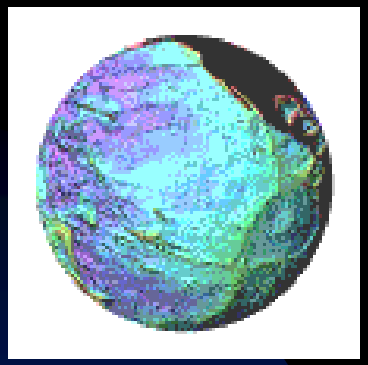
Natural Disasters Laboratory

EOSC105 – Wednesday Lab

Spring 2020 Semester

University of San Diego

Ray Rector: Instructor



First Day Agenda

- Course Description
- Review of Course Syllabus
- Instructor Background
- Student Introductions
- Safety Instruction
- Geologic Timescale
- Minerals for Next Week's Lab

Course Description

- Hands-on, Inquiry-based Lab and Field Activities Examining Features and Processes of the Earth
- **T**opics Include:
  - Scientific Method
  - Geologic Time and Dating
  - Minerals snd Rocks
  - Plate Tectonics
  - Topographic Maps
  - Earthquakes
  - Volcanic Eruptions
  - Mass Wasting
  - Tsunami
  - Fires
  - Storms
  - Climate Change

Course Design

- Laboratory-Based Format
- Course Activities Include:
  - Group-centered, hands-on, inquiry-based lab exercises
  - Field trips
  - Online interactive exercises
  - Lab discussion forums
  - Demonstrations
  - Instructor presentations

Course Syllabus

- Basic Logistics
- Course Objectives
- Important Enrollment Dates
- Instructor's Attendance Policy
- Grading
- Field Trips
- Classroom Website
- Schedule of Study
- Safety Concerns

http://www.geoscirocks.com/

EOSC 105 Lab Link

Wise Suggestions for my Students of Earth Science

- 50% Motivation – 50% Perspiration
- SHOW UP for ALL laboratory meetings
- DO the Pre-lab assignment BEFORE the corresponding laboratory meeting
- ASK lots of questions
- BE PROACTIVE in lab and field activities and discussions
- STAY ALERT in lab and field activities
- HAVE FUN learning about the Earth

Laboratory Safety Issues

Laboratory Safety Rules

1) No food or drinks allowed in lab at any time. Drinks to be stored outside of lab.

2) Everyone must wear closed-toed shoes while in lab – no exceptions. Any student who shows up without closed-toed shoes on will not get credit for that days laboratory work.

3) Any/all lab accidents, injuries, or unsafe medical/health conditions/events – however minor – must be reported to the lab instructor immediately.

4) Only authorized lab experiments or procedures can be preformed. All authorized experiments or procedures must be performed as described and/or demonstrated by the laboratory instructor.

5) Personal belongings need to be stored in a place that will not impede students' movement in and around the lab, nor clutter lab table space.

6) Horseplay, running, or other potentially unsafe activities while in lab is strictly forbidden.

7) When the fire alarm goes off, everyone must leave the lab room immediately - in a calm orderly fashion - to the designated outside emergency assembly area. Know where the assembly area is located.

Professor Ray

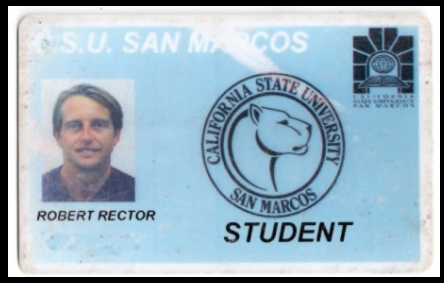
- Instructor's Academic Background
- Instructor's Passion for Geology
- Instructor's Role in Classroom
- Instructor's Teaching Philosophy

Who am I?

