The science of stratigraphy is all about trying to figure out the arrangement of rock layers under the surface and how layers would have been arranged where they have subsequently eroded away. Ultimately, one seeks to undo the deformation of faulting and folding to work out how the layers would have been deposited. This allows the stratigrapher to understand the sequence of events that produced and subsequently deformed the rock layers.

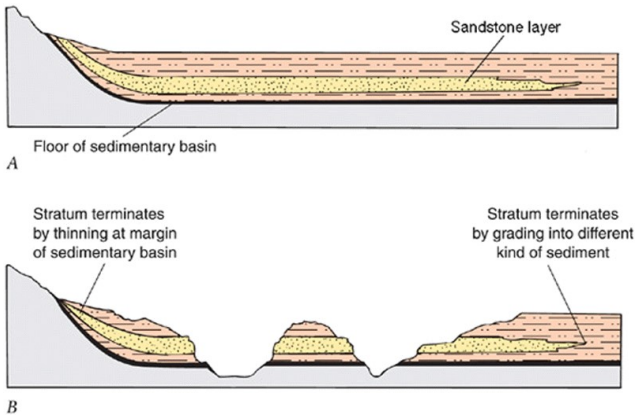
Ideally, this is accomplished without the need to dig huge, expensive trenches into the Earth.

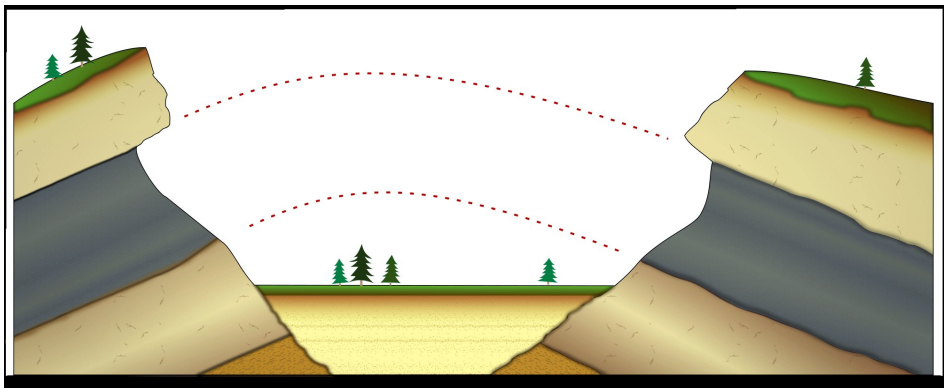
Remember: each rock layer corresponds to some past event whether it was a long-term or short-term event. The same can be said for each fault or fold.

Most of stratigraphy is based on three principles:

- rock layers are deposited horizontally,
- these layers extend for great distances across the earth's surface,
- younger layers are deposited on top of older ones.

There are exceptions to each of these, but they work most of the time.





If we can measure the direction and degree to which rock layers are tilted at the surface, we can work out what the arrangement of layers must be below the surface.

Dip: the angle that a rock layer makes to the horizontal plane.
Strike: the compass direction perpendicular to the direction of dip.

Strike is much easier to measure than the dip direction.

