



Teacher Earth Science Education Programme PARTNERS

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Teacher Earth Science Education Programme

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Teacher Earth Science Education Programme

Round and Round with Rocks

Tracey Lawson
Queensland Resources Council
Manager, Teacher Professional Development

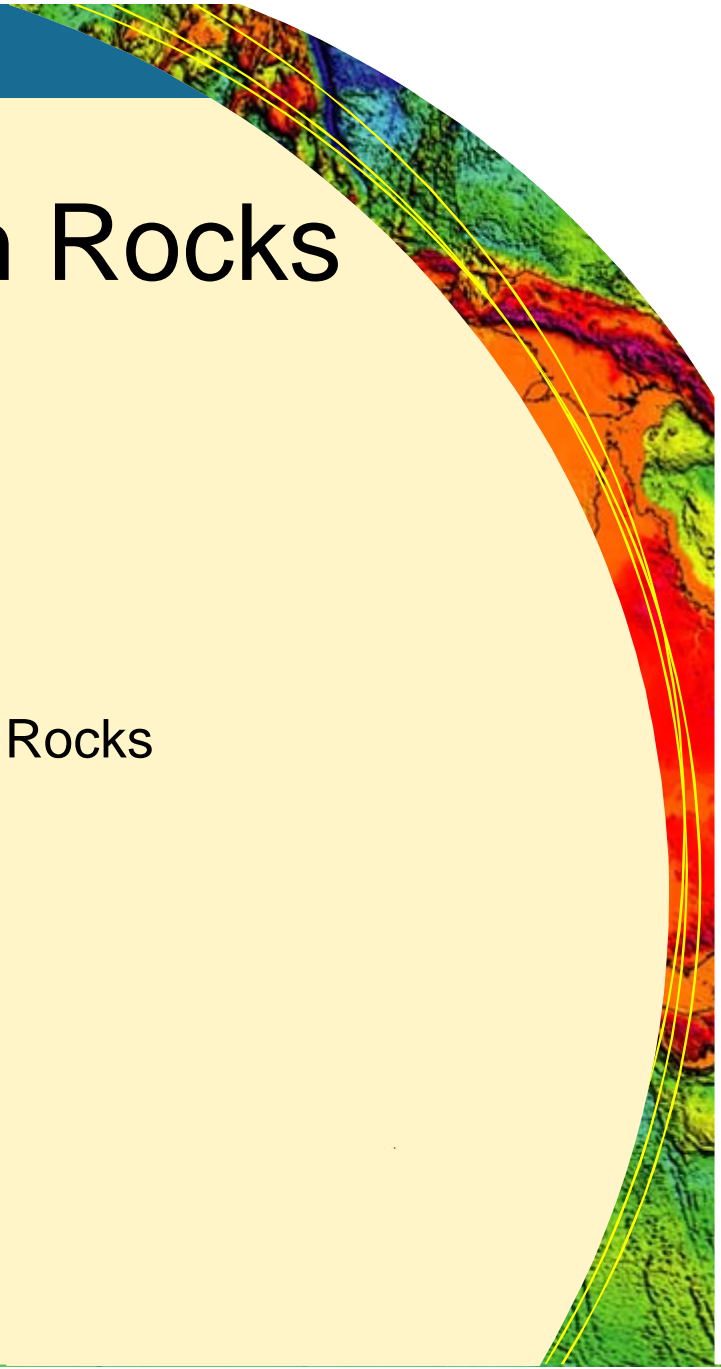
Greg McNamara
TESEP
Executive Officer



Round and Round with Rocks

In this session:

- Geological Time Scale
- Plate Tectonics
- Rock Cycle
 - Igneous, Metamorphic and Sedimentary Rocks
 - Principles of Stratigraphy
 - Geological Cross-sections
 - Intrusive and extrusive igneous rocks
- Resources



Deep time

What is geological time?

- The age of planet Earth
 - Close to 4.6 billion years
- Absolute dates based on
 - Based on radioactive decay
 - Tight correlation with radiometric dates
- Relative dates based on
 - Sequences in the rock record
 - » Layering, Fossils, Cross-cutting
 - » Correlations



Image Courtesy of USGS
<http://pubs.usgs.gov/gip/geotime/time.html>

- Activities
 - Rock Back in Time (Down to Earth)
 - [Geological Time Scale Interactive](#)
- Animations
 - [Evolution Animation](#)

