



An Introduction to Fossils

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What are fossils?

■ 'fossilus'

– Anything dug up from the ground



Fossils and folklore

■ Ammonites

- Snakestones (England)
- Horns of Ammon (Greece)
- Buffalo stones (N. America)
- Chakras of Vishnu (India)
- Crampstones (Scotland)



What fossils really are

- Petrified remains of dead organisms
- Traces of ancient behaviour
- How 'good' is the fossil record?

What gets fossilized?



What gets fossilized?



Mostly hard parts



Taphonomy



Of grave importance

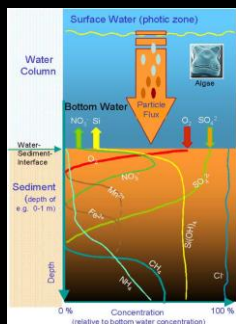
Biostratinomy

- from death to burial



Diagenesis

- after burial



Taphonomic processes

Transport



Decay



Dissolution

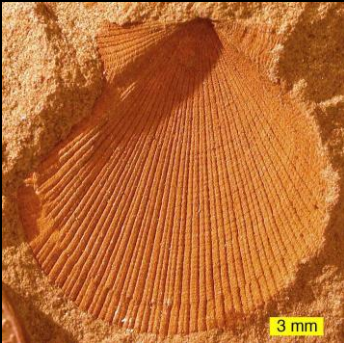


Fragmentation



Fossilization – Moulds & Casts

External
mould



Fossilization – Moulds & Casts

Dino print cast



Recrystallization

Same chemistry
Different structure



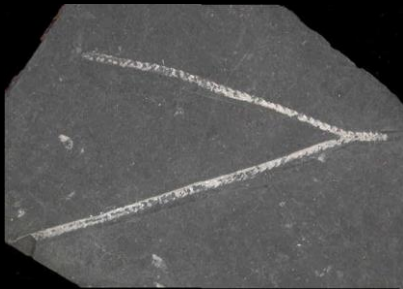
Replacement

New minerals



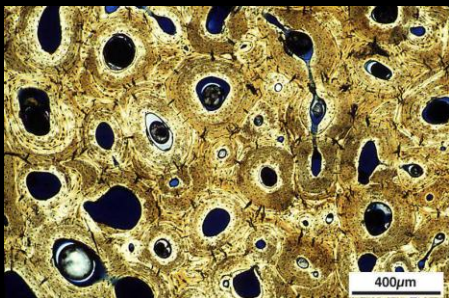
Carbonization

Loss of volatiles in low-oxygen environment



Permineralization

Impregnation of pores



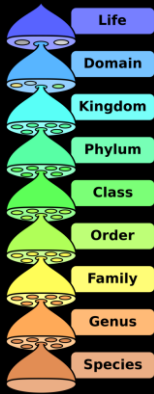
Lagerstätten

Sites of exceptional fossil preservation



Can include soft tissue fossilization

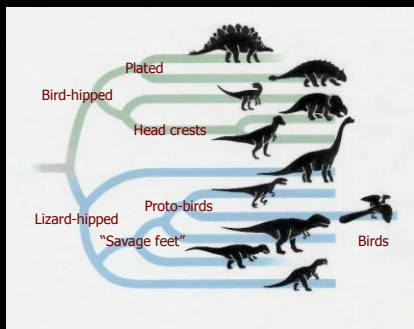
Taxonomy




- Carl von Linne (1707-1778)
- Classification by shared morphology
- Binomial system



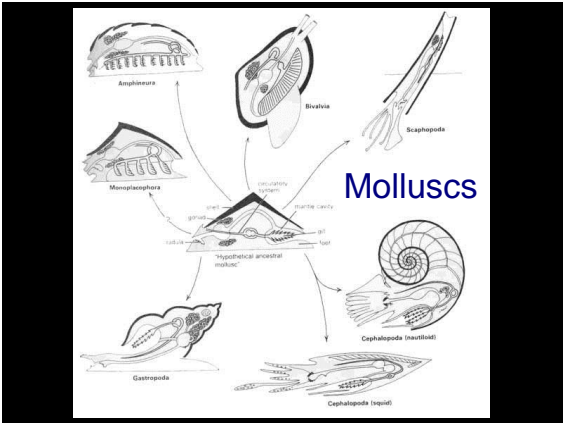
Phylogeny




Commonest fossil types



Shelled
invertebrates
Mainly marine

[illegible]

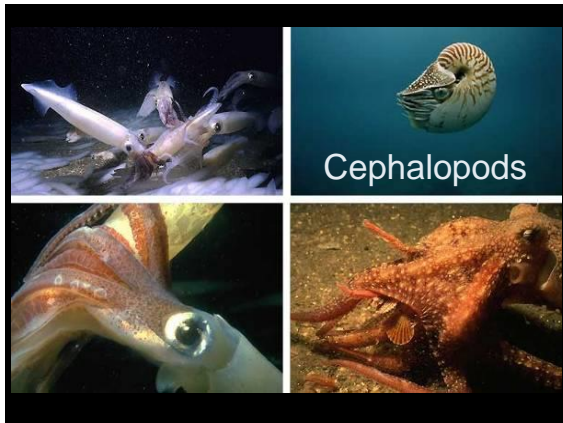
Bivalves



The top image shows a closed scallop shell with a smooth, light brown surface and concentric growth lines. The bottom image shows an open scallop with its mantle edge visible, featuring numerous dark eyes and two long, white siphons extending from the shell.









