IMPOSTER UNCONFORMITY

(Abridged from Churnet, H., 2004. Imposter Unconformity: Part of the Missing an Incomplete Record in Rocks, Proceedings of the Hawaii International Conference, CD ISSN#1544-3361, p. 44-53.)

An imposter unconformity represents a missing record, which is much shorter in duration than the gap in age estimated from rock ages bounding the unconformity surface. Though the designation of imposter unconformity was not previously applied to surfaces, the idea that each sedimentary particle is an imposter unconformity surface at a grain size level is well known. Nonconformities that link up with or are truncated by faults are suspect imposter unconformity surfaces as exhibited in the Grand Canyon sequence and at Death Valley in southwestern USA.

A region that was abruptly uplifted shortly before sedimentation in a subsiding part of the region, such as the Death Valley, California, will serve as a geological model for describing an imposter unconformity surface. Death Valley is a pull-apart basin (Troxel and Wright, 1987) formed subsequent to uplift, erosion, and denudational faulting that propagated westward from Spring Mountains, all within the last 30 million years (Burchfiel and Wernicke, 1989). The Panamint Range was pulled away from the Black Mountains to form the Death Valley (Fig. 6).

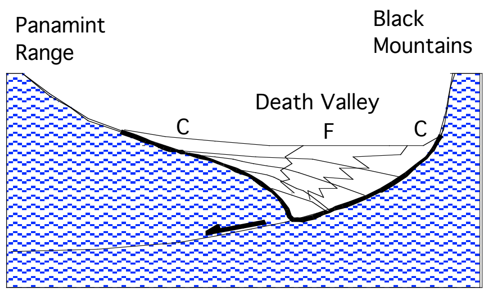
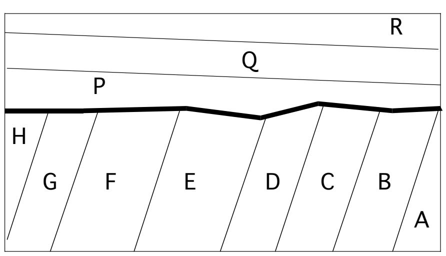


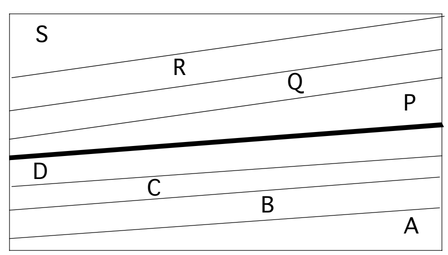
Figure 6. Schematic diagram of Death Valley
C = Coarse grained facies, F = Fine grained facies. Arrow indicates direction of movement of the upper block, the Panamint Range to form the Death Valley depositional basin. Bold contact line represents an imposter unconformity.

The contact between the Cenozoic sedimentary strata and the basin floor is an unconformity that appears to show an age gap between Precambrian and Cenozoic, a gap of over 500 million years.

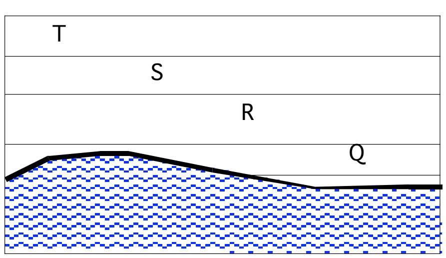
Description of the four major types of unconformities.
Except for the imposter variety, the other types of unconformity are very well known. A brief description of the four major types is given below for the sake of comparison, and line drawings of each type are provided in Figure 9.



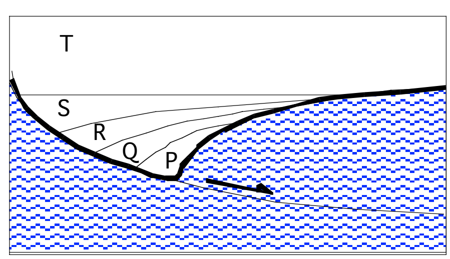
a. Angular unconformity



b. Disconformity



c. Nonconformity



d. Imposter Unconformity

Figure 9. Four major types of unconformities. Bold lines are unconformity surfaces. Patterns represent metamorphic and/or

igneous rocks. Arrow in d indicates direction of block movement. The upper block has rolled over as it slides down a curved normal fault (denudational fault), and has formed a basin (a structural basin called half graben). In metamorphosed faulted and folded belts deciphering between imposter unconformity and nonconformity can be challenging.

1. When an unconformity surface separates strata of different inclination it is called an angular unconformity (Fig. 9a). The unconformity between the Devonian turbidites and the Silurian Old Red Sandstone at Siccar Point, Scotland (Fig.10) is a classic example made famous by James Hutton, the father of modern Geology.

2. When an unconformity surface separates strata that are generally parallel to each other it is called a disconformity (Fig. 9b). The unconformity between the Silurian Rockwood Formation and overlying Devonian Chattanooga Shale (Fig.11) in Tennessee is a good example of a disconformity. Another would be the contact between Cambrian strata and the overlying Mississippian strata (Fig. 12) of the Grand Canyon, Arizona.

3. When an unconformity surface separates metamorphic or igneous rocks from overlying strata, it is called a nonconformity (Fig. 9c). The Great Unconformity that separates the Precambrian Vishnu Schist from the overlying Paleozoic strata (Fig. 12) is a well-known example of nonconformity. However, the same Great Unconformity is an example of an angular unconformity in that portion where it separates the Grand Canyon Group from the overlying Paleozoic strata (Fig. 12).

4. When a surface separates rock layers in obvious discordance (fault-like) on one side of an inferred depositional basin, and its continuation appears to be a nonconformity it is herein called an imposter unconformity (Fig. 9d). The contact between the Vishnu Schist and the Grand Canyon Super group likely is an imposter unconformity (Fig.12). The imposter unconformity surface was activated at least two separate times, once 1200-1100 Ma during the deposition of the Unkar Group, and then 800-742 Ma during the deposition of the Chuar Group (Timmons and others, 2001). Though the fault-like contact appears to give a continuous unconformity surface, spanning over 700 Ma and ranging from 1200 to 540 Ma, in realty that surface marks only a couple hundred million years each that were activated at two separate times. The initial and reactivated faulting resulted from extensional processes.

Figure 12. View of the Grand Canyon from Arizona across the Colorado River into Utah. Dashed black line represents a disconformity between Cambrian and Mississippian strata. Solid black line represents the Great Unconformity that separates Precambrian rocks from Paleozoic strata. Part of the Great Unconformity is a nonconformity that separates the Vishnu Schist

from Paleozoic strata, part of it is an angular unconformity that separates the Grand Canyon Super group from Paleozoic strata. Solid white line represents an imposter unconformity that separates the Vishnu Schist from the Grand Canyon Super group.

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