



# COMMUNICATING THE CREDIBILITY OF CLIMATE CHANGE SCIENCE

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NCAR

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# OUTLINE

- Why This Presentation and Why Now?
- Barriers to Communicating Climate Change Science
- Credibility of Climate Science
- Approaches to Communicating Credibility of Science
- Recommendations

Why This Presentation  
and  
Why Now?

# CLIMATE CHANGE IN THE AMERICAN MIND

Americans' Global Warming Beliefs  
and Attitudes in May 2011

Which comes closer to your own view?

	May 2011	June 2010	Jan 2010	Nov 2008
Most scientists think global warming is happening	39	34	34	47
Most scientists think global warming is not happening	4	4	5	3
There is a lot of disagreement among scientists about whether or not global warming is happening	40	45	40	33
Don't know enough to say	18	17	22	18



George Mason University  
Center for Climate Change Communication

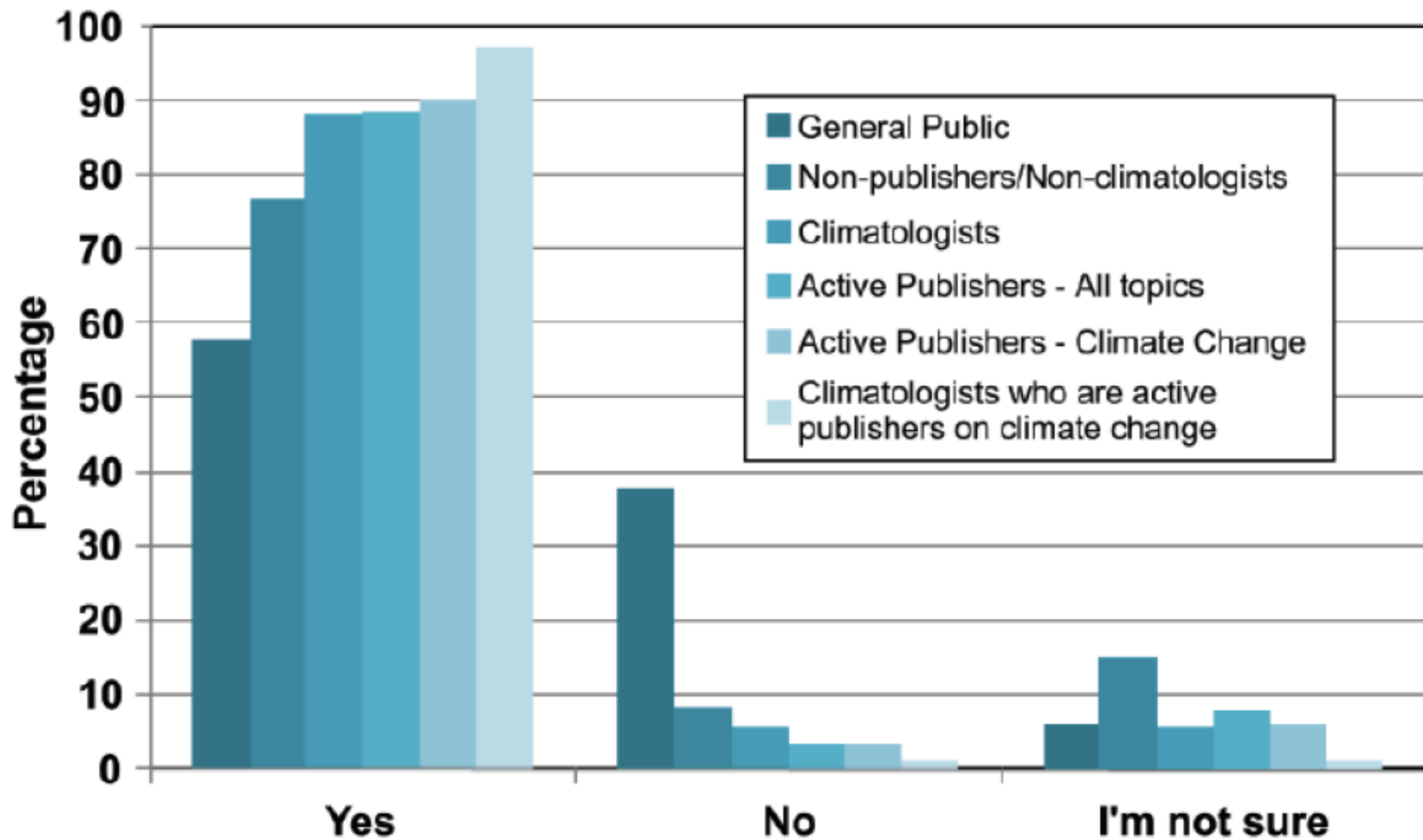


Fig. 1. Response distribution to our survey question 2. The general public data come from a 2008 Gallup poll (see <http://www.gallup.com/poll/1615/Environment.aspx>).

# Climate change should be excluded from curriculum, says adviser

Head of government review says school syllabus needs to 'get back to the science in science'

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**Jessica Shepherd**

guardian.co.uk, Sunday 12 June 2011 22.00 BST

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Leaving climate change out of the curriculum would allow sceptical teachers not to teach their pupils about climate change. "It would be like a creationist teacher not teaching about evolution," said Bob Ward. Photograph: Nathan G/EPA

Climate change should not be included in the national curriculum, the government adviser in charge of overhauling the school syllabus in England has said.

