

**Department:** SCI

**Course No:** 103 (Honors)

**Credits:** 3

**Title:** Geoscience Through American Studies

**Contact:** Robert M. Thorson

**Content Area:** CA 3 Science and Technology

**Catalog Copy:** SCI 103. Geoscience through American Studies. Three Credits. Spring Semester. Open only to Honors Students. Thorson. Reading-intensive foundation course in geology taught from the perspective of American Studies. A small-group, honors-only version of GEOL 103, Earth and Life Through Time. Readings from American history and literature will be linked to the geology course content. An individual project in the student's area of interest is required.

**Course Information:**a) Designed exclusively for honors students, it will provide a small-classroom experience as an alternative to the large lecture setting. The basic formula is: (1) to build a cohesive group of committed able learners, (2) to have them read 4-6 interesting, short, inexpensive, award-winning books with the right mix of genre, geography, and topic, (3) tie this "liberal arts" experience to a basic geology textbook through cross-referencing and explanation, (4) then carry out individual projects that depend on the geological background. The class atmosphere will be relaxed, honest, and intellectually engaging. Evaluation will be done by both traditional exams, and the individual project.

b)The first third of the course will require the students to read several short paperback books and chapters of books across a variety of genres to illustrate the pervasiveness of geology in local history and literature. Books will be selected for geographic, historical, and topical breadth. The second third of the course will emphasize the connections between what they have read, and the geology text being used in GEOL 103 Earth and Life Through Time, which is required for them as well. The last third of the course will be used for integrative discussions and for the preparation and presentation of student projects which will individualize the learning experience.

A midterm and final exam will be a combination of closed-book short-answer questions designed to assess knowledge and short essays to assess understanding of concepts. These will be graded anonymously and will be worth half the course grade. The other half of the grade will be based on the individual project and student participation/effort.

c)Same as [GEOL 103](#), Earth and Life Through Time.

The origin, structure, materials, processes, and history of the earth and the role played by humans. IN ADDITION, students will be emphasizing linkages between American culture and geology.

Meets Goals of Gen Ed: GEOL105 will address all seven of the goals for general education, with a special emphasis on Goals #2, #5, and #7.

#1 - Becoming more articulate. This will take place during labs and field trips, in which all students will be required to participate in group discussions and to prepare written assignments.

#2 - Intellectual breadth and versatility. As Will Durant once quipped Civilization exists by geological consent. Geology is a pervasive influence in our daily lives because: (a) earth history produced the physical geography that constrained the development of regional culture, (b) geological processes regulate our climate and control our susceptibility to natural hazards, and (c) the energy and materials for our lifestyle are of geological origin. Historically, the gradual emergence of the a scientific, rather than a theistic, world view in western thought came about largely through geological discoveries involving: (a) the age of the earth, (b) the re-interpretation of material (sedimentary rock) originally thought to have been deposited by Noah's flood, (3) the proof that life had undergone catastrophic extinctions, and (4) humans are a product of organic evolution.

#3 Critical Judgment. There is no original "sacred" text for geology in general, and the history of life in particular. Instead, the "text" of deep time is the sum total of the minerals, rocks, fossils, and fuels whose origins have been interpreted by observation, induction, hypothesis testing, and judgment. Having spent a semester handling and thinking about such material cannot help but enhance a student's judgment about really important things.

#4 - Moral sensitivity. Geology -- with its emphasis on linkages and limits -- provides a very broad context in which to assess how human morality influences landscapes and other life systems. There are many examples from earth history in which an evolutionary novelty (a.k.a. "invention") caused permanent, irreversible, global changes. In a similar vein, two evolutionary novelties in the human lineage -- hyper-intelligence and consciousness -- have given us the ability to dominate other ecosystems, and to contemplate the effects of our actions, as well. No other creature has been thus empowered.

#5 Era and Society. We live in a materialist epoch. A rare, but very true bumper sticker for geologists is the one that reads "this car and the road, courtesy of the mining industry. The same can be said for our buildings, and most of our prized objects. Large-scale use of fossil fuels began in the middle of the 19 th century and will likely be over by the middle of the next. It was this energy that allowed the extraordinary-- never before in geologic history -- growth in human population and consumption. A consequence of this energy use is greenhouse-enhanced climate warming, which we will be adapting to long after that energy supply runs out. The environmental tasks for the next century will be dominated by adjustments to reduced use of traditional material and energy resources.

# 6 Cultural Diversity. The unity of all global processes soil erosion, earthquakes, volcanoes, ocean basins is the common backdrop for the diversity of historical outcomes reflected by the position and character of continents and oceans. Unique cultural developments evolved in very specific regions in response to geographic isolation and ambient environmental conditions, all of which are contingent outcomes of geology. Beneath regional culture is physical geology, which, in turn, is the child of geology.

#7 Lifelong education. Unlike the object of bird-watching, geology cannot fly away. Ditto for most wildlife, which will run and hide, unless caged. Once the origins of landscape and material culture become known, most students begin to see the world in a completely different way, something that stays with them their entire lives. The only subject as synthetic as earth history is art history. Both integrate their side of C.P. Snow's two cultures.

