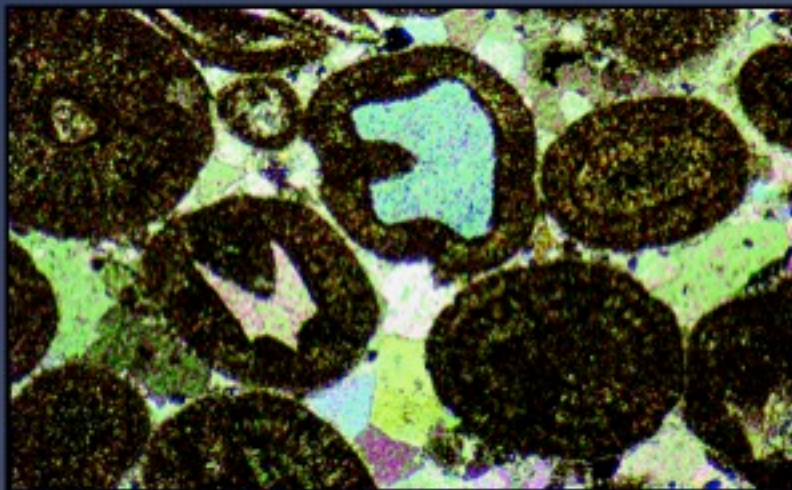
COMPONENTI CARBONATICI



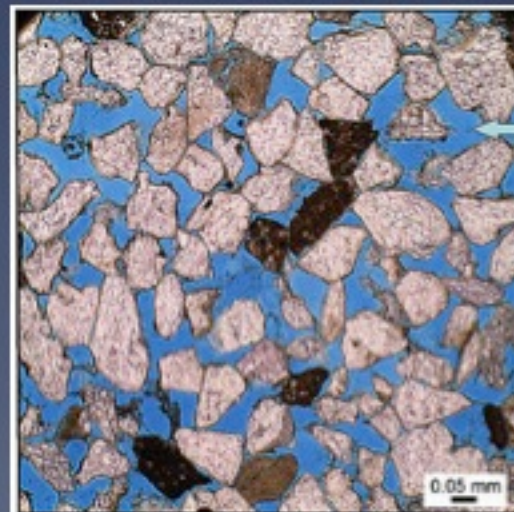
grani



matrice



cemento



pori

Classi sedimenti carbonatici

- *Carb. a tessitura particellare*

⇒ *Bosellini, 1992*

- *Carbonati accresciuti in situ*

- *Skeletal grains*

⇒ *Tucker & Wright, 1990*

- *Non-skeletal grains*

Grani scheletrici

*derivano da numerosi organismi in
grado di produrre parti carbonatiche*

*(molluschi, alghe, coralli, briozoi, foraminiferi,
echinodermi, spugne ecc.)*



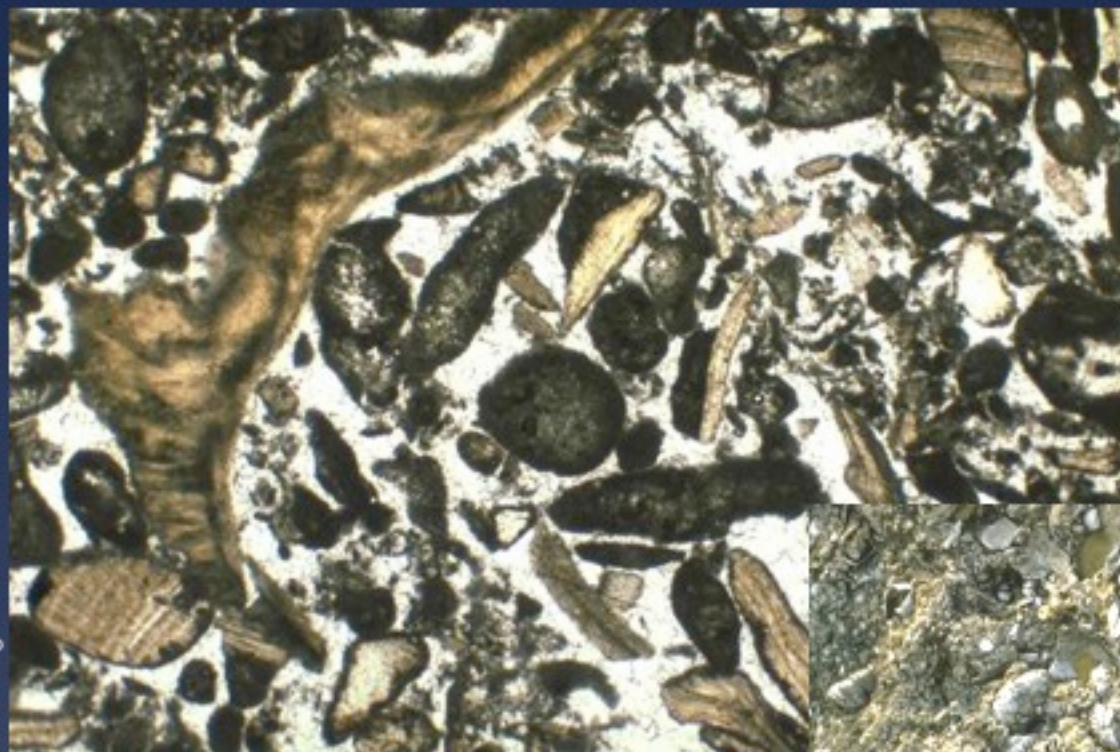
***Gusci interi
(biosomi)***

Bioclasti

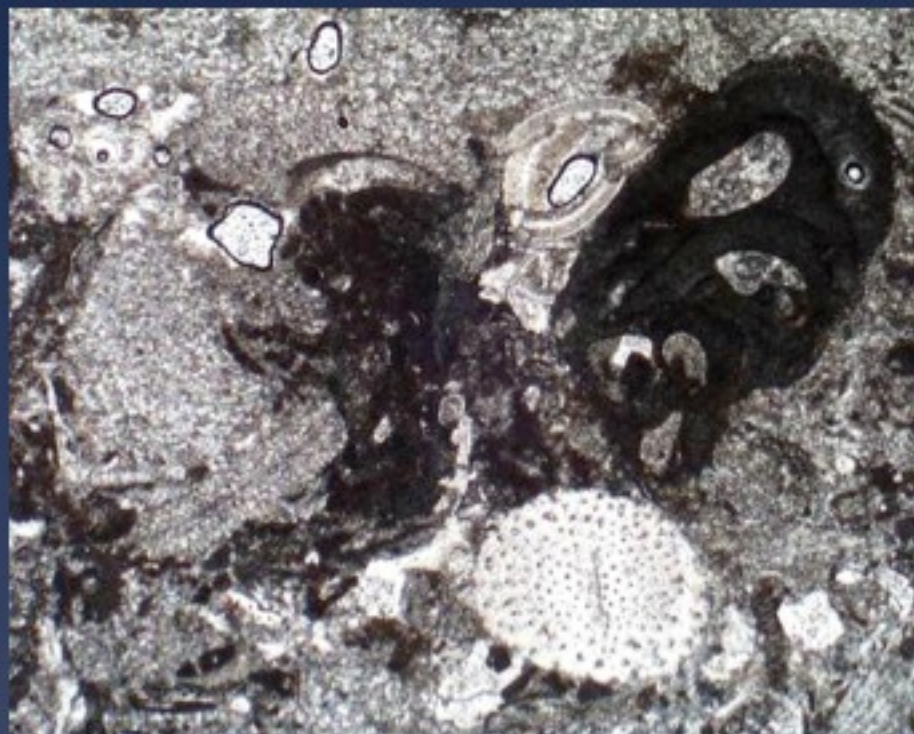


Variano con l'età del deposito

Grani scheletrici



Grani scheletrici

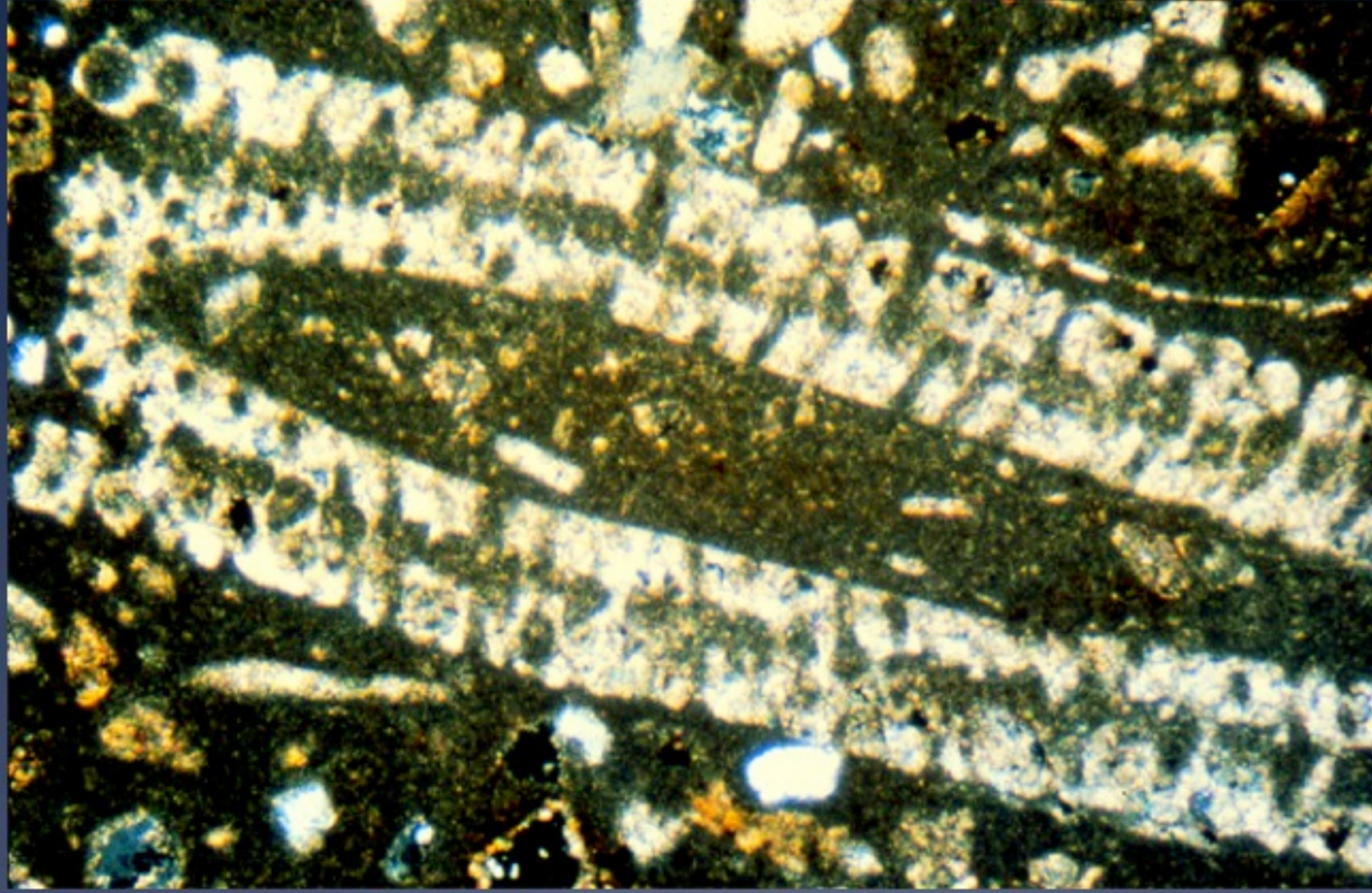


*Foraminiferi bentonici,
Echinodermi, incrostanti*

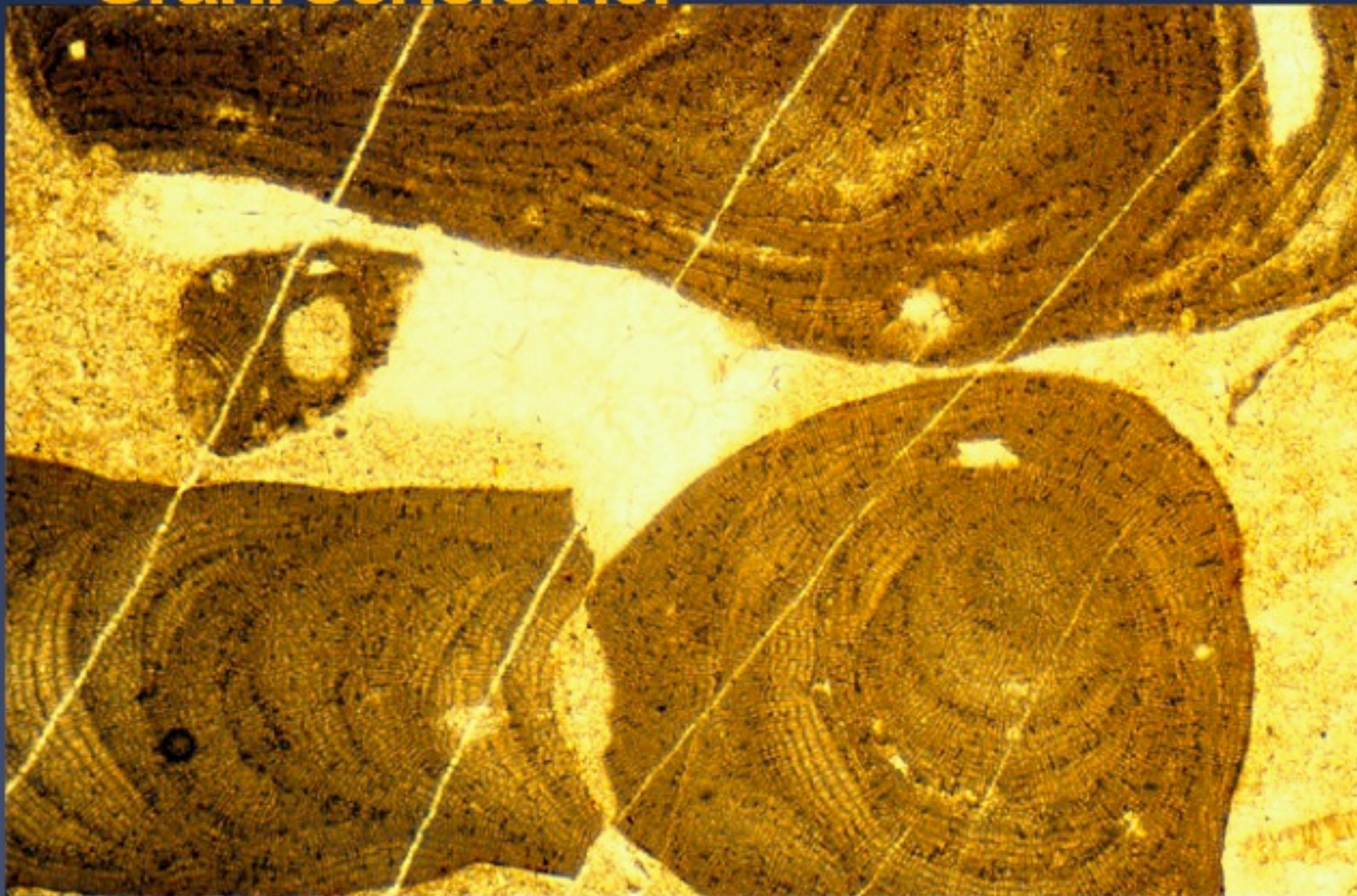


*Eocene, Monte Saraceno
Promontorio del Gargano*

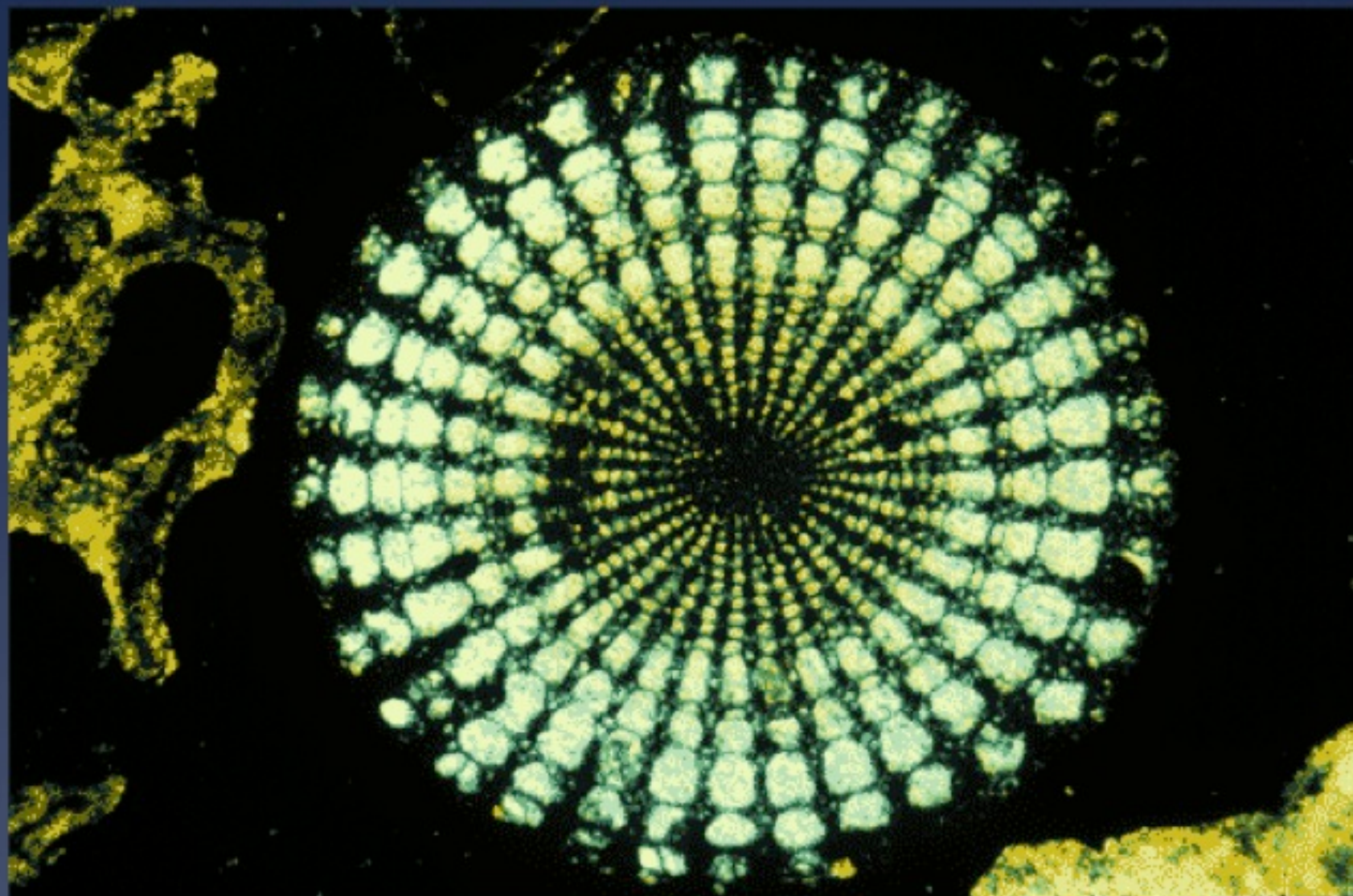




Grani scheletrici



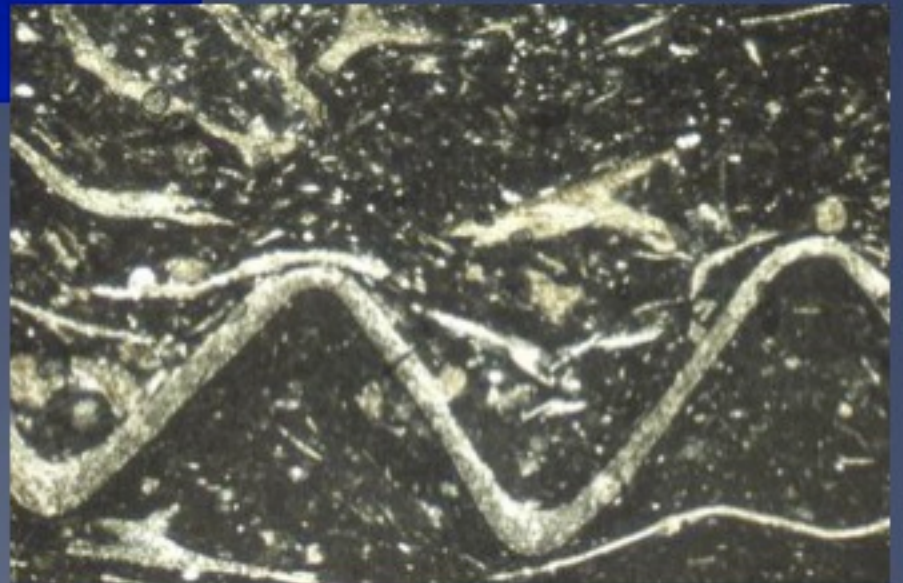
Grani scheletrici



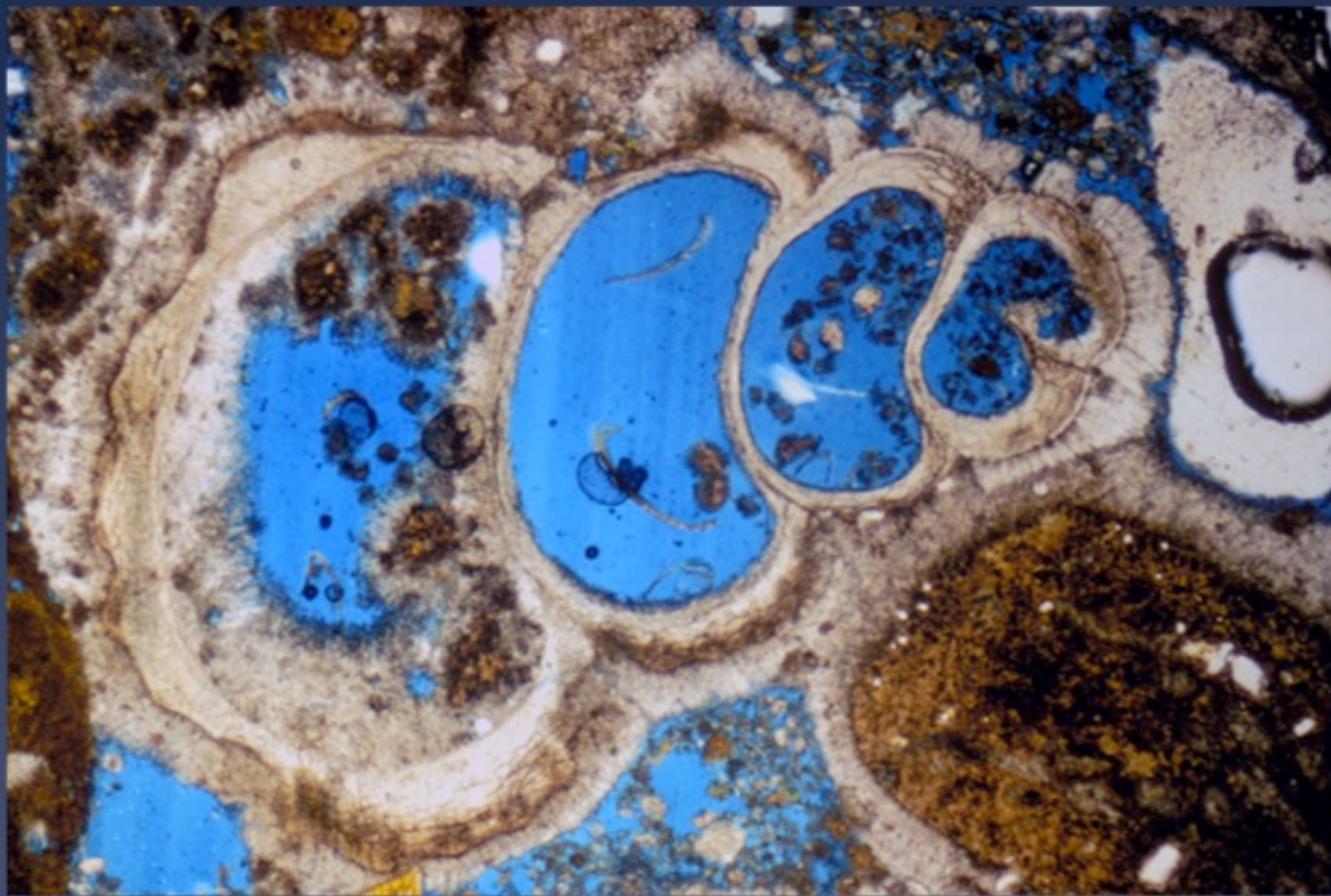
Grani scheletrici



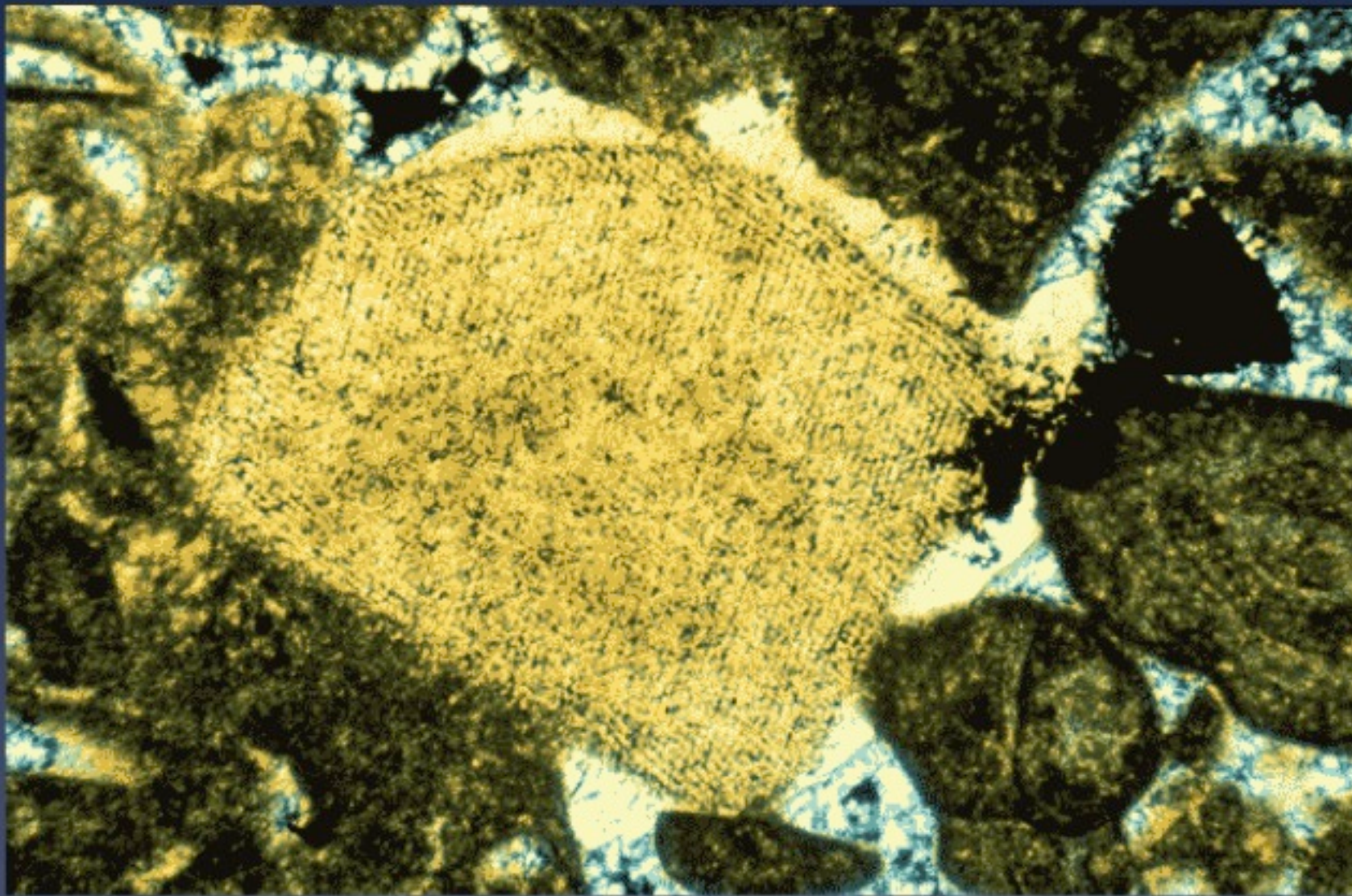
Brachiopodi



Grani scheletrici



Grani scheletrici





Grani detritici

