

NEBULAR CLOUD (4.6 Ga)



<https://www.geol.umd.edu/~jmerck/geol100/lectures/02.html>

THE EARTH FORMS (5.587 Ga)



MOON FORMS (4.527 Ga)



<https://www.geol.umd.edu/~jmerck/geol100/lectures/02.html>

COOLING EARTH (4.5-4.0 Ga)



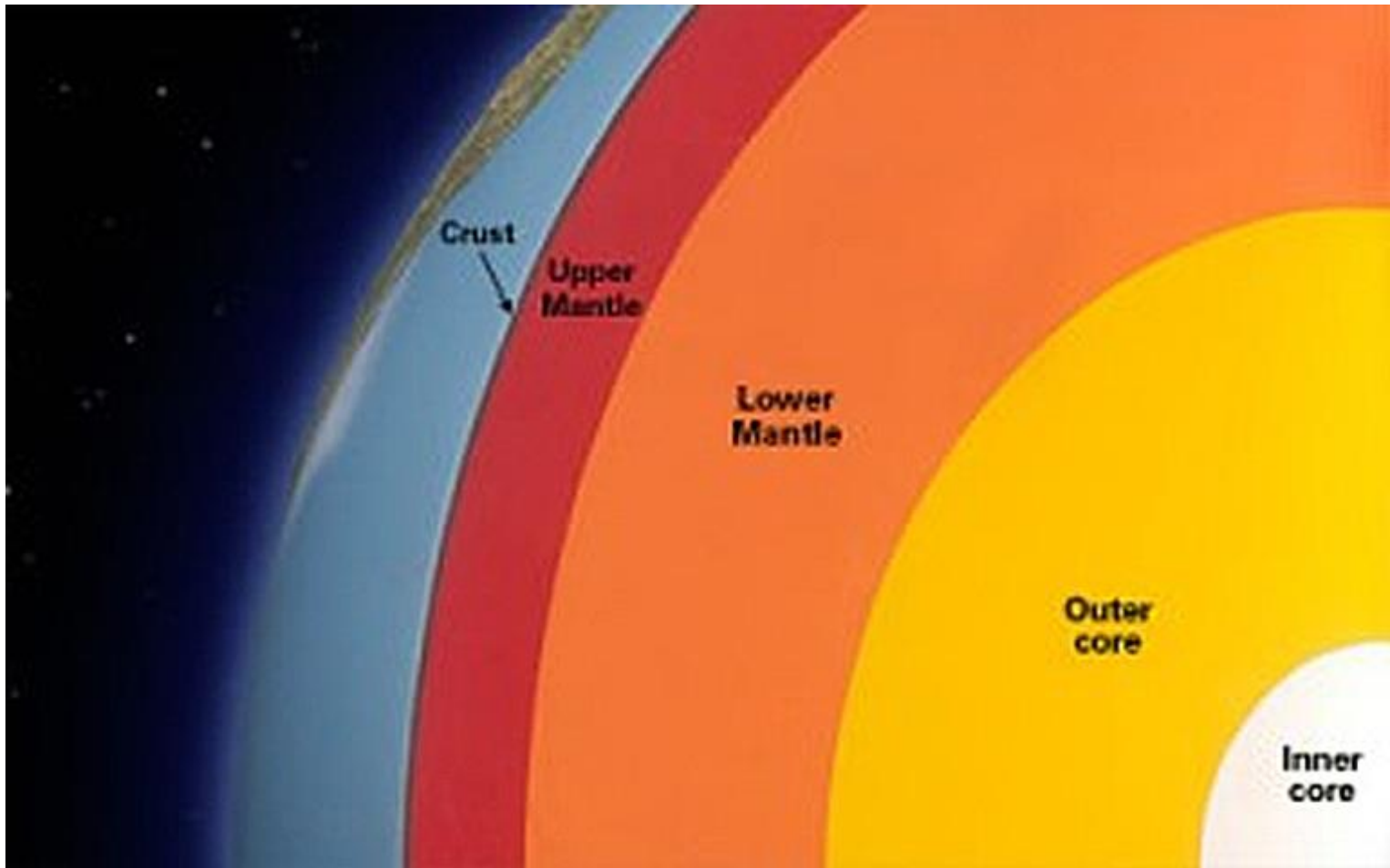
http://www.novacelestia.com/images/hadean_earth_space_art.html

LATE HEAVEY METEORITE BOMBARDMENT (4.1-3.8 Ga)



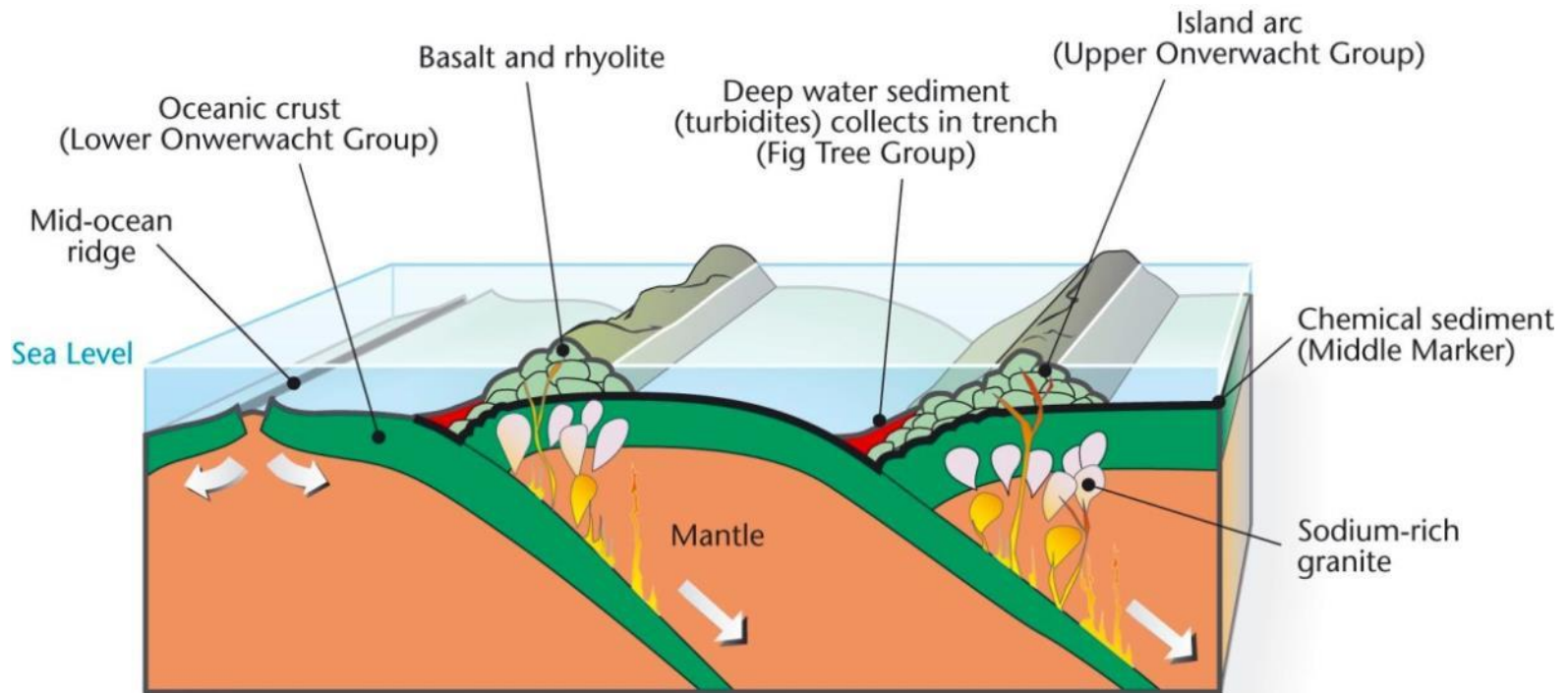
<http://indeep.jp/plant-earth-human-4-5-million/>