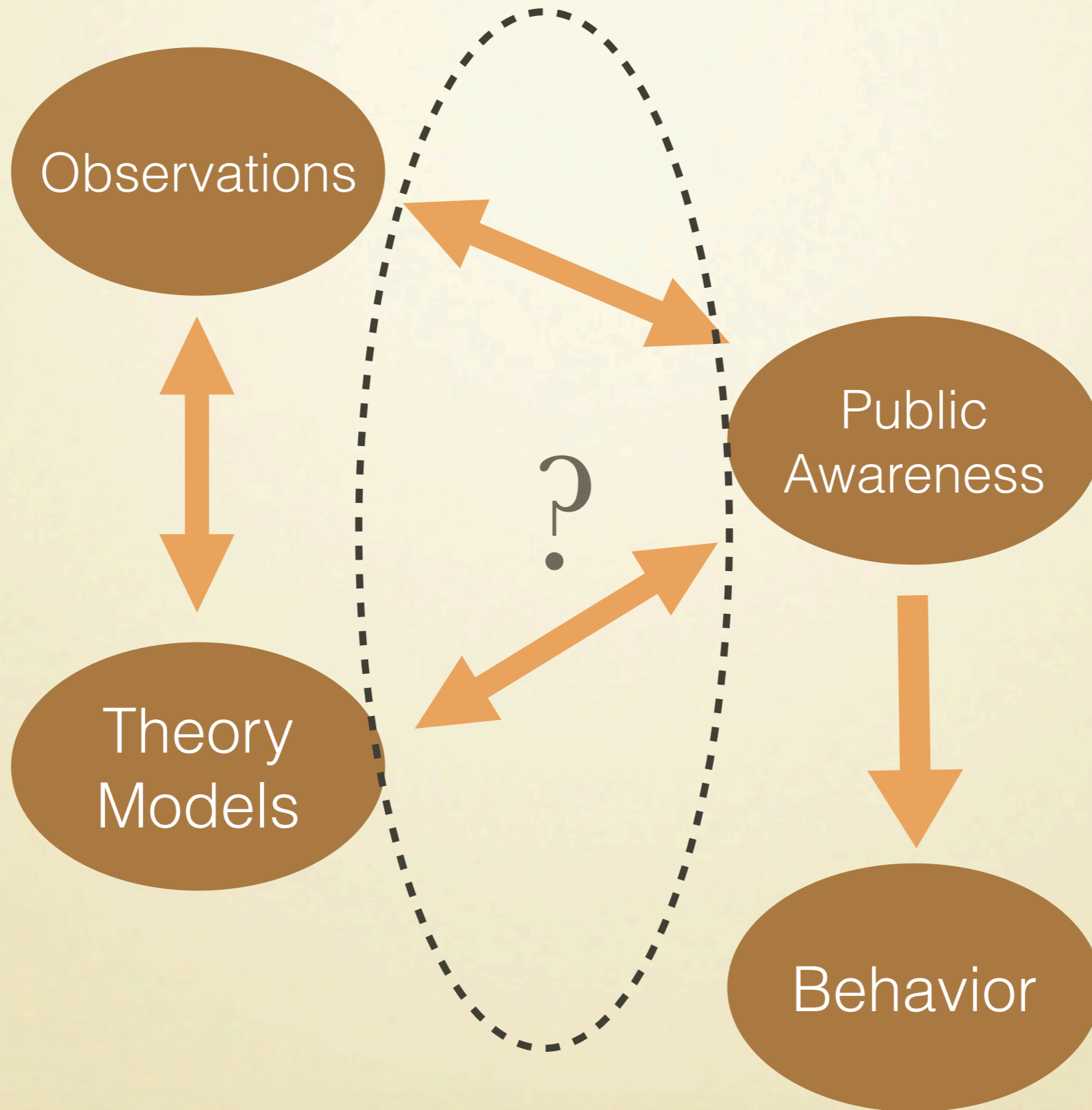
# The New York Times

## The Credibility of Climate Science, Cont.

By [JOHN M. BRODER](#)

“Sheila Jasanoff, professor of science and public policy at ... Harvard, says that climate scientists face two significant challenges: to produce and communicate the best information about climate change, and to build public trust. The trust part, she says, does not necessarily flow from the quality of the science, as many scientists hope or believe.”

# Traditional Information Deficit Model







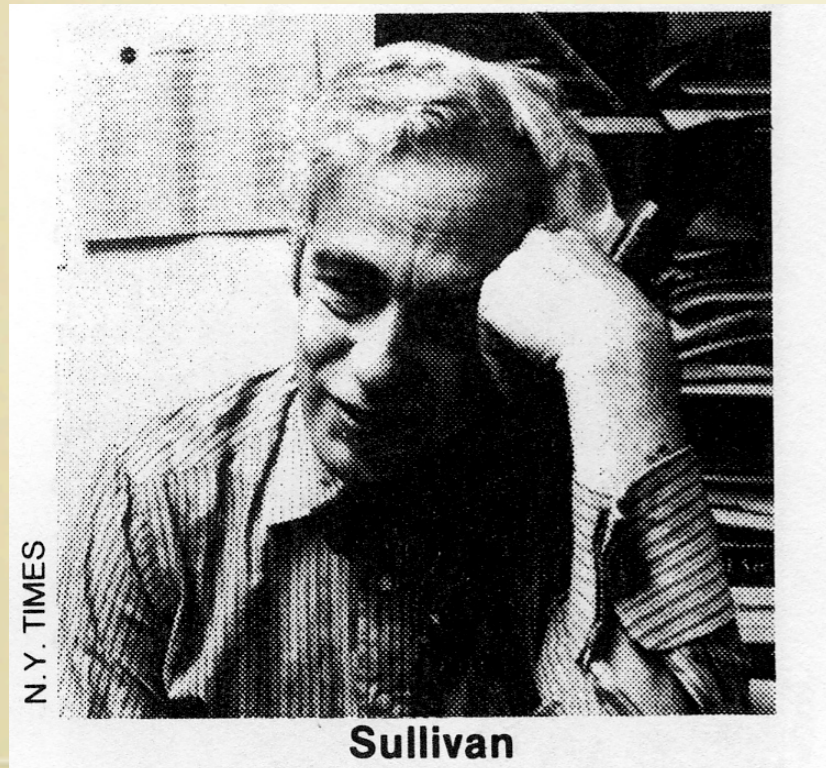
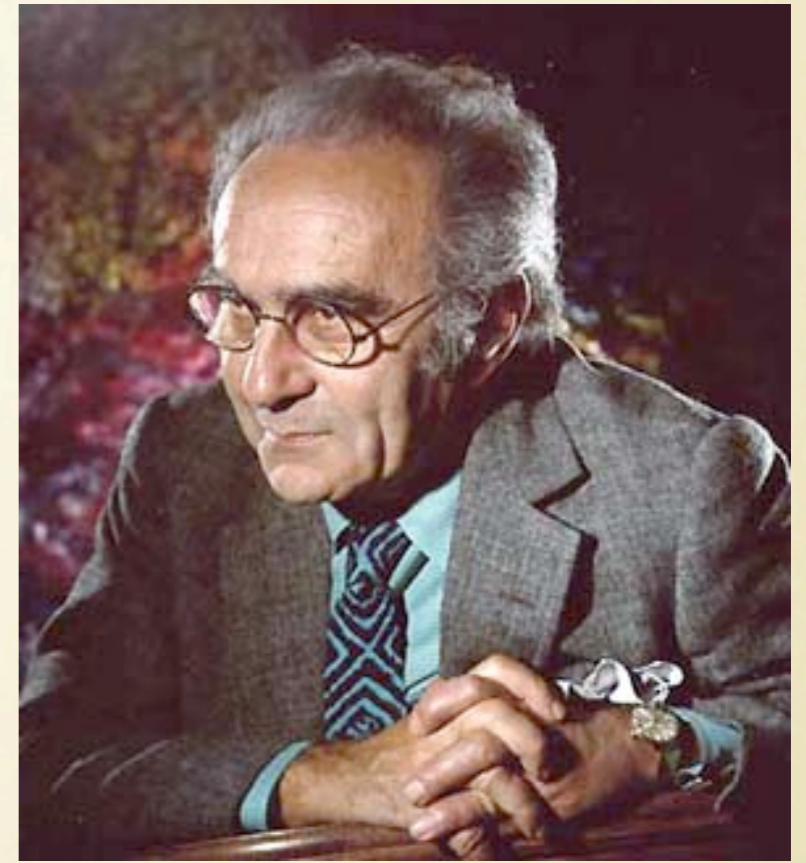
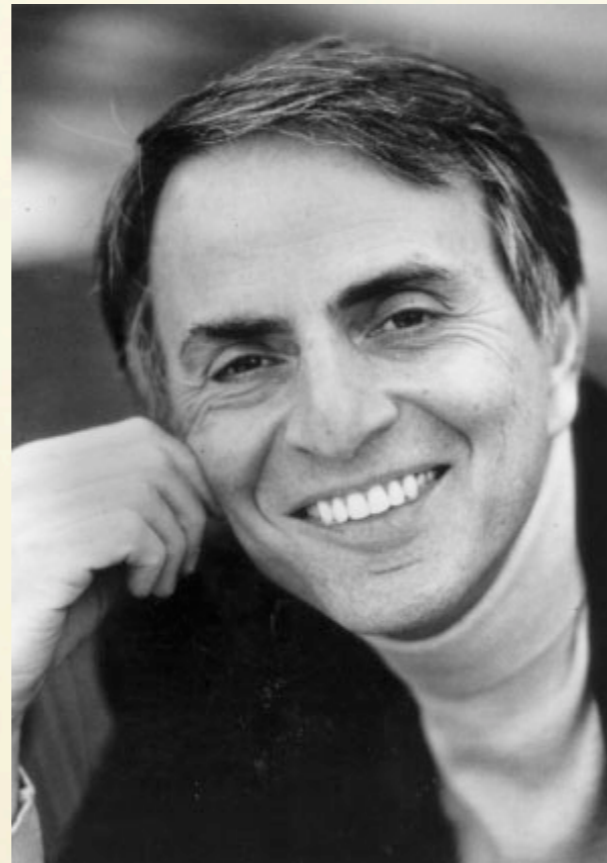
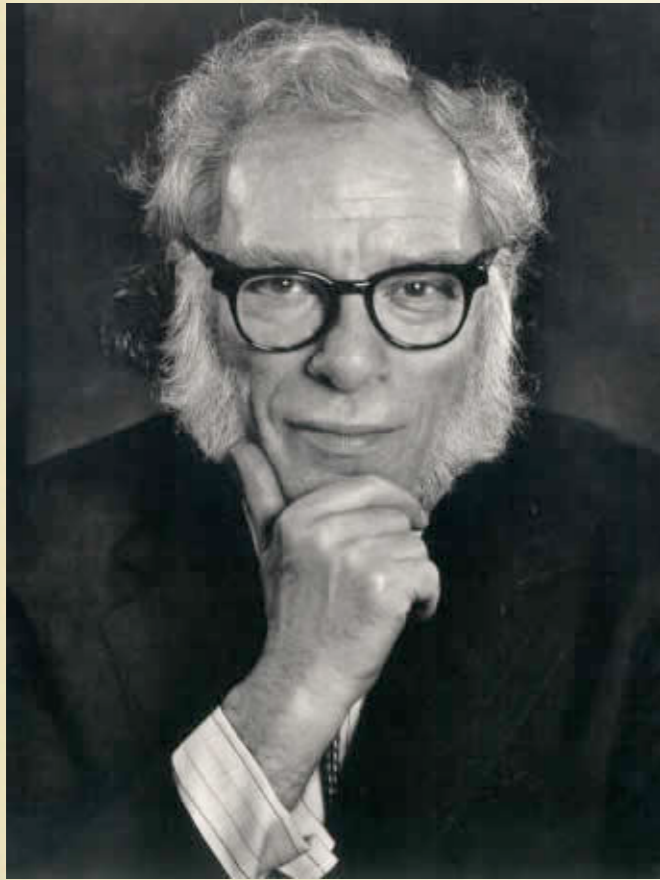
# Barriers to Communicating Climate Change Science

