

## Stratigraphic Cross Sections—Why study old rocks?

The earthquake potential of an area can be determined by studying the relationships between rock strata, both locally and regionally. Faults and folds record a probable earthquake history, so by studying the age of the rocks we can gain an understanding about future earthquakes (applying “*the past is a key to the future*”). This is done by doing field work, studying drill-hole samples, and interpreting seismic reflection data.

This animation, has both stratification and structure. No strata are overturned, thus the following laws apply:

The *law of superposition* simply states that for non-deformed geologic strata, “sedimentary layers are deposited in a time sequence, with the oldest on the bottom and the youngest on the top”.

The *principle of original horizontality* states that rock layers form in the horizontal position, and any deviations from this horizontal position are due to the rocks being disturbed later (the exception being layers deposited on a slope).

The *cross-cutting law* says that if a rock is cut by another rock, then it is older than the rock which has cut it.

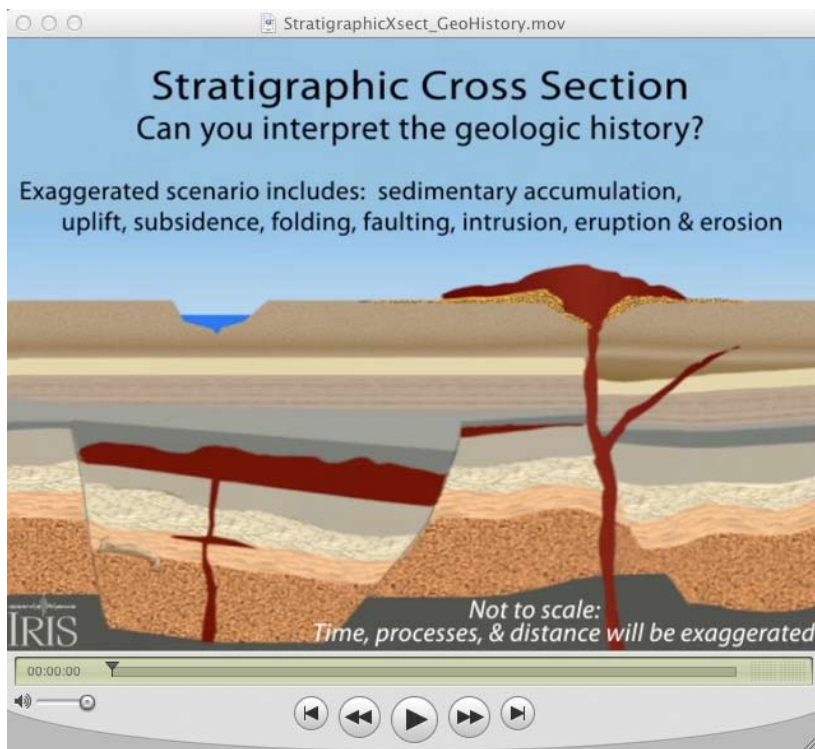
### DEFINITIONS

**Stratigraphy**— The branch of geology that studies rock layers (*strata*) & layering (*stratification*). It is primarily used in the study of sedimentary & layered volcanic rocks.

**Cross section**—A view formed by a plane cutting through an object to reveal a profile (a vertical section of the Earth’s crust showing the different horizons or layers).

**Stratigraphic section**—Also called “stratigraphic cross section”, is a cutaway view, usually with the vertical scale exaggerated with relation to the horizontal scale, that is designed to show the thicknesses & relationships between successions of rock types.