Fossil molluscs



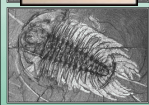
2.0 cm



1 cm



Fossil arthropods

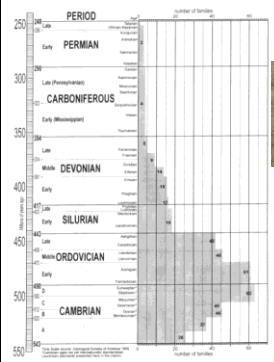


Olenoides:
a trilobite



Ayschaia:
a velvet worm

The Rise and Fall of Trilobites

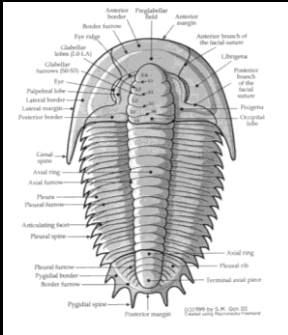


Class Trilobita



www.trilobites.info

Key features



- Axial /pleural lobes
- Cephalon, thorax, pygidium
- Cephalon most useful
- Eyes, glabella, fixed/free cheeks

www.trilobites.info

Phylum Cnidaria

**Anthozoa, Cubozoa,
Hydrozoa, Scyphozoa**

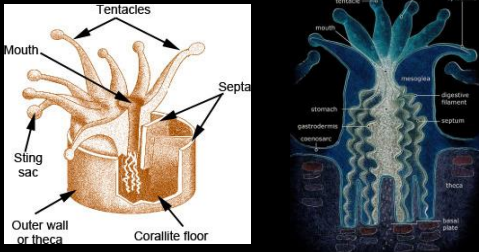


Stony corals

**Class Anthozoa:
Subclass Zoantharia**



Coral anatomy



Fossil corals – Order Tabulata



Colonial; without septa



Fossil corals – Order Rugosa



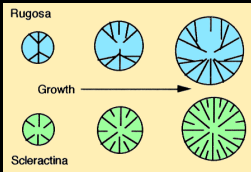
**Solitary / colonial;
septa in four regions**

Rugose = wrinkled



'Modern' corals - Scleractinia

Solitary or colonial
Septa well-developed
- sets of six



Trace fossils?



Sedimentary structures produced by life
- Burrows, borings, tracks, trails, roots...

Uniformitarianism

The present is the key
to the past



Fossils: why bother?

- 1. Earth history
- 2. Correlation of strata
- 3. Palaeo-ecology
- 4. Palaeo-geography
- 5. Just because!



Biostratigraphy

CENOZOIC ERA (Age of Recent Life)	Quaternary Period	<i>Pecten gibbus</i>	<i>Neptunea tabulata</i>
	Tertiary Period	<i>Calyptraphorus velatus</i>	<i>Venericardia planicosta</i>
MESOZOIC ERA (Age of Medieval Life)	Cretaceous Period	<i>Scaphites hippocrepis</i>	<i>Inoceramus labiatus</i>
	Jurassic Period	<i>Periphrinctes litigal</i>	<i>Nerinea trindada</i>
	Triassic Period	<i>Trochites subbulatus</i>	<i>Monotis subcircularis</i>
	Permian Period	<i>Leptodus americanus</i>	<i>Parafusulina bosei</i>
PALAEOZOIC ERA (Age of Ancient Life)	Pennsylvanian Period	<i>Dietrocostus americanus</i>	<i>Lophophyllidium profliferum</i>
	Mississippian Period	<i>Cactocrinus multibrachiatus</i>	<i>Prolecanites gurlayi</i>
	Devonian Period	<i>Microspirifer mucronatus</i>	<i>Palmatolepis unicornis</i>
	Silurian Period	<i>Cystiphyllum niagarense</i>	<i>Hexamerus hertzeri</i>
	Ordovician Period	<i>Bathyrus setana</i>	<i>Tetragraptus fruticosus</i>
	Cambrian Period	<i>Paradoxides pilus</i>	<i>Billingella corrugata</i>
PRECAMBRIAN			

Palaeoecology

- Compare fossil assemblages...