# Barriers to Communicating Climate Change Science

- Few Highly Visible Communicators of Science & Existing Media Bias
- Basic Understanding of Science
- Social, Economic & Cultural Dimensions
- Psychological Dimensions

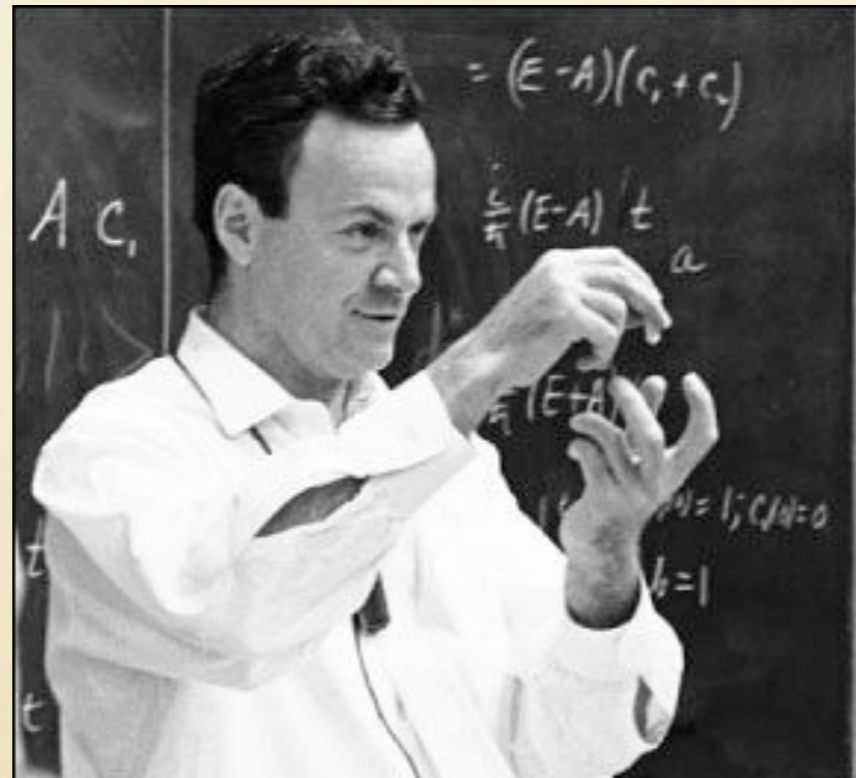


# Science Communicators of Past

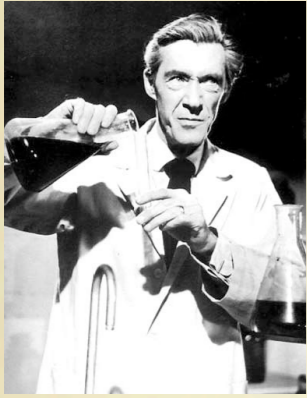


“Feynman truly believed that if you couldn’t explain something simply you didn’t understand it.”

Physicist Leonard Susskind (2011)