*derivano dalla frammentazione di
preesistenti carbonati*

*rottura di parti di un
sedimento
penecontemporaneo*



Intraclasti

*Disgregazione di rocce
più antiche già
consolidate*



Extraclasti

Grani detritici

Intraclasti

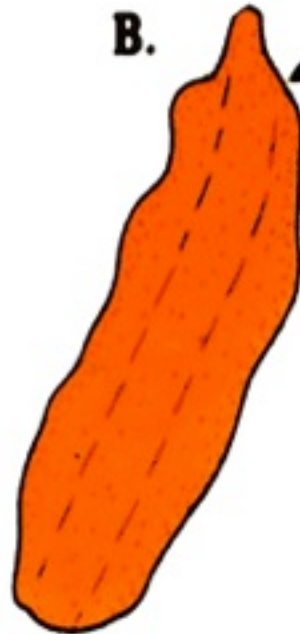
A fragment of penecontemporaneous, commonly weakly consolidated, carbonate sediment that has been eroded and redeposited, generally nearby, within the same depositional sequence in which it formed (Folk, 1959 and 1962).

Extraclasti

A detrital grain of lithified carbonate sediment (lithoclast) derived from outside the depositional area of current sedimentation (Folk, 1959)

Detrital Limestone

B.



INTRACLAST

ERODED FRAGMENT
OF LIME MUD OR
DIAGENETIC FABRIC.

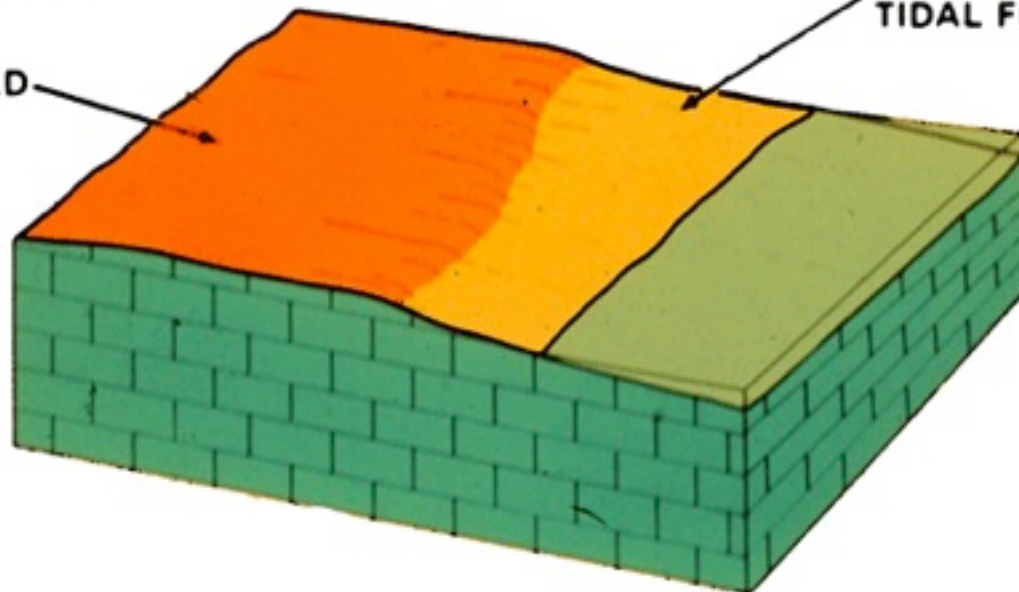
SOURCE:

RIPPED UP
MUD CRACKED SEDIMENT
FROM INTERTIDAL &
SUPRATIDAL ZONE.



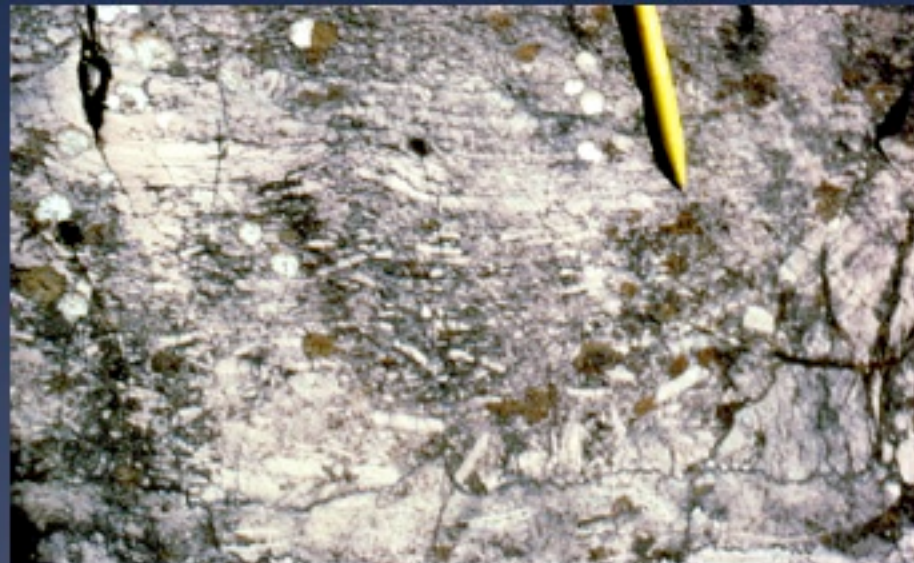
MUD CRACKED
TIDAL FLAT

BURROWED
TIDAL FLAT



Kendall, 2006

Grani detritici



intraclasti







Detrital Limestone

A.

LITHOCLAST OR EXTRACLAST

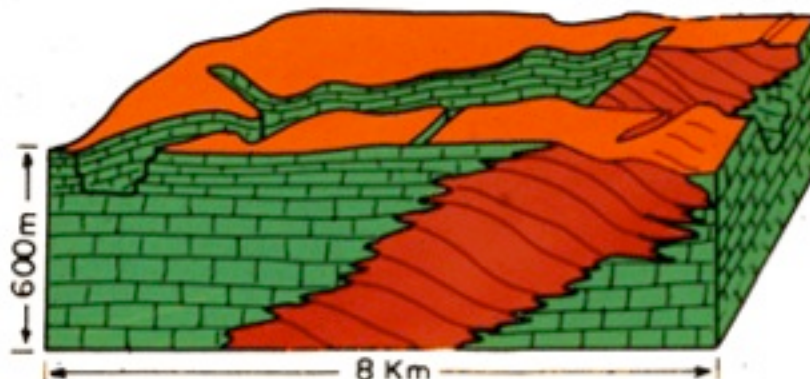
ERODED FRAGMENT OF CEMENTED
LIMESTONE.



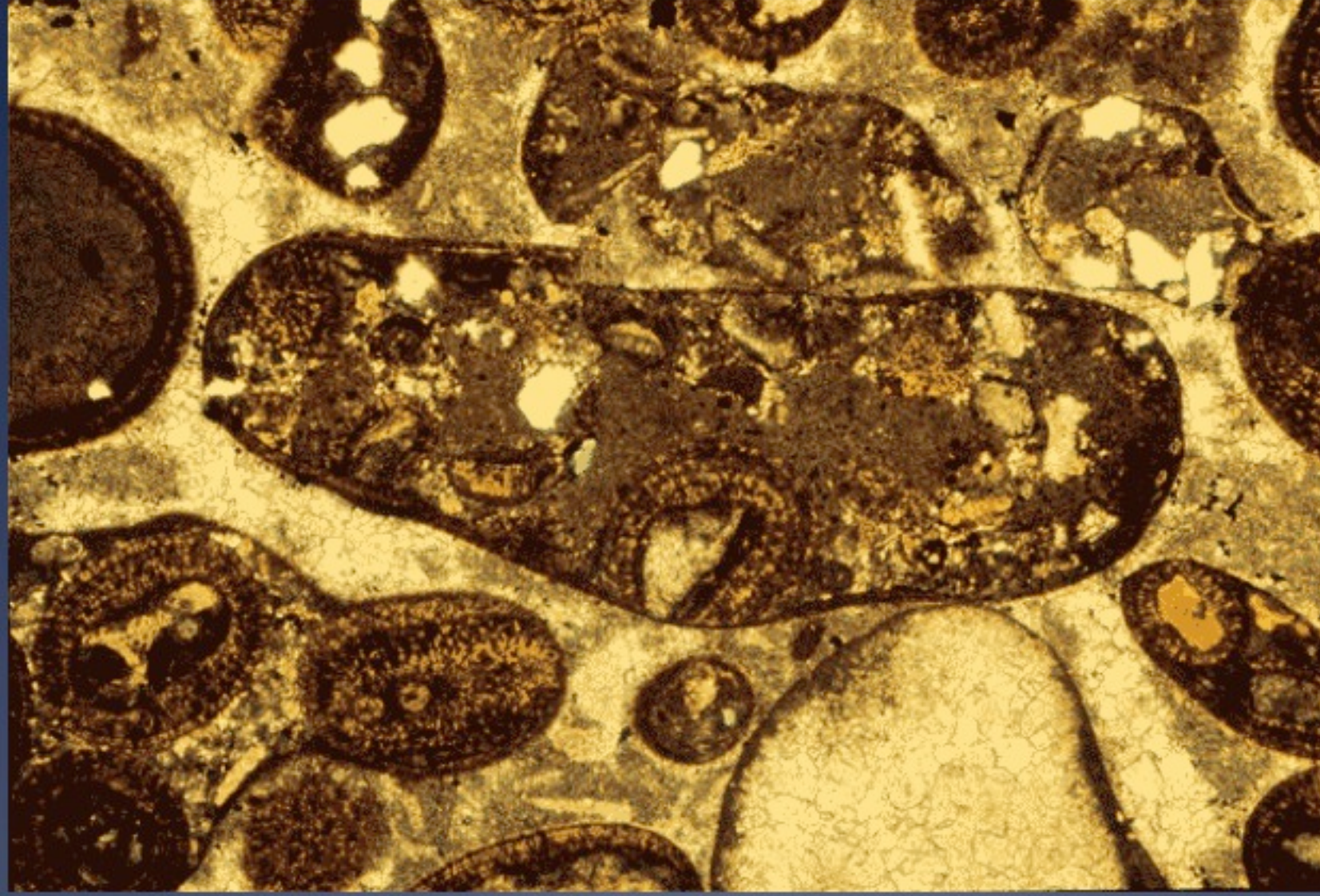
SOURCE

RAPIDLY ERODED LIMESTONE
TOPOGRAPHY AND TRANSPORTATION.

