EXAMPLE LAB REPORTS

G202 Lab Exercise 2 – Overview of Minerals, Rocks, and Plate Tectonics

24 January 2006

(good)

PURPOSE / OBJECTIVE

Lab 2 comprised of several activities intended to improve understanding of rocks, minerals, and plate tectonics. The objectives included:

1. Identifying physical properties of minerals, including cleavage, luster, color, and hardness.
    a. Identifying minerals by their physical properties.
2. Identifying physical properties of rocks, igneous, sedimentary, and metamorphic.
    a. Examining the texture, composition, and color of igneous rocks.
    b. Establishing distinguishing characteristics of sedimentary rocks.
    c. Examining the texture of metamorphic rocks.
    d. Naming and classifying metamorphic rocks based on their physical properties.
3. Understanding the general system of plate tectonics
    a. Visualizing the major types of faults.
    b. Identifying the primary features of plate tectonics.
    c. Identifying the plate tectonic system and its features on a world map.
    d. Connecting the tectonic processes with physical landmarks.

METHODOLOGY / TECHNIQUES

The first portion of the lab required the identification and examination of minerals and rocks. The mineral set was assembled in the room and the lab required varying identification techniques to distinguish characteristics of each mineral or rock.

First, in examining mineral properties, cleavage and fracture surfaces were identified based on the diagrams in the lab manual (Busch, 2003), and dilute hydrochloric acid was used to test for effervescence on two samples. Luster was tested by visual evidence of metallic or non-metallic reflection, and the mineral's color was similarly tested based on empirical evidence. The hardness was tested by use of tools - including a penny, an iron nail, and a sample of glass – and determined based on the Figure 3.17 of the lab manual (Busch, 2003). The minerals were then identified based on the determined physical properties.

In the igneous rock portion, textural and compositional evidence was discerned visually for the samples, and then the specimens became identified using Figures 5.2-5.3 on p. 78-79 of the lab manual (Busch, 2003). The questions concerning sedimentary rocks were answered based on the lab manual, p. 94-100 (Busch, 2003). The texture of the metamorphic rocks were concluded based on visual evidence of foliation and non-foliation, then classified using Figure 7.15 on p. 124 of the lab manual (Busch, 2003).

The lab section dedicated to plate tectonics, comprised of drawing and labeling plate tectonic systems, was completed using p. 31 and 26 of the lab manual (Busch, 2003) and visual evidence.

SUMMARY OF RESULTS

The mineral, rock, and plate tectonic lab focused on the identification of mineral and rock properties, as well a general overview of plate tectonic systems. The first portion of the lab, which focused on the physical properties of rocks and minerals, highlighted the tangible characteristics displayed by rocks and minerals, including cleavage, luster, hardness, texture, and composition. The lab contributed to the better understanding of how rocks and minerals are created/composed and how to identify samples of such based on their properties.

The second section of the lab focused on the concept of plate tectonics, how the tectonic system works and the physical geographic manifestations of tectonic actions and boundaries. This section greatly played a part in understanding the plate system, why the physical landscape of the earth is the way it is, and the individual parts of plate boundaries.

REFERENCES CITED

Busch, Richard M., 2003, *Laboratory Manual in Physical Geology.* Pearson Education, Inc. p. 26, 31, 44, 47, 78-79, 94-100.

G202 Lab 3 – Sedimentary Rock Analysis and Classification

31 January 2006

PURPOSE / OBJECTIVE

Lab 3 consisted of several objectives that intended to aide in the understanding of sedimentary rocks, their processes, and the classification of such. The lab objectives included:

1. Answering and recognizing details of sedimentary rocks based on an in-lab video.
2. Identifying the sedimentary processes involved in a sedimentary rock based on the environment/name of the rock.
3. Understanding and measuring the grain size/ sorting of a sedimentary rock.
4. Answering critical questions about the origin of sedimentary rocks.
5. Identifying sedimentary rocks by their geologic name using physical characteristics.

