

GEOL 1602

FOSSILS AND THEIR LIVING RELATIVES: PROTISTS, SPONGES,
CORALS, BRYOZOANS, BRACHIOPODS, MOLLUSKS, ARTHROPODS,
ECHINODERMS, GRAPTOLITES, AND PLANTS



What is a fossil?

Remains or traces of life in the geologic past.

Regarded as a fossil if it is older than the beginning of recorded human history (Last Ice Age).

Whole or trace fossils

Terminology:

- **Petrification** = “transformation into stone”
- **Permineralization** = gradual addition of chemical precipitates into pore spaces
 - Leads to **Replacement**
- **Carbonization** = Soft tissue are preserved as films of carbon



Whole fossil examples



Petrification



Permineralization
and
replacement



Carbonization

Mold vs. Cast

Mold = material is removed by leaching, leaving a void.

- Internal and external molds

Cast = the void is filled by mineral matter.



Trace Fossils

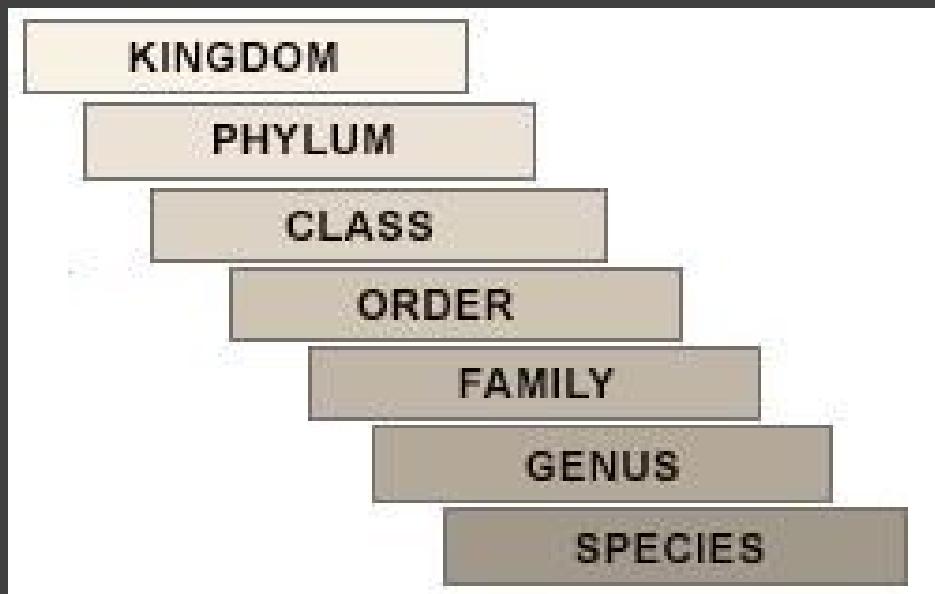
Imprints, tracks, trails or burrows of ancient organisms.



© Juan Carlos Cantero



Nomenclature



3 Domains:

- Archaea
- Bacteria
- Eukarya (**4 Kingdoms**)
 - Fungi
 - Plantae
 - Protista
 - Animalia

Stromatolites

Most abundant and familiar fossils of Domain Bacteria (cyanobacteria).

Thin laminated CaCO_3 buildups.

Date back to 3 billion years.

Still exist in the present.



Fossils and Living Protists

Most are “animal” in their characteristic.

