http://www.biltek.tubitak.gov.tr/bilgipaket/jeolojik/index.htm

Paleontology

Muhittin Görmüş

Department of Geology

Lecture 7

ANKARA UNIVERSITY

http://members.cox.net/jdmount/paleont.html

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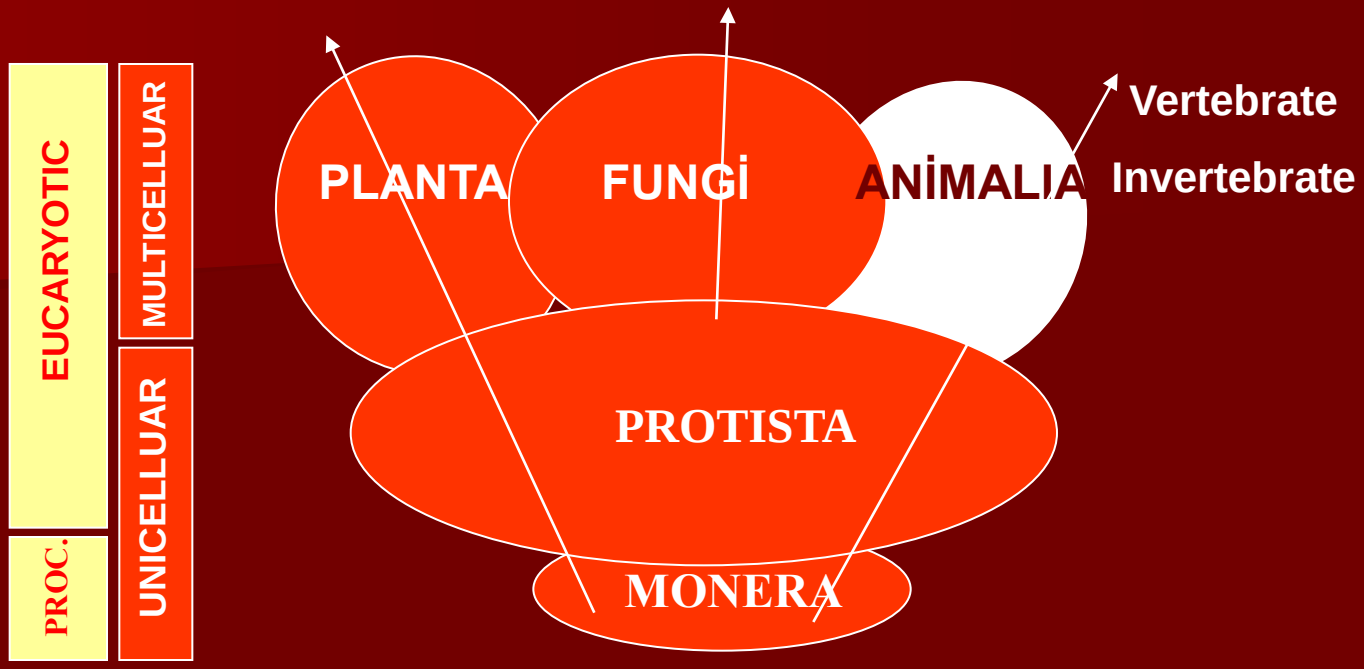
Topics

1. **Spongia**
   - General characteristics
   - Body organisations & related terms
   - Spicules
   - Classification
   - Stratifraphical ranges
   - Examples (Recent)
   - Ancient examples
2. **Coelenterata**
   - General characteristics
   - Body organisations & related terms
   - Classification
   - Stratigraphical ranges
     - Rugosa selected genera
     - Tabulata selected genera
     - Scleractine selected genera



Procaryotic		Eucaryotic			
Unicelluar		Multicelluar			
Domain Bacteria	Domain Archaea	Domain Eukarya			
Kingdom Monera		Kingdom Protoctista (=Protista)	Kingdom Animalia	Kingdom Plantae	Kingdom Fungi

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PHYLUM PORIFERA

http://www.palaeos.com/Invertebrates/Porifera/Porifera.htm

Neoesperiopsis rigida - Orange Finger Sponge
This specimen from Waadah Island Fingers, Strait of Juan de Fuca
Size : 30 cm tall
Class Demospongia

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PHYLUM PORIFERA (=SPONGIA)

http://www.ucmp.berkeley.edu/porifera/porifera.html

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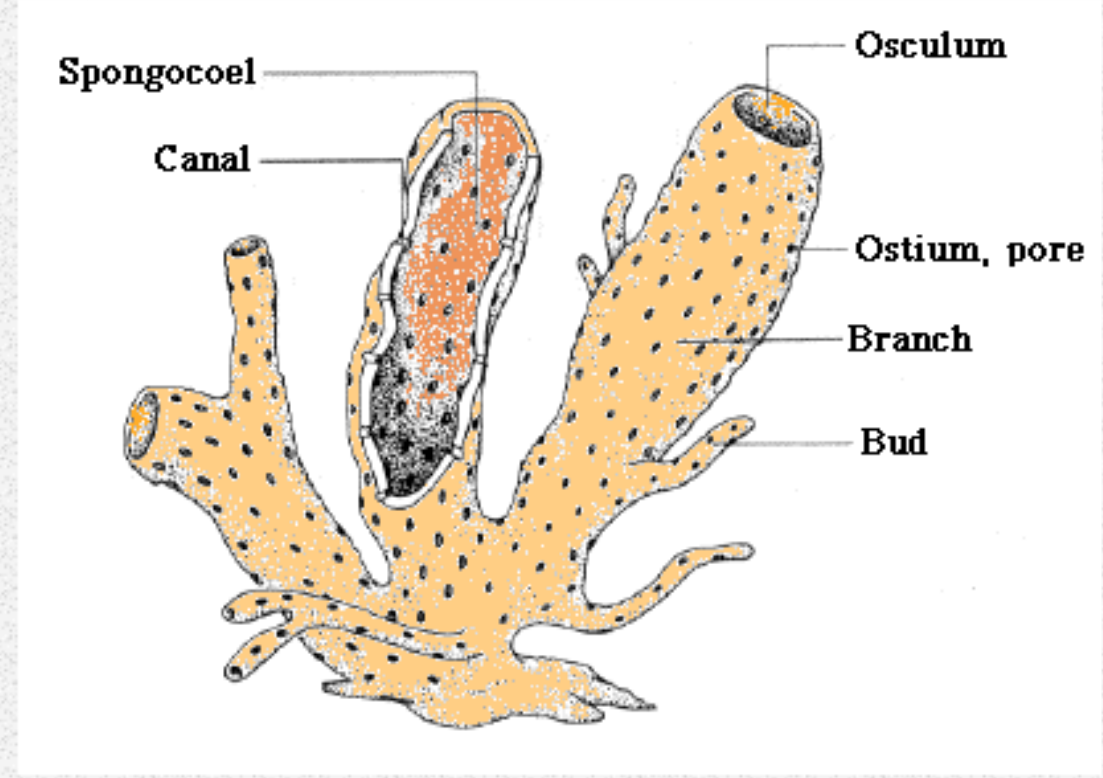
General characteristics



http://paleo.cortland.edu/tutorial/Protista/porifera.htm

Shape: Cyclindirical, bag, globular, wrapper-shaped, colonizied individuals, their sizes change from smaller than 1 cm up to a human-being skull size, multicelluar, primitive

Shell composition: mainly calcerous, some siliceous

Age: Cambrian to Recent

Environment: Shallow, benthic, some open sea marine, 80 % marine, rest freswater, epifaunal, sessile.

Feeding: They use annelide, wermes for feeding by filtering

Others: no nervous system,

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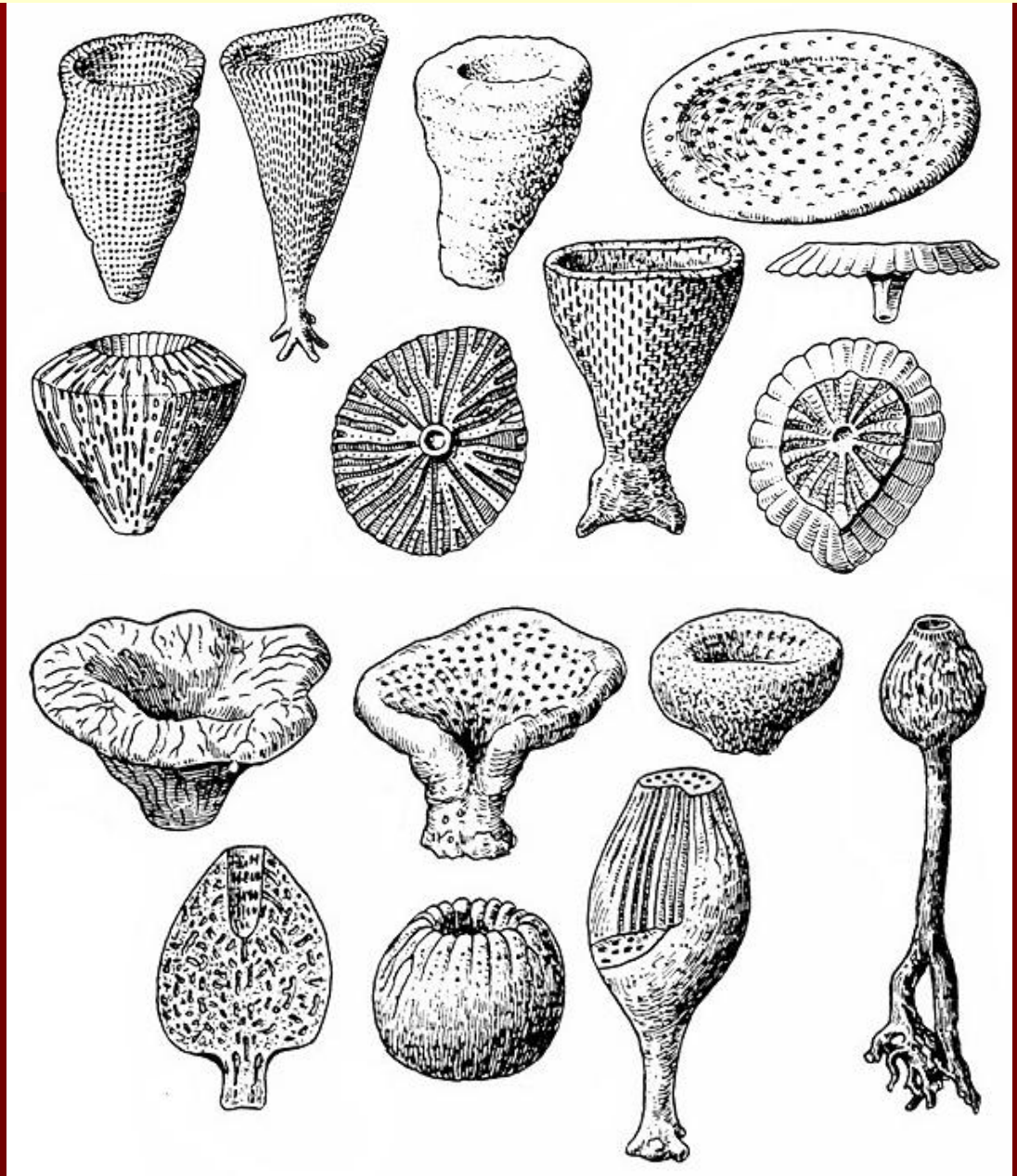
Various porifera sahpes



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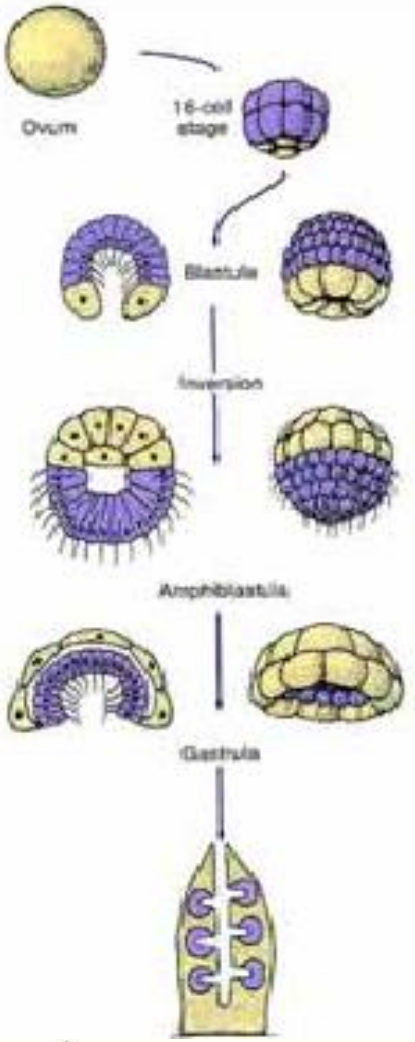
Picture from Alkaya (Selçuk Univ.), lecture notes,



Reproduction

Prifera reproduction may be sexual or asexual.

• Sexual reproduction is related to flagellate larvaes. These larveas are removed from the body, and then they move to a substrate to be sticked. After that, new indivuduals appear.

• Asexual reproduction is associated with budding of colony.

http://www.dicle.edu.tr/~zoology/Erhan%20Unlu%20dosyalar/dersler/hayvan%20morf/Porifera%20BOLUM-3.pdf

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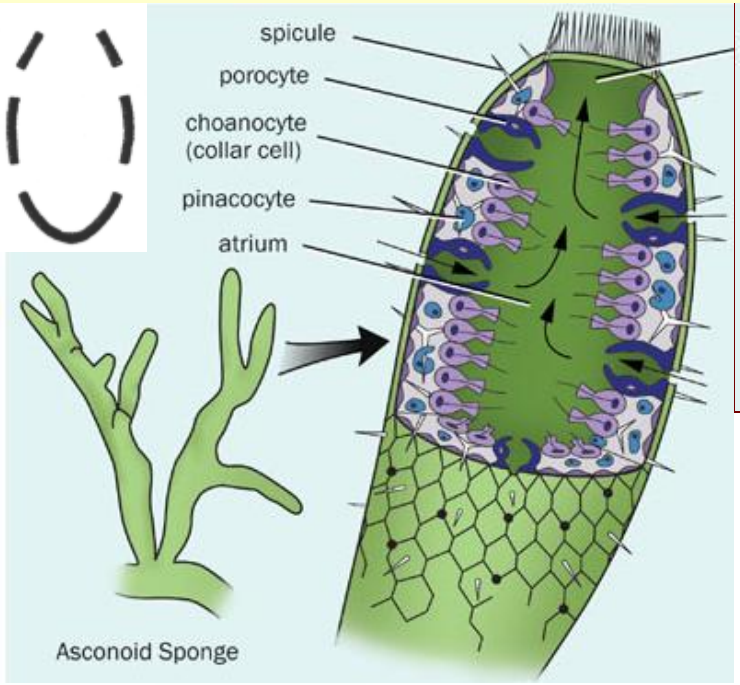
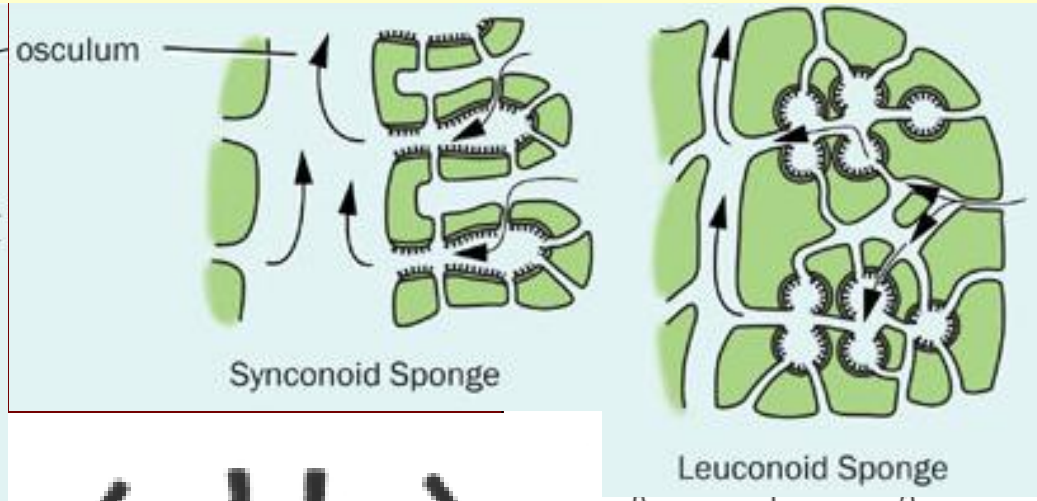
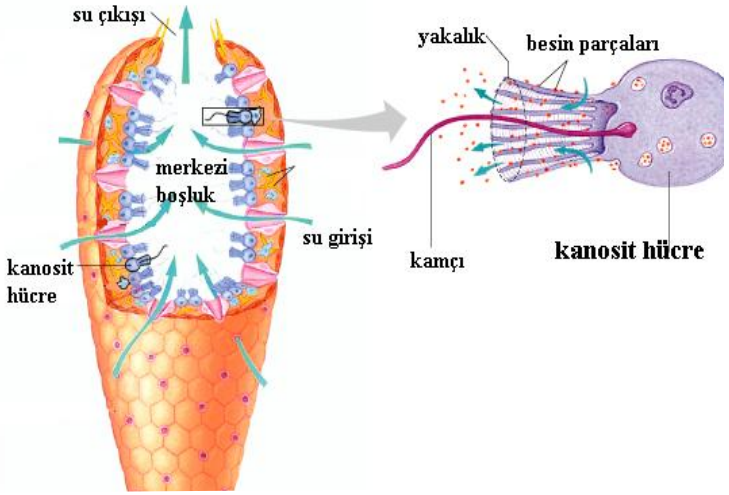
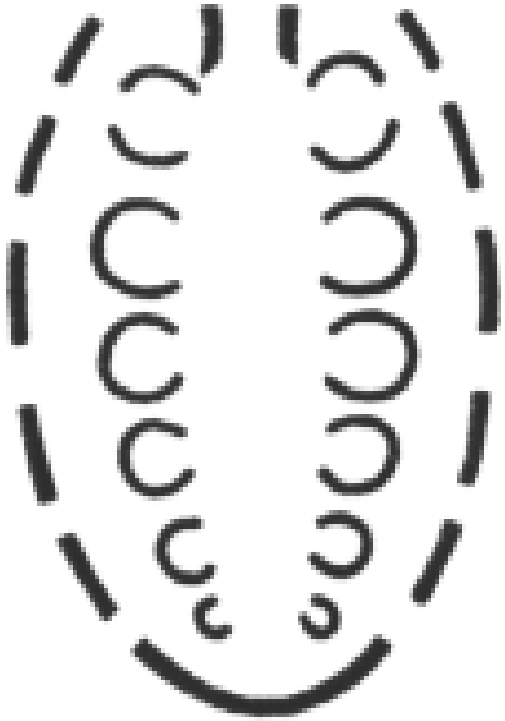
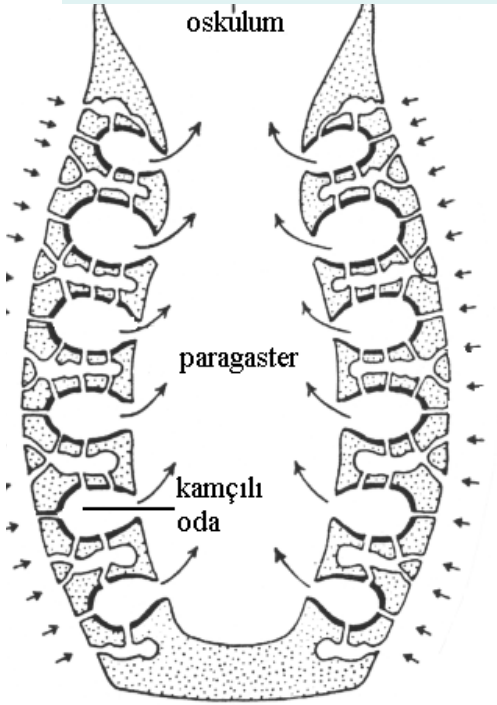
Organisation & Related terms











http://animaldiversity.ummz.umich.edu/site/accounts/specimens/Porifera.html

Hand drawings from Alkaya (Selçuk Univ.), lecture notes,

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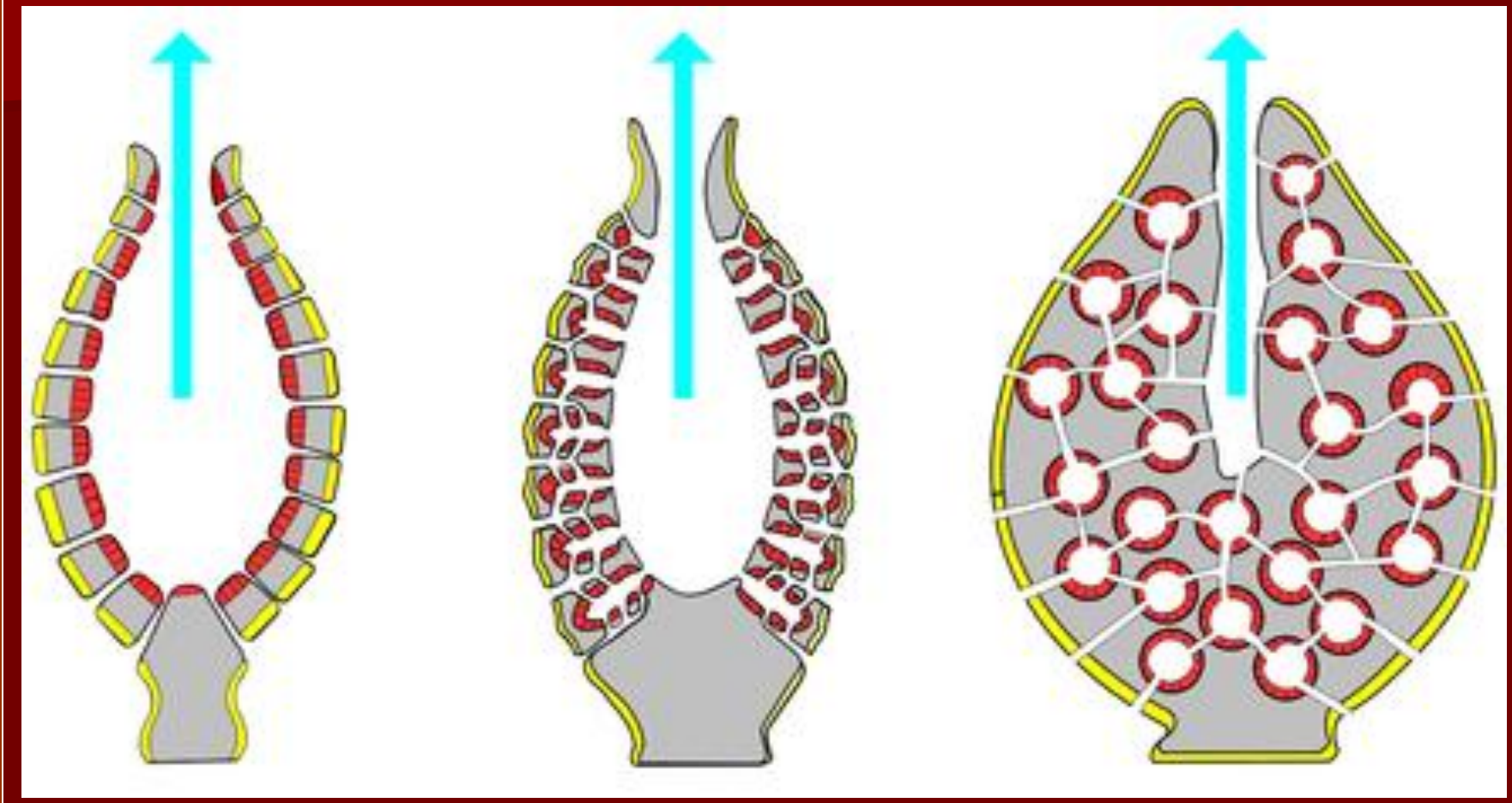
Organisation & Related terms