WATER EROSION →



Kendall, 2006



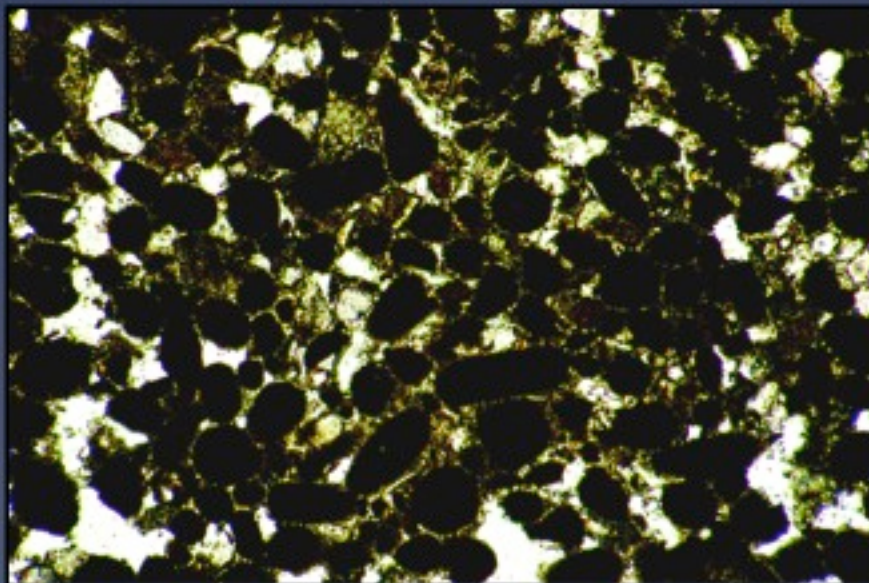
Peloidi

*granuli di carbonato microcristallino
arrotondati privi di struttura interna*

Fecal pellets



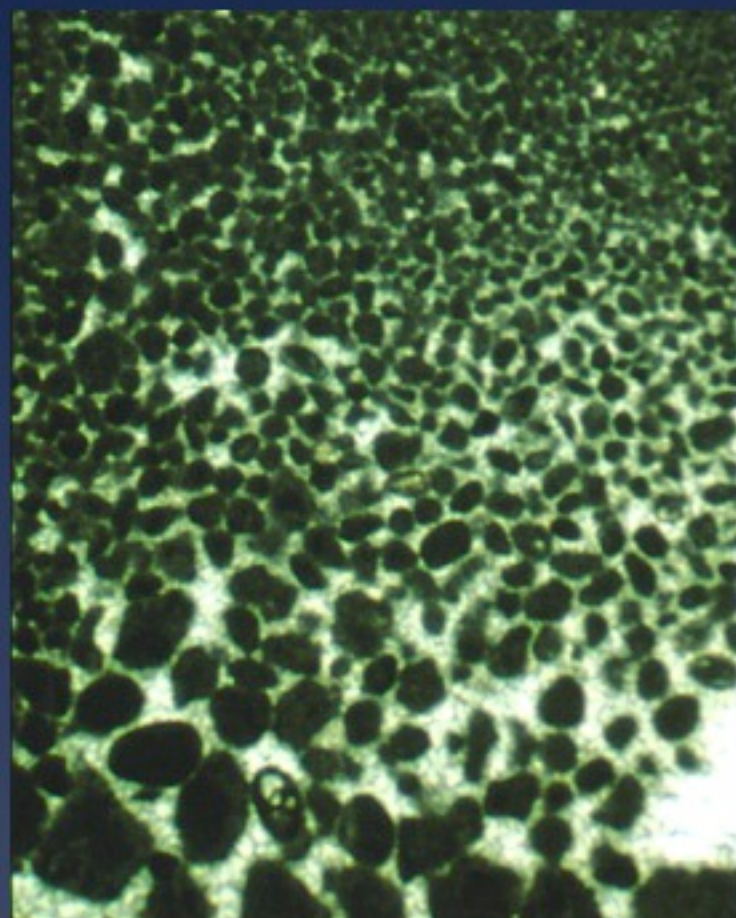
Micritizzazione



Dimensioni: da pochi micron a qualche millimetro

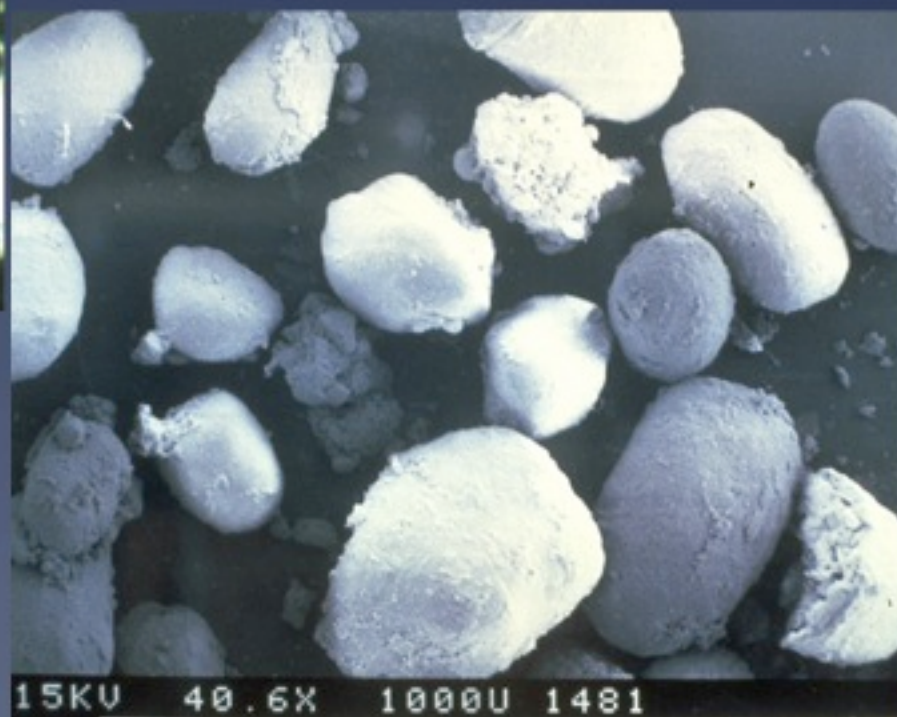
Bahamas





Gargano

Bahamas



Peloidi



Processo di micritizzazione

4 mm

peloidi

Initial boring



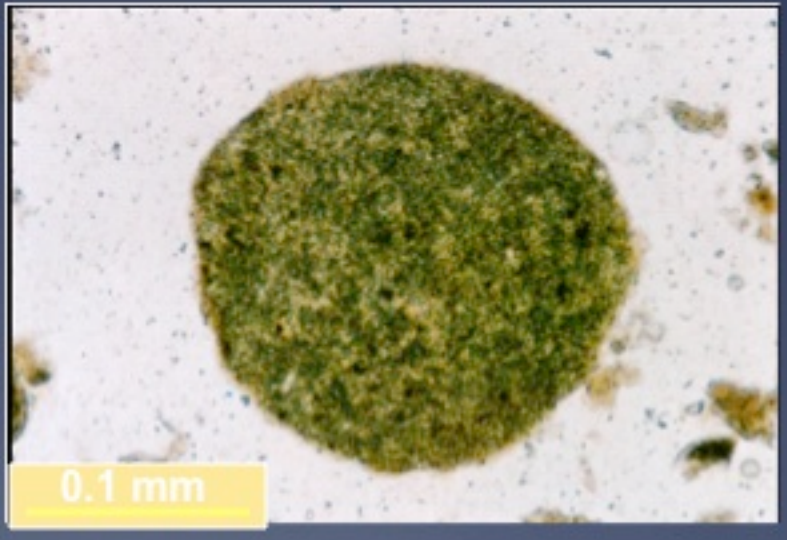
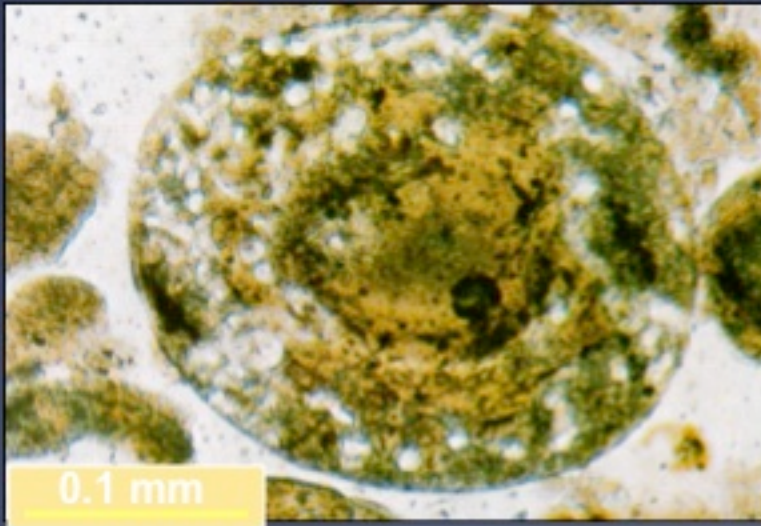
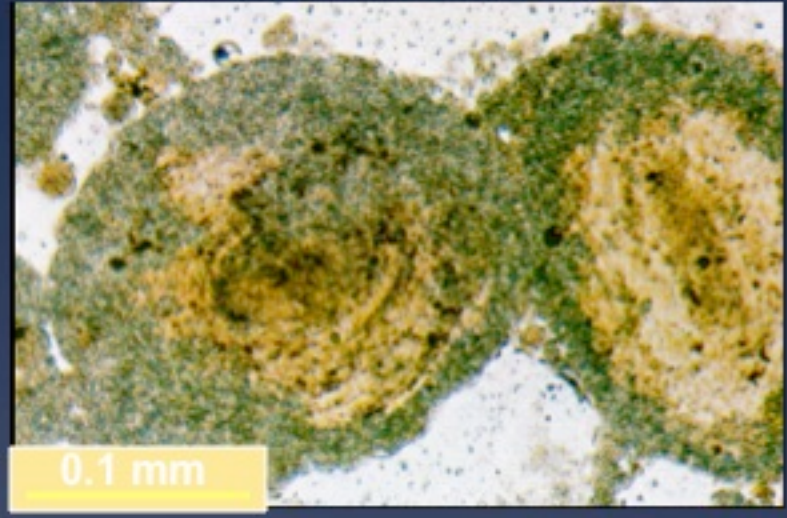
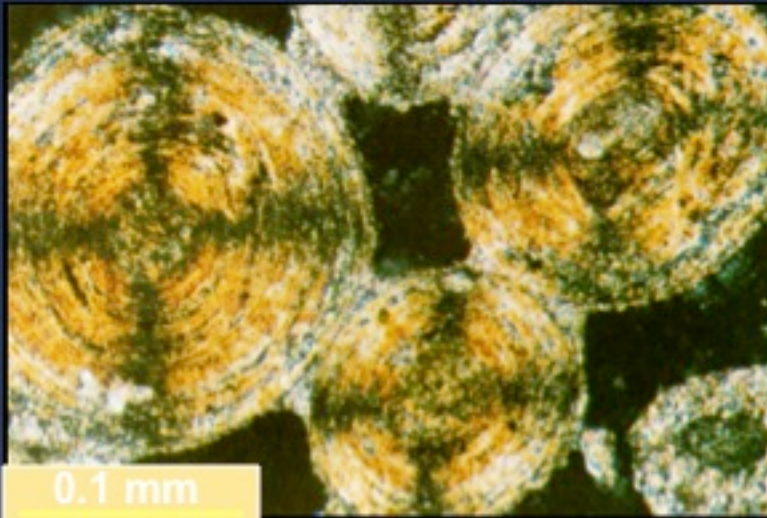
Micrite fill



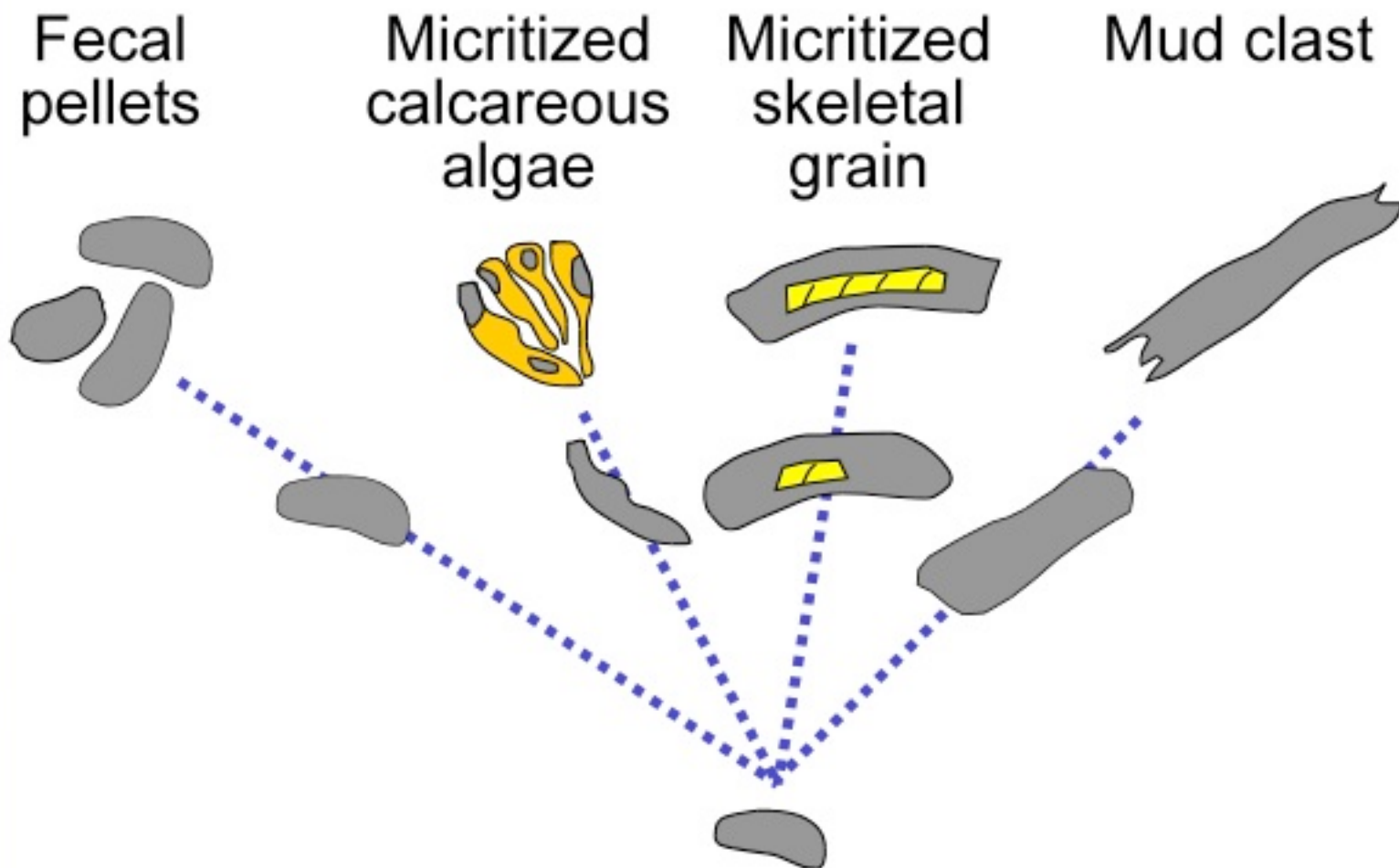
Complete micritization



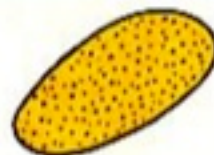
Micritizzazione



Peloidi



Peloidi



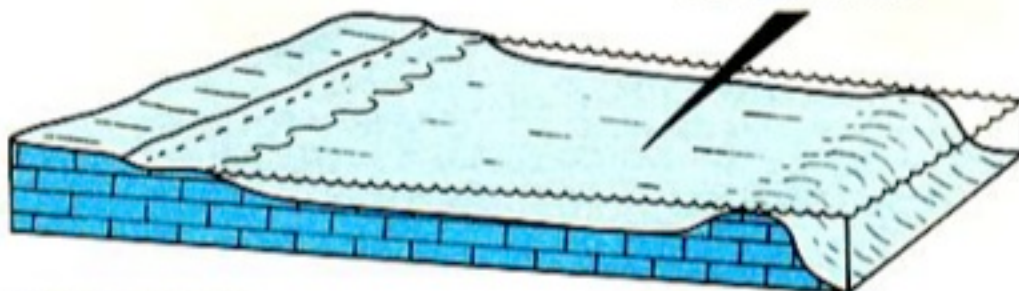
.5mm

GENESIS

EXCRETION

DEPOSITIONAL SETTING

PROTECTED SHALLOW WATER
WITH MINIMAL SUB SEA
CEMENTATION



DIAGENESIS

MOST PRESERVED PELLETS IN ROCK RECORD MUST HAVE BEEN CEMENTED PENECONTEMPORANEOUSLY. MOST LIME MUDS WERE PROBABLY COMPOSED OF SQUASHED SOFT FECAL PELLETS.