LAYERED EARTH

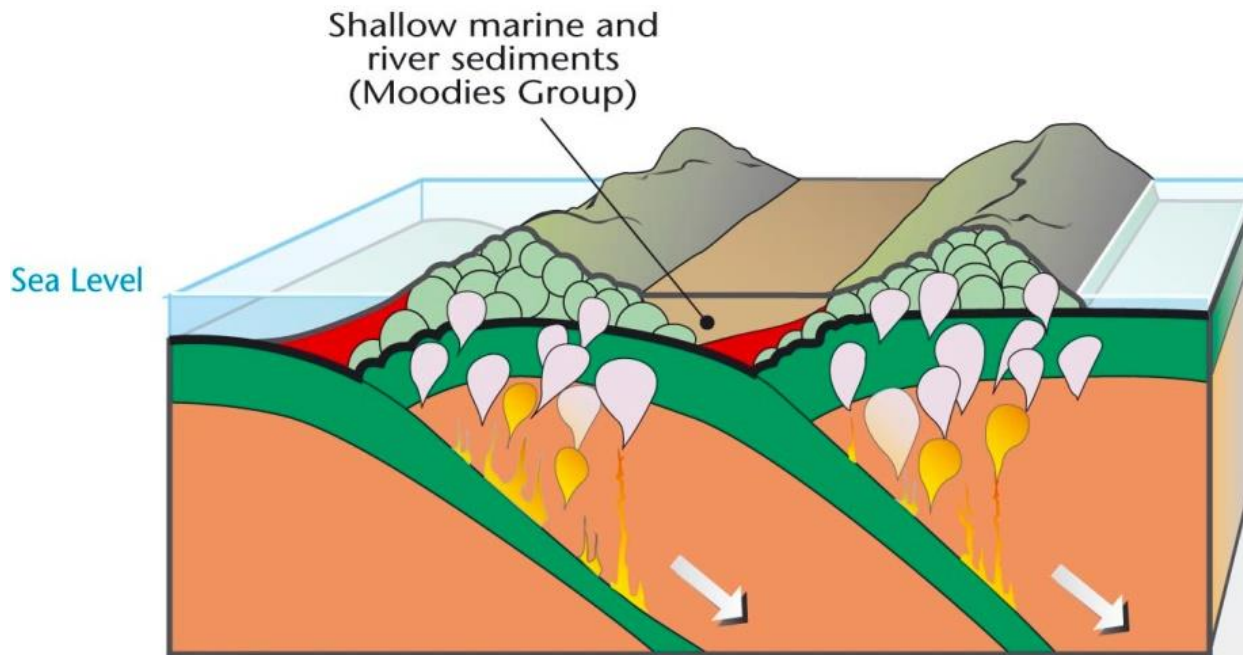


<http://easyscienceforkids.com/all-about-earths-layers/>

FIRST OCEANIC CRUST AND ISLAND ARCS 3.5 - 3.4 Ga



LATER SEDIMENTS, GRANITES, CONTINENTAL CRUST 3.4 – 3.2 Ga



BARBERTON GOLD

- Mpumalanga
- Formed from hot gold bearing fluids at the same time as early island arcs



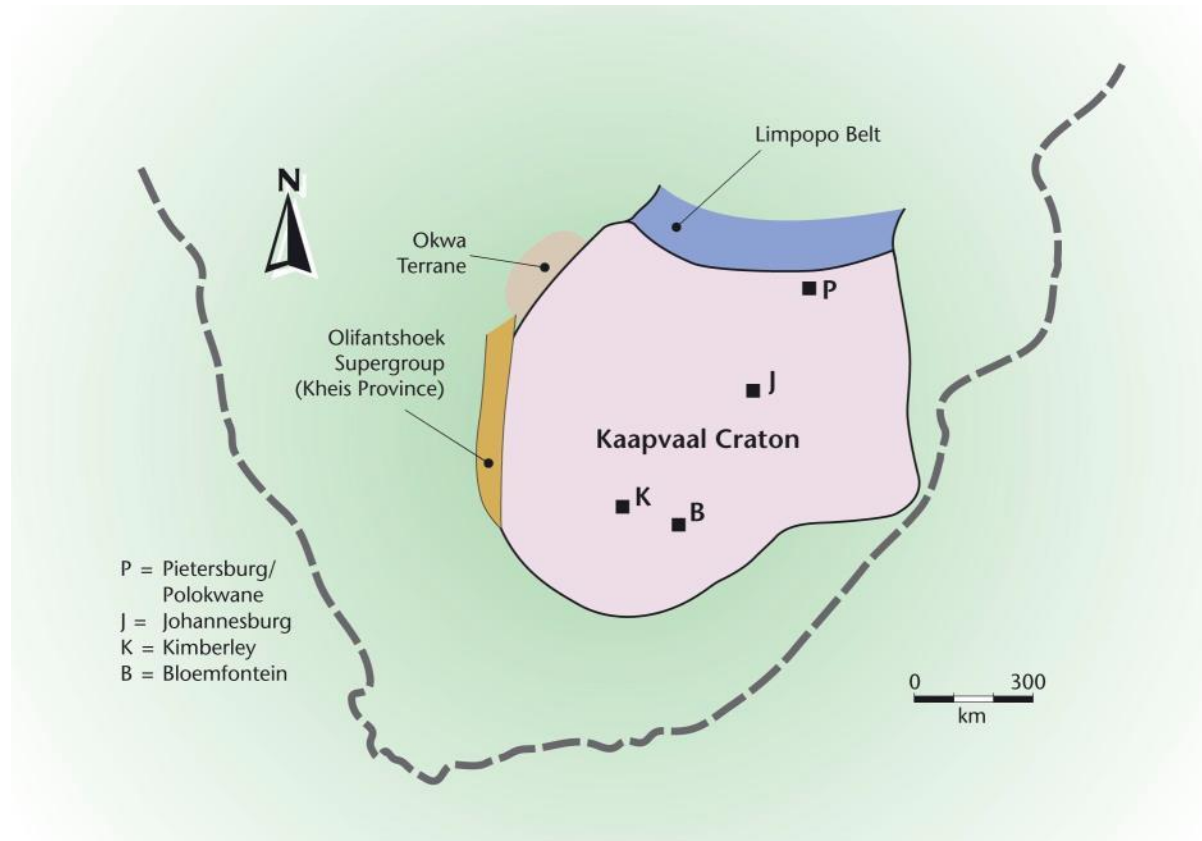
- Oldest crust preserved
- Oldest gold deposits
- Some of the earliest gold discovered in South Africa

THE FIRST LIFE FORMS (4 Ga?)