Paragaster, osculum, ostia, asconoid, synchonoid, leuconoid, spicule, conasit

http://en.wikipedia.org/wiki/Sponge

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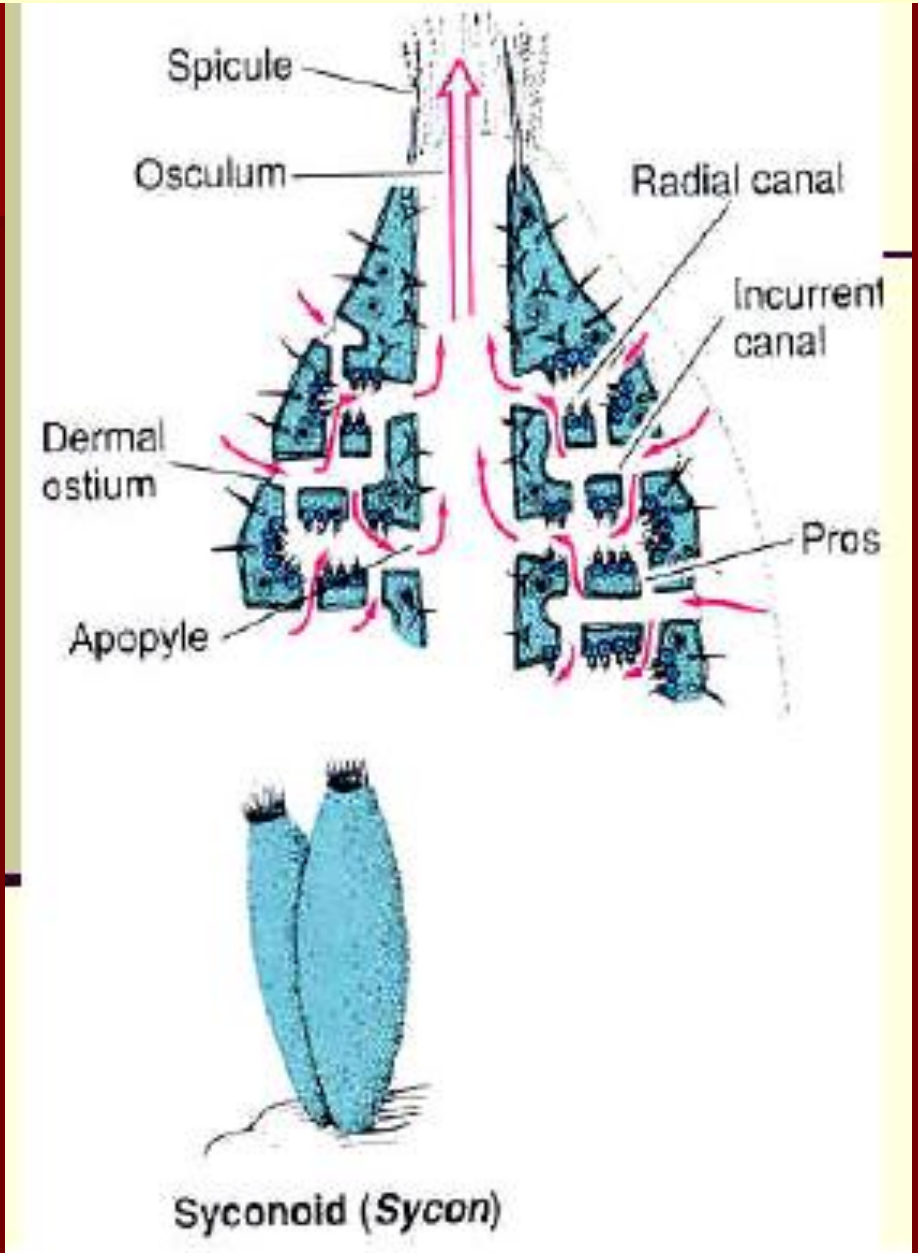
Organisation & Related terms



Dry weight 200 gr a spongia filters 1000 kg water in 24 hours.

http://www.dicle.edu.tr/~zoology/Erhan%20unlu%20dosyalar/dersler/hayvan%20morf/Porifera%20BOLUM-3.pdf

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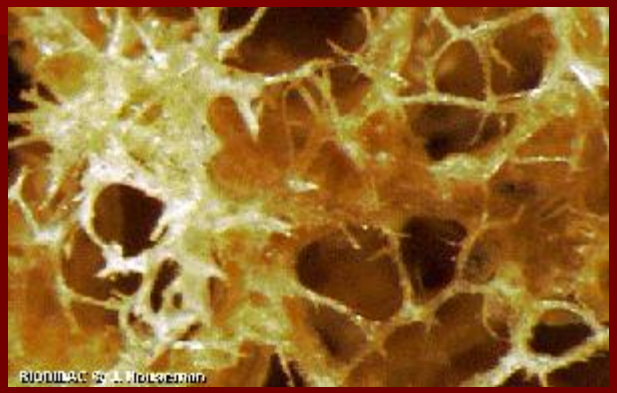
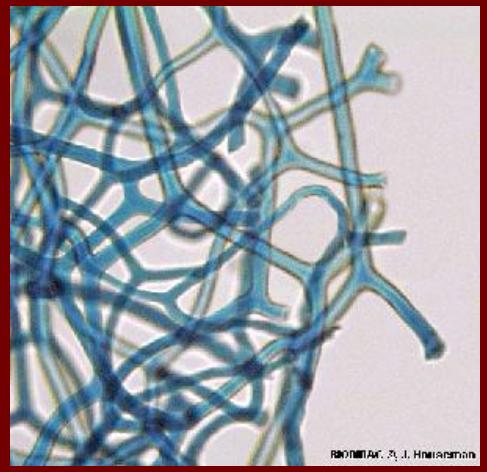
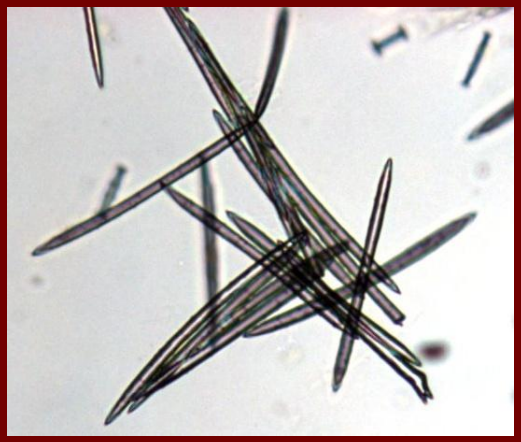
Porifera consist of two kinds of body materials:

1. spongine: organic material





2. Spicule or scleres: carboneceous or siliceous tiny skeletal parts. elementlerdir.



Pictures from Alkaya (Selçuk Univ.), lecture notes,

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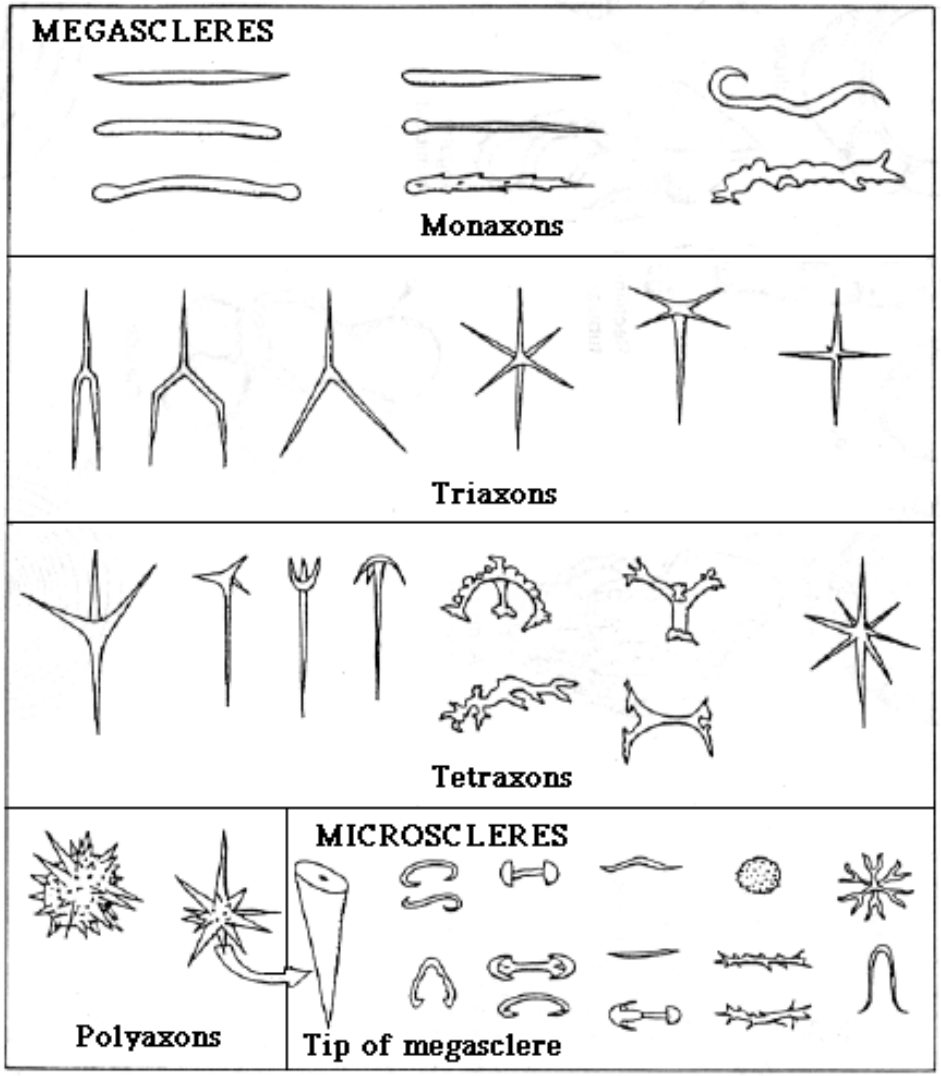
Spicules

Nomenclature of Common Megascleres & Microscleres in Fossil and Modern Sponges



Modified from Boardman et al (1987)

http://paleo.cortland.edu/tutorial/Protista/porifera.htm

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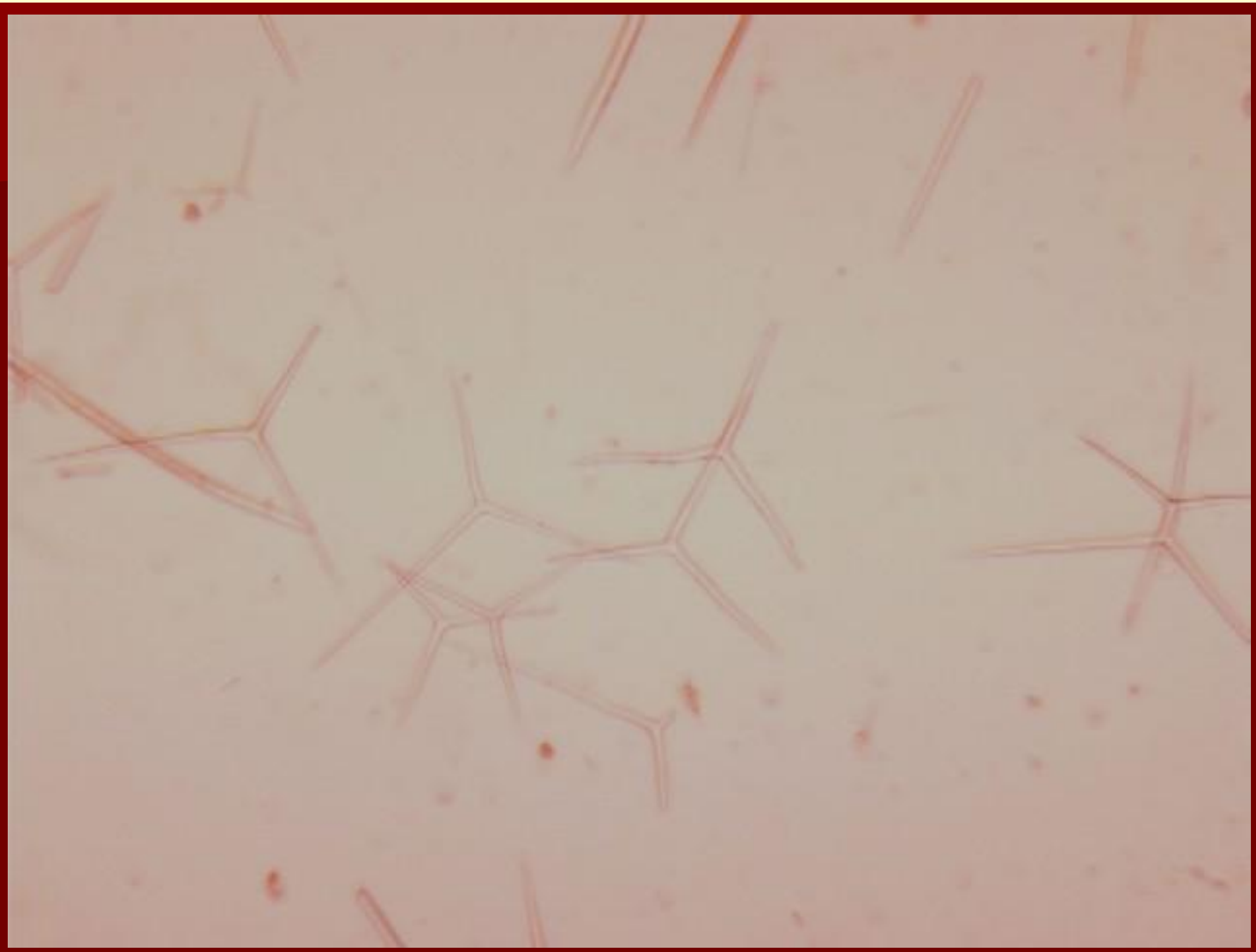
Spicules



Spicules within a thin section

Picture from Alkaya (Selçuk Univ.), lecture notes,

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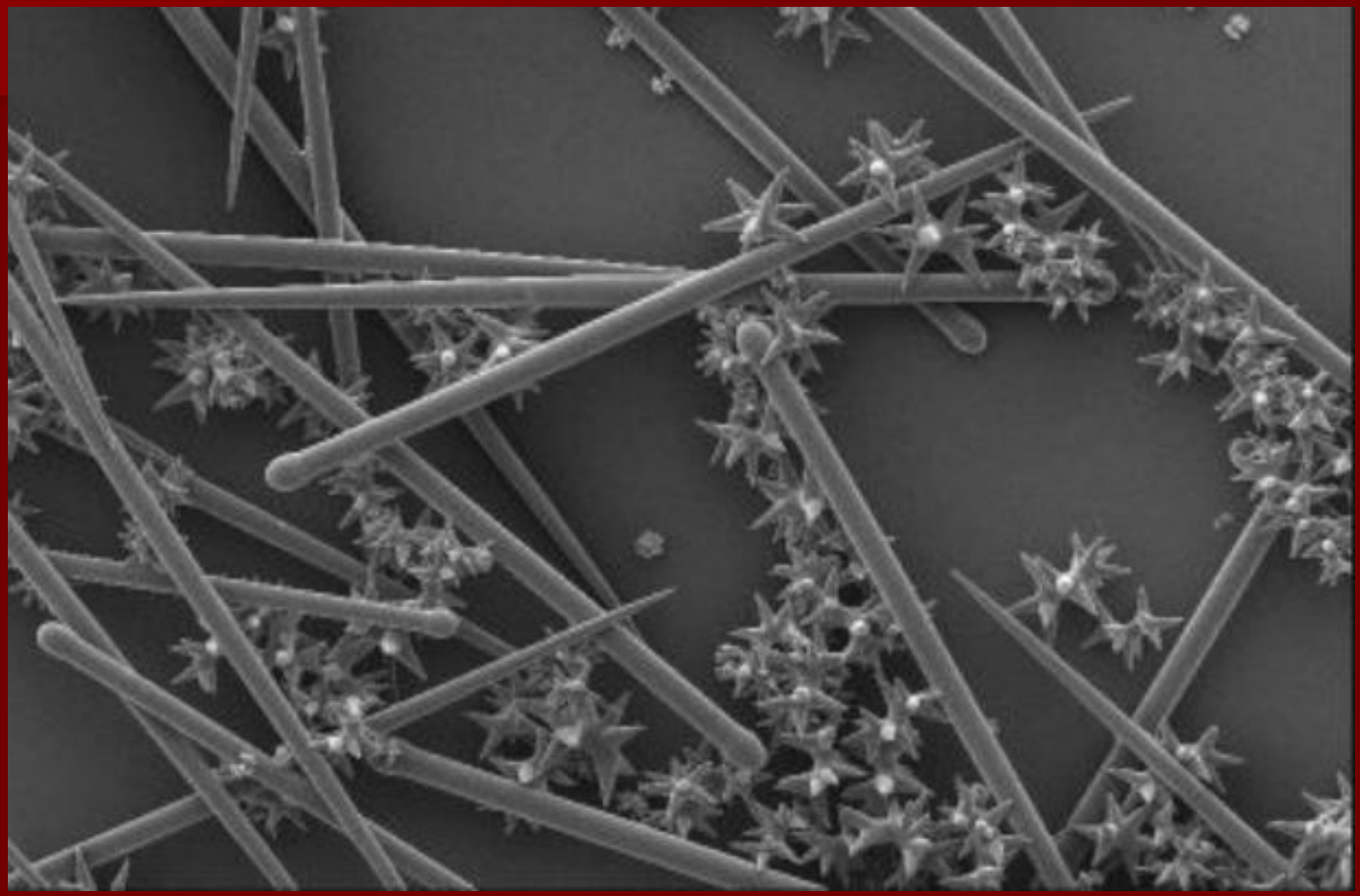
Spicules



SEM views of spicules
If a rock includes rich spicules, it may be called spiculit.

Picture from Alkaya (Selçuk Univ.), lecture notes,

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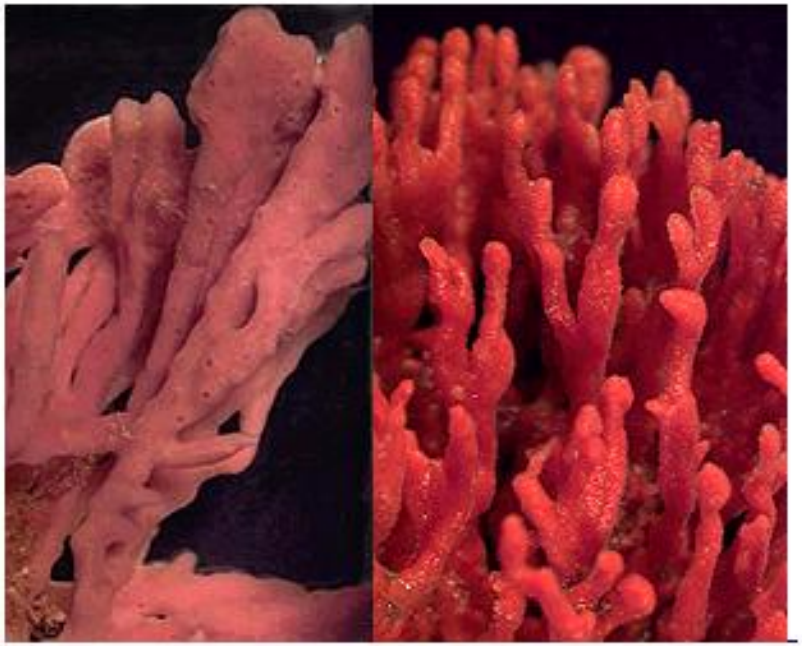
Classification



Calcarea
- Calcinea
- Calcaronea

Hexactinellida
- Amphidiscophora
- Hexasterophora

Demospongiae
- Homoscleromorpha
- Tetractinomorpha
- Ceractinomorpha

Classification from Brusca and Brusca (2003)

Phylum **Porifera**
- Class **Demospongea** (Cambrian - Recent
- Class **Hexactinellida** (Cambrian - Recent)
- Class **Calcarea** (Cambrian - Recent)
- "Class **Stromatoporoida**" (Ordovician - ?Recent)

Phylum **Archaeocyatha** (Cambrian)

http://paleo.cortland.edu/tutorial/Protista/porifera.htm

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Class: Calcerea

Leucosolenia complicata

Leucosolenia coriacea

http://www.dicle.edu.tr/~zoology/Erhan%20unlu%20dosyalar/dersler/hayvan%20morf/Porifera%20BOLUM-3.pdf

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Class: Demospongiae

- Presence of spongin, or silicon spicules (that are not six-rayed) or both.

