

# GEOLOGY 166: HISTORICAL GEOLOGY

**Instructor:** Garry Hayes - Science Community Center 336

**Phone and Voice Mail:** 575-6294

**Office Hours:** TTh 8:15-8:45; 11:45-12:45, 5:30--6:30

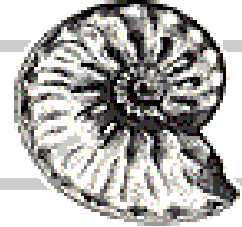
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## Required Texts:

*The Earth Through Time*, Harold Levin



Welcome to the geological sciences! Historical geology deals with the history of planet Earth and the development and evolution of life throughout geologic time. During the semester, we will deal with the origin of the planet and Solar System, the origin of life, the myriads of life-forms that have inhabited the planet, mass extinctions, movement and collisions of continents, and the origins of many of the features we see on earth today.

## Grading Policy: (subject to change due to extenuating circumstances)

Tasks	Points
Midterms	100 points
Final	200 points
Chapter Quizzes	200 points
Laboratory Exercises	300 points
Extra Credit Projects	(50 points)
Total	800 points

**A: 800-720      B: 720-640      C: 640-560      D: 560-480**

The Midterms and Final will each consist of multiple-choice questions, and a selection of essay questions. The final will be comprehensive. Chapter quizzes will mainly be fill-ins and true-false questions. **Quizzes cannot be made up** unless the instructor is notified in advance of an absence. Make-up quizzes will be essay questions.

Extra credit can be earned by completing at least 10 chapter review assignments at five points apiece. Up to 50 points can be earned. You are strongly encouraged to do the extra credit assignments. The chapter review assignments are due at the time of each quiz and **will not be accepted** if they are late. You may get extra credit for attending certain community events on campus. Watch your MJC e-mail account for announcements.

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**“After sleeping through a hundred million centuries we have finally opened our eyes on a sumptuous planet, sparkling with color, bountiful with life. Within decades we must close our eyes again. Isn’t it a noble, an enlightened way of spending our brief time in the sun, to work at understanding the universe and how we have come to wake up in it? This is how I answer when I am asked—as I am surprisingly often—why I bother to get up in the mornings.”**

**Richard Dawkins**

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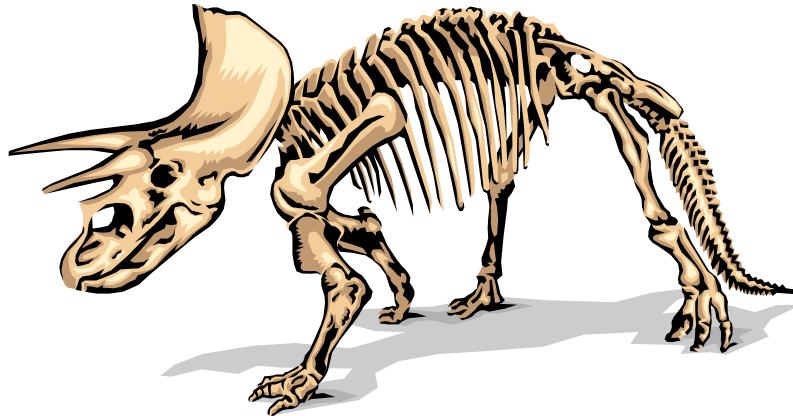
**When does it all happen? (This schedule is really tentative...)**

Week	Date	Topics	Reading
1	Jan 15-17	Intro to Earth History and Geologic Time	Chap. 1-3
2	Jan 22-24	Earth Materials	Chap. 4
3	Jan 29-31	The Sedimentary Archives	Chap. 5
4	Feb 5-7	The Fossil Record	Chap. 6
5	Feb 12-14	Earth Structure and Plate Tectonics(Thursday off)	Chap. 7
6	Feb 19-21	The Archean	Chap. 8
7	Feb 26-28	The Proterozoic Eon	Chap. 9
8	Mar 5-7	Early Paleozoic Events	Chaps. 10
9	March 12-14	Late Paleozoic Events	Chap.11
10	March 19-21	Life of the Paleozoic	Chap. 12
11	March 26-28	The Mesozoic Era	Chap. 13
12	April 2-4	The Mesozoic Biosphere	Chap. 14
13	April 9-11	The Cenozoic Era	Chap. 15
14	April 16-18	Life of the Cenozoic	Chap. 16
15	April 23-25	Human Origins	Chap. 17
16	Final Examination	Tuesday, April 30	Comprehensive

## Surviving Historical Geology

Every student is unique with different strengths and weaknesses. Some of you may find this to be a difficult course, while others may find it to be relatively easy. The most important point to know is that you **can pass this course!** It may, however, be necessary to change some of your study habits and learning strategies, especially if you are just beginning your college education.

