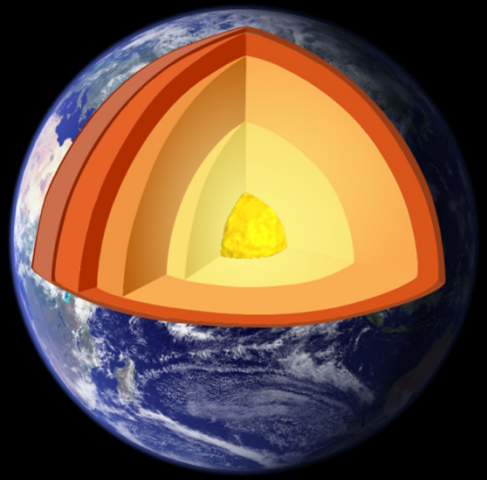
Introduction to Geology - GEOL100



Geology 100 – Physical Geology

San Diego Miramar College

Asynchronous Online Lecture Class

Instructor: Ray Rector

Course Intro Lecture Agenda

- Course Description
- Review Course Syllabus
- Review Course Schedule
- Meet Your Professor
- Intro to the World of Geology
  - ✓ What is Geology?
  - ✓ What Do Geologists Do?
  - ✓ Importance of Earth Science Literacy
  - ✓ Scientific Method
  - ✓ San Diego Geology

Course Description

- Examine the Geologic Features and Processes of the Earth, Ocean and Atmosphere
- Topics Include:
  - Scientific Method
  - Origin of Earth
  - Plate Tectonics
  - Minerals
  - Rocks
  - Geologic Dating
  - Structural Geology
  - Mountain Building
  - Earthquakes
  - Rivers and Groundwater
  - Shorelines
  - Glaciation and Climate Change

Course Design

- Lecture-Based Format
- Course Activities Include:
  - Textbook study
  - Video-taped lecture slides
  - Geology video documentaries
  - Online interactive exercises
  - Lecture discussion forums
  - Demonstrations
  - Virtual geology fieldtrips
  - Geologic science research

Course Syllabus

- Basic Logistics
- Course Objectives
- Important Enrollment Dates
- Instructor's Attendance Policy
- Plagiarism
- Grading
- Extra Credit
- Important Dates
- Study Materials
- Schedule of Study

Course Syllabus

Course Syllabus **Summer 2021** **San Diego Miramar College**

GEOL 100 - PHYSICAL GEOLOGY (Purely Online - Canvas) – CRN **61040**

3 Lecture Hours: 3 Units; Letter Grade; Student may petition for Credit/No Credit (FT). Associate Degree Credit & transfer to CSU and/or private colleges and universities. UC Transfer Course List.

Online Course Duration: June 14, 2021 through July 24, 2021

Instructor: R. Ray Rector

Instructor Contact by e-mail: Canvas email; or professor's personal email **geoprof@geoscirocks.com**

Office Hours: Canvas ConferZoom and Discussion Board – By scheduling an appointment

Course Canvas URL: https://sdccd.instructure.com/login/canvas

Instructor's Web site: www.geoscirocks.com/

Required No-Cost Course Textbook: An Introduction to Geology **Authors:** Chris Johnson, Matthew D. Affolter, Paul Inkenbrandt, Cam Mosher **Publisher:** SLCC **URL: https://opengeology.org/textbook/**

PREREQUISITES ADVISORY FOR ONLINE COURSE: This being an online course, it is advisable that you are computer literate, with a good working knowledge of the World Wide Web, e-mail, and word-processing. A high-speed Internet connection is most advantageous.

COURSE DESCRIPTION: Pursuit of understanding the physical characteristics of the earth as a whole and its past, present and future evolutionary processes. Unifying concepts such as plate tectonics, uniformitarianism, and geologic time will be studied. The causes of natural geologic hazards and their effects on people, society, and the environment will also be explored.

STUDENT LEARNING OUTCOME: Upon completion of this course: the successful student will be able to differentiate among the 3 major types of plate boundaries and recognize their characteristic geologic features.

Course Syllabus

ACCOMMODATION OF DISABILITY: A student with a verified disability may be entitled to appropriate academic accommodations, including the assistance of a note-taker in the classroom, and/or extended time for taking exams. Students with disabilities who may need academic accommodations should notify their professor immediately. For further information, contact the Disabled Students Program and Services (DSPS) Office.

CLASS ATTENDANCE, AND ENROLLMENT NOTES, AND DEADLINES: ALL STUDENTS registered in this course prior to the start date MUST sign-in into the official Canvas course page sometime on or before the end of the THIRD DAY of classes on the first week of the semester - **Wednesday, June 16, 2021**, in order to stay registered in the course. If you do not log by the above date, then I will drop you and give your seat to a waitlisted student.

The last day to withdraw with a refund and with no grade (no "W" placed on permanent record.) is Friday **June 18, 2021.** The deadline to file a petition for PASS/NO PASS grade option is **June 25, 2021.** The very last day to drop a class with a "W" is Thursday **July 8, 2021** (the official withdrawal deadline). If you fail to withdraw by **7/8/21** and/or you stop participating in class, then a final grade must be assigned to you. It is the student's responsibility to add, drop, or withdraw from classes before the deadlines stated in the class schedule. Petitions to add, drop, or withdraw after the deadline will not be approved without written proof of circumstances beyond the student's control, which made her/him unable to meet the deadline. Lack of money to pay fees is not considered an extenuating circumstance. Students anticipating difficultly in paying fees before the deadline should check with the Financial Aid Office about sources of funds or other alternatives for which they may be eligible.

It is the student's responsibility to drop all classes in which he/she is no longer attending (for on campus classes). Registered students who do not login onto this Canvas course and participate in our virtual classroom over a period of 16 consecutive days will be dropped from this course for lack of participation. Students, who remain enrolled in a class beyond the published withdrawal deadline, as stated above (as listed in the official class schedule) will receive an evaluative letter grade in this class.

STATEMENT OF RETENTION: Students, please discuss your plans to withdraw from class with your instructor. You might have options that may allow you to continue in class.

Course Syllabus

INSTRUCTOR'S ONLINE COURSE POLICIES

A. Student Work Load Obligations: Independent direction, discipline and motivation of the student are critical to both learning course content and academic success in this online course. It will be up to you, the student, for staying up with homework assignments, quizzes, and exams. Make sure and consult the instructor and/or fellow classmates about anything in this course that you find difficult and/or confusing. There are no make-up exams or accepted late work, unless the student provides proof of some compelling reason for the make-up. It is the student's responsibility to contact me personally to forewarn me of any problem in completing the regular-scheduled exams or other coursework by their due dates. Business, pleasure, or being generally ill, is not a compelling reason. Being deadly sick, or having a death in the family is good reason.

B. Instructor-Student Communication This course is taught as a completely on-line course. That is, the communication between the instructor and the students, as well as among students, takes place via electronic means on the Internet. The instructor will be initiating contact with students on a nearly daily basis, via announcements, discussion board posts, email, Zoom, and by phone. Students are expected to log into the Canvas course page regularly (several time per week) to update communication with instructor and fellow students. There are no pre-scheduled Zoom meetings for this course. The instructor may initiate a Zoom meeting each week if students indicate a desire for one. The meeting will be recorded, so that non-attending students can watch it a later time. Zoom meetings are intended for discussion of course curriculum. Note that professor also has an office hour set aside every Monday and Wednesday evening from 6pm to 7pm.

C. Course Assignments and Testing: Assignments, either for discussion on the bulletin board, or for completion and return to the instructor, will be posted on the Canvas course site. Student contributions will be evaluated on both the quality (intelligent use of scientific terminology learned from using the textbook and other sources) and quantity (frequency and length) of comments. Reports from students, which are submitted directly to the instructor, will be evaluated based on quality (use of appropriate scientific vocabulary, for instance) and on rigor of the analysis. Testing will occur via the Internet, and tests will use a variety of formats (true-false, multiple choice, matching, short answer, and essay).

Course Syllabus

D. Deadlines, Computer/Internet Mishaps, and Backing-up: Timelines, Deadlines, etc.: Quizzes will be available each week and will appear with a due date. Availability for quizzes and exams prior to the finishing deadline is roughly three to four days. The research writing assignment will not be accepted or submitted following the due date. Note that because it sometimes happens that computer networks (including your own computer) are down or unavailable, it is preferable to get assignments done a day or two earlier, so as to avoid trying to post an assignment on the very last minute of the due date, only to find that one's Internet Service Provider is down, for example. ALSO, as with any writing endeavor on a computer, **YOU MUST ALWAYS BACK-UP ALL YOUR WORK** on an external memory device, in timely increments. The excuse that you permanently lost your entire writing assignment file during a computer crash or Internet disruption is not acceptable, because those sorts of mishaps are totally avoidable by doing regular backup. Additionally, you need to make sure to **ALWAYS HAVE A BACK-UP COMPUTER** at your disposal: family members, friends, or library, school, or even your own secondary computer/smart phone. Finally, you must have a ***reasonably high speed, solidly consistent, trustworthy Internet connection***, especially for test taking, viewing streaming videos, and assignment submission.

E. Online Netiquette and Student Code of Conduct: This class will be conducted in accordance with the college code of student conduct and basic standards of academic honesty. Students are expected to respect and obey standards of student conduct while interacting online in this course. As your instructor, I have the following expectations of your academic behavior while online:

Promote a positive learning environment by exhibiting mutual respect and consideration of the feelings, ideas, and contributions of others, as reflected in your written dialog. Demonstrate a genuine desire to learn, interact, and improve.

Cheating, plagiarism, or other forms of academic dishonesty are totally unacceptable and will not be tolerated in this class. Violations of standards of academic honesty will be reported to the school dean for appropriate action. A detailed explanation of academic integrity of students is found below:

Course Syllabus

The academic integrity of the students in this course and Policy 3100, the SDCCD District Student Code of Conduct, require that all student work including, but not limited to, discussion postings, assignments, essays, papers, and exams be free of plagiarism. Students must fully cite any text, graphics, or others' ideas they include in that work. For additional details, please review AP 3100.3—Honest Academic Conduct.

As part of my commitment to academic integrity, student work in this course may be submitted to an online plagiarism checking service.

Any student caught cheating or plagiarizing will be subject to the disciplinary procedures given in District Policy 3100, which may include receiving a failing grade for the assignment. Any cheating or plagiarism will be reported to the Dean of Student Affairs. Specifically, the following behaviors are examples of cheating/plagiarism (this list is not exhaustive).

- Copying directly from the textbook. Note: you're welcome to summarize the information from when completing homework assignments, but please phrase homework answers in your own words!
- Using unauthorized notes while taking an exam, or copying another student's work.
- Sharing exam answers or collaborating with another student during an exam.
- Turning in homework that contains large blocks of text that are identical or nearly identical to another student's (both parties will receive zero score).
- Copying from any source (including the Internet) without citing the source.
- Turning in work completed for another class (unless pre-authorized by the instructor).
- Passing off work as your own that is not. This includes the use of work completed by other students.

In order to avoid any possibility of someone else plagiarizing your work, you should not share any content-specific material (such as exam answers, homework, or field trip reports) with any other students.

Please note that if I receive any course work from two or more students that is identical or strikingly similar, I reserve the right to assign any and all such students a score of zero for the assignment in question.

Please note that if I suspect academic dishonesty on an assignment or an exam, I reserve the right to schedule a one-on-one Zoom meeting to give you the opportunity to demonstrate that you understand the answer(s) you supplied. In the event that a student is unable to demonstrate their understanding of an exam/assignment answer, I reserve the right to assign the student a score of zero for that exam/assignment. If you have any concerns regarding plagiarism or cheating, please contact the instructor.