FAUNAL ASSOCIATION

HIGH NUMBERS, LOW DIVERSITY, FILTER FEEDERS COMMON

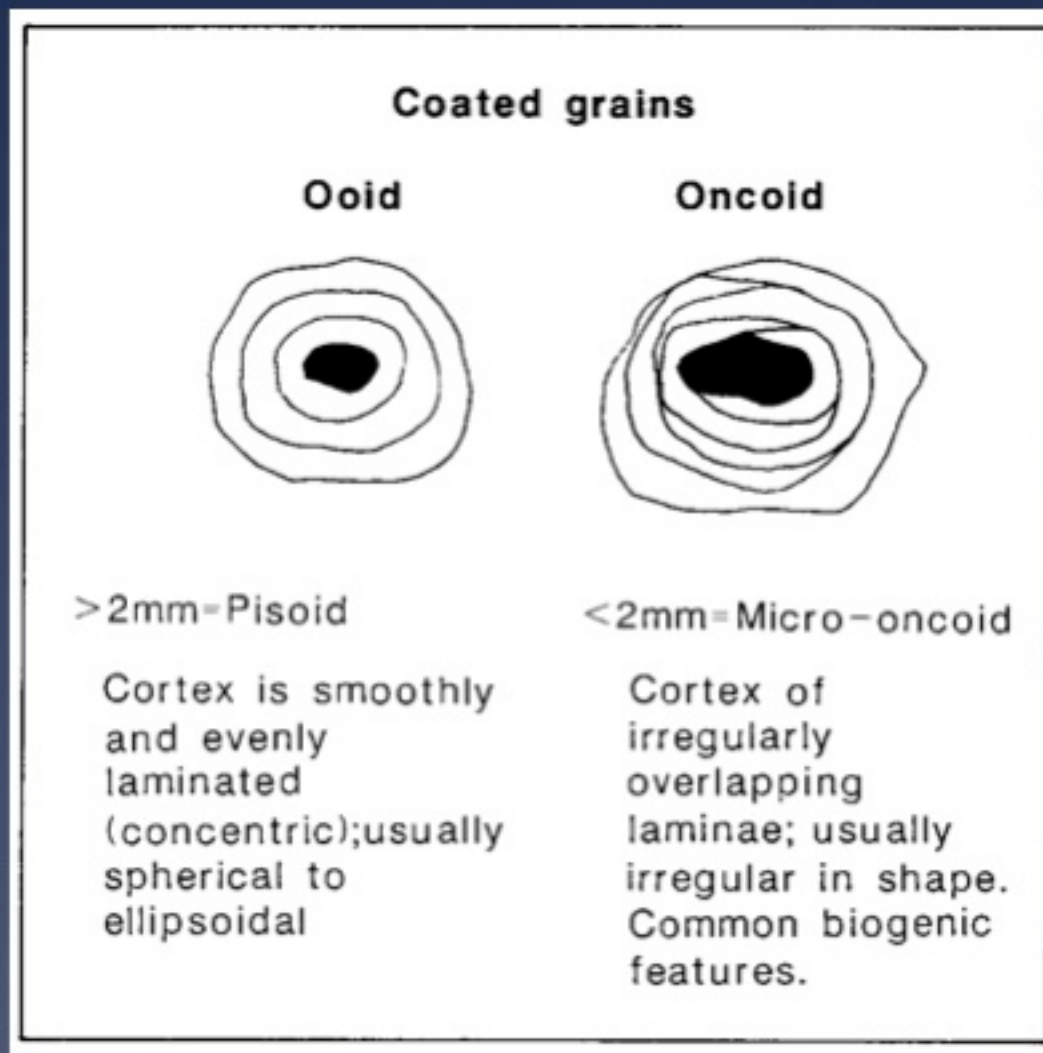
Grani rivestiti

*grani di carbonato di forma e natura
varia legati da cemento o da feltri*

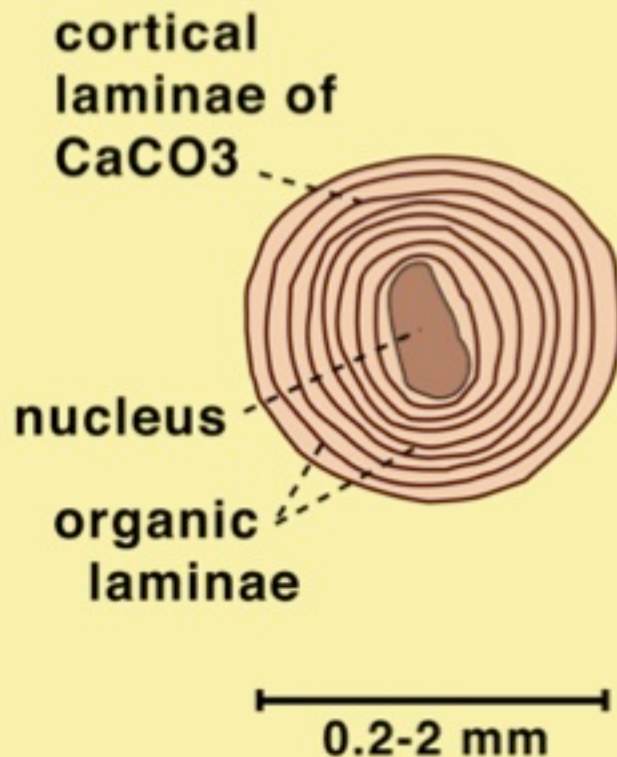


Dimensioni: da 0,5 mm a diversi cm

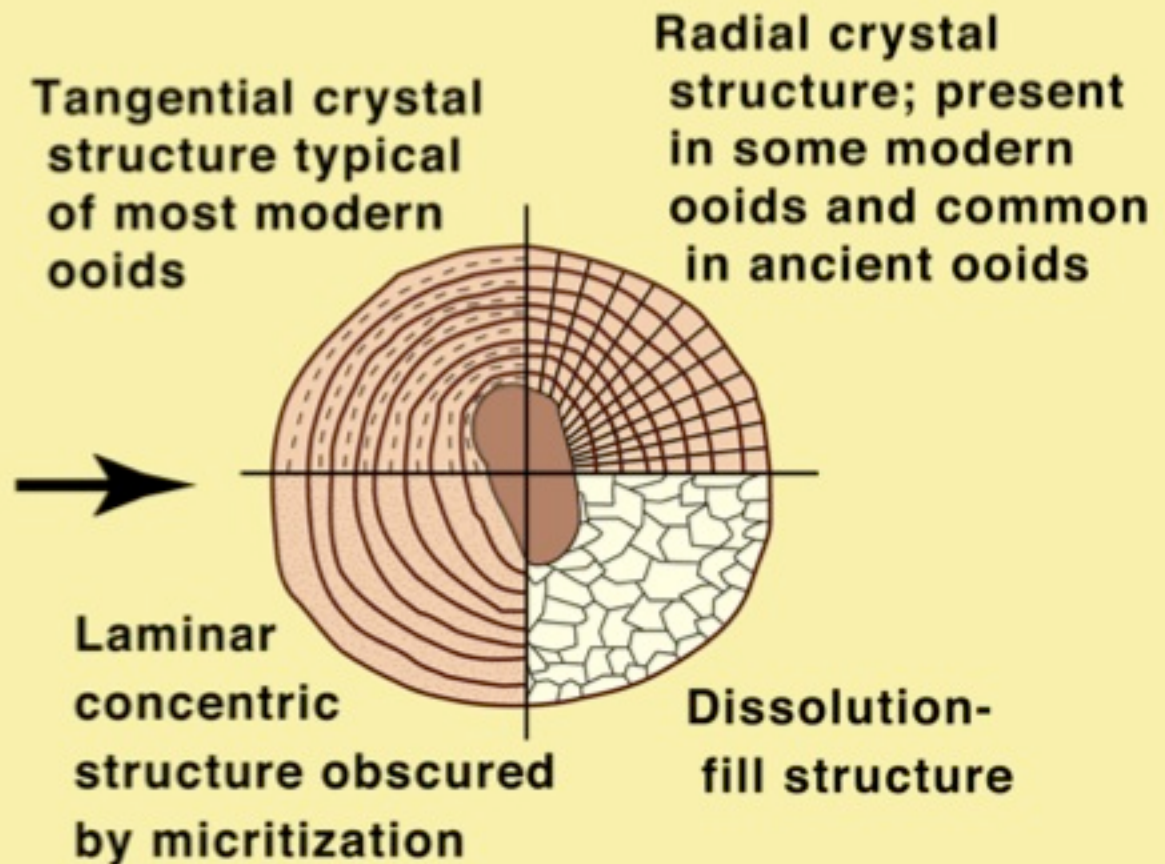
Grani rivestiti



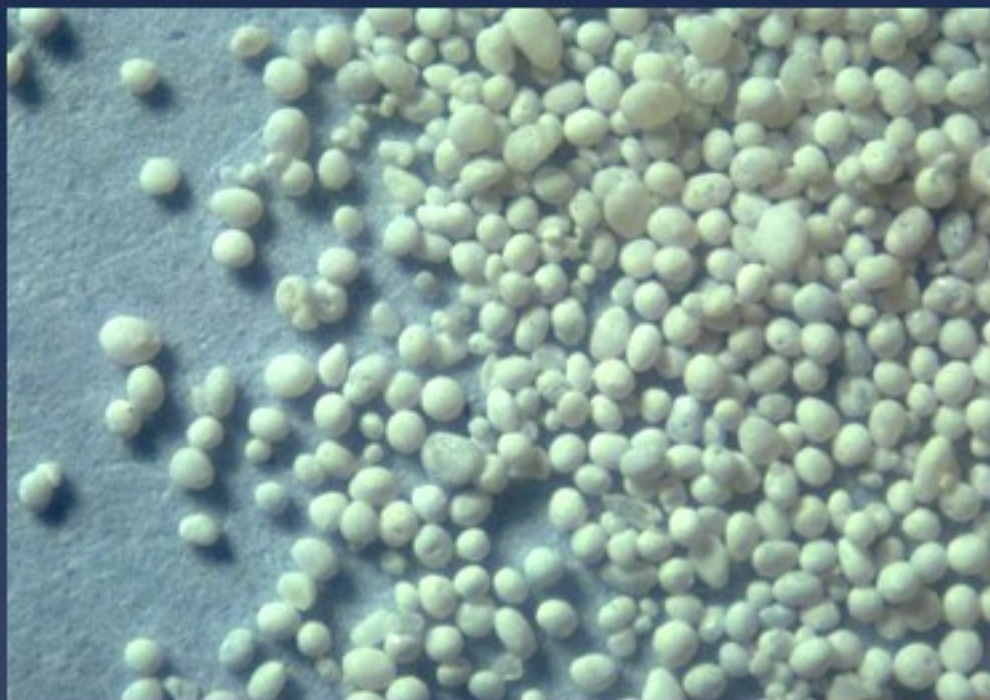
Macrostructure



Microstructure



Grani rivestiti (Ooidi)



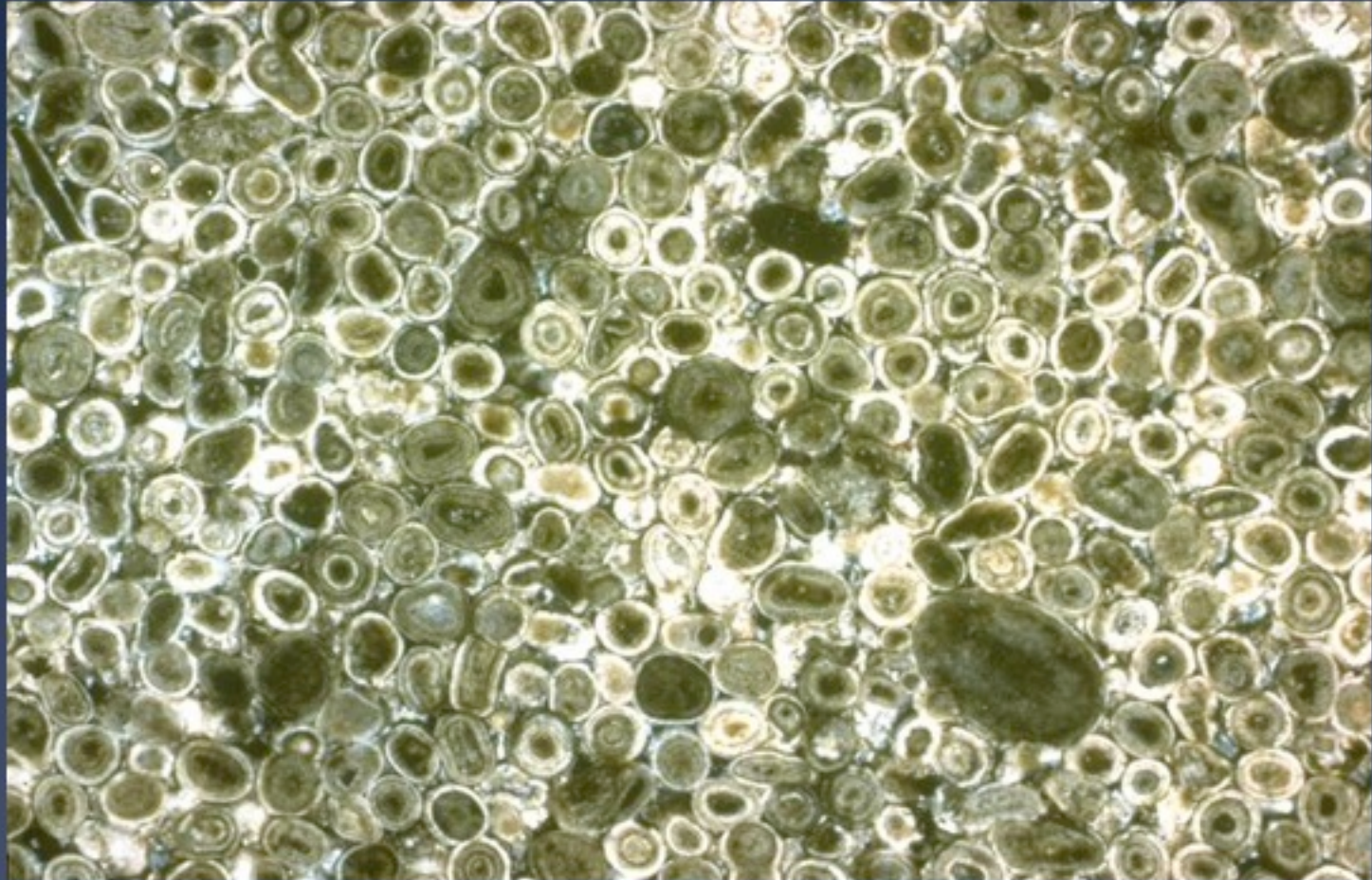
Abu Dhabi

Andros



Sabbie oolitiche

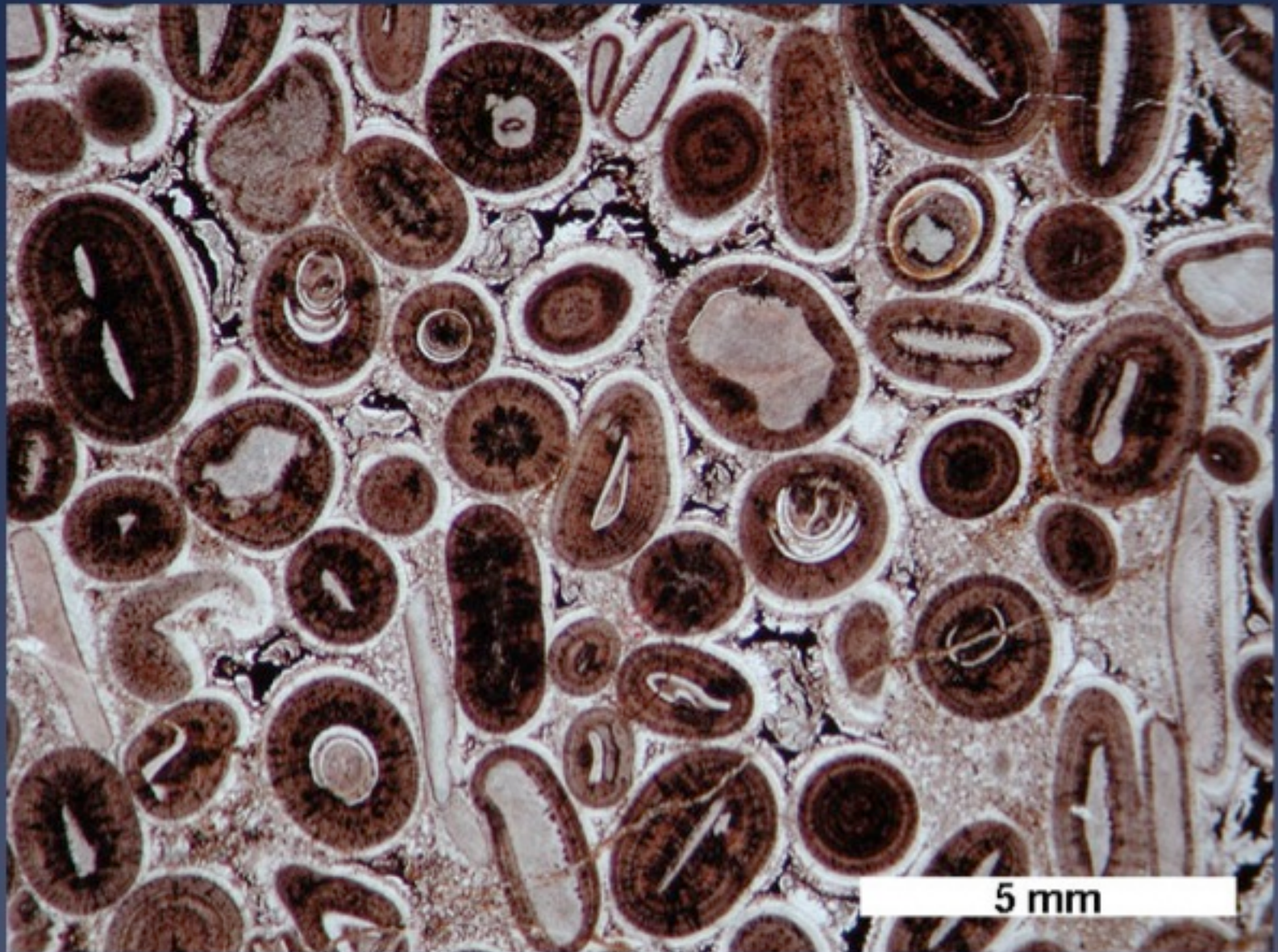
Grani rivestiti (Ooidi)

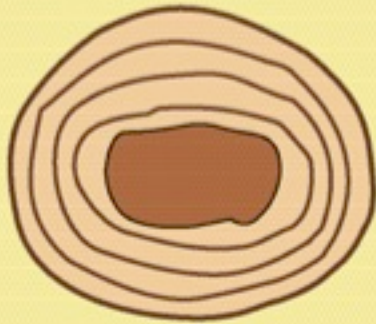


Ooliti

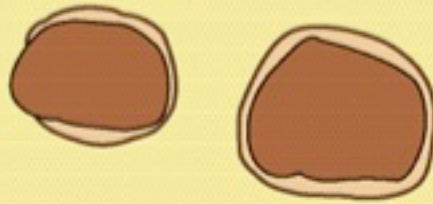
Grani rivestiti (Ooidi)

Scholle, 2002

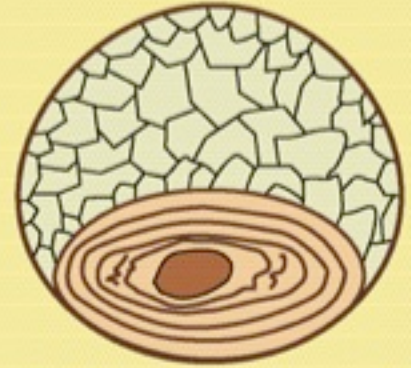




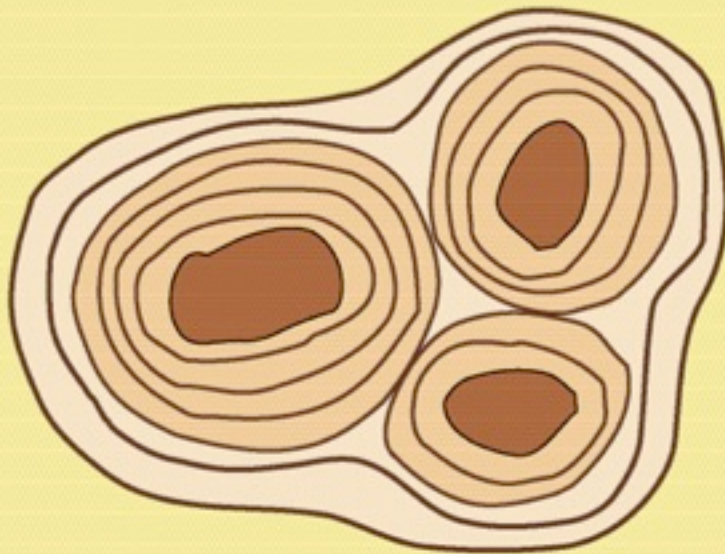
Ooid



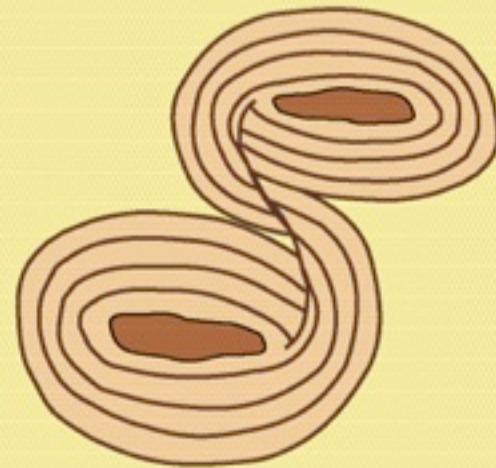
Superficial ooids



Collapsed ooid



Composite ooid

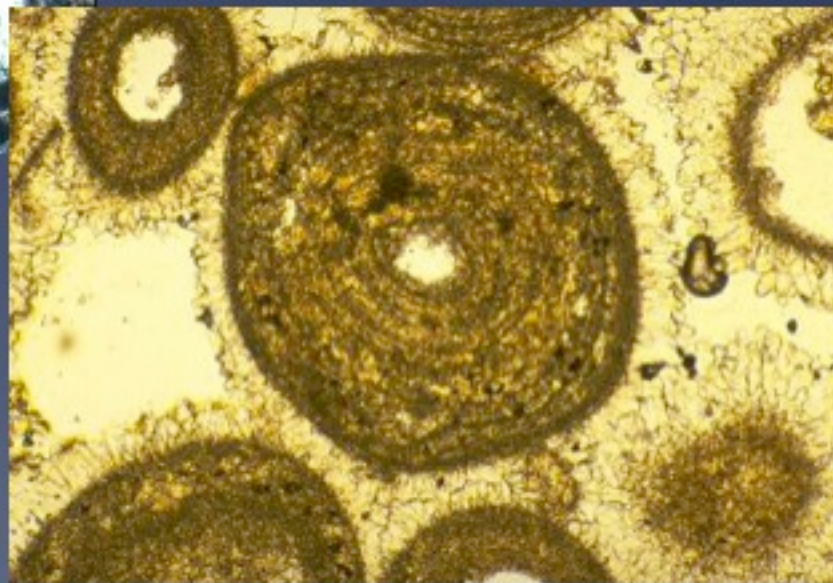


**Deformed ooids
(spastoliths)**

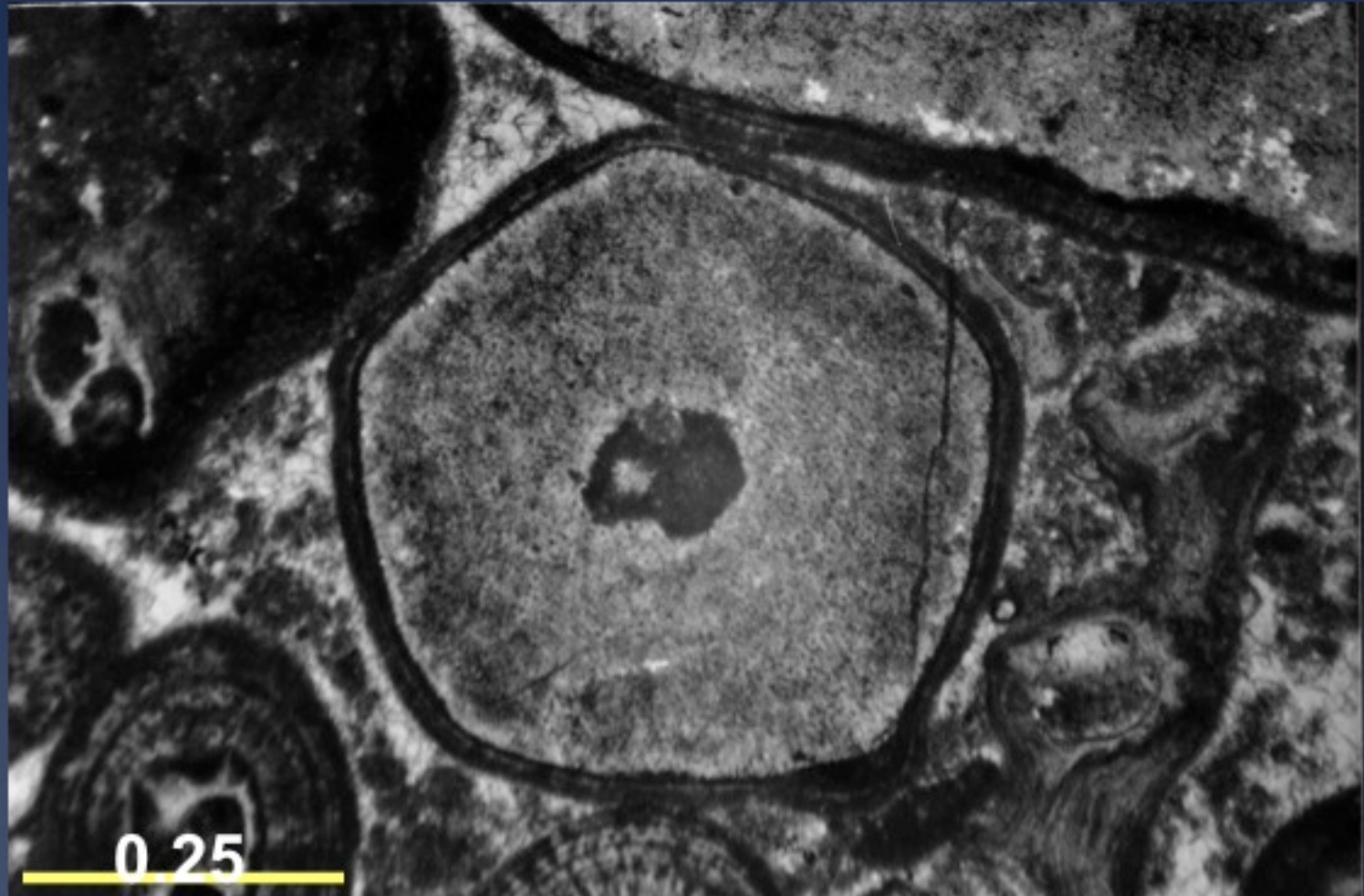
Grani rivestiti (Ooidi)



