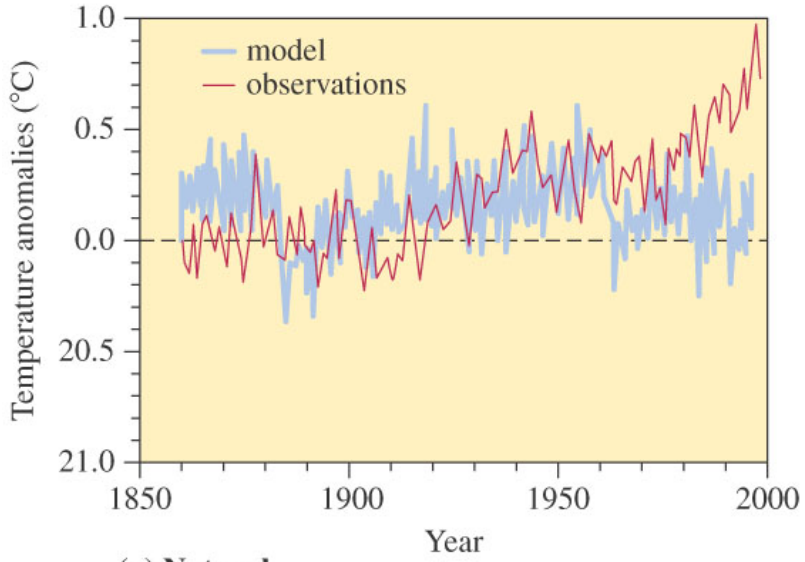
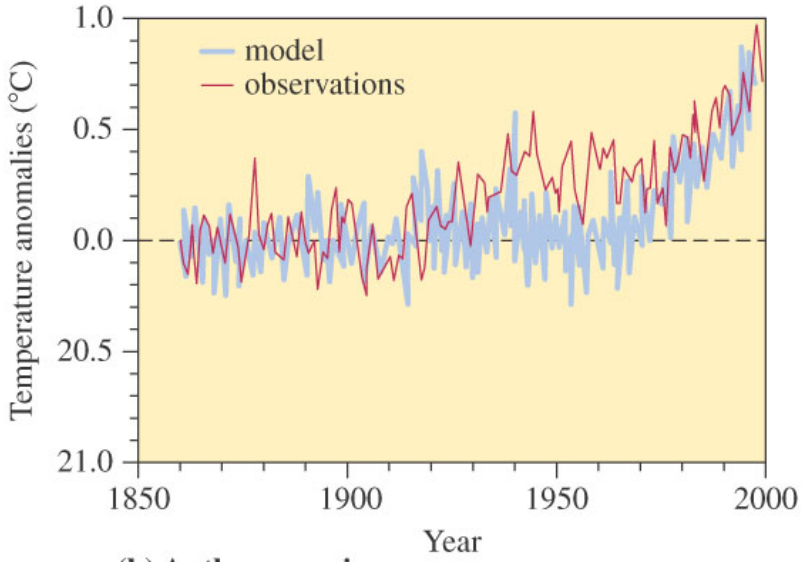
Soda Siphon video

http://franklin.chem.colostate.edu/chem103/movies/Soda-Siphon-large.mp4

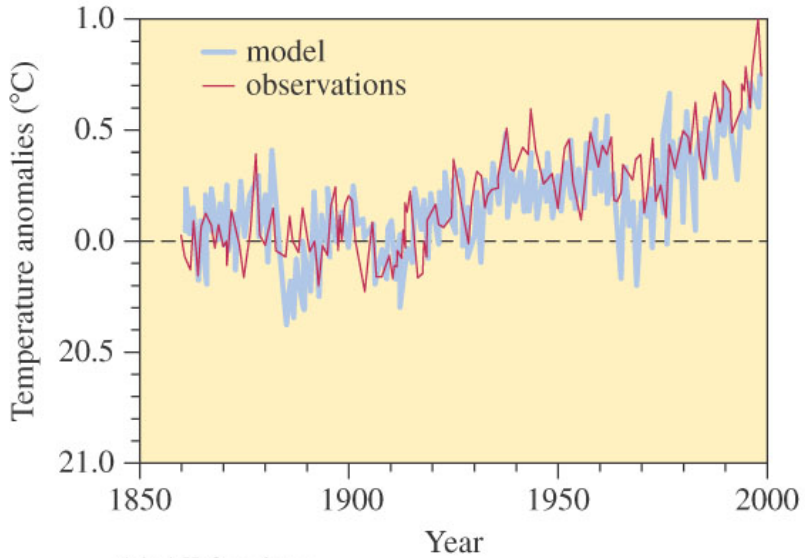
Models of Natural and Anthropogenic Impacts on Temperature



