

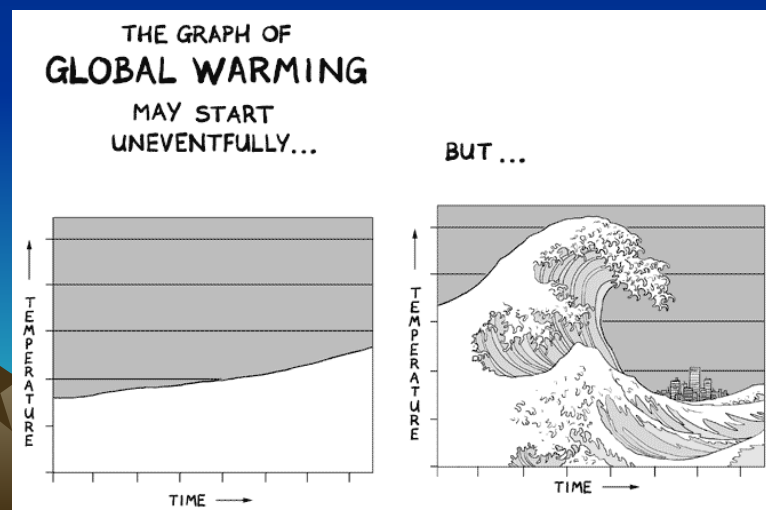
# Introduction to Earth Science

## Chapter 1



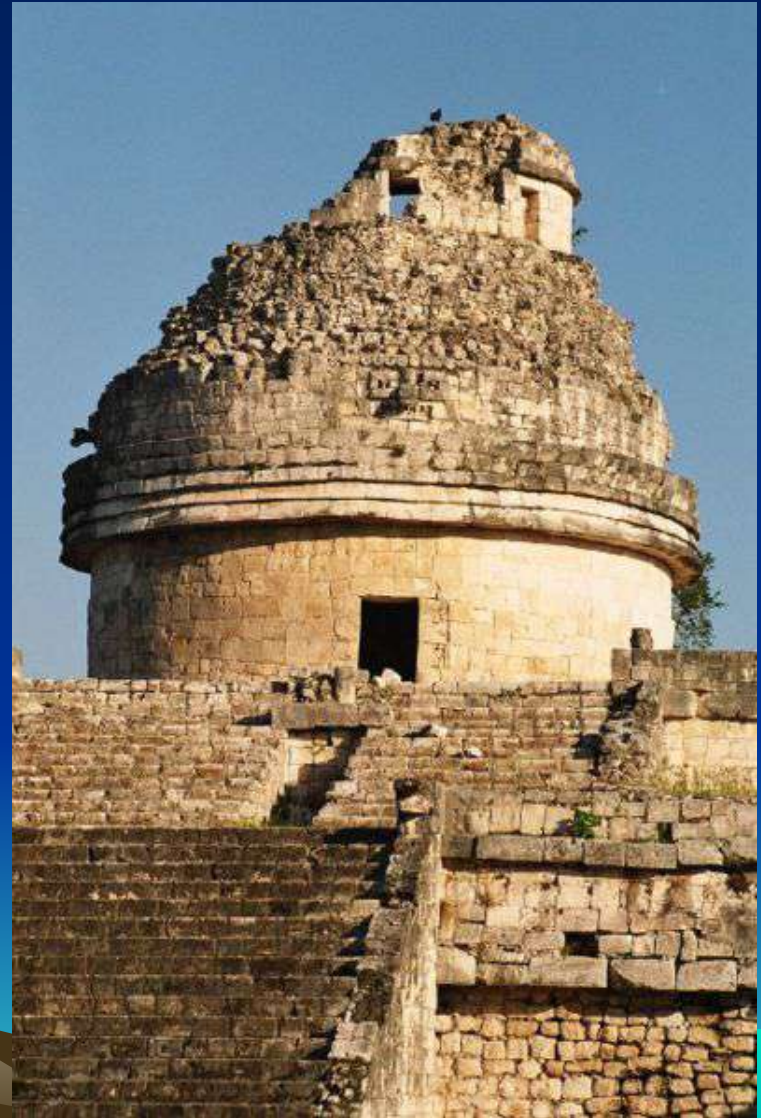
# What is Earth Science?