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

TEACHING EARTH SCIENCE

Cuyamaca College, El Cajon, CA — **2013 - 2016**
- Oceanography Lecture

University of San Diego, San Diego, CA — **2007 - Present**
- 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

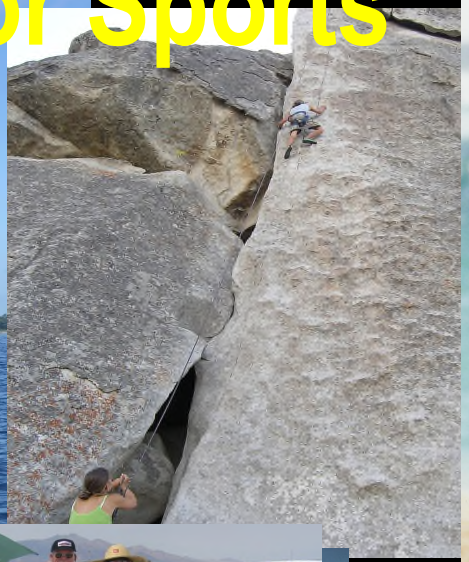
University of California Riverside, Riverside, CA — **1994-1997**
- General geology, Historical geology, Mineralogy, Optical mineralogy, Igneous petrology, and Metamorphic petrology

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

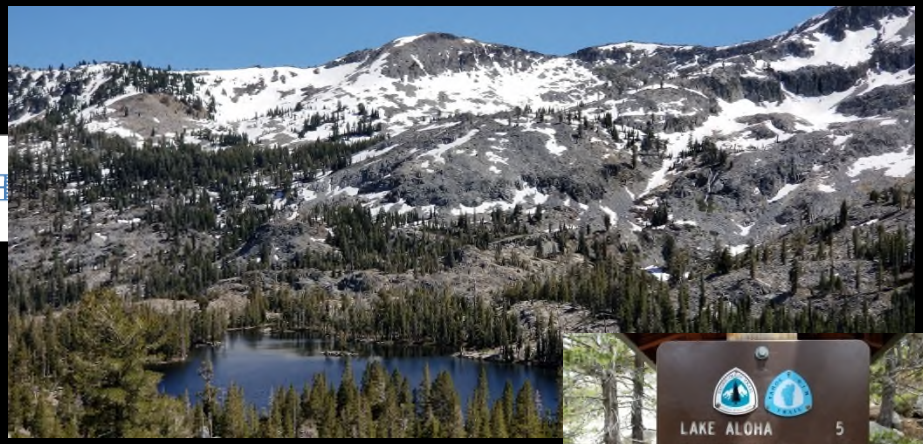
Professor's Interests

Travel to Cool Places, Adventure, Hanging Out, and Partying with Fun and Interesting Friends

Outdoor Sports



Summer 2018 Adventure – Lake Tahoe

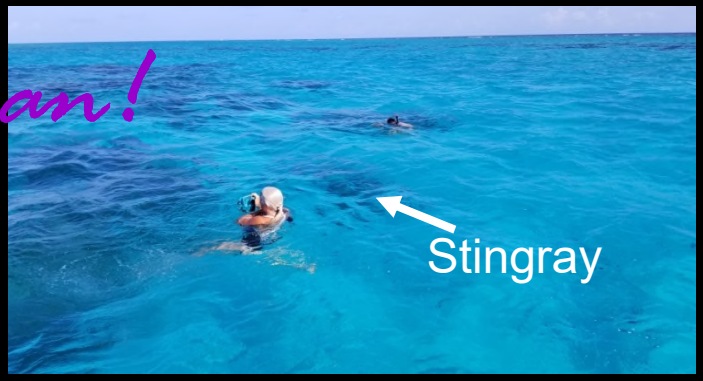


Keep Tahoe

Blue!