Course Syllabus

GRADING/EVALUATION: Grading is based on points earned by completing assignments and tests. Final course grades are based purely on points percentages without any type of weighting. The following is the course grading points breakdown based on the assessment activity:

I. Quizzes (10 @ 30 points each) = 300 points. **Note:** You get three (3) attempts per quiz. Open book.

II. Exams (2 @ 150 points each) = 300 points. **Note:** You get one (1) attempt per exam. Open book

III. Assignments (3 @ 15 + 40 + 75 points) = 120 points; Personal greeting assignment (mandatory) = 15 pts; Geology in News assignment (mandatory) = 40 pts, San Andreas Fault Zone assignment (conditional) = 75 pts
Note: A student can waive doing the SAFZ assignment if he/she gets 100 points or more on their midterm exam.

V. Late Work Policy: No late work accepted - No exceptions.

VI. Extra Credit Policy: Extra credit is available - up to 30 points maximum. Last day to turn in extra credit work is Saturday July 24, 2021 - **Absolutely no EC work accepted after this date**.

VII. Grading Scale: Your final grade is based purely on total percentage out of possible 720 points (with SAF assignment) or 645 points (without SAF assignment):

100% – 90% = A
89% -- 80% = B
79% -- 70% = C
69% -- 55% = D
Less than 55% = F

Note: *Minor adjustments to the deadlines and total course grade points may be made by instructor during the semester. If changes are made, the instructor will inform the students in a timely manner.*

Course Testing Schedule:

1) **Quiz I**: Sunday June 20
2) **Quiz II**: Sunday June 20
3) **Quiz III**: Sunday June 27
4) **Quiz IV**: Sunday June 27
5) **Quiz V**: Sunday July 4
6) **Midterm Exam I**: Wednesday July 7
7) **Quiz VI**: Sunday July 11
8) **Quiz VII:** Sunday July 11
9) **Quiz VIII**: Sunday July 18
10) **Quiz IX:** Sunday July 18
11) **Quiz X**: Saturday July 24
12) **Final Exam**: Sunday July 25

Extra Credit Deadline: *All extra credit must be turned in by* ***Saturday, July 24*** *for credit. Late extra credit work will not be accepted - no exceptions – period.*

Course Syllabus

IMPORTANT COURSE DATES: Assessment of student learning outcomes for this class includes 10 quizzes, 2 exams, and 3 assignments. Each assessment activity has a specific submittal due date. Make sure to keep a VERY CLOSE track of the class schedule of activities, so that you stay on track with your coursework, and get all your fully completed work turned in on time. I suggest printing out the class schedule and taping it somewhere around your work area that you can view it regularly.

Below are the most important course dates for this course:

1) Most quiz and exam completion dates are on Sundays.
2) Class Introduction Discussion Assignment due by Wednesday June 16, 2021
3) Last day to drop without a "W" is Friday, June 18, 2021
5) Midterm exam completion date is Wednesday, July 7, 2020
6) Last day to drop with a "W" (withdraw) is Thursday, July 8, 2021
4) Geology in the News Discussion Assignment due Sunday, July 18, 2021
7) San Andreas Fault Zone Research Assignment due Saturday July 24, 2021
8) Last day to turn in extra credit is Saturday July 24, 2021– **No** late exceptions!
9) Final exam completion date is Sunday, July 25, 2021**- NO** late exceptions!

STUDY MATERIALS FOR THIS COURSE:
There are several primary sources of information that are available for successfully completing this course - they are: 1) Free, open-source website textbook; 2) Earth Revealed Video Lessons available online from the instructor's personal website; 4) the instructor's PowerPoint lecture slides and lecture notes. 3) Geology video slide tutorial lessons. Carefully read and study all assigned textbook reading prior to completing the associated quizzes, exams, and assignments. Note: the SLCCC e-textbook has additional resources and activities to help master the curriculum, which includes summaries and quizzes.

1) **Cost-free E-Textbooks:**

Primary course text: "Introduction to Geology" E-Textbook: https://opengeology.org/textbook/

Supplementary text: "Physical Geology 101": http://gotbooks.miracosta.edu/geology/index.html

This geology course uses a no-cost website-accessed e-textbook titled "A Introduction to Geology". Written by Chris Johnson, Matthew D. Affolter, Paul Inkenbrandt, Cam Mosher and published by Salt Lake Community College, it covers all the course topics, and includes key concepts, practice quizzes and study

Course Syllabus

2) Earth Revealed Geology Video Series: www.learner.org/resources/series78.html

The Annenberg Media Company has available an excellent geology video instructional series called "Earth Revealed" (a total of twenty six 30 minute videos). Links to these videos can be accessed from the instructor's personal website. I have listed the Earth Revealed video series number(s) that correspond to the specific topic(s) of study each week within the class schedule next to the textbook chapter reading assignments. Some quiz questions pertain to Earth Revealed content.

3) Instructor's Personal Student Website: www.geoscirocks.com

To compliment the textbook and ER video series learning resources, the professor has a personal educational website for students that include lecture notes and PowerPoint presentations, plus a wealth of additional, useful information. Carefully read and study the lecture notes and view the complimentary PowerPoint presentations prior to completing the associated quizzes, exams, and assignments. The lecture notes and slide presentations can be directly accessed from the instructor's personal website, which includes an even wider variety of other web-based resources that may be of personal interest. Please check out the above URL.

Click on the Miramar Online link to access all information pertaining directly to this course. Browse down the left-hand side menu for pertinent coursework information and resources. Additionally, the site has links to the "Earth Revealed" geology instructional video series – a set of 26 half-hour lessons that requires a high-speed connection to watch. I have listed the "Earth Revealed" video series number(s) that correspond to the specific topic(s) of homework study each week within the class schedule below the textbook chapter reading assignments. Note that information found within the Earth Revealed videos is included in the test questions within the quizzes and exams.

4) Geology Video Tutorials: http://www.geoscirocks.com/intro_to_geology_lectures_silde_videos.htm

Finally, there are a set of geology video slide study tutorials that are designed to help you better learn the course curriculum. These captioned video slide shows were put together by an earth science professor at the City College of San Francisco, and are very well designed and highly recommended as part of your study plan.

5) Course Study Schedule: http://www.geoscirocks.com/miramar_online_sched.pdf

Below is the course study and test schedule. The course schedule is a very important document that should be checked on daily. The course schedule shows the weekly assigned study materials, tests and assignments due dates, and important course dates/deadlines. The weekly study materials have hyperlinks that will take you directly to the listed study information. The due dates indicate both when the listed course materials need to be studied by, and the last day to take a test or turn in an assignment. Note the listed assigned weekly study materials are the Introduction to Geology text (**ITG**), the Earth Revealed Video series (**ERV**), Professor Ray's PowerPoint lecture slides (**PPP**), and the Geology Video Tutorials (**GVT**)

Course Schedule – Week 1

San Diego Miramar Geology 100 Online Schedule – Summer 2021

Weekly Study Topic	Assigned Weekly Topic Homework	Tests and Assignments	Due Date
Week 1 Intro to Class	Prof's Welcome Message Prof's Video Welcome Personal Intro Assignment in Discussion Folder Professor's PowerPoints (PPP) 1	Post Personal Introduction on Discussion Board	Wed 6/16
Week 1 Course Logistics	Course Syllabus	Quiz #1 - Syllabus and Course Logistics	Sun 6/20
Week 1 Intro to Geology & Earth Origin	Intro to Geology (ITG) Chap 1 Professor's PowerPoints (PPP) 1 Earth Revealed Videos (ERV) 1 Geology Video Tutorials (GVT) 1 - 5		
Week 1 Earth Origin, Physiology & Plate Tectonic Theory	Intro to Geology (ITG) Chap 2, 8 Earth Revealed Videos (ERV) 2, 3, 4, 5, 6 Professor's PowerPoints (PPP) 2, 3, 4, 5 Geology Video Tutorials (GVT) 6 - 17		
Week 1 Plate Tectonics - Evidence and Dynamics	Intro to Geology (ITG) Chap 2, 8 Earth Revealed Videos (ERV) 1, 2, 3, 4, 5, 6 Professor's PowerPoints (PPP) 2, 3, 4, 5 Geology Video Tutorials (GVT) 1 - 17	Quiz #2 – Earth Origin, Physiology, and Plate Tectonic Theory	Sun 6/20

Course Schedule – Weeks 2 and 3

Week 2 Minerals and Mineral Resources	**ITG** Ch 3 ERV - 12 PPP 6 GVT – 18, 19, 20	**Quiz #3** - Minerals and Mineral Resources	Sun 6/27
Week 2 Igneous Rocks, Magma, and Volcanism	ITG Ch 4 ERV 13, , 14 PPP 7 GVT – 21, 22, 23, 24	**Quiz #4** – Igneous Rocks, Magmas and Volcanism	Sun 6/27
Week 3 Sediments and Sedimentary Rocks	**ITG** Ch 5 ERV 15, 17 **PPP** 8 GVT – 25,		
Week 3 Metamorphism & Metamorphic Rocks	**ITG** Ch 6 ERV 18 **PPP** 9 GVT –26	**Quiz #5** – Sedimentary Rocks & Metamorphic Rocks	Sun 7/4

Course Schedule – Week 4

Week 4 Midterm Exam – Review and Test	**Midterm Exam Review –** ITG *Ch 1-8;* ERV 1-6 8-18 PPP 2-10 GVT – 1- 28	**Midterm Exam** – All course material covered in quizzes 2 through 6. Exam available to take on 7/3	Wed 7/7
Week 4	**Withdrawal Warning**	**Last day to withdraw with a "W"**	Thur 7/8
Week 4 Geologic Time and Earth History	**ITG** Ch 7, 8 ERV – 10 PPP 10 GVT – 27, 28	**Quiz #6** –Geologic Time/Dating and Earth History	Sun 7/11
Week 4 Crustal Deformation And Structure	**ITG** Ch 2, 9; ERV 3, 8. 9; PPP 11 GVT – 33, 34, 35, 36		
Week 4 Mountain Building	**ITG** Ch 2, 9; ERV 3, 8, 9; PPP 11 GVT – 33, 34, 35, 36	**Quiz #7** – Crustal Deformation and Mountain Building	Sun 7/11
Week 4 Earthquakes and Seismic Hazards	**ITG** Ch 2 **ERV** 3, 7 **and** 9 PPP 12 GVT – 32, 33, 34		

Course Schedule – Weeks 5 and 6

Week 5 Rivers, Mass Wasting and Groundwater	**ITG** Ch 11, ERV 19, 20, 21 **PPP 13, 14** GVT – 37, 38, 39,	**Quiz #8** – Earthquakes	Sun 7/18
Week 5 Shorelines	**ITG** Ch 12 ERV 16, 23 & 24 PPP 13 GVT – 38, 40, 41, 42, 46	***Quiz #9*** *– Rivers and Groundwater*	Sun 7/18
Week 5	**Geology-in-the-News Assignment** Info in Discussion Folder. Post completed assignment on discussion board	**Post Geology News Article Summary + Discussion**	Sun 7/18
Week 6	**See Earthquake Research Assignment Instructions in Assignment Folder**	**Submit San Andreas Fault/ Earthquake Assignment** into the Assignment folder	Fri 7/23
Week 6 Glaciers and Climate Change	**ITG** Ch 14, 15 ERV 16, 23 & 24 **PPP 14 and 15** GVT – 38, 40, 41, 42, 46	**Quiz #10** – Shorelines, Glaciers & Climate Change	Sat 7/24
Week 6	Extra Credit Work in EC Folder	**Last day to Submit Extra Credit**	Sat 7/24
Week 6	**Final Exam Review** – ITG Ch 2, 9 - 15 ERV 7, 16, 19-24 PPP 11-15 GVT – 29- 46	**Final Exam** - All course material after the midterm exam (covered in quizzes 7 through 10). Exam available to take on 7/22	Sun 7/25

Please Note: This schedule is tentative and may be changed or modified by the instructor at anytime during the semester. Students will be notified in a timely basis if changes are made.

