Relative Dating

Objectives

- **Explain** how relative dating is used in geology.
- **Explain** the principle of superposition.
- **Describe** how the geologic column is used in relative dating.
- **Identify** two events and two features that disrupt rock layers.
- **Explain** how physical features are used to determine relative ages.

I. The Principle of Superposition

A. What Is Superposition? The principle that states that younger rocks lie above older rocks in undisturbed sequences is called superposition.

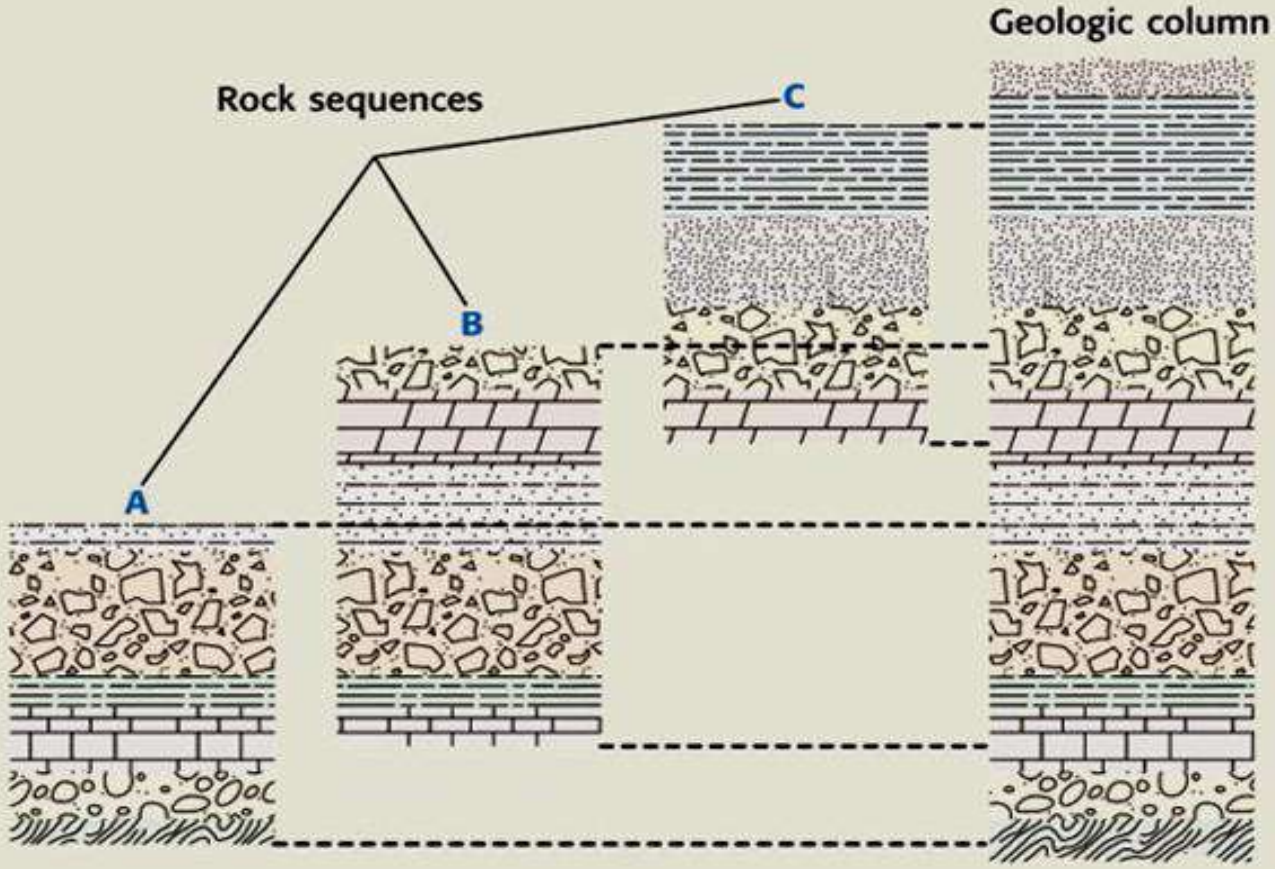
B. Disturbing Forces Not all rock sequences are arranged with the oldest layers on the bottom and the youngest layers on top. Some rock sequences are disturbed by forces within the Earth.