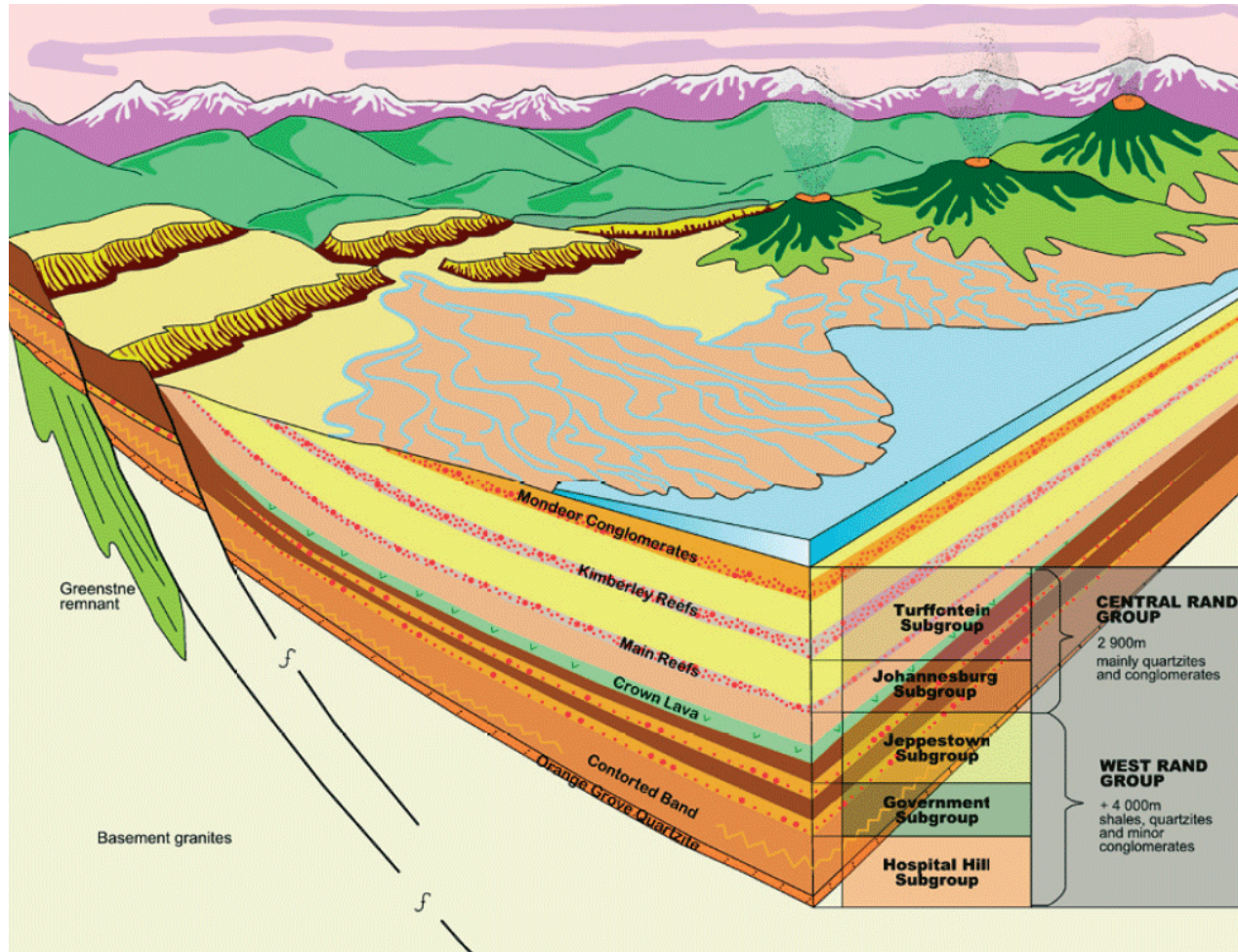


<http://indeep.jp/plant-earth-human-4-5-million/>

EARLY CONTINENTS FORM (3.1 Ga)

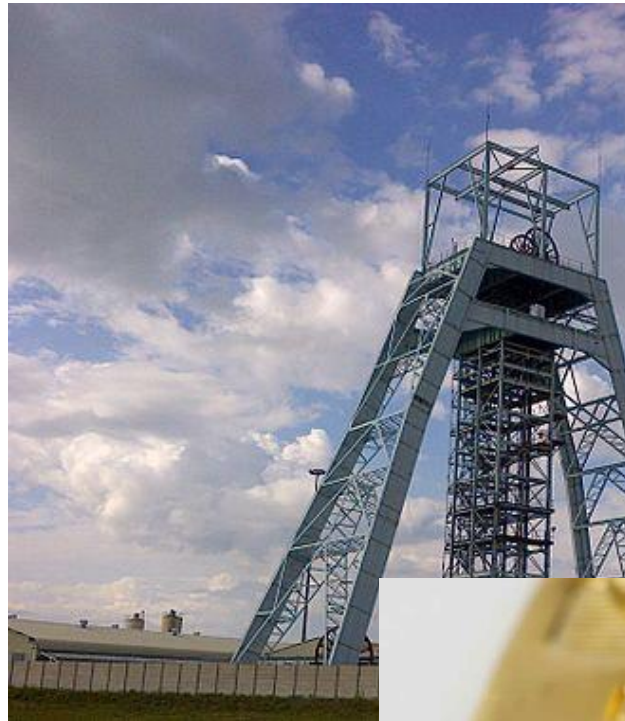


EARLY CONTINENTAL LANDSCAPE WITH ALLUVIAL FANS (2.97 Ga)