Euspongia
(Spongia)

Spongilla

http://www.dicle.edu.tr/~zoology/Erhan%20unlu%20dosyalar/dersler/hayvan%20morf/Porifera%20BOLUM-3.pdf

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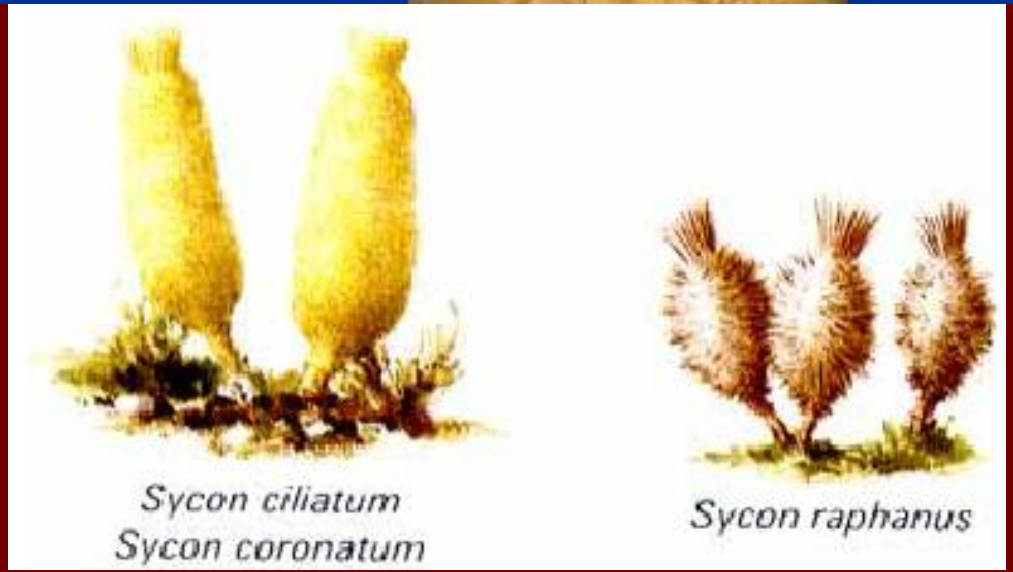
Calcispongiae

- Spicules of calcium carbonate (all three canal systems present in class)

Grantia (*Scypha*)

Leucosolenia (stained)

Spicules



Sycon ciliatum
Sycon coronatum

Sycon raphanus

http://animaldiversity.ummz.umich.edu/site/accounts/specimens/Porifera.html

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Hyalospongiae

- Six-rayed silicon spicules

Euplectella
(Venus' flower basket)

http://animaldiversity.ummz.umich.edu/site/accounts/specimens/Porifera.html

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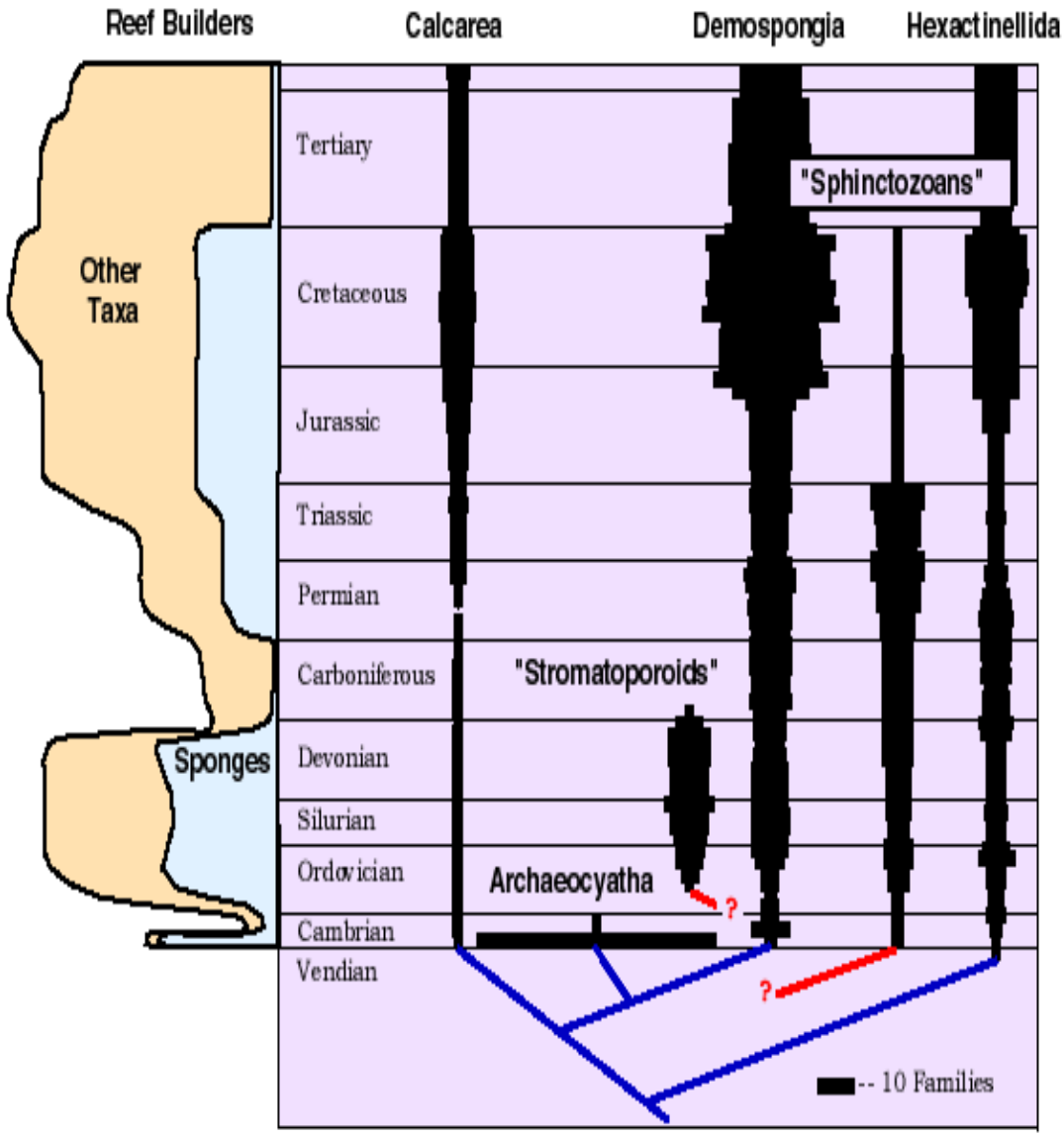
Stratigraphical ranges

http://cas.bellarmine.edu/tietjen/w
images/Sponge_archaeo.gif



http://www.ucmp.berkeley.edu/porifera/poriferafr.html

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Examples (Recent)

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Examples (Recent)

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Examples (Recent)

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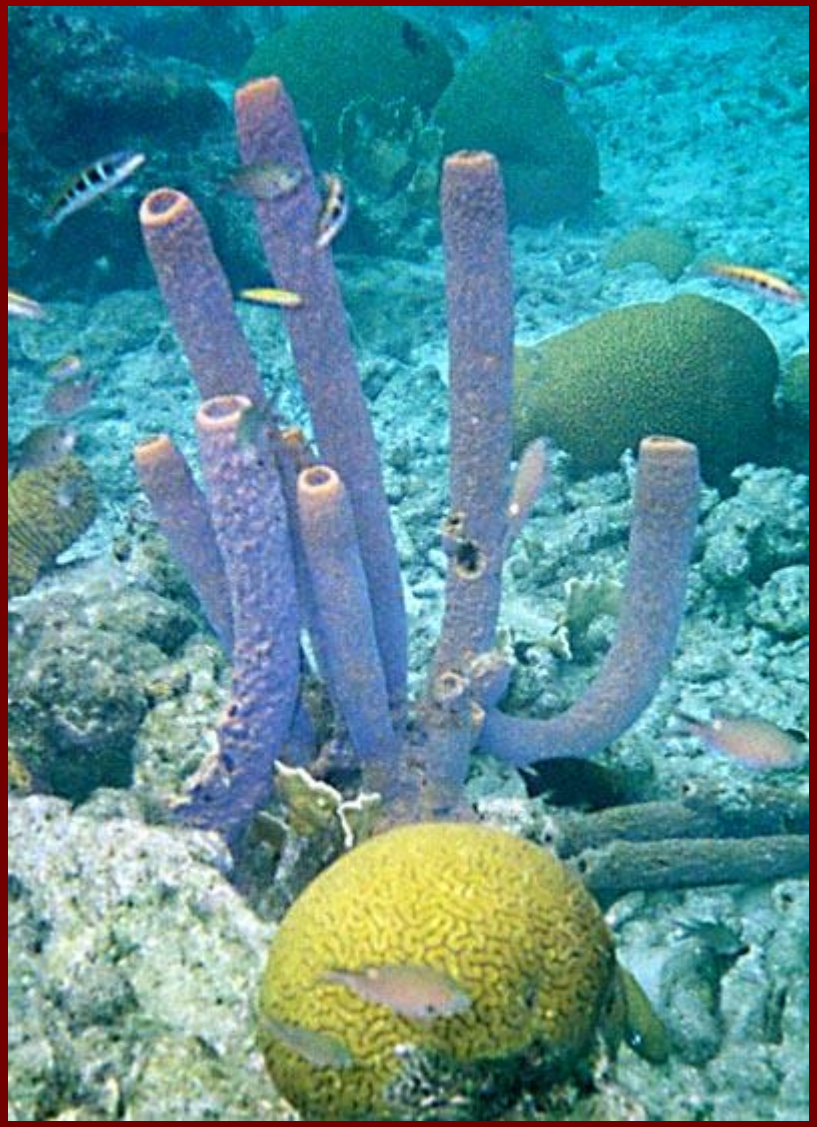
Examples (Recent)



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PHYLUM SPONGIA (=PORIFERA)
Examples (Recent)

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PHYLUM SPONGIA (=PORIFERA)
Examples (Recent?)

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Examples (Ancient)

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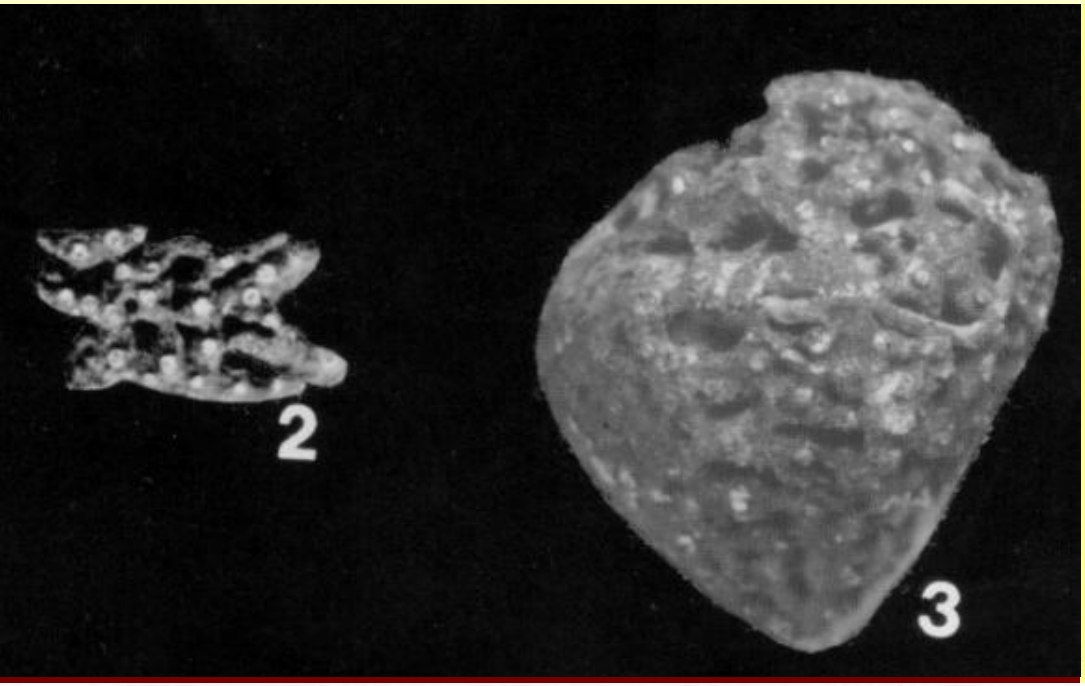

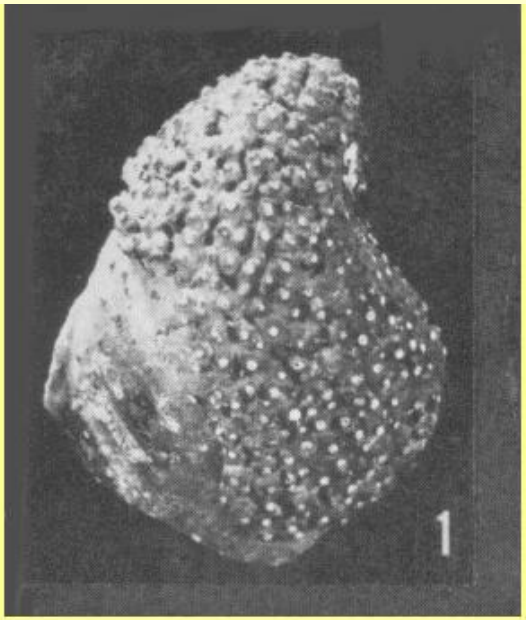

1. *Cliona cretacica* - specimen from the Mount Laurel Formation

Cliona cretacica

http://www.udel.edu/dgs/Paleontology/DE_K_pal/palpages/Porifera3.html

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PHYLUM SPONGIA (=PORIFERA)

Examples (Ancient)

Siphonia ("Siphon") was a genus of extinct hallirhoiddemosponges of the Upper Cretaceous. They lived in the Western Tethys Ocean, in what is now Europe. They all had distinctive pear-shaped bodies that were attached to the seafloor via a long stem. Their common name, "tulip sponges," refers to their suggestive shape, while the genus name refers to how the spongocoel (the main tube of the sponge body) runs almost the entire length of the sponge, as though it were almost a drinking straw. The length was around half an inch (1 centimeter).

http://en.wikipedia.org/wiki/File:MHNT_-_Siphonia_pyriformis.jpg

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PHYLUM SPONGIA (=PORIFERA)
Examples (Ancient)

Ventriculites fistulosus

SCHRAMMEN 1912

Ventriculites fistulosus is a rare species at Misburg, contrary to *V. radiatus*. It differs from the latter species mainly by the more irregular shape and arrangement of the pores.

http://www.cretaceous.de/Ventriculites.html

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PHYLUM SPONGIA (=PORIFERA)

Examples (Ancient)

Creticularia sp.
Jurassic to Pliocene

http://paleopedia.free.fr/spongiaires_classification.html

Doryderma sp.
Carboniferous to Early Cretaceous

http://www.terra.es/personal5/museumfossi/pagina3.htm

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Examples (Ancient)

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Examples (Ancient)

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Not spongia, an algea…

Receptaculies- Receptaculites was long assigned to sponges, but it considered to represent the fossil remains of calcareous algae. They lived from the lower Ordovician through the Permian. Specimens found are usually globular to platter shaped, nd measure from a few cm to over half a meter across. The surface is covered by rectangular plates arranged in intersecting sets of clock-wise and counterclock-wise patterns.

http://en.wikipedia.org/wiki/Receptaculites

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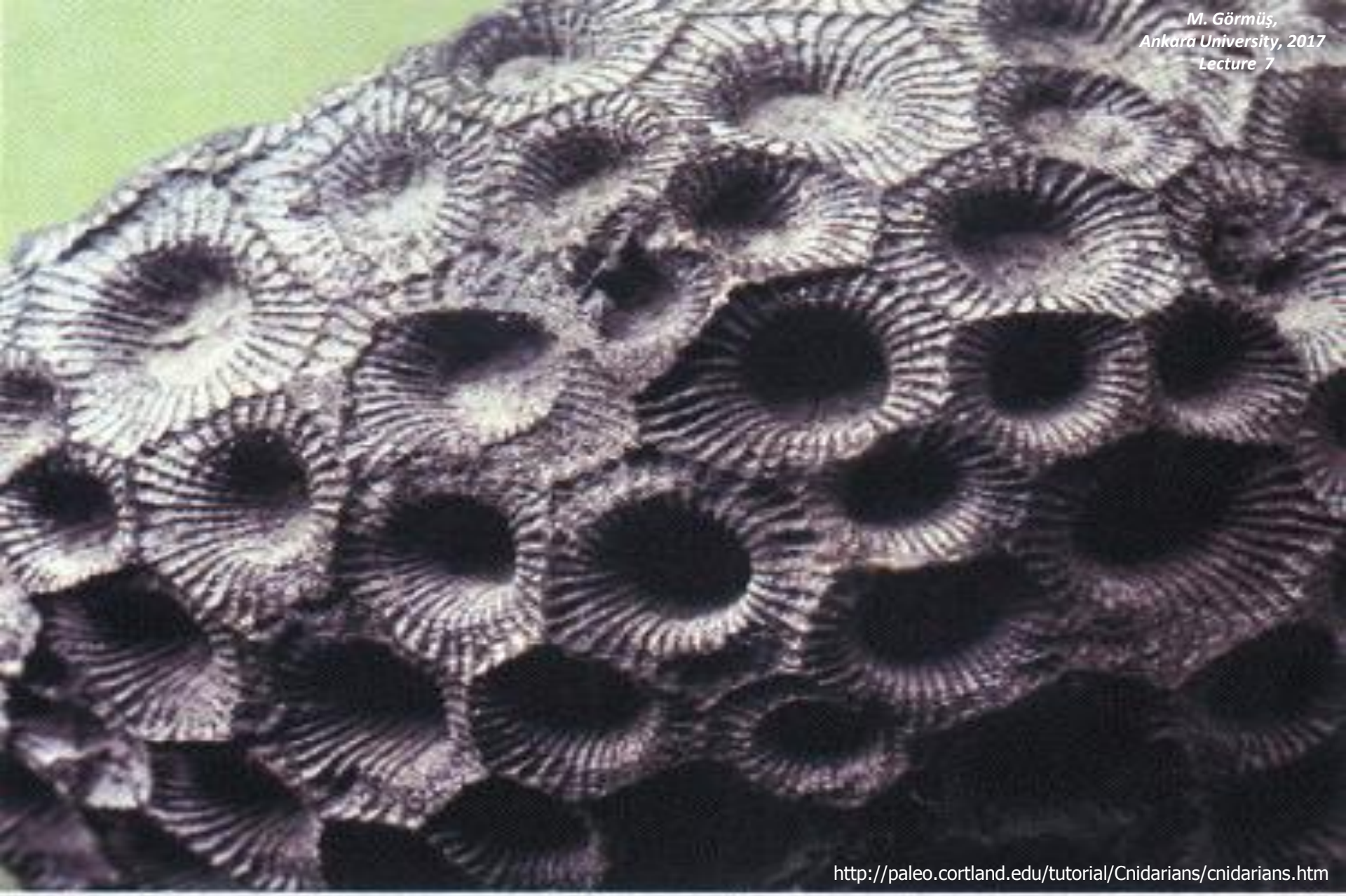
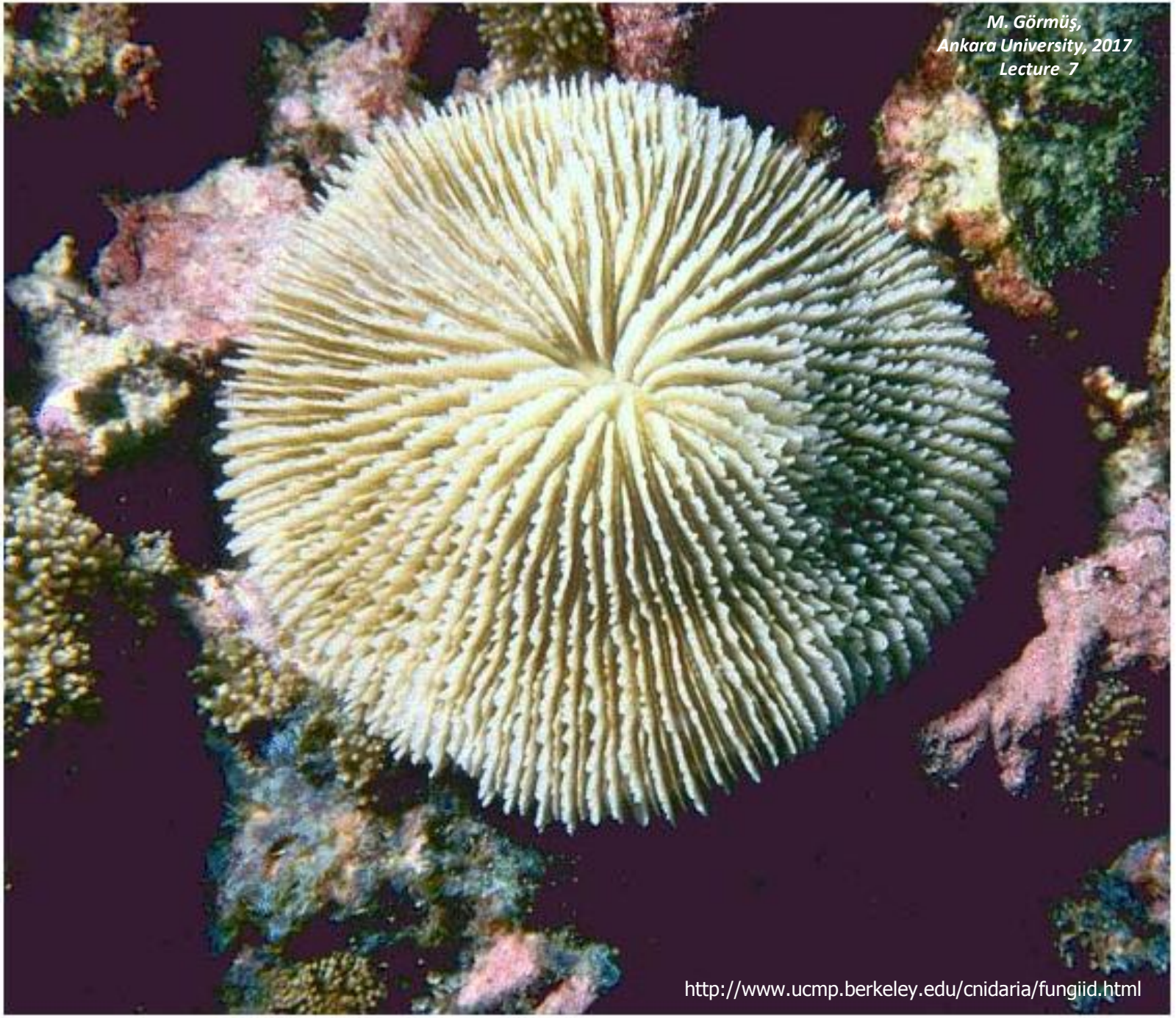
Cnidaria

http://www.ucmp.berkeley.edu/vendian/vendian.html



http://paleo.cortland.edu/tutorial/Cnidarians/cnidarians.htm

From Eldredge (1991)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http://www.ucmp.berkeley.edu/cnidaria/fungiid.html

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Cnidaria

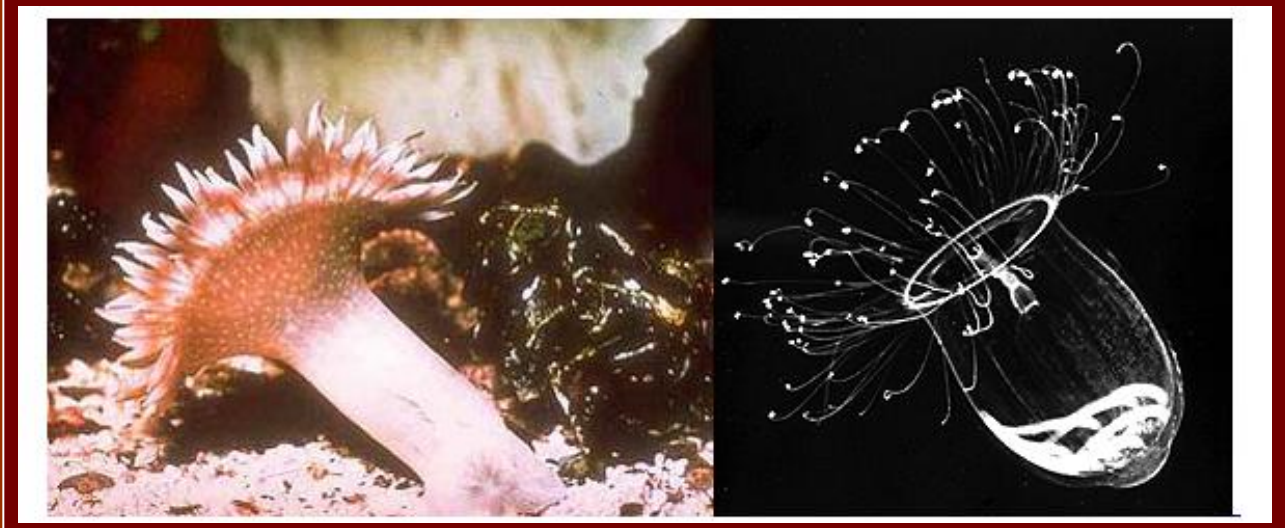
General characteristics

---Phylum Cnidaria includes corals, anemones, jellyfish & hydroids.