**Structural geology**—Used to uncover information about faults & folds in rocks.

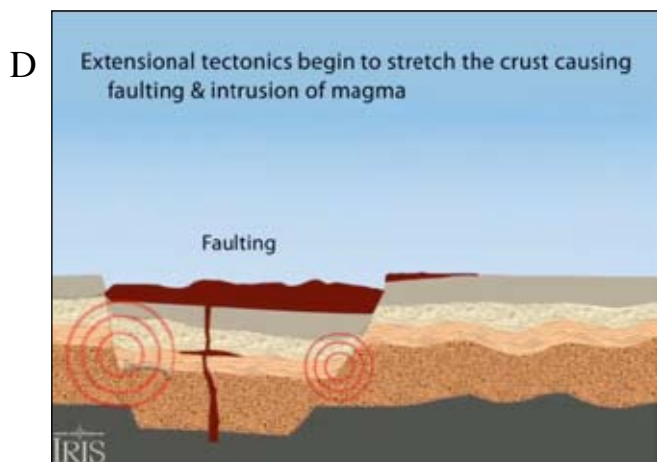
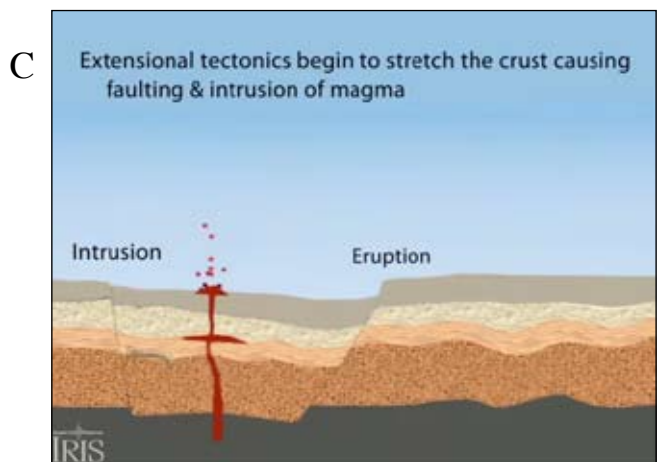
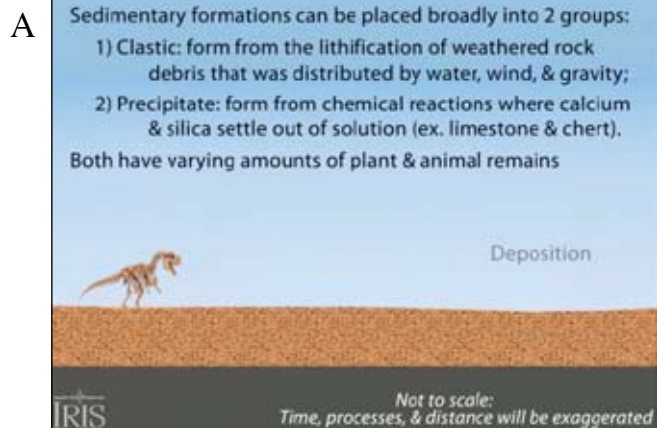


### Can you interpret this hypothetical geologic section?

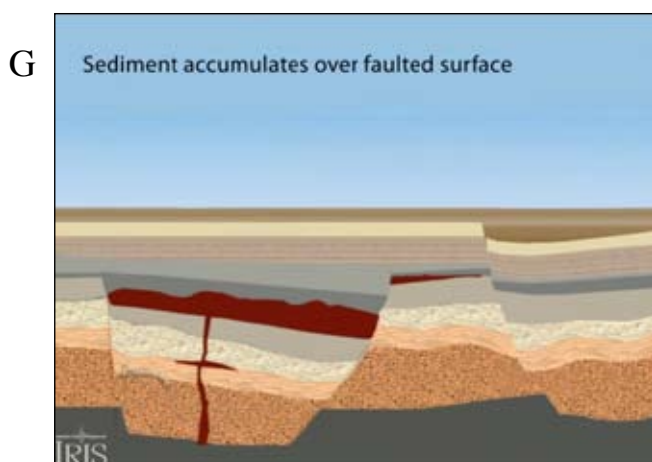
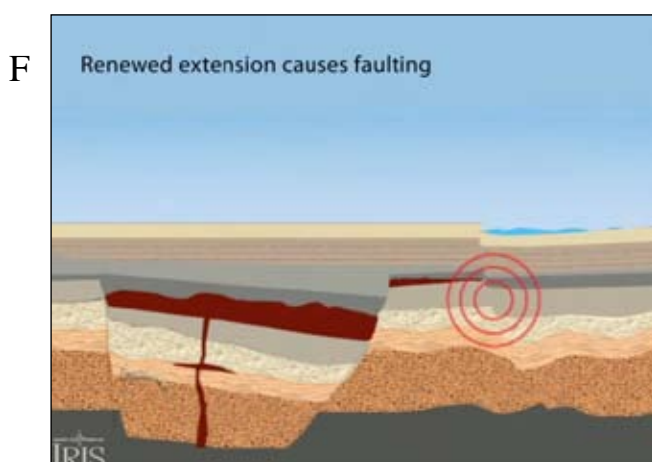
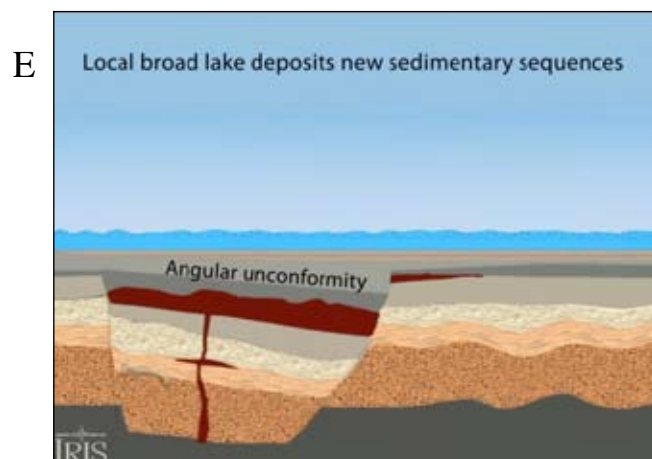
See the following page for keys to the animation.