C. Relative Dating method of determining whether an event or object is older or younger than other events or objects.

II. The Geologic Column

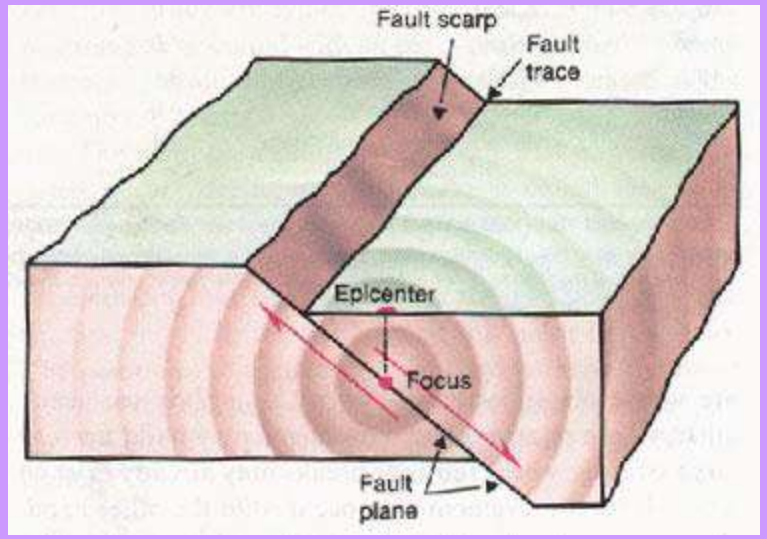
A. What Is the Geologic Column? The geologic column is an ideal sequence of rock layers that contains all the known fossils and rock formations on Earth, arranged from oldest to youngest.

Here, you can see three rock sequences (A, B, and C) from three different locations. Some rock layers appear in more than one sequence. Geologists construct the geologic column by piecing together different rock sequences from all over the world.



III. Disturbed Rock Layers

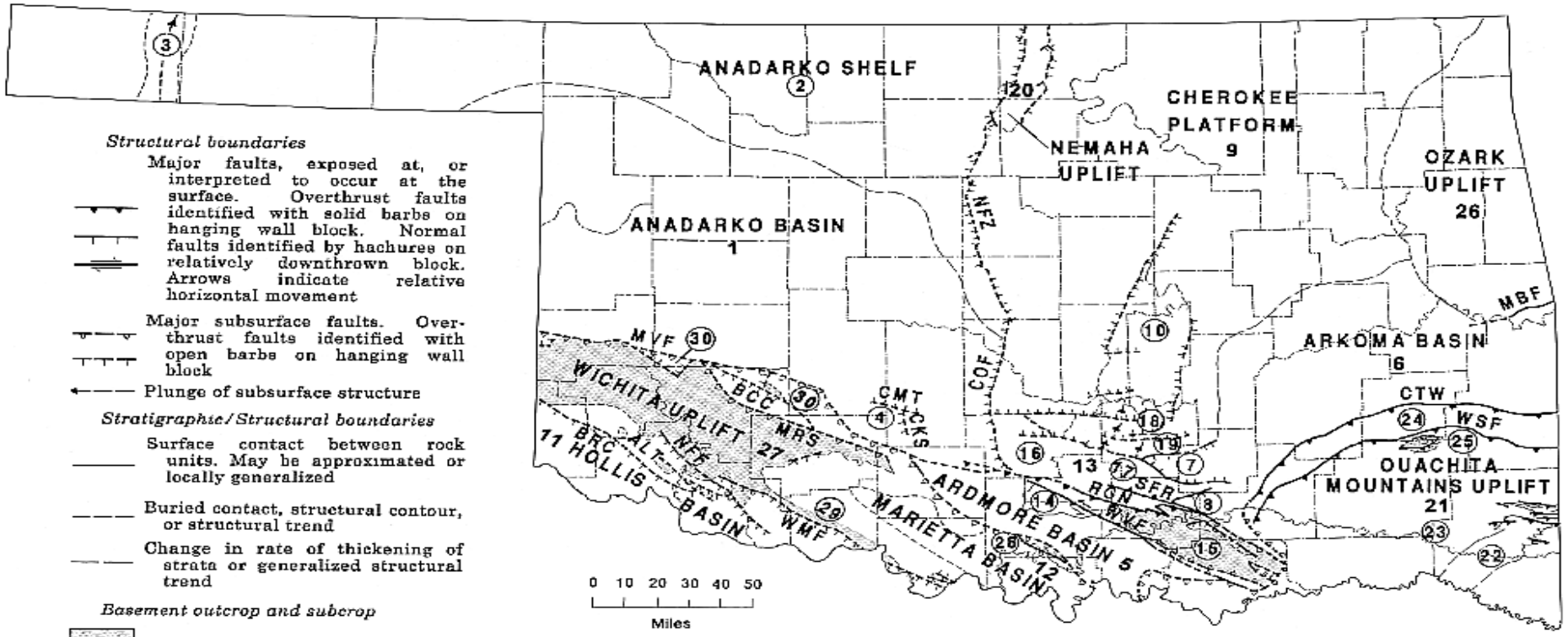
A. Types of Disturbances Faults and intrusions are examples of features that cut across rock, thus disturbing the layers.