--- or **Coelenterata** is a phylum containing over 10,000 species of animals found exclusively in aquatic and mostly marineenvironments (mainly reefal) (http://en.wikipedia.org/wiki/Cnidaria).

--- Calcerous tests, generally colonozied simple multicelluar organisms

---Precambrian to Recent



http://tolweb.org/Cnidaria

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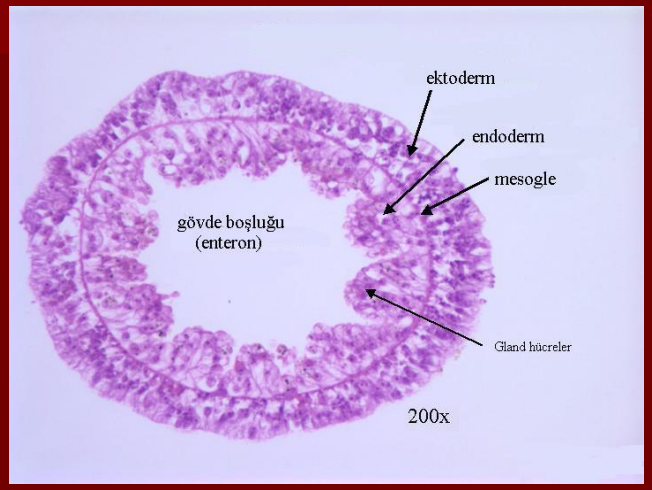
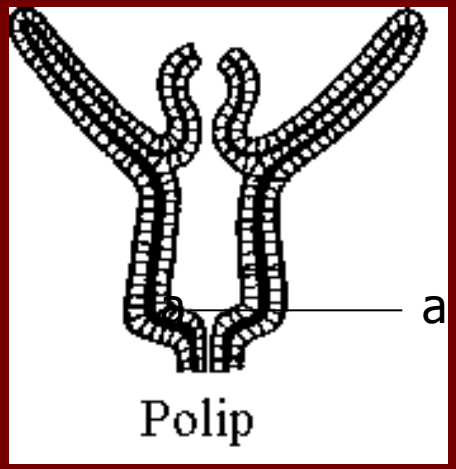
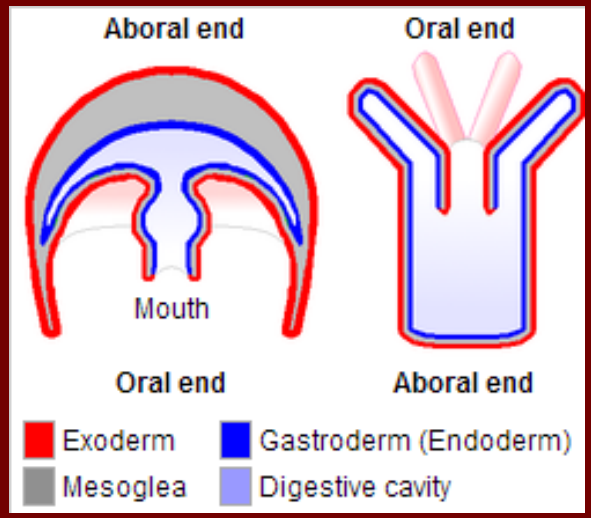
Cnidaria

General characteristics

--- Their bodies cover two layers, outer layer is called exoderm, inner layer is called endoderm, there is a gelatinous mesoglea between endo and exoderms. The mesoglea contain simple a nerveous system.







--- Two life modes are important: Polyps and medusa

Picture from Alkaya (Selçuk Univ.), lecture notes,

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Cnidaria

General characteristics

Medusa

- Discoidal body
- Aperture & anus at bottom
- Thick mesoglae
- Planktic

Polyps

- Cylindirical body
- Aperture & anus at top
- Benthic, sessile

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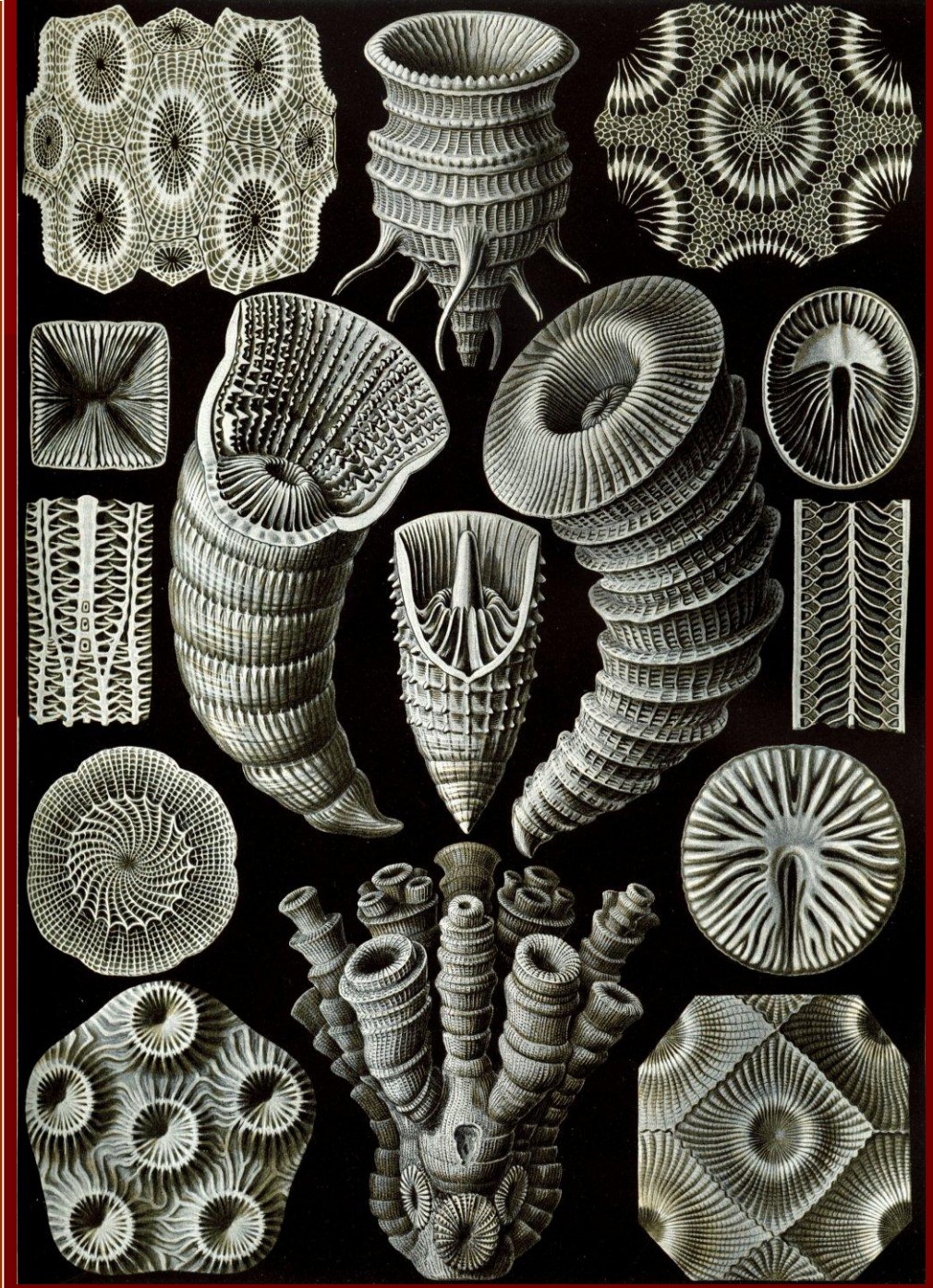
Cnidaria

General terms



http://www.fossilmuseum.net/Tree_of_Life/PhylumCnidaria/Rugosa-Coral.htm

Corallum: Coloni

Corallit: An individual within corallum

Fossula: Distinctive cavity between septa

Dissepiment: Convex many septula

Calisse: concavity at the top

Columel: medium vertical structure within each individual

Fasikül: a colony by free corallits

Masivve: a colony by attached corallits

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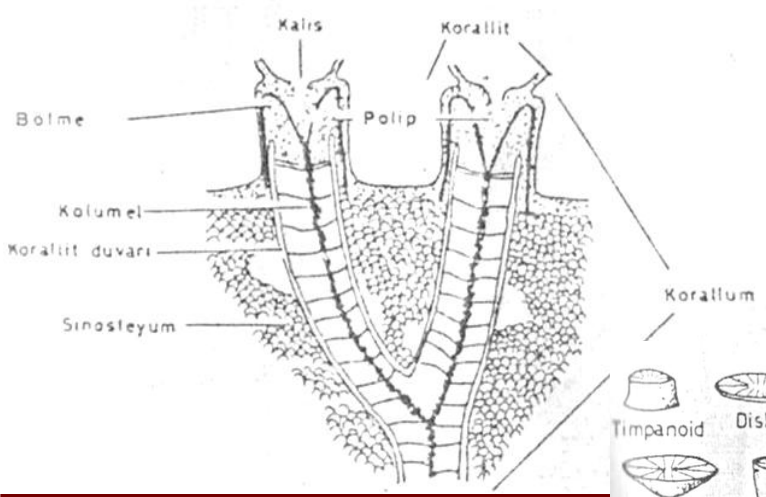
Cnidaria

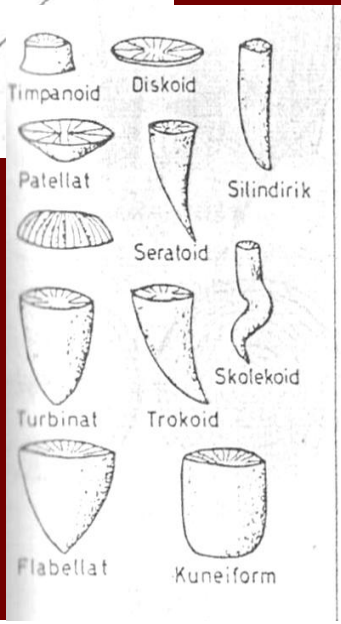
General characteristics

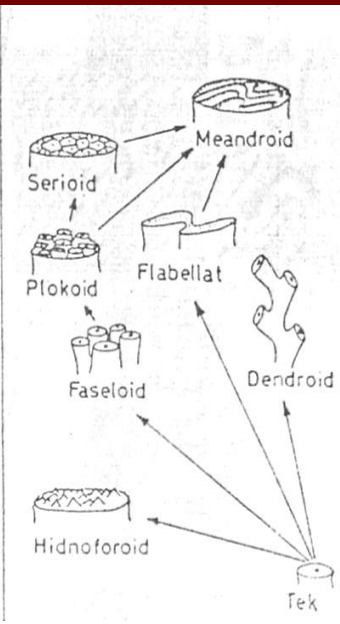


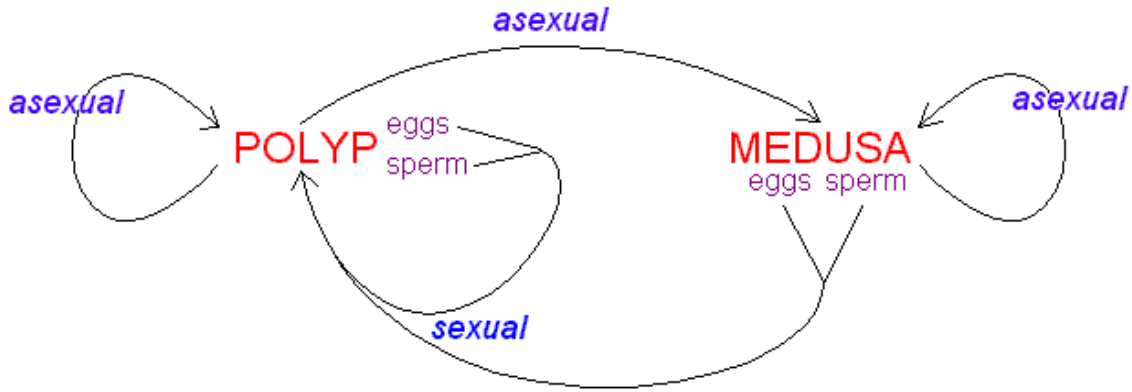
Note that the terms of corallum, corallit, calis, kolumel

Note that massive and solitary corals types

Reproduction







Idealized lifecycle of the Cnidaria.

General characteristics

POLYPS

CORALLUM

(CaCO3)

Picture from Alkaya (Selçuk Univ.), lecture notes,

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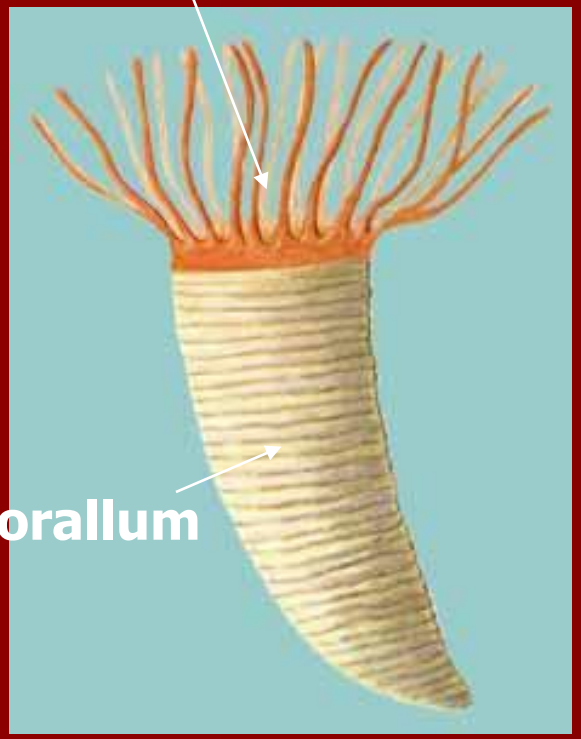
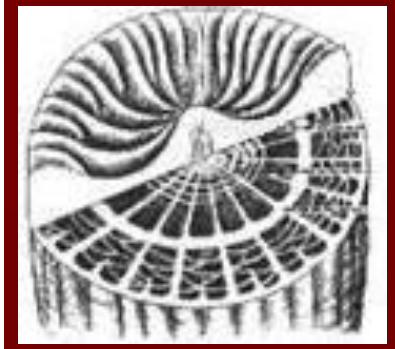
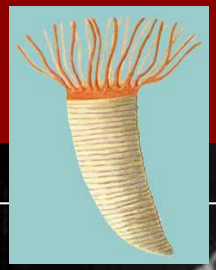
SOLITARY CORALS