The number one rule is this: there is no substitute for effort. **Do not come to my office two weeks before the end of the course asking how you can pass the class.** You will know long before then that you are in trouble.



### **The following tactics have all proven helpful to students over the last few years:**

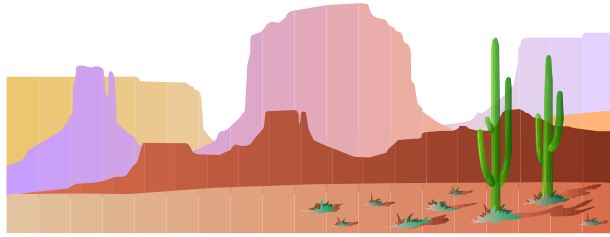
**ALWAYS ATTEND CLASS** - This shouldn't have to be said, but it is truer for science courses than for many others: You will miss a tremendous amount of information if you aren't there. If you **have** to miss a class, you are **still responsible** for all that occurs, including test and quiz announcements. Call me or get notes from someone else in the class. (Also, three (3) consecutive absences will be considered sufficient grounds for dropping you from the course). If you have access to a computer, you can ask questions through the Internet (my E-Mail address is on the first page).

**READ THE TEXT BEFORE THE LECTURE** - Read the text after the lecture. And read it before tests. Do the practice quizzes at the end of the chapters. Books are required for a reason. Make use of them.

**ALWAYS TAKE COMPLETE NOTES** - and rewrite them after referring to your text. You will remember only 10% of what you hear, 20% of what you write, but more than 40% of what you hear and rewrite. Practice your drawing skills; a picture many truly be worth a thousand words.

If these standard suggestions do not work for you, and you are not meeting your goals, it is time to start changing your strategy. Try the following (in no particular order):

**USE 3X5 FLASH CARDS** to help memorize terms. Much difficulty in this course results from not learning the language of science. Put the term on the front, and the definition on the back. Carry a few in your pocket or purse, and glance at them when you are standing in line, or during commercials.



**SET ASIDE STRICT STUDY HOURS.** Students often rebel at the concept of study time outside the classroom (at least I did while in school!) This is unfortunate, since most learning occurs during study time. Make it a habit to give 2 hours of study for every hour of class lecture

**FORM A STUDY GROUP** with other members of the class. Often what is not understood by one person can be

explained by another. You can quiz and drill each other.

**GET THE HELP OF A TUTOR OR LAB ASSISTANT.** Too few students take advantage of the tutoring program here at MJC. The tutors are students who received 'A's when they took the course, and students who have received tutoring have had marked increases in their test scores.

**MAKE USE OF THE INSTRUCTOR'S OFFICE HOURS:** I am available and happy to help you in any way I can. If you can't make it during regular office hours, call me and make an appointment, or contact me through E-Mail.

**GET MORE INVOLVED IN THE SCIENCE OF GEOLOGY:** The Geological Society of America has low student membership rates. The organization is a great way to find out what professional geologists do. I am the campus representative for the GSA and can provide you with more information.

Some people are scared of science courses, believing them to be mysteriously different from other courses, as well as harder and difficult to pass. This is unfortunate because most scientists approach the world with an almost childlike curiosity. Every elementary school child I've dealt with has had an innate fascination for volcanoes, earthquakes, fossils and crystals. I do too, and I hope you will rediscover some of that fascination during this course.

**SCORE CARD:**

**Quizzes:**

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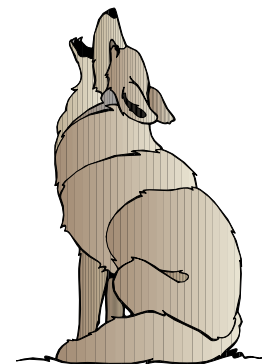
**Chapter Review:**

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**Midterms and Final:**

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If you successfully read all of the above, you have earned the right to some extra credit points! Visit the Geology 166 website, linked from the department web page shown on the front cover (you can access it at <http://havesg.faculty.mjc.edu/Geology166.html>). Note the location at which the picture was taken, and e-mail me before the second class meeting to receive 5 extra points.