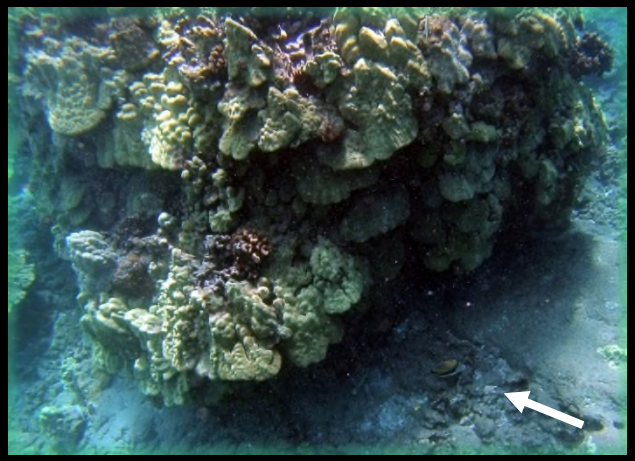
Last Summer's Adventure – Grand Cayman Island

Aloha from Grand Cayman!



Winter 2020 Adventure – The Big Island

Aloha from Hawaii!



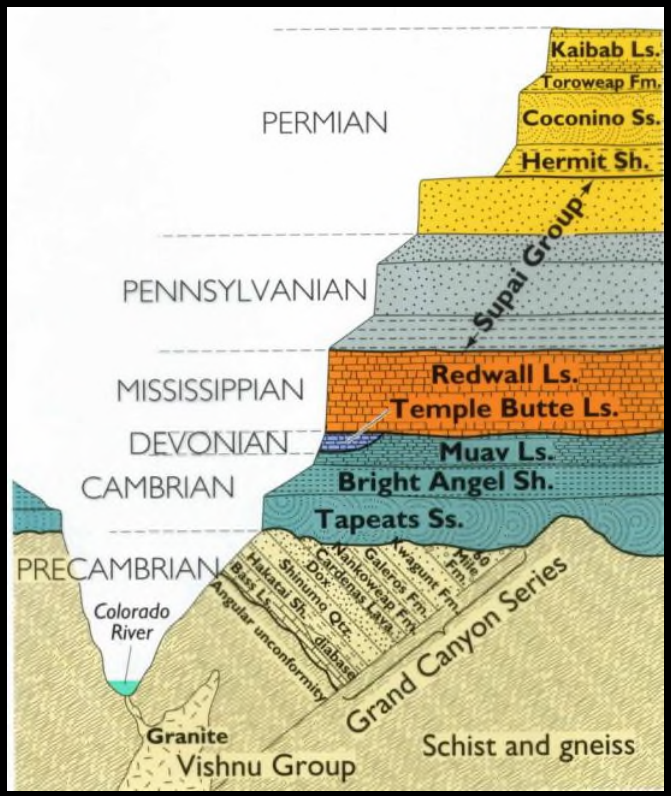
Who are You?

- Your Name
- Academic Focus
- Personal Interests
- Earth/Geology Interests?

Wishing Everyone a Great Spring Semester!

