

SMFT 697: Exploring South Africa's Geologic Environment for Integration into  
High School Earth Science  
Summer 2017

### COURSE DESCRIPTION

This is a three - week field based course to study geology, earth history and current environmental impacts in South Africa. In addition, SMFT students will take earth science content and design and develop curricula around key issues taught in high school earth science.

Specifically, this field trip is designed to teach students multiple components:

- a. **Geological assessment** - The class consists of several exercises that cover fundamentals of geologic mapping using modern tools and methods. You will use GPS and GIS as well as apps from your iPhone (or equivalent) to map rocks and sediments quickly and efficiently. A typical exercise for field camp takes few days to complete and centers around making a detailed geologic map and cross section, accurately recording observations in a field notebook, and writing a summary report interpreting the geologic history and significance of the area. You will learn about earth's history in a part of the world you rarely hear about in your classes. And you will see firsthand some of the best geology in the world. Ours stops have excellent exposures of rocks ranging in age from Proterozoic to Paleozoic (Swassberg pass and Ladismith in the Karoo) to Modern (Langebaan on the Atlantic Coast).
- b. **Environmental assessment** - specifically issues pertaining to water scarcity and water quality (data collection) as well as issues encompassing access to potable water in rural communities including health issues related to access to clean water. Students will also make observations that provide clues regarding stress on the environment. This exercise involves measuring and collecting water quality data using sensor probes, plotting data and interpretation
- c. **Earth history** -studying various depositional environments, stratigraphy and discussing the geological timescale, plate tectonic s, and evolutionary theory.
- d. **Education Integration:** The virtual education field trip will showcase African culture, history and way of life through a series of videos, which can be shared with a primarily underrepresented Charleston area K-12 school. In addition, while in South Africa, we will visit a local school, observing the differences in their instruction. We will develop a relationship with a teacher in Africa to possibly share ideas for an integrated curriculum with a teacher in the United States (at the school where we share the Virtual Field Trip). This educational piece provides an interesting opportunity to share different histories, cultures, geologies, etc. and provides opportunities for future collaborations between educational institutions. In addition, it provides opportunities for young budding scientists to understand different audiences and how to tailor communication based on the audience's needs

### COURSE OBJECTIVES

- a. Learn geologic principles and field skills, and Interpretation of geologic features.
- b. Observe and understand issues pertaining to water scarcity, water quality and pollution
- c. Understand Earth History by applying geologic principles, earth materials, depositional environments, stratigraphy, the geological timescale, plate tectonics, and evolutionary theory.
- d. Integrate content into a high school earth science curricula for dissemination to school in the US.

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**KNOWLEDGE OUTCOMES**

1) Knowledge of the physical world

Students will:

- i. apply geologic terminology
- ii. recognize and interpret geologic history and trends (deposition, structures)
- iii. evaluate environmental issues (water scarcity, water pollution)
- iv. summarize and illustrate fundamental principles, generalizations, and theories appropriate to physical geology

2) Inquiry and analysis

Students will:

- i. show advanced proficiency in using field methods systematically
- ii. explore geology through data collection and analysis (detailed mapping of large scale features (sedimentary sections, intrusions sill and dikes, folds), water quality data collection from ACID mine drainages, wells in rural areas, tap waters etc.
- iii. make logical interpretations from their collected data

3) Critical thinking

Students will

- i. Use field observations to interpret the geologic history of the field area and to integrate it with regional and global geology
- ii. Interpret information and draw conclusions based on the best analysis
- iii. Reflect critically on learning experiences and processes
- iv. Articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts
- v. Listen effectively to decipher meaning, including knowledge, values, attitudes, and intentions
- vi. Demonstrate understanding of the relationship between beliefs, political systems, and environmental values of various cultures
- vii. Demonstrate understanding of environmental issues caused as the result of human interaction with the environment, and knowledge related to alternative solutions to issues

Student Responsibilities:

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- Participate in all course activities.
- During times of discussion, you may find that your ideas and opinions conflict with others in the class, or perhaps your past experiences do not coincide with what is presented during lecture.
  - Pay attention to yourself and others - be considerate of others while they are speaking.
  - Presume positive intentions - be considerate of your peers' opinions to encourage honest and interesting dialogue.
  - Pursue a balance between advocacy and inquiry - Influencing the opinions of your peers is fine, just don't push and also keep your mind open to their ideas.
- Assignments shall be turned at the time it is due. Each student should present his/her original work in a clear and thorough manner. You will use your field journal to write daily field notes and to complete the assignments.
- Be cognizant that we are guests in a foreign country - respect their customs and rituals and avoid any situations that could be misconstrued as being disrespectful.
- Also paramount is your safety in a foreign country that shares little with your background. Always have a travel buddy (more the better) when you explore the neighborhoods outside of class activity periods. Do not accept any "offers" from strangers.
- As a College of Charleston student, you have agreed to follow an honor code. You will receive a failing grade for this course if you lie, cheat, steal, or plagiarize. The Honor Board will be notified for further disciplinary action. (<http://studentaffairs.cofc.edu/honor-system/> for more information).
- CofC has alcohol and drug policy for students in the Student Handbook and this policy applies while in South Africa. Treat all your time as if attending a class. Consume alcoholic beverages in moderation and that only during social events or other appropriate times. If we feel that your behavior is being disruptive (unauthorized escapades, binge drinking at night, being hungover during class time, etc.), we reserve the right to fail you and **send you back home**. **And any cost incurred as a result field etiquette will be charged to the individual.**
- Feel free to consult with Dr. Ali or Instructor Humphreys on any personal issues

### Graded Assessments

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<b>Geologic Observations</b> (15% - 5% each) 1. Langebaan Sediments: notebook - rock description/ observations. Assignment: <b>notebook</b>

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2. Gordon Bay Paleozoic rocks: notebook - rock description/observations. Assignment: **notebook**



3. Table Top Mountain and Chapman's Peak Drive hike: notebook - rock description/unconformities. Assignment: **notebook**



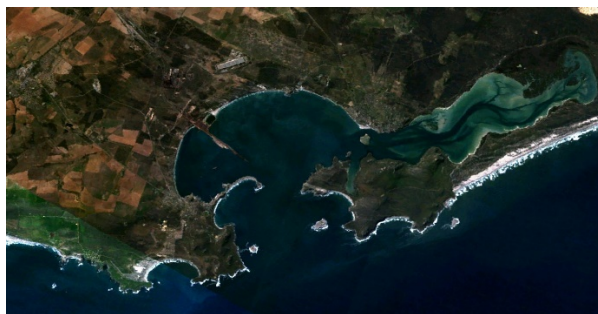
Pick one of the above-mentioned sites and write an interpretive report, considering geologic history (readings and discussion) coupled with your observations.

**Environmental Impact assessment (20%)**

Water sampling, data analysis and plotting, interpretation, and comparative studies (to similar sites in the United States)

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Assessment of the Availability of water in rural areas  
Water quality tests and assessment in Saldanha Bay



Pick one of the above-mentioned sites and develop an awareness brochure for the community (see guidelines below)

**Earth History Discussion (15%)**

Write an interpretive report discussing human history and deep time. How are we linked to the past of Africa? How is ALL modern life linked to the past? Consider the Precambrian, Paleozoic, Mesozoic, and Cenozoic in your discussion.

Prepare a lesson plan for how you might use this timeline to teach the history of the Earth from a South African perspective at a museum - your insights can potentially be used as a display at the Mace Brown Museum of Natural History.

**Curriculum Design and Development (30%)**

Take geologic, environmental, and earth history content and design and develop curricula integrating content, as matched to SC Science, Geography, Math, ELA (and any others of relevance) standards.

Development of a video blog to show students in South Carolina different histories, cultures, geologies, etc.

**Participation/Etiquette (10%)**

**Discussion (10%)**

QRS is an active reading strategy, designed to get students to think more carefully about what they read.

Q = Questions Students write questions as they arise while reading.

R = Reaction Students note their emotional response to reading. Emotional links promote memory.

S = Summary Students write summaries of what they think are the most important points in the reading.

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Evaluation

	Week 1 Exercises	Week 2 Exercises	Week3 Exercises
<u>Knowledge</u>	<u>x</u>	<u>x</u>	<u>x</u>
<u>Inquiry and Analysis</u>	<u>x</u>	<u>x</u>	<u>x</u>
<u>Critical thinking</u>	<u>x</u>	<u>x</u>	<u>x</u>

Grades for all course-related deliverables (e.g., rock descriptions, geologic maps and cross sections, stratigraphic columns, water quality analysis, environmental assessment, participation in discussion, completed assigned work and short written reports) are determined by the faculty. Grades will be based on the level of participation, intelligence of your interpretations; the effort, neatness, clarity, accuracy, pertinence, and conciseness of your work; your creativity and attitude in the field; and the intangible subjective impressions of your instructors. Grades are not helped by sloppiness in work, spelling, grammar, attitude, and poor "**field etiquette**". Deadlines are strictly enforced.