(a) Natural



(b) Anthropogenic



(c) All forcings

Intergovernmental Panel on Climate Change (IPCC) Reports

2001 report:

Table 3.5 IPCC Conclusions

Very Likely *probability correct is 90-99%:*

- Human-caused emissions are the main factor in causing warming since 1950.
- Higher maximum temperatures are observed over nearly all land areas.
- Snow cover decreased about 10% since the 1960s (satellite data); in the 20th century there was a reduction of about two weeks in lake and river ice cover in the middle and high latitudes of the Northern Hemisphere (independent ground-based observations).
- Increased precipitation has been observed in most of the Northern Hemisphere continents.

Likely *probability correct is 66-90%:*

- Temperatures in the Northern Hemisphere during the 20th century have been the highest of any century during the past 1000 years.
- Arctic sea ice thickness declined about 40% during late summer to early autumn in recent decades.
- An increase in rainfall, similar to that in the Northern Hemisphere, has been observed in tropical land areas falling between 108° N and 108° S.
- Increased summer droughts.

Very Unlikely *probability correct is 1-10%:*

- The observed warming over the past 100 years is due to climate variability alone, providing new and even stronger evidence that changes must be made to stem the influence of human activities.

2007 report (which received the Nobel Prize) stated that the scientific evidence for global warming is unequivocal & that human activity is main driver

Comparison of Global Warming and Ozone Depletion

Table 3.6 Global Warming and Ozone Depletion: Some Characteristics

	Global Warming	Stratospheric Ozone Depletion
Region of atmosphere involved	Mostly troposphere	Stratosphere
Major substances involved	H_2O, CO_2, CH_4, N_2O	O_3, O_2, CFCs
Interaction with radiation	When molecules absorb IR radiation, they vibrate and return heat energy to Earth.	When molecules absorb UV radiation, they break apart into smaller molecules or atoms.
Nature of problem	Increasing concentrations of greenhouse gases are apparently increasing average global temperature.	Decreasing concentration of O_3 is increasing exposure to UV radiation.
Major sources	Release of CO_2 from burning fossil fuels, deforestation; CH_4 from agriculture. Natural sources of H_2O	Release of long-lived CFCs from past uses as solvents, foaming agents, air conditioners. CFCs release Cl• that destroys O_3.
Credible consequences	Altered climate and agricultural productivity, increased sea level, effects on health	Increased incidence of skin cancer, damage to phytoplankton
Possible remedies	Decrease use of fossil fuels, slow deforestation; change agricultural practices	Eliminate use of CFCs, find suitable replacements
International response	Kyoto Protocol, 1997 and later amendments	Montreal Protocol, 1987 and later amendments
U.S. response	Signed Kyoto Protocol in 1998; not submitted to Senate for ratification, therefore not bound by its provisions; alternative proposals; actions by states	Signed Montreal Protocol in1987; full participation in protocol and its amendments

Is Anthropogenic Global Warming "Real"?

