

# Can We Really Know Anything At All?

Mark Shelhamer

The Johns Hopkins University

School of Medicine

Baltimore, MD USA

Christian faith is based on verifiable historical evidence.  
Therefore we have reason to believe that objective exploration  
can lead to truth about the universe, that God will not deceive  
us in this endeavor.

– BUT –

Our capabilities to apprehend and understand the universe as  
it truly is are subject to serious constraints..

Sensory Limitations

or

GIGO

# Limitations of Sensory Systems

Visual system and the electromagnetic spectrum

# Binding of visual and auditory information

H McGurk, J MacDonald (1976) Hearing lips and seeing voices.  
*Nature* 264:746-748.

# Illusions of self-motion

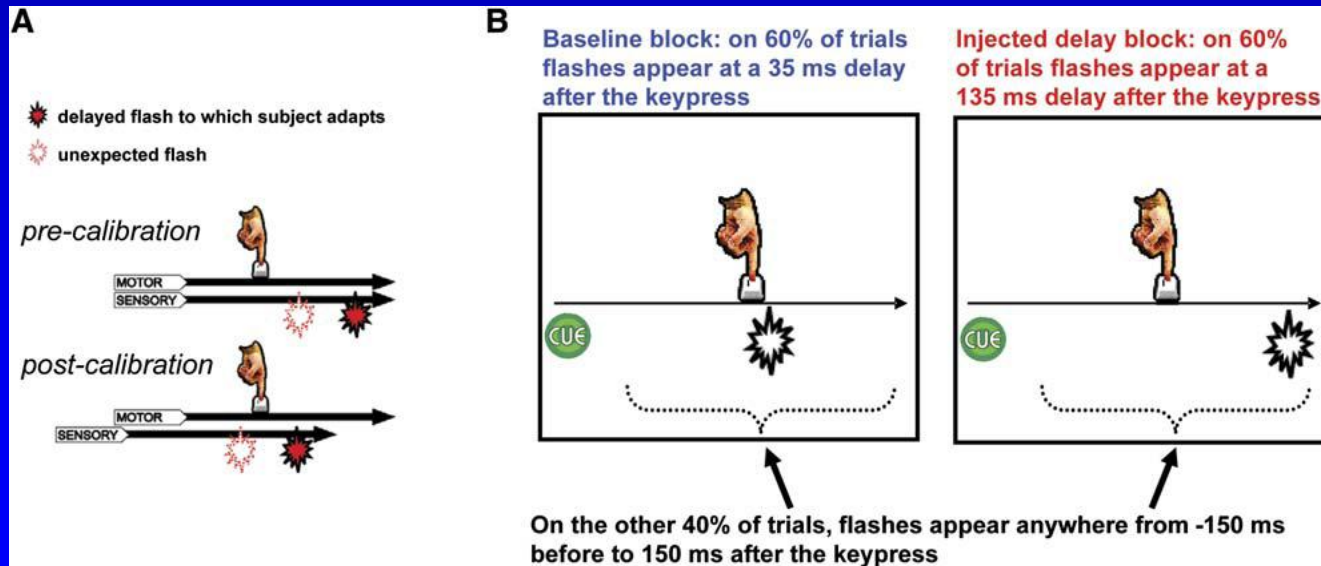
# Rotation illusions

# Rotation illusions - vection



# Illusions of temporal processing

- Variable and unknown delays in different sensory systems
- Brain must learn these delays in order to correctly combine information from different senses
- Experiment:
  - introduce artificial delay between an action and its effect
  - when delay is reduced, subjects often perceive effect as occurring before action



Stetson et al. (2006) Motor-Sensory Recalibration Leads to an Illusory Reversal of Action and Sensation. *Neuron* 51:651–659.

# Change Blindness

- Attentional focus
  - What you see is what you perceive

# Summary

- Our knowledge of the world is incomplete and imperfect
- Our internal model of the world is flawed

# Limitations in Reasoning

# Internal Models

- We are not blank slates
- Preconceptions
- Stairs
- Motion sickness, sensory mismatch
  - Earth overhead
- Saccade adaptation

# Gödel

- Hilbert (1900)
  - 2<sup>nd</sup> of 23 major problems of mathematics
    - finitistic proof of the consistency of the axioms of arithmetic
- Principia Mathematica
  - Russell and Whitehead (1910, 1912, 1913)
  - attempt to describe a set of axioms and inference rules in symbolic logic from which all mathematical truths could in principle be proven (Wikipedia)
  - $1+1=2$  (p 378)

# Gödel's incompleteness theorem

- Problem: any system powerful enough to refer to itself can't be both consistent and complete.
  - consistent: can't prove an untrue statement (can't prove both P and not-P)
  - complete: every statement can be shown true or false – no undecidable statements
- *On Formally Undecidable Propositions in Principia Mathematica and Related Systems I.*
- For any consistent, effectively generated formal theory that proves certain basic arithmetic truths, there is an arithmetical statement that is true, but not provable in the theory (Kleene 1967, p. 250).
- Liar paradox
  - This statement is false.
- Self-reference
  - Hofstadter's Law: It always takes longer than you expect, even when you take into account Hofstadter's Law.

# Scientists as dispassionate observers ??

- Hypothesis = Advocacy ?
- “Religion of science” ?
- Publication bias
- Popper: falsifiability
- Evaluation of Excess  
Significance Bias in Animal  
Studies of Neurological  
Diseases. Tsilidis et al.  
(2013) PLoS Biol 11(7):  
e1001609.



Futility?

Eugene Wigner (1960) The Unreasonable Effectiveness of Mathematics in the Natural Sciences. *Communications on Pure and Applied Mathematics* 13(1): 1–14.

The first point is that the enormous usefulness of mathematics in the natural sciences is something bordering on the mysterious and that there is no rational explanation for it.

However, the point which is most significant in the present context is that all these laws of nature contain, in even their remotest consequences, only a small part of our knowledge of the inanimate world. All the laws of nature are conditional statements which permit a prediction of some future events on the basis of the knowledge of the present, except that some aspects of the present state of the world, in practice the overwhelming majority of the determinants of the present state of the world, are irrelevant from the point of view of the prediction.

# Futility or Humility?

- Scientific method
  - Systematic method to deal with these limitations
- Unreasonable effectiveness
- We can make successful predictions
- But there are limitations to the inductive approach
- Is there an analogous position for religion?
  - “Science of religion” ?