Ooliti



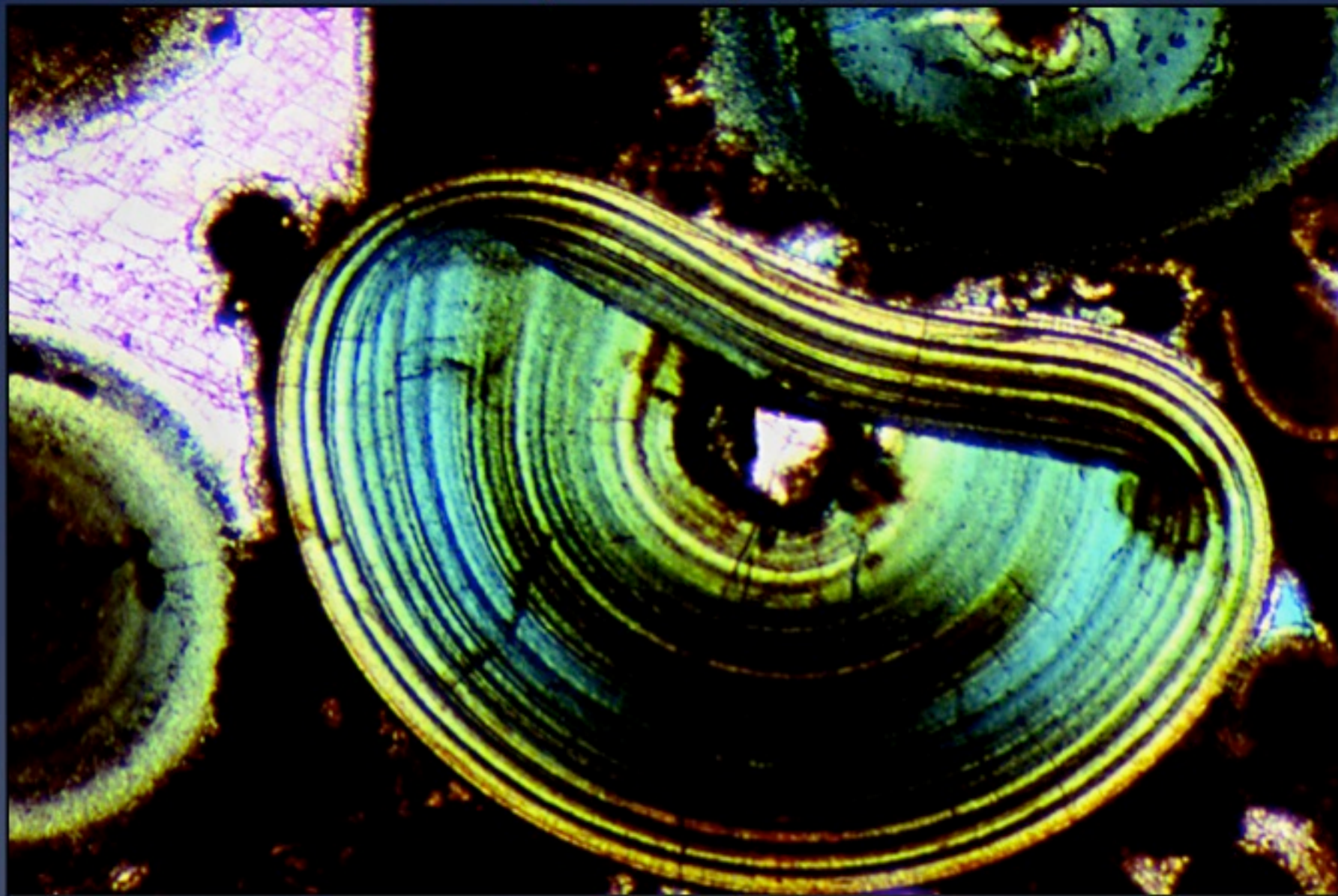
Grani rivestiti (Ooidi)



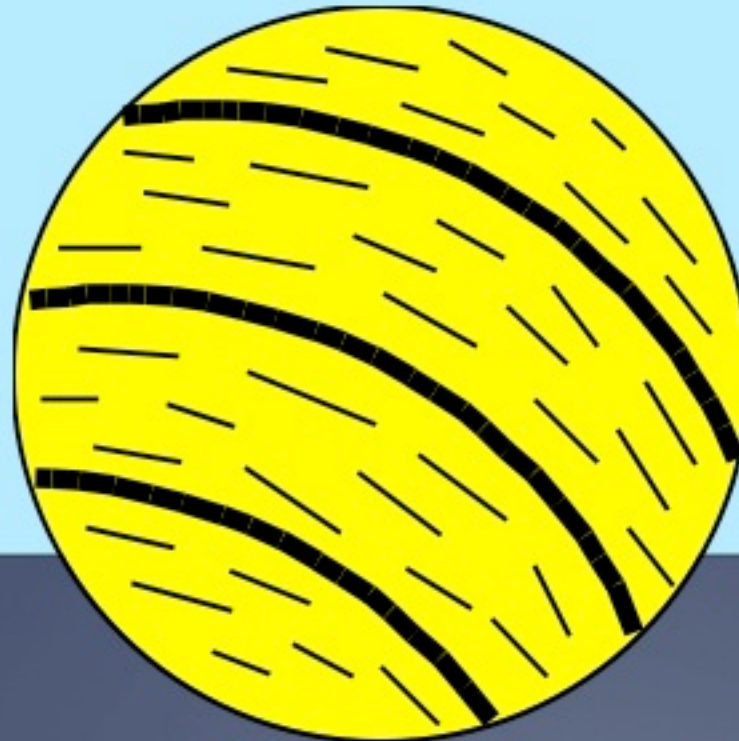
Ooliti superficiali

Grani rivestiti (Ooidi)

Scholle, 2002



Type	Mineralogy	Occurrence	Modern Analog	Depositional Setting
Tangential/Concentric	Predominantly Aragonite	Most Modern Ooids	Bahamas, Persian Gulf, Turks and Caicos	Normal Marine High Energy



**“Snow ball”
Precipitation**

Type	Mineralogy	Occurrence	Modern Analog	Depositional Setting
Tangential/Concentric	Predominantly Aragonite	Most Modern Ooids	Bahamas, Persian Gulf, Turks and Caicos	Normal Marine High Energy
Radial		Many ooids	Great salt Red Sea, Brackish (b)	Supersaline High Energy, Brackish Marine

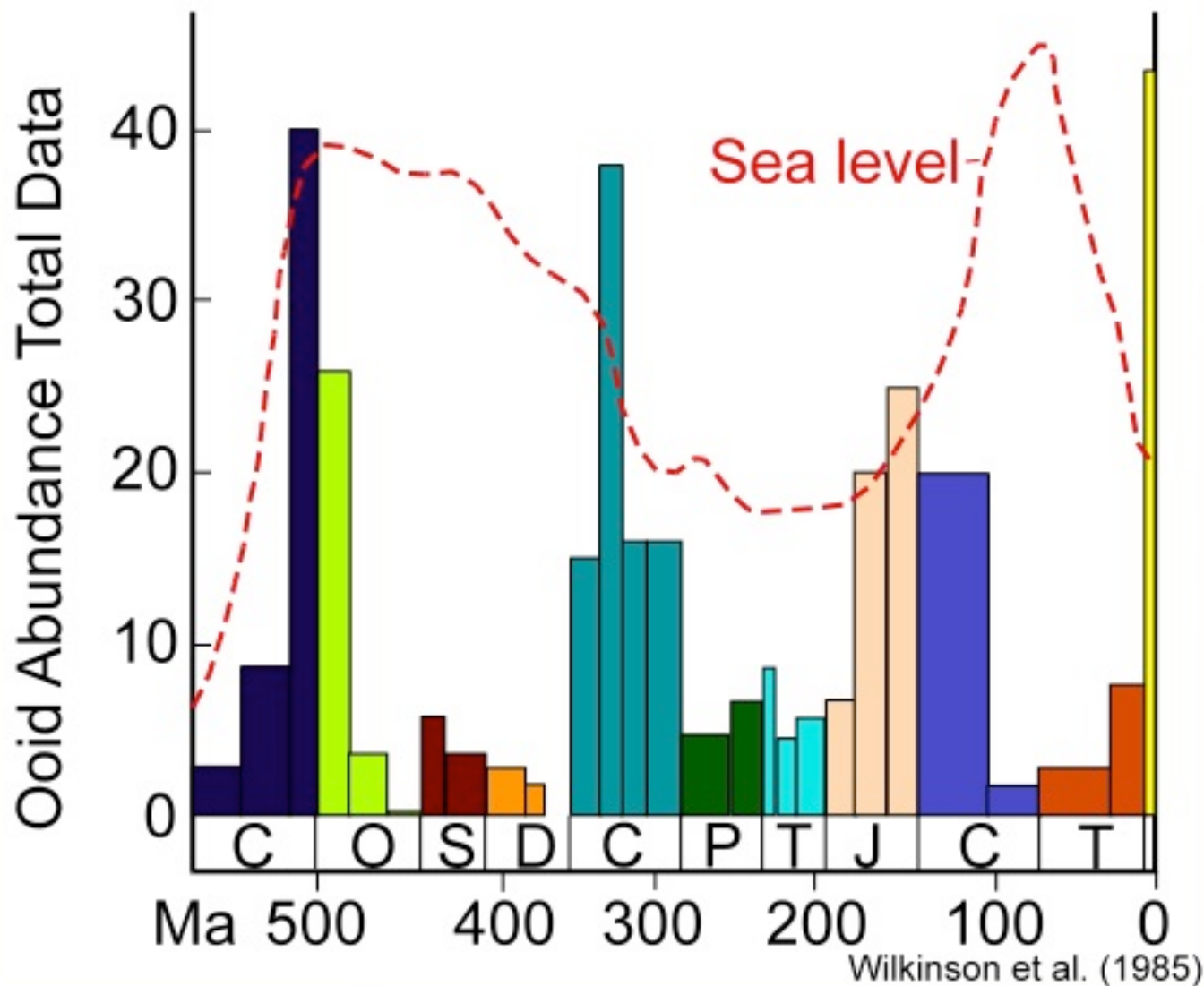
Grani rivestiti (Ooidi)

Former aragonite ooid?

Mg-calcite ooid



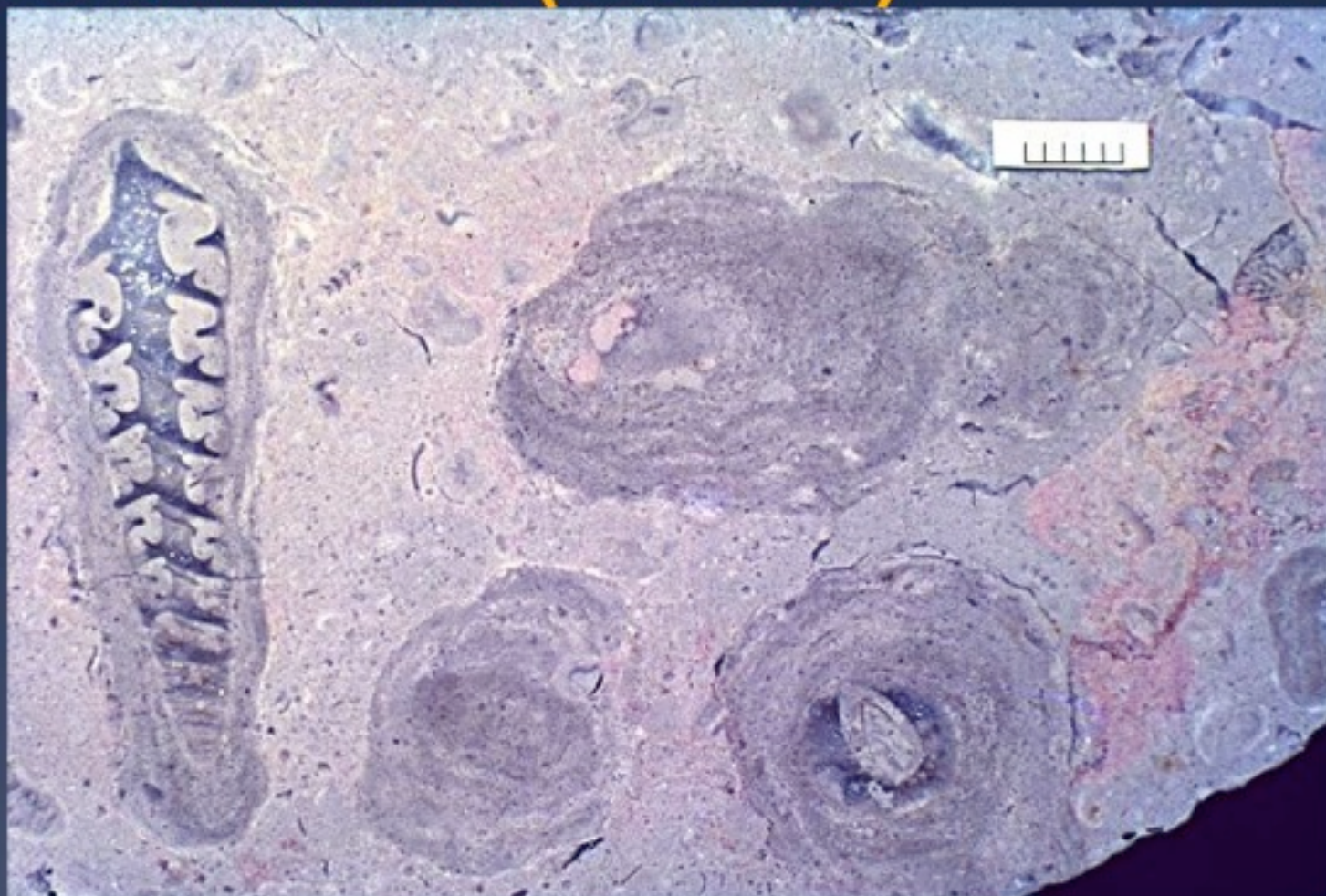
Abbondanza ooidi



Grani rivestiti (Oncoidi)

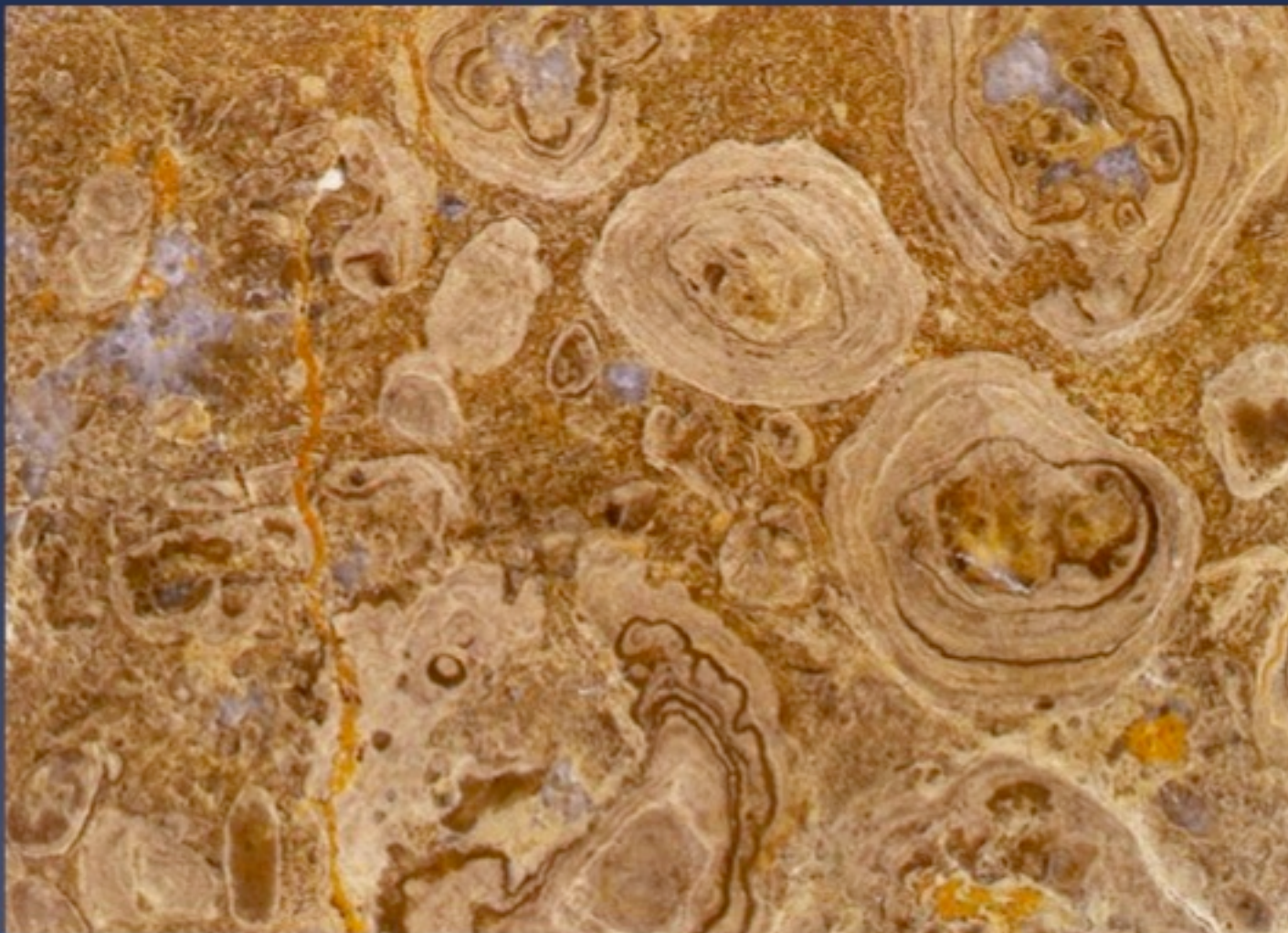


Grani rivestiti (Oncoidi)