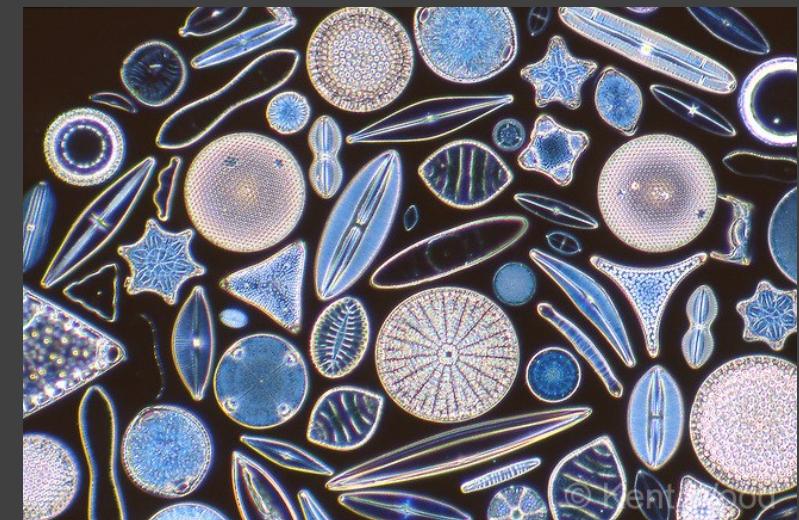
Hard parts are preserved as fossils (useful in biostratigraphy).

Types:

- Coccolithophores – unicellular, planktonic, golden brown algae (CaCO₃ shell)
- Foraminifera – all marine, have shells called *tests* (CaCO₃)
- Diatoms – unicellular, aquatic algae (SiO₂ shell)
- Radiolaria – planktonic, marine microorganisms (opaline silica shell)



Forams



Diatom

Sponges

Phylum Porifera

All but one species are marine.

Species composed of CaCO_3 or SiO_2

Anatomy:

- **Osculum** = central cavity with an opening at the top
- **Spicules** = support the body (preserve the fossil)



Corals & Jellyfish

Phylum Cnidaria

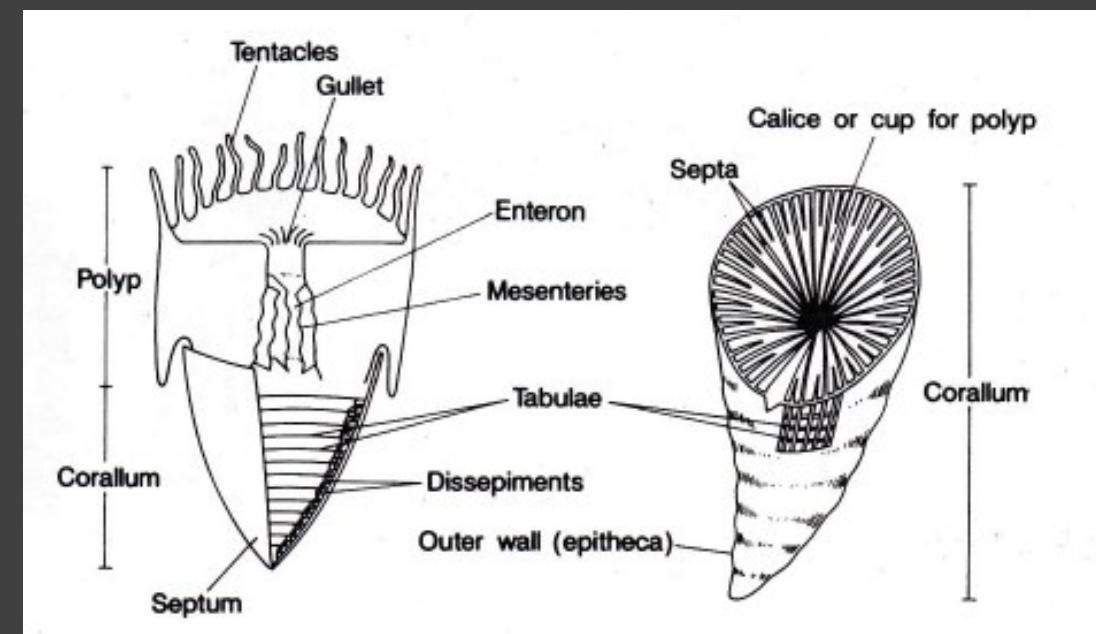
Corals, sea anemones, sea fans, and jellyfish

Have cells called ***cnidoblasts*** used for catching prey (i.e. jellyfish sting)

Jellyfish are rarely preserved as fossils (too soft)

Coral are most important paleontologically

Horn coral/Rugose coral were **solitary**.