METHODOLOGY / TECHNIQUES

The first portion of the lab simply comprised of answering questions on the lab handout based on the information given in the video at the beginning of the lab.

The second part required the identification of sedimentary processes (detrital, chemical, or biochemical) based on a specific rock or rock origin. These questions were answered based on the information given in the video, pre-lab questions, and Laboratory 6 in the lab manual (Busch, 2003).

The third portion asked for the identification of both grain size and sorting of detrital sedimentary rock samples. To identify these characteristics, a Wentworth scale was used to measure grains if they were large enough, and a chart attached to the lab if grain size was too small to measure. The names of the grain size were then charted based on a table in the lab handout. A chart was also attached to the lab that gave examples of sorting and the sorting of the samples was recognized according to that.

The final part of the lab included the specific identification of sedimentary rocks based on their physical properties. Each rock was identified by origin, composition, grain size/crystal size, and other distinguishing characteristics. Much of the identification was done based on p. 101 of the lab manual (Busch, 2003), but the included tables and charts of the lab handout were also implemented.

SUMMARY OF RESULTS

Lab 3 focused on the analysis and identification of sedimentary rocks. The first portion, the video, helped give a general overview of the sedimentary environments and the processes behind sedimentary rocks.

The second portion, which required the identification of sedimentary origins, allowed for the better understanding of sedimentary systems and the distinguishing characteristics that make a rock detrital, chemical, or biochemical.

The third part comprised of identifying sedimentary texture of detrital rocks. This lab portion greatly assisted in the understanding of how to identify a sedimentary rock by name and how to measure the distinguishing characteristics of a rock.

The final part, which required the specific naming of sedimentary rocks, gave an overall picture of the physical properties of sedimentary rocks. The general differences between detrital, chemical, and biochemical rocks became clearer and the rocks' origins became easier to understand.

REFERENCES CITED

Busch, Richard M., 2003, *Laboratory Manual in Physical Geology.* Pearson Education, Inc. p. 26, 31, 44, 47, 78-79, 94-100.

G202 Lab 4 – Introduction to Sedimentary Structures, Sedimentary Facies, and Stratigraphy.
7 February 2006

PURPOSE / OBJECTIVE

Lab 4 implemented several different objectives intended to introduce the basic concepts of sedimentary structures and facies. These objectives included:

1. Identifying sedimentary patterns, including sorting, grading, grain roundness, and rock identification.
2. Examination of cross-bedding and the processes involved in cross-bedding patterns.
3. Determination of the sedimentary structures in a given sample.
4. Hypothesis of the sedimentary environment from which a sedimentary structure originated.
5. Examination, measurement and analysis of clast shapes.
6. Identification, analysis, and interpretation of stratigraphic sequences and sedimentary facies.
7. Interpretation of geological outcrops displayed by field photographs.

METHODOLOGY / TECHNIQUES

The basic method used in this lab was basic visual evidence. For examining grading, grain size, cross-bedding, etc, the lab manual was referenced (Busch, 2003), as well as the back of the lab packet, which included guides for grading, roundness, bedding, sorting, and other physical properties which required identification in the greater portion of the lab.

In station 4, which discussed sedimentary processes and determining "up orientation," the position of shells at the sea floor bottom was deduced by an experiment of dropping shells in a glass aquarium of water and determining whether the shells landed convex-up or concave-up.

In questions that involved the determination of sedimentary structures and the environment from which they originate, figure 6.11 on pages 108-109 of the lab manual was referenced and used for identification (Busch, 2003).

Station 11 required the measurement by ruler of 10 separate pebbles. Each pebble was measured on three axes – short, intermediate, and long – with a ruler in centimeters. The ratios of short to intermediate axis and intermediate to long axis were determined by division. The results were recorded on a table and entered into a plot graph to determine the correct term for each pebble.