Professor Ray

- Instructor's Academic Background
- Instructor's Passion for Geology
- Instructor's Role in Classroom
- Instructor's Teaching Philosophy

Who am I?

Prof's Personal Background

I was born and raised in Southern California – so was my Dad!

Grew up in a family that loved the outdoors – spent lots of time at the beach, camping, hiking, hunting, fishing, and exploring.

Knew by 1st grade that I wanted to be an earth scientist.

Have lived within walking distance to ocean for the last 40 years.

Went into college wanting to become either an oceanographer and/or geologist, even though I first majored in marine engineering (What was I thinking? Submarines, not math!)

Spent a gazillion years as a student in college. Celebrated my free time between classes and semesters hanging out at the beach and in the mountains – mainly doing board sports and biking – surfing since I was 12.

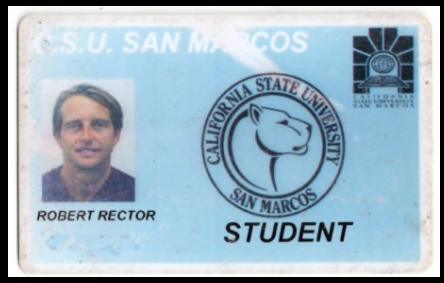
Still I a college guy, but teaching instead – and loving it.

Still trying to maintain the same lifestyle that I had in my 20's, except with less free time, more worries, slightly wiser, and moving a tad slower.

EARTH SCIENCE EDUCATION

California Single Subject Teaching Credential – Geosciences -
California State University, San Marcos, CA

- 35 graduate-level semester units completed; GPA = 3.9
- Cross-Cultural Language and Academic Development
- Additional emphasis of technology in the classroom



Earth Science Doctoral Program – Volcanism and Tectonics
University of California Riverside, Riverside, CA.

- 38 graduate-level semester units completed; GPA = 3.9
- Graduate Division Fellowship
- Mineralogical Society of America scholarship

Master of Science Degree – Igneous Petrology
San Diego State University, San Diego, CA

- 35 graduate-level semester units completed; GPA=3.9
- Achievement Rewards for College Scientists Scholarship

Bachelor of Science Degree - Magna Cum Laude - Geology
San Diego State University, San Diego, CA

- 172 semester units completed; GPA = 3.8
- Outstanding Senior Research Award--College of Sciences
- Outstanding Research Award—Department Of Geology

Engineering Undergraduate Program
California State University, Northridge, CA

- Marine Engineering emphasis

EARTH SCIENCE TEACHING BACKGROUND

University of San Diego, San Diego, CA — **2007 - Present**
- Environmental Hazards Science Laboratory
- Earth Science Laboratory

MiraCosta College, Oceanside, CA — **2004 - Present**
- Oceanography Lecture and Laboratory
- Online Geology

San Diego Miramar College, San Diego, CA — **2003 - Present**
- Geology Laboratory
- Online Oceanography Lecture

San Diego Mesa College, San Diego, CA — **2002 - Present**
- Online Geology Lecture
- Geology Laboratory

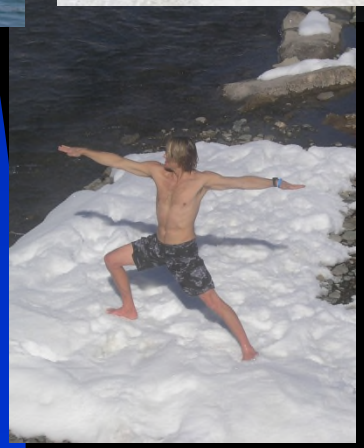
University of California Riverside, Riverside, CA — **1994-1997**
- General geology, Historical geology, Mineralogy, Optical mineralogy, Igneous petrology, and Metamorphic petrology

San Diego State University, San Diego, CA — **1991-1993**
- General geology laboratory
- Advanced field geology course in Baja, Mexico.

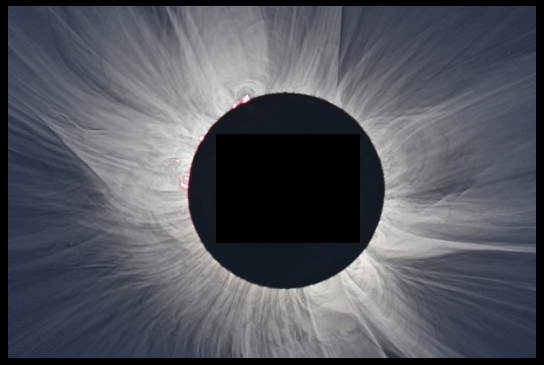
Professor's Interests

Travel to Cool Places, Outdoor Adventure/Exploring and Hanging with Fun and Interesting Friends

Outdoor Sports



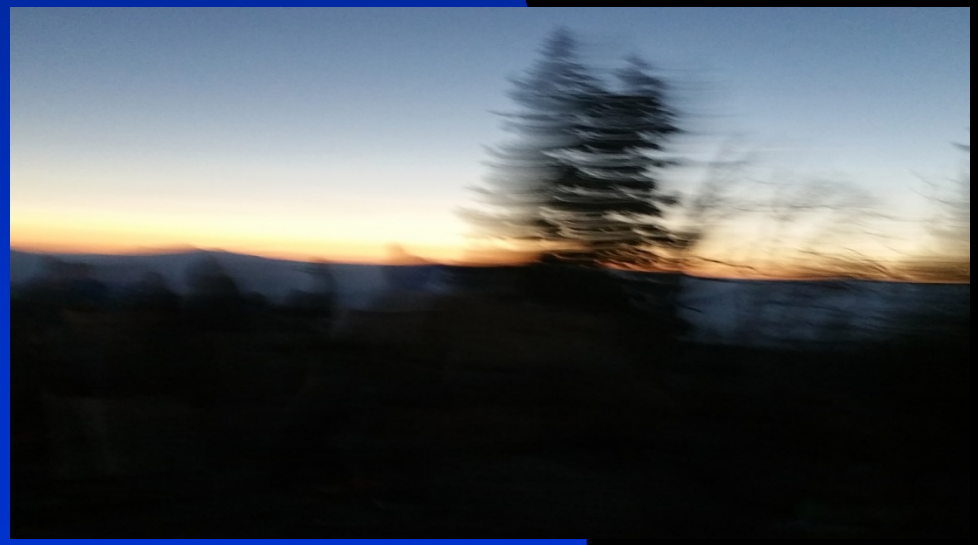
Once in a Lifetime Adventure– Total Eclipse

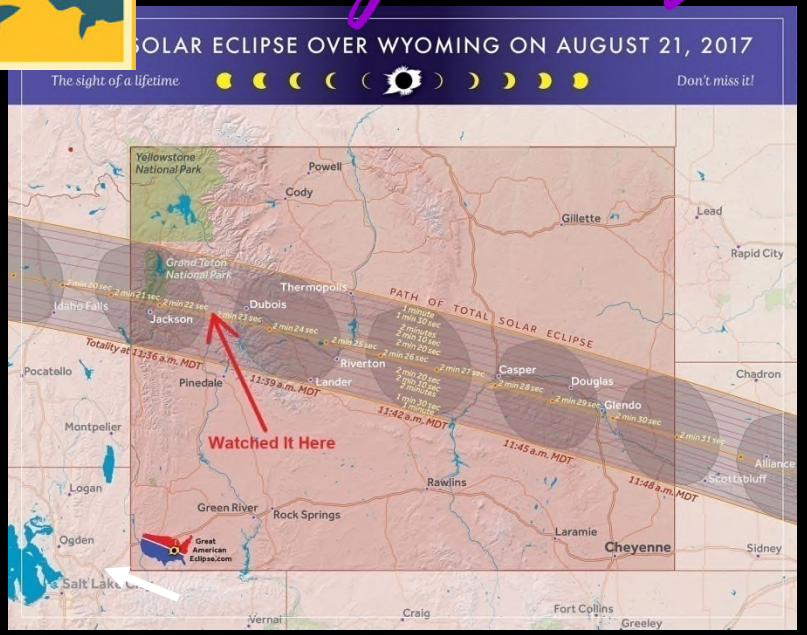


Howdy from

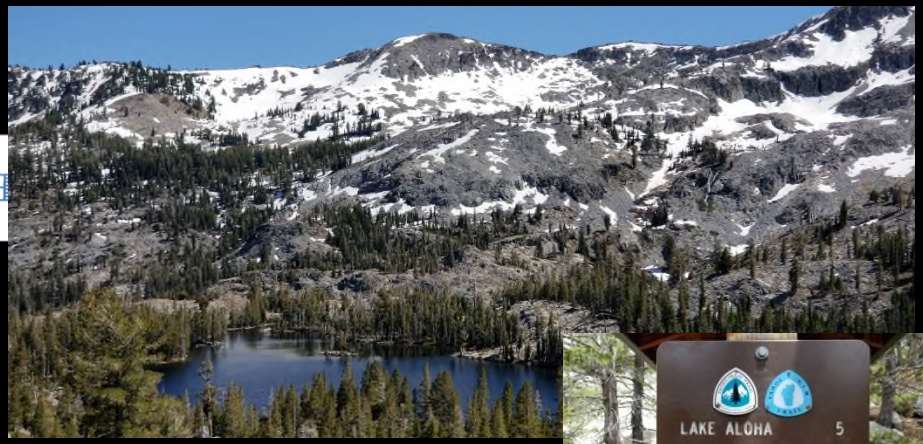
Wyoming!

That's WY
WYOMING
SOLAR ECLIPSE
AUGUST 21, 2017





Summer Mountain Adventure – Lake Tahoe

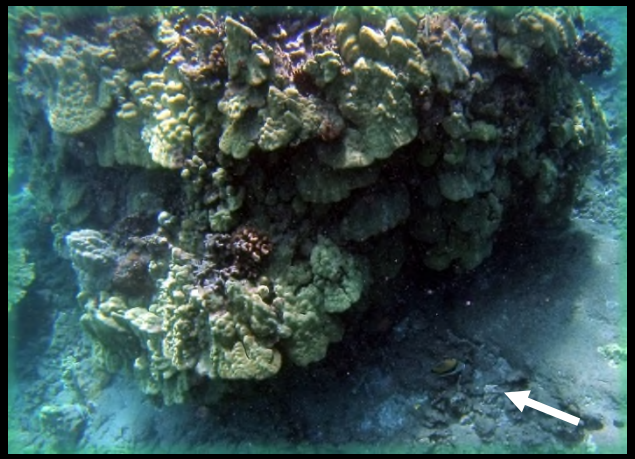


Keep Tahoe

Blue!

Adventures on The Big Island

Aloha from Hawaii!



Adventures on Grand Cayman Island

Aloha from Grand Cayman!

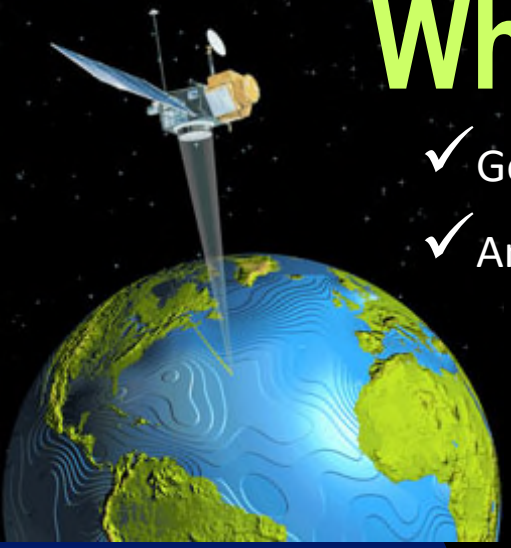
Who are You?