GEOLOGIC PROVINCES OF OKLAHOMA

Robert A. Northcutt and Jock A. Campbell

1	***Anadarko Basin***	11	***Hollis Basin***	21	***Ouchita Mountain Uplift***
(2)	Anadarko Shelf	12	***Marietta Basin***	(22)	Broken Bow Uplift
(3)	Cimarron Arch	13	***Arbuckle Uplift***	(23)	Ouachita Central Region
(4)	Cyril Basin	(14)	Arbuckle Mountains	(24)	Ouachita Frontal Thrust Belt
5	***Ardmore Basin***	(15)	Tishomingo-Belton Horst	(25)	Potato Hills
6	***Arkoma Basin***	(16)	Pauls Valley-Hunton Horst	26	***Ozark Uplift***
(7)	Franks Graben	(17)	Clarita Horst	27	***Wichita Uplift***
(8)	Wapanucka Graben	(18)	Ada High	(28)	Criner Uplift
9	***Cherokee Platfomm***	(19)	Lawrence Horst	(29)	Waurika-Muenster Uplift
(10)	Semonole Structure	20	***Nemaha Uplift***	(30)	Wichita Frontal Fault Zone



Structural boundaries

Major faults, exposed at, or interpreted to occur at the surface. Overthrust faults identified with solid barbs on hanging wall block. Normal faults identified by hachures on relatively downthrown block. Arrows indicate relative horizontal movement

Major subsurface faults. Overthrust faults identified with open barbs on hanging wall block