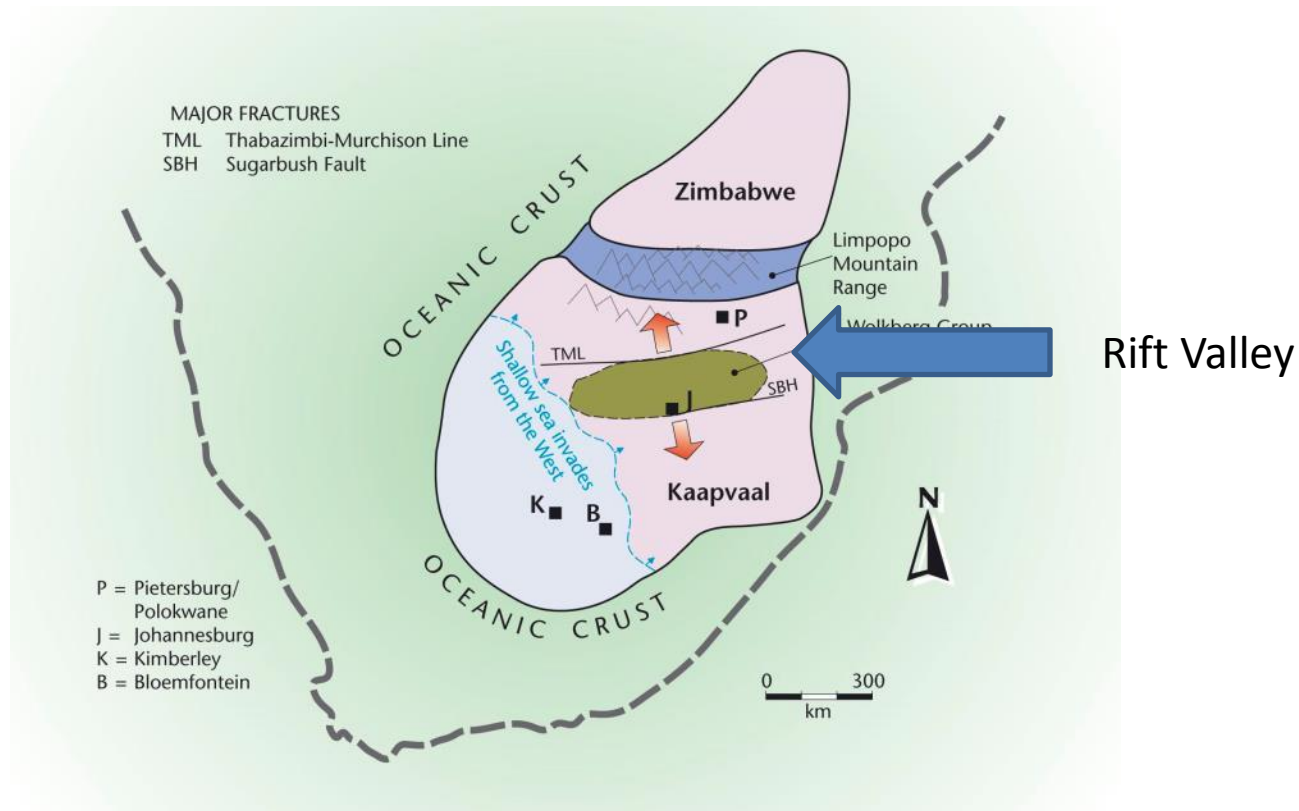


WITWATERSRAND GOLD

- Gauteng, Northwest and Free State
- Gold was eroded from early greenstones and deposited in alluvial fans
- Still the largest gold reserves in the world
- Deepest gold in the world
- At the moment we are the fourth largest gold producer in the world



THE KAAPVAAL CRATON IS AFFECTED BY A RIFT VALLEY WHICH FILLS WITH A SHALLOW SEA (2.65 Ga)



THE SHALLOW SEA IS THE PERFECT HOME FOR OXYGEN PRODUCING DOMES OF CYANOBACTERIA (STROMATOLITES) FORMING THE TRANSVAAL SUPERGROUP (2.65 Ga)



Stromatolites in dolomite



Living Stromatolites

ATMOSPHERE BECOMES OXYGEN ENRICHED (2 Ga)



BANDED IRON STONES FORMED WHEN INSOLUBLE IRON IN OCEANS OXIDISED BECOM INSOLUBLE (2.65 Ga)



By James St. John - Hollywood Granite (jaspilite meta-BIF, Paleoproterozoic, Iron Quadrangle District, Minas Gerais State, Brazil), CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=34480370>

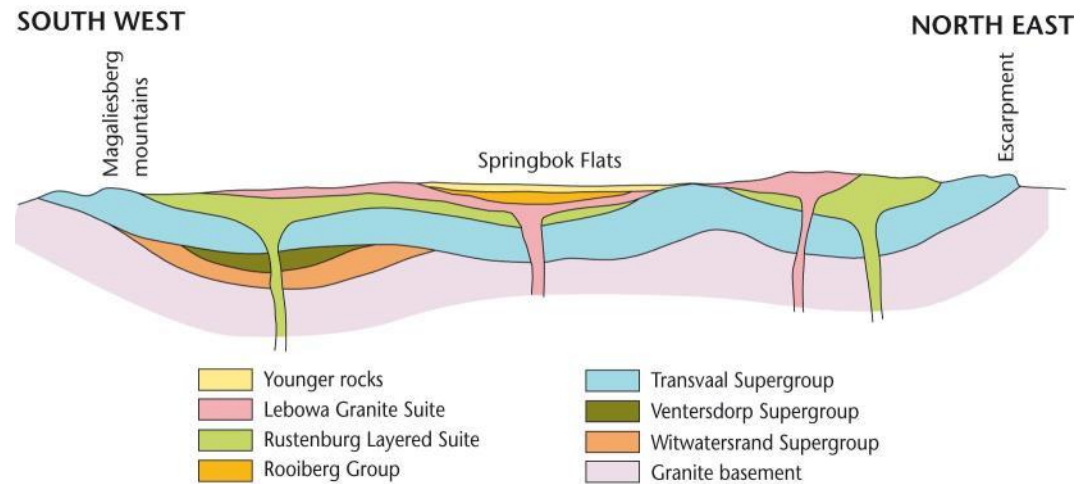
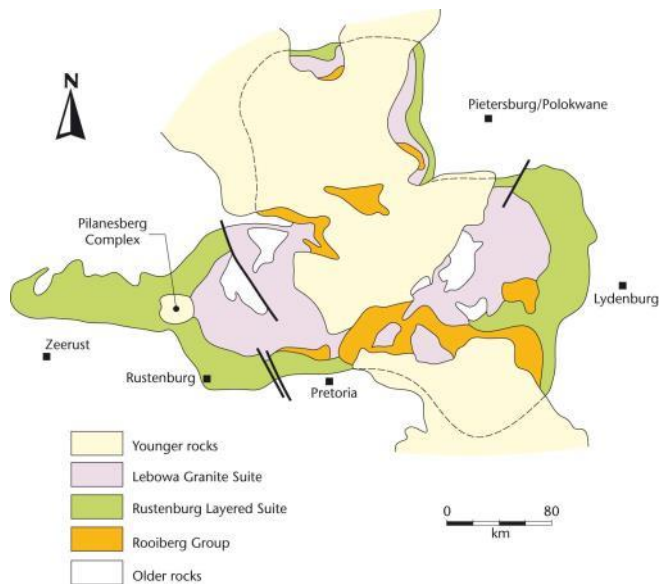
SISHEN IRON ORE MINE