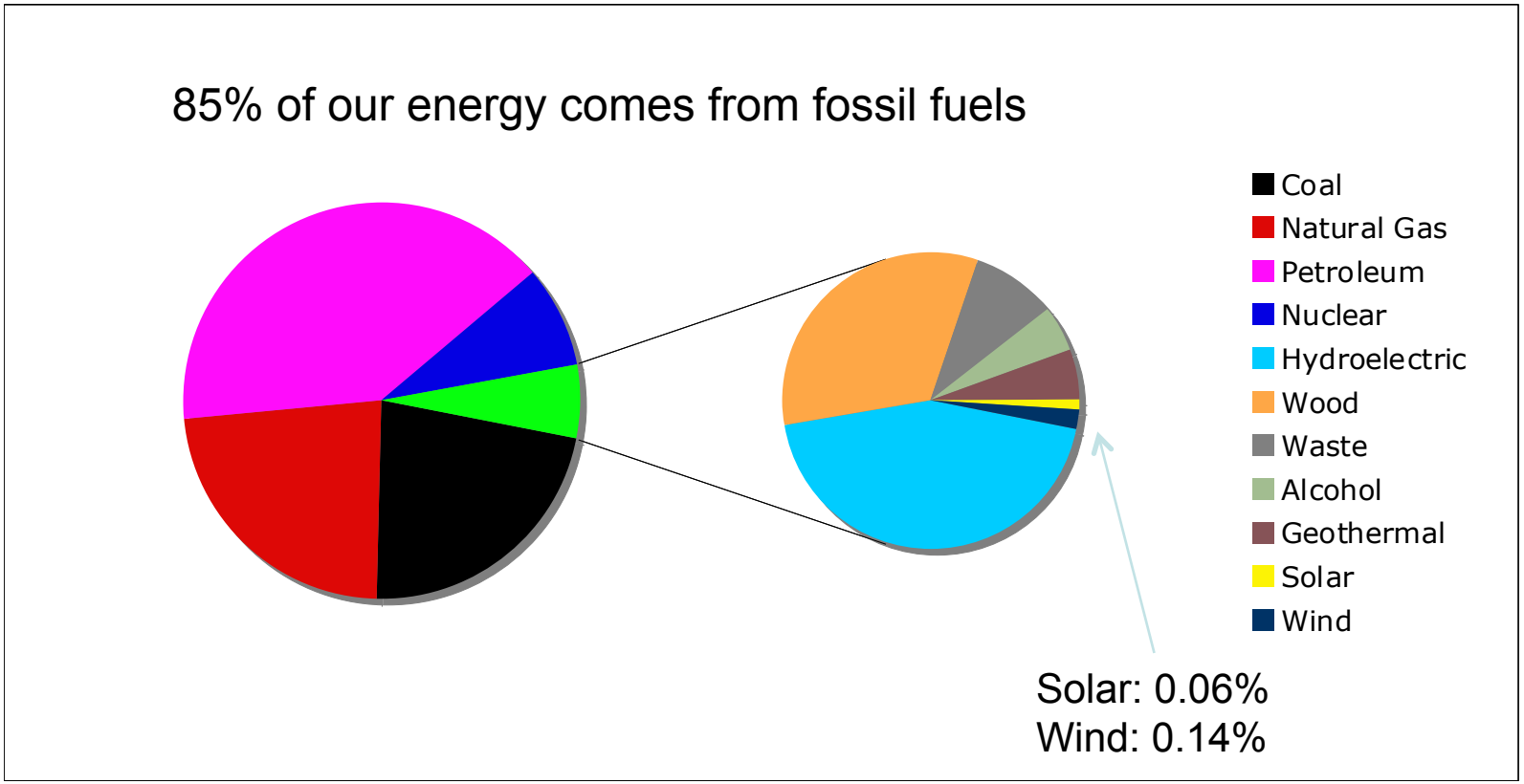
- Well…
  - CO_2 is definitely a greenhouse gas
  - More CO_2 is **correlated** to higher surface temperatures on Earth
  - People burn a lot of stuff, so we make a lot of CO_2 (and SO_2 and N_2O and CH_4 and other things)
  - [CO_2] is higher now than at any other time since people have occupied the planet
- Arguments over (un)certainties
  - in the quality of climate models
  - in the methods behind making models
  - in the data collection and incorporation into models
- Phrases floating around in the news (re: e-mails between climatologists):
  - "hide the decline"
  - "trick"
  - "climategate"

- My advice: read a lot; read critically; be suspicious of cherry picking of anything (data and quotes come to mind); remember that scientific terminology doesn't always translate to journalism…and vice versa