Plunge of subsurface structure

Stratigraphic/Structural boundaries

Surface contact between rock units. May be approximated or locally generalized

Buried contact, structural contour, or structural trend

Change in rate of thickening of strata or generalized structural trend

Basement outcrop and subcrop

Pre-Pennsylvanian strata missing

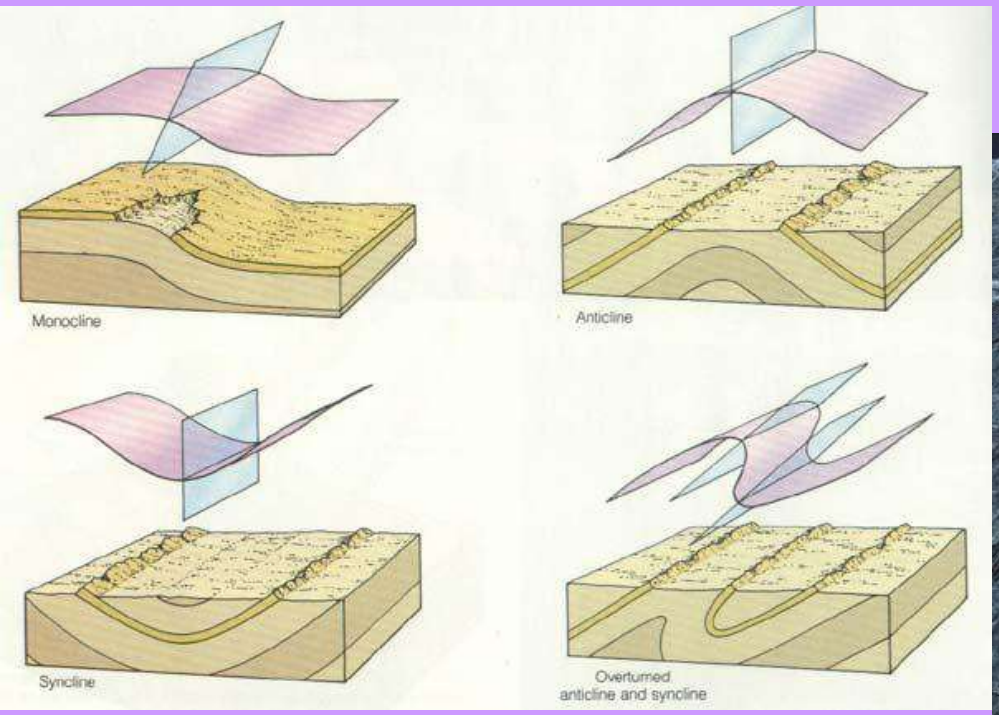
MAJOR FAULT BOUNDARIES

ALT	Altus Fault	COF	Central Oklahoma Fault Zone	NFF	North Fork Fault
BCC	Blue Creek Canyon Fault	MRS	Meers Fault	RGN	Reagan Fault
BRC	Burch Fault	MVF	Mountain View Fault	SFR	Sulphur Fault
CMT	Cement Fault	MBF	Mulberry Fault	WVF	Washita Valley Fault
CKS	Chickasha Fault	NFZ	Nemaha Fault Zone	WMF	Waurika-Muenster Fault
CTW	Choctaw Fault			WSF	Windingstair Fault

OKLAHOMA GEOLOGICAL SURVEY

B. Events That Disturb Rock Layers

Folding and tilting are two types of events that disturb rock layers. These events are always younger than the rock layers they affect.