Part 2 of the lab required the identification of rocks to understand stratigraphy. Determination of each sample was completed by referencing figure 6.8 on page 101 of the lab manual (Busch, 2003).

SUMMARY OF RESULTS

The lab dealt with the interpretation of sedimentary facies, structures and stratigraphy. A large portion of the lab was examining specific samples and identifying their properties, including grading, cross-bedding, roundness, etc. This aided in the understanding of what process created each property that a rock displayed.

More importantly, the lab gave the opportunity of interpreting the earth's history based on the sedimentary facies, structure, or stratigraphy displayed in the different portions of the lab. By using the techniques taught in the lab, samples could be hypothesized about and conjectures about each rock could be made. Geology is, of course, the study of the earth and its history, and the determination of the history of a rock is a large portion of that foundation.

REFERENCES CITED

Busch, Richard M., 2003, *Laboratory Manual in Physical Geology.* Pearson Education, Inc. p. 101, 108-109w

G202 Lab 5 – Introduction to Topographic Maps

14 February 2006

PURPOSE / OBJECTIVE

Lab 5 focused on the understanding and conception of topographic maps. It included the following objectives:

1. Understanding the basic portions of topographic maps, including scale, gradient, contours, distance, etc.
2. Measuring the basic portions of topographic maps
3. Locating and identifying specific parts of topographic maps.
4. Calculating numerical portions of topographic maps.
5. Understanding and examination of aerial photographs

METHODOLOGY / TECHNIQUES

This lab required a combination of several techniques to decipher and analyze specific aspects of the topography. Certain portions of the lab required simply the identification of specific topographic features based on evidence on the map. Latitude and longitude, location of specific landmarks, contour lines, and other facts were determined by information on the maps themselves.

The determination of fractional scales and distances were identified using simple conversion techniques that changed km to miles, feet to inches, etc. Simple math was also used to determine gradient in portion F of 1-8. As was it used to determine vertical exaggeration.

To determine bearings, both azimuth and quadrant, protractors were used. With the protractors the degrees were simply measured and recorded.

A handful of questions were answered based on questions in the lab manual, mainly the questions in Part 1 of the lab (Busch, 2003).

To answer one of the questions of the lab, it was also required that we make a topographic profile. This included the graphing of a cross-section of a portion of a topographic map.

For the aerial photography portion of the lab, visual evidence was used to discern the answers to the questions that required hypothesizing about pictures of areas. Also used was a stereoscope, which allowed us to view the aerial photographs in three dimensions, further advancing our conception of the landscapes.

SUMMARY OF RESULTS

The majority of the lab presented questions and concepts that had to do with topographic maps. The problems that were included allowed me to read a topographic map, understand what the symbols mean, and interpret the geology by using that knowledge. By understanding topography, greater understanding of geological landscape can be developed. It is important to know about the context of locations and geological structures, which often must be obtained by the usage of maps.

The other portion of the lab discussed aerial photography. The problems mostly discussed identification of geologic structures based on 3-D aerial photographs. Aerial photographs are important due to their visualization of otherwise unidentifiable geologic structures. By identifying structures on aerial photography, we can make inferences about the landscape of the area, and understand more about the geological processes of the local geology.

REFERENCES CITED

Busch, Richard M., 2003, *Laboratory Manual in Physical Geology.* Pearson Education, Inc. Pg. 144-168.

G202 Lab 6: Fluvial Processes

21 February 2006

PURPOSE / OBJECTIVE

Lab 6 involved the examination of fluvial processes, including streams, rivers, and others. The objectives of lab 6 included the following:

1. Identification of major processes of streams and their landscapes.
2. Analysis of topographic maps of fluvial environments.
3. Interpretation of geologic processes involved with fluvial systems.
4. Determination of geologic history behind the development of specific fluvial qualities.
5. Quantifying the basic qualities of fluvial environments, i.e. gradient, distance, etc.

