INTRODUCTION TO GEOLOGICAL PROCESS IN ILLINOIS

GEOLOGY

THE SCIENCE OF GEOLOGY

Geology is the scientific study of the earth. The principles of science provide a method by which we understand how natural processes work and how natural features are created.

Science

Science operates on the premise that the natural world behaves in a consistent and predictable manner, and through careful inquiry, we can determine how natural processes work. The method of scientific inquiry generally follows the following steps.

STEP	EXAMPLE
Make an observation	The window is wet.
Develop a question for investigation	Why is the window wet?
Collect facts	Take a picture, collect a sample
Form a hypothesis or hypotheses T Must be based on facts T Must be testable T Must be falsifiable T Should be as simple as possible	Rain Lawn sprinkler Snow Condensation Spit from a passer-by Squirt gun Window was washed
Test/Collect data	T Test the liquid. (Is it water? Is anything dissolved in it?) T Check the weather. (Did it rain or snow? What was the humidity?) T Check with building staff. (Was the lawn watered or the windows washed?) T Examine the pattern of the liquid on the window. (With which hypothesis is it consistent?) T Try wetting the window with each of the hypothesized methods. T Make a laboratory model of the window and test the methods.
Revise and develop a theory	Based on the data, which hypothesis has not been ruled out and has the most support?
Share results	Present the research and conclusions (verbally or in writing). Prepare for critique!
Continue to test & collect data & revise theory	

One of the most misunderstood terms in the process is theory. In common usage, a theory is an off-hand explanation with little support; this is closer in definition to a scientific hypothesis. In science, theories are the best, most well supported explanations. All scientific results are

subject to critique by other experts in the field, but such criticism must be based on the data. Scientific theories are constantly revised, but the core ideas are less likely to change.

Geology
Geology is the application of scientific principles to the examination of earth processes, materials, and features. The study of geology has its roots in prehistory, but serious study by individuals focusing solely on the earth and its process began in the 1700's. Since then, geology has grown and developed numerous sub-disciplines many of which will be touched on in this course. Some of the major sub-disciplines include:

- Mineralogy (the study of minerals)
- Petrology (the study of rocks)
- Sedimentology (the study of sedimentary rocks and the process that produce them)
- Stratigraphy (the study and mapping of layered rocks)
- Paleontology (the study of fossils)
- Geomorphology (the study of the Earth's surface and the processes that shape it)
- Geophysics (the use of seismic waves, gravity, and electro-magnetics to study the earth)
- Seismology (the study of earthquakes and seismic waves)
- Vulcanology (the study of volcanoes)
- Oceanography (the study of the ocean)
- Pedology (the study of soils)
- Hydrogeology (the study of the movement of ground and surface water)
- Structural Geology (the study of Earth's structural features)
- Economic Geology (the study of Earth's resources and their uses)
- Environmental Geology (the study of the interactions of humans and the Earth)

Basic concepts of geology
Uniformitarianism or actualism is the idea that the physical, chemical, and biological processes that operate today operated in the past. Although the scale and importance of the processes may have varied (for example, during the ice age, glaciers were a dominant process in Illinois), the way in which those processes operate remains the same throughout time. Short hand for this concept is the geological catch-phrase: "The present is the key to the past." Therefore, to understand a geologic feature, the geologist looks for the evidence of the process responsible in modern environments or through experimentation.

Maps
Geologists use many types of maps when studying the Earth. If you are not familiar with the topographic maps, you should find and review information on their use