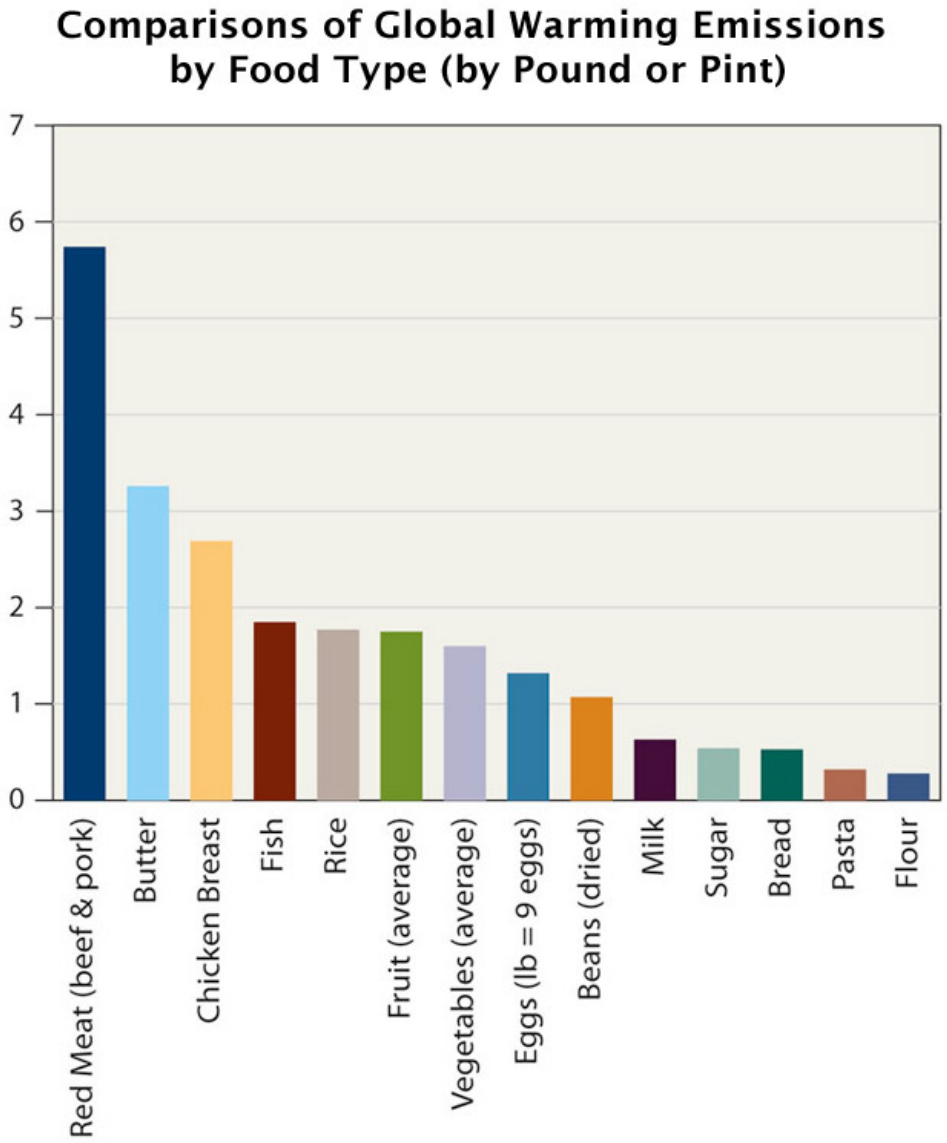
What to do about it?

Simple yet difficult: reduce CO_2 emissions

- sequester CO_2
- reduce our use of fossil fuels (coal, natural gas, petroleum)



Food We eat


Comparisons of Global Warming Emissions
by Food Type (by Pound or Pint)
7
6
5
4
3
2
1
0
Red Meat (beef & pork)
Butter
Chicken Breast
Fish
Rice
Fruit (average)
Vegetables (average)
Eggs (lb = 9 eggs)
Beans (dried)
Milk
Sugar
Bread
Pasta
Flour

Unit 4.2 Summary

- energy balance: all of our energy comes from the sun
  - greenhouse effect vs enhanced greenhouse effect
- “global climate change” is a better descriptor of the whole ‘experiment’ we’re currently undertaking with the Earth
  - remember: the planet will be fine no matter what happens
- molecular shapes tell us what molecular vibrations are operative
  - start with Lewis (dot) structures, then consider that electron pairs repel each other
  - infrared radiation
  - there must be a change in dipole for a vibration to contribute to warming
- carbon cycle
  - natural forcings vs anthropogenic forcings
- data collection and interpretation:
  - difference between correlation and causation
  - scientific arguments about theories versus legal/political coverage of the issues