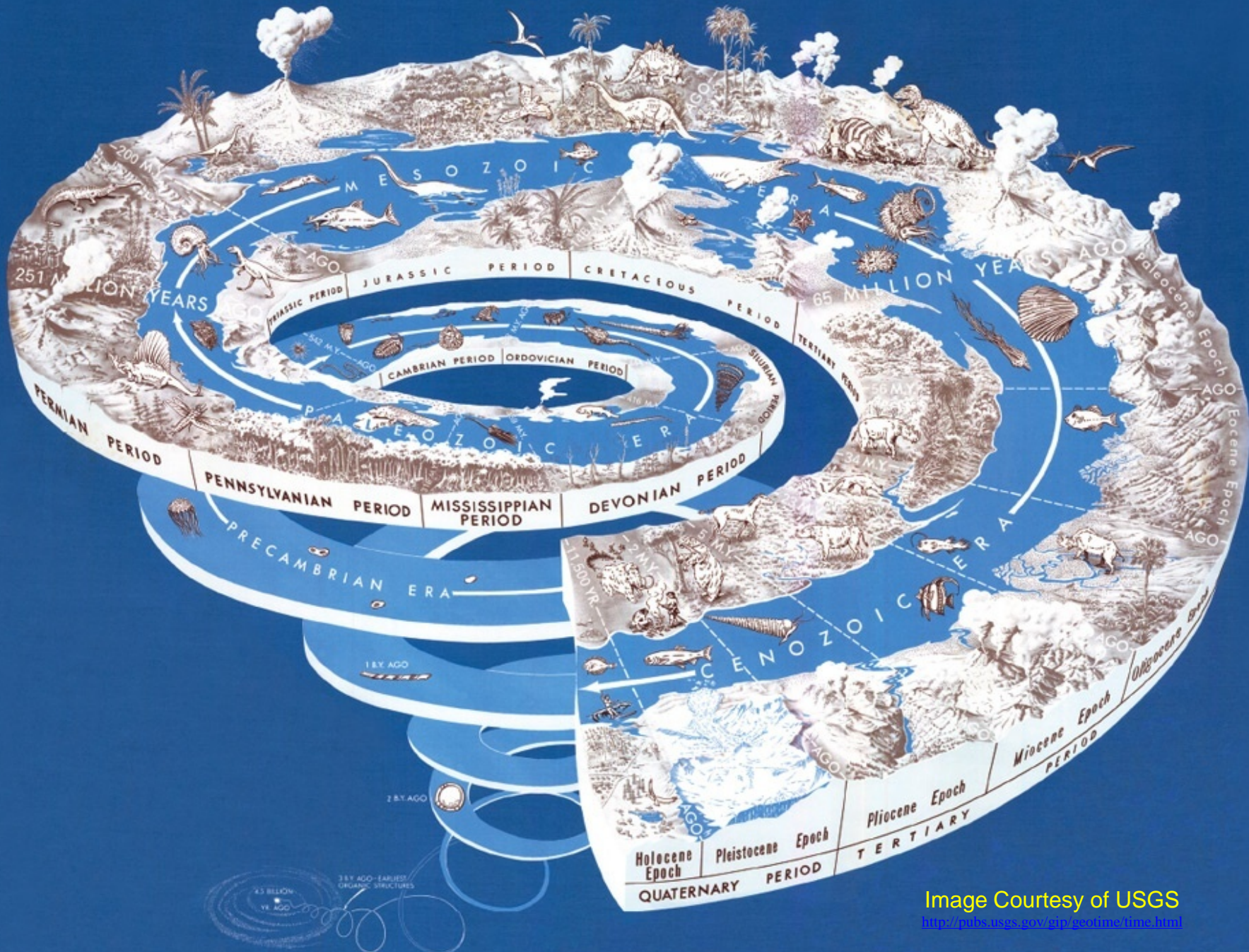


Image Courtesy of USGS

<http://pubs.usgs.gov/gip/geotime/time.html>