Bryozoans

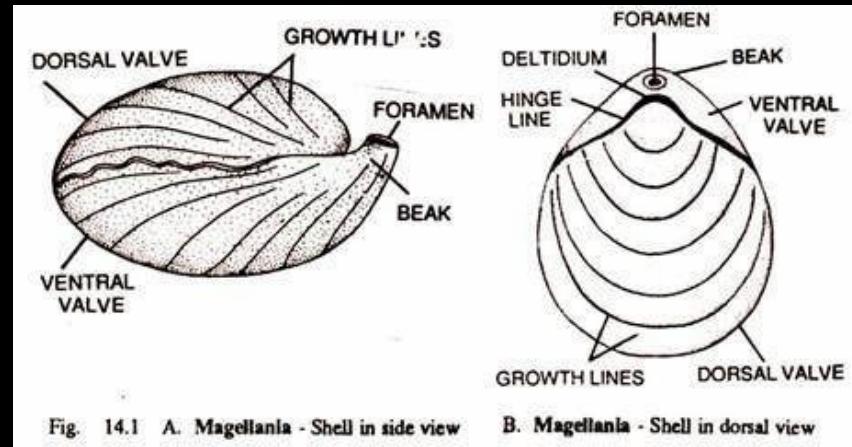
Phylum Ectoprocta

Colonial organisms that look similar to some Cnidarians.

Small, and abundant in Paleozoic carbonate strata.

Have a horseshoe-shaped structure called a lophophore.





Brachiopods

Phylum Brachiopoda

Can be confused for clams (Phylum Mollusca, Class Bivalvia)

Shell is composed of CaCO_3 and chitin

Valves are NOT identical:

- Pedicle = ventral valve
- Brachial = dorsal valve



Mollusks

Phylum Mollusca includes:

- Bivalves (clams, scallops, oysters)
- Gastropods (snails, sea slugs)
- Cephalopods (squid, octopus, cuttlefish)

All members possess:

- A calcareous shell (CaCO_3)
- **Mantle** = shell building function
- **Foot** = locomotive function



