PSYCH 260/BBH 203

Introduction to the course

Rick O. Gilmore

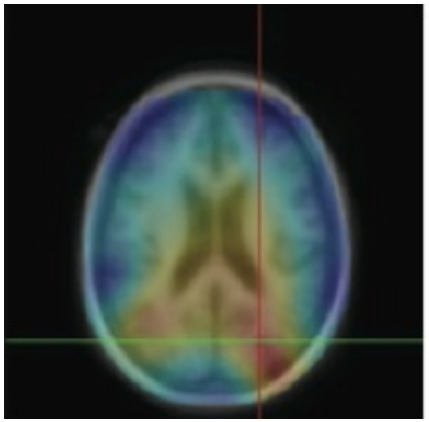
2022-01-11 08:16:25

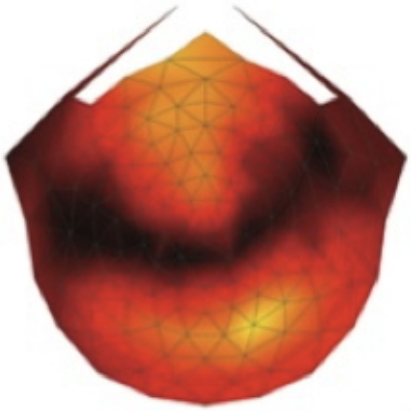
Prelude

https://www.youtube.com/embed/JB7jSFeVz1U

PSYCH 260/BBH 203

Neurological Bases of Human Behavior





TA & Instructor

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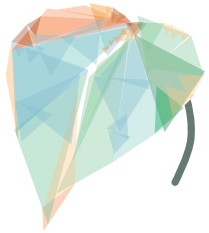

Databrary

What is this course about?

- What is behavior?
- How is human behavior similar to/different from other animals?
- What are the *neurological* bases (of human behavior)?
- What other bases are there?
- How do the neurological bases of human behavior affect your life?