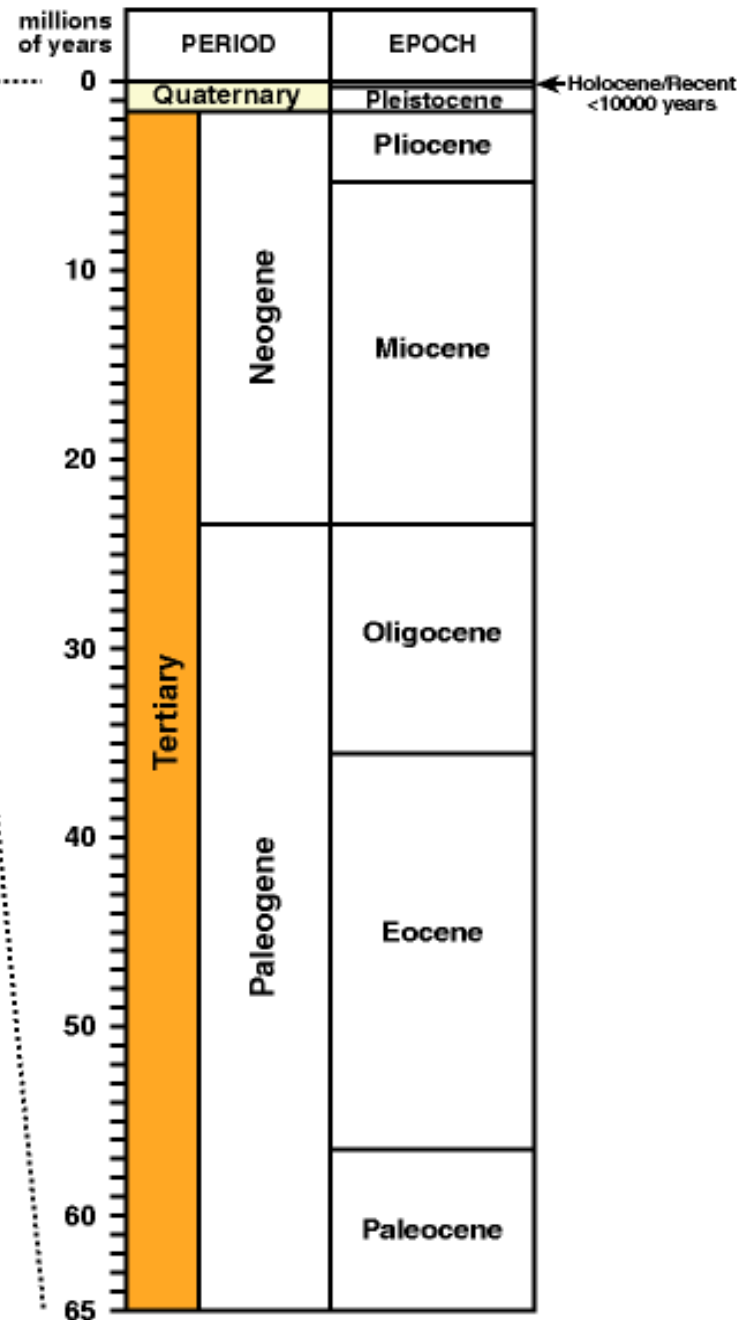
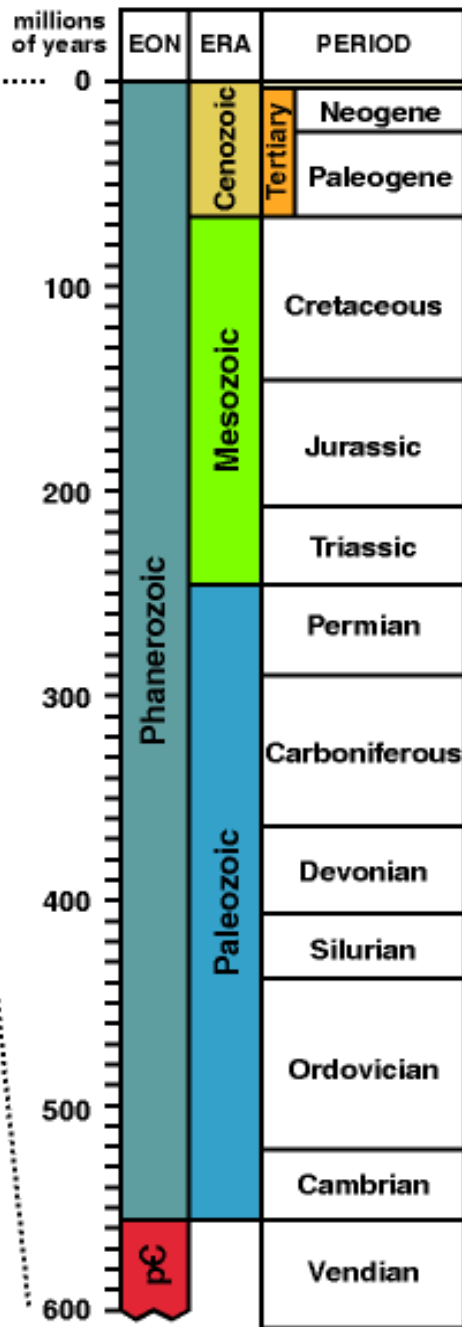
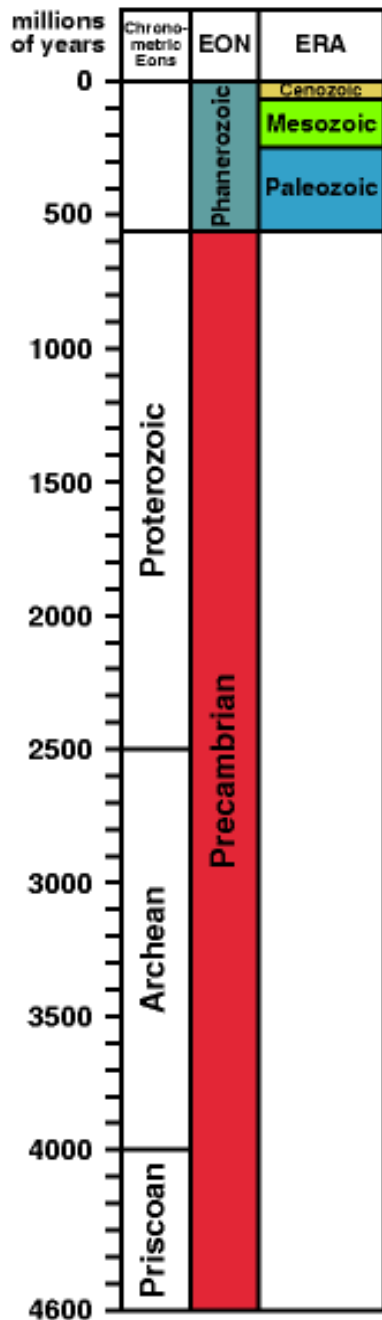