GEOLOGIC TIME

Principles and Applications



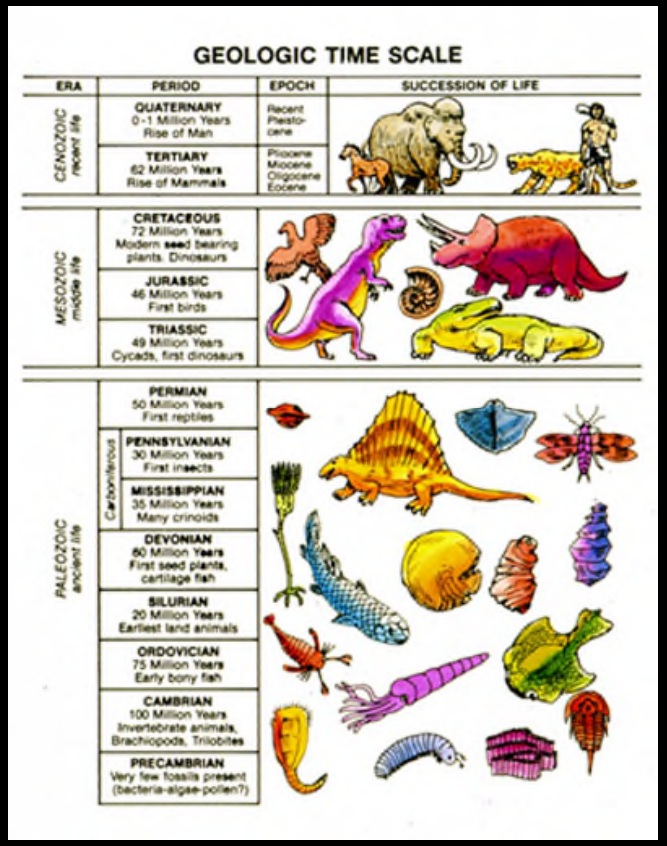
Natural Disaster Laboratory - ENVI 105

Ray Rector - Instructor

Geologic Time Laboratory

Today's Topics of Inquiry

1) Age of the Earth
2) Geo-dating Principles
3) Dating Geologic Events
4) Fossils and the Geologic Time Scale
5) Construct a Geo-Timeline



Earth's Age and History

How Old Is the Earth?

How Can We Determine Earth's Geologic History?

Scientific Means of Dating Earth

Two Primary Means of Dating Rocks:

1) **Relative Dating**
   - ✓ Determines the temporal order of rock forming events
   - ✓ Does not give numeric ages
   - ✓ Use of stratigraphic principles and fossils
2) **Absolute Dating**
   - ✓ Determines the numeric age of rock forming events
   - ✓ Only appropriate for ages of igneous rocks and minerals
   - ✓ Primary method is the ***radiometric technique***
   - ✓ Used in conjunction with stratigraphic principles and fossils