NOTE: For a much more simplified cross section, see pages 4 & 5 ([take me there](#))

**Video image grabs from the animation:**



- A. Deposition of sedimentary sequences
- B. Compression and folding
- C & D. Extension accompanied by faulting & intrusion of magma
- D. Continued extension following eruption
- E. Angular unconformity during continued deposition
- F. Renewed faulting
- G. Unconformity over fault offset.



**Sample questions to ask about the section:**

What is the oldest layer?

Which is the youngest rock?

Which is the youngest fault? The oldest?

Can you find an angular unconformity?

What does the dinosaur bone tell you?

What is evidence for erosion?

How do you know there was ever compression in the area?

What is the evidence for extension?

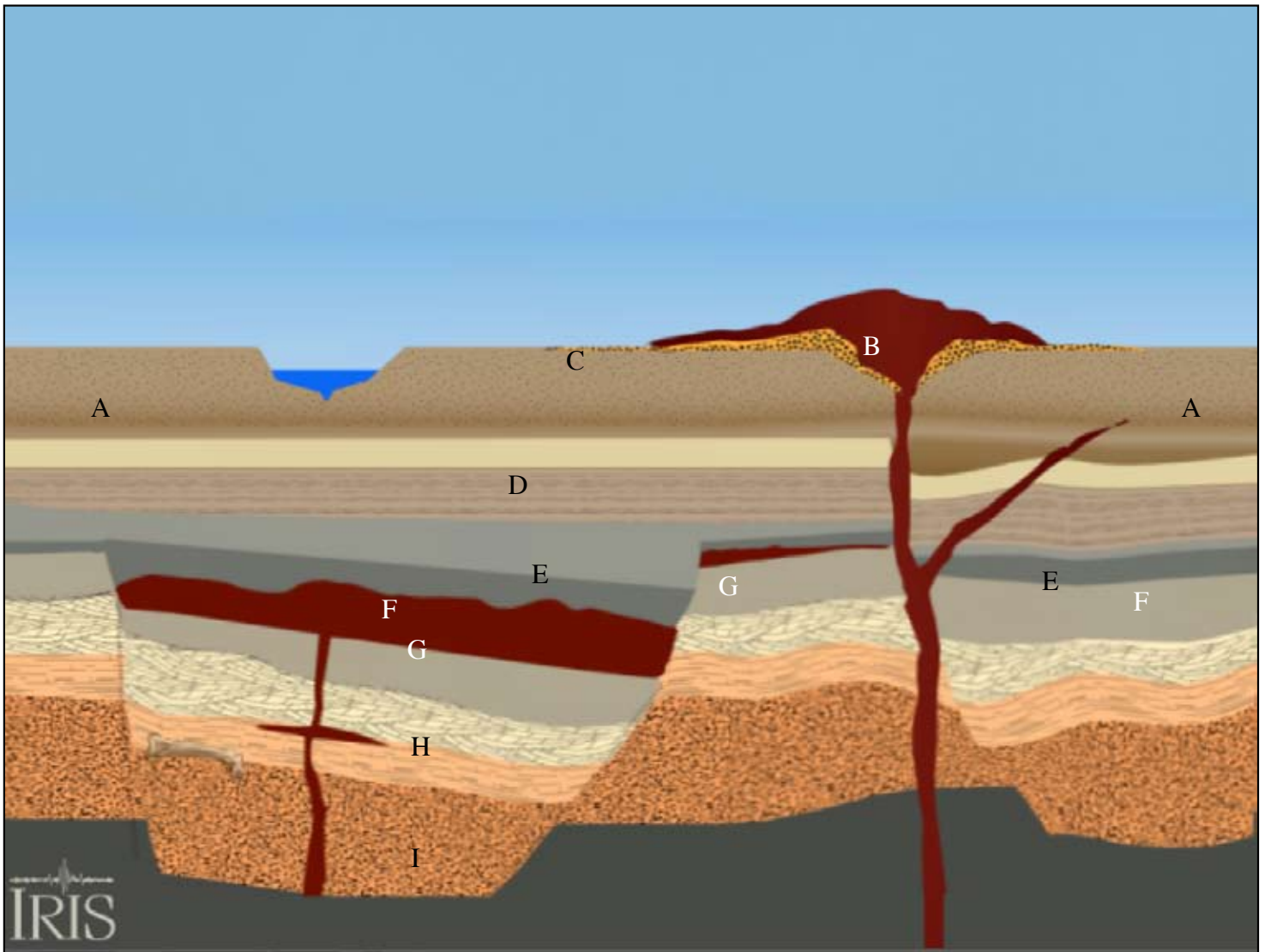
**List the stratigraphic sequences in order of their relative ages using the letters on image below:**

