

260-2017-08-21

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2017-08-18 14:44:50

Prelude

PSYCH 260.002

Neurological Bases of Human Behavior

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What is this course about?

- What is behavior?
 - What distinguishes human behavior from other animals?
 - What are neurological bases?
 - What other bases are there?
 - How do the neurological bases of human behavior affect your life?
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- Why does taking/drinking X make me feel Y?
 - My grandmother has Alzheimer's disease. What's happening to her brain?
 - Carrie Fisher had bipolar disorder. What's that about?
 - Why is sleep so important for brain health?
 - My mom says my brain isn't fully mature. Is she right?
 - Is it safe for high school athletes to play football (or soccer, hockey, etc.)?

This course is about...

Genes

Neurotransmitters

Neurons

Networks

Brains

Behavior

Today's topics

- Introduction to the course
- A bit about systems

Course overview

- <http://psu-psychology.gitbub.io/psych-260-2017-fall/>

Keys for success

- Study the figures.
- Study regularly – don't cram.
- Come to class.
- Participate!

Why is biology essential for the science of behavior?

- What is science?
- What distinguishes sciences?
- What is neuroscience?
- Why is neuroscience harder than physics?

What is science?

- Science

What is science?

- Body of facts or truths.
- Process of acquiring knowledge
- Systematic study
- Observation, experiment, description
- Strives for objectivity

- Aims at reliable, reproducible, general, systematic, universal laws

Gilmore on science vs. other ways of thinking

- Science is a way of thinking
- Science *describes* or *predicts*, but not well-suited to *proscribing*
- Science has little to say about what is good, just, right, moral, etc.
- Science rests on evidence and logic NOT on authorities
- Science respects tradition, but questions and tests it

Gilmore on science vs. other ways of thinking

- Science (and allied fields)
 - led to huge advances in human health and prosperity.
 - will be essential for maintaining and extending those advances in the future

Mertonian norms

- **universalism**: scientific validity independent of sociopolitical status/personal attributes of its participants
- **“communalism”**: common ownership of scientific goods (intellectual property)
- **disinterestedness**: scientific institutions benefit a common scientific enterprise, not specific individuals
- **organized scepticism**: claims should be exposed to critical scrutiny before being accepted.

Modern science aspires to embody these norms.

Your turn: How does science differ from other ways of knowing?

Similarities between sciences

- What are the different kinds of X?
 - Form, e.g., anatomy
- How does X work?
 - Function, e.g., physiology
- Where did X come from?
 - Origins, e.g., development/evolution

Differences among sciences

- Phenomena of interest
- Methods or tools
- Levels of analysis
 - Spatial scale (nanometers to light-years)
 - Temporal scale (milliseconds to millenia)

What is neuroscience?

- The study of the nervous system
 - And the behavior it makes possible

- Questions
 - What are the parts of the nervous system?
 - How do the parts work? What do they do?
 - Where did they come from?

Why neuroscience is harder than physics

Why neuroscience is more fun than physics

A bit about systems

A bit about systems

- What are systems?

Related ideas

- Wikipedia on systems theory
- Wikipedia on systems thinking
- Wikipedia on cybernetics
 - *Science concerned with the study of systems of any nature which are capable of receiving, storing and processing information so as to use it for control.*

Non-biological examples

- Solar system
- Climate system
- Economic system
- Internet

Systems have

- Components
- Interactions
- Forces/influences
- Boundaries
- Inputs/outputs/processes

Systems...

- “Behave” or change state across time
- Return to starting state
- Appear to be regulated, controlled, influenced by feedback loops

May be thought of as networks

Why is studying systems so hard?

- Single parts -> multiple functions
- Single functions -> multiple parts
- Change structure/function over time (learning, development)
- Biological systems not “designed” like human-engineered ones
- What information is being processed? What is being controlled?

Next time...

- History of neuroscience