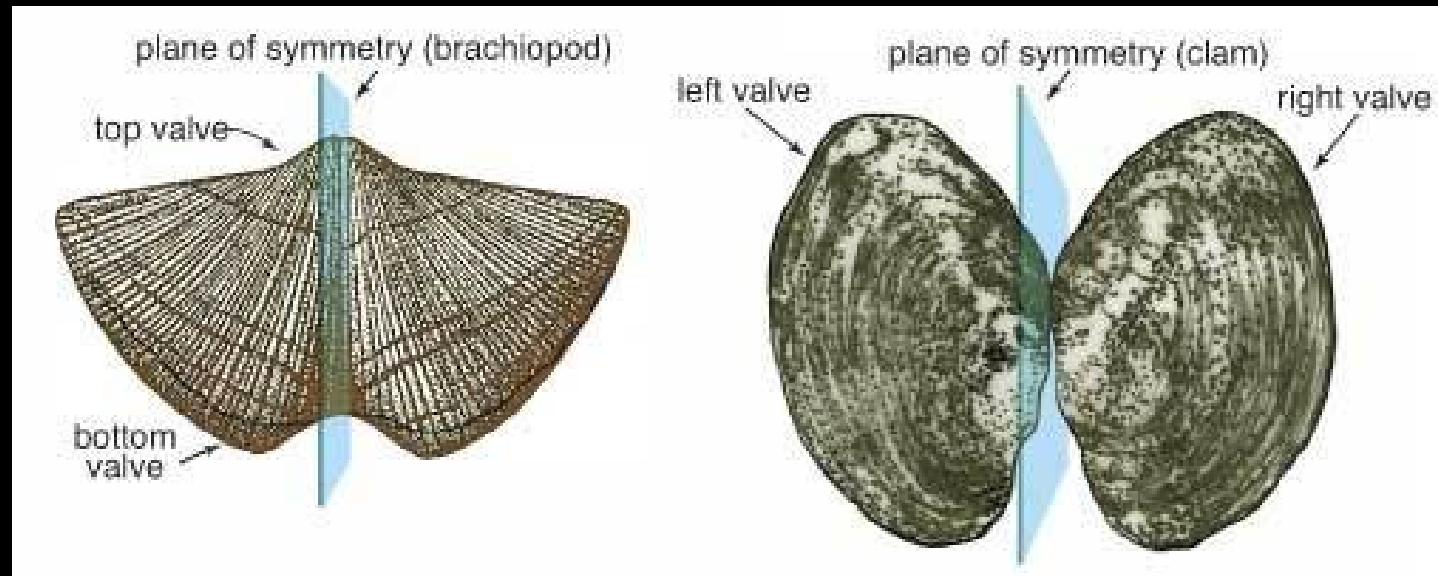
Mollusks: Bivalves

Class Bivalvia

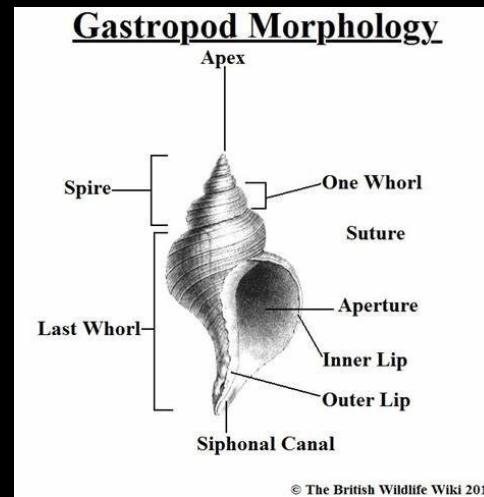
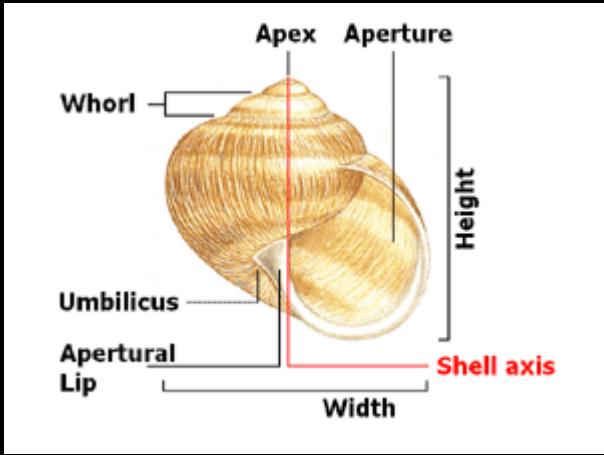
Unlike brachiopods, bivalves have **right and left valves**.

First appeared in Cambrian Period

Have a pallial line which marks the place of attachment to the shell.



Mollusks: Gastropods



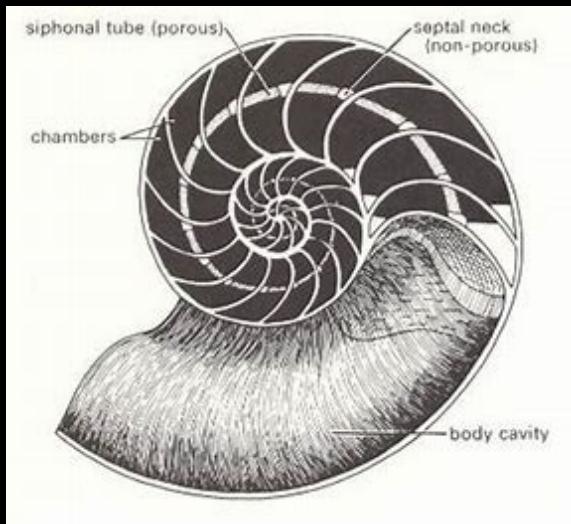
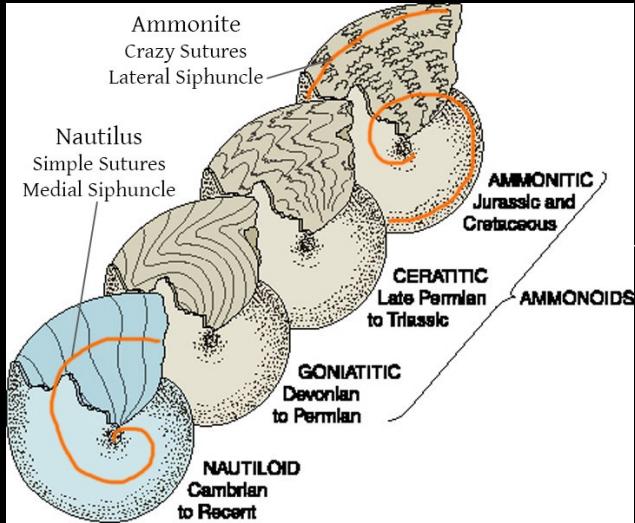
Phylum Gastropoda

