Geoscience 001 Fall 2005

Rock Identification and Contextual Interpretation

The purpose of this week's lab is to gain some more experience and practice in identifying rocks and then interpreting the geologic history of a region based on the context of the different rocks – their relationships to one another. Geologic history is a story told by sequences of rocks and other features like faults and unconformities. The first and most important step is always the identification of the rocks because different rocks form in different ways — a particular rock implies a set of processes and an environment of formation that can contribute a great deal of information to the history of a region.

Faults and unconformities also provide important parts of the story. An unconformity usually represents a good deal of missing time, which is like tearing a bunch of pages out of a book. This might seem like a useless feature, but you can still say some things about what must have happened during that missing time. For instance, if you have an unconformity in which metamorphic rocks that formed at depths of around 20 km below the surface are covered by sediments (which are obviously deposited at the surface), then you've got to explain how 20 km of material was removed — no small task. Erosion is limited by sea level (rivers cannot erode below sea level and wave action is confined to the upper 100 meters of the oceans), so erosion alone cannot do the job. We require some process to actively uplift the rock as the surficial layers are stripped away by rivers — this process is generally called uplift and is usually driven by crustal thickening, which is in turn caused by compression of the crust related to larger processes of plate convergence and collision. As you can see, some big things are hidden in the form of the modest-looking unconformity.

There are nine unknown samples to be identified. Carefully examine each one and fill out the identification form for each, providing as much information as possible. Make use of the lab manuals and the rock identification charts in the lab.

Once you have identified the rocks, fill in the blank spaces of the schematic cross-sectional view of our mystery region using the appropriate symbols shown below. This is a schematic cross-section, which means that it does not necessarily represent a particular slice through the upper crust, but is instead a kind of cartoon that represents the relationships observed in a specific area. Then, , construct an outline of the geologic history following the example shown here. It will be useful to study the example carefully to make sure you can follow the kind of reasoning that is used to construct the geologic history. Note that you have to explain the formation of all the rocks, but also the faults and unconformities as well.

Sequence of Geologic Events

(to be read from the bottom up)

youngest

Uplift and erosion, forming modern topography(9)

Thrust faulting (8) from tectonic compression

Deposition of fluvial sandstone and conglomerate (7) deposited by rivers in a terrestrial environment near mountains — suggests a fall in sea level or regression relative to previous formation

Deposition of shallow marine sandstone (6) — suggests a regression or sea level fall relative to previous formation

Deposition of deep marine shale (5) — suggests a transgression or sea level rise relative to previous formation; could be related to crustal thinningimplied by the normal faulting

Normal faulting (4) from tectonic extension

Deposition of shallow marine limestone (3) — suggests a sea level rise (transgression) relative to the underlying unconformity, which probably formed by erosion above sea level

Unconformity (2) — lots of uplift and erosion because schists form at depths of greater than 15 km below the surface

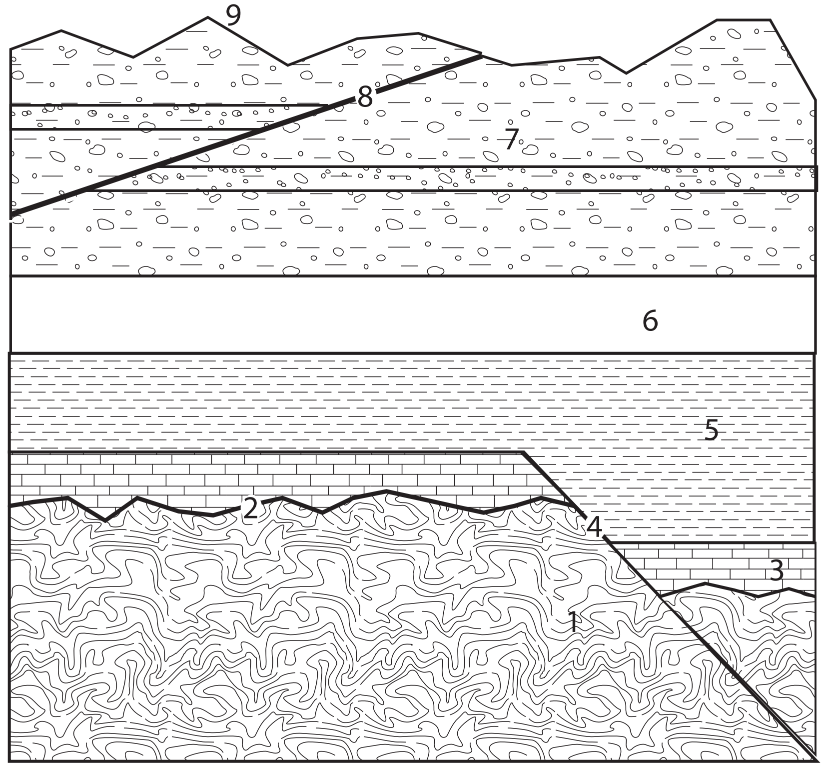
Metamorphism and folding of shales and sandstones to make schist (labeled 1) — suggests major tectonic compression

Deep burial to around 15 km or more.

