Name______________________________________Date_____________Period__________

Geologic Mapping

Background

Geologic maps are very useful tools for the interpretation of Earth history. Showing the geographic distribution of geologic layers exposed at the Earth's surface regardless of their age, geologic maps are among the most important of a scientist's tools. Because of erosion and deformation, it is often quite difficult to piece together the geologic layout of the Earth as these processes bend, fold, fault and erase many of the keys to understanding Earth's geologic past. Geologic maps are therefore very useful in delineating the existence of exposed structural features like folds and faults, the locations and links of seemingly unrelated strata, and the presence of important igneous and metamorphic features. Most often, the basic geologic map is created from data obtained by field geologists doing detailed mapping of a local area using a standard topographic map as a reference. However, with today's modern technology, aerial photos and even satellite imagery are now used to map much of the Earth's surface and have served to greatly enhance the data collecting ability of geologists. Once all data is configured together, the final maps are produced (now often as GIS products).

North American Geology

In general, the continent and all of its landforms are a direct function of its different rock and mineral deposits and the ongoing modification of these deposits by major weathering processes. Currently, the United States is divided into 25 major geologic zones, called ***terranes***, where the rock types, their structure and ages are roughly similar. Since most geologic maps are regional in scope, it is not unusual to see several of these zones on a single map. For instance, Montgomery County (PA) is part of a linear region stretching from New York state to Alabama. Consisting of mainly regionally deformed metamorphic rock, this geologic province is known as the *Piedmont Terrane*. Like the Piedmont, each other province has its own distinctive set of geologic structures and other variables that sets it apart from the others. The uniformity and similarities of the overall geology within a province therefore suggest that processes of geologic change have affected the area as a unit and that all parts of the region have a similar geologic history.

Strangely enough, the present landforms of the United States are relatively young and were only developed during the late Cenozoic Era. Extensive glaciation during the Pleistocene Epoch, for instance, forever changed the appearance of the mountains of the western US, the Great Lakes region and even sections of northern and central Pennsylvania. Most of the modern river systems of the US and the creation of the Great Plains also attained their present appearance as these same Pleistocene glaciers receded and melted. However, as the rivers ran in torrents and mountains were scoured bare by ice and wind, they laid bare the geologic skeleton of the United States and allowed scientists a vast window into the geologic past of this region which should not be underestimated. In this lab, you will begin to work with geologic maps, their symbols, keys and patterns to determine the significance they play in geologic research.

AAPG Geologic Maps

For this lab, the geologic maps to be used were published by the American Association of Petroleum Geologists (AAPG). The AAPG is one of the leading geologic associations in America and it is often their members who are hired by the world's major oil and gas companies to perform field surveys and resource prospecting missions. Like most geologic maps, you will find they conform to a few basic standards found in most geologic mapping but, for this series of maps, highways have been added to allow for quick association between a geologist's specific location and the actual rock formation, fault or other feature.

Following USGS standards, rock layers are color coded by their age and follow the scheme listed here:

Geologic System	Standard Color
Quaternary	Brownish-Yellow
Tertiary	Yellow
Cretaceous	Green
Jurassic	Blue-Green
Triassic	Peacock Blue
Permian	Blue
Pennsylvanian	Blue
Mississippian	Blue
Devonian	Blue-Grey
Silurian	Blue-Purple
Ordovician	Blue-Purple
Cambrian	Brick Red
Precambrian	Brownish-Red
Igneous Intrusions	Red, Pink, Orange

Each rock formation also includes a name often derived from a local geographic area: the *Wissahickon volcanics, Antietam dolomite, Allentown limestone*, etc. To determine their age, simply look at the color code used for each layer or read the letter designation found somewhere in the rock layer itself on the map. After a few attempts, the symbol abbreviations used for each geologic time period should become obvious as well.

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Geologic Mapping
Lab Sheet

Map: AAPG Northeastern Region

1. Locate the following regional features and indicate their general location and geologic age (period and MYBP):

	Location	Age(Yrs.)/Geol. Period
A. The youngest volcanic deposits		
B. The oldest known rocks in the region		
C. Good rocks to look for dinosaur fossils		
D. Cenozoic river deposits		
E. Ancient (400-500 MYBP) marine fossils		
F. Large granite deposits for building stone		

2. Completely explain the nature (origin) of the huge blue colored deposits found in central and western PA and southern NY. Include the likely depositional environment and approximate ages.

3. Explain how the term "hiatus" applies to geologic mapping. (Look in the geologic columns to find the term)

4. To the best of your ability, identify the general type and age of the bedrock that Upper Dublin lies upon. Note - On the AAPG map the Northeast Extension of the PA Turnpike (Rt. 476) is identified by its original number, *Route 9*.

5. Approximately 250 million years ago, the supercontinent Pangaea formed and the Mid-Atlantic region of the U.S. had a front row seat to one of the major continental collisions that occurred around that time. Name and describe two pieces of geologic evidence that support this continental "car accident".

6. All things come to an end and, of course, Pangaea was no exception. Whereas #5 asked to identify evidence of Pangaea's formation, there is also ample evidence of its eventual breakup. Although Pangaea broke up in four distinct phases starting about 210 million years ago, Phase 1 was of particular interest to PA. Name and describe two pieces of geologic evidence that support the notion that a portion of PA had a front row seat to its disintegration. To assist with this question, first consult the Paleontology E-Unit section on Plate Tectonics and check out "The Fragmentation of Pangaea" section. Second, do a quick search for a geologic feature widely known as CAMP (Central Atlantic Magmatic Province).