METHODOLOGY / TECHNIQUES

The first section of the lab required many different techniques to determine information involving fluvial processes. The section depended entirely on questions and figures taken directly from the lab manual (Busch, 2003)

Specific questions required the analysis of maps, which included several different techniques. Simple calculations were necessary to determine the gradient of specific streams. To determine distances between points or distance of erosion, the value was calculated by marking the distance on a piece of paper and then comparing it to the graphical scale.

To determine physical properties of fluvial processes, such as channel types or stream drainage patterns, figures 11.1 and 11.2 from the lab manual were referenced for comparison on the maps (Busch, 2003)

To interpret questions 8 and 15, which implemented figures 11.8 and 11.10 from the lab manual (Busch, 2003), pocket stereoscopes were used. This allowed for the 3-dimensional interpretation of the aerial photographs.

Additionally, questions 36-38 were answered by visiting the FEMA homepage and searching for the information about NFIP and other flood dangers.

The final section of the lab was completed by watching a video entitled *Earth Explored,* which was viewed at the beginning of the class period. To complete the questions, the TV outline in the back of the lab packet was used.

The bulk of the remaining questions pertained to interpretation of the geological processes apparent in the maps. These questions were answered by using the content of pages 210 –229 in the lab manual (Busch, 2003), visual evidence, and prior knowledge that applied to the analysis of the geologic properties.

SUMMARY OF RESULTS

Lab 6 was an overview of the basic properties of stream processes, landscapes, mass wastage, and flood hazards. The geologic concepts included: stream drainage patterns, drainage basins/divides, physical properties of streams (channel type, etc.), stream weathering, river valley properties, stream erosion, and flood hazard assessment.

The questions in the lab packet of lab 6 pertained to the analysis of topographic maps, including various problems that pertained to the geologic hypothesizing about the areas displayed.

The lab greatly attributed to the knowledge of general stream/river processes. It also enhanced the quality of topographic analysis. The lab taught helpful lessons in flood dangers and preparation. Additionally, the questions contributed to the interpretation of how fluvial structures became the way they did on a basis of geologic processes, how basic sedimentary structures create fluvial environments, and how topography (fluvial topography) points to the basic geologic history of a specific area.

REFERENCES

Busch, Richard M., 2003, *Laboratory Manual in Physical Geology.* Pearson Education, Inc. p. 101, 108-109w

ES202 Lab 7: Groundwater Processes, Resources, Risks

7 March 2006

PURPOSE / OBJECTIVE

Lab 7 involved the examination of groundwater processes and a general overview of the intricacies of groundwater development. The objectives of lab 7 included:

1. Understanding of general groundwater processes, including porosity/permeability, aquifers, etc.
2. Interpretation of the geologic history behind groundwater landscapes.
3. Analysis and understanding of Karst landscapes.
4. Definition of an aquifer.
5. Conceptualization of wells, unconfined/confined aquifers, and well measurement
6. Analysis of porosity and permeability of a sediment.
7. Determination of an aquifer or an aquiclude.

METHADOLOGY / TECHNIQUES

Station 1 of the lab consisted of several different portions, which required different techniques. Simple measurements were needed to ascertain the bed thicknesses, grain sizes and all the groundwater model measurements. Basic graphing techniques were implemented to graph the static groundwater model in part 1. Some simple calculations were needed to determine question 9 in part one – converting the measurements in question 6 to an elevation of 500 ft.

Station 2 of the lab was completed using visual evidence and hypothesis that allowed for the determination of porosity and permeability. The specific definition of each porosity type was found by referencing the lab handout.

Station 3 dealt with models and air photos. All questions required the use of a stereoscope. To answer the questions involving drainage patterns and Karst landscapes, figures 11.2 and 12.2 of the lab manual were used (Busch, 2003)

Station 4 of the lab required the examination of a dynamic groundwater model. Simple measurements were required to determine well and water table data. Calculations were also needed to ascertain the gradient between Well A and Well J.

Finally, the remainder of the lab was filled with questions about groundwater processes that occupied the lab manual (Busch, 2003), and the manual was therefore used to answer the questions.