- Earth science is the study of Earth and the universe around it
- Uses observations and experimentation to discover the causes of natural events



# Cultural Contributions

- China: kept records of earthquakes (780 BC)
- Ancient Greeks: cataloged rocks and minerals (200 BC)
- Mayans: tracked celestial movements



# Branches of Earth Science

- There are four major areas of study: geology, oceanography, meteorology, & astronomy



# Geology

- The study of the origin, history, processes, and structure of the solid Earth
- Examples:  
volcanologist studies volcanoes



# Oceanography



- The study of Earth's oceans
- Example: studying waves, tides, or ocean currents



# Meteorology

- The study of Earth's atmosphere, especially weather and climate
- Examples: meteorologists use Doppler radar to track storms



# Astronomy

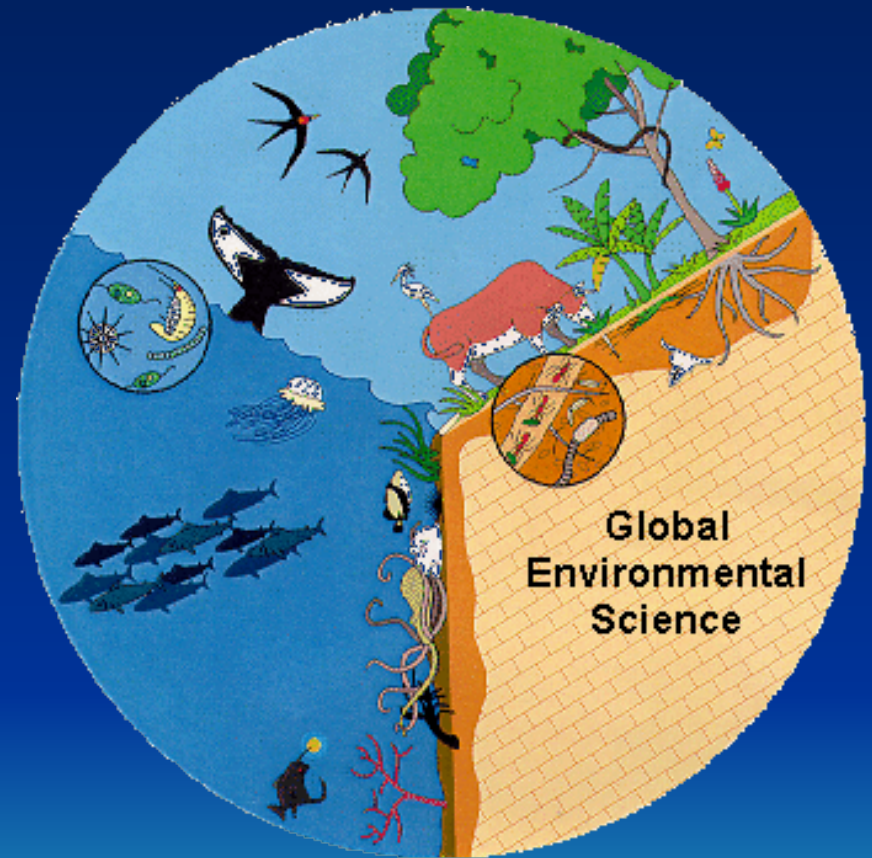


- The study of the universe beyond Earth
- Oldest branch of Earth Science
- Example: space exploration



# Environmental Science

- Study of the way humans interact with their environment
- Example: effects of pollution, loss of biodiversity, use of natural resources



# The Importance of Earth Science

An understanding of natural forces can help predict potential disasters

- We also need to understand conservation of natural resources



# Science as a Process

## Section 1.2



# Behavior of Natural Systems

- Scientists assume:
- Nature is understandable
- Similar forces = similar results
- Nature is predictable



# Ice Cores

- Provide clues to Earth's past climate changes
- Ice cores are sliced thin and the gases they contain are analyzed