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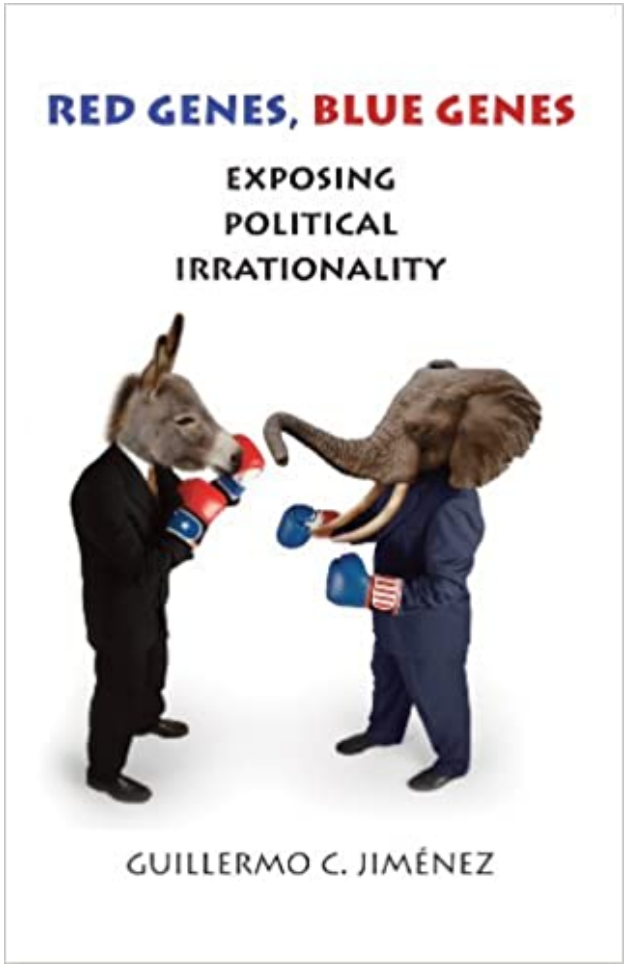
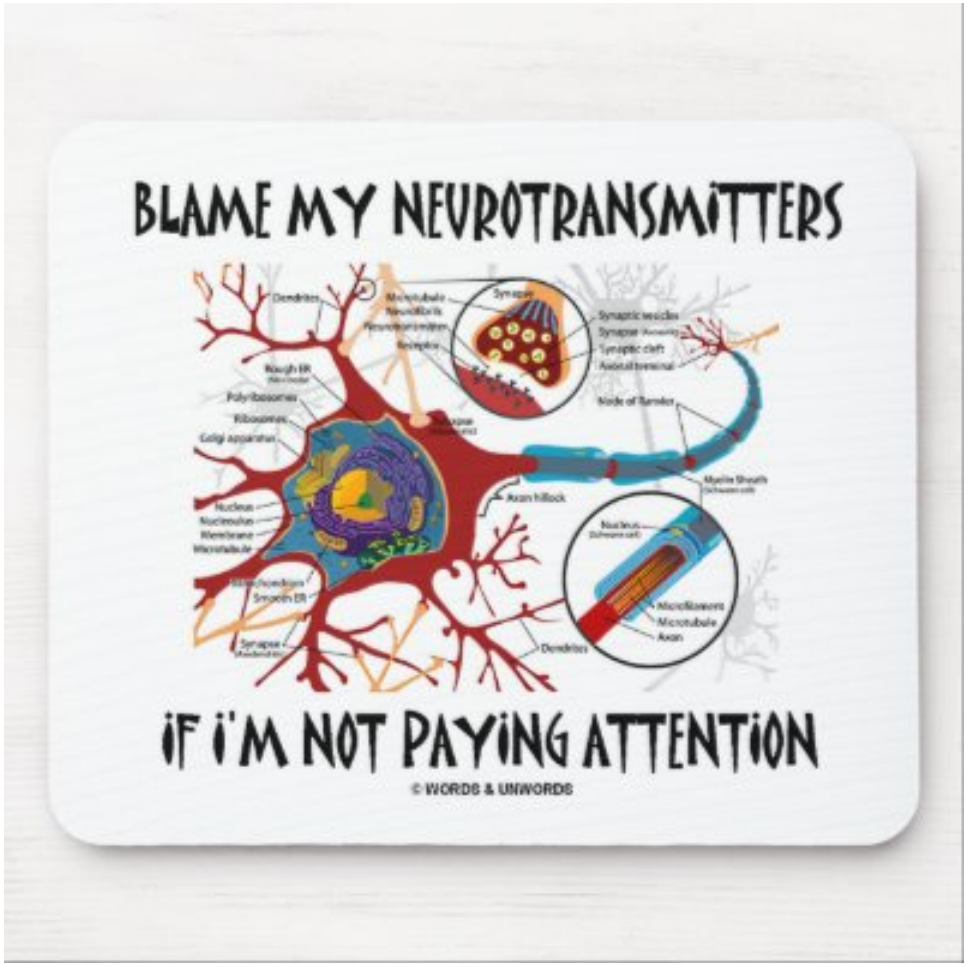
- Why does taking/drinking X make me feel Y?
- My grandmother has Alzheimer’s disease. What’s happening to her brain?
- Carrie Fisher had bipolar disorder. What’s that about?
- Why is sleep so important for brain health?
- My mom says my frontal cortex isn’t fully mature. Is she right?
- Is it safe for high school athletes to play football (or soccer, hockey, etc.)?

