

Course Organization:

- MWF 2:00-2:50 PM, AHC5, Room 357
- H. E. Willoughby, 305-348-0243,
AHC5, Room 363, hugh.willoughby@fiu.edu
- Office Hours:
 - MW10:00 AM-11:00 AM & Tue 2:00 PM-3:00 PM,
- On-line course materials at:
 - http://faculty.fiu.edu/~willough/met_3103/0_LINKS.html
- This site links to both grad and undergrad materials

Text:

- Available at the Bookstore or on-line.
- Not as expensive as some other texts
- Very detailed, but misses a few important points
- But, on the whole, a reasonably good book

Grades (u):

Grading Factors	
Essays	40%
Midterm Exam	25%
Final Exam	30%
Participation	5%
Total	100%

Grading Scale	
100-90	A
89-80	B
79-70	C
69-60	D
below 60	F

Grades (g):

Grading Factors	
Essays	15%
Term Paper	25%
Midterm Exam	25%
Final Exam	30%
Participation	5%
Total	100%

Grading Scale	
100-90	A
89-80	B
79-70	C
69-60	D
below 60	F

A Bit About Empiricism:

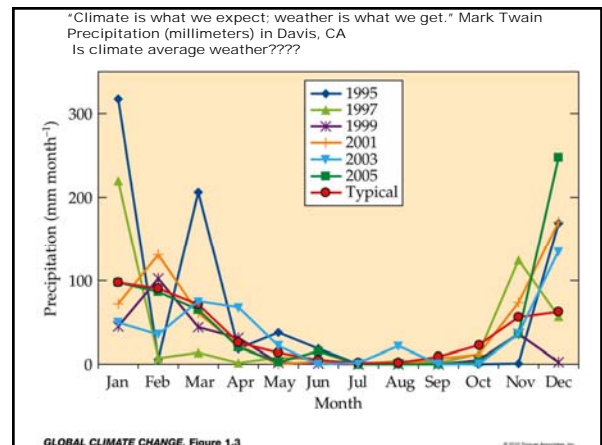
- Sir Francis Bacon's Idols:
 - **Idols of the Tribe** have their foundation in human nature itself...the human understanding is like a false mirror, which, receiving rays irregularly, distorts and discolours the nature of things by mingling its own nature with it.
 - **Idols of the "Cave"** ... For every one has a cave or den of his own, which refracts and discolours the light of nature...
 - **Idols of the marketplace** ...of commerce and consort of men...an unfit choice of words wonderfully obstructs the understanding
 - **Idols of the theater** ... all the received systems are but so many stage-plays, representing worlds of their own creation after an unreal and scenic fashion.
- Shadows of all four idols fall upon the issue of global warming



"Doom and Gloom with Bloom"

- **FUD:** Fear Uncertainty Doubt
- Bloom relieves the tension with humor—to an extent
- Distortions of the science
 - Confirmation (and Refutation) bias
 - File-drawer bias
 - Media bias
 - Economic self interest
 - Ideological bias
 - Intellectual inertia
- A scientific hypothesis should be falsifiable. (Karl Popper)
- Natural or Anthropogenic (human-caused) changes?

- Reasons to find global warming credible
 - Observed CO₂ increase
 - Observed warming
 - Observed sea-level rise
 - Observed retreat of polar icecaps and mountain glaciers
 - Physical understanding
 - Climate models, despite their limitations
 - Reconstructed past climate