Youngest

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Oldest

Where do the faults occur in the sequence?



IRIS



## A simpler example of stratigraphic relations:

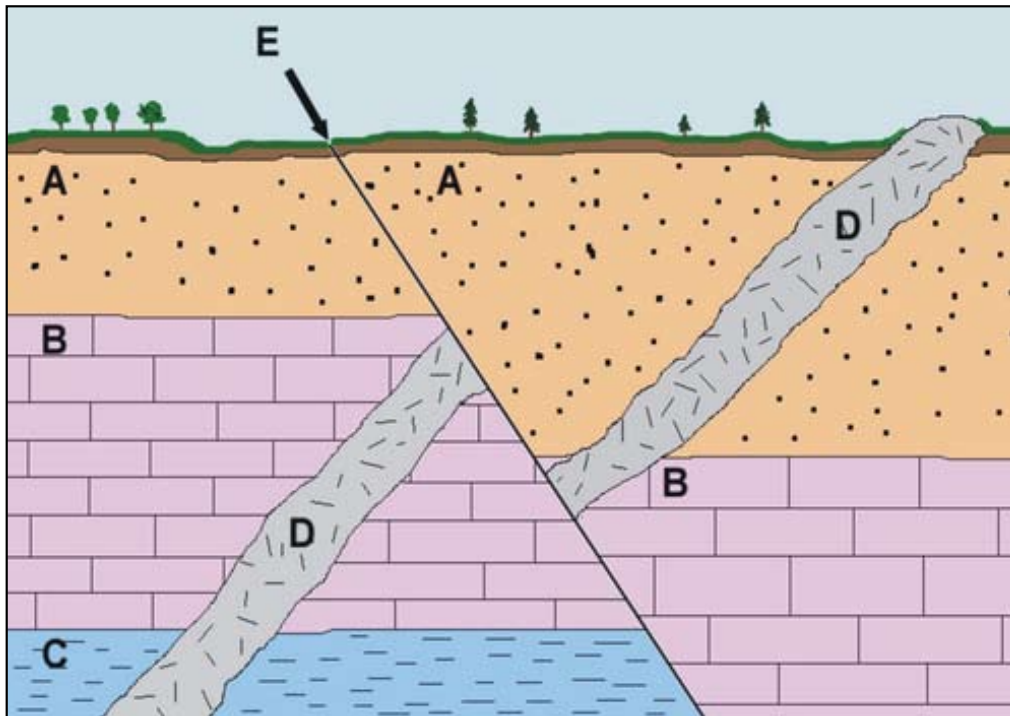
Modified from:

### High School Earth Science/Relative Ages of Rocks

from Wiki books: [http://en.wikibooks.org/wiki/High\\_School\\_Earth\\_Science/Relative\\_Ages\\_of\\_Rocks](http://en.wikibooks.org/wiki/High_School_Earth_Science/Relative_Ages_of_Rocks)

The relative age of a rock is its age in comparison with other adjacent rocks. If you know the relative ages of two rock layers, you only know which is older and which is younger, but you do not know how old the layers are in years. In some cases, it is very tricky to determine the sequence of events that leads to a certain formation.