This course is about…

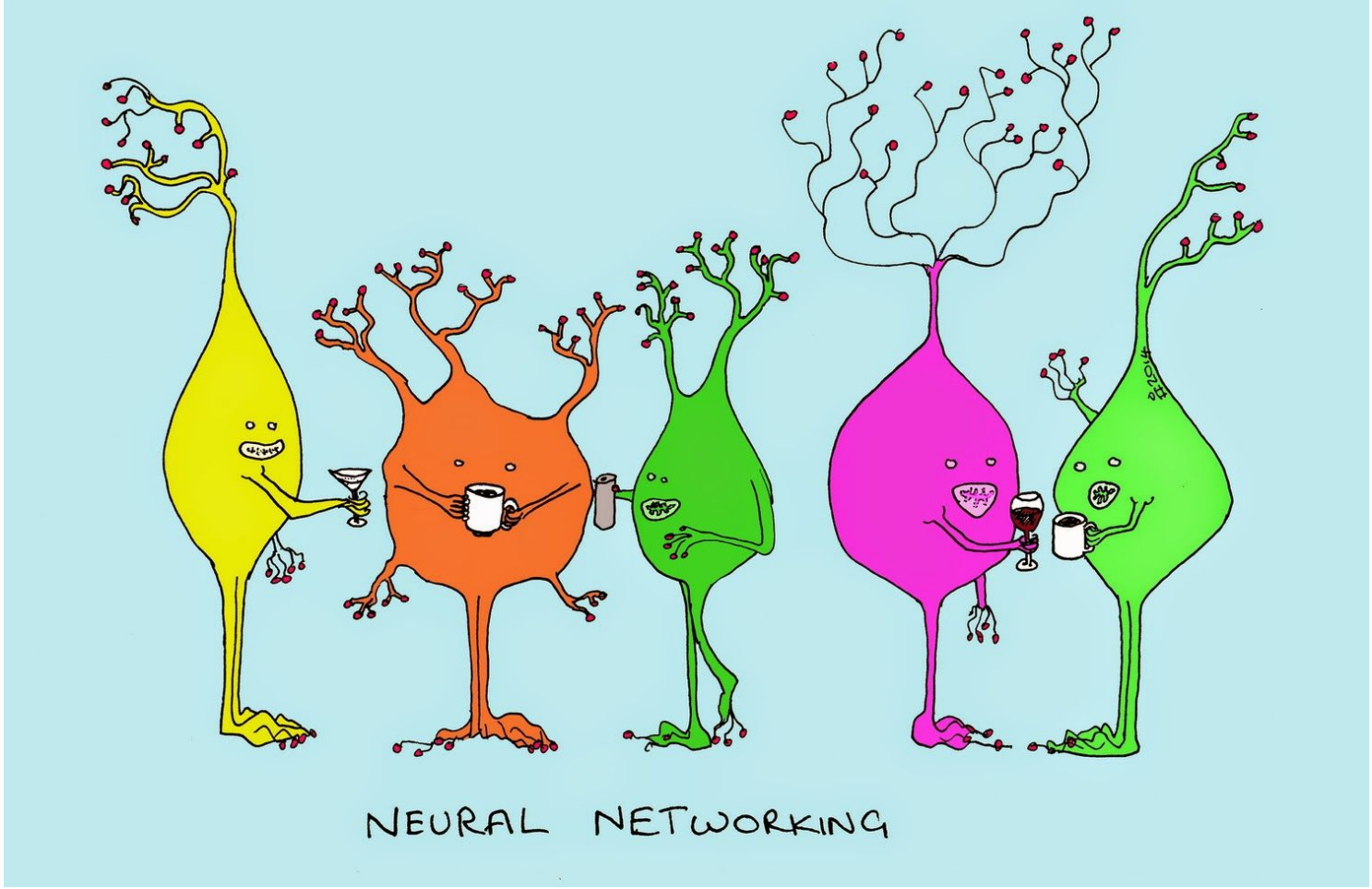
Genes


RED GENES, BLUE GENES
EXPOSING
POLITICAL
IRRATIONALITY
GUILLERMO C. JIMÉNEZ

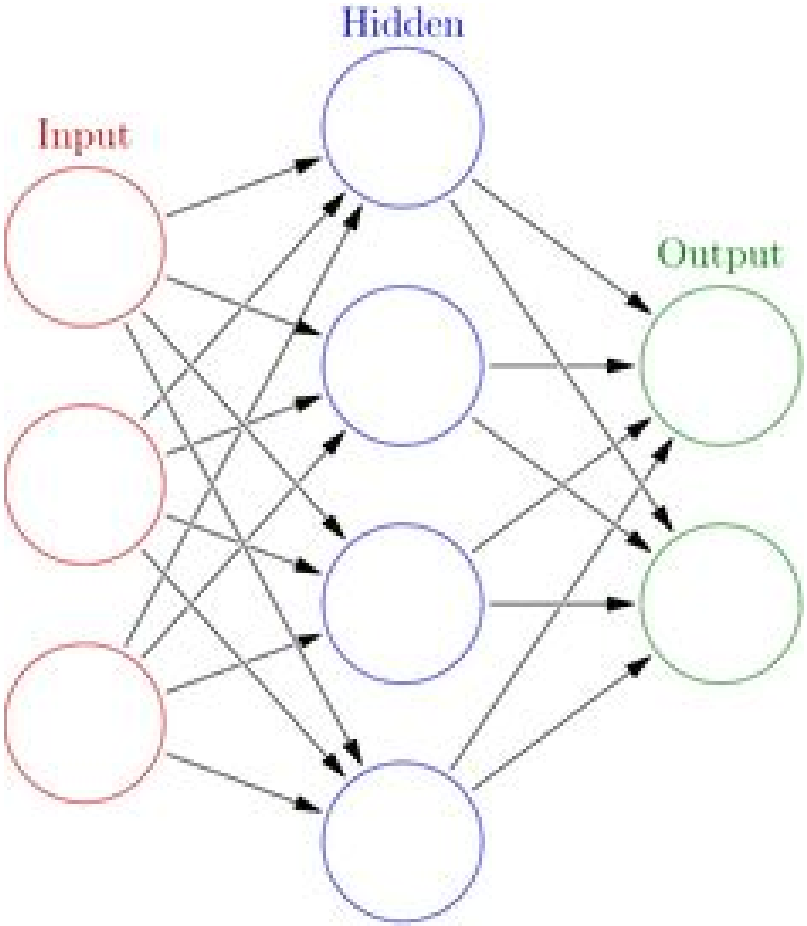
Neurotransmitters



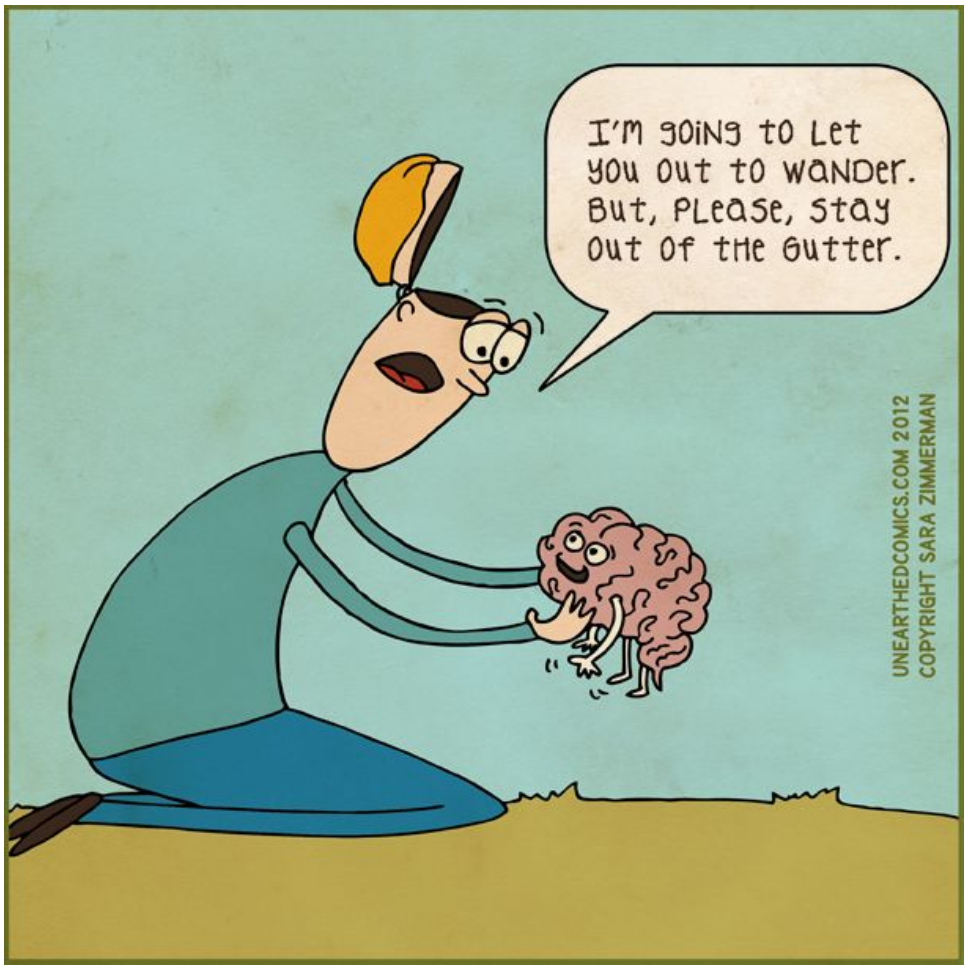
Neurons