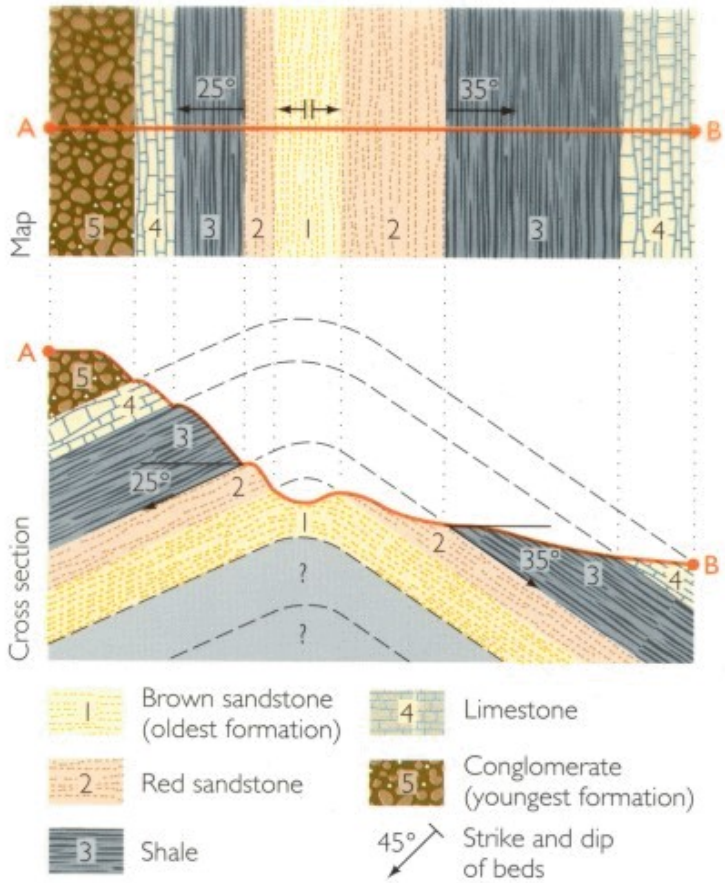


Figure 10.6
Press and Siever: ***Understanding Earth***

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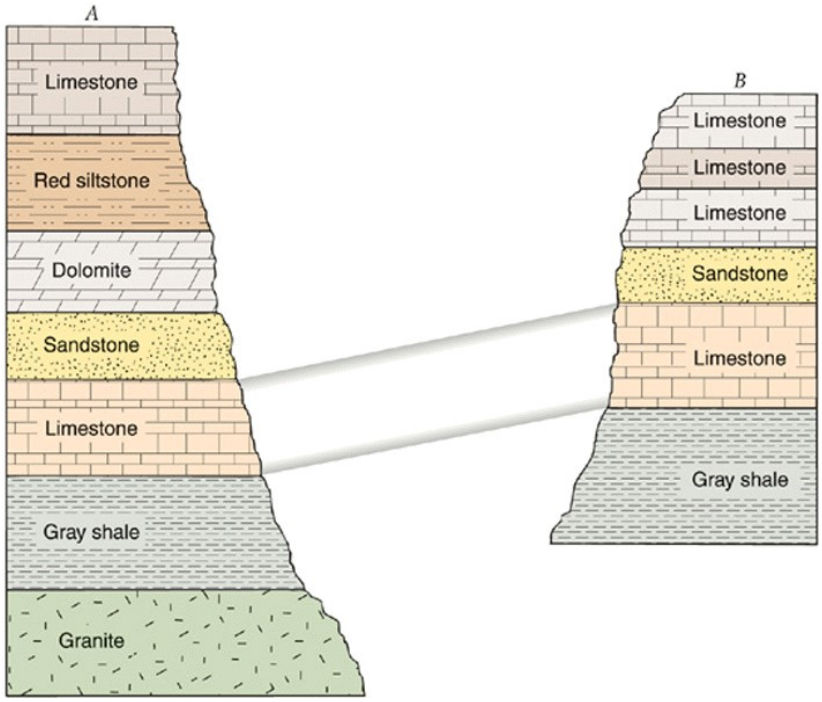
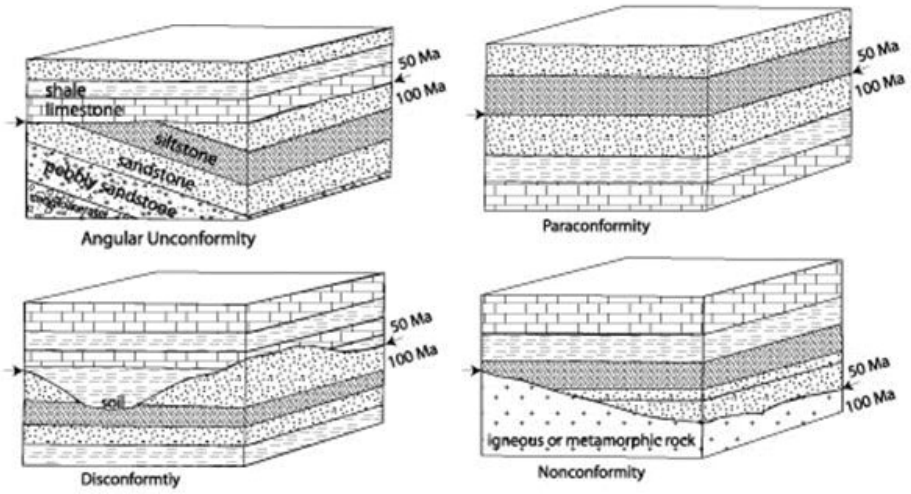
By matching patterns of different rock types in a sequence of layers, we can work out whether or not a layer in one outcrop might be contiguous with a similar looking layer in another outcrop. In other words, are they the same layer. This process is called correlating.