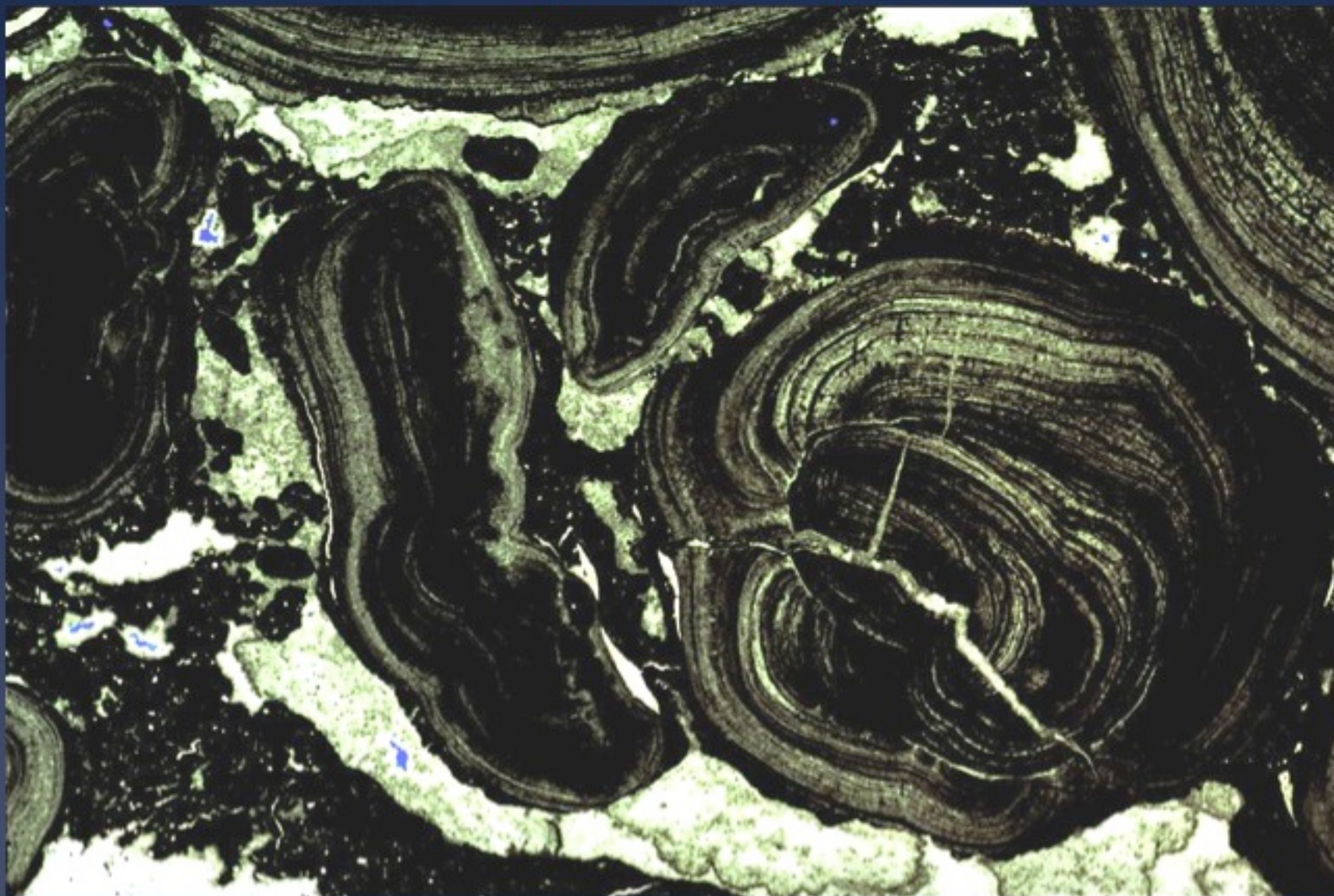
Oncoidi

Grani rivestiti (Oncoidi)



Grani rivestiti (Oncoidi)

Scholle, 2002



Grani rivestiti (Oncoidi - RODOLITE)

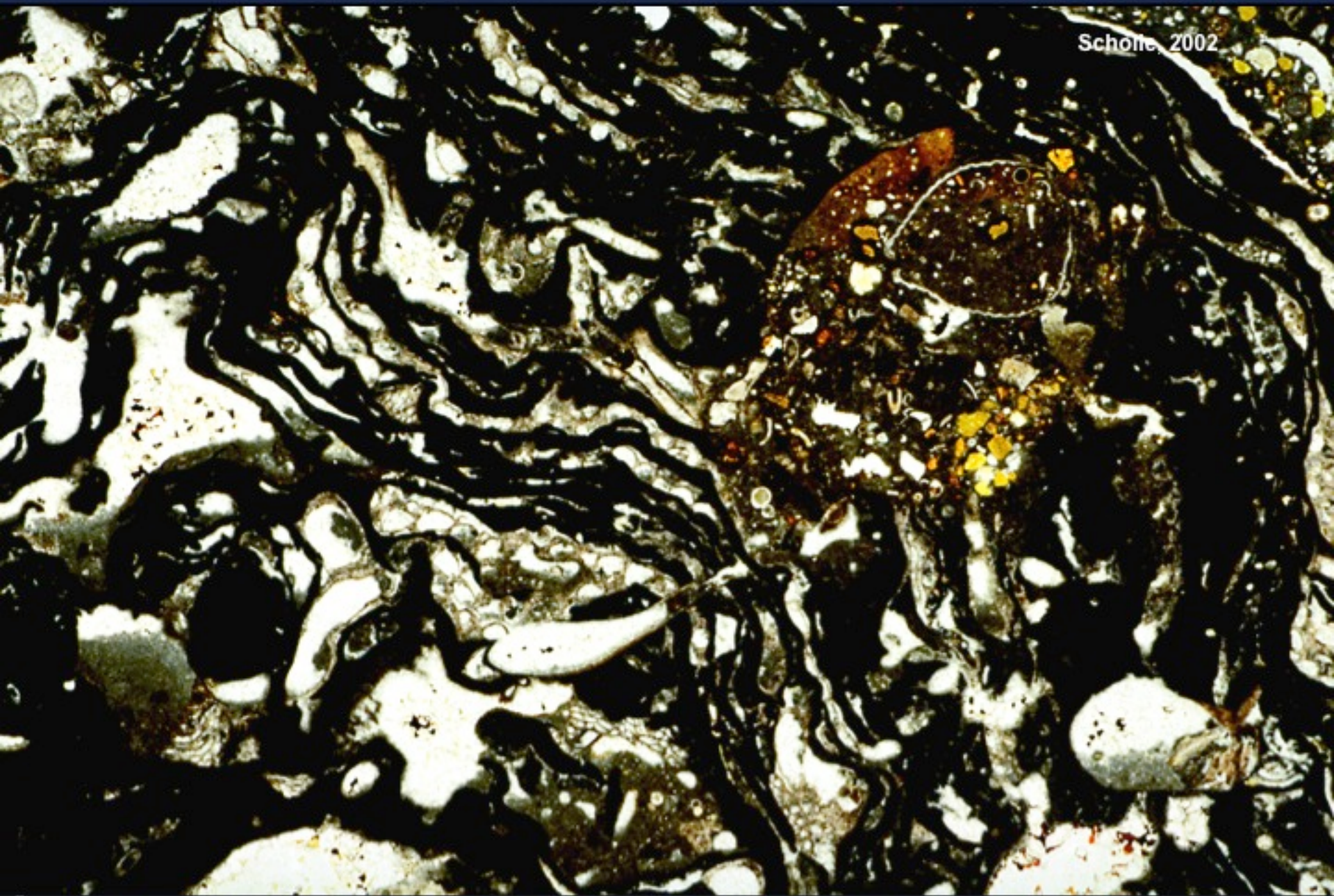




Calcareniti di Porto Badisco – Oligocene sup. (Salento)

Calcareniti di Gravina – Pliocene (Matera)

Schone 2002



Grani rivestiti

pisoidi

*granuli con diametro $>$ di 2 mm e
con struttura interna simile agli ooidi*



Ambiente non marino



Grotte – sorgenti termali – suoli bauxitici – suoli calcarei

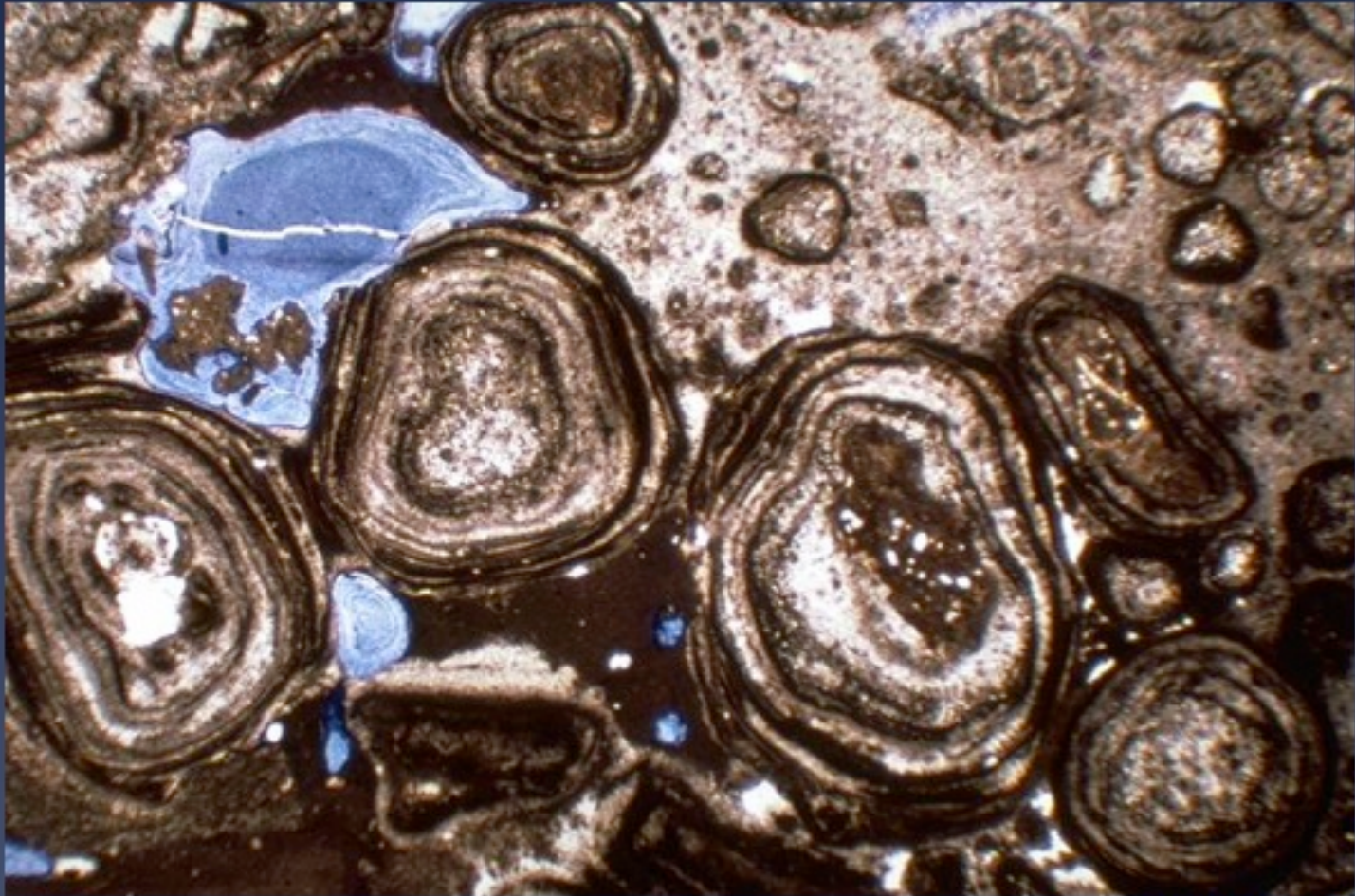
Grani rivestiti (Pisoidi)



Grani rivestiti (Pisoidi)



Grani rivestiti (Pisoidi)

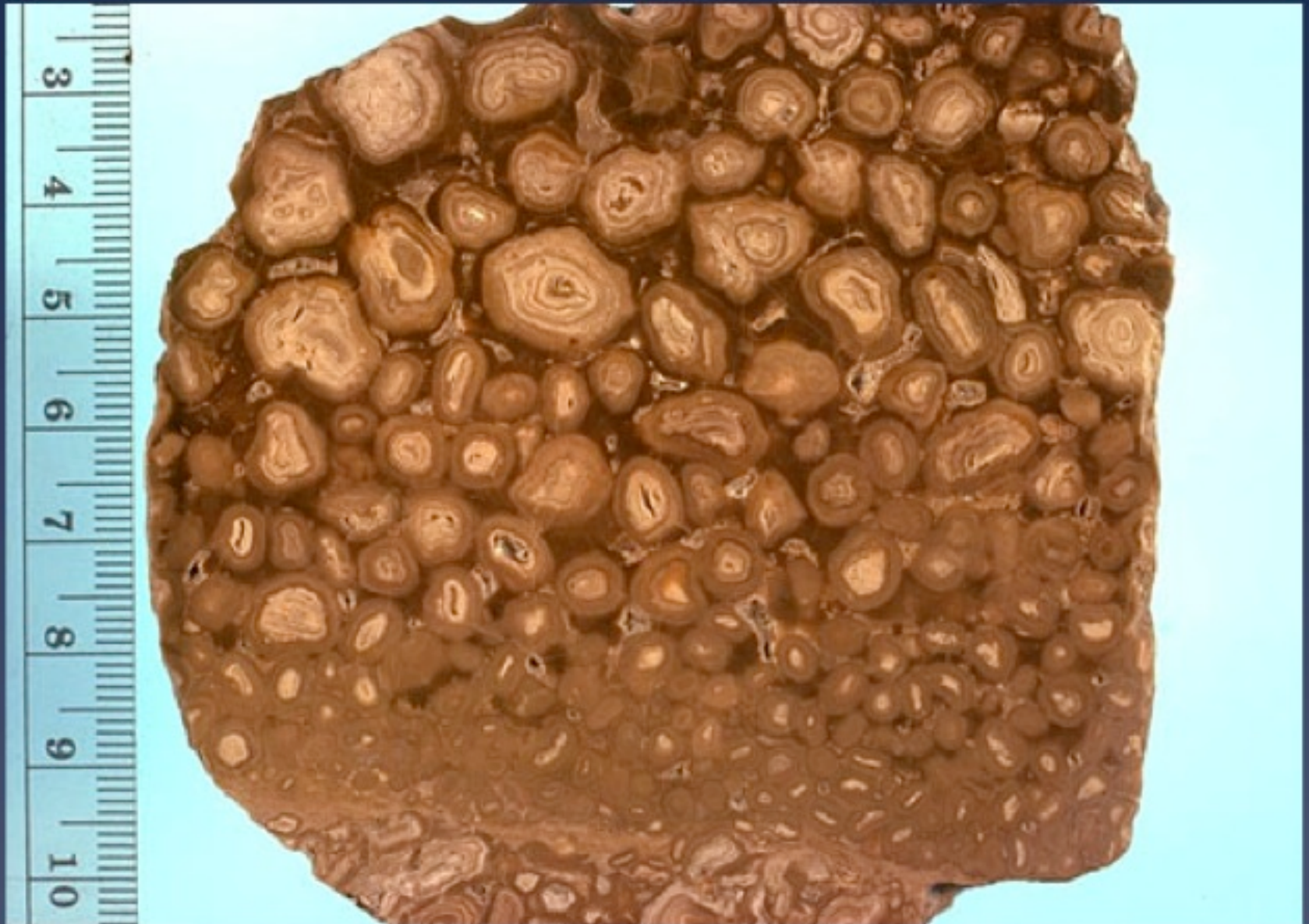


2-3 mm

Pisoidi aragonitici

Grani rivestiti (Pisoidi)