Post Your Personal Introduction on the Discussion Board

- Your Name
- Academic focus
- Personal interests
- Why take a geology Lab?
- Memorable place you have been of geologic interest?
- Image of Yourself

Wishing Everyone a Great Summer Session!

What is Geology?



- ✓ Geology is the scientific study of the Earth
- ✓ An interdisciplinary science that embraces the traditional sciences

Hydrologic Studies

Volcanic Studies

Seismic Studies

Marine Studies

GEOLOGY -- an Interdisciplinary Science

Geology integrates many different types of geosciences

- **Mineralogy and Petrology** - the study of minerals and rocks
- **Marine geology** - the study of Earth's ocean bottom
- **Geochemistry**- study of chemical nature of rocks, minerals and fluids
- **Hydrology -** study of rivers, groundwater, flooding, dams
- **Volcanology –** study of the nature and distribution of volcanoes
- **Engineering geology-** design and construction of structures
- **Structural geology -** form and development of geologic structures
- **Geophysics –** study of forces and mechanisms of geologic phenomena
- **Environmental geology** – study of geological resources and pollution
- **Petroleum geology** – Locate. assess, and extract oil and natural gas

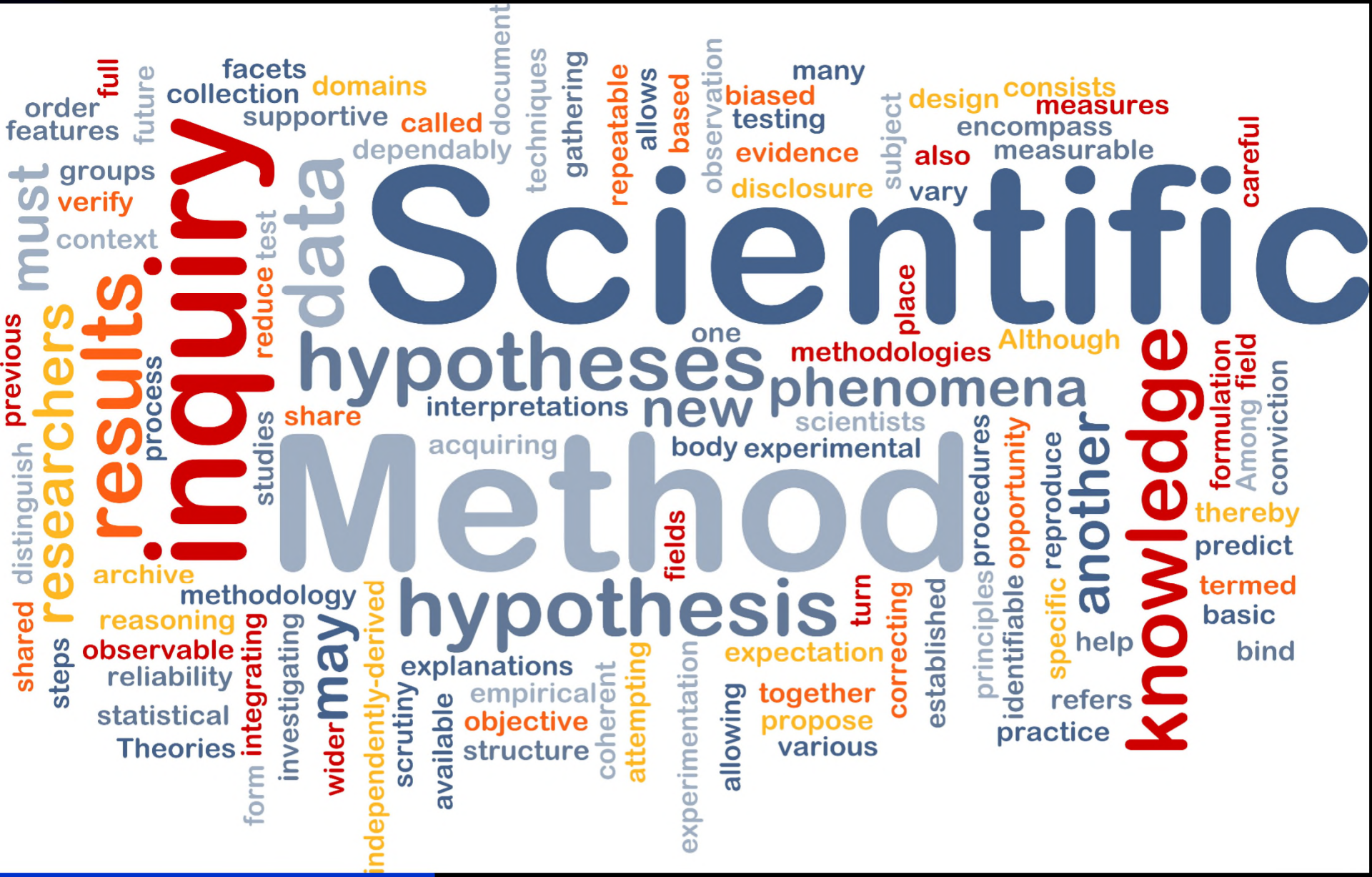
What Do Geologists Do?

Answer: …they *do* earth science.

Science defined: The investigation and acquisition of useful, reliable knowledge of earth's crust that is based on empirical observations (physical evidence).

- ✓ Earth scientists use a powerful way of thinking, that is rational, logical, and organized, called ***scientific thinking***.
- ✓ Intelligence, imagination, creativity, inspiration, and luck are other important attributes of scientific study.
- ✓ Earth scientists use a powerful approach to inquiry called the ***scientific method***.
- ✓ Central to science is community and peer review.

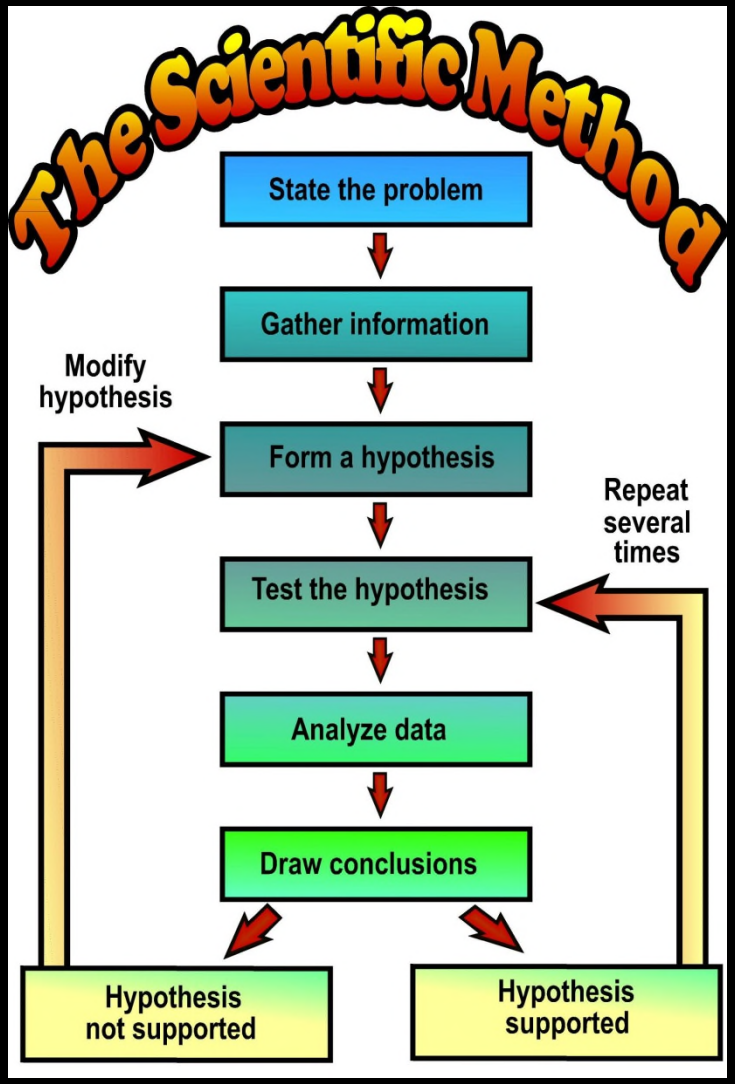
The Scientific Method – Heart of Science



THE SCIENTIFIC METHOD

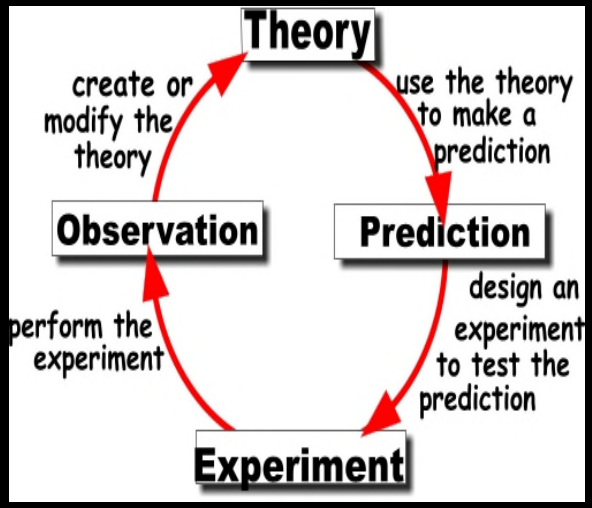
The Basic Components

- ✓ *Empirical Observations*
- ✓ *Questions / Problems*
- ✓ *Hypotheses / Models*
- ✓ *Predictions*
- ✓ *Tests / Experiments*
- ✓ *Analysis of Results*
- ✓ *Draw Conclusions*
- ✓ *Reevaluate Hypothesis*