Pictures from Alkaya (Selçuk Univ.), lecture notes,

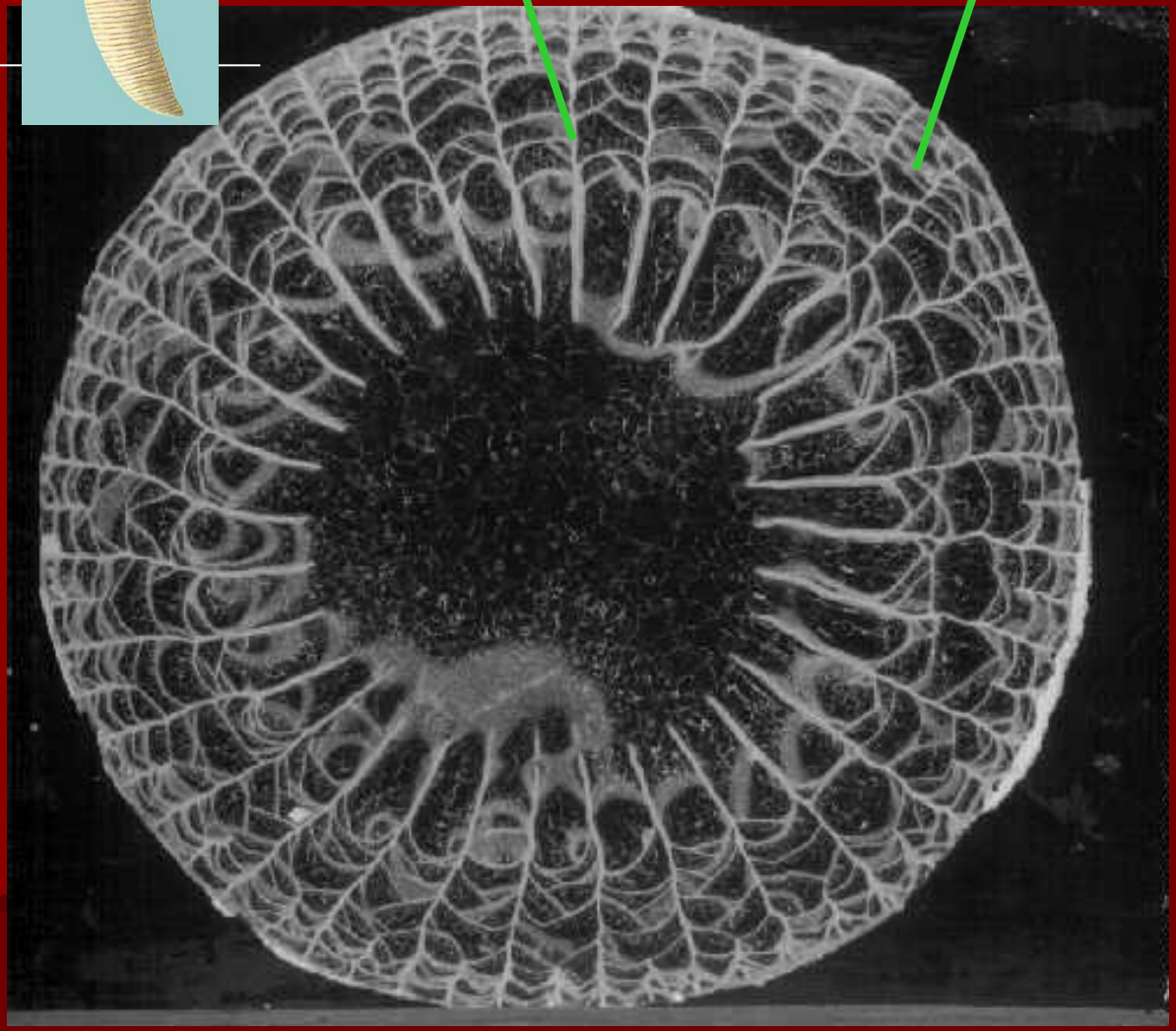
SOLITARY CORALS

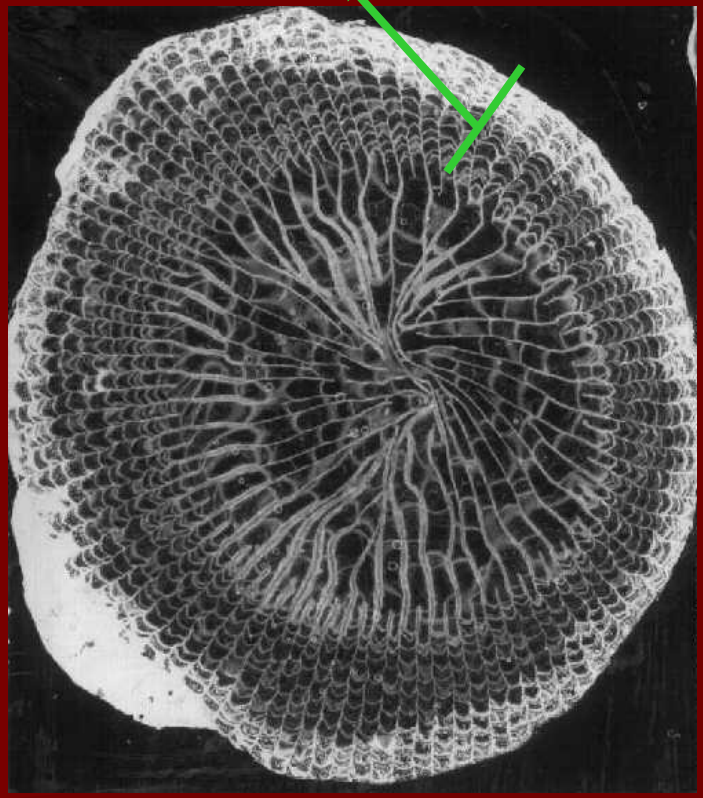


septum

dissepiment

dissepiment zone



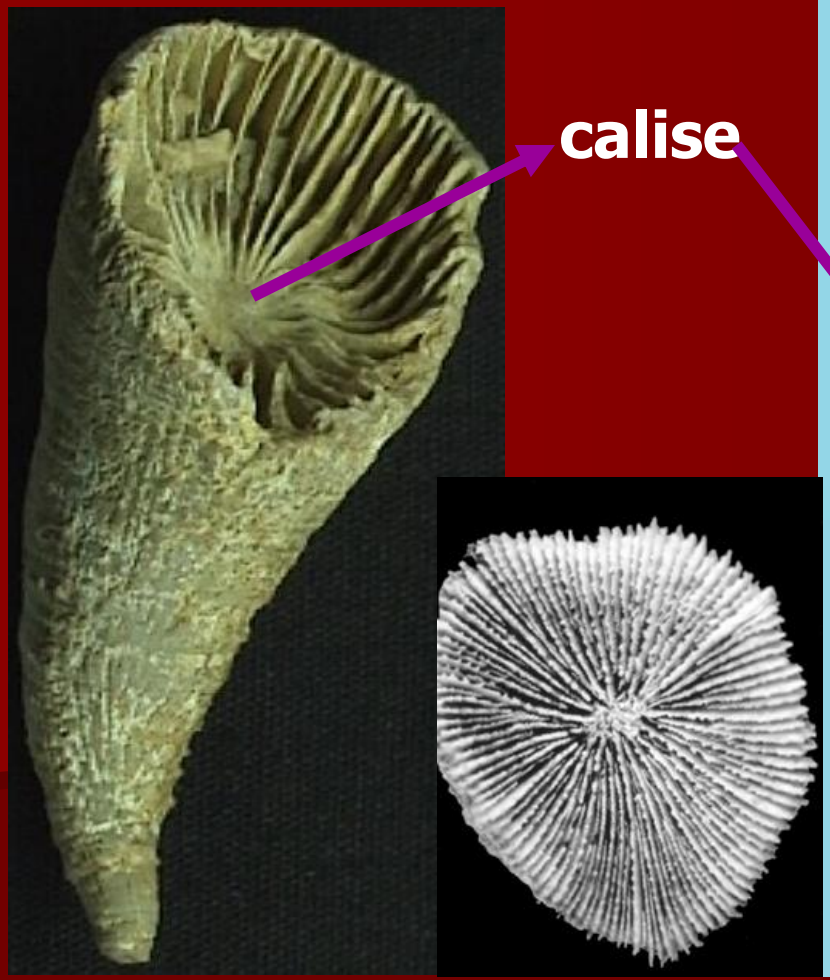


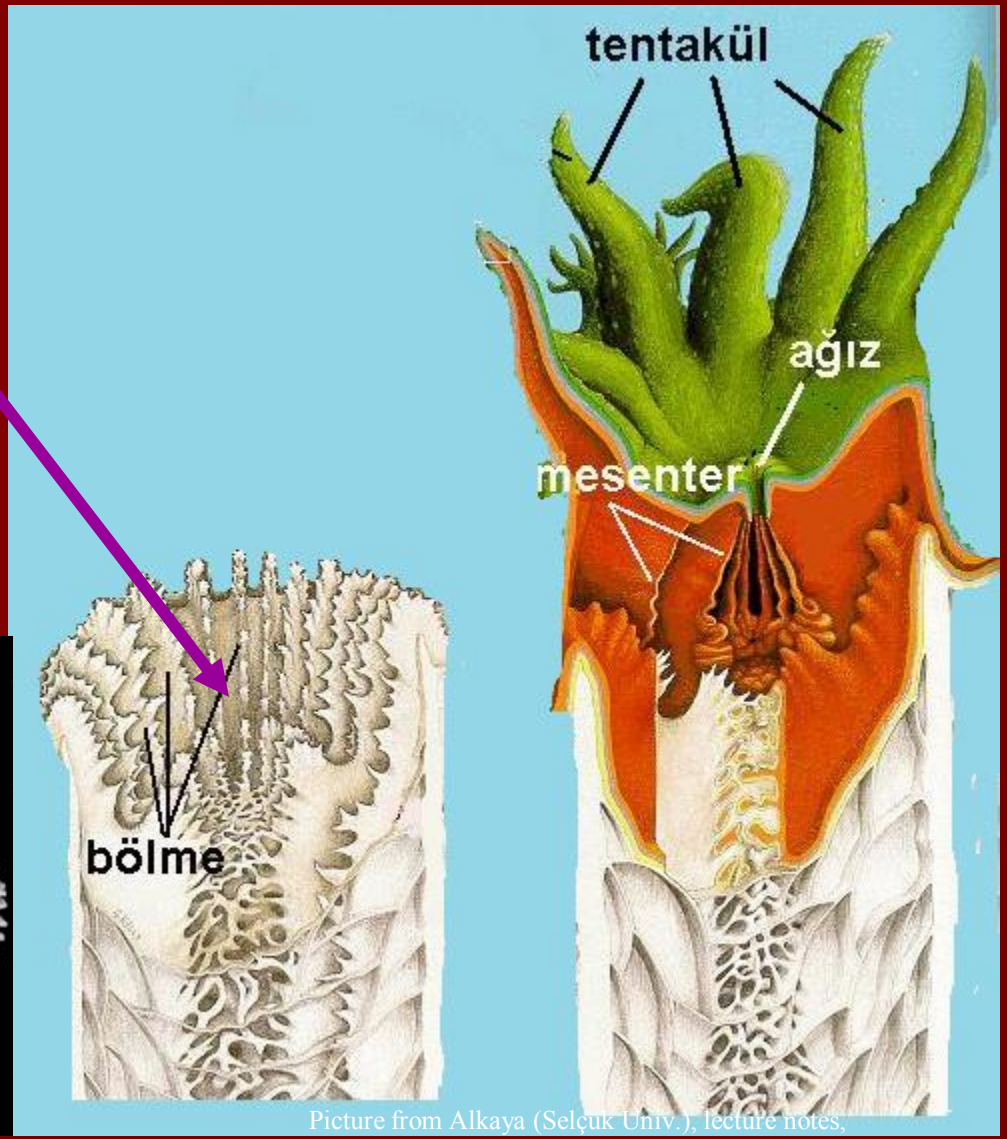
Transversal sections

Picture from Alkaya (Selçuk Univ.), lecture notes,

SOLITARY CORALS

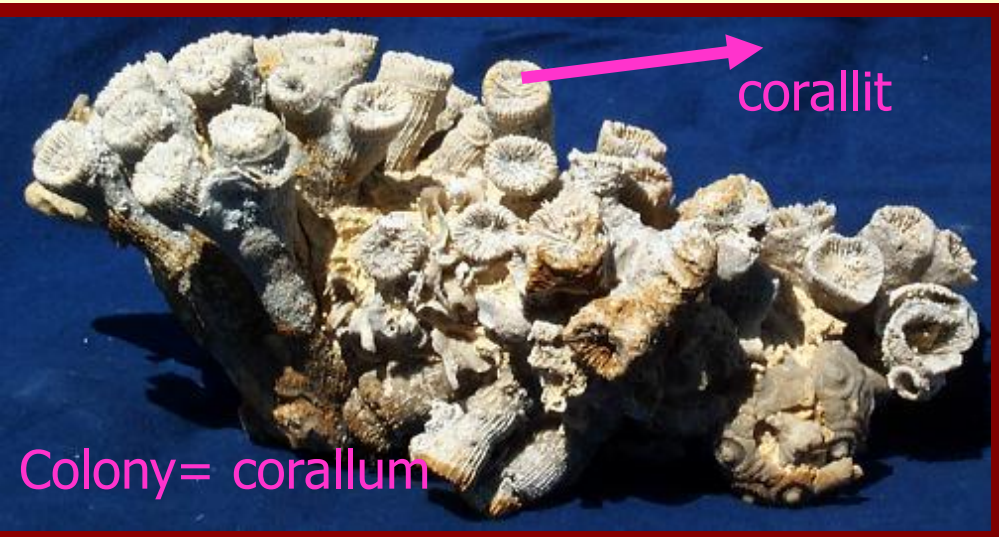
Organism lives within calise

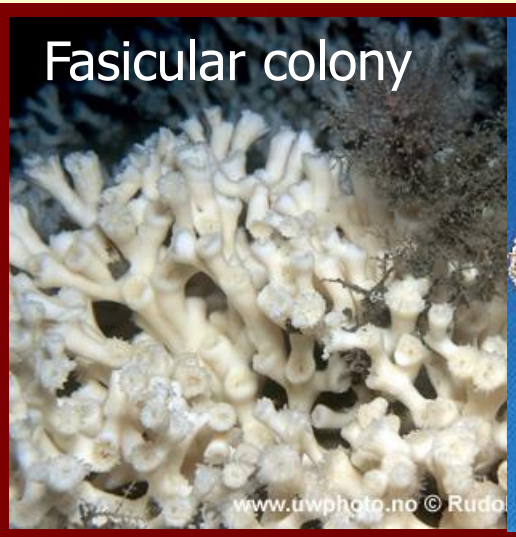




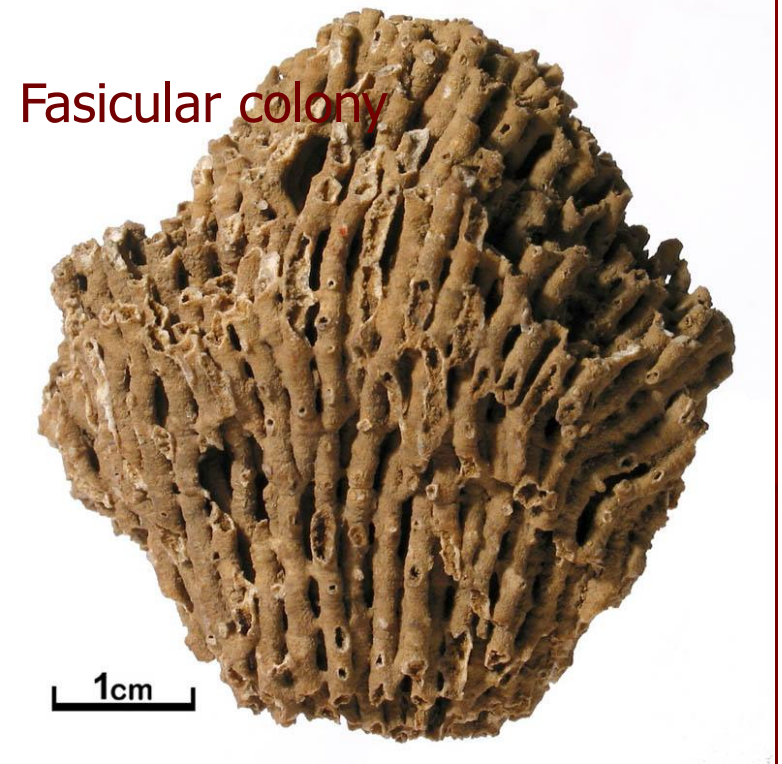
Picture from Alkaya (Selçuk Univ.), lecture notes,

COLONY CORALS (fasicular, massive)

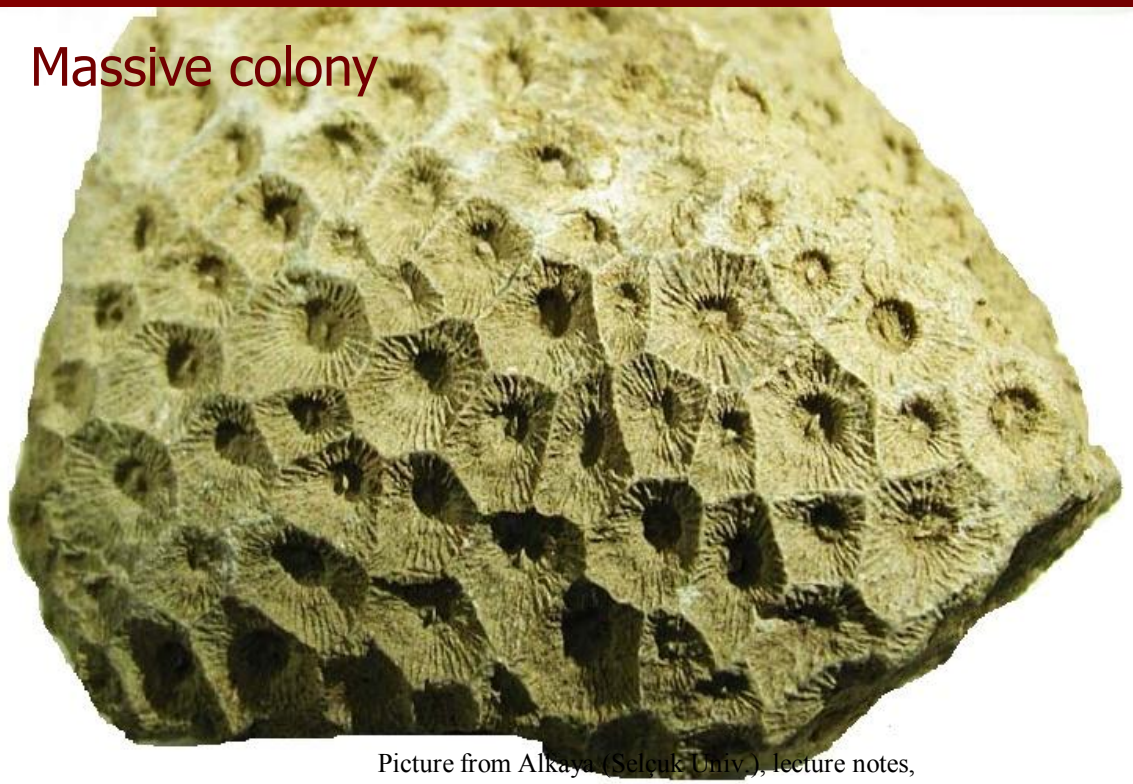




Fasicular colony



Massive colony



Picture from Alkaya (Selcuk Univ.), lecture notes,

COLONY CORALS (Fasicular)

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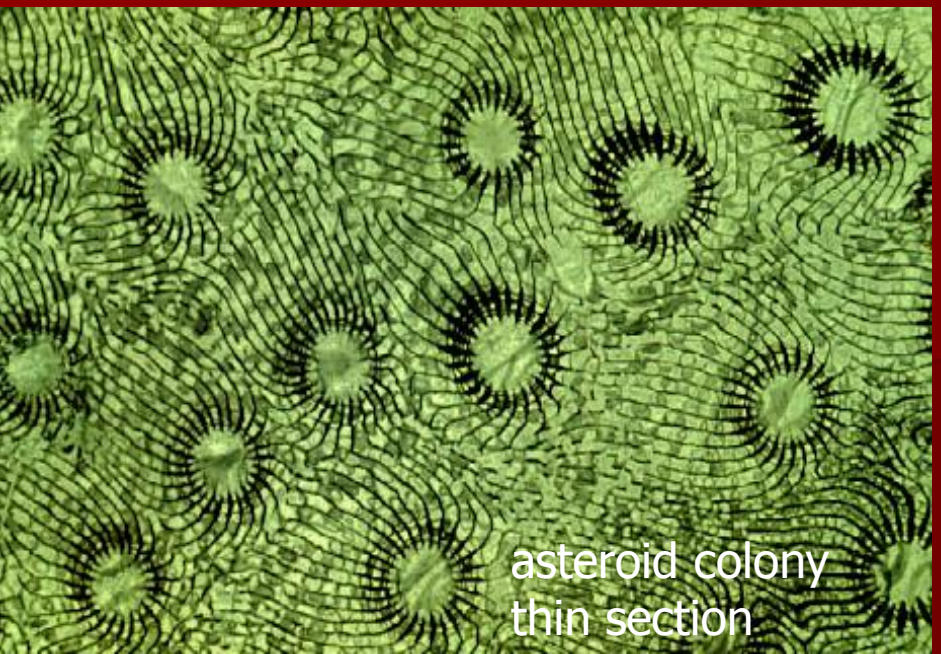
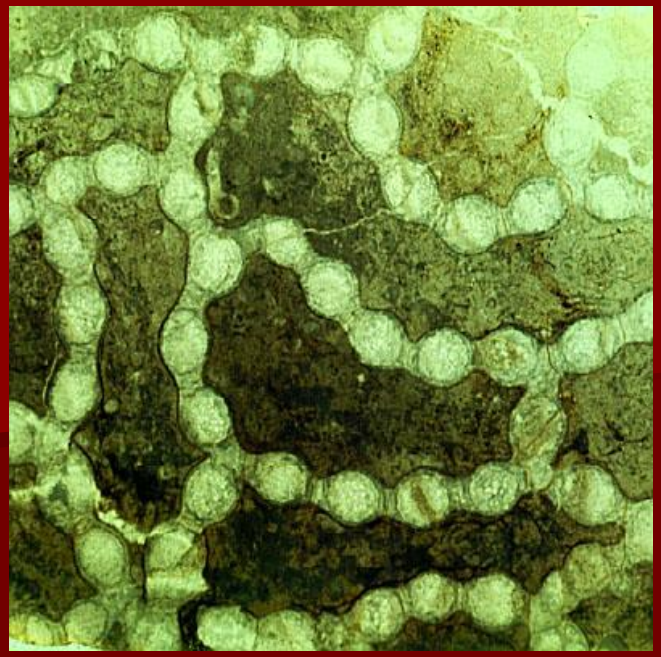
COLONY CORALS (Massive)



Picture from Alkaya (Selçuk Univ.), lecture notes.

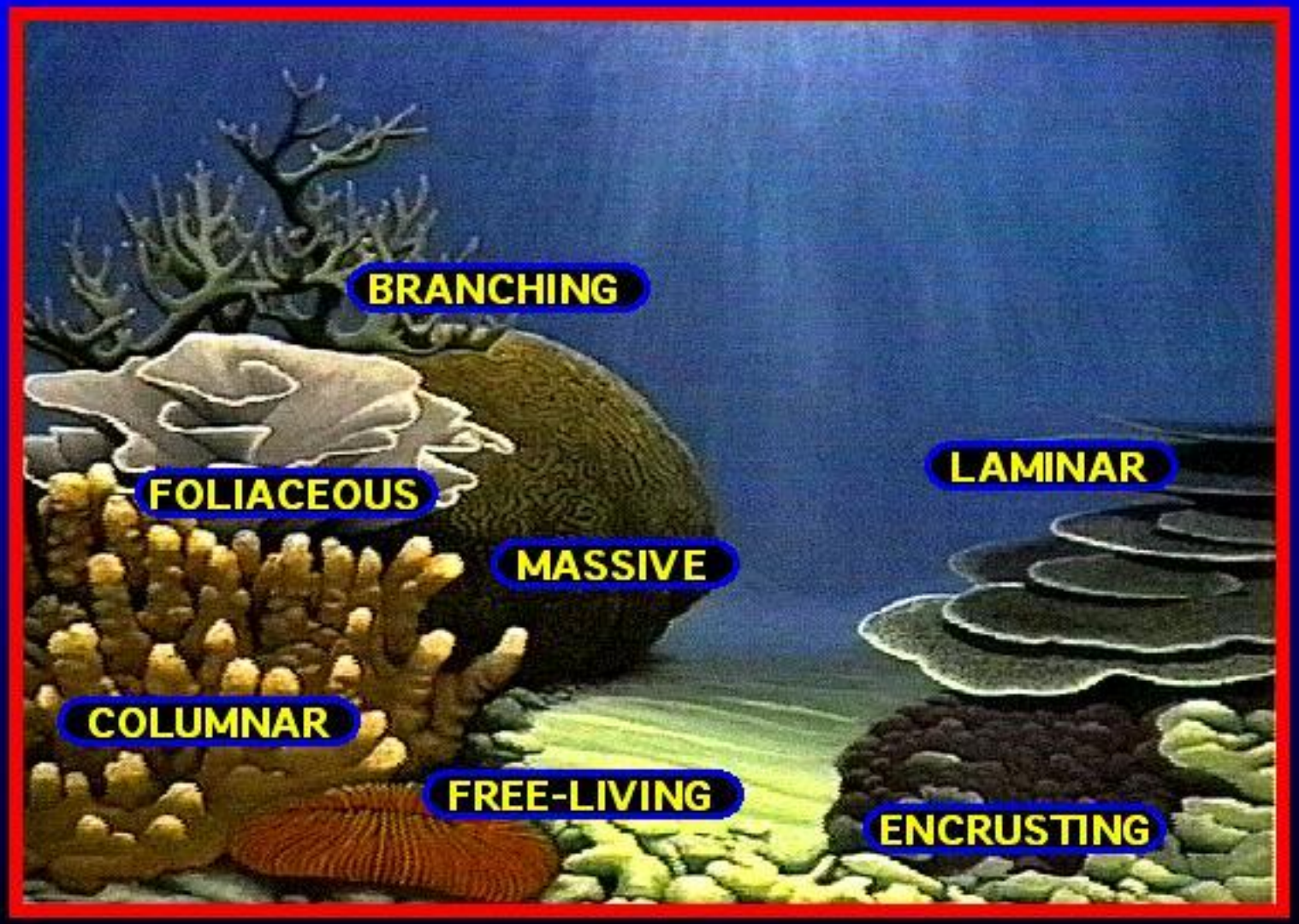
COLONY CORALS (Massive, brain-shaped, chain-shaped)



Picture from Alkaya (Selçuk Univ.), lecture notes,

COLONY CORALS

Colony Growth Forms



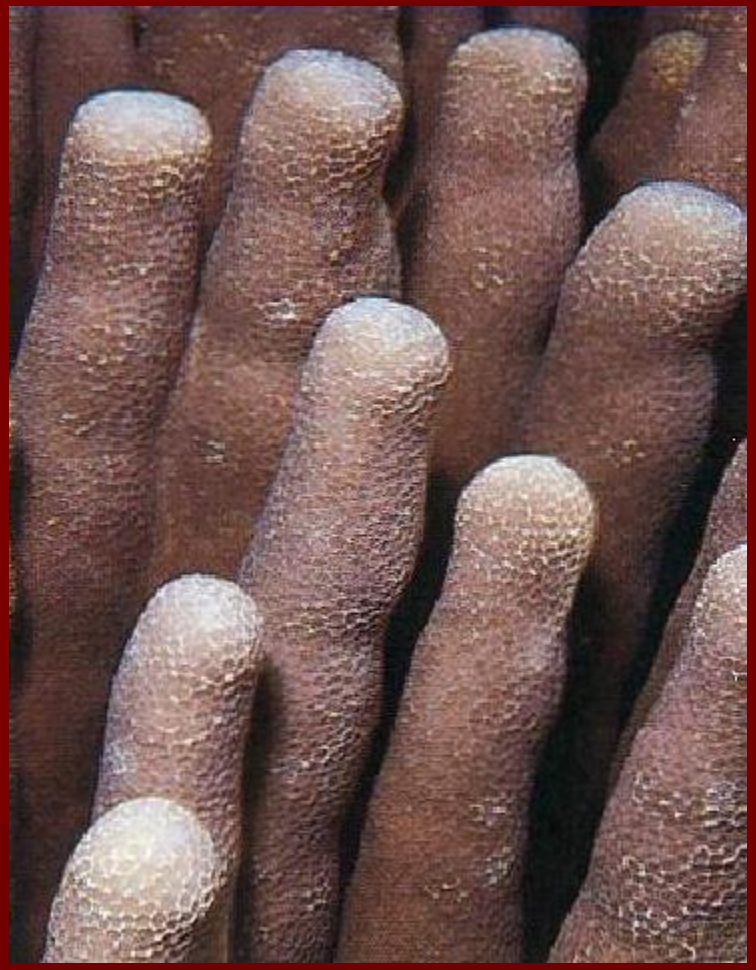
Picture from Alkaya (Selçuk Univ.), lecture notes,

