

Lecture 1 – Aussie Extremes

- Life firsts
 - o 4.45BYO solid Zircon – First Solid Anything
 - o 3.5BYO prokaryotes from North pole – Earliest Life
 - o 1.5BYO Eukaryote Tappania – Oldest Eukaryote and the first to have sex
 - o 650MYO sponge fossil – world’s first animal fossil
 - o 500MYO First chordates
 - o 495MYO world’s very first bone from a fish like creature
 - o 385mya antiarch placoderms had sexual intercourse (square dancing)
 - o 380mya first vertebrate give birth to live young
 - o 130myo 1.75m wide track left by brachiosaurus-like sauropod – biggest dinosaur in the world
- Riversleigh QLD World Heritage Property
 - o Spans the last 27myo to 37000 ybp (years before present?)
 - o Many first and lasts have come from 250 freshwater lake and cave deposits
 - The galloping, flesh eating kangaroo
 - Dromornithid birds – 3m tall and 44kg, possibly carnivorous
 - One of the biggest snakes in the world
 - Sabre toothed bandicoot
 - A toothed Miocene platypus *Obdurodon tharalkooschild*
 - Flesh eating platypus
 - o Megalania – gigantic Australian goanna from 100 thousand years ago – largest poisonous animal in the world

Lecture 2 – Processes of Fossilisation

Fossilisation: A quick burial in a protective medium

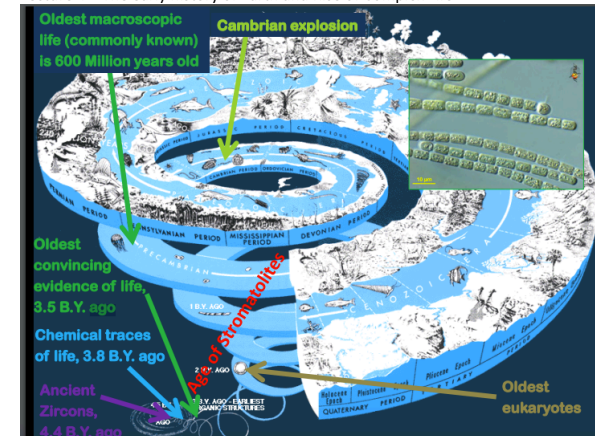
- Soft Parts
 - o Rarely preserved
 - o Rapid burial in antiseptic conditions
 - o Ice, amber
- Hard Parts
 - o Common (shells, bones, exoskeletons)
 - o Calcium carbonate, calcium phosphate, and silica
- Altered Remains of Hard Parts
 - o Permineralization – addition of inorganic material in the pores of shells and skeletons through ground water
 - o Replacement – inorganic material replaces volume by volume (so not just the pores) the original material (through ground water)
 - Calcite replaced by silica, pyrite, hematite
 - o Recrystallization – original material changes into a more stable form (aragonite into calcite)
 - o Casts and molds
- Kingdom – ANIMALIA > Phylum CHORDATA > Class MAMMALIA > Order PRIMATES > Family > HOMINIDAE > Genus > *Homo* (Neanderthal, modern, Heidelberg) > Species > *Homo Sapiens* (Cro-Magnon, modern man) > Sub-species *Homo sapiens sapiens* (modern man)
- Extinction happens on timescale boundaries?

Lecture 3 – Plate Tectonics

- Evidence for plate tectonics
 - o Continental outline matches
 - o Disjunct distributions of the same fossil deposits
 - Against – some think accidental dispersion, former land bridges
 - o Conventional Plate tectonic model with mid-oceanic ridges, subduction zones, and mountain chains, where plates carrying continents override one another
 - Spreading sea floor
 - 7 major plates

- Divergent boundary (coming apart)
- Convergent boundary (coming together, one goes over or under the other)
- Transform fault boundary (sliding against each other)
- Earthquakes follow these plate boundaries
- Indo-Australian plate has recently fractured, separating from India
- Supercontinent of Pangea was during the Triassic (early Permian – 260mya)
 - Triassic organisms were similar around the world
 - Jurassic brought on the further break up of Pangea and the beginnings of regional endemism
 - Cretaceous boom – Regional endemism common
- o Supposedly Australia will crash into the eastern flank of Asia (50million years from now)
 - 65mya Australia and Antarctica connected
 - 50mya they begin to separate (South Coast, where Aus tore free)
 - This brought on the **Antarctic Circumpolar Current** as S. America was also breaking free
 - Also brought the rise of New Guinea, about 15mya
 - o The highest rocks in New Guinea are 15mya marine limestones
 - Caused the Great Dividing Range (rain shadow)
- o Biological Consequences of Continental Drift
 - Convergence evolution
 - Two or more creatures evolve from different groups, end up looking like each other
 - o I.e., elephants and the S. American Pyrotheres
 - “Noah’s Ark” – one continent carrying a unique fauna ‘docks’ against another
 - “Beached Viking funeral boat” one continent carries fossil types to a land that never had them
 - Great movies like San Andreas, Ice Age, and 2012

Lecture 4 – The early history of Earth and Rise of Complex Life



- Stromatolites
 - o Layered bio-chemical accretionary structures formed in shallow water by trapping, binding and cementation of sedimentary grains of biofilms of microorganisms, especially cyanobacteria.
 - o Provide ancient records of life on earth, some older than 3.5 byo.
 - o Modern stromatolites found in hypersaline lakes and marine lagoons, such as Shark Bay WA.
 - o Photosynthetic – absorb CO2 and expel oxygen into atmosphere