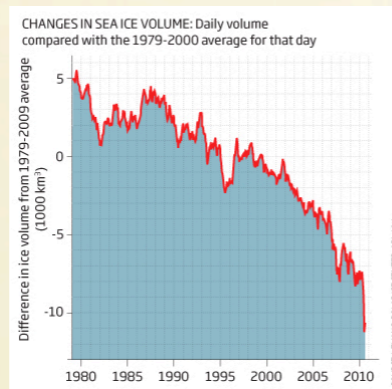


# The Many Levels of Communicating



Science

Scientific Image



Message

Message imbedded in a narrative



A contextual narrative with metaphors

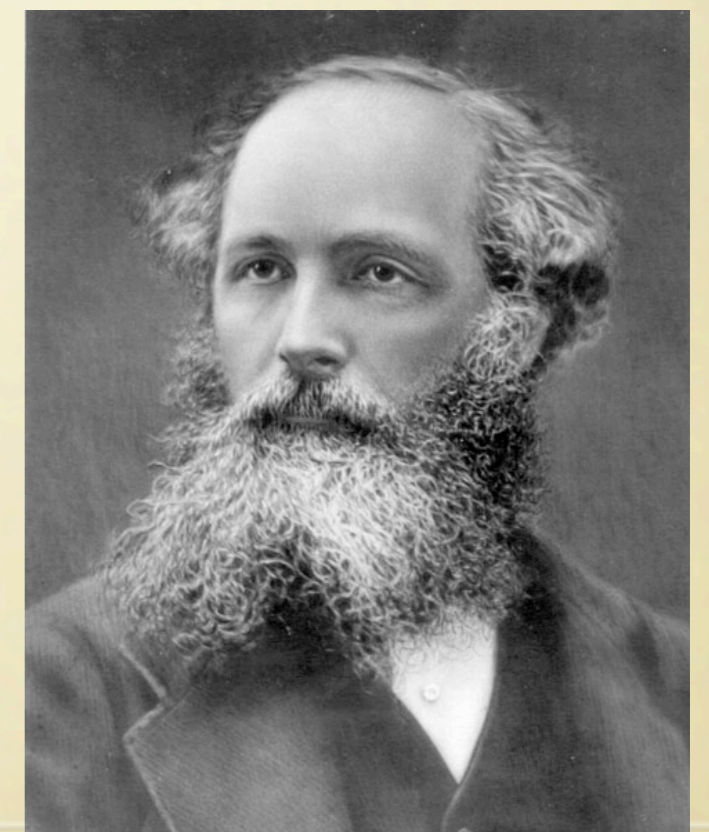
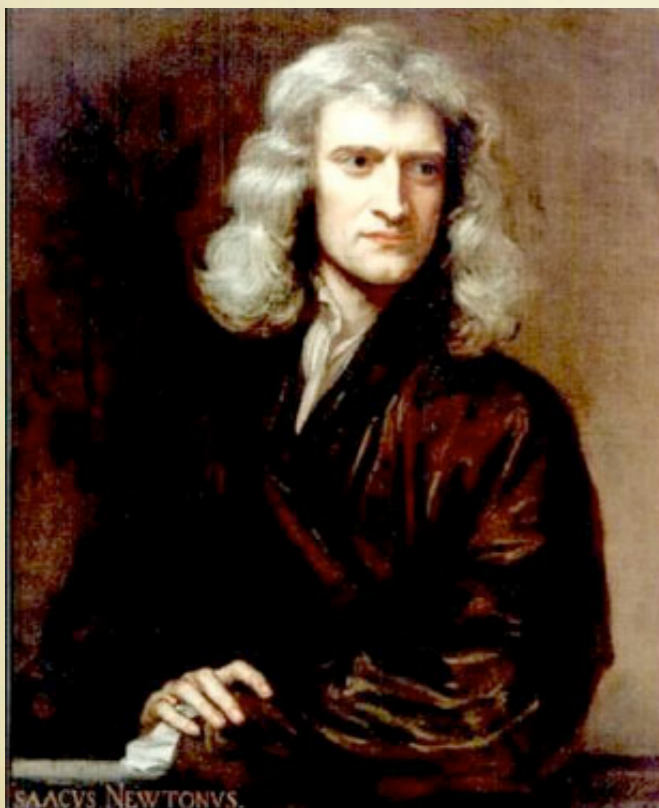
Audience



# Barriers to Communicating the Science: Basic Understanding of Science

- K-12 Science Education
- Complexity of the Climate Problem
- Discerning between Climate & Weather

But beware of the Sputnik fable!



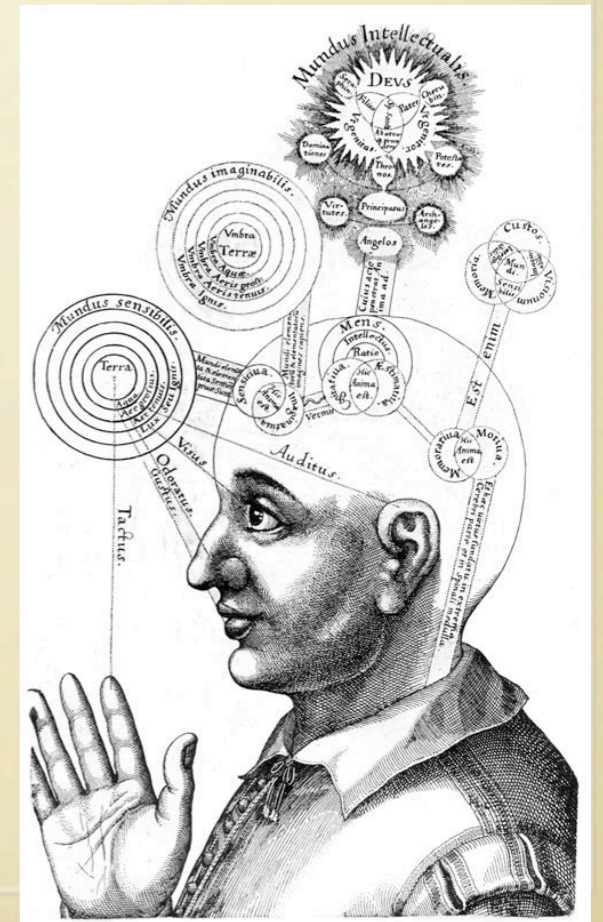
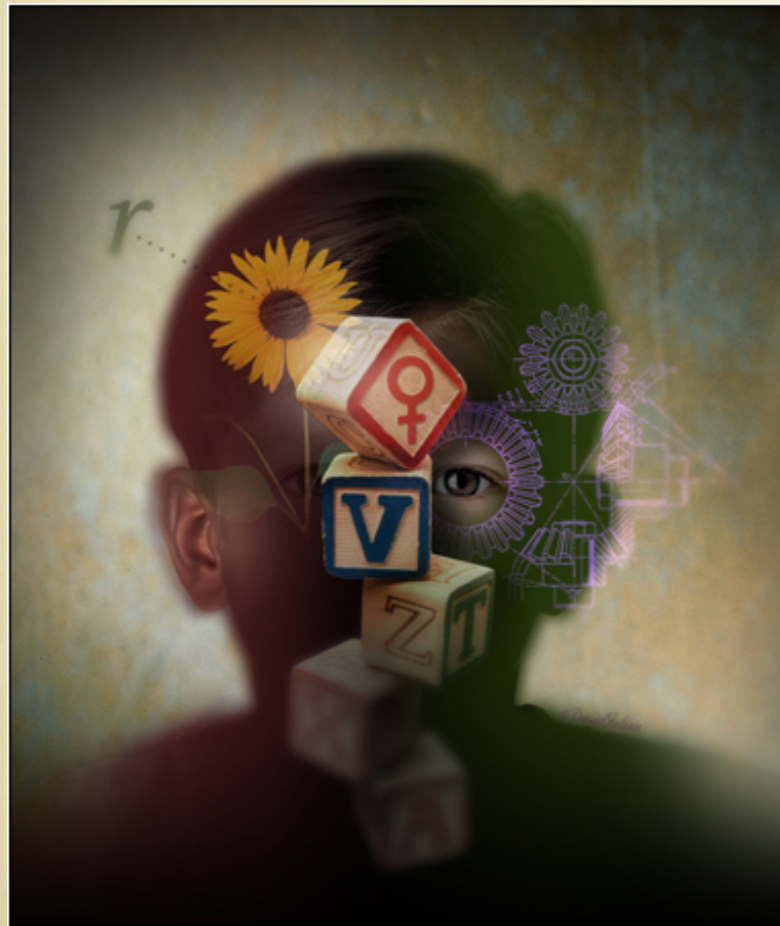
# Barriers to Communicating the Science: Social, Economic & Cultural Dimensions

- Challenge to Religious Belief Systems
- Fear of Government Control  
(Loss of Independence)
- Threat to the Economy (Loss of Safety)
- Threat to Fossil Fuel Industry



# Barriers to Communicating the Science: Psychological Dimensions

- Intrinsic Defense Mechanisms
- Self Identity & Consumerism
- Relatedness to Environment
- Typological Differences





## Emotional Reactions\*

\*Moser (2007)

- Fear
- Guilt
- Powerlessness
- Despair
- Numbness
- Anger
- Hopelessness
- Defiance

## Defense Mechanisms

- Denial
- Distortion
- Regression
- Withdrawal
- Dissociation
- Projection
- Rationalization
- Intellectualization
- Splitting
- Reaction Formation

A faint, light-colored world map is centered in the upper half of the slide, showing the outlines of continents.