COLONY CORALS (Massive)

Ramose or Branching

Picture from Alkaya (Selçuk Univ.), lecture notes,

COLONY CORALS (Columnar)



Picture from Alkaya (Selçuk Univ.), lecture notes,

COLONY CORALS (Laminar)

Picture from Alkaya (Selçuk Univ.), lecture notes,

COLONY CORALS (Foliaceous)

Picture from Alkaya (Selçuk Univ.), lecture notes,

COLONY CORALS (Encrusting)

Picture from Alkaya (Selçuk Univ.), lecture notes,

COLONY CORALS (Massive)

Picture from Alkaya (Selçuk Univ.), lecture notes,

FREE LIVING SOLITARY CORALS

Picture from Alkaya (Selçuk Univ.), lecture notes,

CORAL REEFS

CORAL REEFS DEVELOP IN CLEAR WARM SEAS

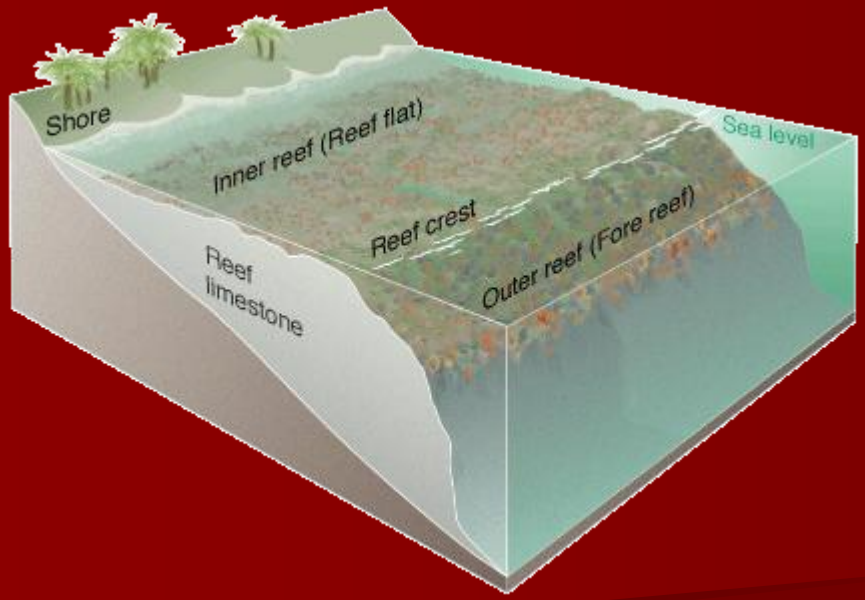
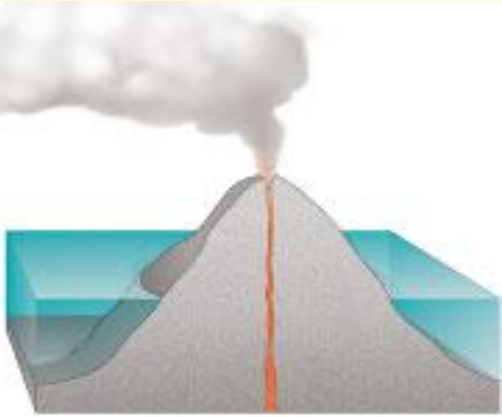
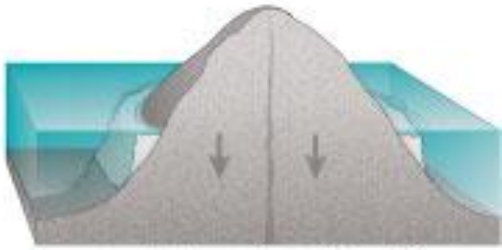


Diagram of a fringing coral reef.

http://pubs.usgs.gov/fs/2002/fs025-02/

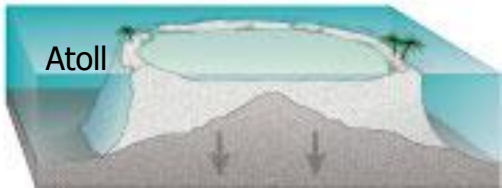


Volcanic Island



Fringing Reef

Barrier Reef



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Cnidaria

Classification

Groups that include stony corals are in **bold face** type.
Polyp groups without skeletons are *italicized*.
The names of the most important fossil group are CAPITALIZED.

Taxonomic Category	Geologic Range
Class Hydrozoa	Vendian[1] to Holocene
Class Scyphozoa	Vendian to Holocene
Class **Anthozoa**	Vendian to Holocene
Subclass Octocorallia	Vendian to Holocene
Subclass **Zoantharia**	Cambrian to Holocene
Group 1	
Order **Tabulaconida**	Lower Cambrian
Order **Cothoniida**	Middle Cambrian
Order **TABULATA**	Lower Ordovician to Upper Permian
Order **Heliolitida**	Middle Ordovician to Middle Devonian
Order **RUGOSA**	Middle Ordovician to Upper Permian
Order **Heterocorallia**	Upper Devonian to Middle Carboniferous
Order *Zoanthidia*	Holocene
Group 2	
Order **Kilbuchophyllida**	Middle Ordovician
Order **Numidiaphyllida**	Middle Permian
Order **SCLERACTINIA**	Middle Triassic to Holocene
Order *Corallimorpharia*	Holocene
Order *Actiniaria*	Holocene

[1] Latest Precambrian period.

http://geology.er.usgs.gov/paleo/coralstable1.shtml

http://paleo.cortland.edu/tutorial/Cnidarians/cnidarians.htm

Phylum **Cnidaria**
- Class **Anthozoa** (Precambrian-Recent)
  - Order **Tabulata** (Ordovician-Permian)
  - Order **Rugosa** (Ordovician-Permian)
  - Order **Scleractinia** (Triassic-Recent)
  - Subclass **Octocorallia** (Ordovician-Recent)
- Class **Hydrozoa** (Precambrian-Recent)
- Class **Scyphozoa** (Precambrian-Recent)

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Examples

Class HYDROZOA

Class SCYPHOZOA

Class ANTHOZOA

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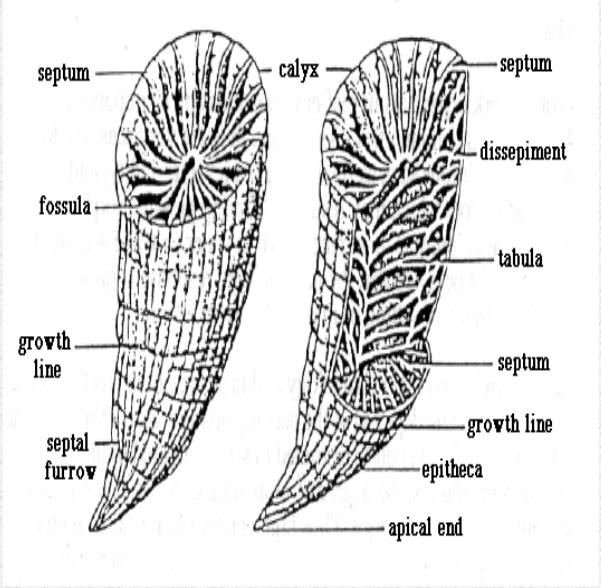
Cnidaria
(Order Rogosa)



From McRoberts (1998)

The Paleozoic rugosan corals can be either solitary or colonial. Although they may have originally had aragonitic skeletons, all are now calcite. Rugosa corals are distinguished from the other Paleozoic group, the Tabulata, by having dissepiments and well developed septa in addition to the tabulae. As shown in the accompanying figure (Figure 3.1), rugosan corals have six primary septa and new septa are added in only four of the resulting six spaces with none added in the remaining two spaces. This septal arrangement is well illustrated in the external mold where the septa are preserved as gaps.

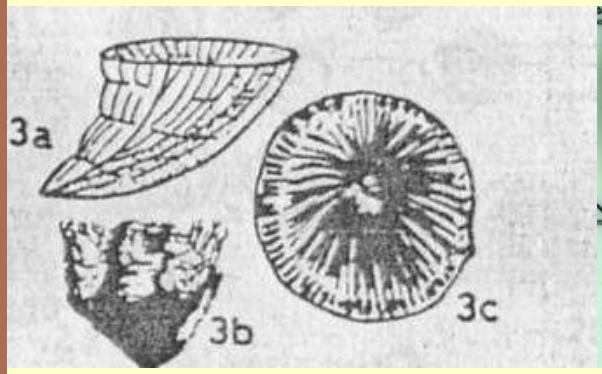
For examples of solitary forms which typically exhibit a cone or horn morphology (hence the informal name "horn corals") examine these specimens, - and This specimen has excellent dissepiments visible where the epitheca is worn-away. For examples of colonial rugosans view this specimen.

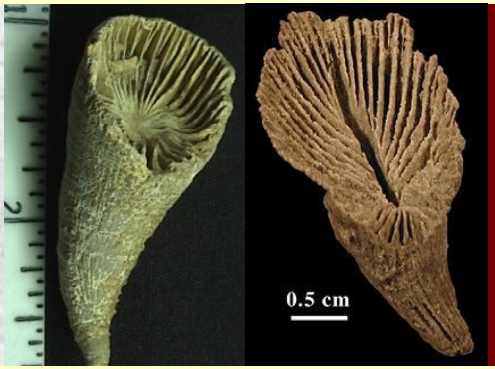
Rugosa morphology

http://paleo.cortland.edu/tutorial/Cnidarians/cnidarians.htm

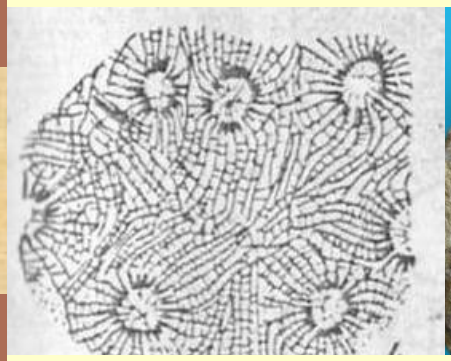
Cnidaria (Rogosa)

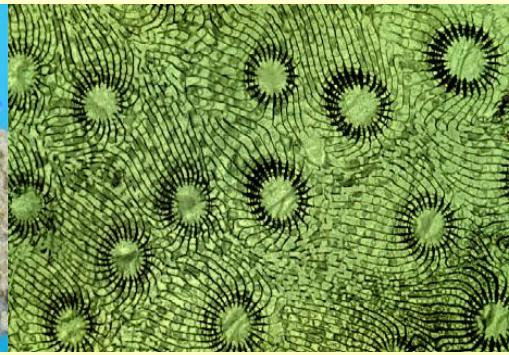
***Zaphrentis* sp.** (Devonian)



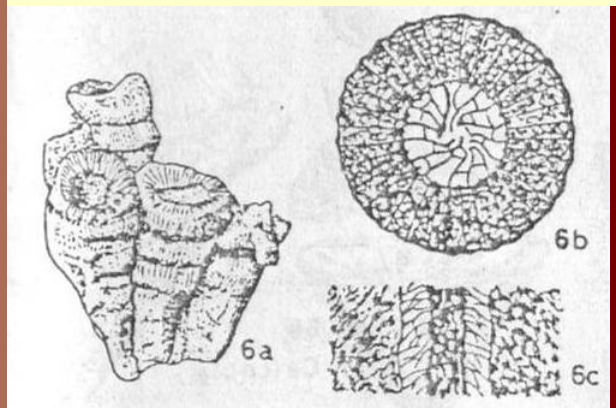


***Philipsastrea* sp.** (Devonian)



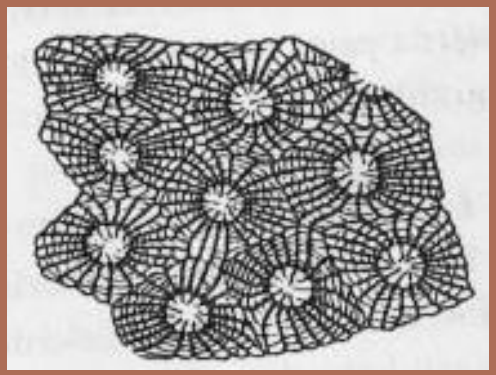


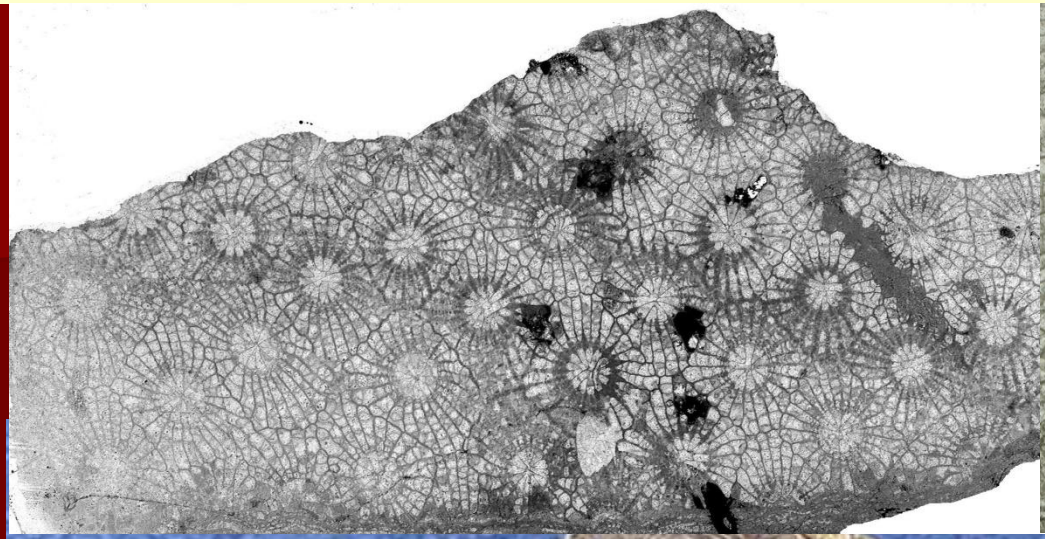
***Kodonophyllum* sp.** (Silurian) ***Goniophyllum* sp.** (Silurian)



Picture from Alkaya (Selçuk Univ.), lecture notes,

Hexagonaria sp. (Devonian)



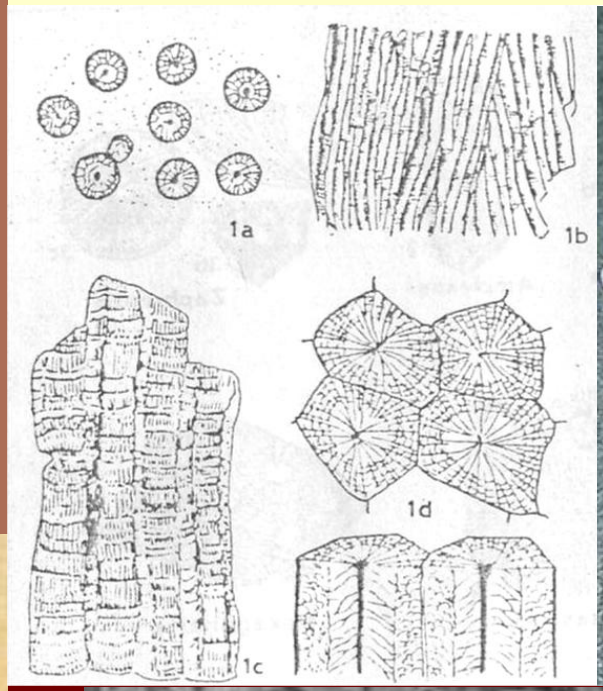


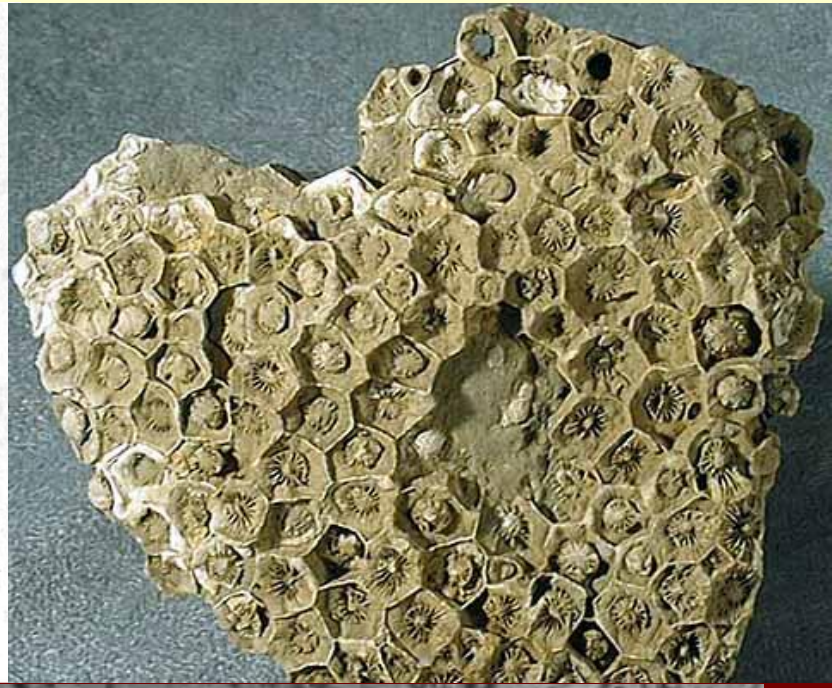
Cnidaria
(Rogosa)

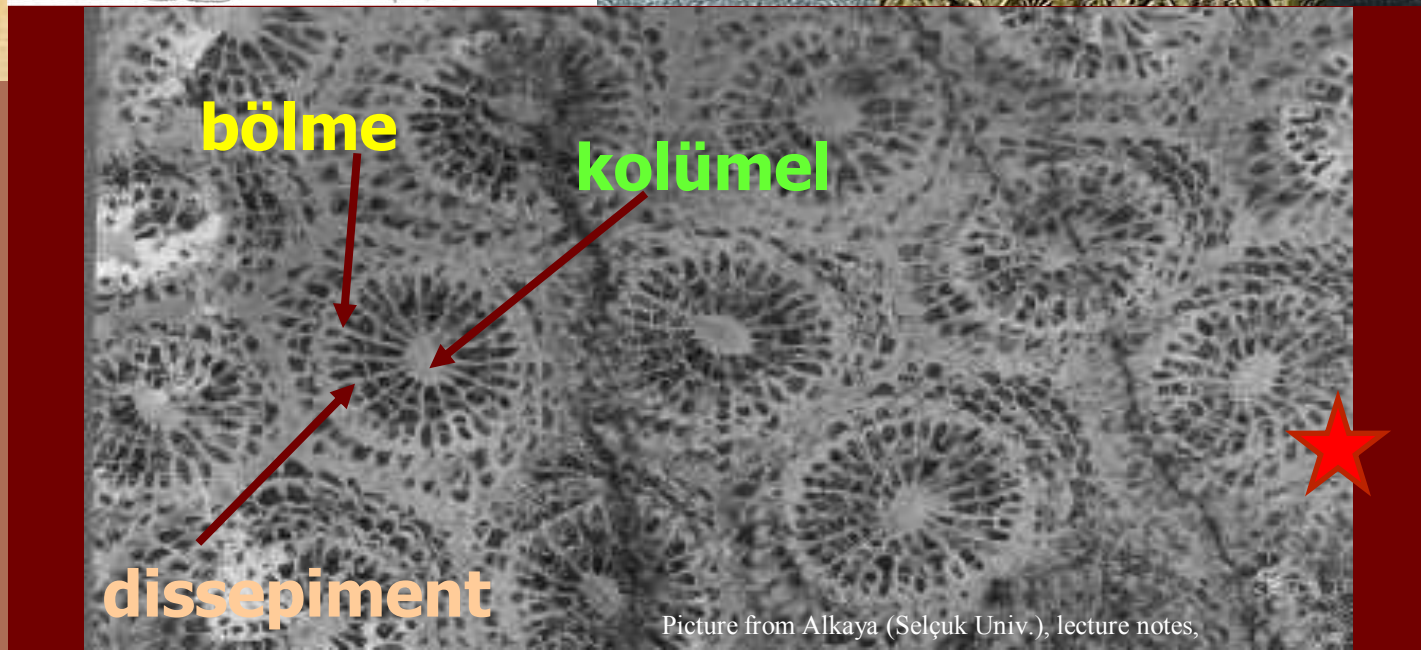
Picture from Alkaya (Selcuk Univ.), lecture notes,

Cnidaria
(Rogosa)

Lithostration sp. (Carboniferous)



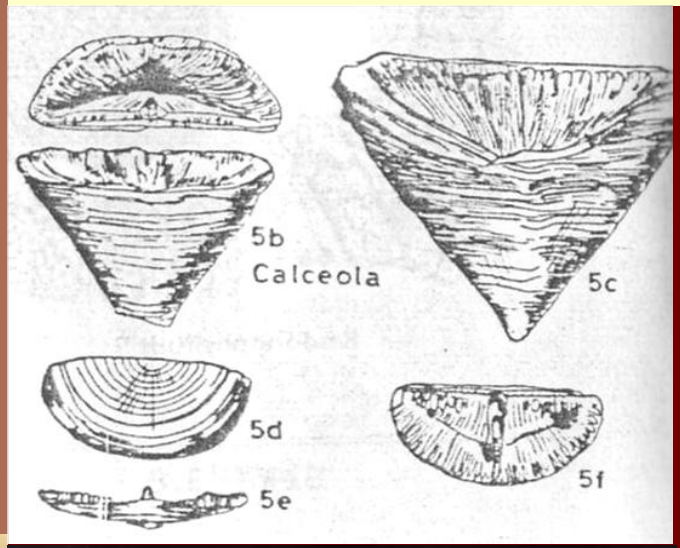




Picture from Alkaya (Selçuk Univ.), lecture notes,

Calceola sp. (Devonian)

Cnidaria
(Rogosa)