Image Courtesy University of Calgary

<http://pubs.usgs.gov/gip/geotime/time.html>

Plate Tectonics

Theory to explain observed evidence for large scale motions of the Earth's lithosphere

- Activities
 - Science of Mining (p13 – 19)
 - AGSO/USGS Plate Tectonic Model
 - Biscuit Plate Tectonics
 - Hand Model
- Animations
 - [Plate Boundaries](#)

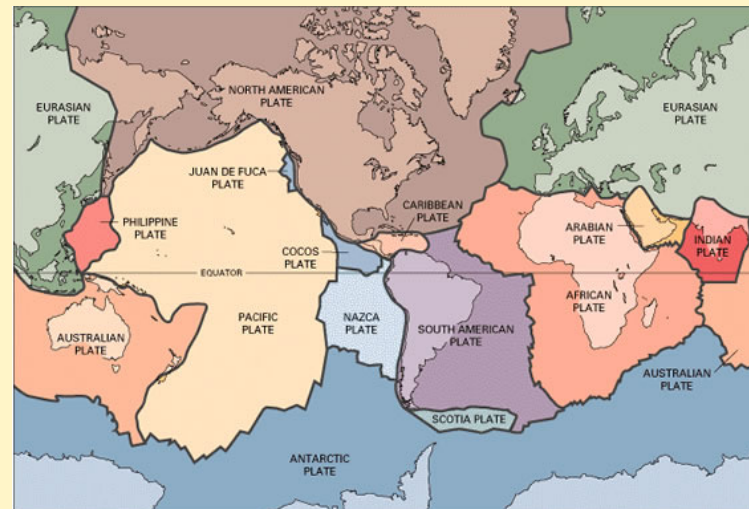


Image Courtesy USGS

Rock Cycle

The geological processes that form rocks is cyclical. Each type of sedimentary, igneous or metamorphic rock can be changed into each other type of rock. This is known as the rock cycle.

- Experiments
 - Investigating the rock cycle (SoM p36 – 37)
 - Science Rocks (p26 – 28)
 - Activities
 - Rocky recipes (SR p24 – 25)
 - [Interactive Animation](#)
- [Animation](#)
 - Activity
 - The animation shows American examples of landscapes formed by erosion. Use the internet and other resources to find Australian examples of these landscapes.

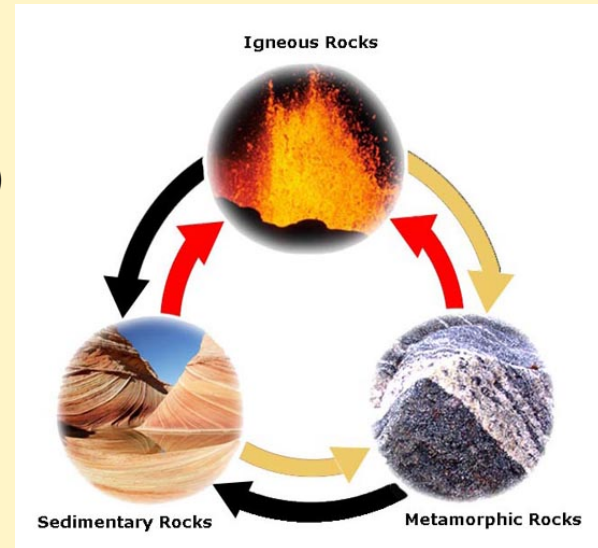


Image Courtesy of:

<http://www.rocksandminerals4u.com/images/rock-cycle-diagram-im.jpg>

Sedimentary rocks

Formed when sediments are cemented together

- Experiments
- Weathering (Physical and Chemical Act 1 - ESEU)
- Deposition Demo
- Lithification of Sediments (Act 4 – ESEU)
- [Making conglomerate](#)
- Activities
- [Sedimentary Rock Vodcast](#)
- Rocky Road Conglomerate
- [Animations](#)

