

# Ch 1 Introduction to Environmental Science

## I) Our Island Earth

A) Every living thing requires resources (food, shelter etc...)

- 1) They get these things from their environment.
- 2) At any time misuse can result in a loss of resources
  - a) Easter Island is an example of overusing a resource (trees)
  - b) The population went from ~10,000 to ~2,000

B) Just like on an island, the earth has limited resources

1) Somehow the resources ARE governed. How, who, why etc... is the domain of Env.Sci

- 2) Any way you cut it we are changing the earth.
- 3) Some resources are more limited than others
  - a) The renewability spectrum is a way of describing how quickly a resource can be naturally renewed)
  - b) Some resources take millions of years to replace, others are renewed daily, and everywhere in between

C) Environmental science is the study of how the whole system works (earth, biosphere, the whole shebang)

- 1) It's a **science** - so: Scientific Method, data etc...

D) Environmentalism is advocating (actively supporting) environmental issues.

- 1) Environmentalists sometimes can bring a negative public opinion onto Env. Sci.
  - a) Firebombing a lab that is researching on pristine habitats is in no way part of Env. Sci.
  - b) Many environmentalists are perfectly helpful members of society

F) Population change

- 1) For most of history there were no people (1.5 billion years)
- 2) Humans became a species ~ 100,000 years ago
- 3) Humans became 'dominant' at the end of the last ice age (~14,000 years ago)
- 4) Human population took ~ 14,000 years to reach 1 billion
- 5) it has reached 7 billion in the last century

G) Effect on resource

- 1) just having that many people takes a whole lot of food.
- 2) Some resources are 'better' than others
  - a) better means they are more renewable
- 3) the resources used minus the resources made is your ecological footprint
  - a) can be as individuals, countries, states, businesses

## II) The Nature of Science

A) Science is a system for understanding the natural world

- 1) The Scientific Method is the tool of all science

- a) Incredibly flexible
- b) Required (for a given problem/question)
  - i) Hypothesis (proposed solution/answer)
    - An educated guess
  - ii) experiment (test)
  - iii) Data (information from the test)
  - iv) Analysis (looking at the data)
- B) Hypothesis
  - 1) to be 'scientific' there must exist a test
    - a) until disproven, we accept an answer as true
    - b) In science we don't prove things.
  - 2) Over time, with new technology, new test often provide new data
    - a) Evidence changes. SO science changes.
- C) Experiments
  - 1) Central to science, they are the tests.
  - 2) An experiment should change only ONE thing at a time
    - a) if you change more than one thing, you can't know what causes the effects.
  - 3) Scientists then measure what changes in response
    - a) ideally only one thing changes
    - b) really you never know, and you have to be open to anything.
    - c) Albert Einstein, "The most exciting phrase in science is not, 'I found it.' It is, 'Hmmm, that's funny.'"
  - 4) Keeping things the same is called controlling variables.
    - a) Often scientists will have one sample they call the 'control'
- D) Data (results of tests)
  - 1) data comes in many types:
    - Quantitative data - numbers.
    - Qualitative data - other observations (like color)
    - Hard data - unchanging over time (boiling point)
    - Soft data - can change (popularity, or psychology)
  - 2) Math helps science because numbers are easy to disprove
  - 3) Graphs show correlation (when two things change together)
    - a) Correlation does not mean causation.
      - i) two things might always change together, but that doesn't mean that one is making the other change.
    - b) Correlation may be proportional (if one goes up, the other goes up)
    - c) or inversely proportional " " " " , " " " down

### III) The Community of Science

#### A) Peer Review

- 1) In order to be trustworthy science today uses a process to ensure logical and reasonable conclusions.

- 2) To be considered scientific a study must be *published*
  - a) A *Scientific Journal* accepts someones research/experiment
  - b) The journal sends it to professionals in the same field
  - c) These *peer reviewers* read the study and say:
    - 1-Publish; 2-Don't publish; 3-Send it back for revision

#### B) The role of science in life

- 1) Because the goal of science is explanation (how things work) it serves as a very useful tool in life
  - a) It has limited scope (no morals, no "Why's") so it can't replace logic, art or religion
- 2) We can use the method to answer our own questions
- 3) Pay attention because "Science" changes
  - a) When it comes time to vote, things might be different then you were told
- 4) Some terms have specific meaning in science
  - Scientific fact - observable by a common person (the table is black)
    - Facts can change (consider heliocentrism)
  - Scientific Theory - Hypothesis (hypotheses) that appears to be true (tested and not disproven)
  - Scientific Law - theory, or group of theories that themselves explain other observations (law of gravity)

#### C) Ethics - discussion of what is right and wrong

- 1) Science has no morals. Therefore the society has to decide what is right.
- 2) In this discussion value can be placed in different ways
  - a) ex- is an innocent life more valuable than a tainted one?
- 3) Environmental Justice - a movement that says we should all get the same resources, and make the same waste (to be fair)
  - a) The rich get many times over more resources
  - b) 99% of people in the US rank in the top 15% of wealth globally

#### D) Predicting the future

- 1) Science often acts as though it can predict the future
  - a) It CAN make logical predictions
  - b) They are often wrong
- 2) The Chaos Theory - If a system is complex enough, than the most minute (smallest) changes will have profound (giant) effects
- 3) In fact there is no better way of making decisions on how to act, but the conclusions of science must be tempered with observations of history.