Note: The scientific method is NOT a *recipe* – it's a *process*

Investigation and Application of the Scientific Method



Investigation and Application of the Scientific Method

Scientific Method

- O OBSERVATION

- H HYPOTHESIS

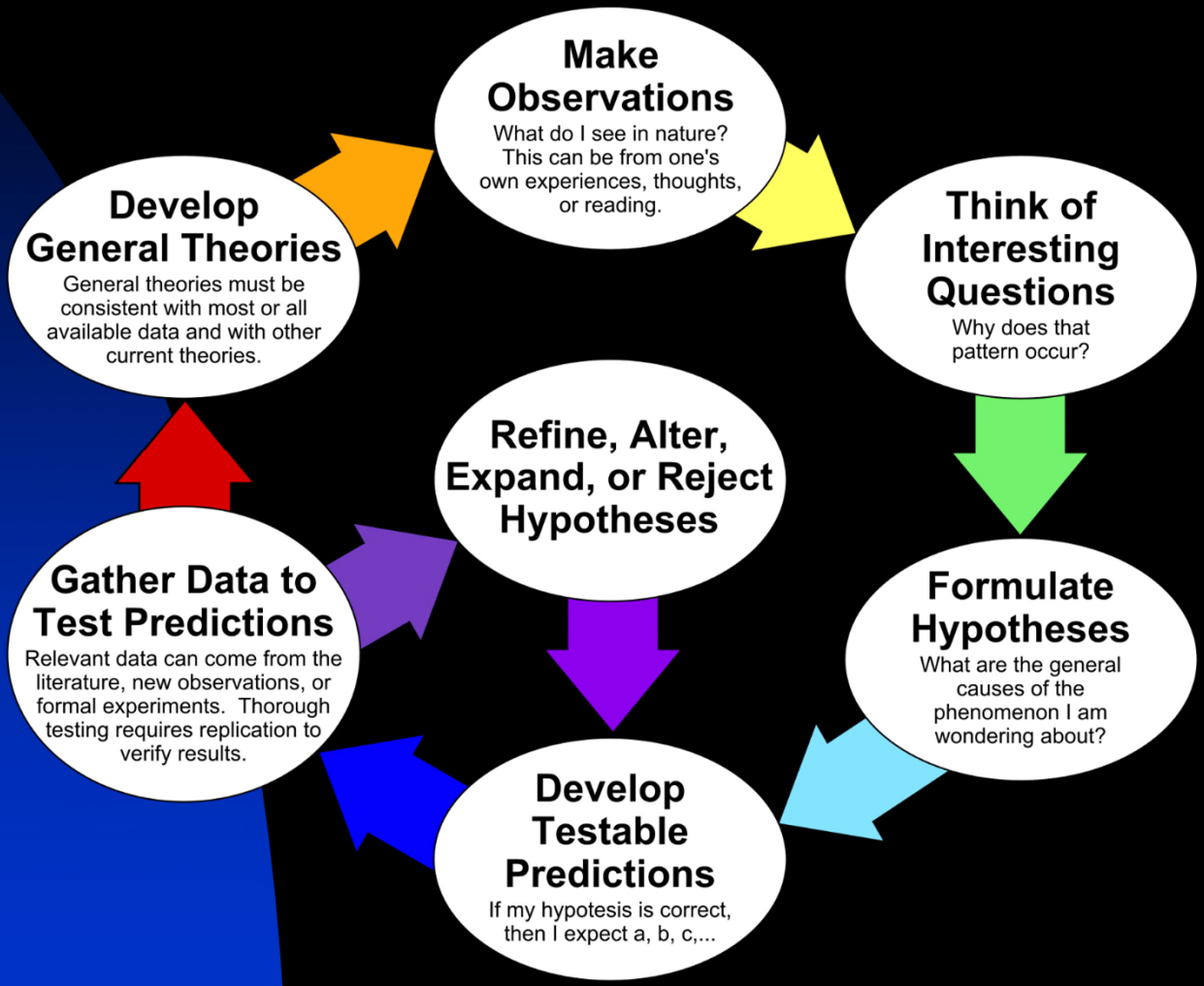
- T TEST

Star	Color	Elements in Spectrum	Class	Other Observations
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

- A ANALYZE DATA

- C CONCLUSION

Scientific Method is an Ongoing Process



Scientific *Observations*

Making Observations

- There are two different types of observations – **quaLitative** observations and **quaNtitative** observations.

Quantitative Units of Measurement

US Standard System of Units

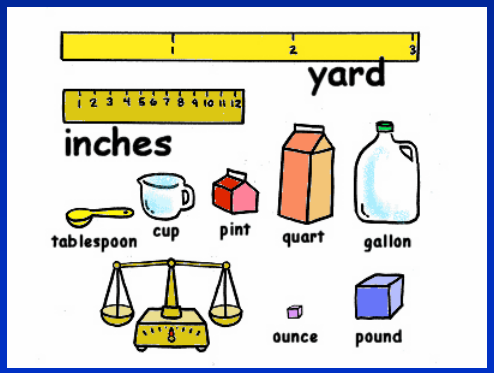
inch/foot
square foot
ounce/gallon
ounce/pound
second
Fahrenheit

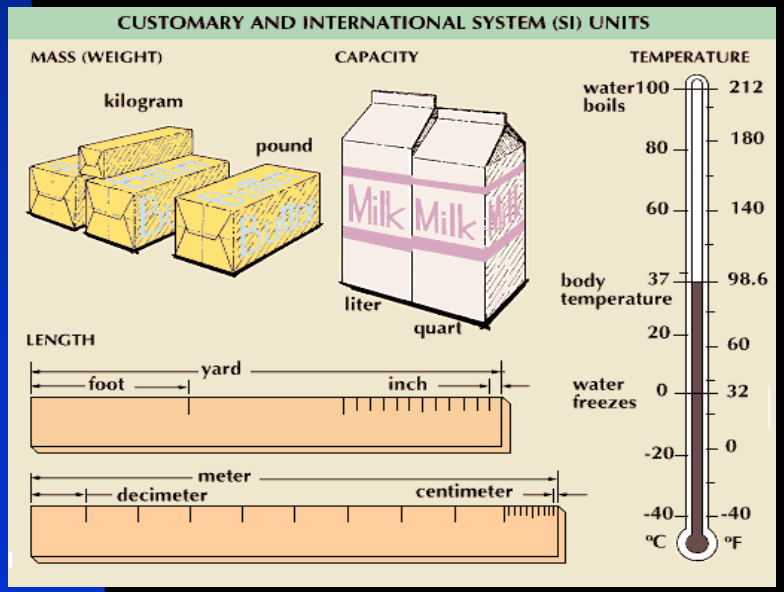
Measurable Physical Quantities

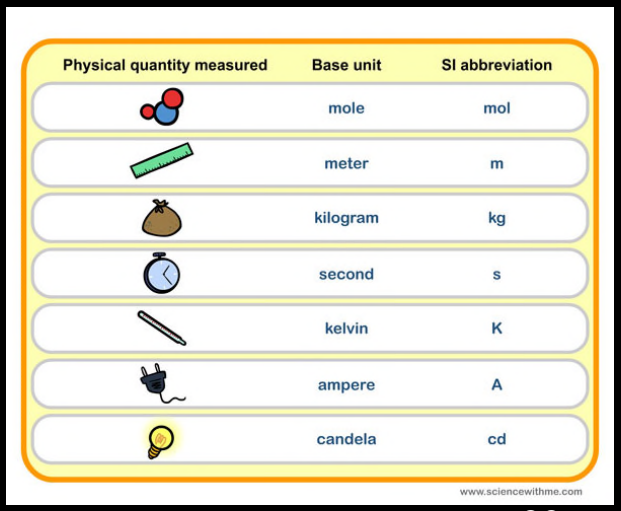
1) Distance -
2) Area -
3) Volume -
4) Mass -
5) Time -
6) Temperature -

International Metric System of Units

centimeter/meter
square meter
milliliter/liter
gram/kilogram
second
Kelvin/Celsius



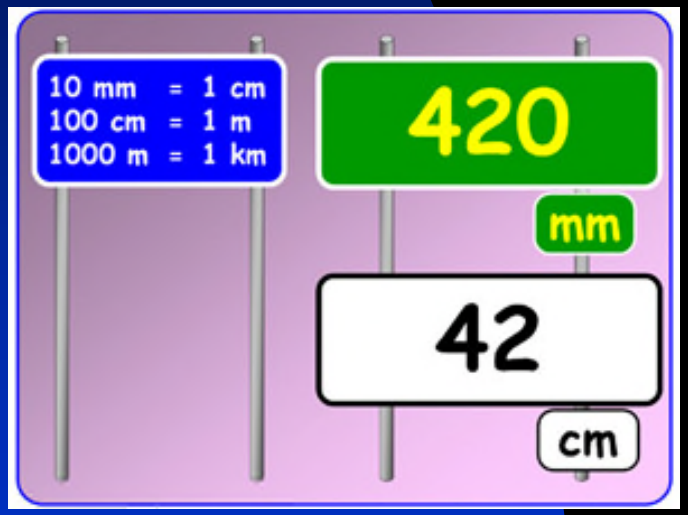




International Metric Units

Quantity measured	Unit	Symbol	Relationship
Length, width, distance, thickness, girth, etc.	millimeter	mm	10 mm = 1 cm
	centimeter	cm	100 cm = 1 m
	meter	m	
	kilometer	km	1 km = 1000 m
Mass (“weight”)*	milligram	mg	1000 mg = 1 g
	gram	g	
	kilogram	kg	1 kg = 1000 g
	metric ton	t	1 t = 1000 kg
Time	second	s	
Temperature	degree Celsius	° C	
Area	square meter	m^2	
	hectare	ha	1 ha = 10 000 m^2
	square kilometer	km^2	1 km^2 = 100 ha
Volume	milliliter	mL	1000 mL = 1 L
	cubic centimeter	cm^3	1 cm^3 = 1 mL
	liter	L	1000 L = 1 m^3
	cubic meter	m^3	
Speed, velocity	meter per second	m/s	
	kilometer per hour	km/h	1 km/h = 0.278 m/s

Metric Unit Prefixes



Prefix	Symbol	Factor	Numerically	Name
giga	G	10^{9}	1 000 000 000	billion**
mega	M	10^{6}	1 000 000	million
kilo	k	10^{3}	1 000	thousand
centi	c	10^{-2}	0.01	hundredth
milli	m	10^{-3}	0.001	thousandth
micro	μ	10^{-6}	0.000 001	millionth
nano	n	10^{-9}	0.000 000 001	billionth**

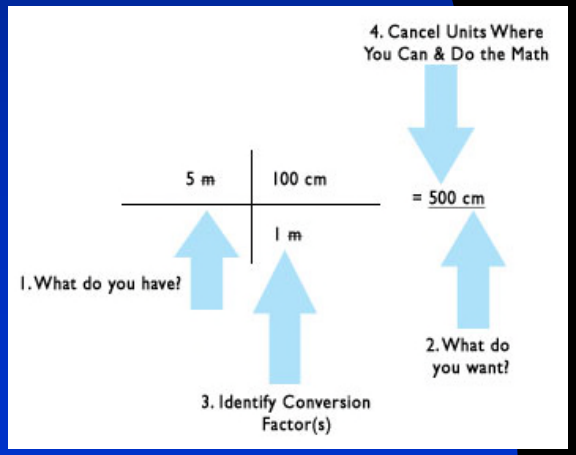
Converting Units of Measurement

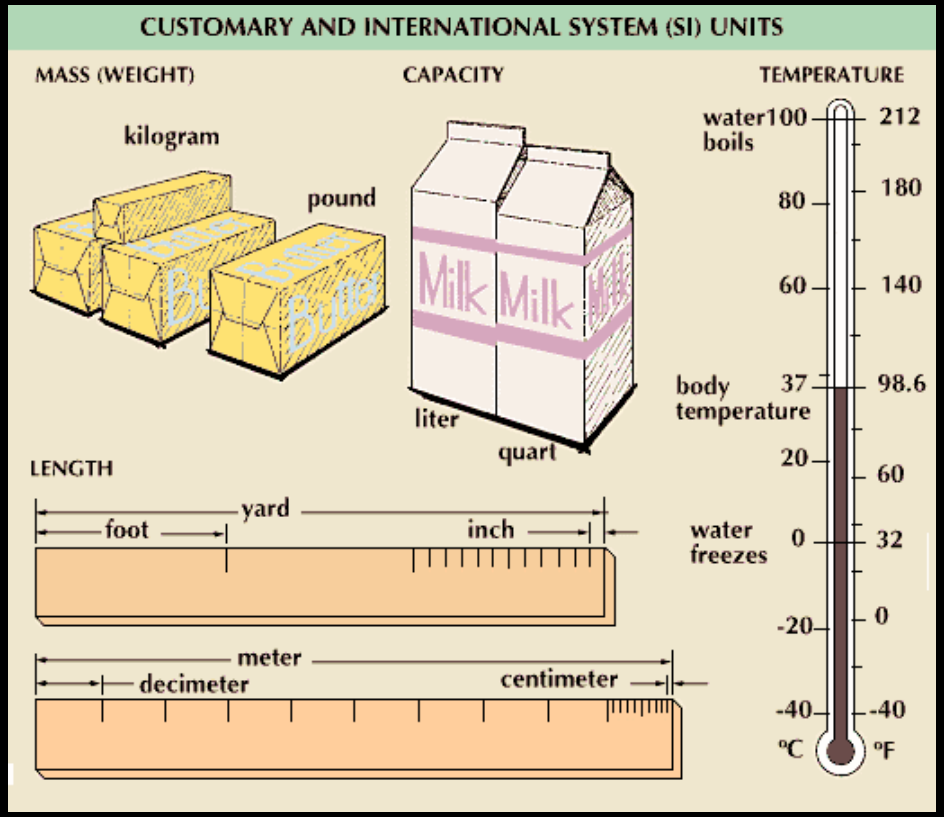
Setting Up the Problem:

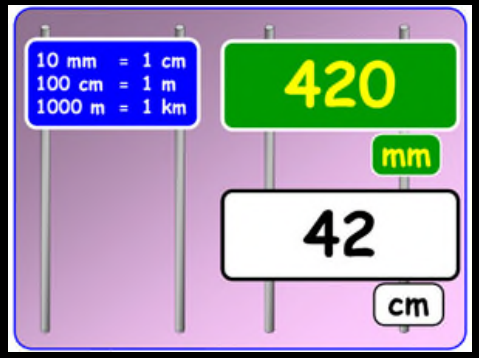
$$\frac{\text{Starting Units} \quad \text{Desired Units}}{\text{Starting Units}} = \text{Desired Units}$$

Example:

Convert 15 m to ? cm







Converting Units

Make sure to:

1) Find the proper conversion factor for the two units
2) Set up the equation with all numeric values having a unit symbol
3) Do the conversion making sure that the old unit cancels

APPROXIMATE CONVERSIONS FROM ENGLISH UNITS TO SI UNITS				
SYMBOL	**WHEN YOU KNOW**	**MULTIPLY BY (CF)**	**TO FIND**	**SYMBOL**
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32) ÷ 9	Celsius	°C

Metric Conversion Chart and Table

Length

1 centimeter (cm)	=	10 millimeters (mm)
1 inch	=	2.54 centimeters (cm)
1 foot	=	0.305 meters (m)
1 foot	=	12 inches
1 yard	=	3 feet
1 meter (m)	=	100 centimeters (cm)
1 meter (m)	≅	3.281 feet
1 furlong	=	660 feet
1 kilometer (km)	=	1000 meters (m)
1 kilometer (km)	≅	0.62137119 miles
1 mile	=	5280 ft
1 mile	=	1.61 kilometers (km)
1 nautical mile	=	1.85 kilometers (km)

Area

1 square foot	=	144 square inches
1 square foot	=	929.03 square centimeters
1 square yard	=	9 square feet
1 square meter	≅	10.76104 square feet
1 acre	=	43,560 square feet
1 hectare	=	10,000 square meters
1 hectare	≅	2.47 acres
1 square kilometer	=	100 hectares
1 square mile	≅	2.59 square kilometers
1 square mile	=	640 acres

Speed

1 mile per hour (mph)	≅	1.467 feet per second (fps)
1 mile per hour (mph)	=	1.61 kilometers per hour
1 knot	≅	1.15 miles per hour
1 foot per second	≅	0.68 miles per hour (mph)
1 kilometer per hour	≅	0.62 miles per hour (mph)

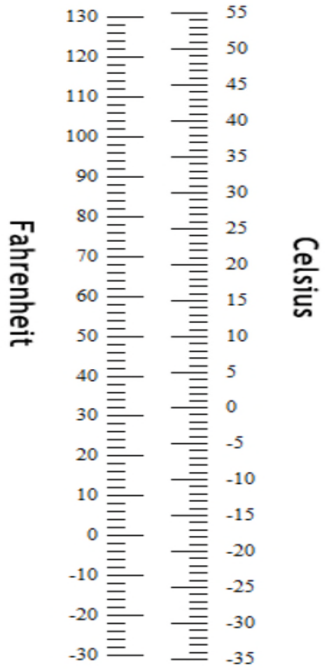
Volume

1 US tablespoon	=	3 US teaspoons
1 US fluid ounce	≅	29.57 milliliters (ml)
1 US cup	=	16 US tablespoons
1 US cup	=	8 US fluid ounces
1 US pint	=	2 US cups
1 US pint	=	16 US fluid ounces
1 liter (l)	≅	33.81 US fluid ounces
1 liter (l)	=	1000 milliliters (ml)
1 US quart	=	2 US pints
1 US gallon	=	4 US quarts
1 US gallon	=	3.785 liters

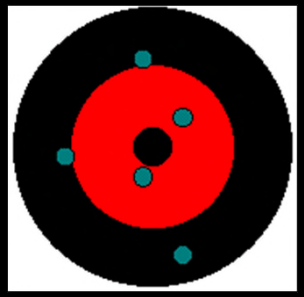
Weight

1 milligram (mg)	=	0.001 grams (g)
1 gram (g)	=	0.001 kilograms (kg)
1 gram (g)	≅	0.035 ounces
1 ounce	=	28.3 grams (g)
1 ounce	=	0.0625 pounds
1 pound (lb)	=	16 ounces
1 pound (lb)	=	0.45 kilograms (kg)
1 kilogram (kg)	=	1000 grams
1 kilogram (kg)	≅	35.27 ounces
1 kilogram (kg)	≅	2.2 pounds (lb)
1 stone	=	14 pounds
1 short ton	=	2000 pounds
1 metric ton	=	1000 kilograms (kg)

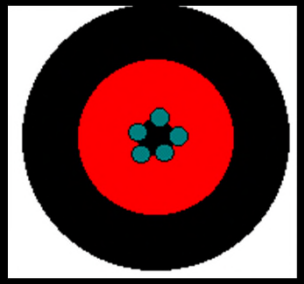
Temperature



Accuracy, Precision and Uncertainty in Measurement



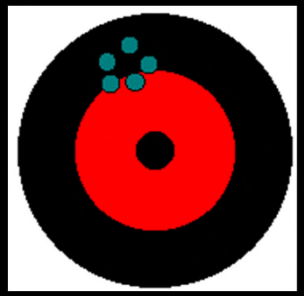
1) ***Accuracy*** of the measurement refers to how close the measured value is to the true or accepted value.



2) ***Precision*** refers to how close together a group of measurements actually are to each other.

3) Accuracy can be determined by only one measurement, while precision can only be determined with multiple measurements.

4) Precision has nothing to do with the true or accepted value of a measurement, so it is quite possible to be very precise and totally inaccurate.



5) When precision is high and accuracy is low, the fault can lie with the instrument.

Significant Digits or Figures

Rules For Significant Digits

1. Digits from 1-9 are always significant.

2. Zeros between two other significant digits are always significant

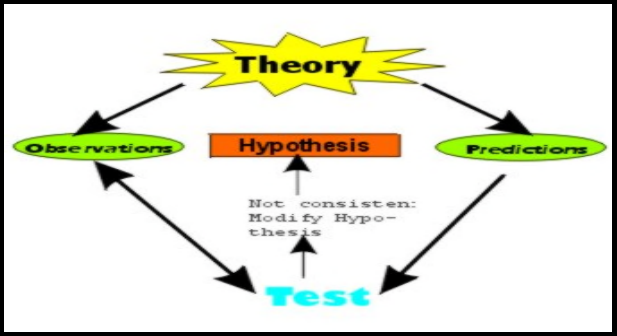
3. One or more additional zeros to the right of both the decimal place and another significant digit are significant.

4. Zeros used solely for spacing the decimal point (placeholders) are not significant.

EXAMPLES	# OF SIG. DIG.	COMMENT
453 g	3	All non-zero digits are always significant.
5057 L	4	Zeros between 2 sig. dig. are significant.
5.00 ml	3	Additional zeros to the right of decimal and a sig. dig. are significant.
0.007 km	1	Placeholders are not sig.

Hypotheses and Scientific *Testing*

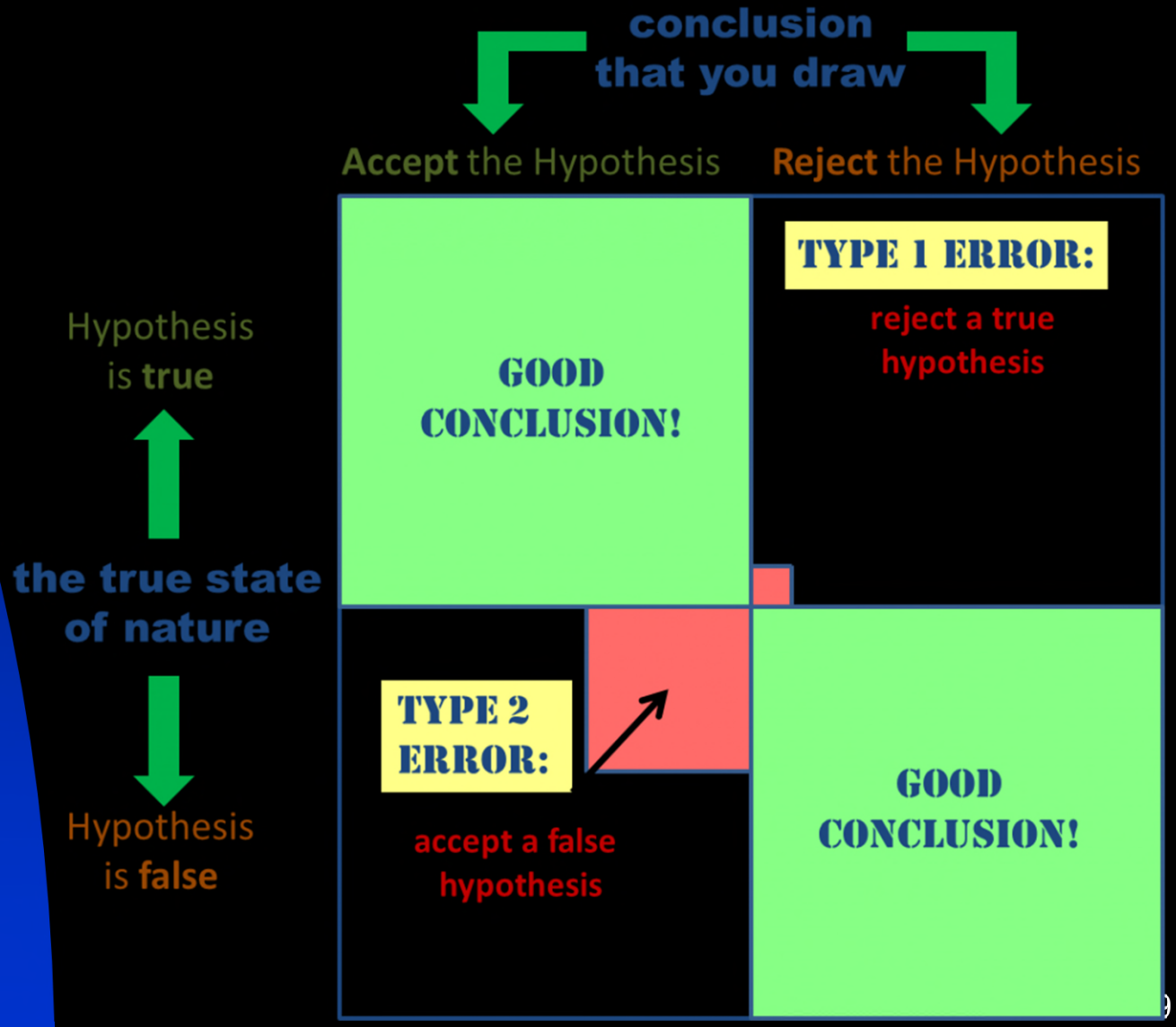
Observations and Predictions



Testing Hypotheses and Theories

1) A hypothesis is a simple explanation, model, or prediction of nature that requires testing (attempt to falsify or confirm).
2) Hypotheses are based on empirical physical evidence (data).
3) Hypotheses must be falsifiable (testable/predictable).
4) Hypotheses can never be proven as an absolute fact.
5) Hypotheses are always open to elimination or modification.
6) A theory is a broad, elegant, unifying explanation of a set of otherwise unconnected natural phenomena.
7) A theory is established by the interconnection (framework) of well-tested and confirmed hypotheses that are, in turn, supported by an enormous amount of physical evidence.