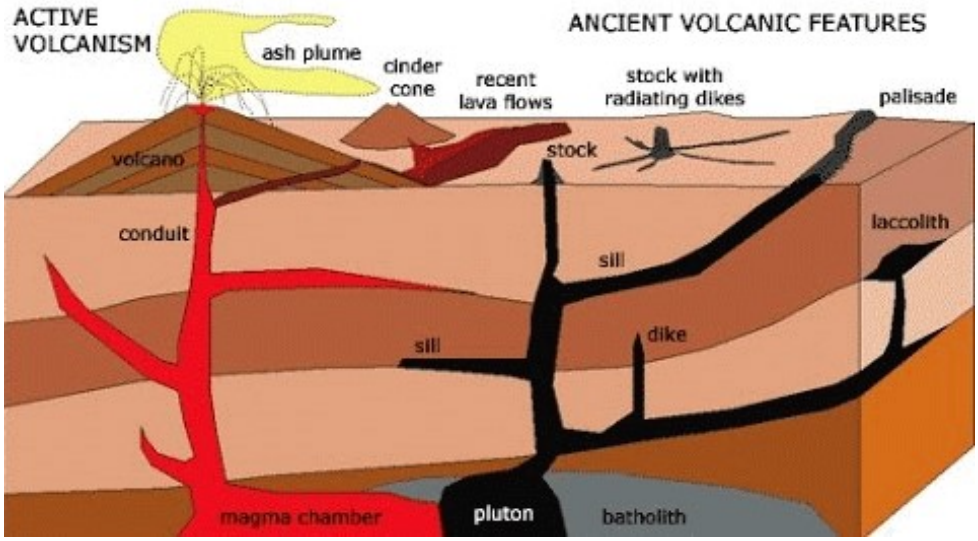
Unconformities are surfaces in a section of rock layers that represent missing time: time during which rock-forming material was not deposited or rocks that were originally deposited, but later eroded away so that the rock record of that time is not represented in the layers.



Unconformities (redrawn from Boggs, 2001)

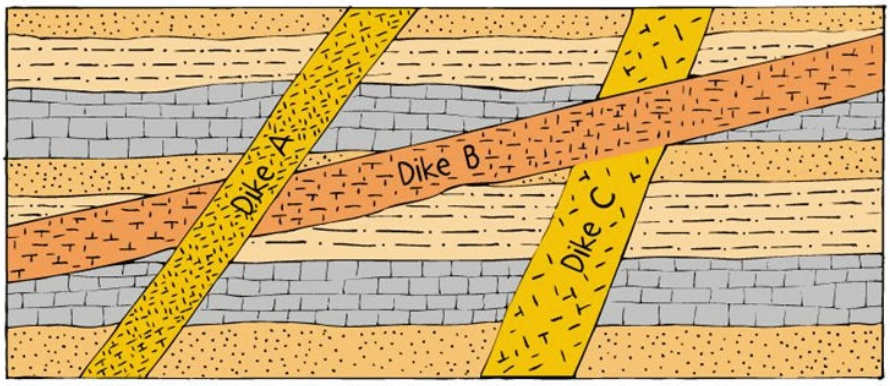
Unconformities are not always easy to spot.

Volcanic rocks can be intruded between pre-existing layers, thus breaking one of the basic stratigraphic principles. Usually there is evidence of the rock above and below getting cooked - thermally altered - which is a clue to the true time relationship. The upper layer must have been present first in order to be cooked by the volanic magma.



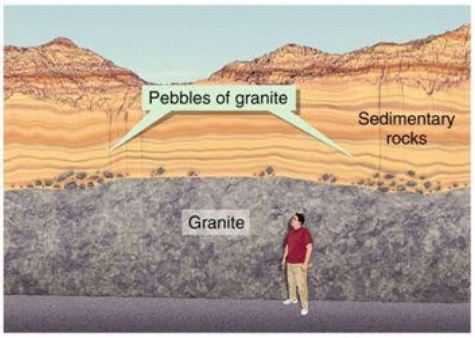
Near vertical intrusions are called dikes, near horizontal ones are sills.

- Cross Cutting – an igneous intrusion or fault that cuts through preexisting rock. This intrusion will be younger than the rock through which it cuts.

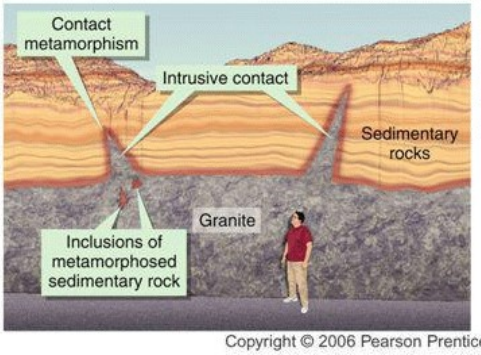


Conceptual Physical Science, Second Edition, by Paul G. Hewitt, John Suchocki, and Leslie A. Hewitt.