# Credibility of Climate Science

# CREDIBILITY ISSUES

- Climate Observations
  - \* Data Quality (Urban effect, sampling, ...)?
- Climate Models (How Can We Believe Models?)
  - \* Tuning?
  - \* Greenhouse Effect?
  - \* Parameterization is Not Science!
  - \* How Are Models Evaluated?

# TUNING?

*Usually Asked by Scientists from Other Communities*

- What Is It?
- Why Is It Done?



# TUNING?

*Usually Asked by Scientists from Other Communities*

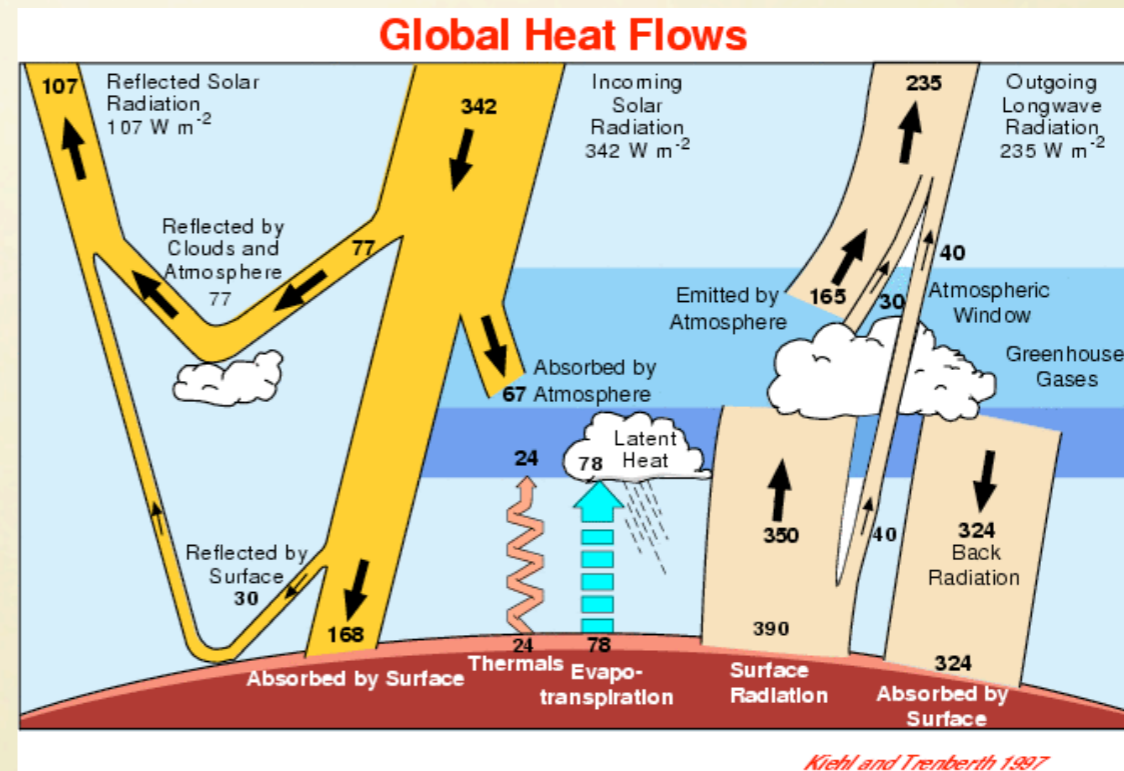
- How Is It Done?



# TUNING?

*Usually Asked by Scientists from Other Communities*

- What Does It Effect?



# TUNING?

*Usually Asked by Scientists from Other Communities*

- Does It Change Climate Response to Increasing Greenhouse Gases?

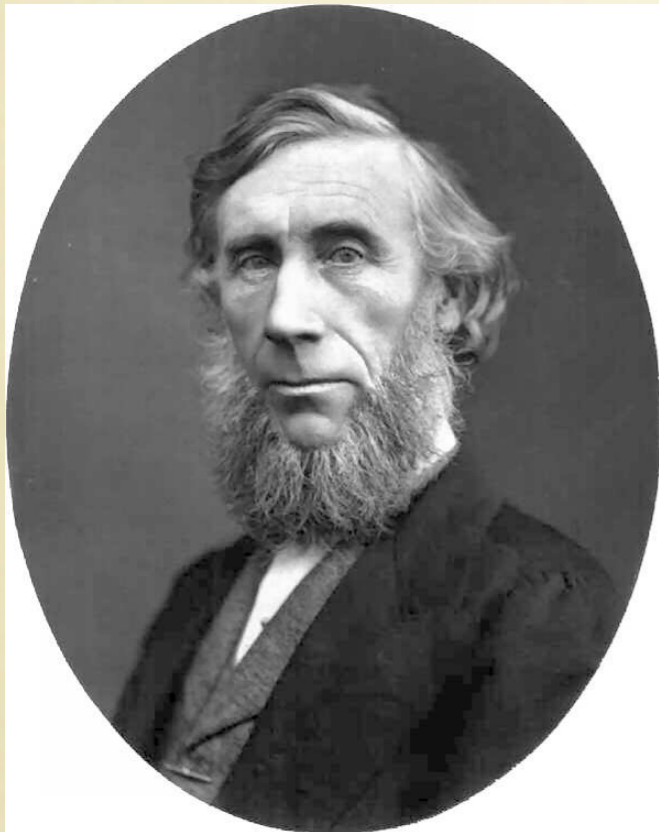
**A note on the effect of GCM tuning on climate sensitivity**