### CA3 Criteria:

#1 Body of Knowledge. Geology emerged as a unified science in the early 19th century, when the layer-cake, study of "natural history" (a.k.a. evolutionary biology) merged with "hard-rock" mineralogy (a.k.a. physical chemistry) to contribute to problems involving the origin of the earth and its terrain (ocean basins, mountains, continents, shorelines), which are essentially geophysical in nature.

#2 Nature of Scientific Inquiry. Geology contributes uniquely to this objective, because earth history is an experiment that cannot be run again, and because most of the earth is inaccessible. Hence, induction and hypothesis generation are well developed tools. For example, understanding the core-mantle boundary requires -- on the part of a student -- that they believe something not on the basis of their senses or on hearsay, but on the power of a good scientific argument. Three examples of how geology has influenced scientific inquiry are presented: (1) Historically, evolutionary theory derived largely from what is now a geological sub-discipline, paleontology. Darwin, who worked at a time when biology and geology were unified, credited Charles Lyell's *Principles of Geology* as the bedrock for much of his thinking. (2) The combination of field geology and lab-geophysics (especially seismology, heat flow, magnetism, and gravity) gave us the ability to see our planet as a single enormous machine that endlessly cycles matter into, and out of the crust, vis a vis plate tectonics. (3) This set the stage for understanding global climate change which had been realized from the study of sedimentary layering (stratigraphy), but not understood.

#3 Unresolved Questions. The best way to describe unresolved questions is to ask them. Exactly how will our planet adjust to the climate warming? When will we run out of fossil fuels? What will happen if a large meteorite strikes the earth? Will earthquake prediction ever succeed? If geology can explain "heaven and earth," by which we mean the origin of the atmosphere, oceans, the earth's crust, and the origin(s) of life as physical chemistry, then what role is left for a creator?

#4 Continued learning. A basic course in geology provides a student with knowledge that can be used and added to throughout their life. We are all part of the planet earth, and our lives will be profoundly affected by our interaction with the planet. An introductory course in geology can provide the first step in what will undoubtedly be a life-long learning experience. Without such a course, the learning experience is likely to be more painful and full of surprises.

**Role of Grad Students:** The course is being designed to be independent of graduate students. Involvement of a half-time GA, particularly one from either English or History would benefit the students, the GA, and the instructor.

**Supplementary Information:** Pasted here are a few paragraphs from the successful proposal to the Provost's Office to support new GenEd initiatives, which, as requested above) describe major themes.

Though the course would teach the students about glaciers, coasts, rivers, and volcanic processes, it would do so, indirectly. We would start with “second-floor” subjects already of compelling interest to the serious student such as the California Gold Rush of 1849, Colonial Slavery, Transcendentalism, Moby Dick, and the Battle of Bunker Hill. I would then take each student on a quick tour of the “first-floor” where geography lies, then go down to the basement of geology where we would spend most of our time. Beneath regional culture is physical geography, the offspring of geology.

From their existing understanding of history, they will learn why the America's first European residents at Jamestown Virginia failed to find gold, and why those at Sutter's Mill, California did. This is a story of hydrothermal mineralization, the chemical weathering in soils, and the hydraulics of stream flow.

They will learn why the slave-plantation system worked so well (from the point of view of those who were not enslaved) in tidewater, Virginia, but not in the north. Though cultural factors are compelling to most interpreters, to my mind as a geologist, this is also about the control of space, which is really about the development of a low-gradient micro tidal coastal plain on America's passive tectonic margin. Plantation “overseers” could oversee rather well in a country without hills.

Then there is coal, and its distant remove from its distant geological cousin, iron ore. Great Lakes industry results from many things, chief among them is glaciation. This ice sheet stripped away the overburden strata from northern Michigan Wisconsin, and Minnesota, exposing the truly ancient iron ores of what amounts to a national basement. Drainage from the ice exposed the merely old coalfields of the Appalachian Plateau, while simultaneously creating a transportation corridor of river and rail. Pittsburg simply had to happen.

The battle of Bunker Hill was fought on Breed's Hill, with the “grain” and shape of the glacially streamlined hill setting the stage. On, and on, and on...

From their existing understanding of literature, they will learn that: Ethan Frome is a story about climate change. Moby Dick is really about the security offered by New Bedford's deeply gashed, granite coast. Huckleberry Finn needed the “strong brown god” called Old Man River just as surely as Tom Sawyer needed Injun Cave, a karst cavern. Laura Ingalls Wilder (and Ole Rolvaag) wrote about the prairie grasslands, which are also about the alluvial veneer on top of an old, dinosaurian bone-bearing foreland basin, created by the weight of the growing Rocky Mountains to the west, later destined to become the Great Plains. Paul Bunyan's Babe the Blue Ox didn't stomp out Minnesota's ten thousand lakes (there are actually more); it was the chaos of ice stagnation, which was, in turn, caused by the well-drained bed of the glacier and its low slope on the three-way drainage divide between the St. Lawrence, the Mississippi, and the Red River of the North, which drains to Hudson's Bay. Hawaii is, and always was, about geology, simply because it is too young to have much else, except for the recent exotica of island biogeography.