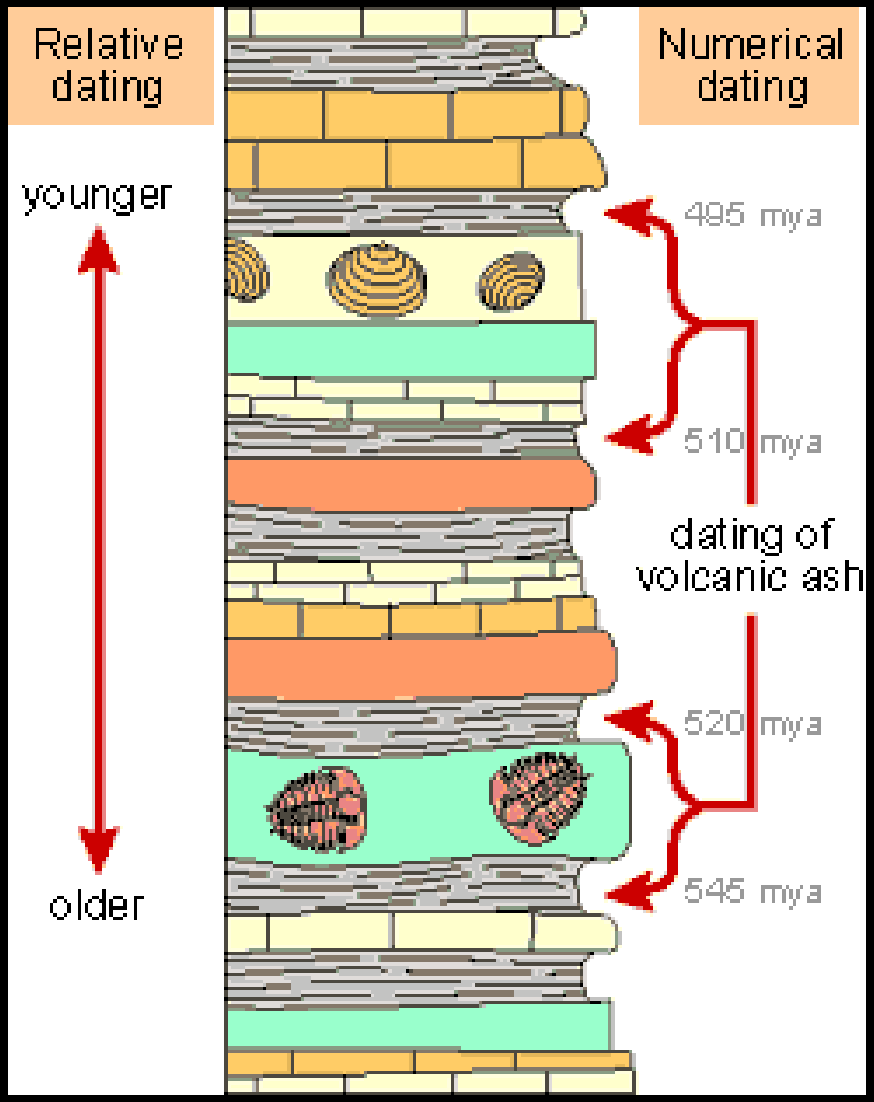
Relative Versus Absolute Dating

Relative Dating