Kendall, 2005



Grani aggregati

grani di carbonato di forma e natura

varia legati da cemento o da

organismi incrostanti



Lumps

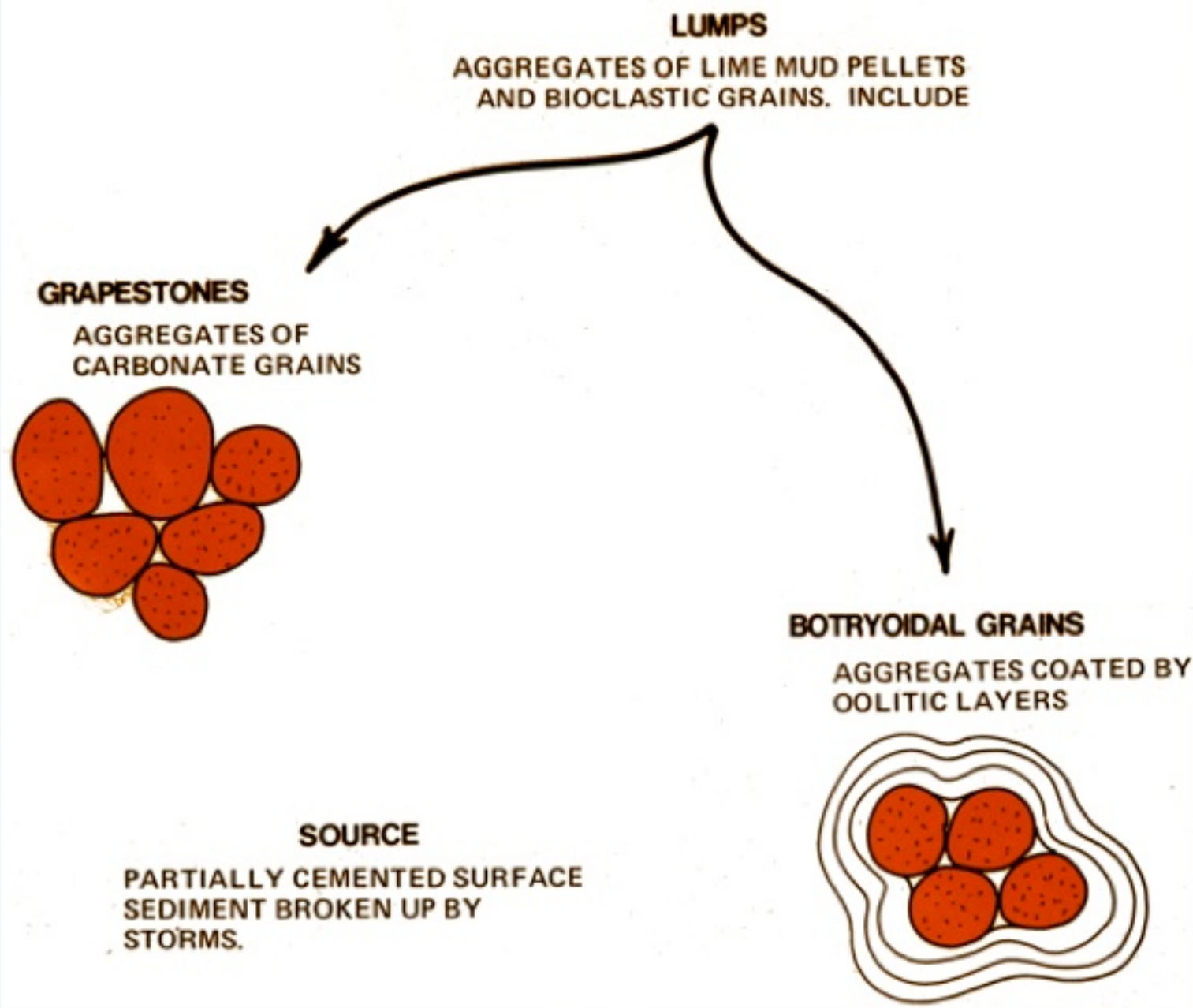


Grapestones



Botryoidal lumps

Dimensioni: da 0,5 a circa 3 mm



SOURCE OF CARBONATE LUMPS

1. ACCUMULATION OF LOOSE CARBONATE SAND



2. PRECIPITATION OF MARINE CARBONATE CEMENT WHILE AT REST



3. BREAK UP OF LAYER BY STORM INTO LUMPS

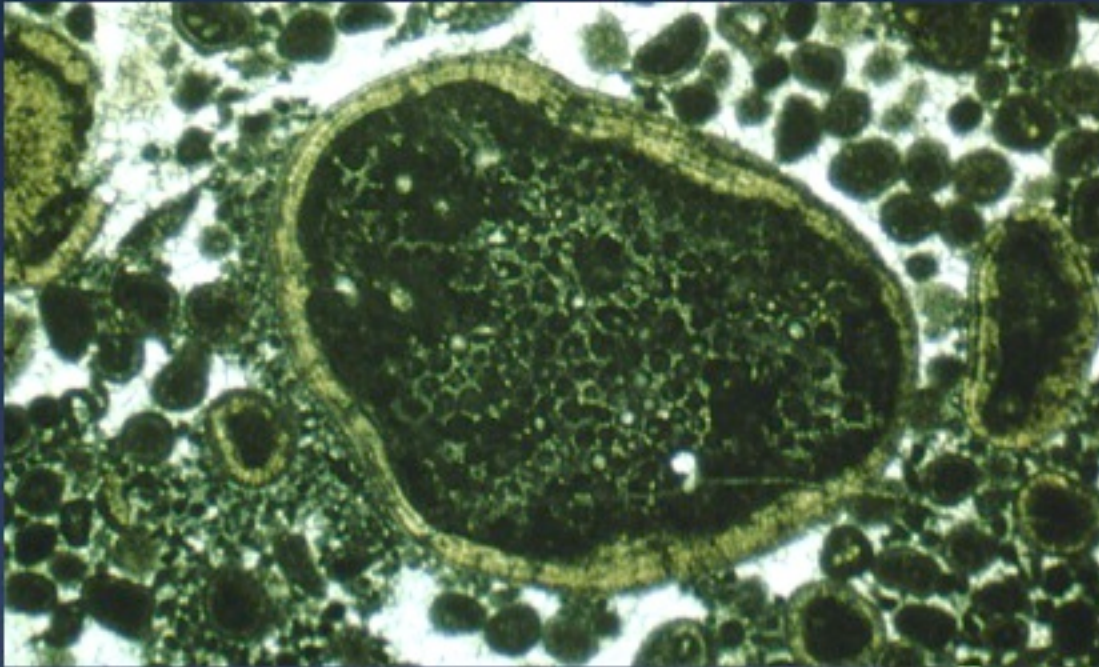


Grani aggregati

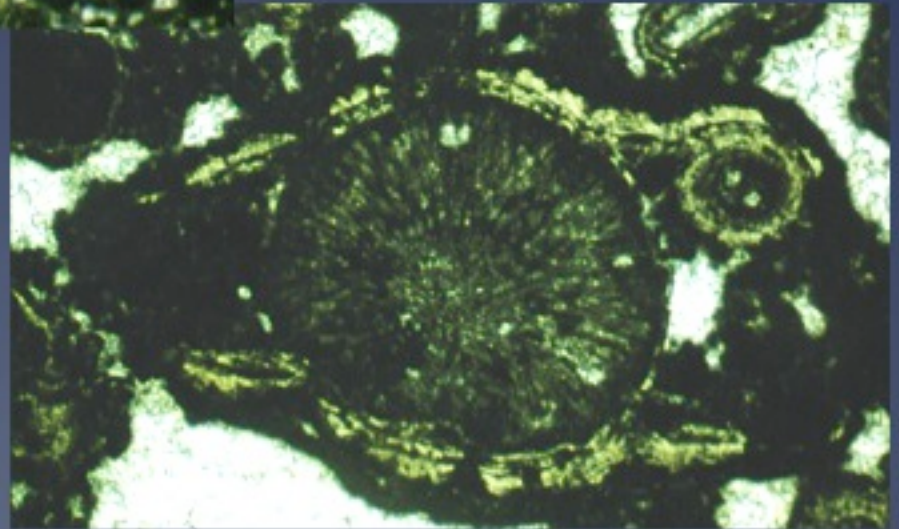


Grapestones

Grani aggregati



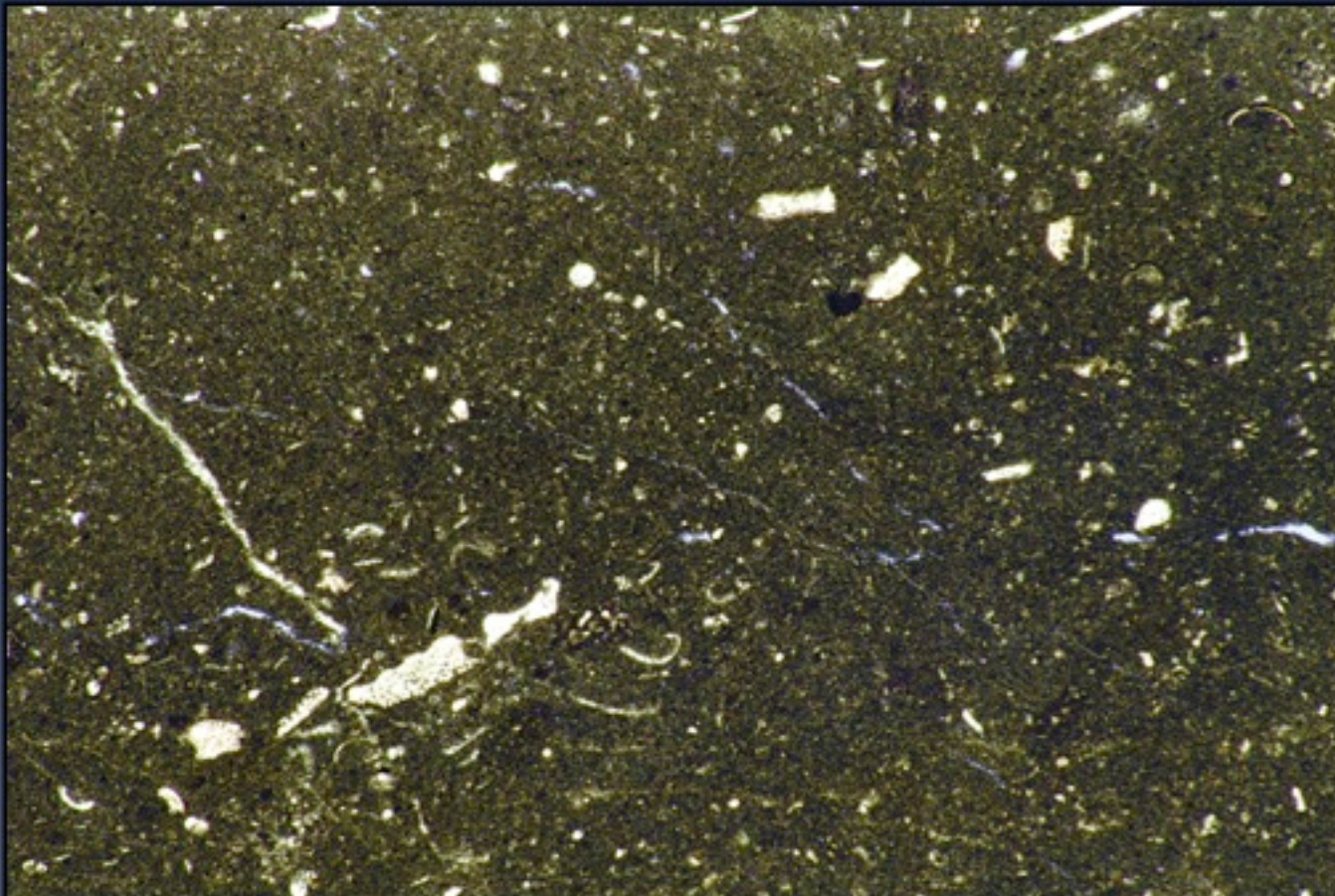
Botryoidal lumps

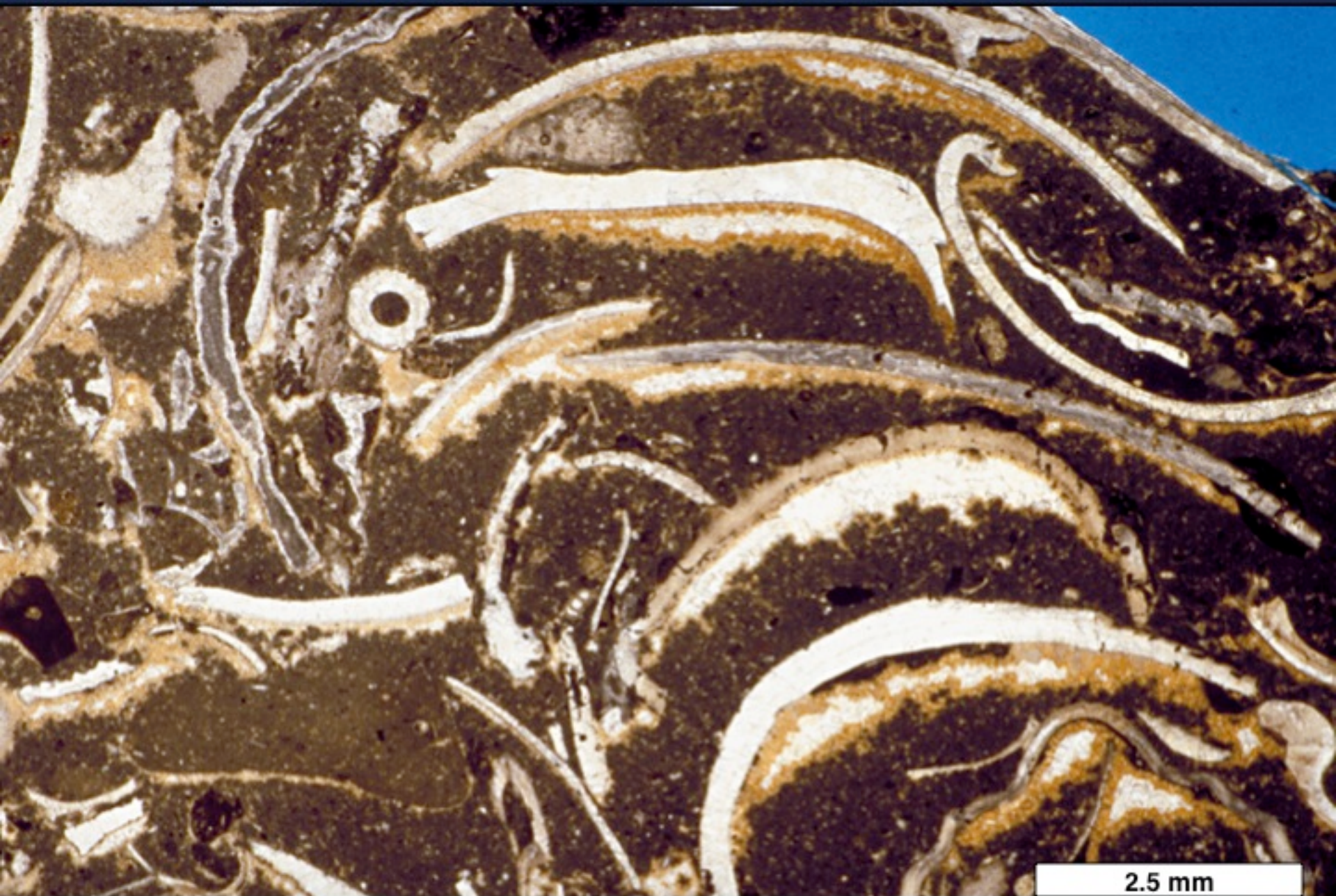


Matrice

Fango - micrite

cristalli di carbonato di calcio con dimensioni molto piccole inferiori a 62 micron.





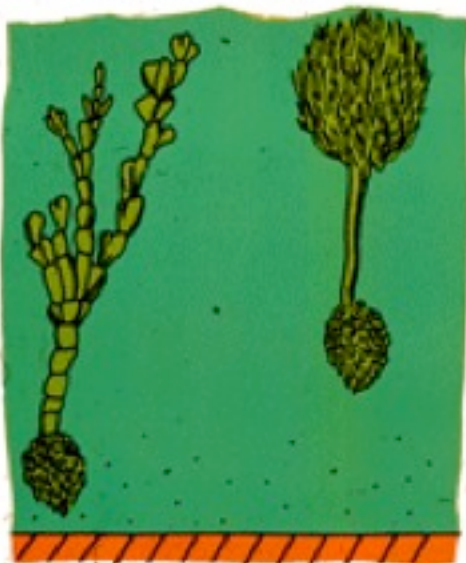
2.5 mm

ORIGINS OF MICRITE

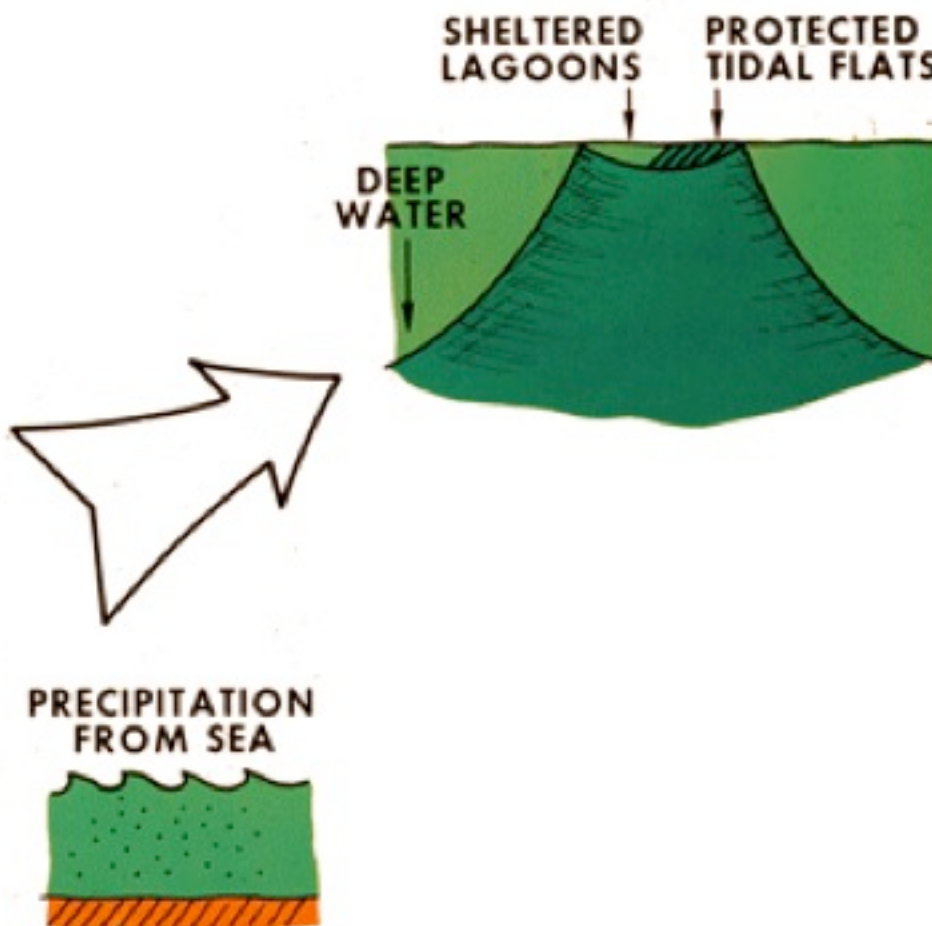
ABRASION OF CARBONATE SEDIMENTS



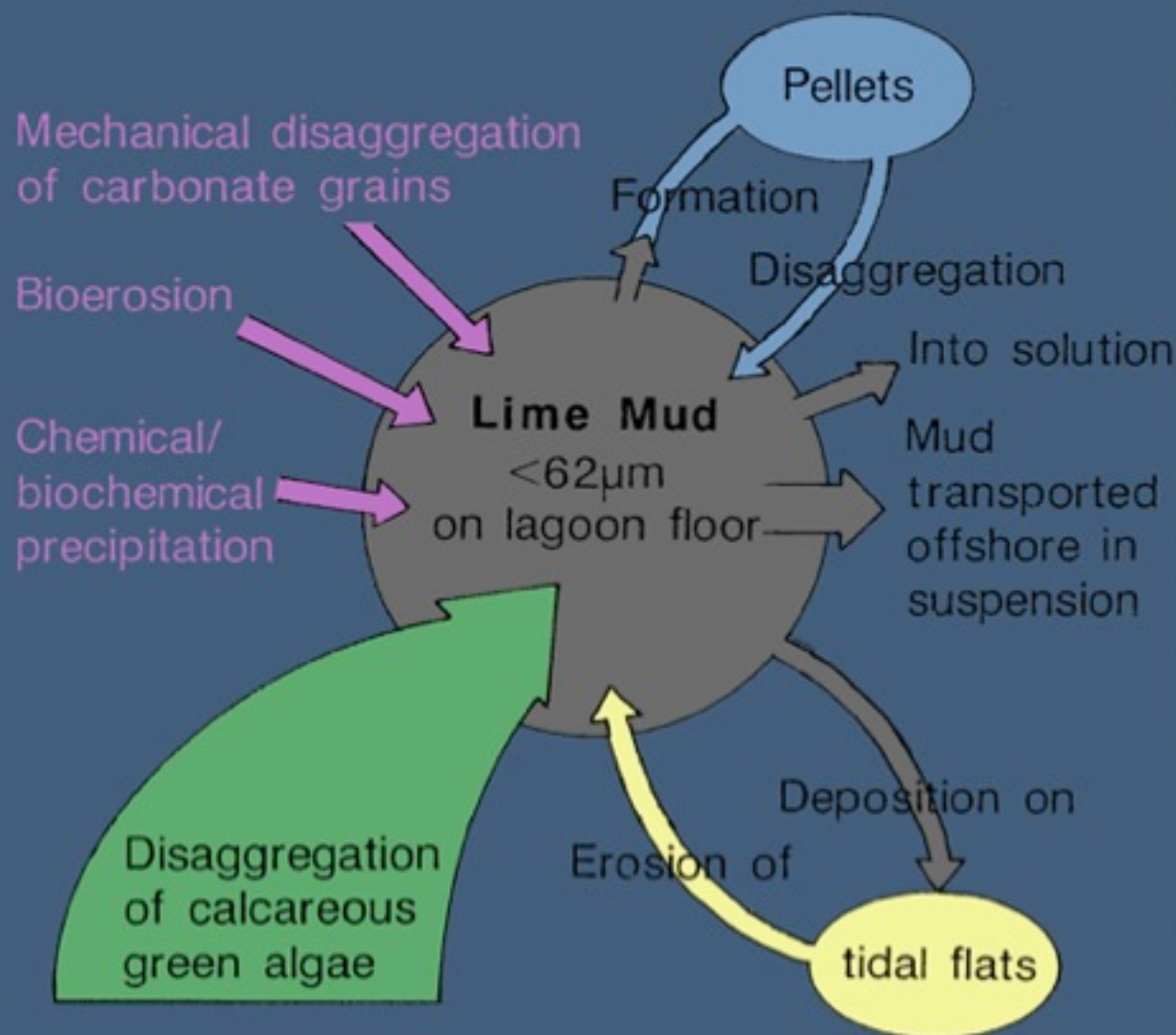
ORGANIC BREAKDOWN OF CALCAREOUS GREEN ALGAE



DEPOSITIONAL ENVIRONMENTS OF MICRITE



Origine Micrite



Penicillus

CATEGORIE E TIPI DI GRANI CARBONATICI

• *Skeletal grains*

Bioclasti
Biosomi

• *Non-skeletal grains*

GRANI DETRITICI

Intraclasti
Extraclasti

PELOIDI

fecal pellets – pellets (es.
micritizzazione – intraclasti
fangosi arrotondati)

GRANI RIVESTITI

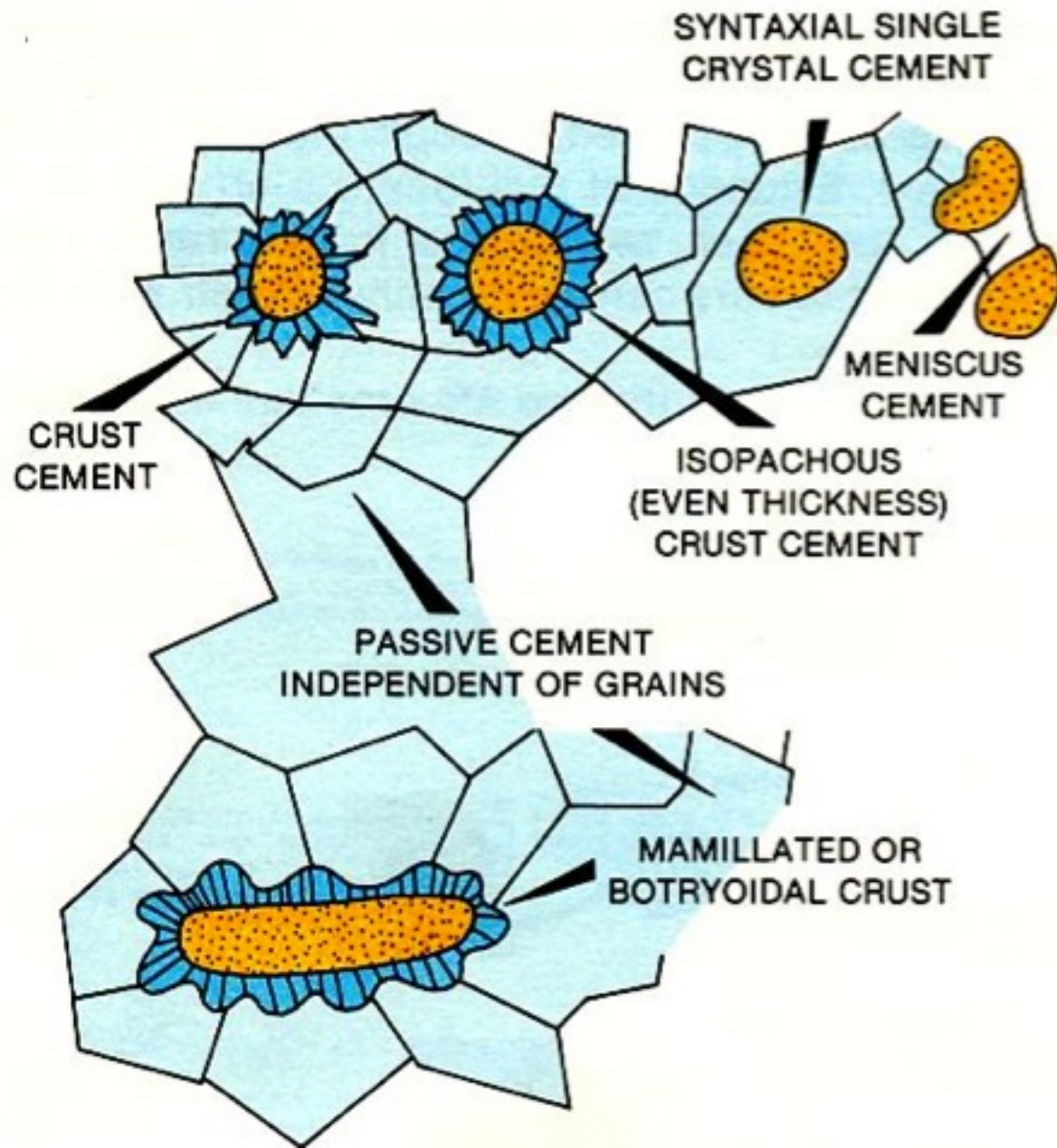
Ooidi
Pisoidi
Oncoidi - rodoliti

GRANI AGGREGATI
(Lumps)

