A lot of very smart people were very wrong.

Philosophy
- Philosophy used to mean something different than it does now
- Used to mean the study of “anything”
  - All scientists were philosophers
- As the scientific method became dominant, it required specialized skills and training
  - Philosophers became people who only thought about things
- Long after Newtonian physics was established, human behavior was still the domain of philosophers and religion
  - A lot of very smart people were very wrong

Experimental psychology
- Experimental psychology came out of the recognition that scientific methods could be applied to studying human behavior
  - A revolutionary idea
- Early studies were on perception
- Gustav Fechner
  - Elements of Psychophysics (1860)
  - Relate properties of physical stimuli to perception

Psychophysics
- Measure thresholds
  - Absolute threshold (e.g., energy)
  - Difference threshold
- Method of limits
- Method of adjustment
- Method of constant stimuli

Method of limits
- Is the black line longer than the blue line?
- Is the black line longer than the green line?
Method of limits

- Is the black line longer than the blue line?
- Is the black line longer than the green line?

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- Is the black line longer than the green line?

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- Is the black line longer than the blue line?
- Is the black line longer than the green line?
Method of limits

- Find the perceived equality of the lines
- Contrast with the physically measured length of the lines
- What’s a problem with the current design of this experiment?
- How to make it better?

Percentage correct

- We often want to measure things other than thresholds
- Is the image of the person with the gun on the left or the right?
Another way of getting information about the visual system is to explore how long it takes to process information. For example, do the following images contain (non-human) animals? Respond as quickly as possible. But try not to make a mistake!
Reaction time

- People analyze the properties of pictures that give fast or slow reaction times
- To derive what kinds of image properties allow us to identify animals
- The same idea works for many other situations
- Time reveals details about information processing

Neurophysiology

- Functional cells in the brain are neurons
- Many different types
- The image shows three pyramidal neurons
  - They have been stained to show their structure
  - They are nearly 2mm in length and receive over 10,000 inputs from other neurons

Neurophysiology

- Here is a close up of the neurons

Neurophysiology

- The neurons are not in isolation
- The image shows hundreds of neurons and their connections
- This is a tiny fraction of the number of cells actually involved in a small section of the brain
- The basic structure is repeated throughout the brain
What do neurons do?

- The key behavior of a neuron is an action potential
  - Spike, firing
- A rapid change in the electrical difference between the inside and the outside of the neuron
- The action potential carries information
- The neurons connect together in circuits to process and compute information

What do neurons do?

- When a neuron has an action potential, it sends a signal to other neurons
  - Or muscles
- The signal influences the receiving neuron to either
  - Have an action potential (excitation)
  - Not have an action potential (inhibition)

Neural circuits

- Thus, neural processing is a matter of circuits of excitation and inhibition
- In this image, the blue and white colors indicate inhibitory fibers that modulate the excitatory signals from the pyramidal neurons

Brain structure

- Neural circuits are specialized to process certain types of information

Brain structure

- Neural circuits are specialized to process certain types of information
- Can measure properties of this specialization with brain scanning technology
  - fMRI
  - Movie: motion

PSY 310: Sensory and Perceptual Processes
The perceptual process

Conclusions
- Introduced issues in studying perception
- Philosophy
- Experimental techniques
- Physiology
- It’s much more complicated than this
- As we’ll see…

Next time
- A bit more about brain structures
- Properties of light
- Properties of the eyes