What is real..?

Early history of perception

Allegory of the cave: Prisoners, tethered together since childhood, in a cave lit by a fire, only able to stare at the wall (and the shadows of people walking in front of the fire)...

Perception of the world depends on sensory experience
Sensation and perception, are the results of natural selection

- **Sensation**: sensory detection; selective!
- **Perception**: sensory experience, identification, interpretation
- Helps keep us alive

Charles Darwin, 1809 - 1882
Sensory detection links to behavior

Example: Dead ants (E. O. Wilson)

When an ant dies, other ants just walk right over it for about two days - until the corpse emits a chemical signal, which provokes the other ants into carrying it out...

E.O. Wilson looked for chemical signal, and found **oleic acid**. He put one drop on a live ant - *what do you think happened?*
“You can never step in the same river twice...”

Heraclitus, 540 – 480 BCE

But in addition to the change in the river... ...there is also a subsequent change in YOU...
Should you trust your senses?

- **Democritus** thought so*. Suggested that “atoms” leave objects and then collide with our eyes, ears, nose...
- *Most reliable senses: weight, texture (**primary qualities**)
- *What do you think..? 😊

Democritus, 460 – 370 BCE

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**Sensory transduction**

**Perception?**
Dualism vs. Monism

Rene Descartes (1596 – 1650)
Published “The Description of the Human Body” (1647)
Mechanistic, BUT...
Cogito ergo sum
Pineal gland: “seat of the soul”

Albert Hoffman (1906 – 2008)
"Outside is pure energy and colorless substance," he said. "All of the rest happens through the mechanism of our senses. Our eyes see just a small fraction of the light in the world…”

The Wax Argument
Senses tell you about physical characteristics, which change. You can’t trust your senses...
But your thoughts are more trustworthy...
Res Cogitans > Res Extensa
Empiricism

Only matter exists
All knowledge arises from sensation
“For there is no conception in man’s mind, which hath not first, totally, or in parts, been begotten upon the organs of the Sense…”

All thoughts could be constructed from experience with various sensations. Start with “simple ideas,” and add complexity over time...

Thomas Hobbes
(1588 – 1679)

John Locke
(1632 – 1704)
“Esse est percipi”

“To be is to be perceived”

How do we know how near or far objects are when we see them..?

Perceptual experience

Why does the world seem so real..?

HUME: Reliability and validity (why?)

Reliability without validity: ILLUSIONS

George Berkeley (1685 – 1753)

David Hume (1711 – 1776)
Psychophysics

Relating changes in the physical world to changes in our psychological experiences

Our experience of stimulus intensity (e.g., loudness) increases less quickly than the actual physical stimulus (e.g., in decibels) increases...

\[ S = k \log R \]

Gustav Fechner (1801 – 1887)
Measuring the absolute threshold

Auditory example: How quiet a sound can you hear..?
NOT a sharp border: thresholds are probabilistic...

1. **Method of constant stimuli**: many tones of varying intensity presented randomly; those loud enough are always detected, but where detection is only 50/50: **Absolute threshold**.

2. **Method of limits**: tones presented in order of increasing or decreasing intensity.

3. **Method of adjustment**: Subject adjusts intensity. Least reliable method 😊
Signal detection theory

- Why the variability in signal detection? Why is the absolute threshold probabilistic, and not clear cut and consistent?

**Signal vs. Noise, Bias...**

<table>
<thead>
<tr>
<th>More correct rejections</th>
<th>More misses</th>
<th>Fewer hits</th>
<th>Fewer correct rejections</th>
<th>More hits</th>
<th>More false alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>What phone?</td>
<td></td>
<td></td>
<td>Gotta get that call!</td>
<td></td>
<td></td>
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</tbody>
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