Networks



Brains


I'M GOING TO LET YOU OUT TO WANDER. BUT, PLEASE, STAY OUT OF THE GUTTER.
UNEARTHEDCOMICS.COM 2012
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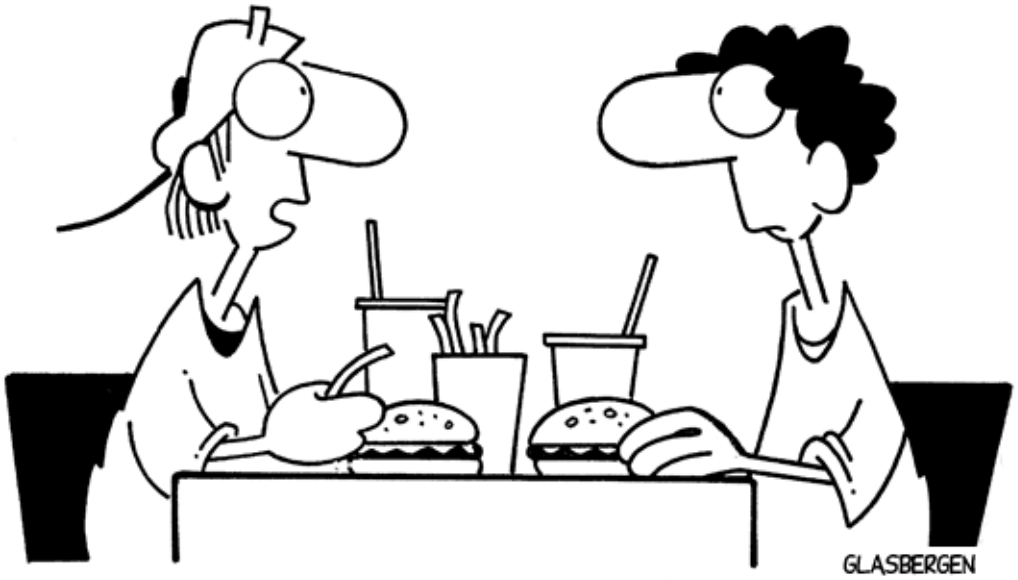
Behavior



"I forgot to make a back-up copy of my brain, so everything I learned last semester was lost."

Today's topics

- Introduction to the course
- A bit about systems

Course overview

http://psu-psychology.github.io/psych-260-2022-spring/

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?

What is science?