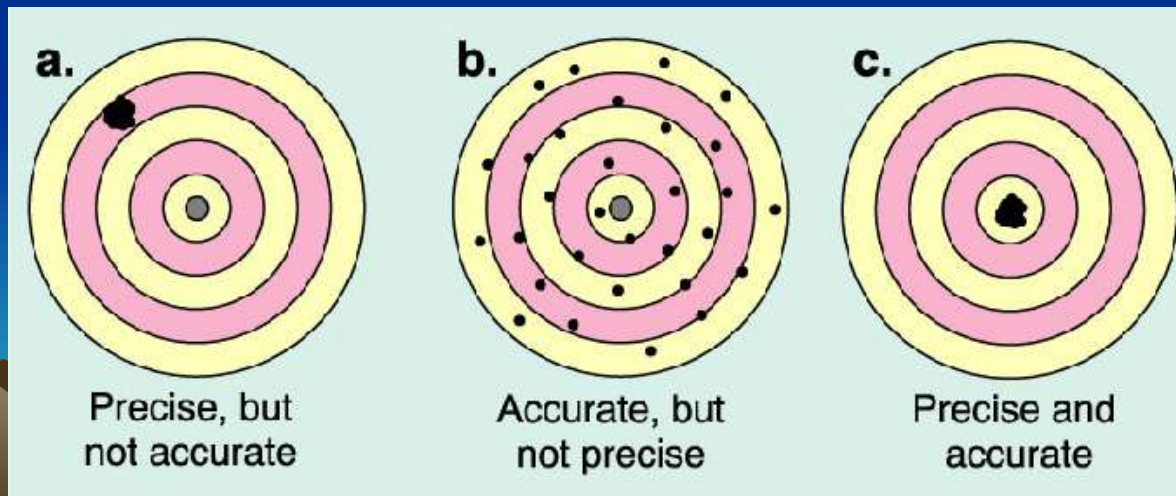
# Scientific Measurements and Analysis

- Measurement is the comparison of some aspect of an object or event with a standard unit
- The International System of Units (SI) is used worldwide (based on powers of 10)



# Accuracy and Precision

- Accuracy: how close a measurement is to the true value of the thing being measured
- Precision: the exactness of the measurement



# Error

- An expression of the amount of imprecision or variation in a set of measurements
- Expressed as percentage error or as a confidence interval

## Percent error formula

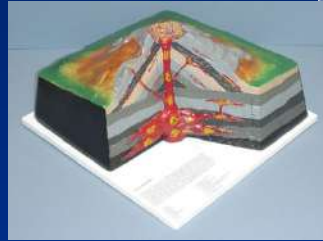
$$\text{P.E.} = \frac{\text{Difference from accepted value}}{\text{Accepted value}} \text{ Times } 100$$

Expressed as a percentage (%)  
and always kept as a positive number



# Observations and Models

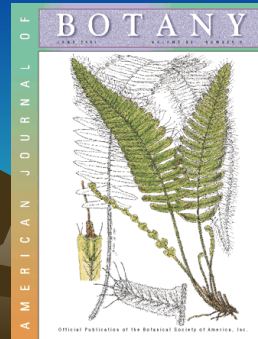
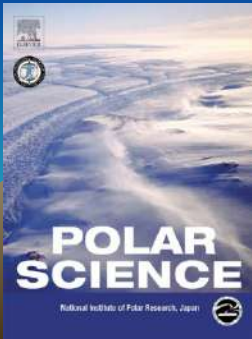
- A model is a representation, description, or imitation of an object, system, process, or concept



- Conceptual model: verbal or graphical (represents how a system works)
- Mathematical model: equations

# Scientific Publication

- Scientific results are often published in journals
- Written in standard scientific format
- Many journal articles are found online



# Peer Review



- Articles are submitted for peer review before they are published
- Several experts read through the article to make sure it is worthy of publication
- Scientists follow a code of ethics that only valid scientific results should be published



# Formulating a Theory

- A theory is an explanation that has been tested and supported by experimental results
- Theories are based on scientific laws
- Scientific laws are general statements that describe how the natural world works
- Example: Law of gravity



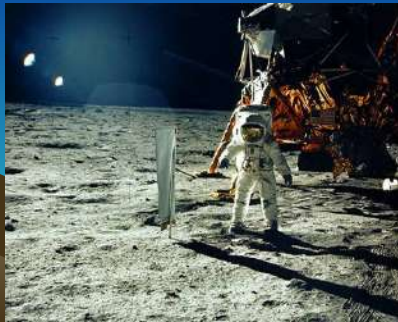
# Interdisciplinary Science

- The exchange of ideas between fields of science supports scientific evidence
- When an explanation is supported in a variety of fields, it is more accurate
- Example: meteor impact hypothesis



# Science and Society

- Advances in science have led to the development of new machines, tools, materials, and processes
- Technology that was designed for space exploration has been used to improve computers, cars, medical equipment, and airplanes



# Problems with Technology

- New technology can lead to new pollution problems
- Risks, costs and benefits must be considered
- Example: drilling for oil in ANWR will cause irreversible damage to the tundra