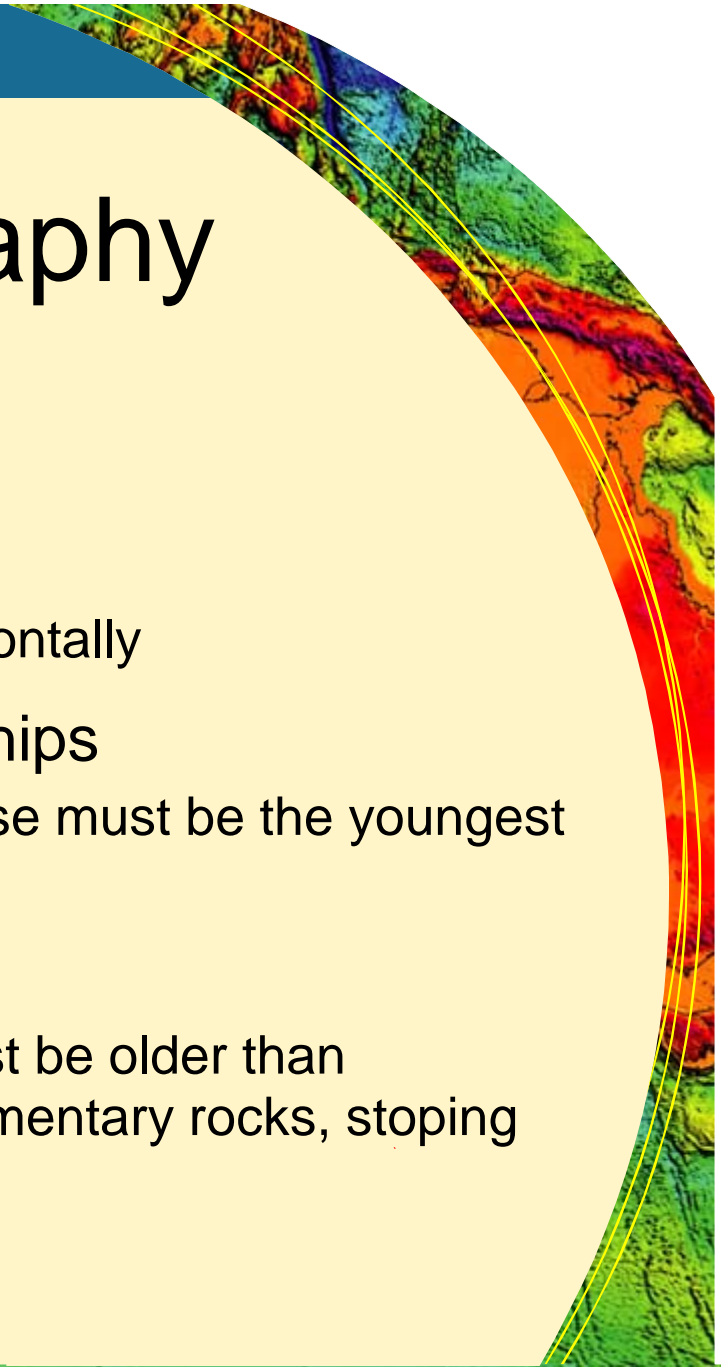


Image Courtesy of

<http://www.dkimages.com/discover/previews/1051/25002102.JPG>

Principles of stratigraphy

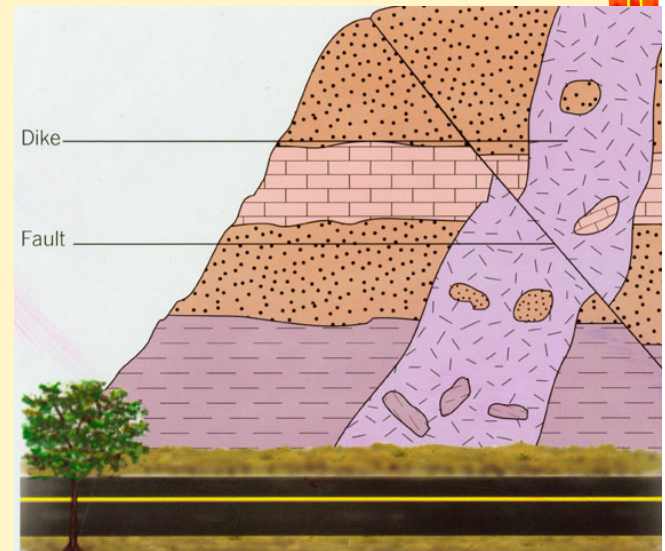
- Principle of Superposition
 - oldest layers on the bottom
- Principle of Original Horizontality
 - all layers were originally deposited horizontally
- Principle of Cross-cutting Relationships
 - anything that crosses over something else must be the youngest e.g. intrusions, faults
- Principle of Inclusions
 - anything included in something else must be older than the thing in which it is included e.g. sedimentary rocks, stoping
- Principle of causality
 - an event cannot precede its cause



Geological cross-sections

Diagrams that show the patterns of rocks as they would exist under the Earth's surface; can be interpreted to determine the geological events that occurred in the region

- Activities
- A slice of geological cake
- Drawing cross-sections from drill core data
- Using 3-D GIS model on OresomeResources.com
- [Animations](#)



Metamorphic rocks

Metamorphic Rocks

– formed as a result of heat and pressure being applied to pre-existing rocks

- Activities
- Properties of MM Rocks (SOM p33-34)
- Identifying MM Rocks
- [Crossword](#)
- [Animations](#)



Image Courtesy of

<http://www.cropsoil.uga.edu/soilsandhydrology/Important%20Rocks%20&%20Minerals.htm>

Igneous rocks

Igneous Rocks

- formed when molten material cools and crystallises above (extrusive) or below (intrusive) the Earth's surface
- Experiments
 - Heating and cooling igneous rocks (SR p29 and extension with BB)
- Activities
 - Identifying igneous, metamorphic and sedimentary rocks (SR p 55 – 57)
- [Animated Notes](#)
 - Difference between intrusive and extrusive based on crystal size
- [Animation](#)

Image Courtesy of
http://seis.natsci.csulb.edu/basicgeo/IGNEOUS_ROCKS_QUIZ/Granite_Xenolith_closeup.jpeg