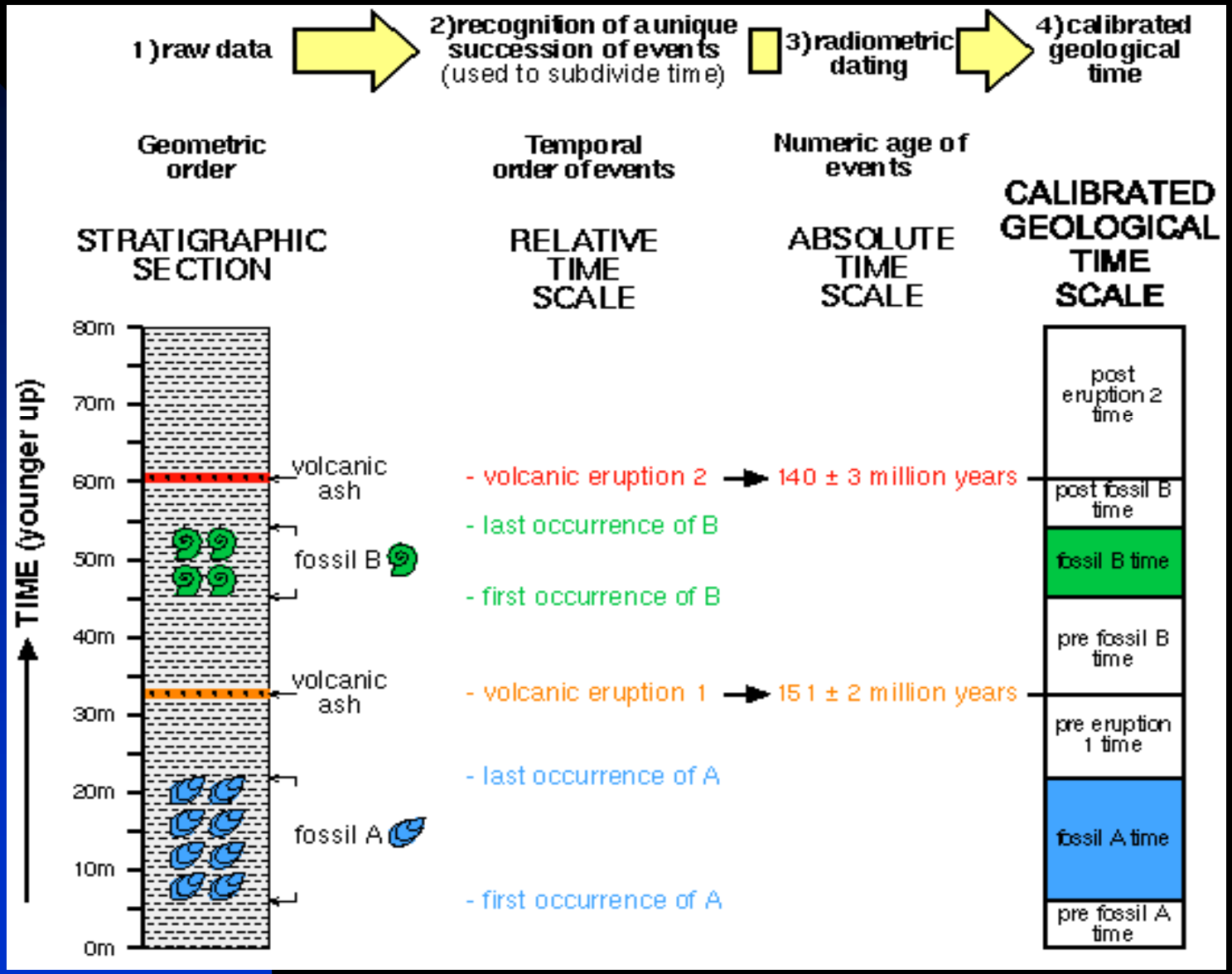
- Stratigraphic principles
- Fossil Succession