F A-M Bender

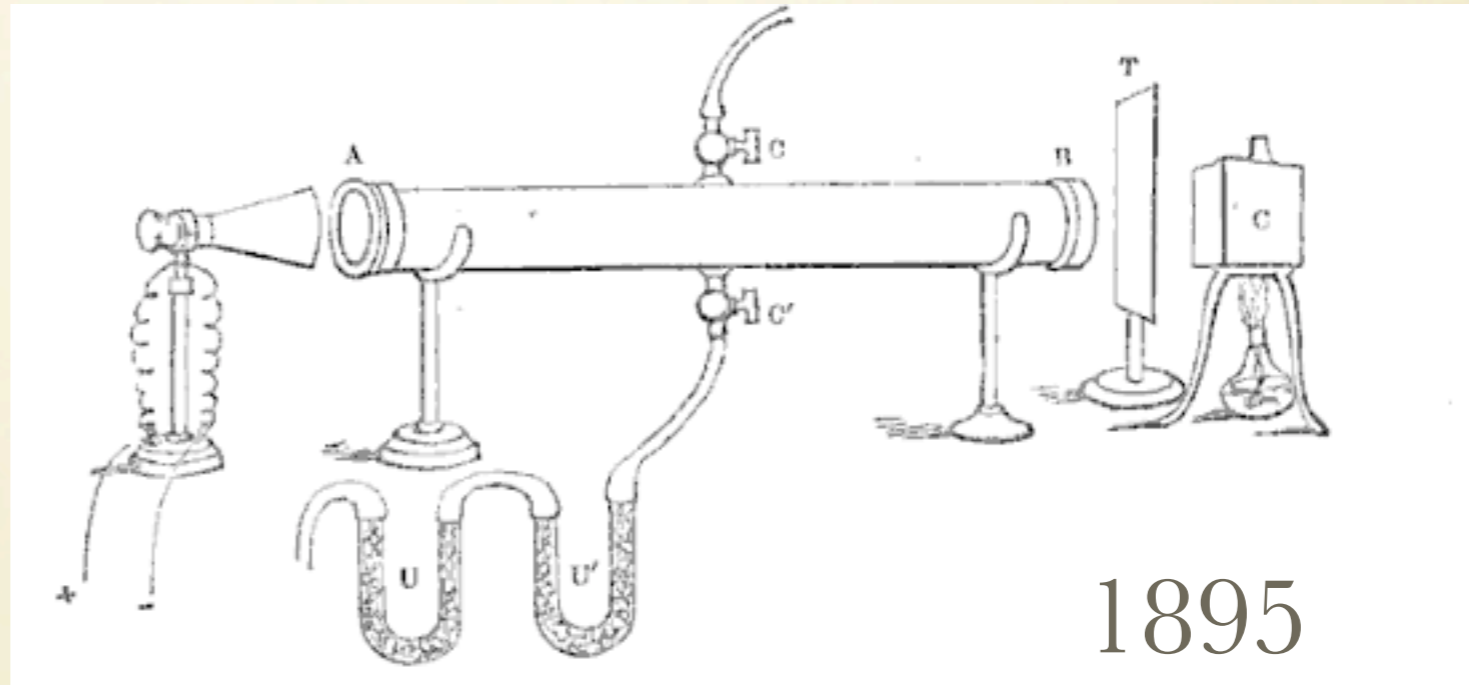
This indicates that it is possible to tune the model to either of the two satellite datasets without drastically changing the climate sensitivity.

# Greenhouse Effect?

*How do we know CO<sub>2</sub> is so important to the climate?*



John Tyndall



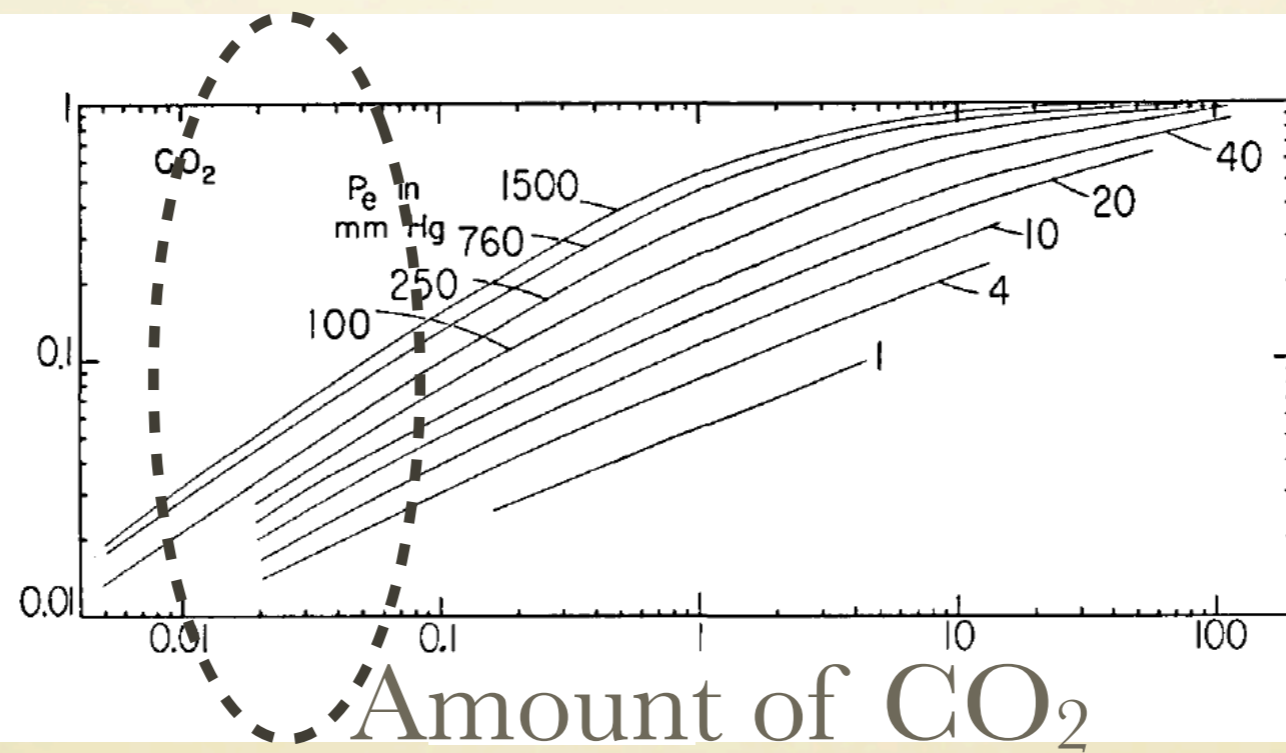
*The bearing of this experiment upon the action of planetary atmospheres is obvious ... the atmosphere admits of the entrance of the solar heat, but checks its exit; and the result is a tendency to accumulate heat at the surface of the planet (Tyndall, 1859a).*



Over 100  
years of  
observations!



