H A&S 222d Introduction to Energy and Environment (Life Under the Pale Sun)
Spring 2007 revisions shown in red
MWF 10.30-11.20 plus a 4th hour Mary Gates Hall 242
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energy (in nature)
|
environment
|
energy (human use)
/ \
global **local** --- Arctic

Abstract:

1. Energy: an organizing principle for studying Nature
   forces: electrostatic, electromagnetic, gravitational
   energy: mechanical, thermal, chemical, electromagnetic;
   energy production, flux, storage, transformation
   the ultimate energy source: the sun
   flow of energy through the Earth
   water and heat
   atmosphere
   ocean
   biosphere
   conversion, storage
   'physics' of biology: photosynthesis, carbon cycle
2. The global environment:
   earth, air, fire, water
   circulation of atmosphere and ocean
   global biosphere: its relation with circulation, energy and nutrient supplies
   the end of Nature?
3. Humans and their energy use
   global population and its 'footprint'
   global energy resources
   the great debate over oil
   alternative fuels
   relation to global change, global warming
4. Life at the rim of the Arctic: people and ecosystems
   interaction with energy: human use
   energy resources in the far North
   native culture and its relation to energy issues
   global change and its Arctic amplification

An underlying environmental ethic, and a practical strategy for success, both require an understanding of the place of humans among ecosystems of the Earth. A part of this

understanding comes from scientific observation and analysis…which requires familiarity with some of the underlying principles of natural science, coming from physics, chemistry, and biology.

Week 1: 26/30 March 2007

Note taking: We will put a lot of the ideas and observations on the class web-site and in some handouts, but taking good lecture notes is still a very good idea. A strategy is to buy one of those hard-bound lab books (with lines) and use it for both class notes, homework drafts and essay drafts.

Assignment: Check your computing resources:

- ability to download, save and organize Adobe PostScript files
- email organization and storage
- class website found and explored (www.ocean.washington.edu/courses/as222d)
- confirm your email address and tell us how good your web access is:
  - all the time, easy
  - I have to go to a UW computing lab
  - I can't access the Web at important times like evening/weekends
  - My access is low-speed (telephone modem), high-speed (cable-modem or better)

(brief) Essay #1: A Vivid Outdoor Memory
out: Mon 26 March 2007
due: Fri 30 March 2007 (i.e., the 3d meeting of class)

On one page describe an outdoor place that you remember as being exceptionally beautiful, peaceful, interesting or inspiring. Frame your discussion in terms of your emotional or artistic reaction to this place. You might ponder *why* you reacted so strongly, making yourself a part of the picture.

On a second page describe the same place in terms of its function: for example if it were a waterfall you could discuss why it is there, where the water originates, how it has affected the geology (rocks) and ecology (plants and animals) of the area; if there are plants and animals you could think about who is doing what to whom. Are humans involved in its function (or, potentially will they affect its future)?

Reading week 1: McNeill *Something New Under the Sun:*
on energy: preface xxi-xxvi
Ch. 1 Peculiarities of a Prodigal Century 3-17

McKibben *The End of Nature* in course pak

Thoughts about your writing.

A page is about 450 words, say 30 lines of 15 words each; if using Microsoft Word, use 1.5 line spacing and a 12 pt font like Times New Roman with about 1" margins. Your word count is easily checked. But we are happy if you don't use Microsoft Word. In a way it is sad to see everyone on Earth using the same writing tool.

Writing is an essential part of this course. Good writing will get you far. We can easily imagine another course in which you looked at the environment in literature, in the poetry of Emily Dickinson and Robert Frost. Or a course on representation of environment in great paintings. But scientific writing and other kinds of prose or poetry differ. We are a science-based course, though with an important component of humanities. We wonder, for example, "How do people and ecosystems relate to and react to the winds and currents around them?" Tersely focused writing is taught, for example by Strunk & White's classic little book *The Elements of Style*.

Something important has happened to science writing in the past few years. It has become much better, more effectively channeling information and ideas between scientists and non-scientists (yes, both ways). People with Ph.D. degrees in physics have become full-time writers of articles in magazines and of books. A good example is Phillip Ball, author of H_2O – *The Matrix of Life: a Biography of Water*. By combining hard science with an understanding of its impacts on humans—you might call this philosophy of science—writers like Ball give us a deep understanding of things that matter. Sometimes they fool us into thinking that we really understand the essence of a difficult scientific idea (as in *Genius-the Life and Science of Richard Feynmann*, a biography of the physicist by James Gleick). But, as in this course, they can succeed by using some results of science (not derived or demonstrated) and from these, showing an important result (for example, if we are given the amount of sulfur put into the atmosphere each year by human activity, and the observed concentration of sulfur in air we can calculate the average lifetime of a sulfur atom—how long it resides in the atmosphere before being rained out. And, in a way that is what scientists all do; they understand some parts of a complicated system, far less than they would like, and yet deduce something important about it.

Other authors are highly successful scientists who also like to write. For example Prof. Brownlee of UW Astronomy has written in '*Rare Earth*', about the chance of finding life elsewhere in the Universe. Fred Hoyle, the most prominent astronomer in England for many years, wrote wonderful science fiction (*The Black Cloud, October 1st is Too Late).* In the book *A For Andromeda (1961)* Hoyle imagines a radio signal arriving in Scotland from far outside the solar system. It is decoded, and turns out to be a computer program, together with instructions for assembling the computer. When the program is run it contains the DNA sequence which produces a beautiful alien named Andromeda. Of course her mission is to invade the Earth, but Hoyle, writing just 8 years after Crick & Watson's discovery of the DNA molecules helical structure (the 'physics' of life), sees how, all of a sudden, life has in a sense become a computer program and aliens could transmit themselves rather than ride spaceships. Science fiction is one of the few activities in which writers are imagining humanity's future.

On the other hand, non-science (almost rhymes with nonsense) authors like Gretel Ehrlich (*This Cold Heaven*, about Greenland) write as artists infatuated with Nature, and seeing scientific ideas in their own way. They have much to teach scientists about what's important. And so we will read excerpts from her book.