Absolute Dating

- Radiometric techniques
- Igneous layers



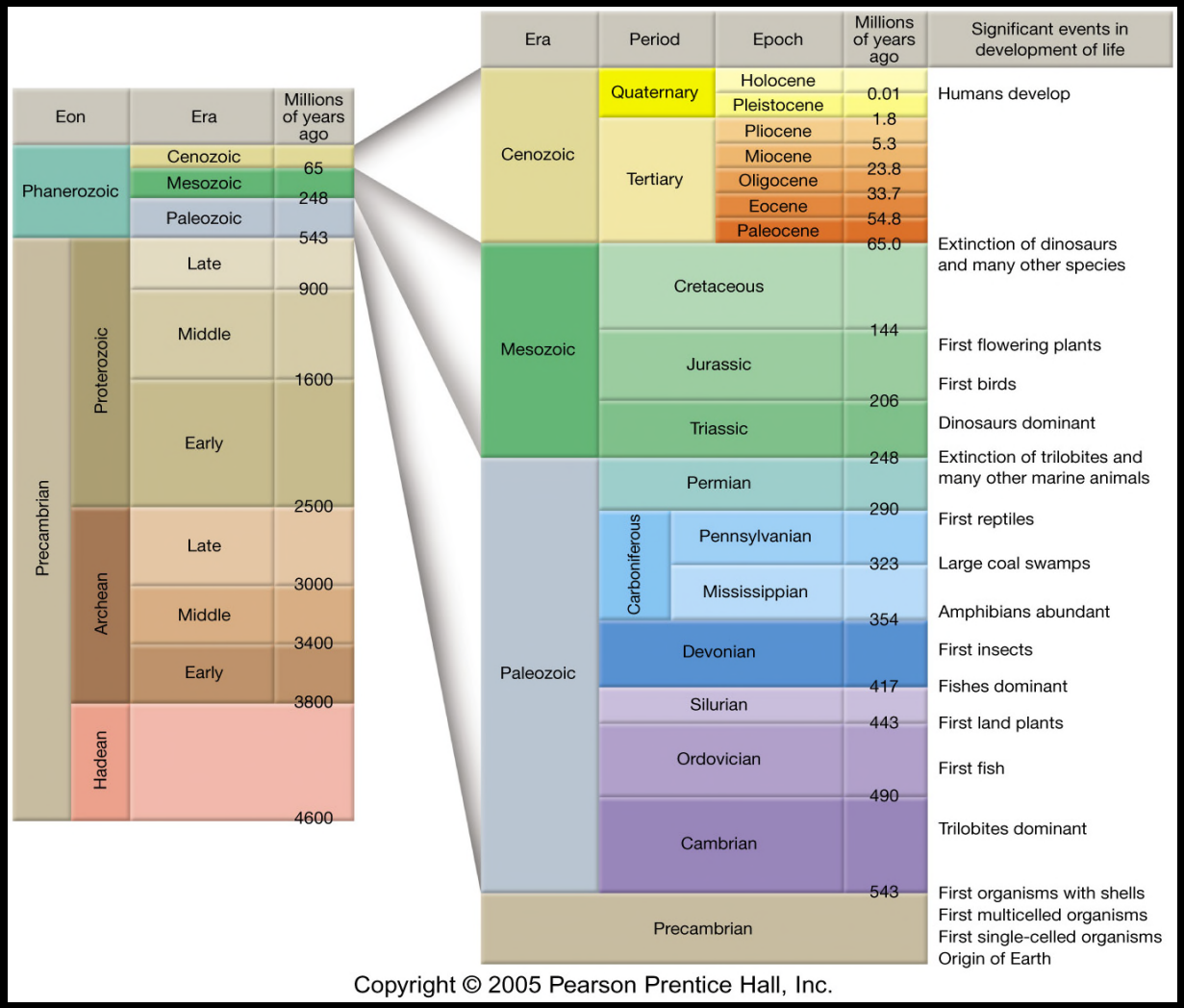
Combined Use of Relative and Absolute Dating