Over 14,000 species of fossils

Head and foot of organism can be retracted into the shell.

Shell referred to as a *conch*.

The part of the conch representing one revolution is called the *whorl*.



Mollusks: Cephalopods

Phylum Cephalopoda

Most advanced and complex of the mollusks

Shell is divided into chambers by partitions called **septa** (as in Nautiloids).

A thin, porous calcareous tube called the **siphuncle** extends through the septa.

Cuttlefish, along with the extinct Belemnites, contain an internal shell.



Arthropods

Phylum Arthropoda; Class Trilobita

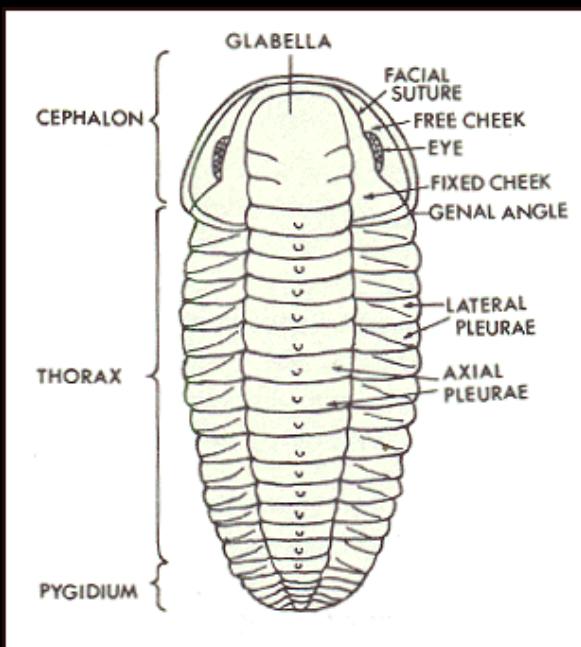
Over 80% of living animal species.

Includes lobsters, spiders, insects, trilobites

Exterior shell made of chitin, segmented into parts.

Trilobites are a famous example of an arthropod fossil.