- N. Cape
- The iron deposits settled out in an early oxygen rich ocean
- Sishen iron ore mine is one of the largest open pit mines in the world



<http://www.miningreview.com/wp-content/uploads/2016/04/Kumba.jpg>

VOLCANIC ERUPTIONS AND LOPOLITHS INTRUDE THE TRANSVAAL SUPERGROUP FORMING LAYERS OF MINERALS MANY OF THEM PRECIOUS (2.061 Ga)



PLATINUM, VANADIUM, CHROMITE

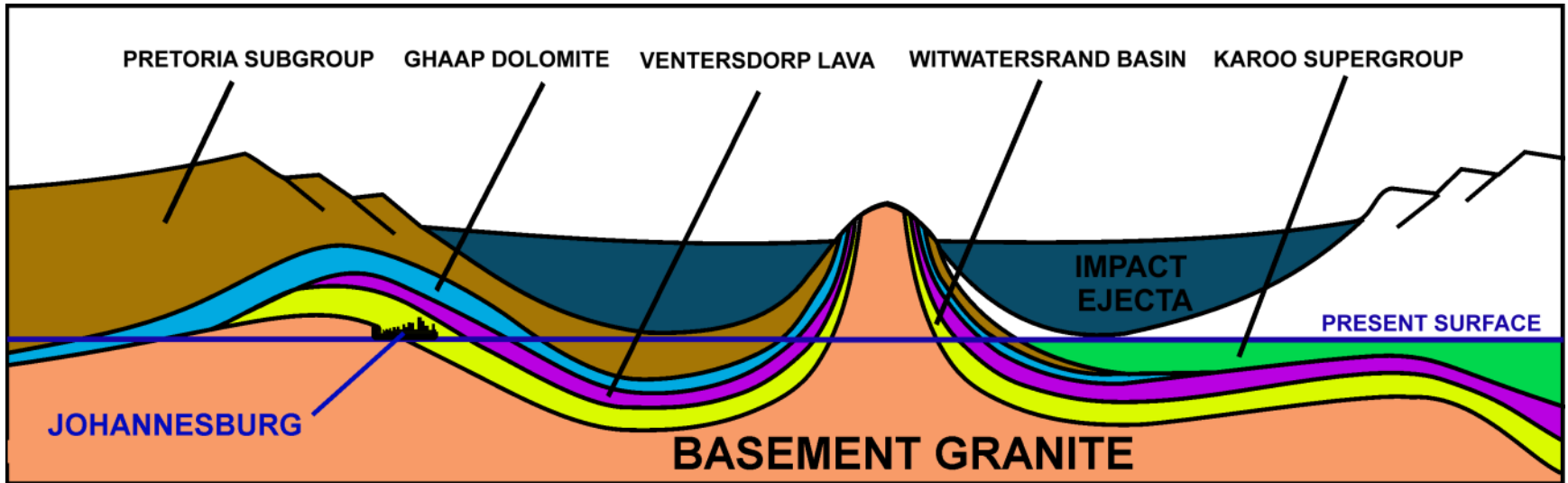
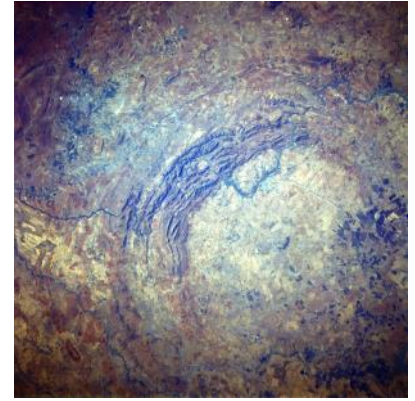
- Rustenburg, Limpopo, Mpumalanga
- Found in the biggest layered complex in the biggest
- South Africa produces 78 % of the platinum in the world
- Platinum is normally found along with Palladium and Rhodium which are used in the car industry (e.g. exhaust catalysts)



VREDEFORT METEORITE IMPACT CRATER (Largest and oldest in the world) (2 Ga)



Diameter 300 Km

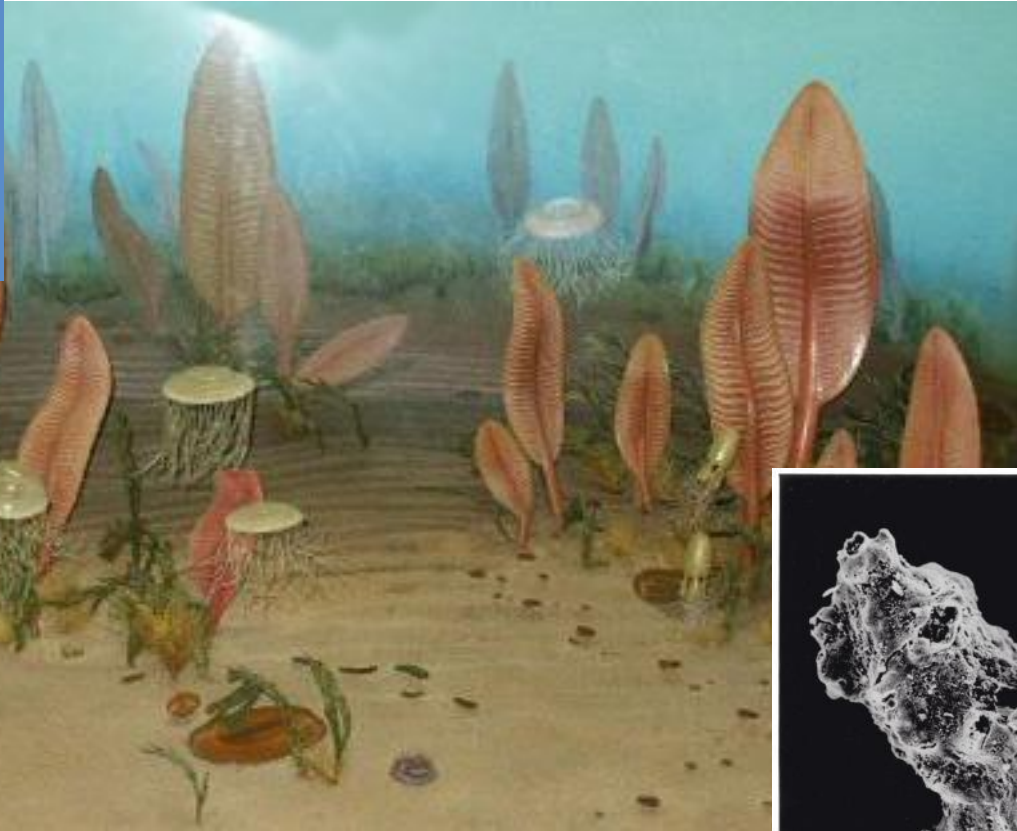


https://commons.wikimedia.org/wiki/File:Vredefort_crater_cross_section_2.png

WORLD HERITAGE SITE



EDIACARAN FAUNA (640 – 539 Ma)