Sea lily



Trilobite



Starfish



Coral

Palaeoecology

■ ...with modern ecosystems



Tropical reef

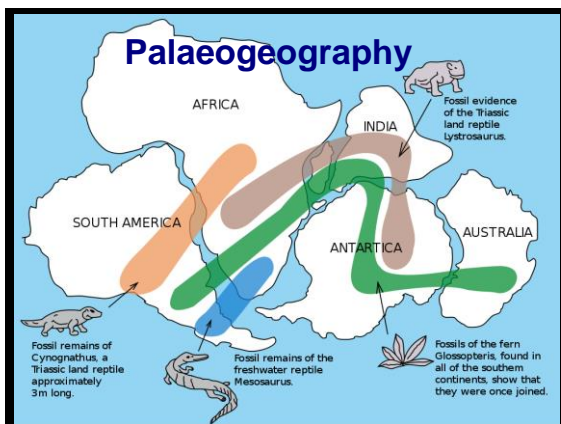
Palaeoecology

■ The present is the key to the past

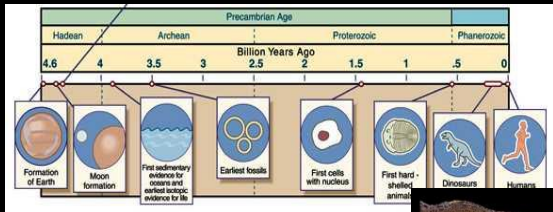


Silurian reef ecosystem?

Palaeogeography



Early fossil record



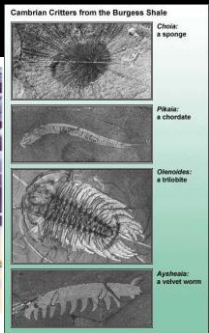
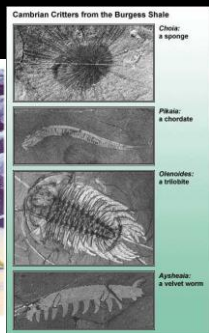
MISS in 3.48 Ga rocks of W. Australia
Stromatolites & cyanobacteria

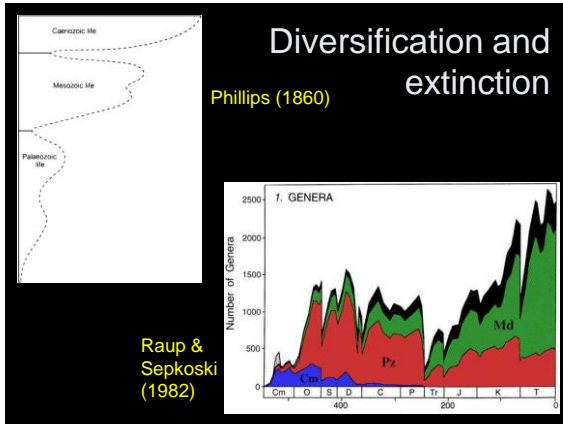


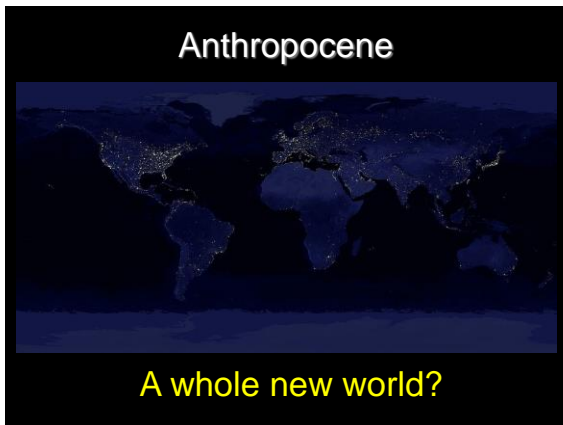
Beginnings of animal life

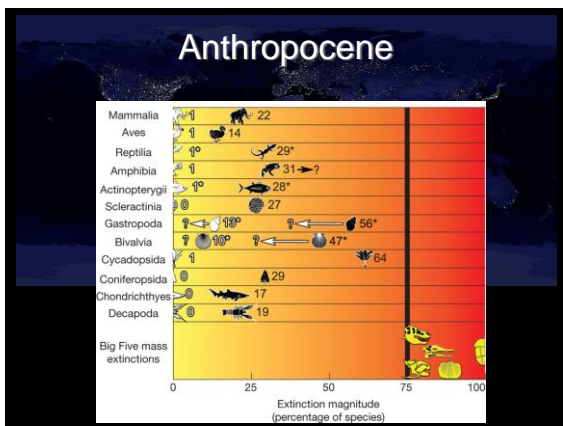


Cambrian Explosion









Future CLL classes

Heroes of Rock

Mondays, 7-9pm, from Jan 19th (8 weeks)

York: A Rocky History

Thursday 19th Feb, 7-8pm (free)

A Geological History of Britain

Saturday 14th March

(Geology of Yorkshire...)

www.fossilhub.org