- Body of facts or truths
- Process of acquiring knowledge
  - Systematic study
  - Observation, experiment, description
  - Aims at reliable, reproducible, general, systematic, universal laws
  - *Strives* for objectivity

Gilmore on science vs. other ways of thinking

- Science is a *way of thinking* and a *set of behaviors*
- Science *describes*, tries to *predict*
- Science alone not well-suited to *prescribing* (recommending) or *proscribing* (prohibiting)
    - little to say about what is good, just, right, moral, etc.
    - (Although systematic descriptions of phenomena can be used to make pre/proscriptive claims…)

- Science rests on **evidence and logic**
  - NOT on authorities (e.g., people whose stature is largely or solely based on their position or economic status)
  - However, some scientific claims (and scientists) are more credible and authoritative than others.

- Science respects tradition
  - but questions and tests it repeatedly…
- Science should be reproducible
  - others can get the same answer

- Science
  - has led to huge advances in human health and prosperity over the last several centuries
  - will be essential for maintaining and extending those advances in the future
  - Example: Rapid development and deployment of multiple, effective, and safe vaccines for SARS-CoV-2 that sharply reduce severe illness and death.

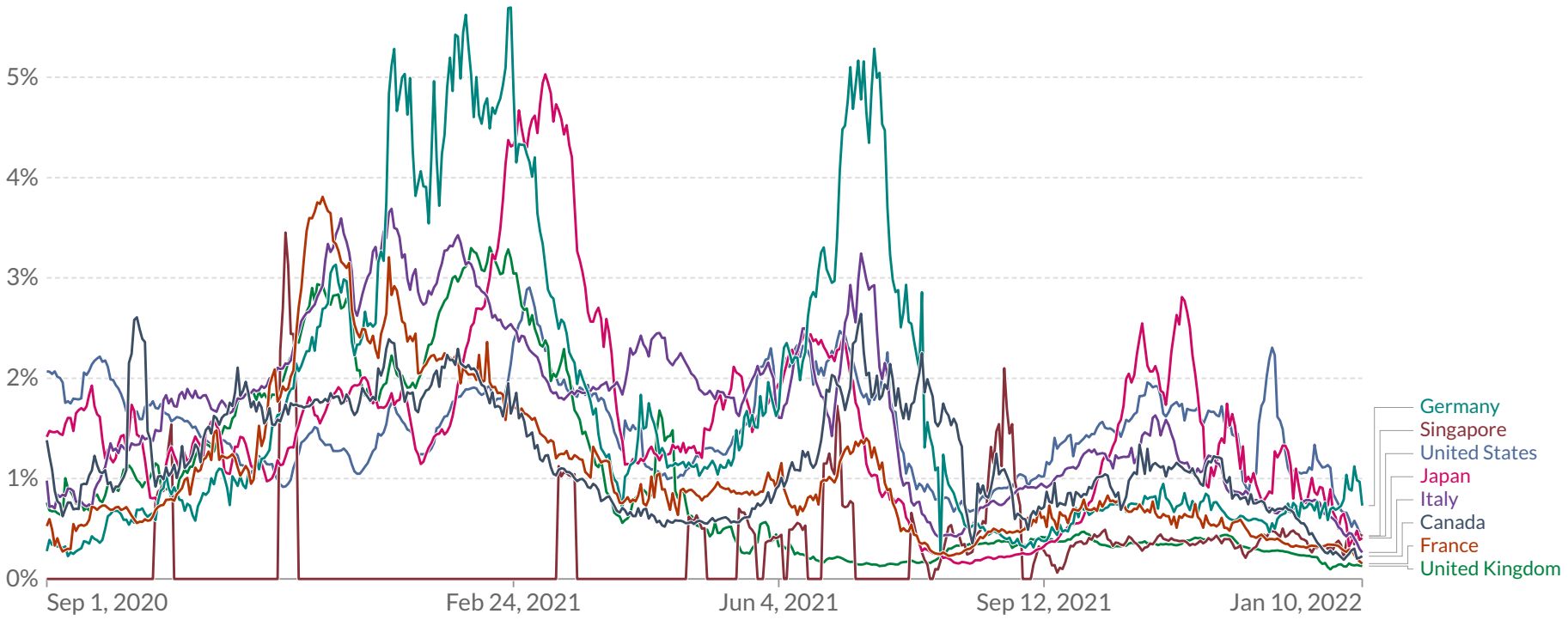
Moving-average case fatality rate of COVID-19

The case fatality rate (CFR) is the ratio between confirmed deaths and confirmed cases. Our rolling-average CFR is calculated as the ratio between the 7-day average number of deaths and the 7-day average number of cases 10 days earlier.