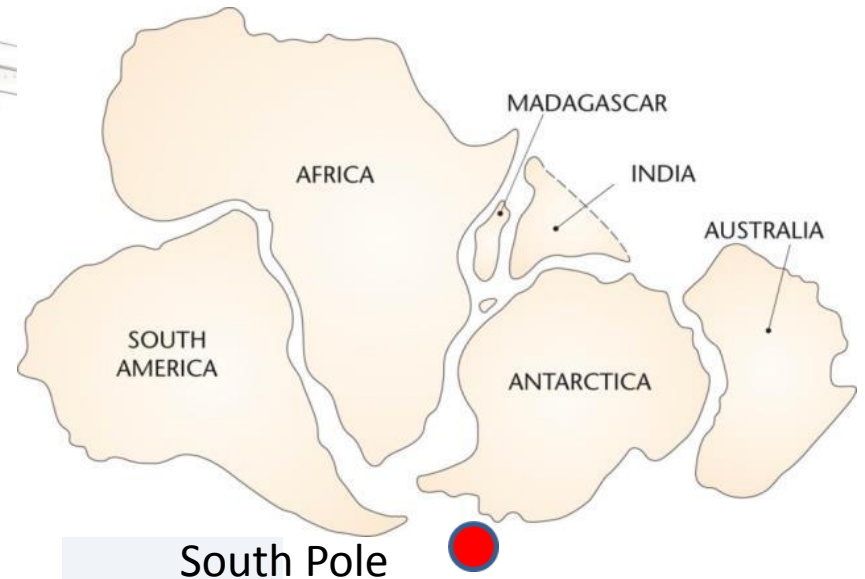
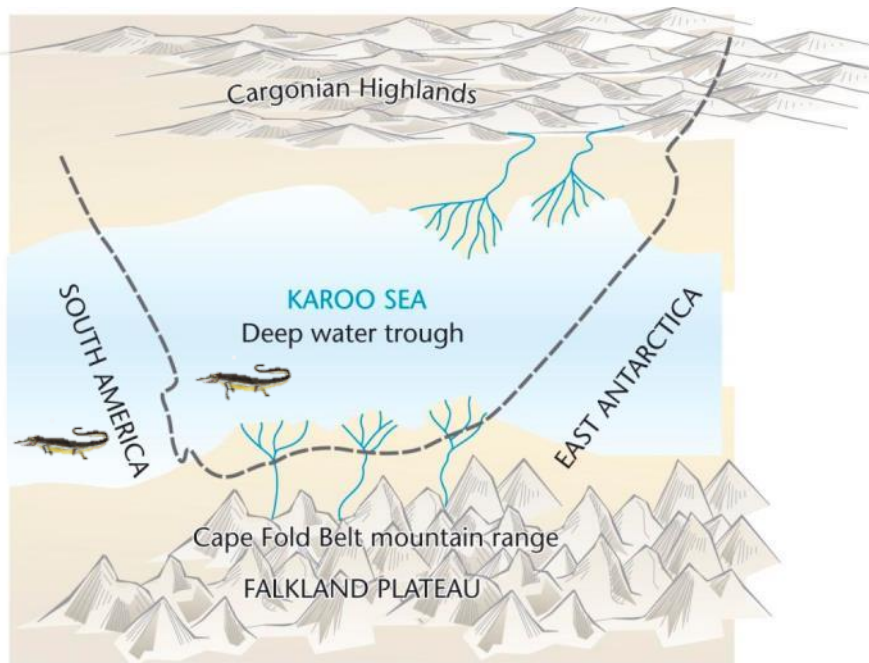


Good examples pre-Cambrian animals found
in Namibia

CAMBRIAN EXPLOSION (540 Ma)



KAROO SEA (260 MA)

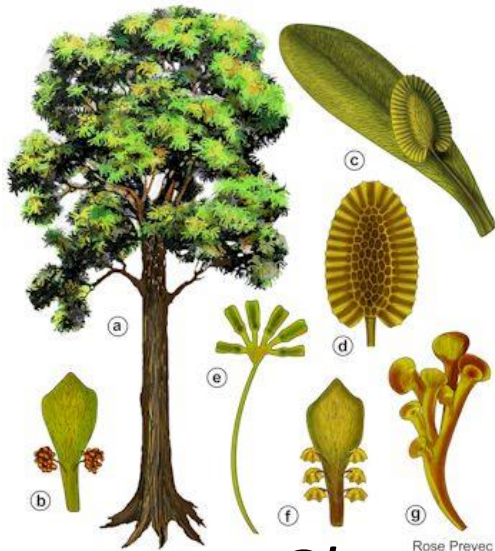
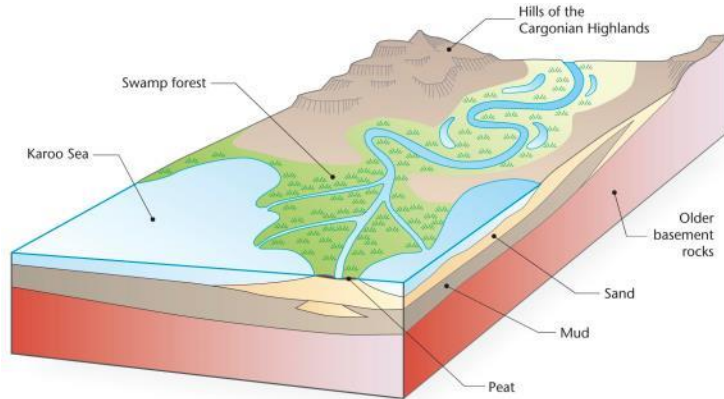


Mesosaurus

McCarthy, T and Rubidge B, 2005. History of Earth and Life. Struik

KAROO SEA (260 Ma)