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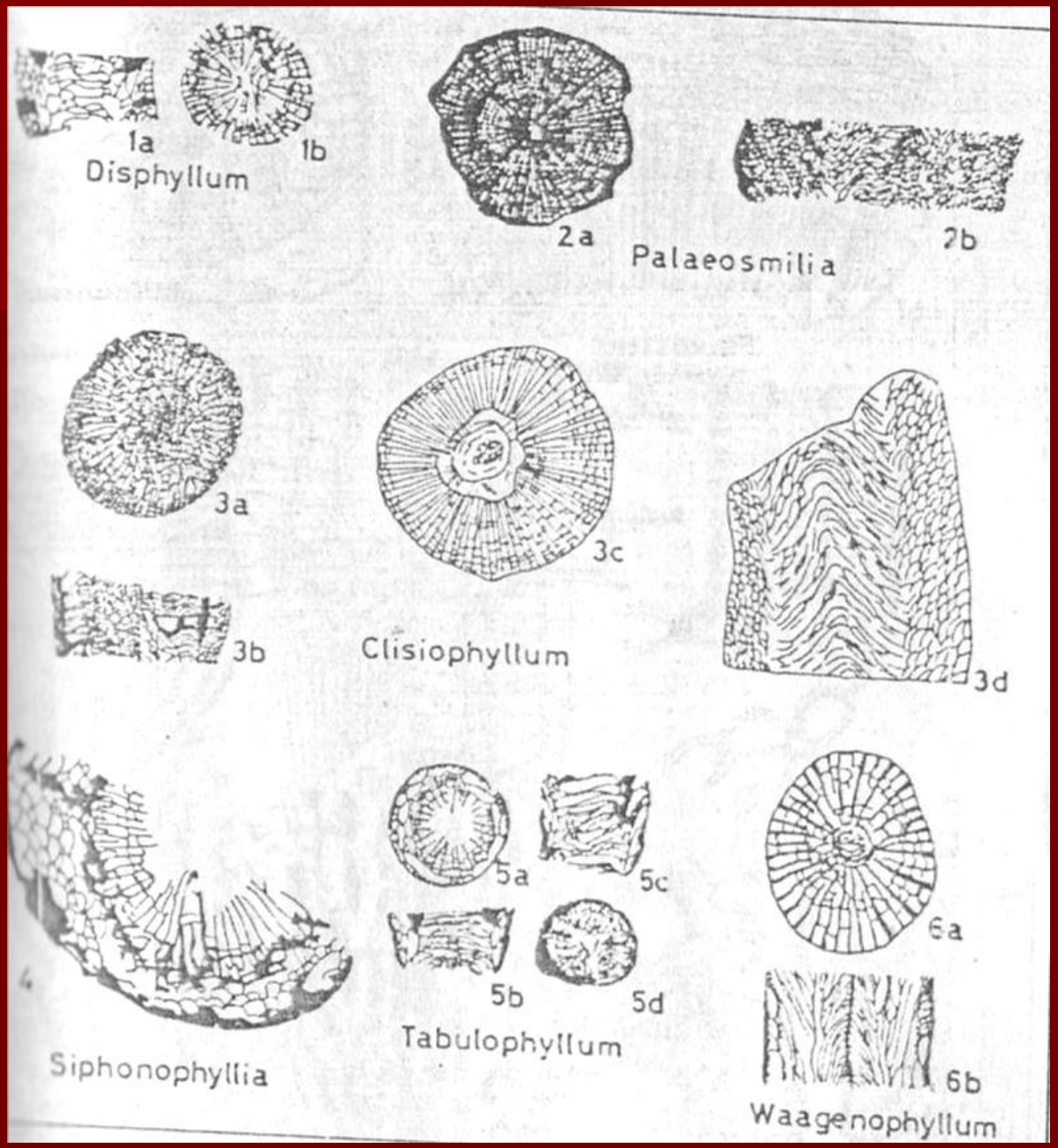
Cnidaria
(Rogosa)



Some selected species of Rugosa in Turkiye

Picture from Alkaya (Selçuk Univ.), lecture notes,

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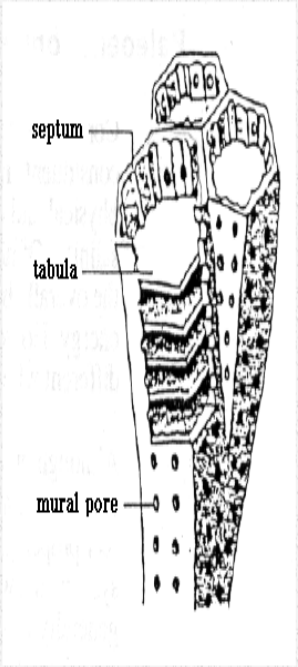
Cnidaria
(Order Tabulata)

Order TABULATA

The exclusively colonial Tabulate corals occur only in the Paleozoic. Their calcite skeletons typically have a lateral wall (epitheca) that separates each rather small corallite. Each of the corallites typically have a tabula that serve as the floor for the polyp. Septa in tabulate corals are either absent or inconspicuous. Although their growth forms vary, they often occur in "honeycomb" or chain-like morphologies.

Figure 1 - **Tabulate Morphology**



From McRoberts (1998)

http://paleo.cortland.edu/tutorial/Cnidarians/cnidarians.htm

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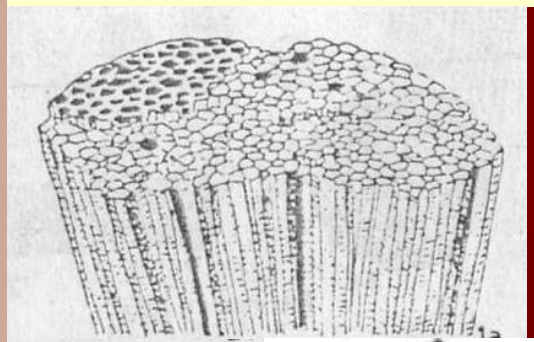
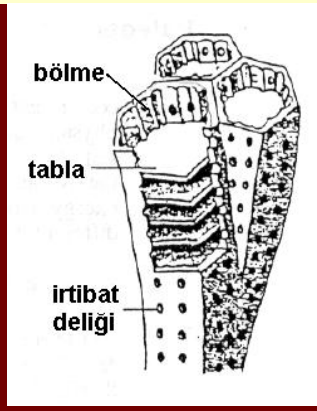
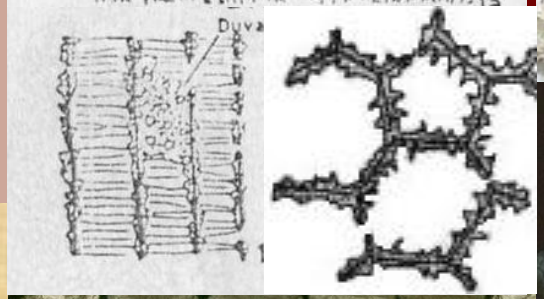
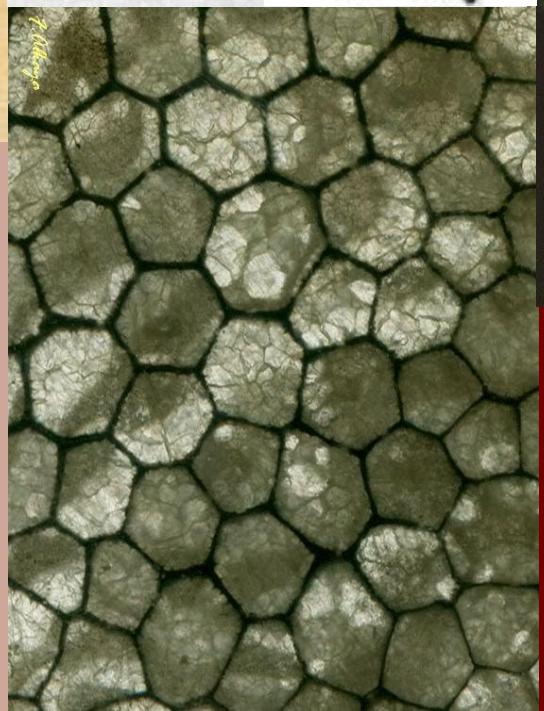
Favosites sp. (Late Ordovician to Devonian)

Cnidaria
(Tabulata)









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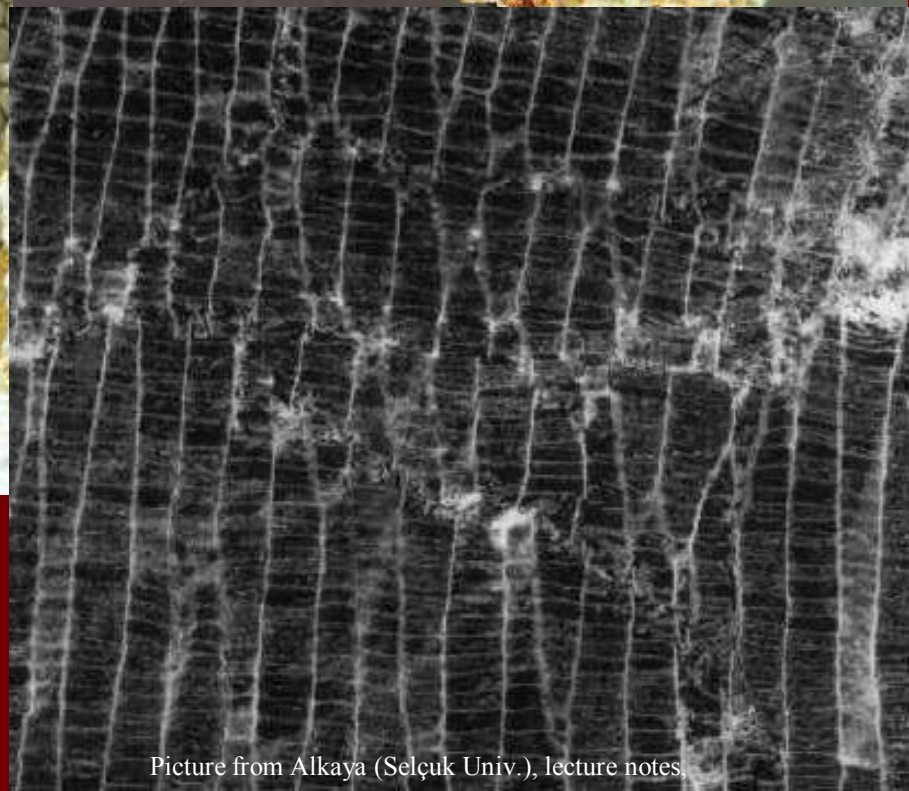
Cnidaria
(Tabulata)

***Favosites* sp.** (Late Ordovician to Devonian)



Picture from Alkaya (Selçuk Univ.), lecture notes.

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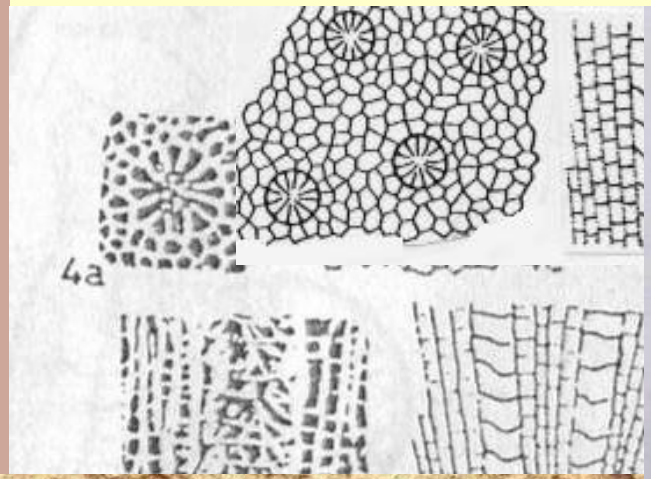
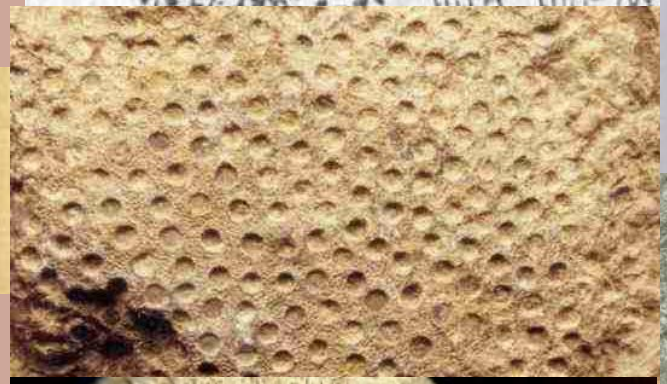
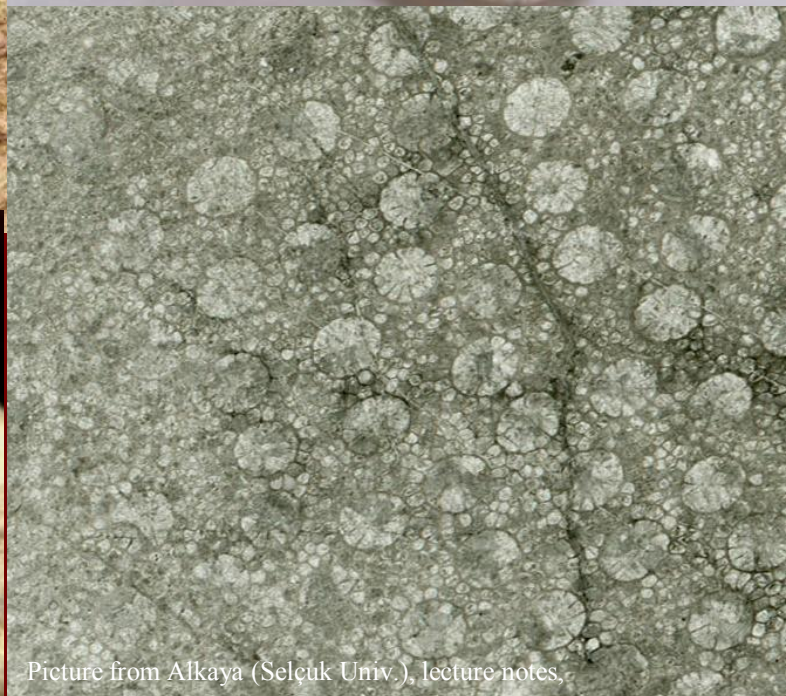
Heliolites sp. (Early Silurian to Middle Devonian)

Cnidaria
(Tabulata)







Picture from Alkaya (Selçuk Univ.), lecture notes.

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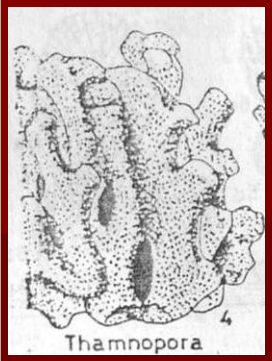
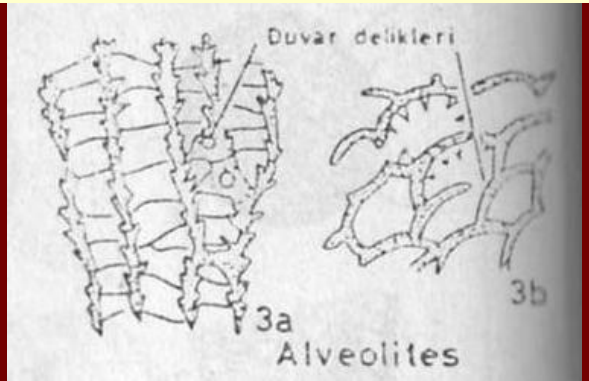
Cnidaria
(Tabulata)

***Thamnopora* sp.** (Silurian to Permian)



***Alveolites* sp.** (Silurian to Dev.)



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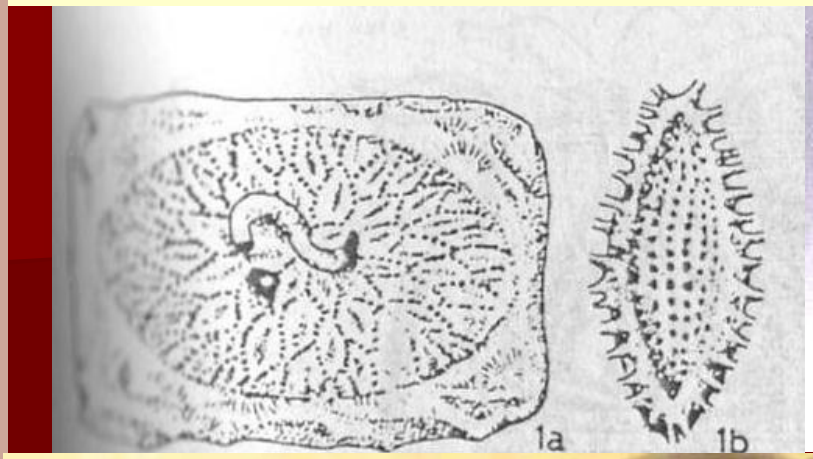
Cnidaria
(Tabulata)

Pleurodictyum sp. (Devonian)



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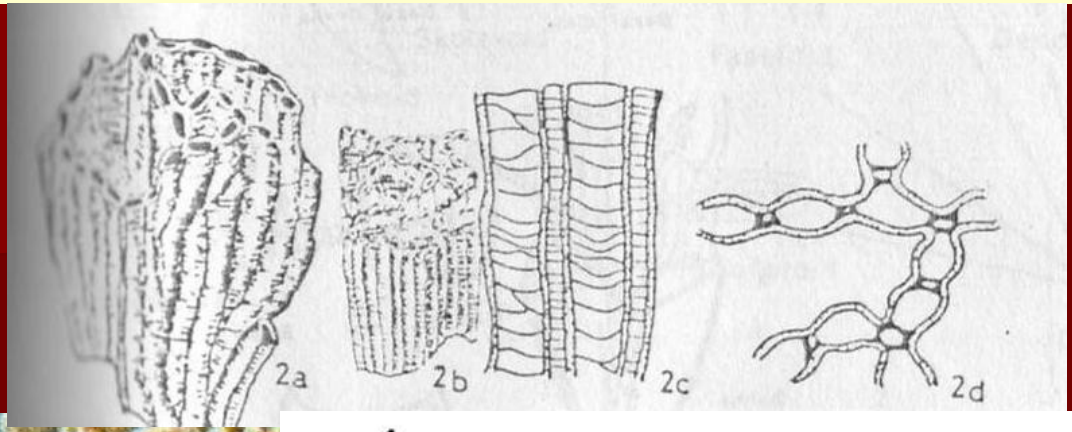
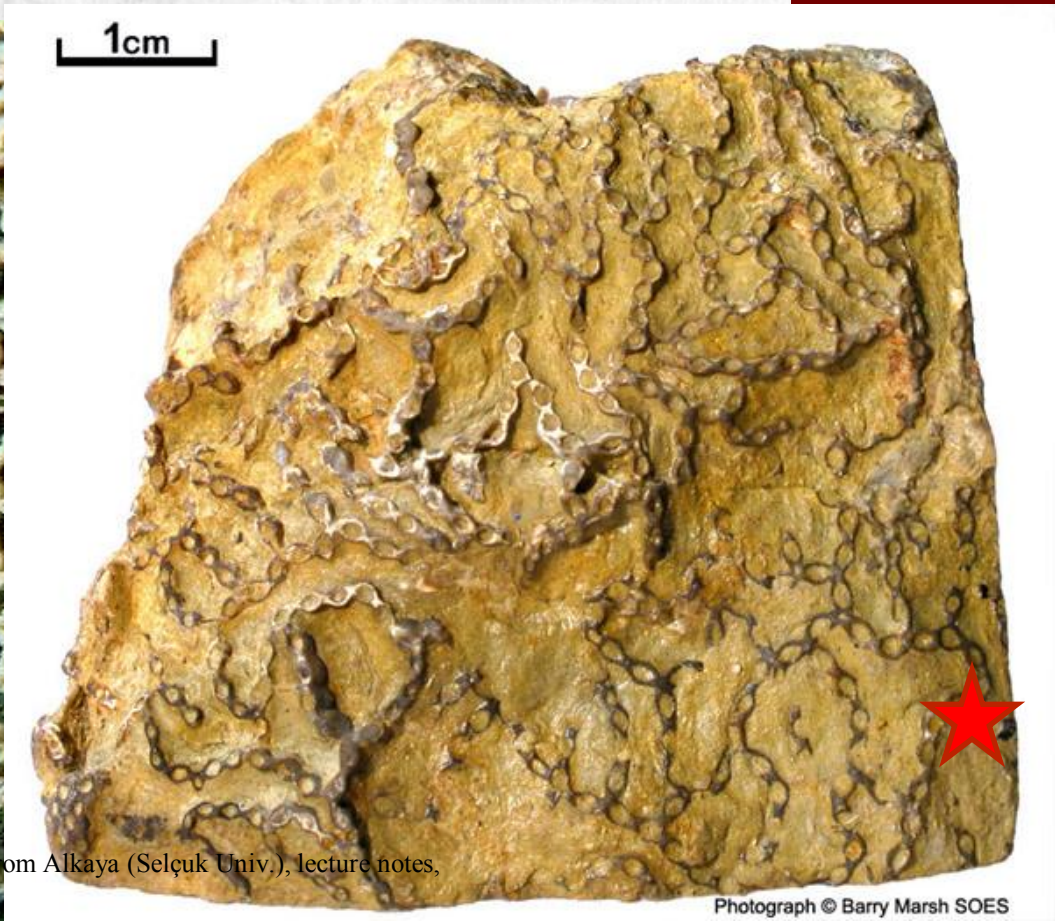
Halysites sp. (Ordovician to Silurian)



Cnidaria
(Tabulata)