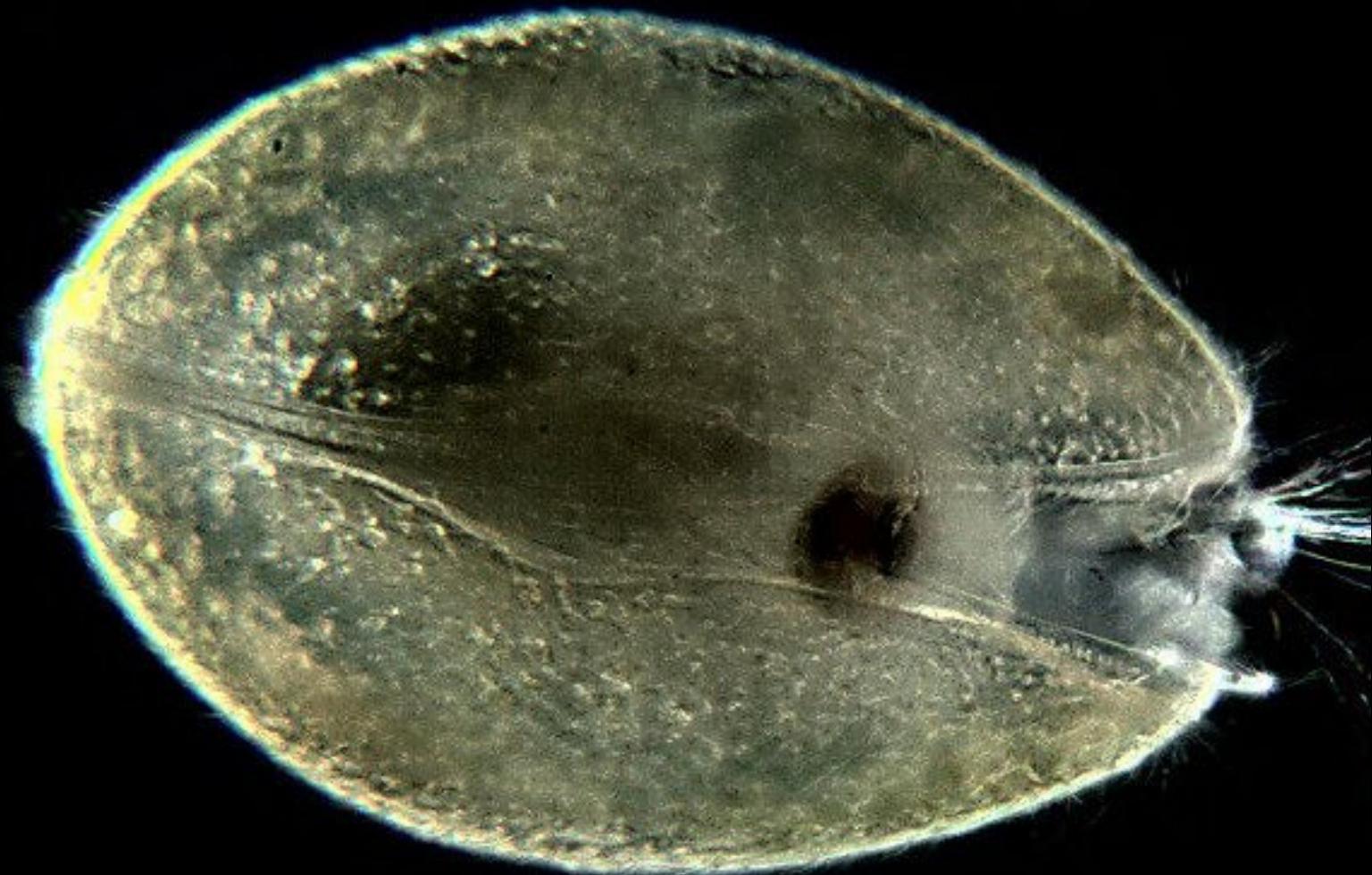
- Cephalon = head
- Pygidium = tail/posterior



Arthropods: Ostrocods

Small, lentil-shaped crustaceans with a bivalved shell (carapace).

Useful for correlating strata from well cuttings.



100 μ 10X

Echinoderms

Phylum Echinodermata

Move with fluid-filled tube feet.

Consists of:

- Starfish (class Asteroidea)
- Brittle stars (class Ophiuroidea)
- Sea urchins (class Echinoidea)
- Sea cucumber (class Holothuroidea)
- Sea lilies (class Crinoidea)
- Blastoids (class Blastoidea)



Graptolites

Phylum Hemichordata,
Class Pterobranchia

Extinct organisms once
thought to be plants.

Typically preserved as
carbon films in shales.

Resemble **pencil
markings**



Fossil Plants

Nonvascular and vascular plant types

Nonvascular includes mosses and plants not rooted to the ground.

Vascular consist of:

- Gymnosperms (ferns, conifers)
- Angiosperms (flowering plants)