Testing Your Hypothesis

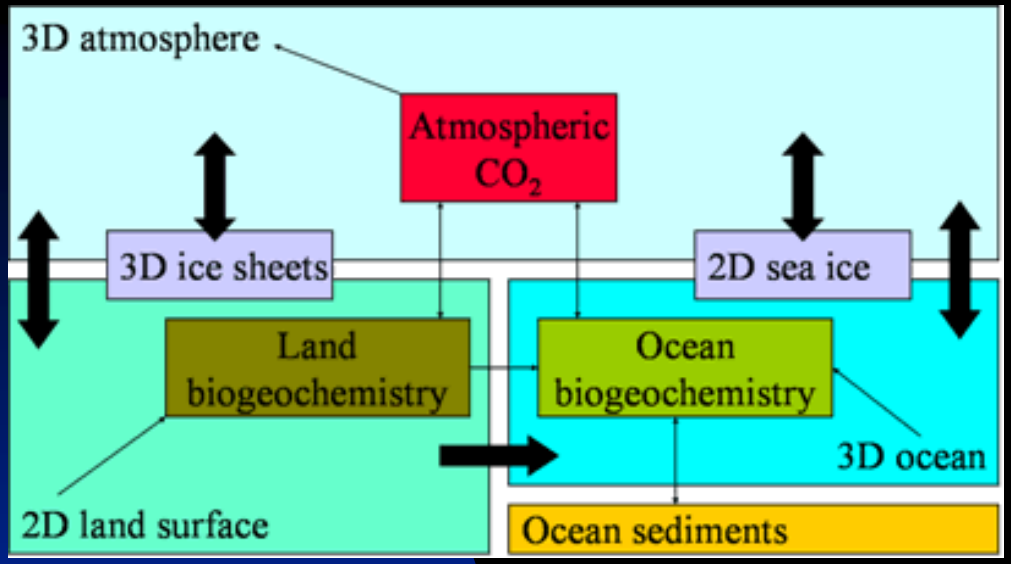


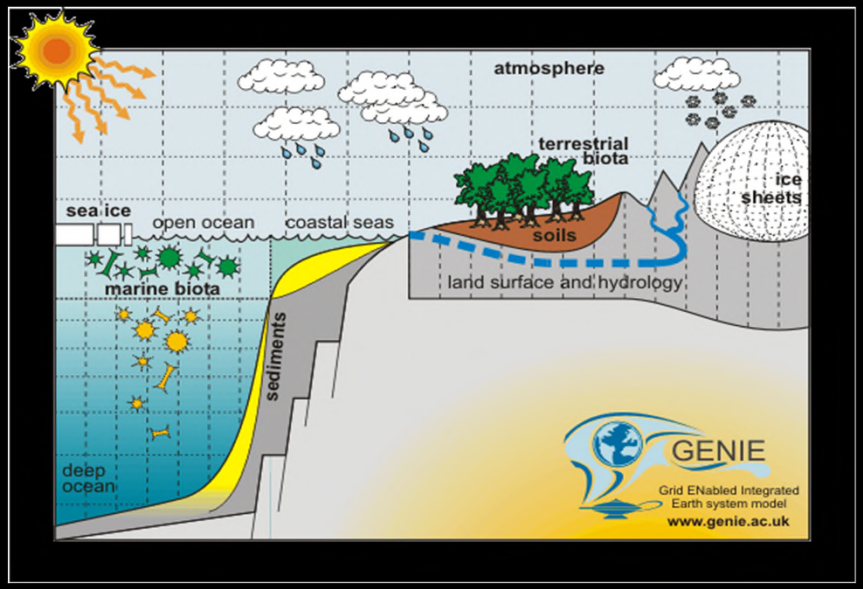
Scientific *Predictions*

Prediction

- A statement of what may happen in the future based on observations, data, experience or scientific reason

Scientific *Modeling* and *Predicting*





Purpose of Modeling: Understand and predict how parts of the Earth operate and interact with each other

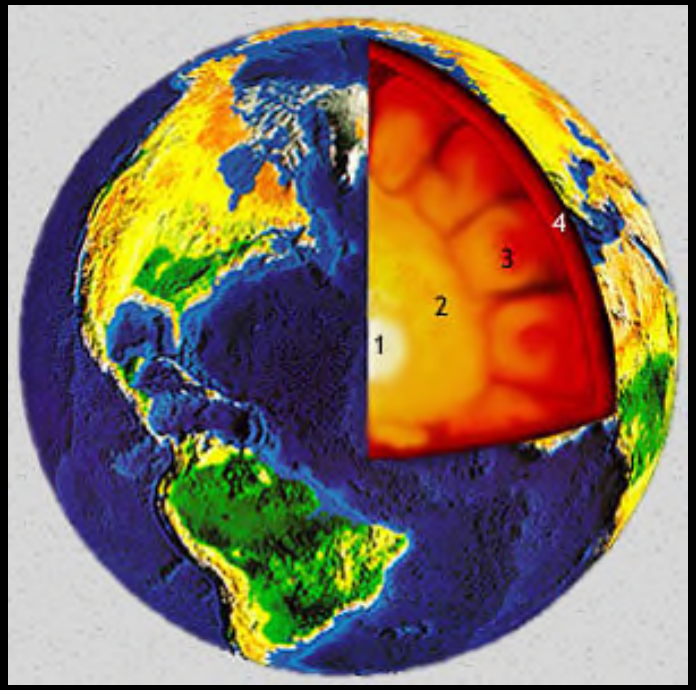
--- Start simple and get more complicated over time