**What will you know when you finish this course? What new skills will you have? The following items are the Student Learning Outcomes (SLO's) for Historical Geology. Upon successful completion of the course, you will be able to:**

- A. **Analyze the elements of the scientific method and explain how these principles apply to the study of the earth.** All sciences share a common methodology of attaining knowledge that seeks to eliminate bias and prejudice in research. You will know the difference between a hypothesis and a theory (and it may very well not be what you think!).
- B. **Use the basic geologic principles of uniformitarianism, original horizontality, lateral continuity, superposition, cross-cutting relationships, and biologic succession and the examples of present-day geologic processes to explain the formation and evolution of the features of the earth.** Many people are surprised that a geologist can look at a few rocks in a roadcut or mountainside and then immediately tell a complete story of how those rocks came about. In this class, you will learn the set of principles that geologists use to tell the story of the rocks. You will have the ability to interpret the story in the rocks yourself, either in pictures and diagrams, or by visiting the localities yourself.
- C. **Assess and evaluate competing hypotheses regarding the concept of geologic time, the origin of the earth and solar system, patterns of evolution and paleobiology, and the development and movement of continents through time.** Geologists are still arguing about geological processes. This is how science is meant to work, so we will be learning how controversies and arguments are settled in geologic research.
- D. **Test for the physical and chemical properties of minerals, and identify the most common minerals and igneous, sedimentary and metamorphic rocks.** The nuts and bolts of geology is the ability to identify the most common rocks and minerals. You will know fully 95% of all the minerals and rocks anyone will ever ask you about! We will especially observe sedimentary rocks and the structures they have that reveal the past history of the earth and its environment.
- E. **Interpret geologic features and landforms from geologic and paleogeographic maps.** Historical geologists reconstruct past worlds through the use of these maps; we will do the same, figuring out the locations of ancient mountain ranges, valleys and oceans, where none exist today
- F. **Identify and interpret the evolution of life through time** through the observation and analysis of fossil specimens. The record of life is replete with strange creatures of great diversity. We will learn of the extensive fossil record that exists in the rocks.
- G. **Explain the necessary role of the historical geologist in the modern technological society in areas such as urban planning, the search for new energy resources, and environmental research.** Can we drill offshore of California and bring back \$2/gallon gas? Are politicians correct when they say global warming is not real, or that what we are now experiencing is a natural, repeating process? What are the long-term effects of human activity on the biosphere? Are we causing a mass extinction event like those of the geologic past? (yes) Geologists have a lot to say about these issues, and you will understand how scientists approach these problems.



# Historical Geology Laboratory

## "DOING" SCIENCE:

Contrary to the view of many people, most scientific research is not done by the lonely and slightly mad research genius working in an isolated castle. It is a communal effort of many people working together, trying to solve a common problem or puzzle.

In the lab, we will also work in groups. Your grade points will be evenly split between your individual efforts and those of your group. Each group should have 3-4 people and will be selected during the first lab period. If anyone is not doing their part in the group, they will not be given the credit for the group's work. Please see the instructor if there are any problems. If you work better on your own, you may feel free to do so.

## THE LAB:

The Lab meets in Room 326 of the Science Community Center. Each week a new exercise will be assigned. Unless otherwise noted, the lab exercises will be due at the beginning of the following week. Although each individual will complete the assignment in their own lab manuals, most weeks the group will submit a single copy of the assignment with everyone's signature. **Twice during the semester, the lab notebooks will be collected and graded for individual credit.** Pop quizzes will be given a number of times during the semester (groups will work together on these). **The midterm and final will be individual efforts.**

## LAB EXIT QUIZZES

You can leave the lab as soon as you are done with the day's assignment. For attendance purposes, and as a source of learning outcome feedback, you are requested to take the **lab exit quiz**, a series of four questions or problems on the subject of the day. The quizzes are worth two points each and cannot be made up at a later time.

## EQUIPMENT AND TEXT:

The Earth Through Time by Levin

Historical Geology Lab Manual (provided)

10 power handlens (available at Bookstore, Great Valley Museum or NASCO West)

Colored Pencils

## Group Exercises

Assignment																	
Score																	
Exit Exam																	

## Tentative Schedule

Week	Date	Topics	Reading
1	Jan 15-17	Introduction to Rock Forming Minerals, Igneous and Metamorphic Rocks	Chap. 4
2	Jan 22-24	Sedimentary Rocks and Textures	Chap. 5
3	Jan 29-31	Sedimentary Environments	Chap. 5
4	Feb 5-7	Facies and Paleogeographic Maps	Chap. 5
5	Feb 12-14	Lithofacies Maps and Geologic Cross-Sections	
6	Feb 19-21	TBA	Chap. 5
7	Feb 26-28	Tectonics and Sedimentation	Chap. 7
8	Mar 5-7	Introduction to Paleontology	Chap. 4
9	March 12-14	Micropaleontology	Chap. 15
10	March 19-21	Porifera, Cnidaria, Bryozoa, and Brachiopoda	Chap. 15
11	March 26-28	Mollusca: Pelecypoda, Gastropoda, Cephalopoda	Chap. 15
12	April 2-4	Arthropoda, Echinodermata, Graptolithina	Chap. 10
13	April 9-11	Geological Maps	Chap. 12
14	April 16-18	Geologic Maps	
15	April 23-25	<b>Laboratory Final</b>	Chap. 14