Intrusive and Extrusive Igneous Rocks

Intrusive Igneous Rocks

- formed when magma cools and crystallises below the surface of the Earth

Extrusive Igneous Rocks

- formed when lava cools on the surface of the Earth
- Experiments
 - Crystal growing (SR p 58 – 59)
 - Affect of Temp on Crystal Growth (SoM p28)
- Activities
 - Demo – A volcano in the lab (ESEU p20 – 21)
 - Coffee Intrusions
 - How silicate chemistry affects viscosity
 - AGSO/USGS Model Volcanoes



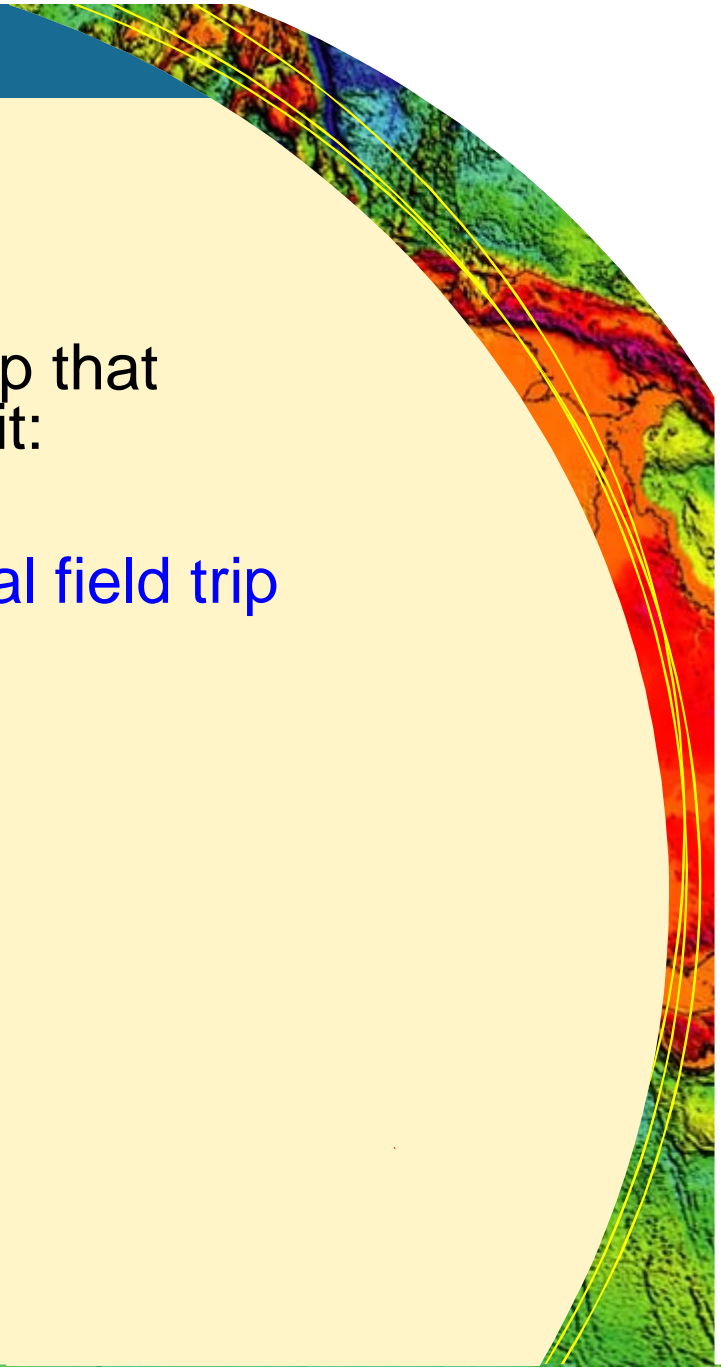
Image Courtesy of

http://www.allposters.com/-sp/Volcanic-Eruption-Arenal-Volcano-Costa-Rica-Posters_i1100429_.htm