--- Add more and more parameters over time

--- Test computer models with real historic data

---- Develop and refine models to predict future scenarios

Geology of Planet Earth

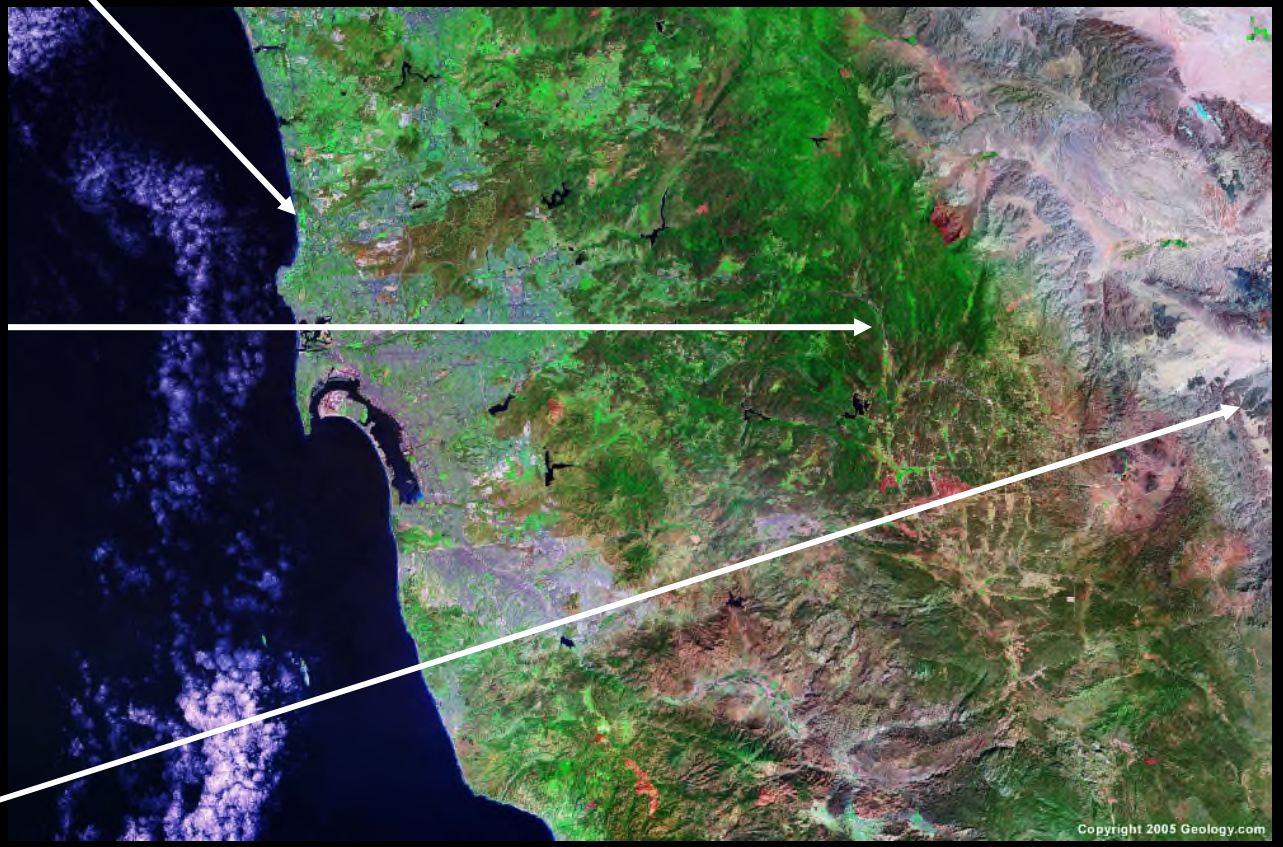


Geology of San Diego County

The Coastal Geology

Backcountry Geology

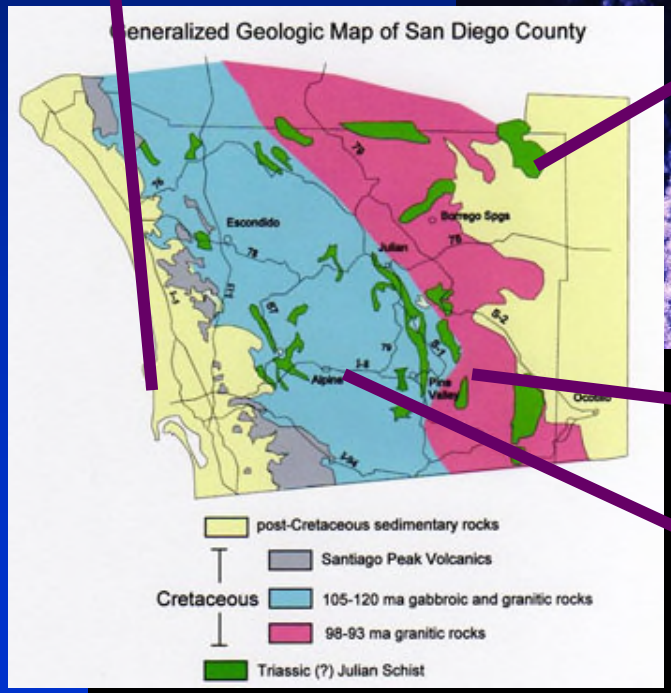
Desert Geology

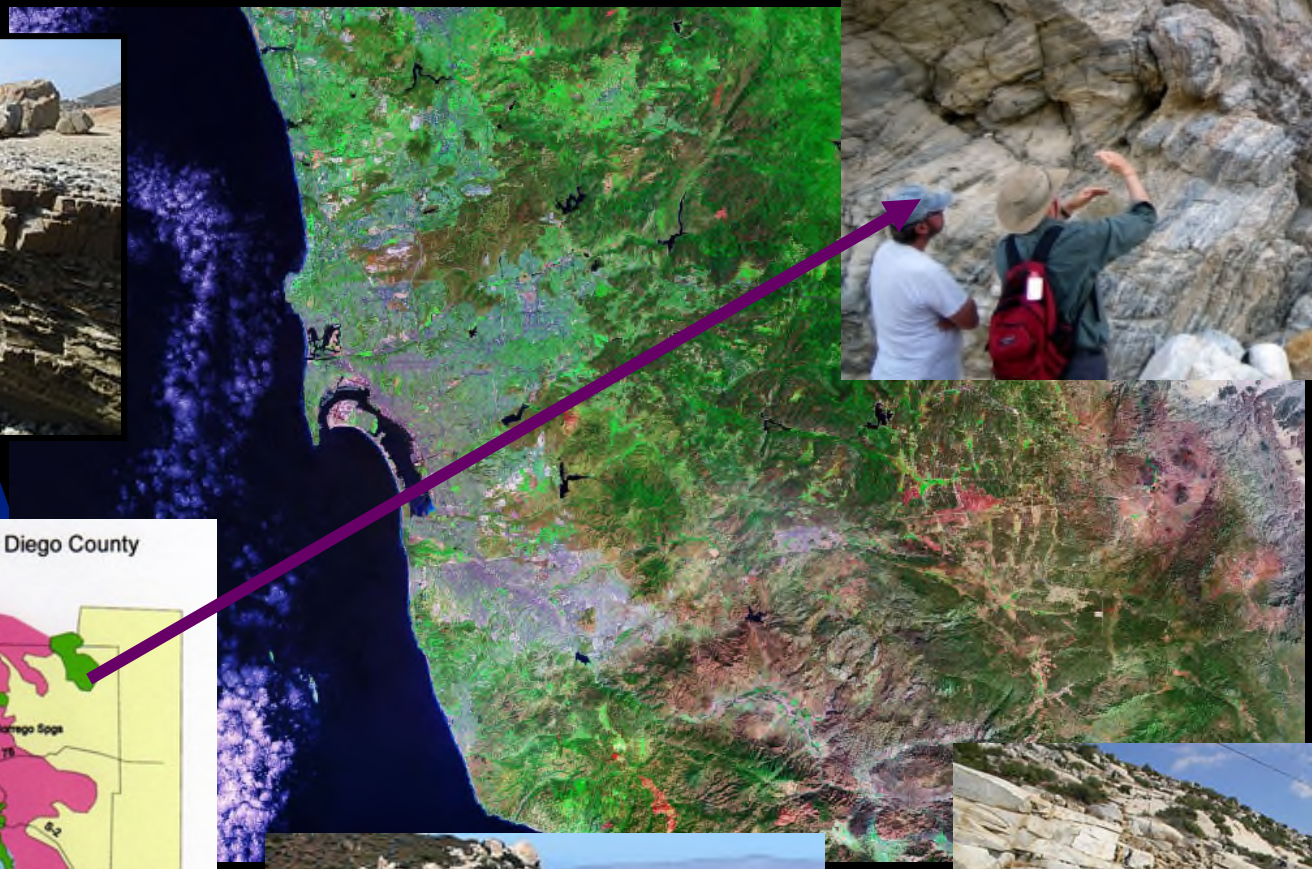


Geology of San Diego

Metamorphic

Sedimentary





Igneous

Local Natural Hazards

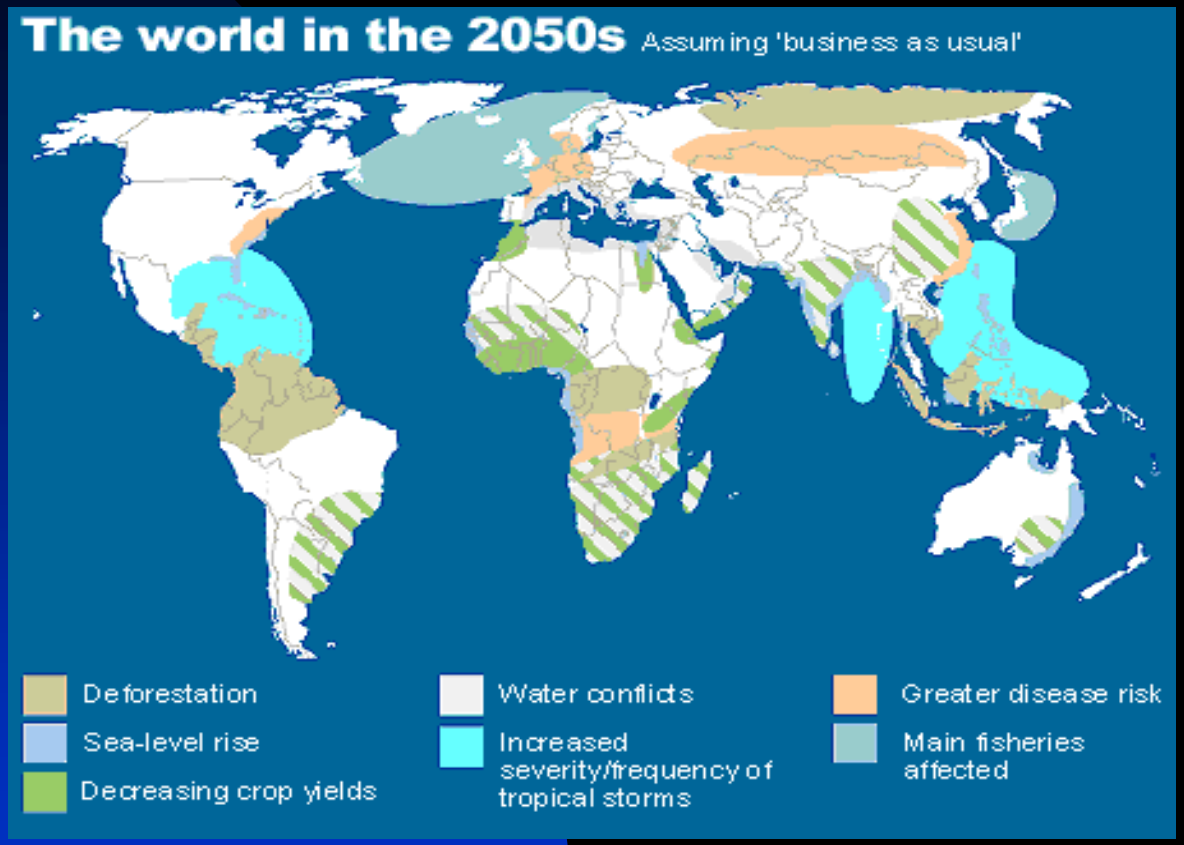

Homes on cliffs of Pacifica, CA

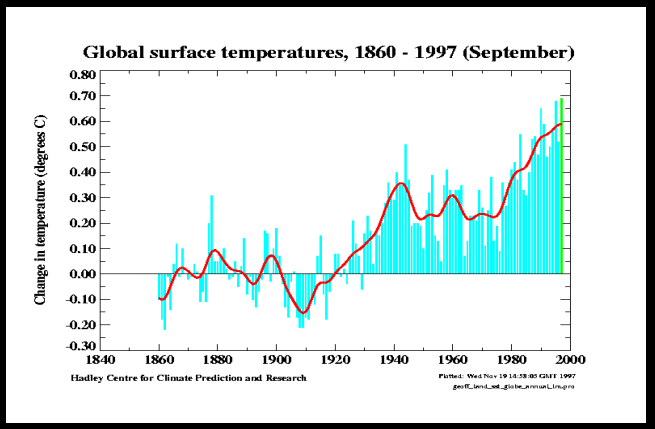
Question:

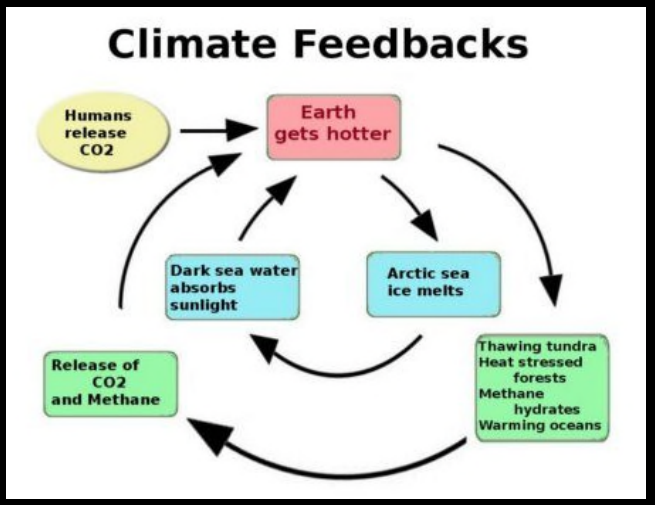
What other geologic hazards do we face in San Diego?

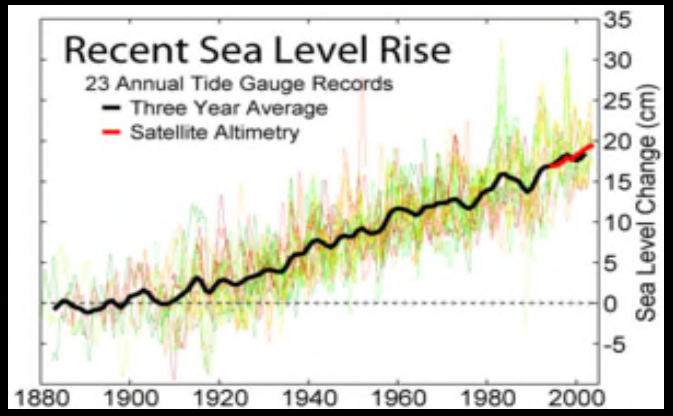
Climate Change:

The Ocean-Human Equation









Global Warming – Fact or Fiction?

SLOW OR ABRUPT CHANGE?

EARTH LITERACY

What All of Us Need to *Know* About the *Earth*

OLP #1: Earth has many geologic features that are forever changing.

OLP #2: Plate tectonics is the primary force shaping Earth's surface.

OLP #3: The ocean and atmosphere are the secondary forces that shape earth's surface.

OLP #4: The ocean makes the Earth habitable.

OLP #5: The Earth supports a great diversity of life and ecosystems.

OLP #6: Humans are inextricably interconnected with the planet.

EARTH LITERACY

An Earth-literate person:

1) Understands the essential principles and fundamental concepts about the functioning of the planet – the land, ocean and atmosphere, and the interior.

2) Can communicate about the Earth – its features and processes - in a meaningful way;

3) Is able to make informed and responsible decisions regarding the Earth and its resources; and

4) Respects, appreciates, and enjoys the land and ocean, and all its creatures.

Increase Our *Awareness & Understanding* of the Earth

Be ***Earth-Wise***… Think Globally – Act Locally

Care and Respect For Our Planet

She Takes Care for Us - We Need to Care for Her

Next Lecture

1) Origin of Solar System, Earth, Ocean, & Life

2) Overview of Earth Composition & Structure

3) Geologic Time and The Age of Earth

Homework for these topics **–**

1) Read and Study Chapter 1
2) View Earth Revealed Videos 1 & 2
3) Study Prof's Power Points and Lecture Outlines

Also Study the Instructor's Website @ www. geoscirocks.com