Example:



Sample stratigraphic section to show relative rock ages.

**See Next Page** for a pictorial representation of the history that elaborates on the text below.

The principle of cross-cutting relationships states that a fault or intrusion is younger than the rocks that it cuts. The fault labeled 'E' cuts through all three sedimentary rock layers (A, B, and C) and also cuts through the intrusion (D). So the fault must be the youngest formation that is seen.

The intrusion (D) cuts through the three sedimentary rock layers, so it must be younger than those layers. The principle of superposition states that the oldest sedimentary rock units are at the bottom, and the youngest are at the top. Based on this, layer C is oldest, followed by B and A.

So the full sequence of events is as follows:

Layer C formed.

Layer B formed.

Layer A formed.

When layers A-B-C were present, intrusion D formed.

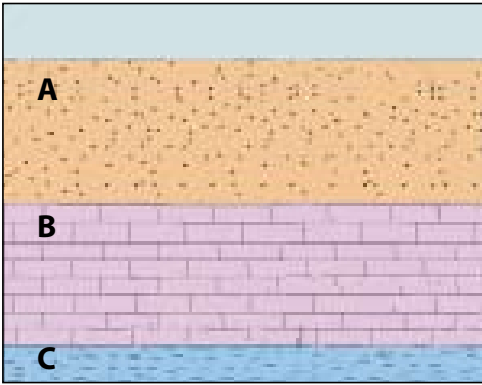
Intrusion D cut through layers A-C.

Fault E formed, shifting rocks A through C and intrusion D.

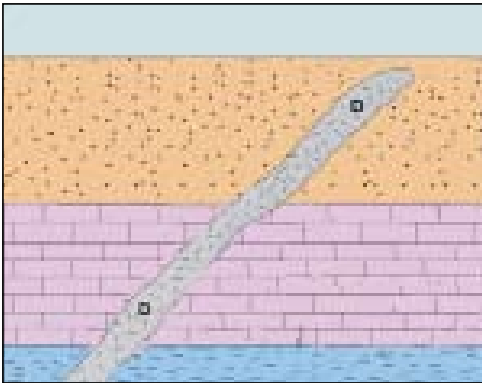
Weathering and erosion occurred, forming a layer of soil on top of layer A.

**Possible hypothetical series of events**

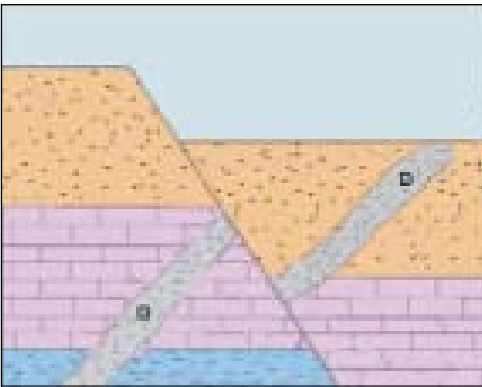
(A,B,C...match the original drawing on previous page)



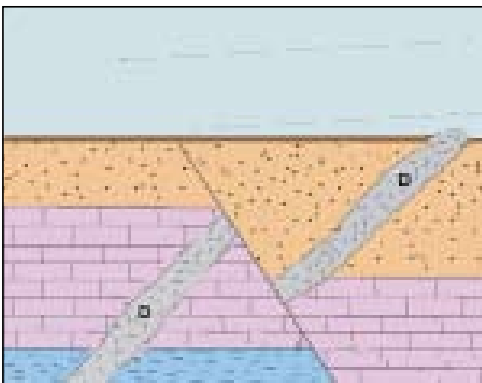
Original rock layers in situ



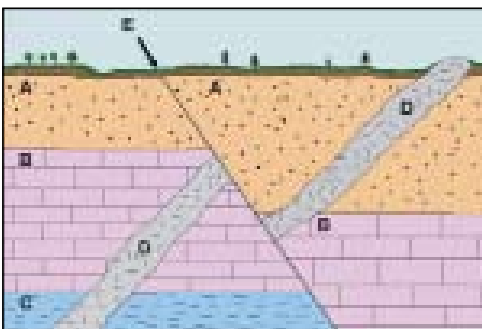
Intrusion



Faulting



Erosion of highlands



Soil development