Amount  
of  
Absorption

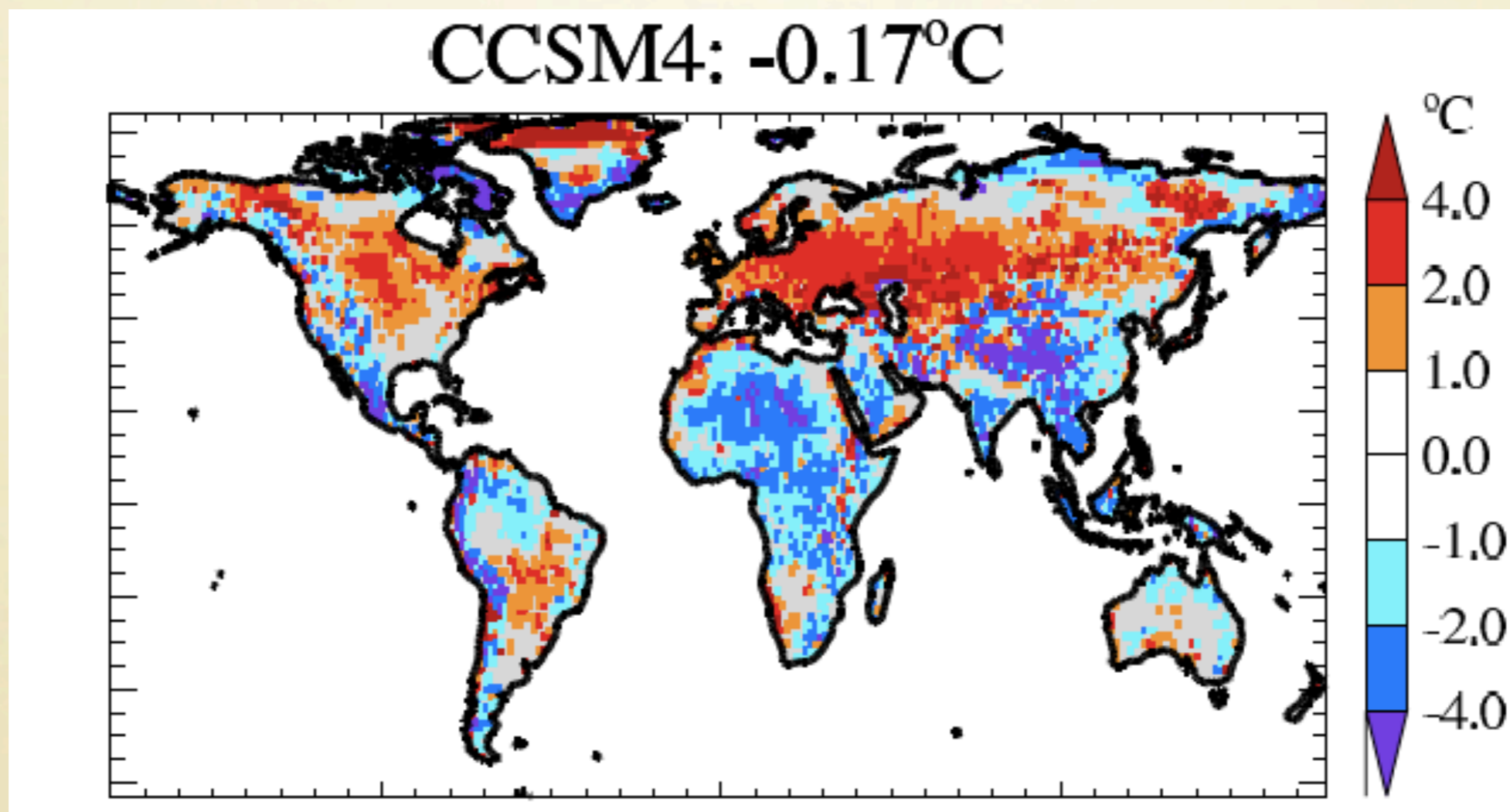


Burch et al. (1962)

# How Are Models Evaluated?

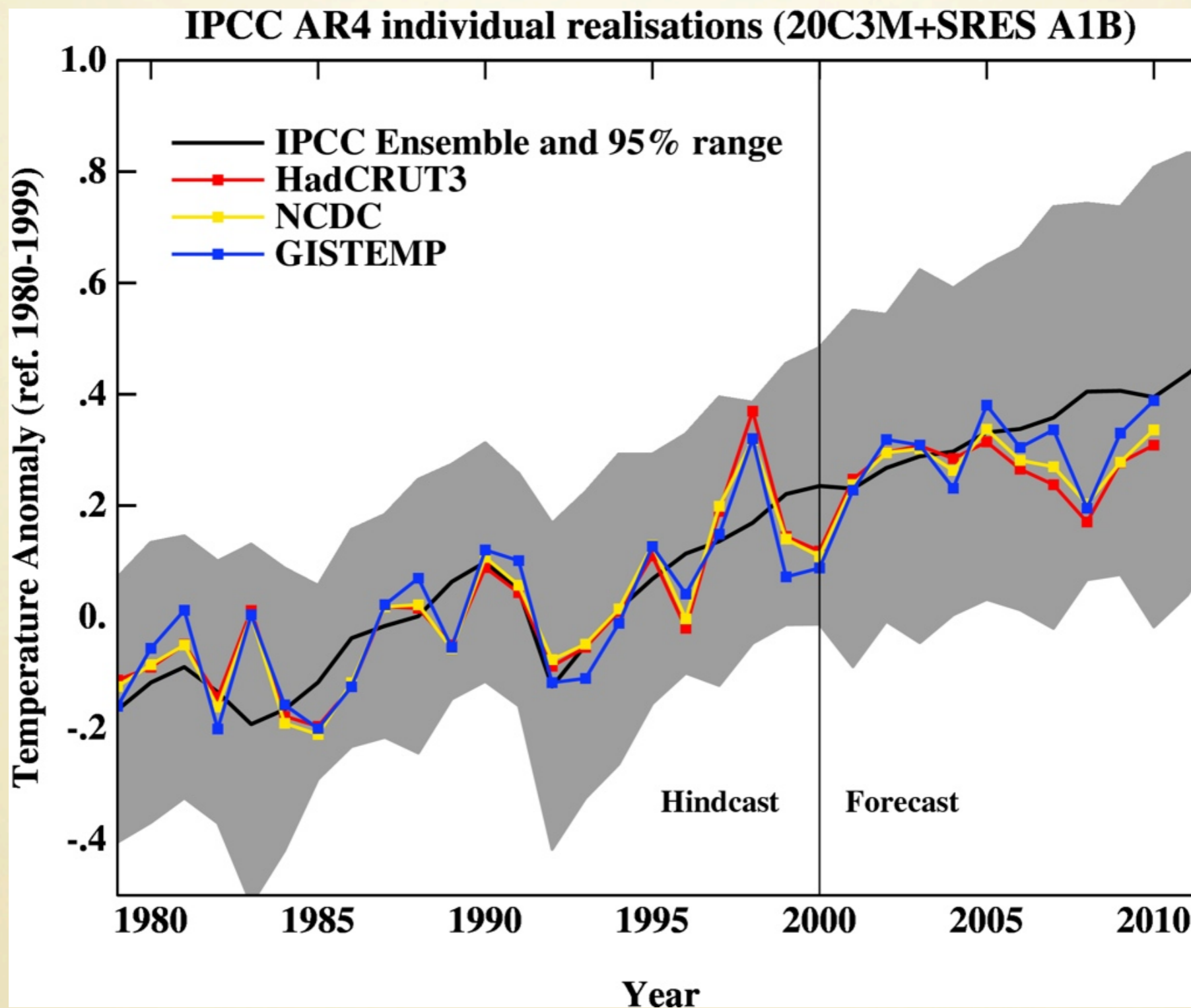
## A Challenge, What Would You Do?