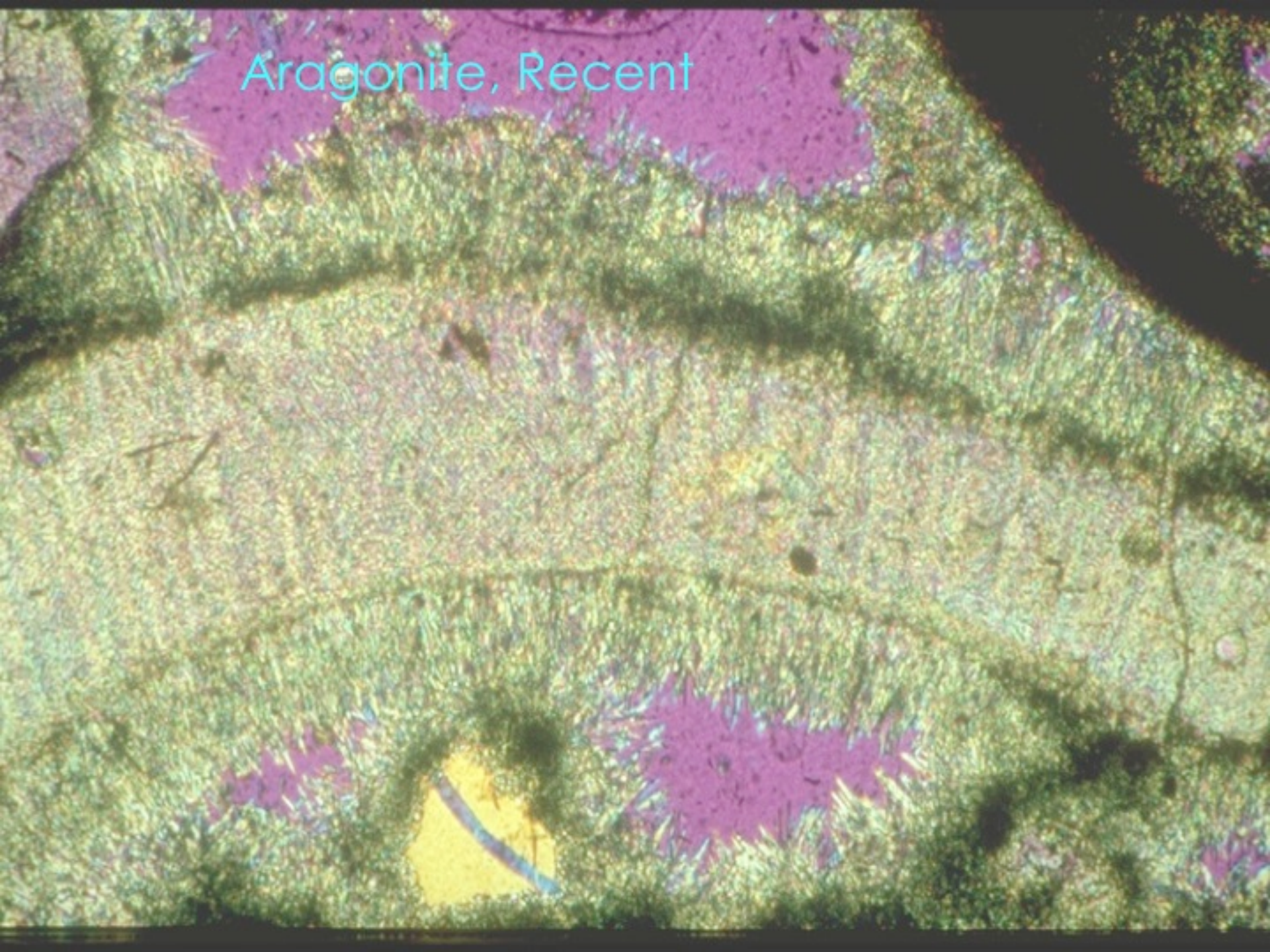
Grapestone
Botryoidal lumps

Tucker & Wright, 1990

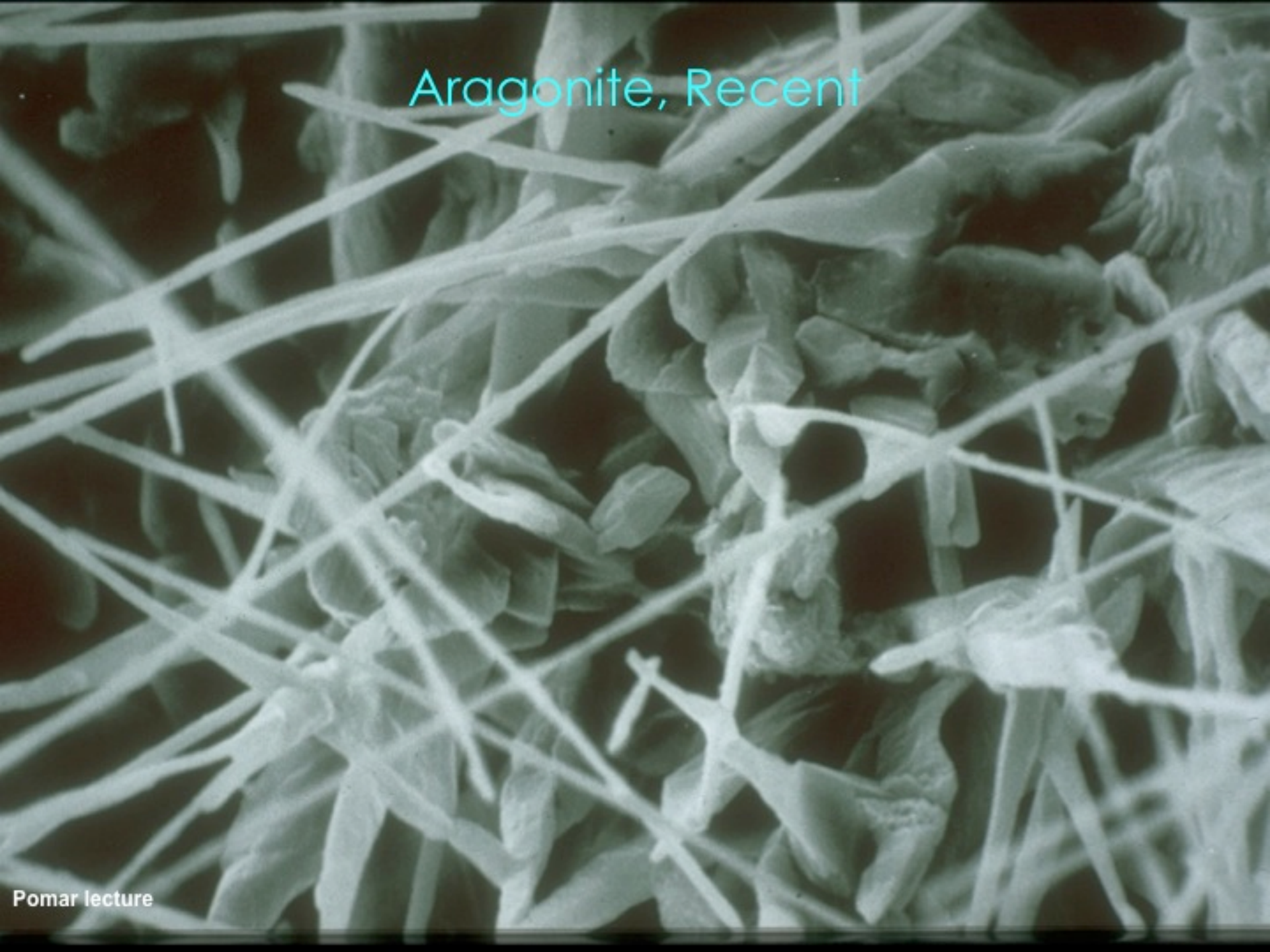
cementi



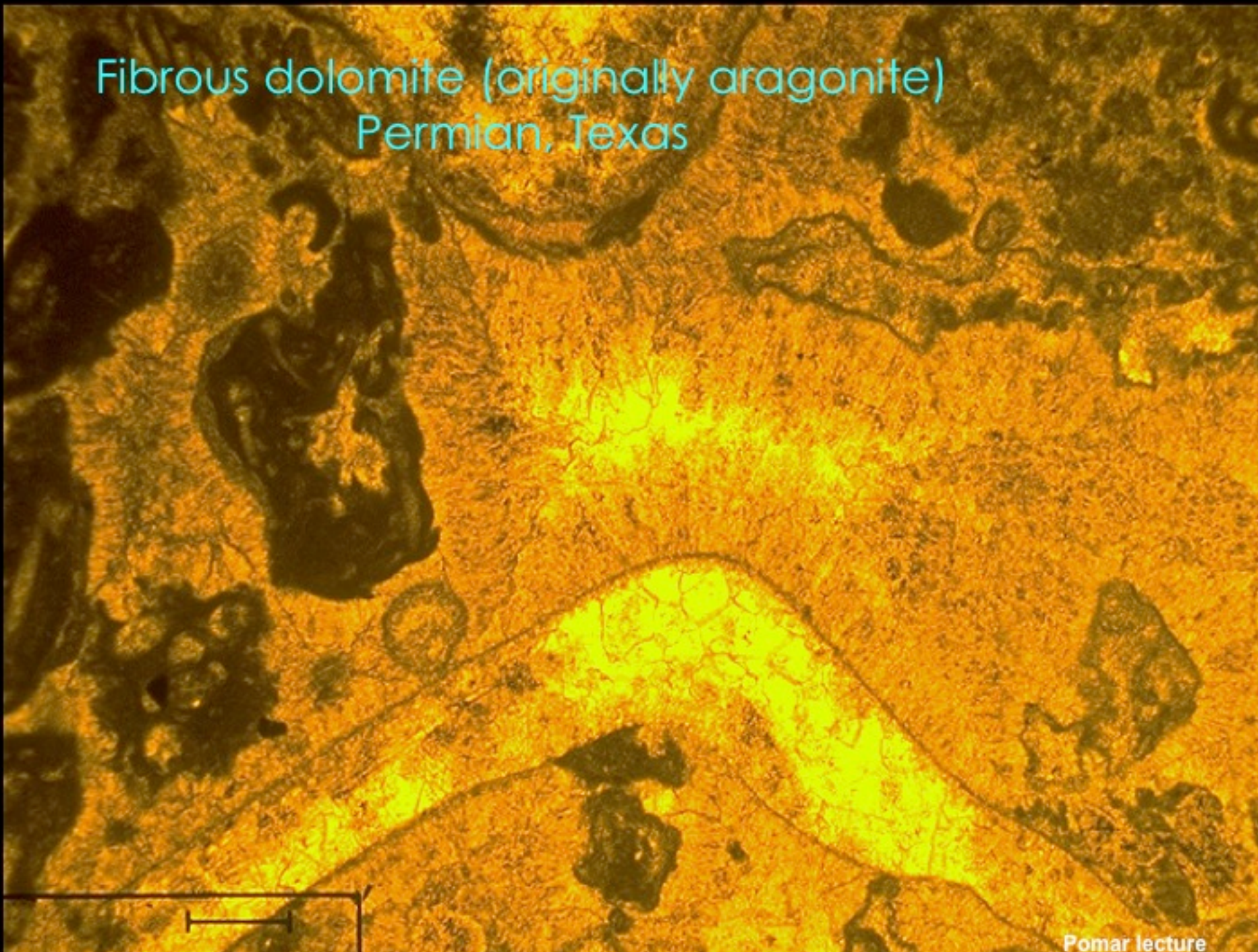
Aragonite, Recent



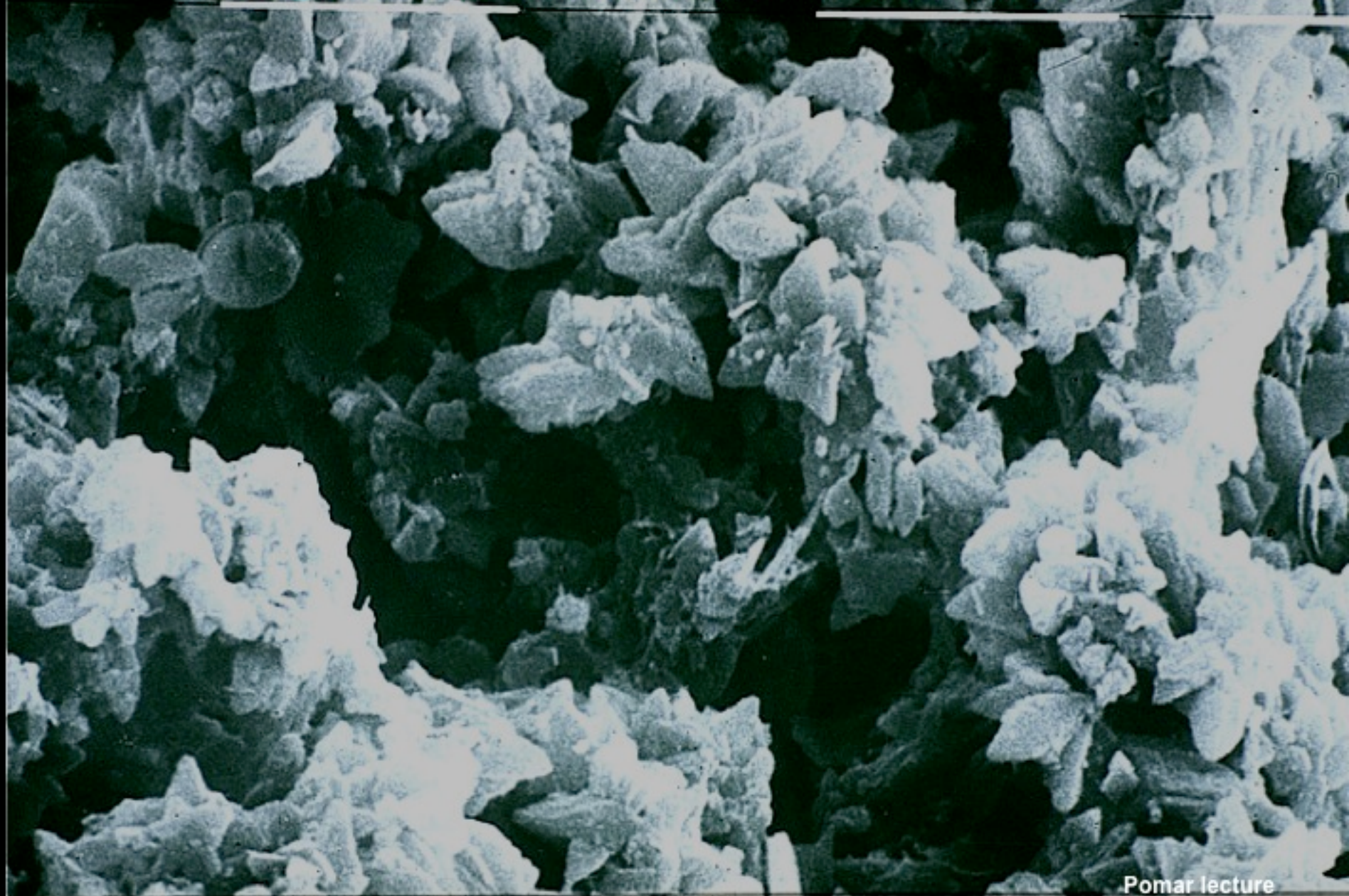
Aragonite, Recent



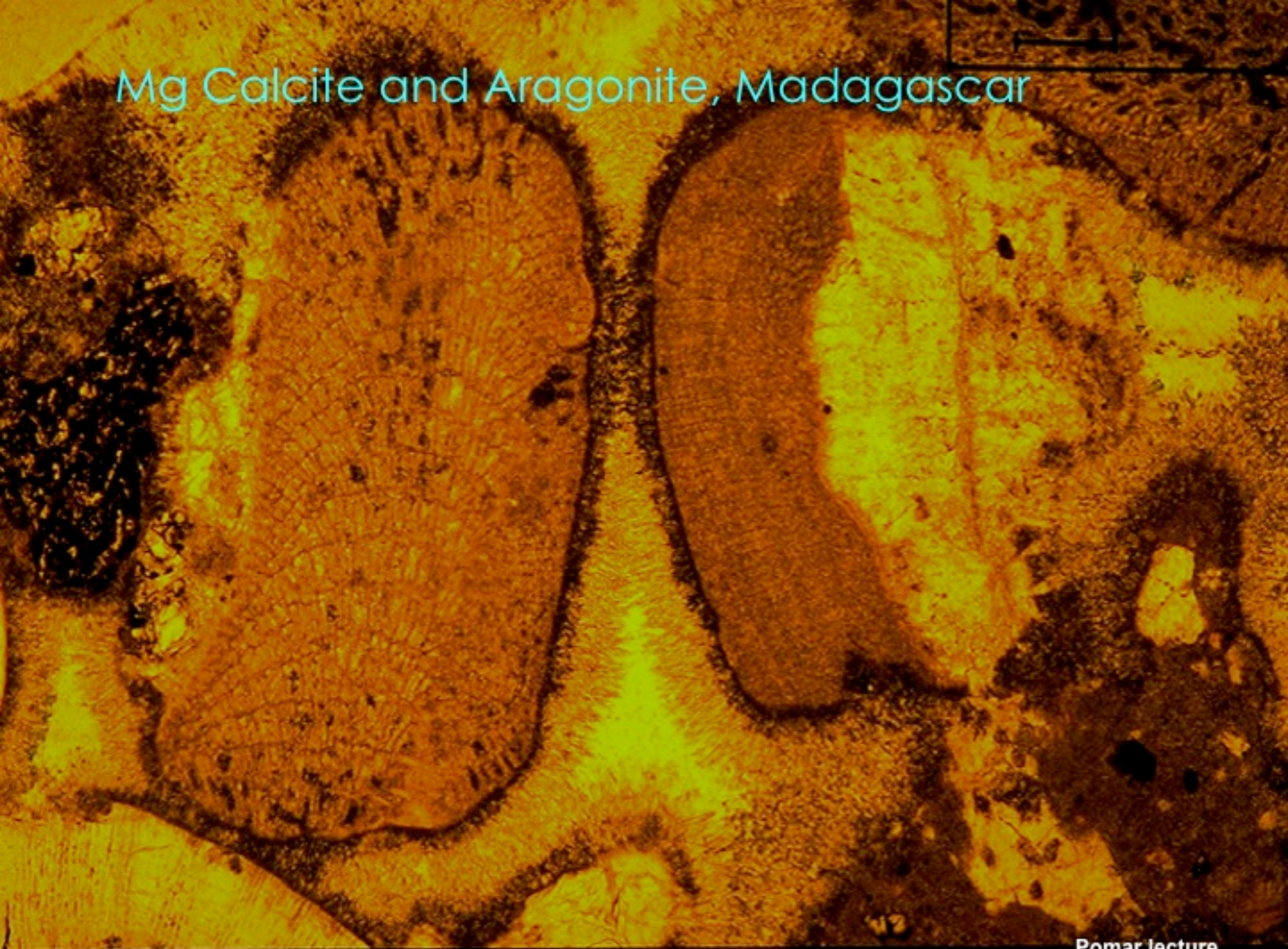
Fibrous dolomite (originally aragonite)
Permian, Texas



Mg Calcite, Recent, Mediterranean



Mg Calcite and Aragonite, Madagascar



Multiple, Pleistocene Jamaica:

- 1- Fibrous isopacous Aragonite
- 2- Micritic Mg Calcite
- 3- Fibrous Aragonite
- 4- Late Calcite