Field trip

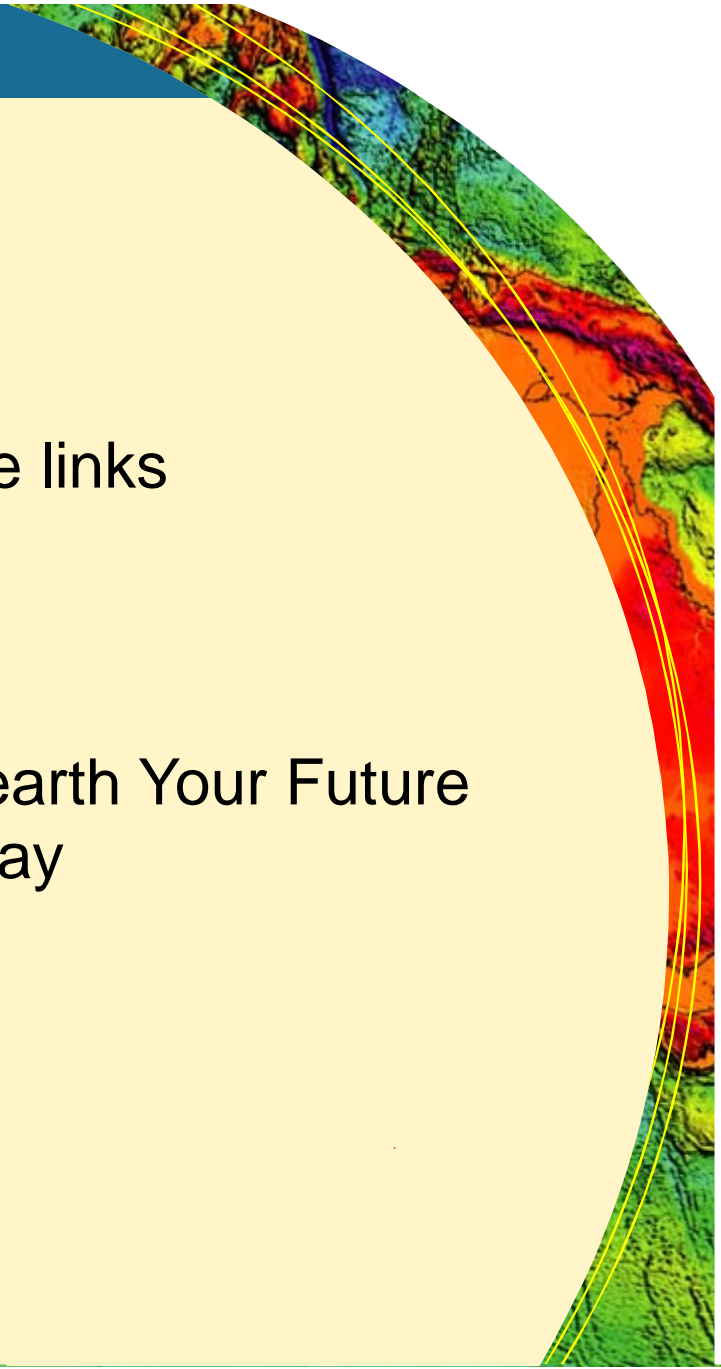
To find out information about a field trip that would be useful in your local area, visit:

[www.oresomeresources.com/virtual field trip](http://www.oresomeresources.com/virtual%20field%20trip)



Useful resources

- CD Provided at this PD
 - word documents, pdf files, website links
- PESA posters and questions
- Rock Cycle Game
- Down to Earth, Oresome Froth, Unearth Your Future and various other materials on display