McCarthy, T and Rubidge B, 2005. History of Earth and Life. Struik

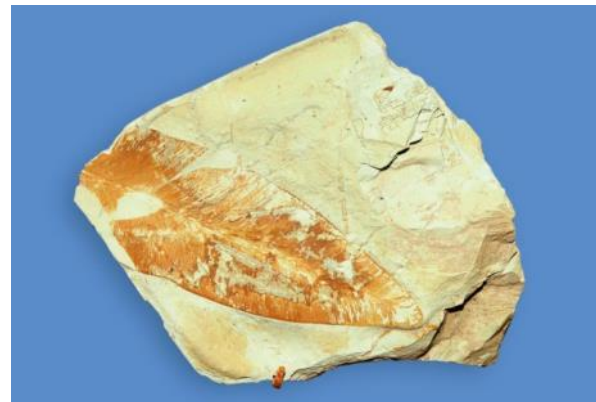
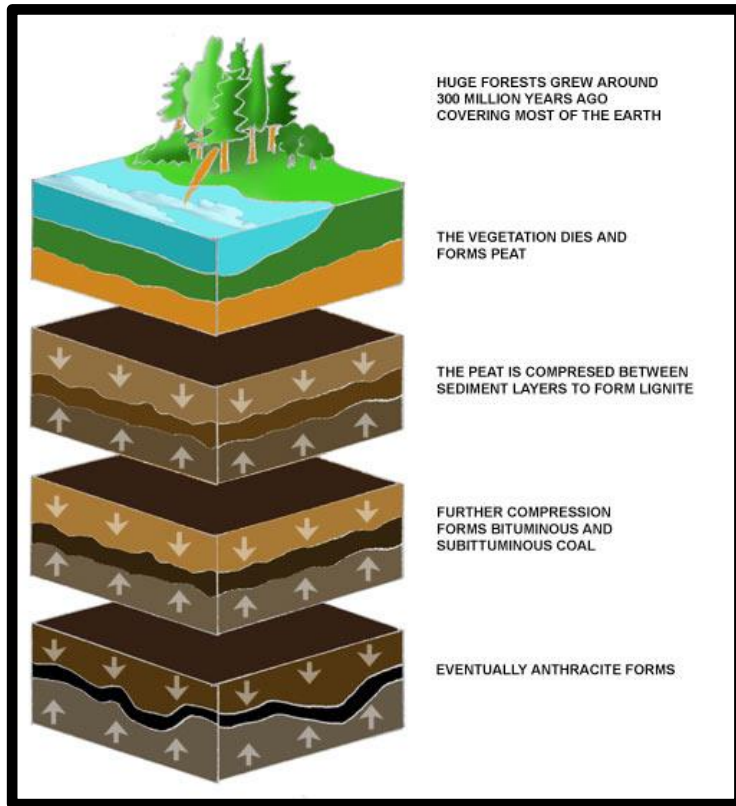


Glossopteris

Artist: Maggie Newman

McCarthy, T and Rubidge B, 2005. History of Earth and Life. Struik

FORMATION OF COAL (260 Ma)



McCarthy, T and Rubidge B, 2005. History of Earth and Life. Struik

SOUTH AFRICAN COAL MINES

- Mainly Limpopo, Mpumalanga, Gauteng and KZN
- South Africa is home to 3.5% of the world's coal resources
- The country's production is 3.3% of the world's annual total
- Exports are 6% of global exports
- This ranks South Africa as 6th in the list of coal-exporting nations
- The Richards Bay Coal Terminal (RBCT) serves as the primary export port
- Coal provides 81% of the power generated by state-owned power utility Eskom



END-PERMIAN EXTINCTION (252 Ma)

- Almost all life on earth was destroyed

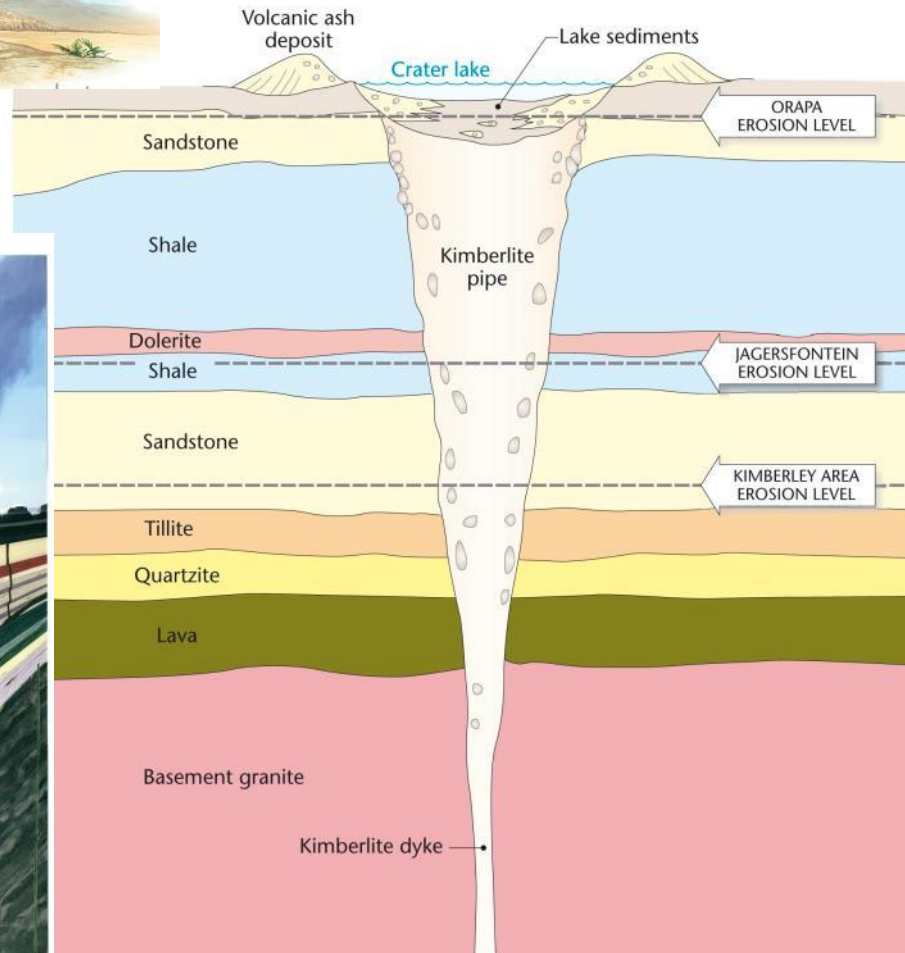
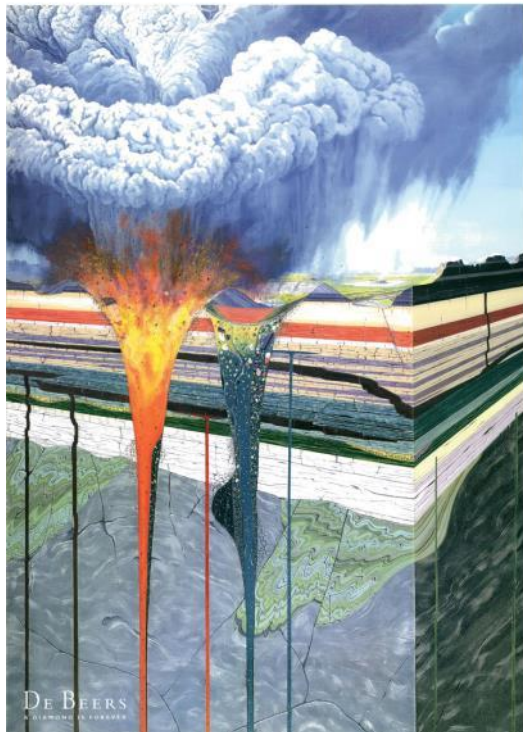
- Super rain shadow effect (Pangea)
- Tethys sea becomes surrounded by land and anoxic
- Sheet volcanics in Siberia



AGE OF THE DINOSAURS (240 – 65 ma)



