260-2017-01-11-history

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Prelude

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Today's topics

- History of neuroscience

History of neuroscience

- History of the study of brain and behavior
- What did humans know about brain and behavior *before* the emergence of the scientific method?

Why study history?

- What can *observation* tell us about brain and behavior?
- Vital role of *tools/methods/techniques* in discovery
- *"If I have seen further, it is by standing on the shoulders of giants."* – Isacc Newton, 1676

Pre/Early history

Trephining **(trepanning)**

Trephining

Beer-making (~5,000 BCE)

Egyptians (1,500-3,000 BCE) first written record of the term "brain"

Greeks

- *Hippocrates*
- *Aristotle* (335 BCE)

Aristotle on the mind and brain

- mind and body not distinct.
- brain "cools" the body, *heart* is the mental organ.

Galen (~177 CE)

Galen's and his ideas

- Physician in Roman Empire, of Greek descent
- Anatomical reports based on dissection of monkeys, pigs
- Human temperaments (~personalities) linked to "humors": blood, black bile, yellow bile, phlegm.
- Gladiators' head injuries impaired thinking, movement
- Fluid fills the brain cavities called *ventricles*, circulates through nerves, body

Ventricles

What did early humans know about the mind and brain?

- Mental functions controlled by organs in the head, the brain
- Mental functions can be influenced by exogenous substances
- Head injury can impair behavior and thinking

What did early humans know about the mind and brain?

- Brain surgery can (potentially) repair disorders of the brain or behavior
- Mental functions can be influenced by endogenous substances
- Ventricles are filled with fluid; something flows from brain to body via nerves.

Why didn't they know more?

- A. Limited technology.
- B. Limited cultural support for systematic observation, description. = SCIENCE
- C. Lack of ability to use knowledge even if it were acquired.

The "dark" ages (in Europe, not elsewhere)

- Ibn al-Haytham's *Optics*, ~1000 CE
- Mansur's *Anatomy* ~1400 CE

New technologies, new ideas

Vesalius (1543)

- 1st detailed drawings of brain and body anatomy

Vesalius' drawings

Leonardo da Vinci (1504)

- Wax casts of ventricles
  - fluid filled inner regions of brain
- Ventricles not spherical!

da Vinci's sketches

The body as machine (René Descartes – mid 1600's)

Descartes' 'reflexes'

- Reflexes "reflect" events in the world
- Not the same as voluntary functions

Descartes' reflexes

Descartes' 'dualism'

- Reflexes and animal "minds" are physical
- Human mind is not
  - "Dual" influences on behavior
  - Physical + spiritual
- Soul controls body via *pineal gland*
  - Causes muscles to "inflate"

Pineal Gland

Pineal gland

Do you agree with Descartes?

- A. Yes, human minds are fundamentally different from animal minds. The human mind is influenced by both physical and extraphysical processes.
- B. No, human minds are similar to animal minds. The human mind arises solely from physical processes.

How would you test Descartes idea about the role of the pineal gland?

Other milestones

- Invention of light microscope (1609 CE), electron microscope (1926)
- Cell stains – Camillo Golgi, Santiago Ramon y Cajal – late 1800s
- Recording of electrical activity of nerves, Luigi Galvani
- Magnetic resonance imaging (MRI)

The lessons from history

- Neuroscience shaped by new methods, tools (next time)
- Neuroscience shaped by great debates
  - Mind vs. brain debate
  - Localist/holist debate
  - Nature of neural communication
- Forms at multiple levels of analysis contribute to function

Does it matter who did what in science?

Next time...

- Levels of analysis
- Neuroscience methods