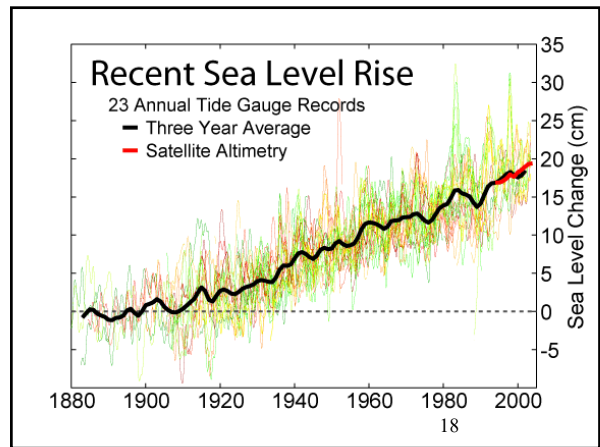
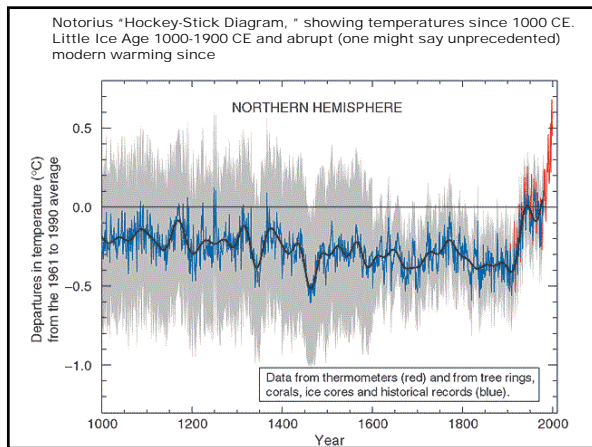
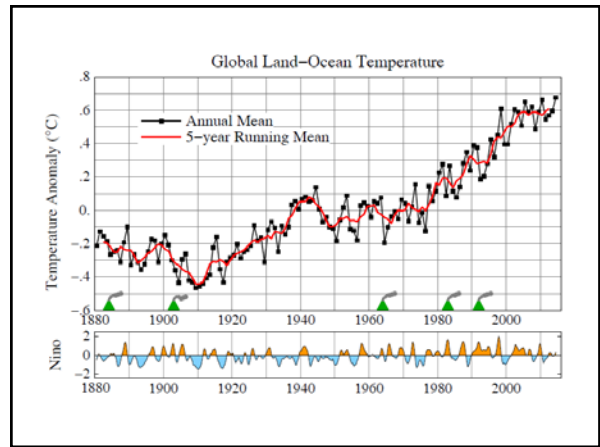
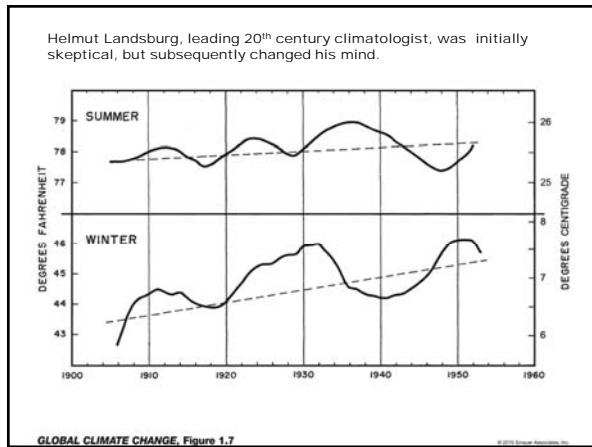
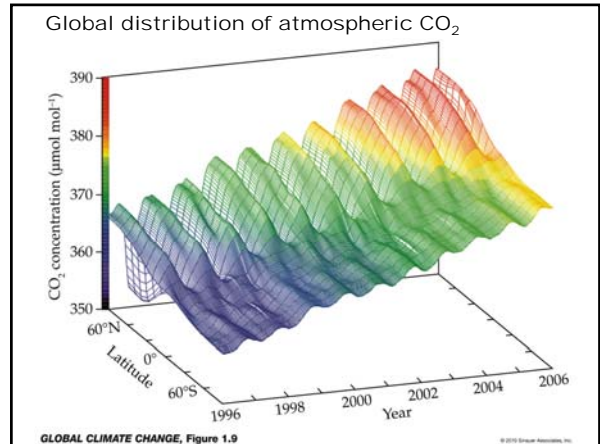
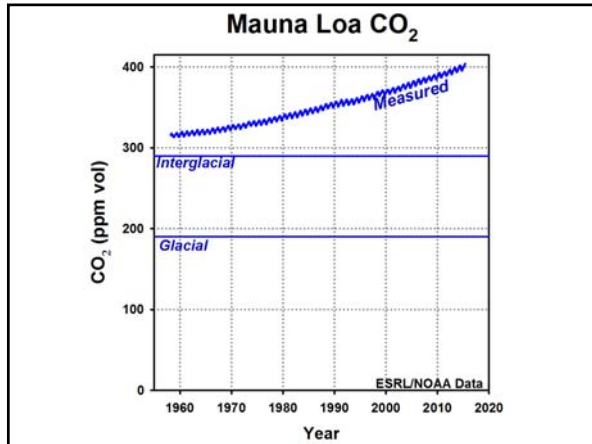
Callendar (1938) linked CO₂ and global temperatures.