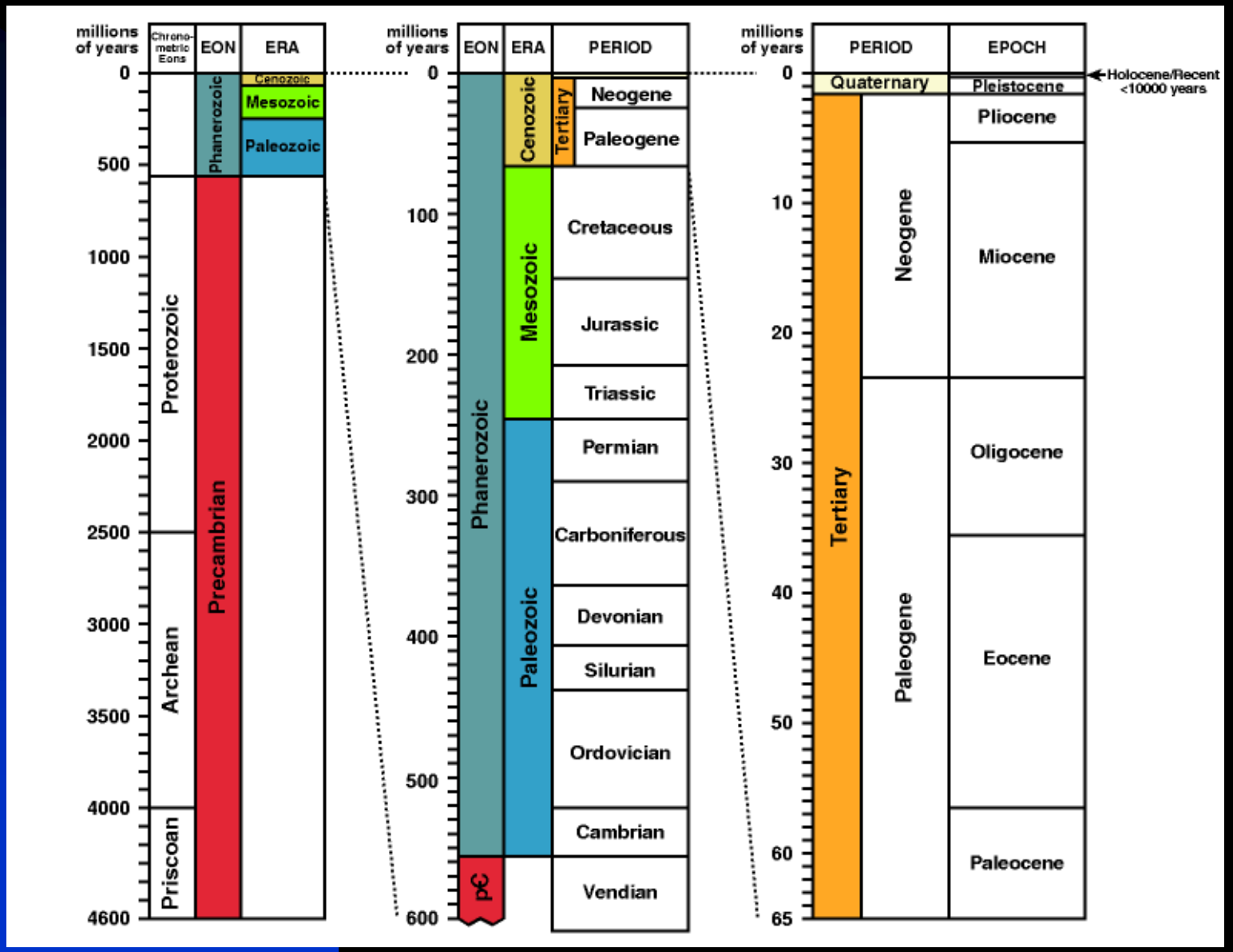
THE GEOLOGICAL TIMESCALE

Key Ideas:

- ✓ Originally based on relative dating and the use of age-specific fossils
- ✓ Periods separated by mass extinction events
- ✓ Numeric ages derived from radiometric analysis of igneous rocks found within the stratigraphic record



THE GEOLOGICAL TIME SCALE



MAKE YOUR OWN GEOLOGICAL TIME LINE

EON	ERA	PERIOD		EPOCH	Ma	"FOSSIL RECORD"
Phanerozoic	Cenozoic	Quaternary		Holocene	0.01	Human civilizations evolve, great extinctions begin
				Pleistocene		Ice Ages and interglacial periods cause widepread changes in climate
					2.6	Modern humans evolve and migrate around the world
		Tertiary	Neogene	Pliocene		First ice ages begin as Himilayan Mountains rise, Isthmus of Panama closes
					5.3	Most modern families of mammals evolve and migrate across land bridges
				Miocene		Grasses evolve and spread worldwide
						Yellowstone Hotspot migrates eastward, Colorado Plateau and Great Plains rise
					23	Great Basin extension begins as San Andreas Fault System develops
			Paleogene	Oligocene		Deciduous forests (leaves fall in winter) dominate temporate climates
					33.9	
				Eocene		Rocky Mountains rise, shedding sediments throughout western US region
						"Age of Mammals" begins
					56	Western Interior Seaway vanishes
				Paleocene		Cretaceous/Tertiary boundary extinction wipes out dinosaurs, ammonites, etc.
					66	"Greenhouse Earth" - Dinosaurs at their "peak"
	Mesozoic	Cretaceous				Western Interior Seaway forms in Great Plain region
					145	
		Jurassic				Breakup of Supercontinent Pangaea, birds and early mammals appear
					201	
		Triassic				Dinosaurs (warm blooded) replace reptiles (cold blooded) as dominant land animals
					252	
	Paleozoic	Permian				End of Permian extinction greatest of all extinction events
					299	"Age of Reptiles" - Pangaea Supercontinent forms
		Pennsylvanian			323	Carboniferous Period - great coal swamps form as Appalachian Mountains form
		Mississippian			359	"Age of Amphibians"
		Devonian				"Age of Fishes"
					419	First forests (coal beds) appear
		Silurian			444	
		Ordovician				"Age of Invertebrates" - brachiopods, trilobites, corals
						First land plants evolve
					485	
		Cambrian				First shelled invertebrates appear
					541	
Precambrian	Proterozoic					Multicellular organisms evolve
						Modern continental shield regions of continents gradually assemble
						Banded Iron Formations are deposited as oxygen atmosphere forms
	Archean				2500	Stromatolites appear in "fossil record"
						single-celled organisms evolve
					4000	Oldest rocks preserved
	Hadean					
					4500	Solar System forms, Moon and Earth system forms by accretion of extraterrestial materials

Next Lab Topic

Minerals

- Define
- Origin and Importance to Formation of Ro
- Classification – Mineral Groups
- Physical Properties
- Identification