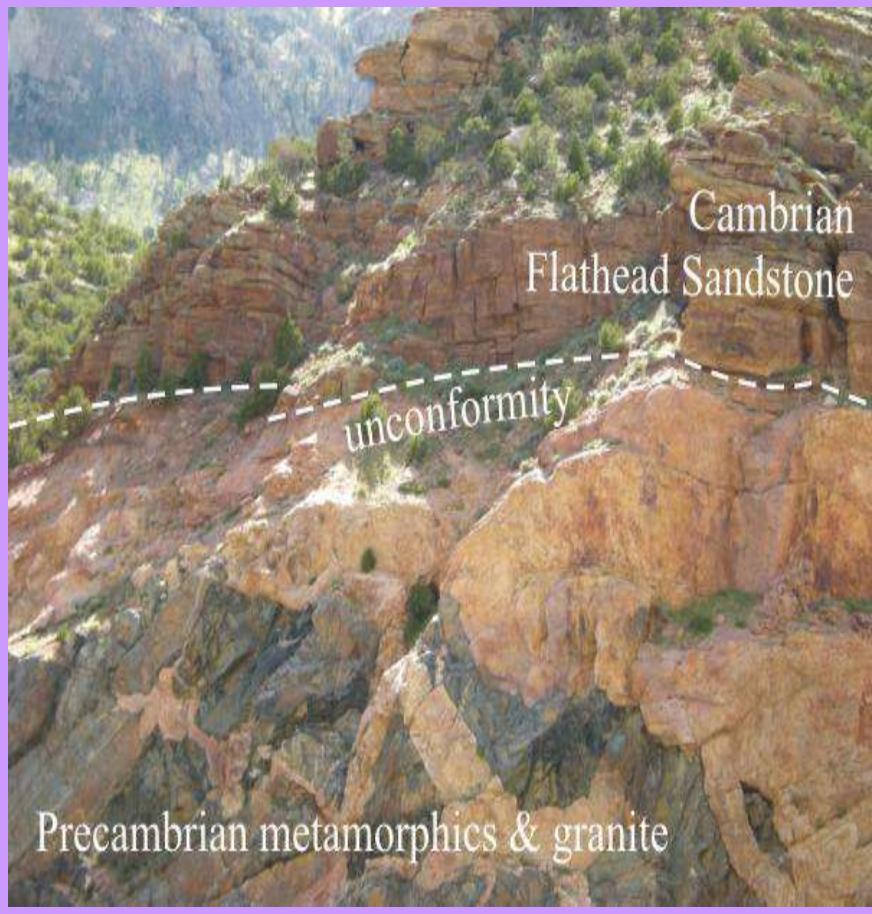
IV. Gaps in the Record-Unconformities

A. Broken Record

Sometimes, layers of rock are missing altogether, creating a gap in the geologic record.

B. Missing Evidence

Missing rock layers create breaks in rock-layer sequences called unconformities. An unconformity is a surface that represents a missing part of the geologic column.



V. Types of Unconformities

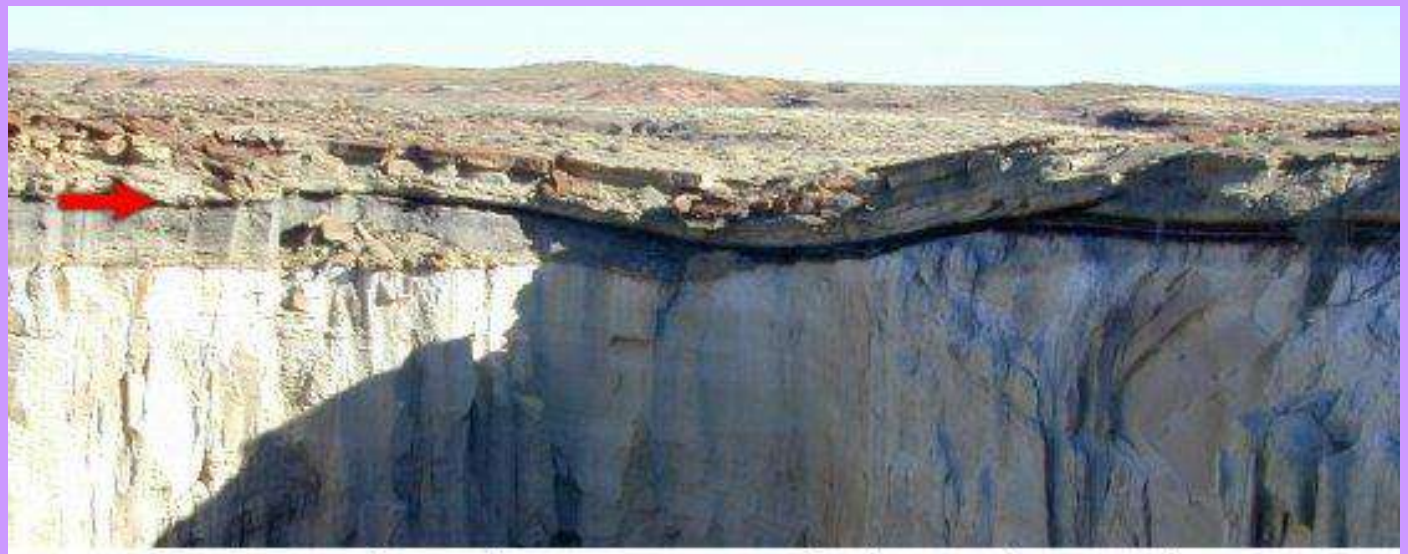
A. **Discomformities** Disconformities are found where part of a sequence of parallel rock layers is missing.

B. **Noncomformities** Noncomformities are found where horizontal sedimentary rock layers lie on top of an eroded surface of older intrusive igneous or metamorphic rock.

C. **Angular Uncomformities** Angular Uncomformities are found between horizontal layers of sedimentary rock and layers of rock that have been tilted or folded.

Critical Thinking Time

Disconformities are hard to recognize because all of the layers are horizontal. How does a geologist know when he or she is looking at a disconformity?