Our World in Data

LINEAR | LOG

Add country



Source: Johns Hopkins University CSSE COVID-19 Data

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Sep 1, 2020 — Jan 10, 2022

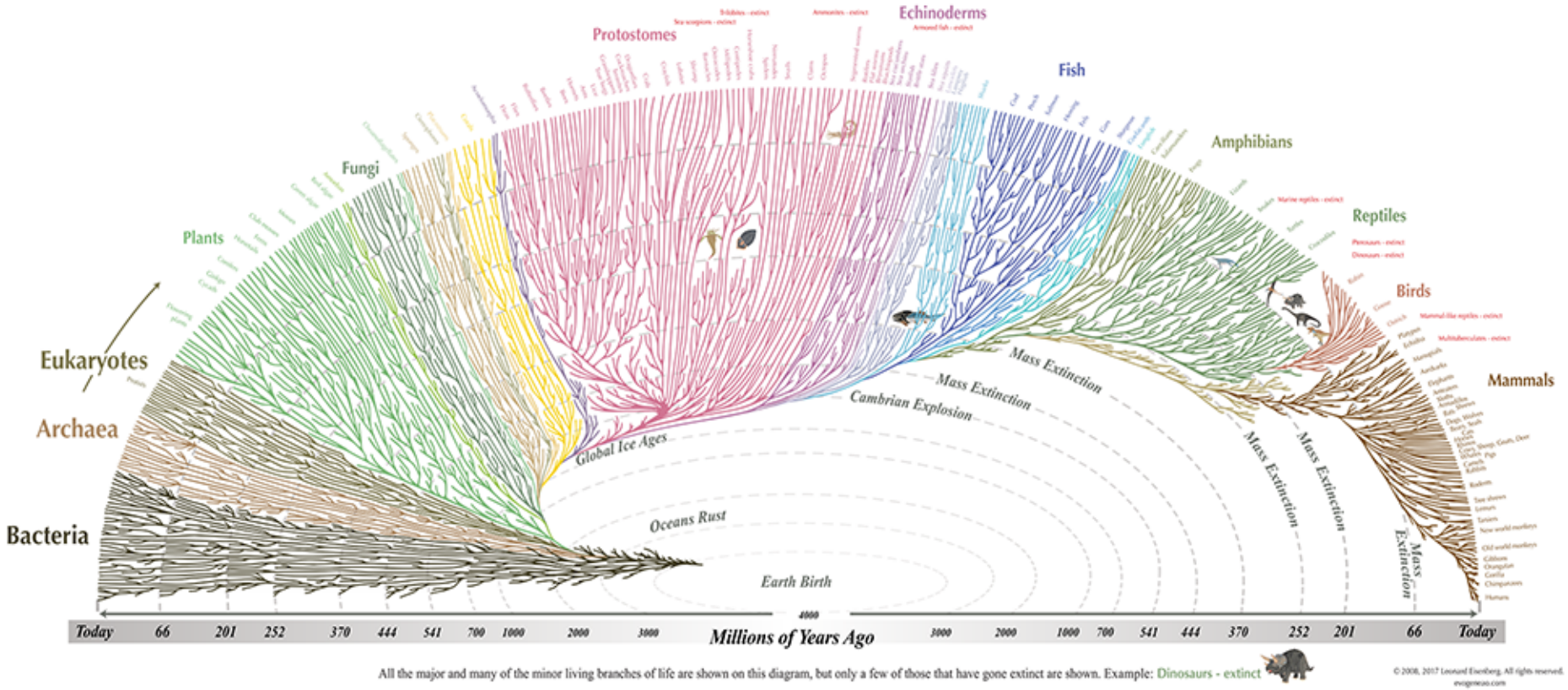
CHART | MAP | TABLE | SOURCES | DOWNLOAD