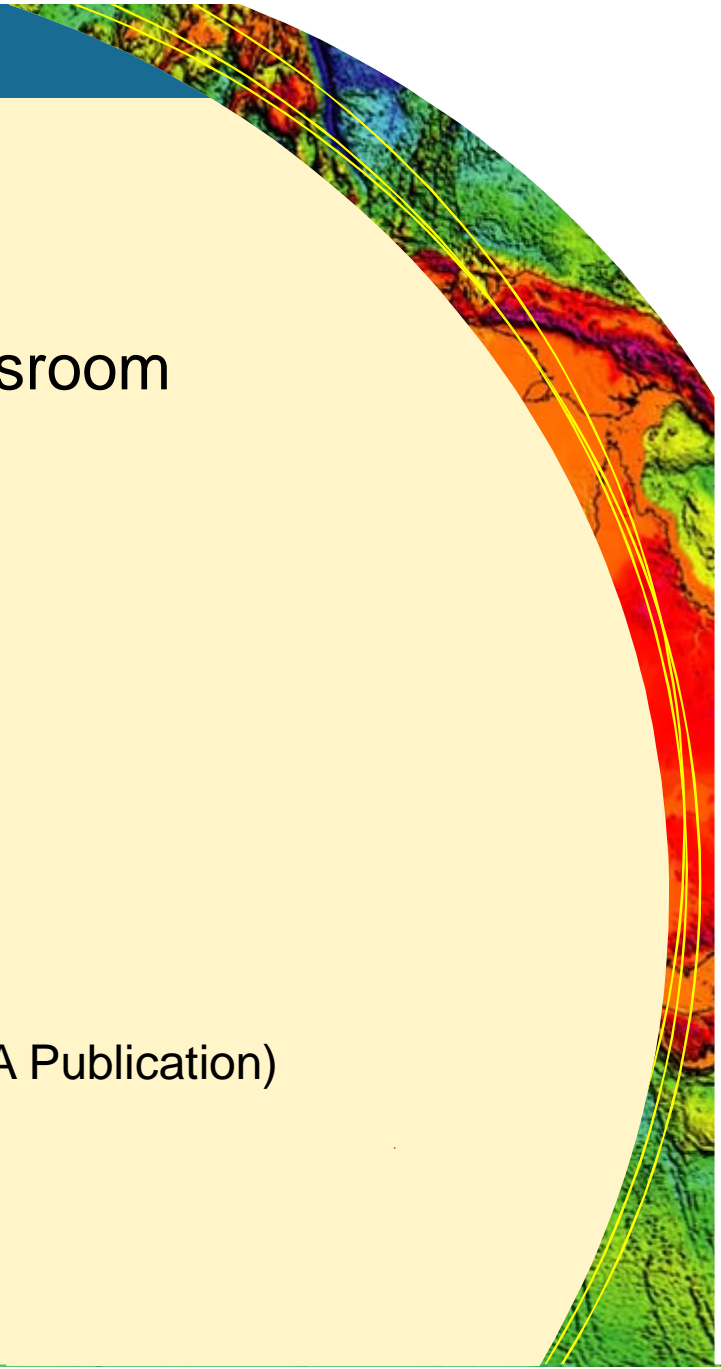
Useful Websites

- <http://www.oresomeresources.com>
- <http://www.geolsoc.org.uk/gsl/site/GSL/rockcycle>
- <http://www.bbc.co.uk/schools/gcsebitesize/chemistry/changestoearthandatmosphere/>
- <http://www.geosciencepathways.org.au>
- <http://www.gsa.org.au/resources/education.html>
- <http://science.uniserve.edu.au/school/curric/stage6/ees/dynamic.html>
- http://www.earthscienceeducation.com/workshops/worksheets/dynamic_rock_cycle.pdf



Putting it together

- Creating a unit of work for your classroom
- Sequence of activities
- Assessment ideas
- Field Work
- Other useful resources
 - [OresomeResources](#)
 - Science Rocks (QRC Publication)
 - Science of Mining (QRC Publication)
 - Teaching the Dynamic Earth (ESEU / UKOOA Publication)



Geoscience Pathways

TESEP uses this fabulous website to distribute materials

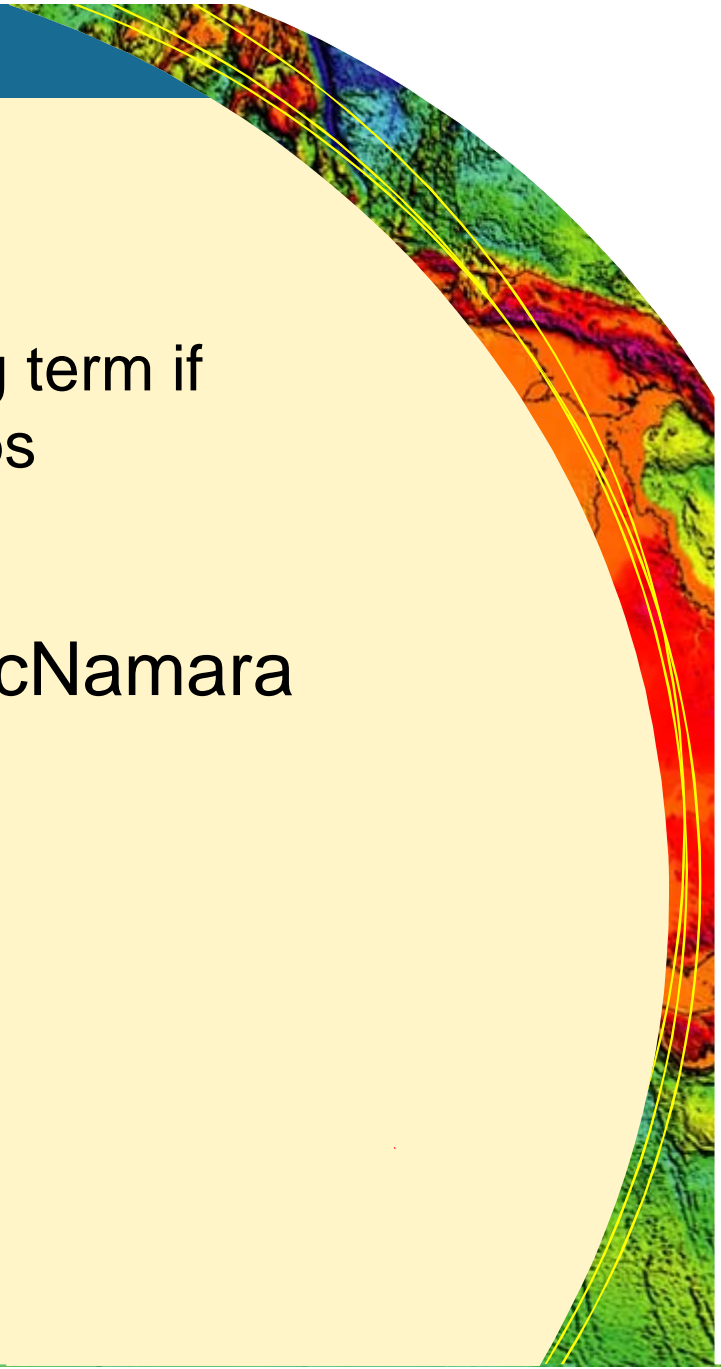
www.geosciencepathways.org.au



Please partner!

- TESEP will only succeed in the long term if we continue to grow our partnerships
- Contact either
 - Executive Officer, Greg McNamara
 - eo@tesep.org.au
 - Chairperson, Jill Stevens
 - cp@tesep.org.au

to discuss the options



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- Monash Energy
- Museum Victoria
- Our Water Our Future, Vic
- Petroleum Geo-Services
- Primary Industries and Resources SA
- Stanwell Corporation
- Velseis
- ZeroGen



TESEP

Also wishes to thank:

- Australian Geoscience Council
- Australasian Institute of Mining and Metallurgy
- Geoscience Australia
- Minerals Council Australia



Thank you