# Geology Department Field Studies Spring 2019



## **Geology 187: Death Valley (5156) - 2 units** Thursday, February 14 (4:00pm) to Monday, February 18 (6:00pm)

Death Valley is one of the most desolate places on our planet. Receiving less than two inches of rain a year, the Valley is the hottest and driest place on the North American Continent. The resulting lack of vegetation allows geologists to see evidence of the earliest history of our land, for within the monument are rocks ranging in age from more than 2 billion years to less than 1,000 years. Active faults, evidence of 900-foot-deep lakes, fish, salt flats, sand dunes, and shark teeth and dolphin bones are all part of this trip. **This is a rigorous trip** with long drives and rugged camping conditions. Geology wimps not recommended! (Fee: \$90.00)

## **Geology 176: California Mother Lode (5500)- 1/2 unit** Sat., March 16 (7:30am - 7:00pm)

Mineral hunting (pyrite, mariposite, quartz crystals and more) highlight this trip which will explore the southern Mother Lode between Mariposa and Jamestown. Other sights include ghost towns, old mines, ancient lava flows, and the California State Mineral Exhibition (Fee \$15.00).

## **Geology 172: Yosemite Valley (5499)- 1/2 unit** FRIDAY, April 12 (7:30am - 7:00pm)

One of the world's most famous works of nature, Yosemite Valley is a perfect locale for understanding the work of glaciers, streams, landslides, and the processes producing granite. Stops include the lower Merced River valley, Bridalveil Falls, Yosemite Falls and Inspiration Point, and if possible, a look at flood and landslide damage (Fee \$15.00)

## **Geology 190: Geology of British Columbia and the Pacific Northwest**

Summer Field Studies: June 26-July 10, 2019

It's the adventure of a lifetime! The Pacific Northwest is one of the most dramatic landscapes in North America: the Cascadia Subduction Zone has produced a chain of active volcanoes and an incredible system of coastal mountains and seaways. On this trip we will explore the Olympic Peninsula and Olympic National Park, and then take a ferry across the Juan de Fuca Strait to Vancouver Island and the beautiful city of Victoria. We'll move on to Howe Sound and explore the mountains around the city of Whistler and Pemberton before traveling into the Channeled Scablands and North Cascades National Park of Washington State. Details on next page.



## Important Details!

Each of these field trips is a separate course for academic credit. To enroll, you will need an add card from the instructor. When you apply, a per-credit fee and trip fee will be charged in the admissions/business office. You are expected to take notes and complete a worksheet for each field trip you attend.

**For day trips**, bring a sack lunch, canteen (or small ice chest), notebook, and coat or rain protection if the weather threatens. Rock hammers and cameras are optional.

Transportation is provided by the school (private vehicles are not allowed on trips). We will meet in front of the Science Community Center (north side) on West Campus at 7:30 AM. We generally expect to return about 7:30 PM. More information at <http://hayesg.faculty.mjc.edu/geology171x.html>.

**The extended trip** to Death Valley involves camping out in fairly rugged conditions which necessitates additional planning and preparation. We will have an **organizational meeting** prior to the trip (**Thursday, January 31 at 5:30 PM in Science Community Center Room 326 on West Campus**), and you will need to prepare some written materials. **Attendance at the meeting is mandatory**. More information at [http://hayesg.faculty.mjc.edu/Death\\_Valley\\_Field\\_Studies.html](http://hayesg.faculty.mjc.edu/Death_Valley_Field_Studies.html).

### Looking ahead:

**Geology and Anthropology of British Columbia and the Pacific Northwest- June 26-July 10, 2019** (Geology 190 and Anthropology 190 – 6 units): It's the adventure of a lifetime! The Pacific Northwest is one of the most dramatic landscapes in North America: the Cascadia Subduction Zone has produced a chain of active volcanoes and an incredible system of coastal mountains and seaways. On this trip we will explore the Olympic Peninsula and Olympic National Park, and then take a ferry across the Juan de Fuca Strait to Vancouver Island and the beautiful city of Victoria. We'll move on to Howe Sound and explore the mountains around the city of Whistler and Pemberton before traveling into the Channeled Scablands and North Cascades National Park of Washington State. The geology class will be held jointly with the Anthropology 190 Field Studies Course, which will provide an in-depth human history of the region.

Cost (transportation after meeting in Seattle, meals, hotels, and entrance fees): approximately \$1,600

We will have several organizational meetings, the first of which will be on **Wednesday, January 23, at 7:00 at MJC in Science Community Center Room 326 (West Campus)**. Previous experience in geology or earth science is recommended, but not required. For more info, check out:

<http://hayesg.faculty.mjc.edu/GeologyPacificNorthwest.html>