- Svante August Arrhenius (Swedish Physical Chemist) first proposed "Greenhouse" Effect in 1896.
- Guy Stewart Callendar
 - Grouped temperatures from reliable observing stations
 - Made 10-year moving averages
 - Indicated 0.2°C warming 1890-1935
 - Attributed to increased CO₂ based upon crude measurements and a simplistic model
 - Ideas not well-received

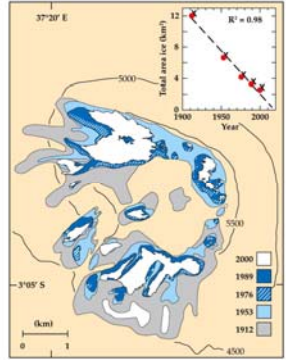
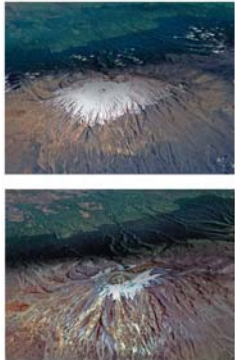
Keeling and atmospheric CO₂ concentration

- Began in 1957/58 (311 ppm)
- South Pole & Mauna Loa
- South Pole discontinued after 2 yr
- Seasonal Oscillation
- Typical increase 1.8 ppm/yr
- 400 ppm = 0.04 % in 2014
- Roger Revelle & Hans Suess (1957) argued for slow CO₂ absorption into the sea

GLOBAL CLIMATE CHANGE, Figure 1.5

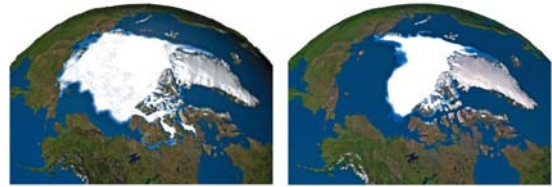


Melting of Mountain Glaciers Worldwide, In this case Mt. Kilimanjaro in Kenya



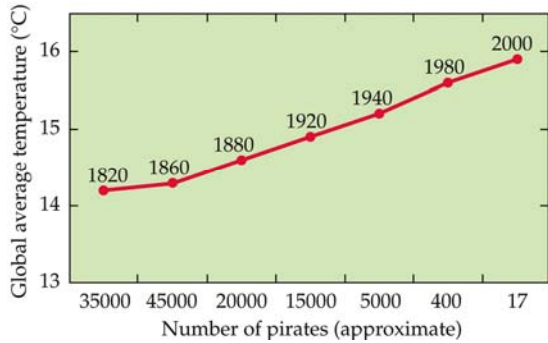
GLOBAL CLIMATE CHANGE, Figure 1.10

21st Century Melting of Arctic, but not Antarctic, Sea Ice



CO₂ concentration, temperature, sea level, and ice extent are natural low-pass filters. Because of averaging, or storage capacity, or thermal inertia they smooth out random fluctuations so that we can see underlying trends

Wacky correlation, illustrating "Hic post hoc ergo propter hoc." Correlation does not prove causation.



An alternative explanation for global warming

LETTERS

Daylight exacerbates warning

You may have noticed that March of this year was particularly hot. As a matter of fact, I understand that it was the hottest March since the beginning of the last century. All of the trees were fully leafed out and legions of bugs and snakes were crawling around during a time in Arkansas when, on a normal year, we might see a snowflake or two.

This should come as no surprise to any reasonable person. As you know, Daylight Saving Time started almost a month early this year. You would think that members of Congress would have considered the warming effect that an extra hour of daylight would have on our climate. Or did they?

Perhaps this is another plot by a liberal Congress to make us believe that global warming is a real threat. Perhaps next time there should be serious studies performed before Congress passes laws with such far-reaching effects.

CONNIE M. MESKIMEN

GLOBAL CLIMATE CHANGE, Box 1.1, Figure B

We probably could have saved ourselves, but we were too damned lazy to try very hard ... and too damn cheap.



Kurt Vonnegut, Jr., 1922-2007
And so it goes...

SUMMARY

- Review course management
- Bacon's Idols of the Hearth, Cave, Market Place and Theatre
- CO₂ increase leads to temperature increase
 - Callendar (1938)---and Arrhenius (1896)
- Global Warming Evidence
 - Measured CO₂ increase (311-400 ppm since 1957)
 - Measured temperature increase (0.7°C since 1900)
 - Measured sea-level rise (2-3 mm/ yr)
 - Observed retreat of mountain glaciers and Arctic sea ice
- Correlation does not prove causation.
- For next time, read Bloom, Chapter 2