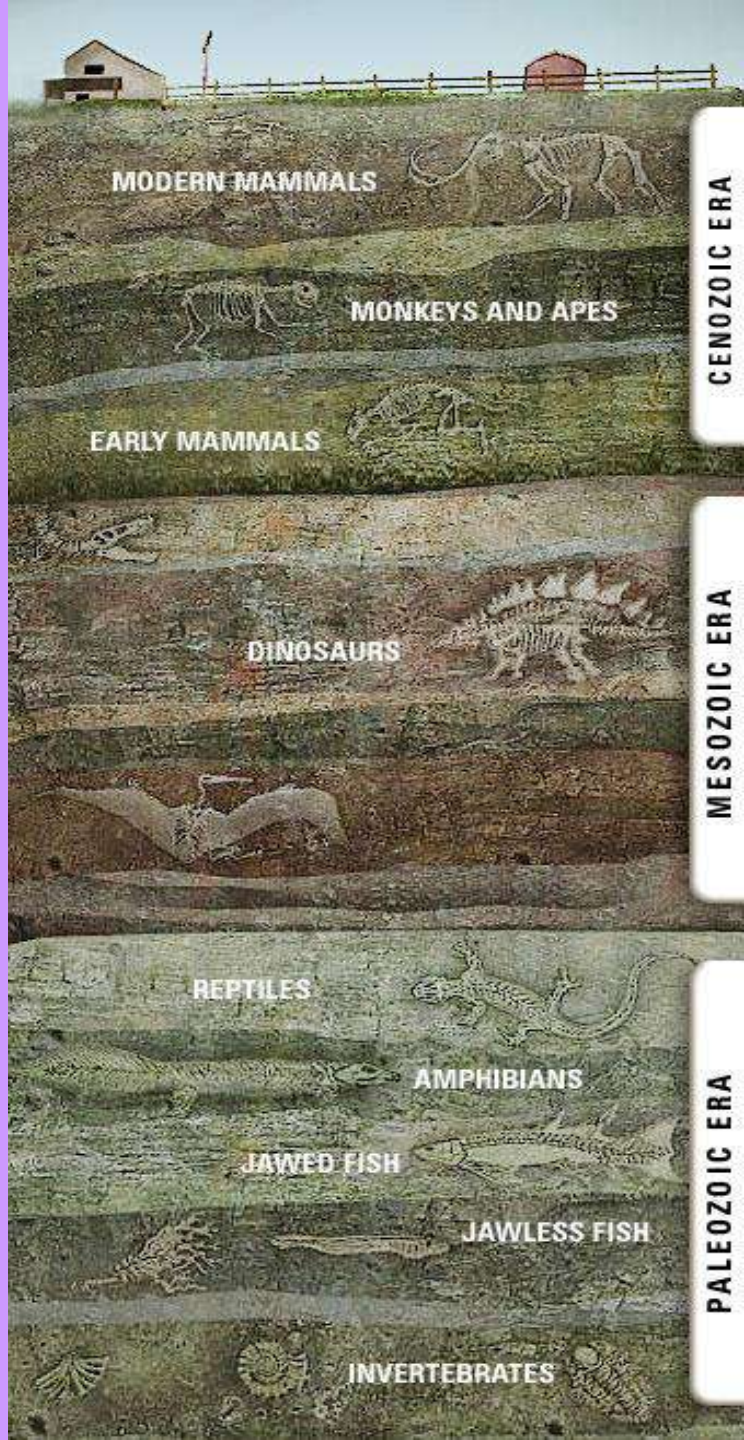


Disconformity in the Dakota Formation (red arrow); note the stream channel that has cut into older layers, including the Cow Spring Formation. Coal Mine Canyon, Arizona

VI. Rock-Layer Puzzles

A. More Than One Disturbance Geologists often find rock-layer sequences that have been affected by more than one of the events and features mentioned in this section.

B. Solving the Puzzle Determining the order of events that led to such a sequence is like piecing together a jigsaw puzzle. Geologists must use their knowledge of the events that disturb or remove rock-layer sequences to help piece together the history of Earth as told by the rock



Science Journal Entry #1

- Draw and label disconformities, nonconformities, and angular unconformities.
- Identify the youngest and the oldest rocks in each example.
- Draw and label examples of faults, intrusions, folding, and tilting.