Geology 640T: Geology through Global Arts and Artifacts
22.5 hours lecture, 45 hours lab; 3 credits

General Information
Class Time: Tuesdays 6:10-9:20 + 3 Weekend Fieldtrips
Classroom: 4239N
Prerequisites: None
Instructor: Wayne Powell (wpowell@brooklyn.cuny.edu)
Textbooks: No Required Textbook (Supporting Texts Listed at End of Syllabus)
Equipment: Digital Camera, Hand-lens, Flash Drive
Webpage URL: http://academic.brooklyn.cuny.edu/geology/powell/geol640/geol640.htm

Summary of Assessment
Rock and Mineral Guide 20%
Natural Paint Project and Gallery Walk 10%
Materials in Ancient Culture Halls 15%
Student Field Projects and Guides 20%
Midterm Exam 10%
Final Exam 25%

Objectives of the Course
1. Students will be able to create interdisciplinary, age-appropriate learning activities for students that utilize NYC cultural resources, focusing on the following state-mandated subjects:
   o Minerals and their cultural applications
   o Rocks and their cultural applications
   o Weathering
   o Mining and natural resources
2. Students will be able to identify common rocks, rock-forming minerals, and ore minerals in hand-sample, and describe practical applications of these common earth materials
3. Students will be able to deduce geological/tectonic environments from suites of earth materials
4. Students will be able to describe how availability of earth materials dictate aspects of a culture’s legacy of arts and artifacts
5. Students will be able to extract geological data and metadata from cultural resources.
6. Students will be able to use computer-based media (word processors, Powerpoint, and/or websites) to convey both text and graphic information
<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Lab / Fieldtrip</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Properties and Applications of Minerals (Jigsaw Exercise)</td>
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<td>2</td>
<td>Introduction to Classification and Identification of Minerals and Rocks</td>
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<td>3</td>
<td>The Chemistry of Color (Periodic Table, Orbitals, Absorption and Emission)</td>
<td>Paints from Natural Materials</td>
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<td>4</td>
<td>Bonding (Electronegativity, Types of Bonding)</td>
<td>Hardness of Mineral Groups; Sculpting: Rock and Tools</td>
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<td>5</td>
<td>Crystals (Pauling's Rules, Silicate Structures)</td>
<td>Crystal Form</td>
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<td>Paint Exercise Gallery Walk</td>
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<td>6</td>
<td>Oxidation and Reduction (Chemical Weathering; Greek Pottery; Smelting)</td>
<td>Ore Minerals; Set-up for Rock Tumbler Experiment</td>
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<td>Weekend: Franklin Mine Fieldtrip</td>
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<tr>
<td>7</td>
<td>Sedimentary Processes and Environments</td>
<td>Sedimentary Rocks and Weathering; Examination of Rock-Tumbler Results</td>
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<td>Weekend: Margaret Mead Hall (AMNH)</td>
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<td>8</td>
<td>Midterm</td>
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<td>9</td>
<td>Igneous Processes and Phase Diagrams</td>
<td>Igneous and Metamorphic Rocks</td>
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<td>Weekend: Earth Materials in Ancient Cultures Halls at Metropolitan Museum of Art</td>
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<td>10</td>
<td>Metamorphic Processes and Conditions</td>
<td>Glazing as an Igneous Process</td>
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<td>Rock and Mineral Guides Submitted</td>
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<td>11</td>
<td>Plate Tectonics</td>
<td>Group Meeting Time</td>
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<tr>
<td>12</td>
<td>Earth Materials in Met Ancient Cultures Halls: Presentations and Jigsaw Exercise</td>
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<tr>
<td>13</td>
<td>Project Question Time and Course Review</td>
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<td>14</td>
<td>Presentation of Student Field Projects</td>
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<tr>
<td>Exam Period</td>
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<td>Final Exam; Final Field Guide Submitted</td>
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Method of Evaluation

Paint Project 10%
Purpose of Assignment: To provide a practical example of the application of the mineral properties of streak and hardness in art; to model an activity that could translate to a pre-college classroom.