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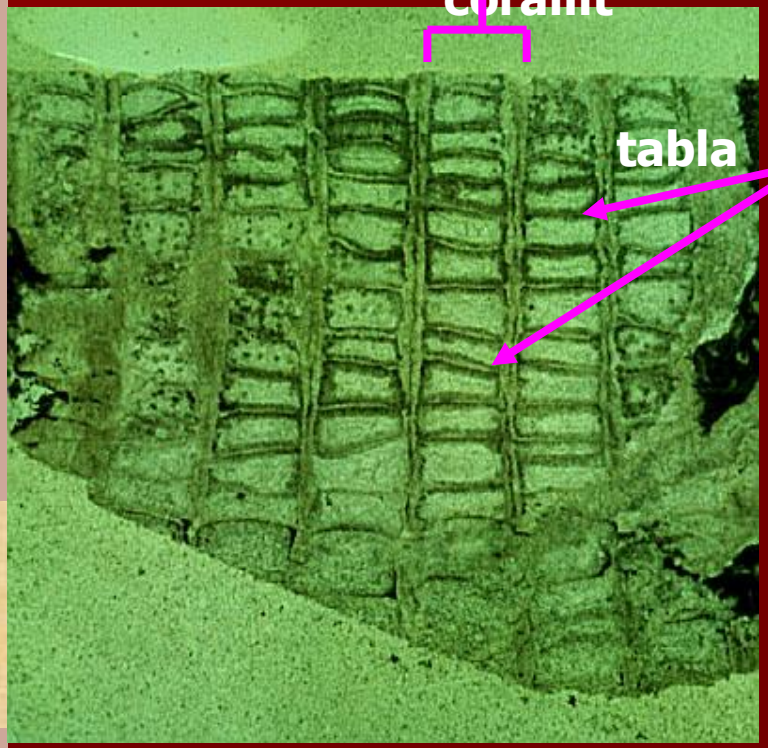
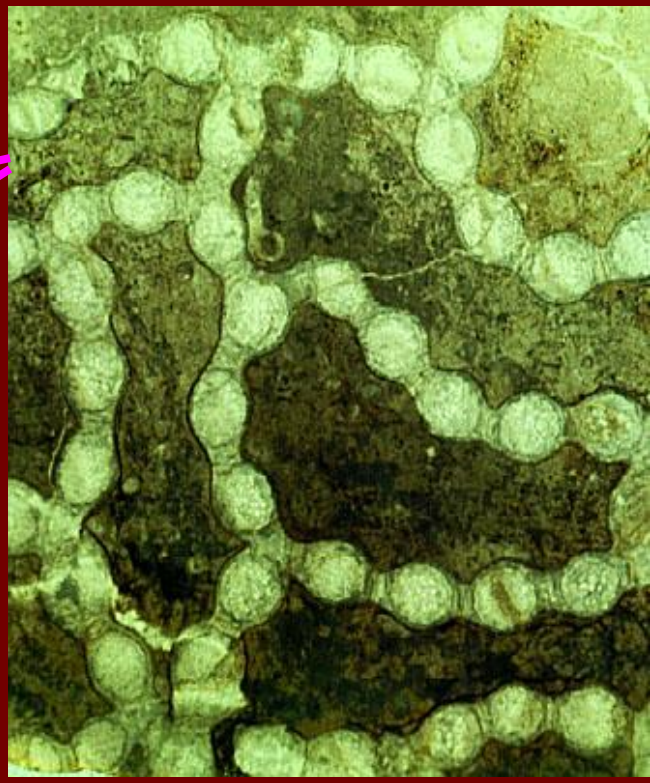
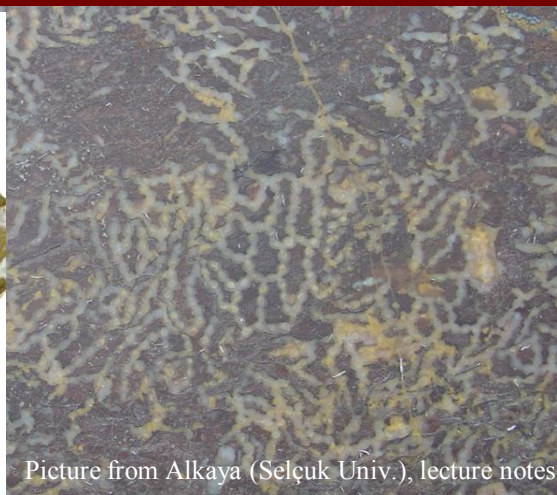
Halysites sp. (Ordovician to Silurian)

Cnidaria
(Tabulata)



Vertical section under microscobe





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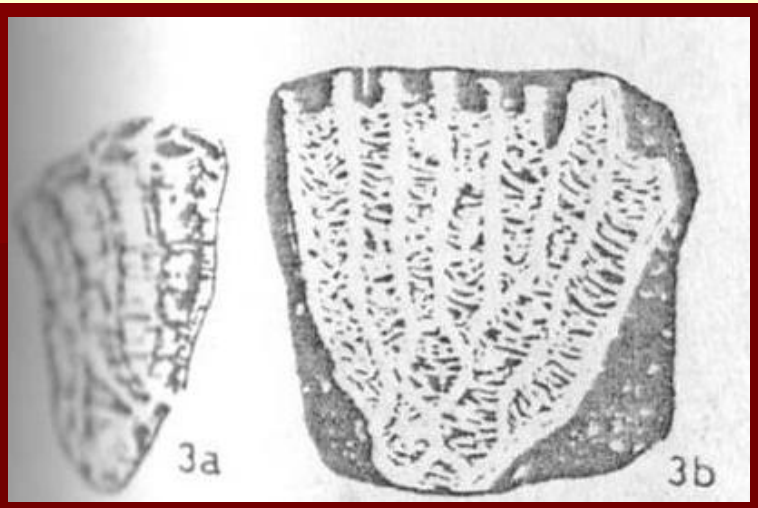
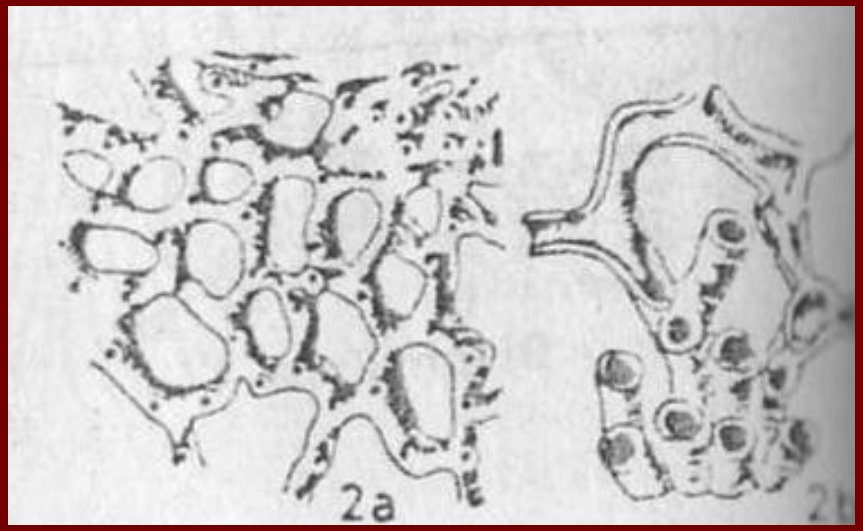
Cnidaria
(Tabulata)

Michelina sp. (Devonian to Permian)



Aulopora sp. (Devonian)



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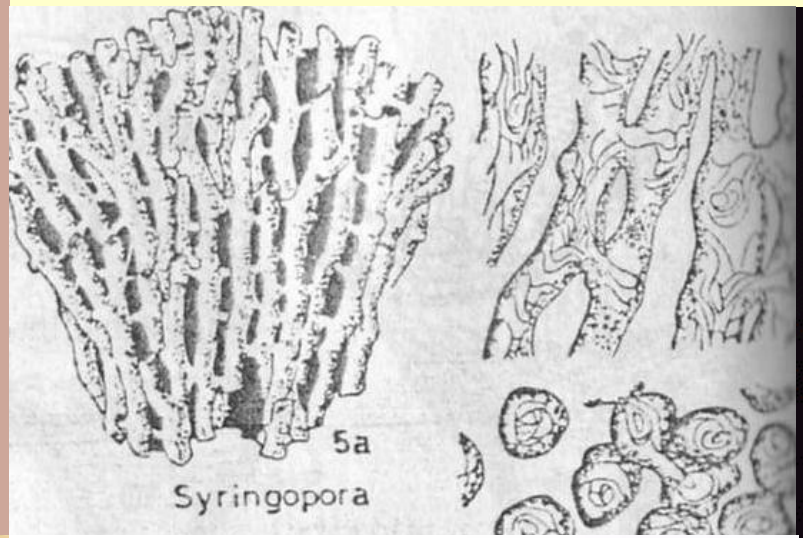
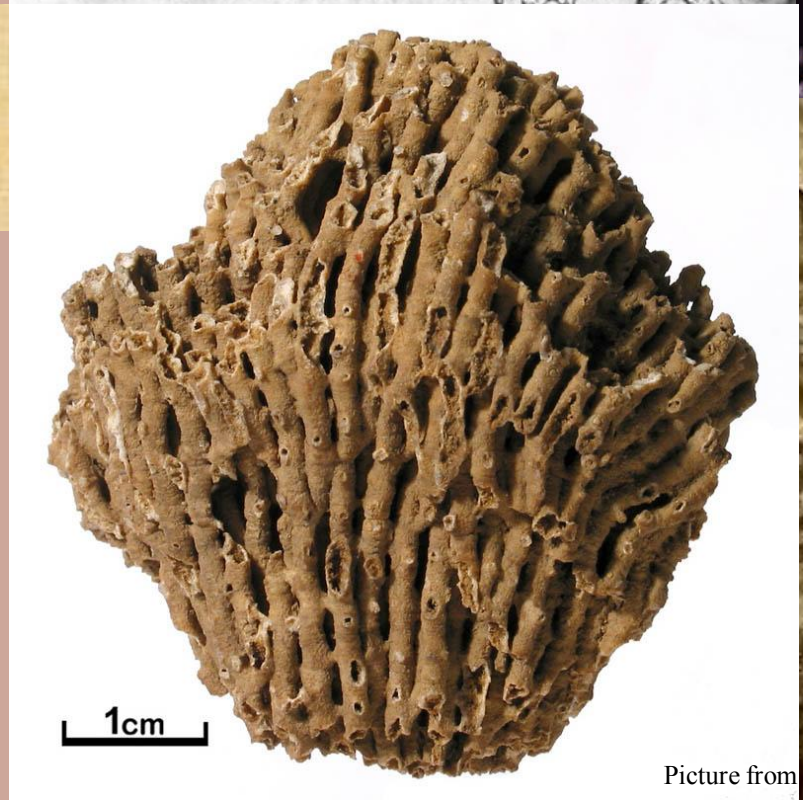
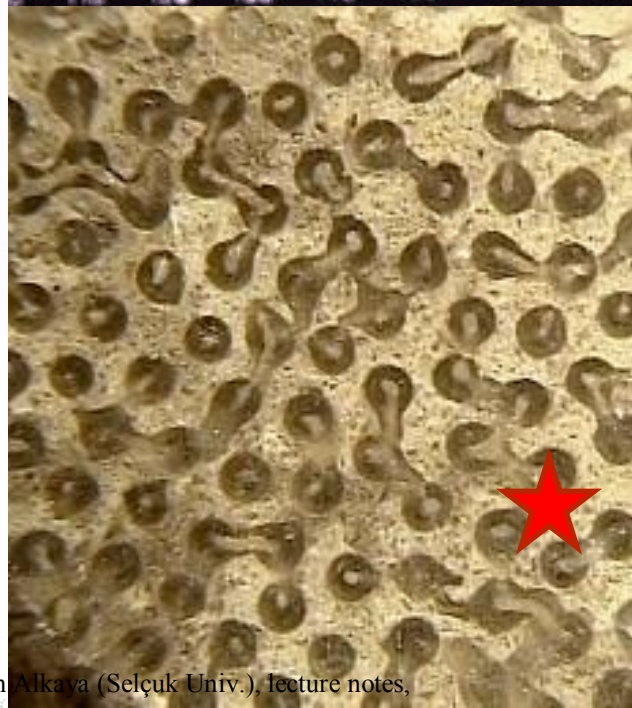
Syringopora sp. (Silurian to Permian)



Cnidaria
(Tabulata)





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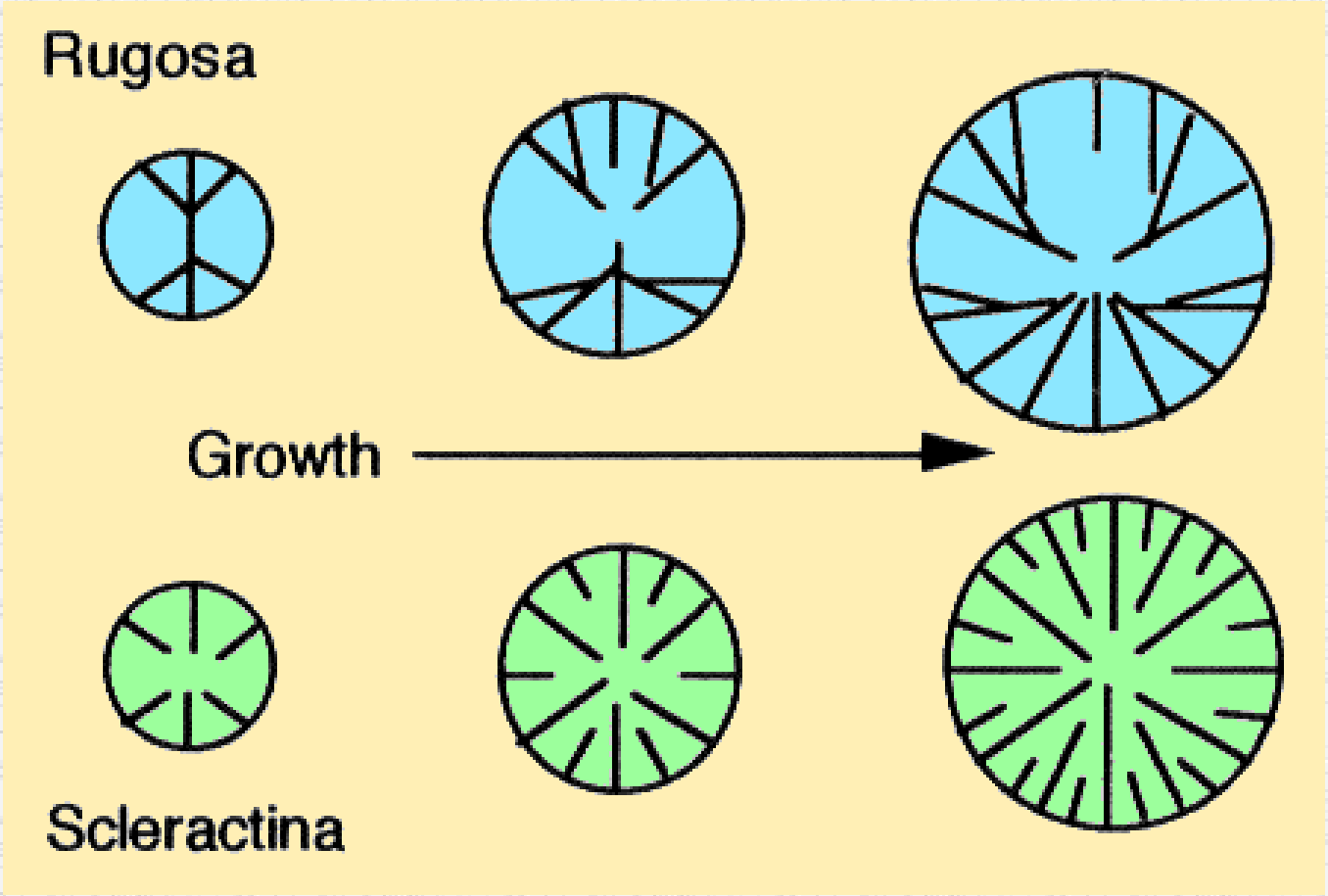
Syringopora sp. (Silurian to Permian)

Cnidaria
(Tabulata)

Picture from Alkaya (Selçuk Univ.), lecture notes.

Figure 3 - **Septal Growth Patterns**



Modified from McRoberts (1998)

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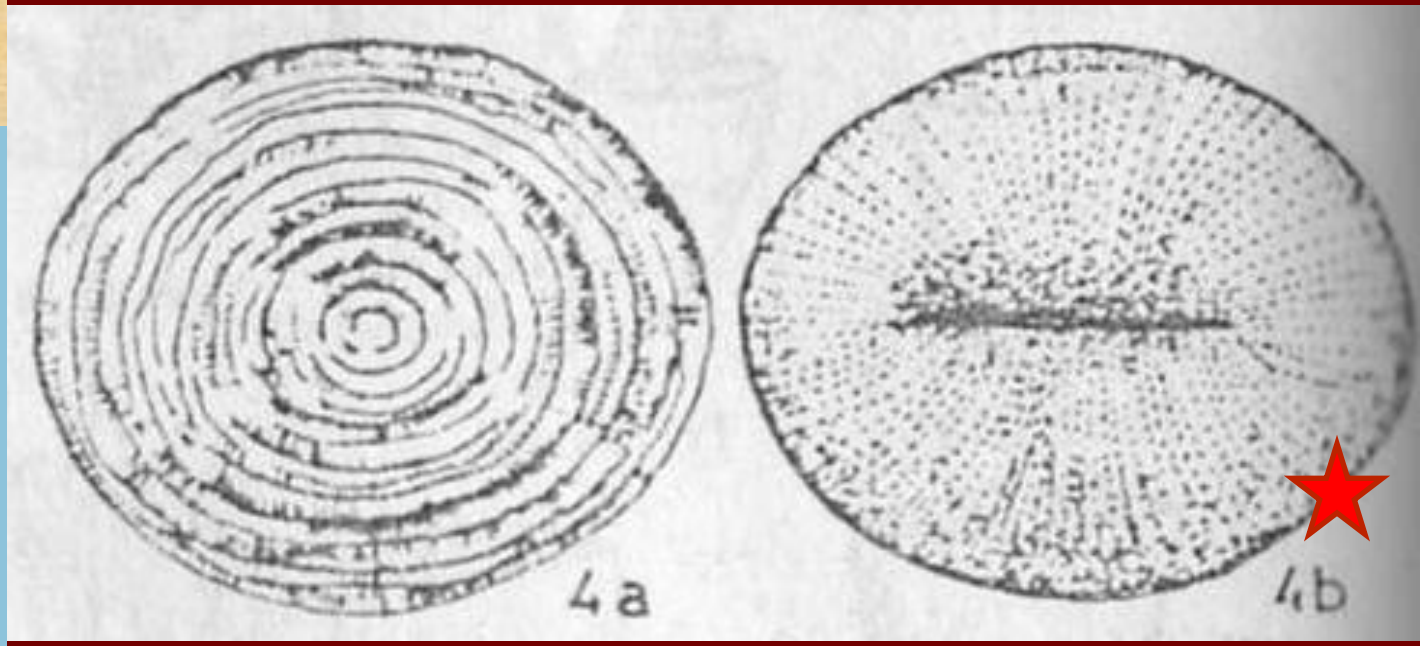
Cnidaria (Scleractina)

***Isastrea* sp.** (Middle Jurassic to Cretaceous)

***Cyclolites* sp.** (Cretaceous to Eocene)



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Cyclolites sp. (Cretaceous to Eocene)

Cnidaria
(Scleractina)

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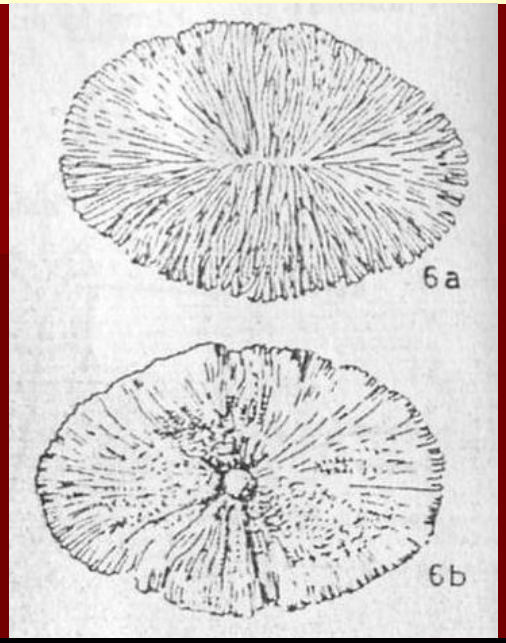
Cnidaria (Scleractina)

Fungia sp. (Miocene to Recent)



Picture from Alkaya (Selçuk Univ.), lecture notes,

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Cnidaria (Scleractina)

Fungia sp. (Miocene to Recent)

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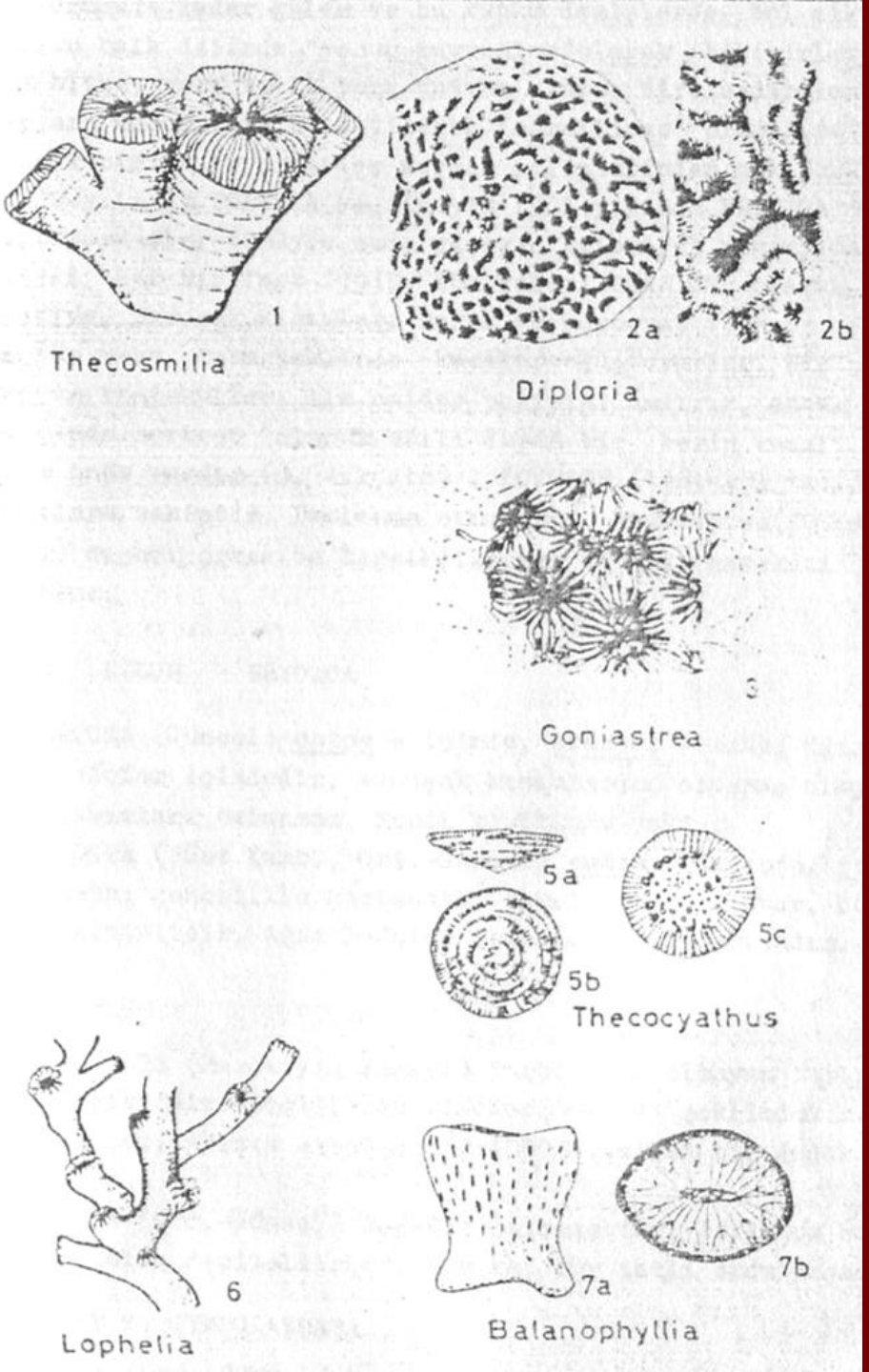
Cnidaria (Scleractina)



Homework 7

Please get a stratigraphical range chart of the genera of Spongia and Cnidaria phylums mentioned in the Lecture 7.