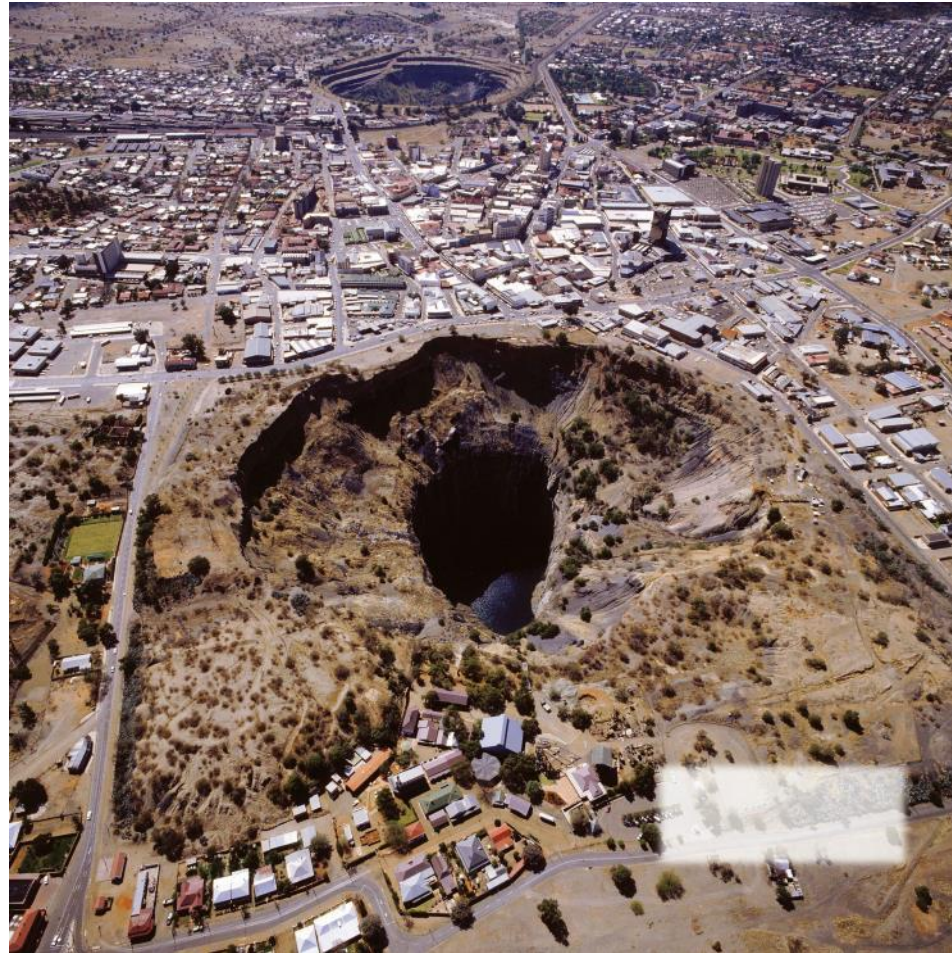
KIMBERLITE PIPES (+/- 120 Ma)



There were earlier and later Kimberlites (no modern ones) but many erupted about this time.

KIMBERLEY AND S.A. DIAMONDS

- Eureka diamond first one discovered in South Africa
- Premier mine North of Pretoria has produced the largest gem quality diamond in the world- some of which are to be seen in the Crown Jewels



EXTINCTION OF THE DINOSAURS (AND OTHER ORGANISMS) 65 Ma)



DIVERSIFICATION OF MAMMALS (66 Ma until now)



ICE AGES 2 (Ma until now)



FORMATION OF THE ICE CAPS (30 Ma)

- Drop in CO₂ levels from 1000 ppm to about 600 ppm
- Antarctic separated from South America
- Formation of a circumpolar current
- Isolated from warm tropical water



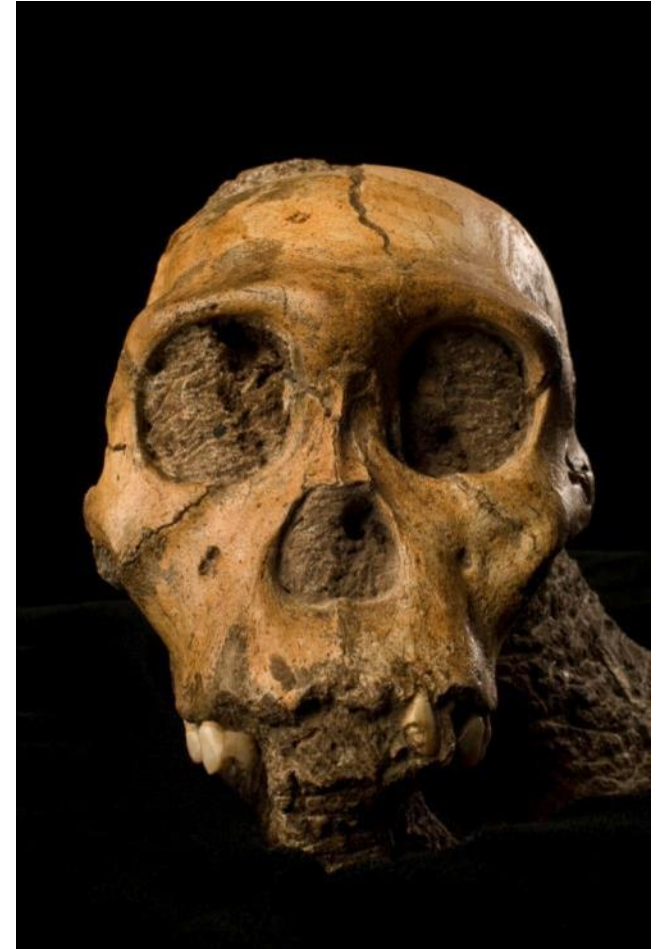
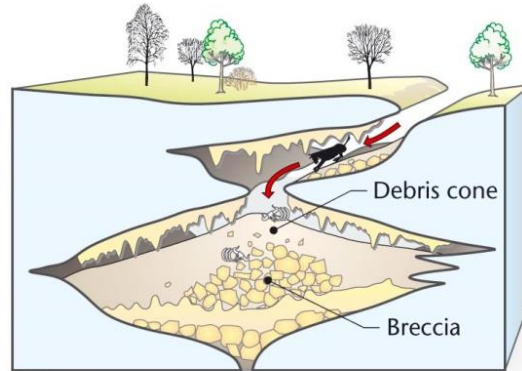
HUMAN ANCESTORS (7 Ma)



<http://www.geotimes.org/apr05/WebExtra041505.html>

SOUTH AFRICAN HOMININS (3 Ma to present)

- Caves formed in dolomite rock
- Soluble in acidic water (carbonic acid)
- Fossil bones preserved by carbonate and mud



TSWAING METEORITE CRATER (200 Ka)

- North of Tshwane
- Second most well preserved meteorite crater in the world.



CRADLE OF HUMANKIND

- Taung (NW), Makapansgat (L), Gauteng and North West
- UNESCO World Heritage site
- Palaeotourism



HUMANS