Deposition of a thick sequence of shales and sandstones

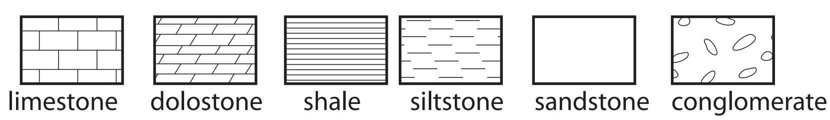
oldest

Geologic Cross Section

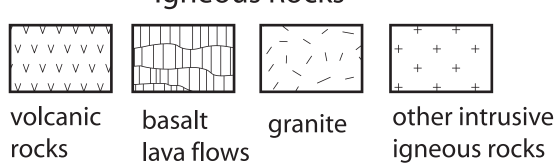


Standard Lithologic Symbols

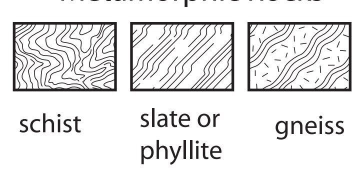
Sedimentary Rocks



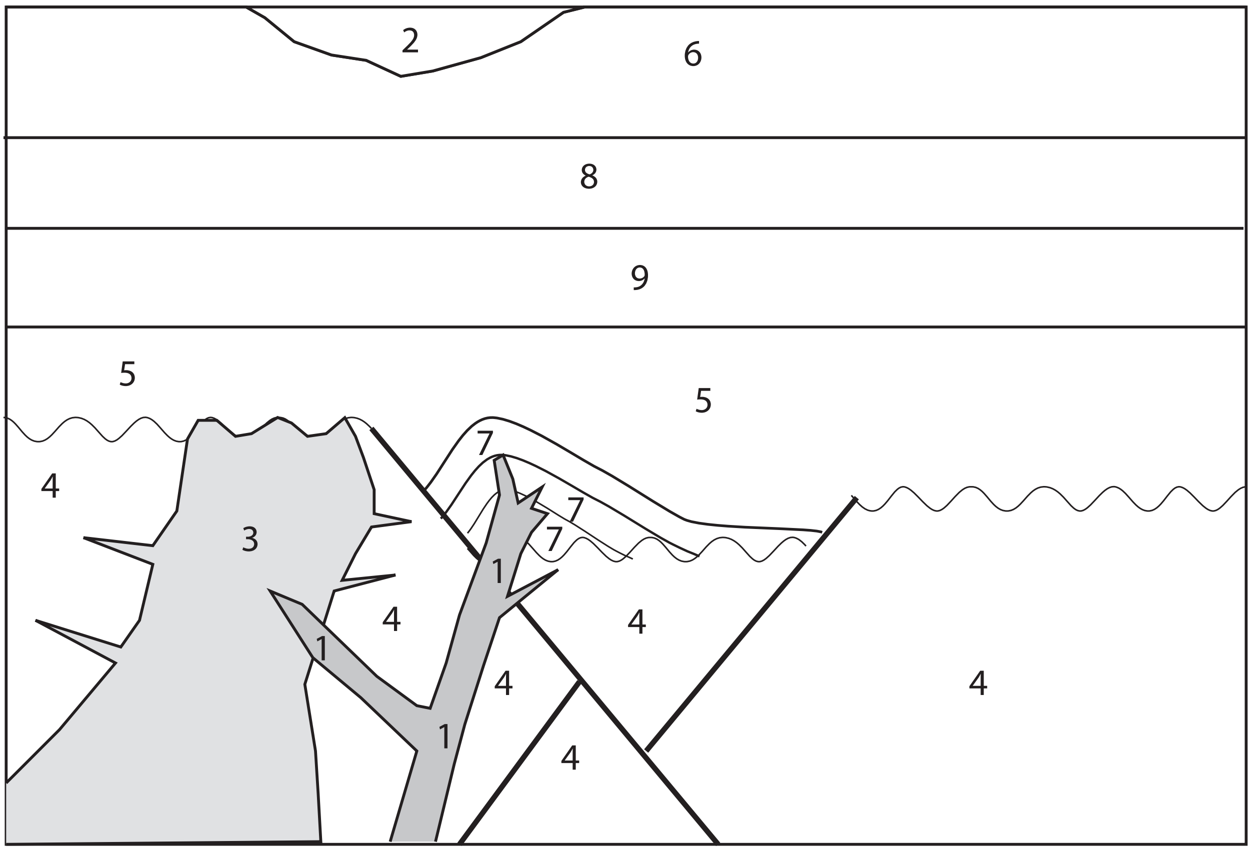
Igneous Rocks



Metamorphic Rocks



Schematic Geologic Cross Section



Rock Identification

#1

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ______________________________

Identifiable Minerals ______________________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ______________________________

Rock Name ______________________________

#2

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ______________________________

Identifiable Minerals ______________________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ______________________________

Rock Name ______________________________

#3

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ______________________________

Identifiable Minerals ______________________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ______________________________

Rock Name ______________________________

#4

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ______________________________

Identifiable Minerals ______________________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ______________________________

Rock Name ______________________________

#5

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ______________________________

Identifiable Minerals ______________________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ______________________________

Rock Name ______________________________

#6

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ______________________________

Identifiable Minerals ______________________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ______________________________

Rock Name ______________________________

#7

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ____________________

Identifiable Minerals ____________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ____________________

Rock Name ____________________

#8

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ____________________

Identifiable Minerals ____________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ____________________

Rock Name ____________________

#9

General Rock Type (circle one): igneous metamorphic sedimentary

Color(s) ____________________

Identifiable Minerals ____________________

____

Texture (terms depend on whether it is igneous, metamorphic, or sedimentary)

____

Fossils (if present) ____________________

Rock Name ____________________