- **Principle of Inclusions** – This states that objects enclosed in rock must be older than the time of rock formation

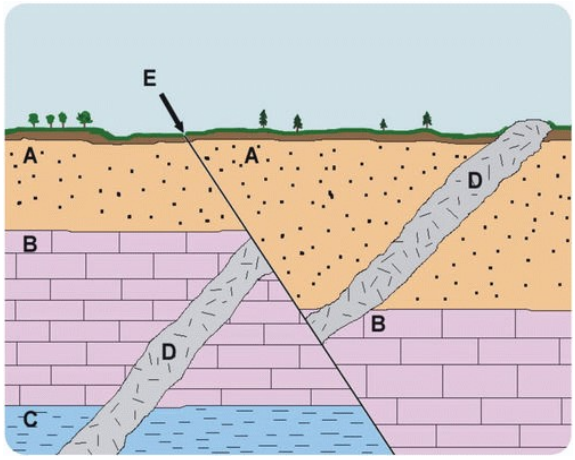


In this diagram, geologists can tell that the sediment was deposited on top of the granite because the lowest sedimentary bed contains pebbles eroded from the granite. Superposition reveals that the sedimentary rocks are younger than the granite.

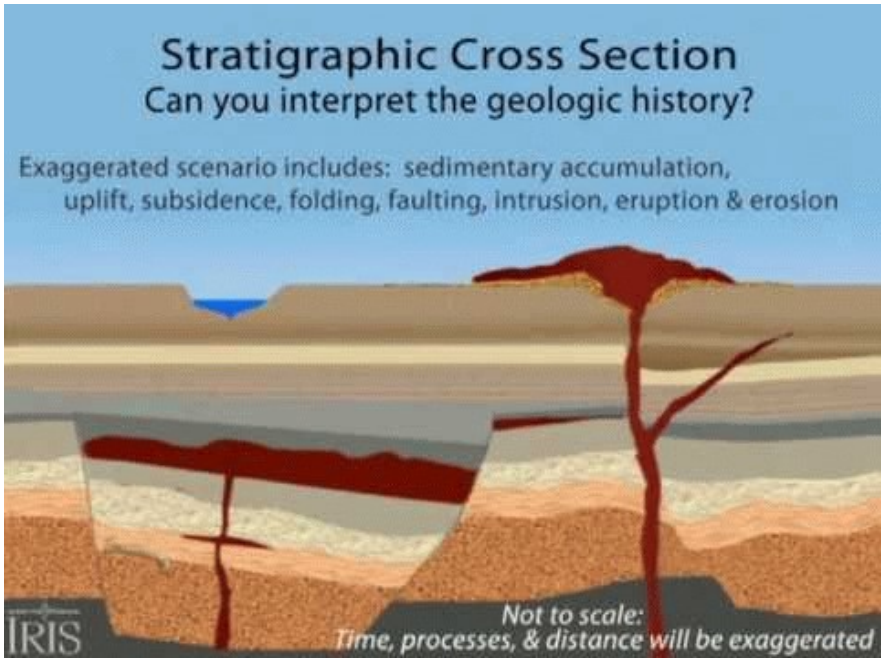


In this diagram, the granite cuts across the sedimentary strata along an intrusive contact and the sedimentary rock is metamorphosed near the contact with the granite. Therefore, the granite must be younger than the sedimentary rock.

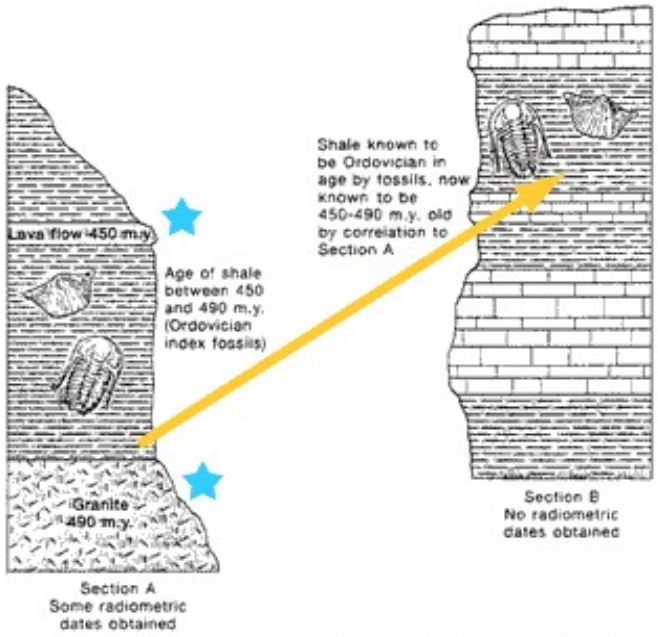
Faults and folds also must be younger than the rock layers that they deform.



The correct sequence from oldest to youngest: C-B-A-D-E.



Fossils and radiometrically datable volcanic rock layers can be used to refine a sequence of events and to put actual numerical dates to different events. Remember that each rock layer corresponds to some event in the past.



The actual age of rocks that cannot be dated radiometrically can sometimes be ascertained by correlation.