SUMMARY OF RESULTS

The lab worked with many problems involving groundwater processes. Station 1 assisted in the concept of a simple groundwater aquifer system, displaying the way in which water travels through sediment and through aquifers. It also assisted in the understanding of what makes an aquifer or an aquitard/aquiclude.

Stations 2 aided in the concept of porosity and permeability, what makes a sediment porous or permeable, and the role of porosity and permeability in groundwater systems.

Station 3 helped in the interpretation of geological landscapes. By examining the aerial photographs, hypotheses and analysis was made about the geological processes that create certain groundwater landforms.

Additionally, the lab taught the processes that added to the understanding of wells. This is important, since groundwater is a necessity in our water supply. Generally, the lab's content illustrated the importance and complexities of groundwater.

REFERENCES CITED

Busch, Richard M., 2003, *Laboratory Manual in Physical Geology.* Pearson Education, Inc. p. 230 – 244.

G202 Lab 8 – Glacial Processes and Climate Change

14 March 2006

PURPOSE / OBJECTIVE

Lab 8 consisted of a variety of exercises, in-lab and in-book, that introduced and discussed glaciers and their many processes/attributes. The objectives of Lab Exercise 8 included:

1. Introduction to the general features of glaciers (cirques, horns, tarns, etc.)
2. General understanding of the underlying processes that influence glaciers.
3. Interpretation of glaciated landscapes.
4. Interpretation of glaciated areas on a topographic map.
5. Analysis of the geologic processes of a glaciated area.
6. Analysis of aerial photography of glaciers.
7. Interpretation of glacial models.

METHADOLOGY / TECHNIQUES

The beginning of the lab consisted of a video introducing the general processes of glaciers. A lab handout involving the presentation was completed using the information given in the video.

Part 1 of the lab was a set of questions that pertained to the features and processes of glaciers. The majority of the questions were answered using the chapter on glaciers in the lab manual (Busch, 2003), though the answers were also influenced by the information given by the in-lab video.

Part 2 consisted of a handful of questions from the text of the lab manual (Busch, 2003). These questions were answered based on the information included in the lab manual, including maps and figures. Question 1 pertained to the roundness of rocks in a glacier body, and rock samples were included in-lab. The answers to question 1 were ascertained based on the evidence presented by these samples.

Part 3 included three portions: a topographic map study, an aerial photograph station, and a glacial model section. The topographic map portion required the analysis of glacial evidence using topographic techniques. The locations of glaciers were derived by the Township and Range method. Elevation of the glaciers were determined by recording their highest and lowest contour level.

The answers for the aerial photograph section required the use of stereoscopes, which allowed the examination of each photo in three dimensions. The photographs were analyzed and the features were defined using visual evidence and cross sections/figures in the lab manual (Busch, 2003).

Finally, the glacial models were analyzed using the visual evidence presented, as well as the cross-sections and descriptions in the lab manual (Busch, 2003).

SUMMARY OF RESULTS

Lab 8 worked on a handful of problems involving glacial processes. The in-lab video and Part 1 concisely introduced the major features and qualities of glaciers, giving a general understanding of how glaciers form, what causes them to created the features they do, and how they affect the environment.

Part 2, which implemented the lab manual, gave a large spectrum of questions pertaining to glaciers, all including maps, figures, samples, etc. Answering the questions allowed for greater specification and interpretation of the processes behind glaciers - more specifically, the analysis of tangible evidence for glaciation. This portion assisted in the understanding of how glaciers display themselves in the geologic world.

Part 3 involved the examination of several types of visual diagrams displaying different representations of glaciated areas. Analyzing these figures helped in the general conception of how glaciers display themselves in the natural world and how glaciers affect the land around them.

REFERENCES CITED

Busch, Richard M., 2003, *Laboratory Manual in Physical Geology.* Pearson Education, Inc. p. 230 – 244.