- Working in groups (3 or 4), students will prepare a palette of colors of gouache paints using powdered samples of common minerals that exhibit a distinct streak (Black: magnetite; Red: hematite; Yellow: Limonite; Green: Glauconite; White: Calcite)
- Each student will conduct research to find a culture that uses/used the limited color palette created in lab, and write a 1-page research summary of their findings. Which culture did you choose? Where did they live? What is the general geological setting in which they live (e.g., volcanic island, coastal mountains, inland plains)? What materials did they use to create painted art? From where did they get their materials? What role did their paintings play in their culture? Did certain colors/pigments have certain meanings?
- Each student will create a painting in the style of their selected culture on an appropriate piece of earth material (stone, wood, tile, etc).
- Artwork and research summaries will be displayed during an in-class gallery walk and discussion. Students will field questions from classmates regarding their artwork and related culture.

Mineral and Rock Guidebook: 20%
Purpose of Assignment: To provide a mechanism for students to systematically organize data on rock and mineral identification/classification, and to compile the applications of these earth materials; to provide a lasting resource that a teacher may use in their own classroom and for classroom preparation; to model an activity that could translate to a pre-college classroom.

- Each student will construct a personal, illustrated mineral and rock guidebook. Students will compile original photographs, physical properties, diagnostic properties, mineral formulae, and cultural applications of samples introduced in lab activities in weeks 1 through 9. Entries will include synonyms, related terms, and variations in the meaning of the rock/mineral name (e.g., meaning of “mineral” to a geologist and a nutritionist, meaning of “marble” to a geologist and an architect).
- The guidebook will be written at a level to be understood by a 10th grade earth science student. Be sure to define all technical terms either within the text or within a glossary.
- Each student will develop a flowchart for mineral identification, and a second flowchart for rock identification. These flowcharts will be included in the guidebook.
- Note that each student may use their own guidebook as a resource during the rock and mineral identification portion of the midterm and final exams.
Materials in Ancient Culture Halls: 15%

Purpose of Assignment: To examine earth materials and their physical properties in a broad cultural context; to model the use of a museum setting in the teaching and learning of earth science; to model an activity that could translate to a pre-college classroom.

- This exercise builds on the class experience at the Margaret Mead Hall of Oceanic Peoples at the American Museum of Natural History, and applies the concepts learned in the Paint Project.
- Each group of students (3 to 5) will examine an assigned collection of ancient cultural artifacts on display at the Metropolitan Museum of Art (Roman, Greek, Egyptian, Middle Eastern, Chinese, or Mesoamerican). Each group will develop a generalized inventory of the earth materials (stone, metal, gems, pigments) used most commonly by this culture, and note for what purposes each of the materials is used (e.g., palaces and temples, homes, housewares, and jewelry). If the use of materials varied over time, the group will document the general trend.
- Students will present their work in a 10-minute PowerPoint presentation on Week 12. The presentation will emphasize the most commonly used earth materials, and for what they were used.
- Each group will prepare a 1-page summary sheet of their findings, and distribute a copy to each student in the class.
- Presentations and summary sheets will serve as the foundation for a follow-up activity, to uncover underlying patterns in materials use globally, and investigate why certain materials are chosen in certain geographic regions.

Student Field Projects and Guides: 20%

Purpose of Assignment: To examine earth materials and their physical properties in the context of New York City culture and history; to model the use of a community setting in the teaching and learning of earth science; to model an activity that could translate to a pre-college classroom.

- Each student will choose a site within NYC to examine in terms of the earth materials used. The site should have a convenient location so that it can be revisited easily, and should contain between 4 and 6 distinct geological materials that can be examined readily. Students will identify the earth materials present, and take into account the properties, age, use, and prestige of the site in interpreting why these specific earth materials were used. The class will be provided with a model assignment that documents the use of earth materials in Grand Central Terminal.
- Each student will present their work in a 10-minute PowerPoint presentation. The presentation will emphasize the identification of materials, and the evidence that led to each identification.
- Peers and instructors will critique the conclusions and offer suggestions for improvement. This constructive criticism will be compiled by the student and used to improve the identifications and interpretations for the written report (3-5 pages) that will be prior to the final exam.
Bibliography of Supporting Texts and Webpages