Annual Mean Surface Air Temperature Bias ( $^{\circ}\text{C}$ )



from Gent et al. (2011)

# How Are Models Evaluated?

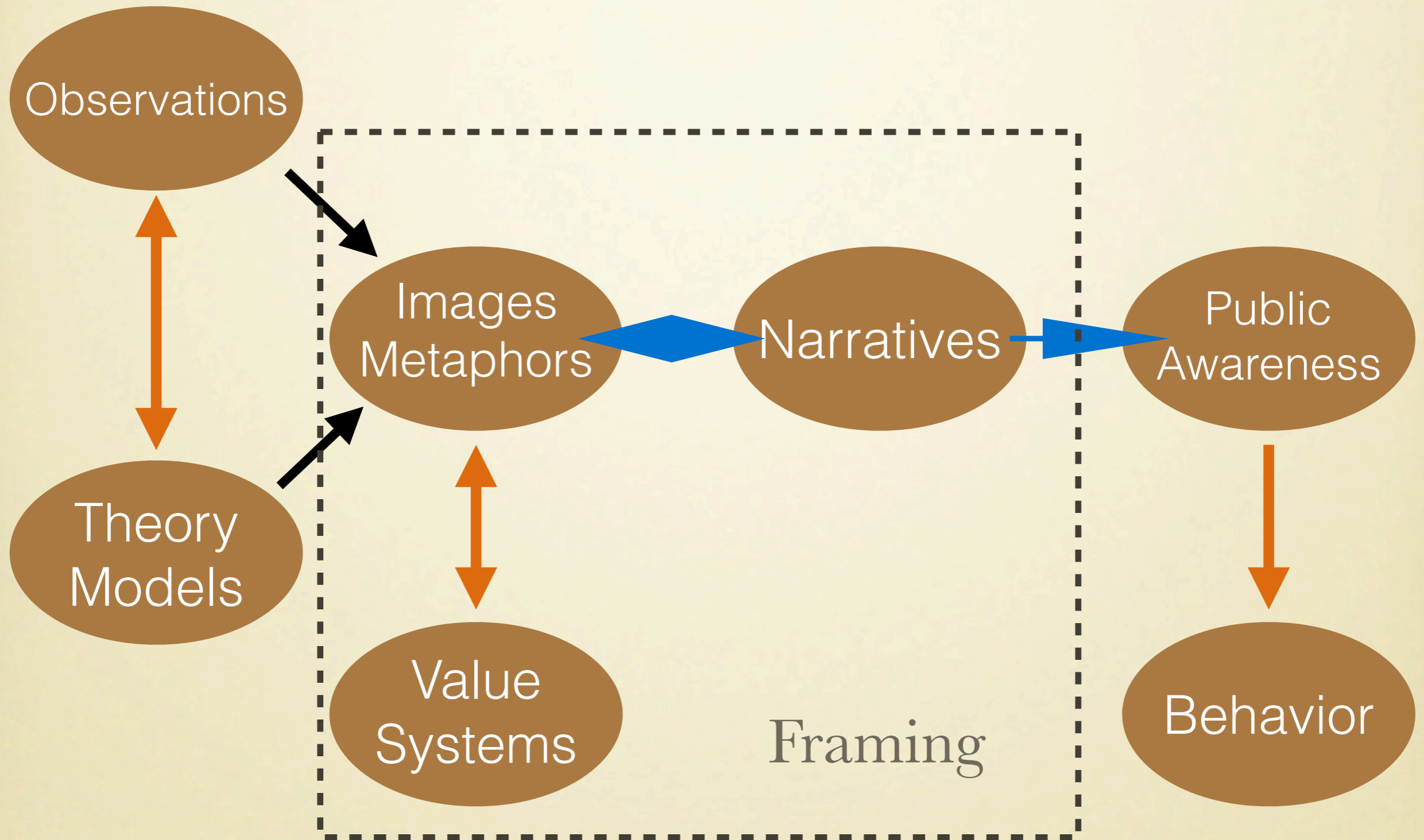


# UNCERTAINTY

- Scientists are taught to articulate all of the caveats & uncertainties in their research
- Public perceives these caveats & uncertainties as equivocation
- How to better frame uncertainty without creating a mistrust within the listener?

# Approaches to Communicating the Credibility of Climate Change Science

# Narrative Model





# Framing

“... affective reactions to stimuli are often the very first reactions, occurring automatically and subsequently guiding information processing and judgment.”

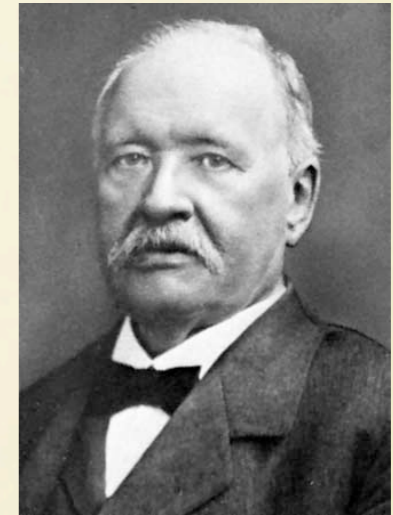
Slovic et al. (2005)

“Frames organize central ideas, defining a controversy to resonate with core values ... They allow citizens to rapidly identify why an issue matters...”

Nisbet & Mooney (2007)

# Examples of Framing Messages

- History of Global Warming



- Memory of Climate System



- Earth's Energy Budget



- Medical Analogies





# RECOMMENDATIONS

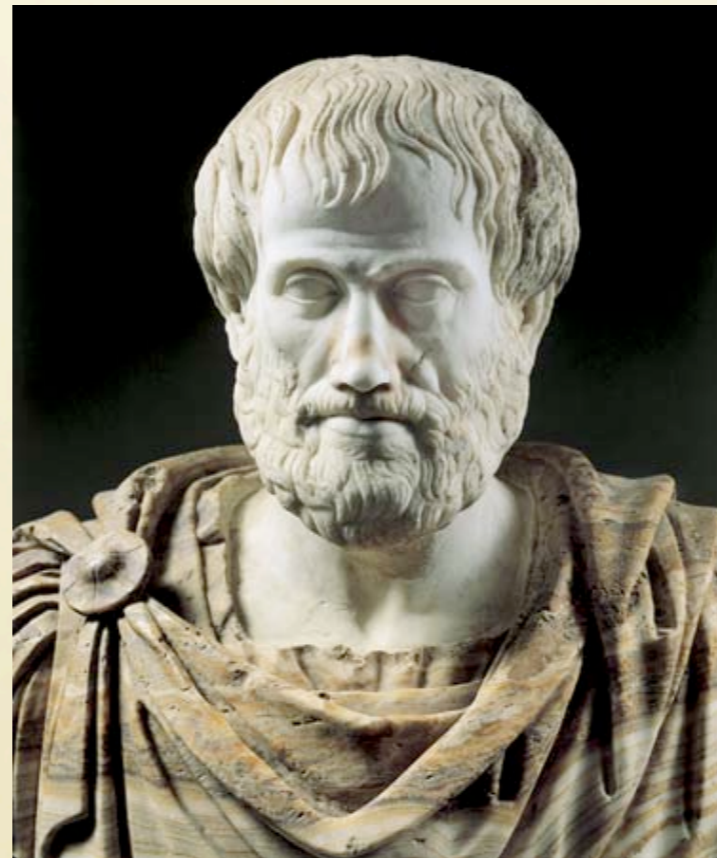
- We need to create metaphors & images that better communicate our work
- Identify highly effective, visible communicators
- Publish more articles summarizing measures of climate model credibility (using easily understood images)
- Meet with messengers that can reach out to other communities
- Train ourselves to provide simple and clear answers to standard climate questions

# Rhetoric

“The three means of effective persuasion ...

- 1) to reason logically
- 2) to understand human character and goodness in their various forms
- 3) to understand emotions”

*The Rhetoric*



Aristotle (384 -322 BC)

The End