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

Examples

- “Coronavirus gets its name because of its crown-like shape.”
- “Coronavirus appears to have originated in non-human animals in China.”
- “Viruses reproduce (and cause illness) by forcing host organisms to create massive quantities of the virus that then spread to others.”



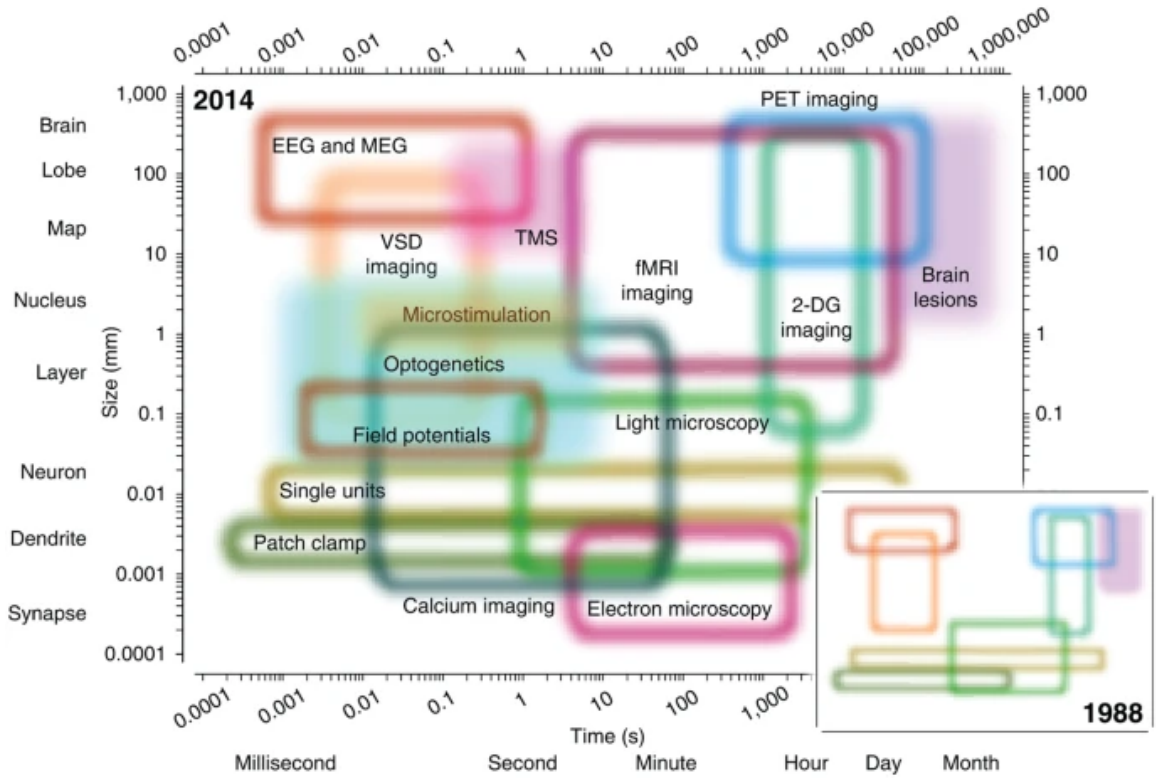
www.evogeneao.com

Differences among sciences

- Phenomena of interest (studying what)
- Methods or tools (studying it how)
- Levels of analysis
  - Spatial scale (nanometers $10^{-9}m$ to light-years $10^{15}m$)
  - Temporal scale (milliseconds $10^{-3}s$ to millenia $10^{3}s$)

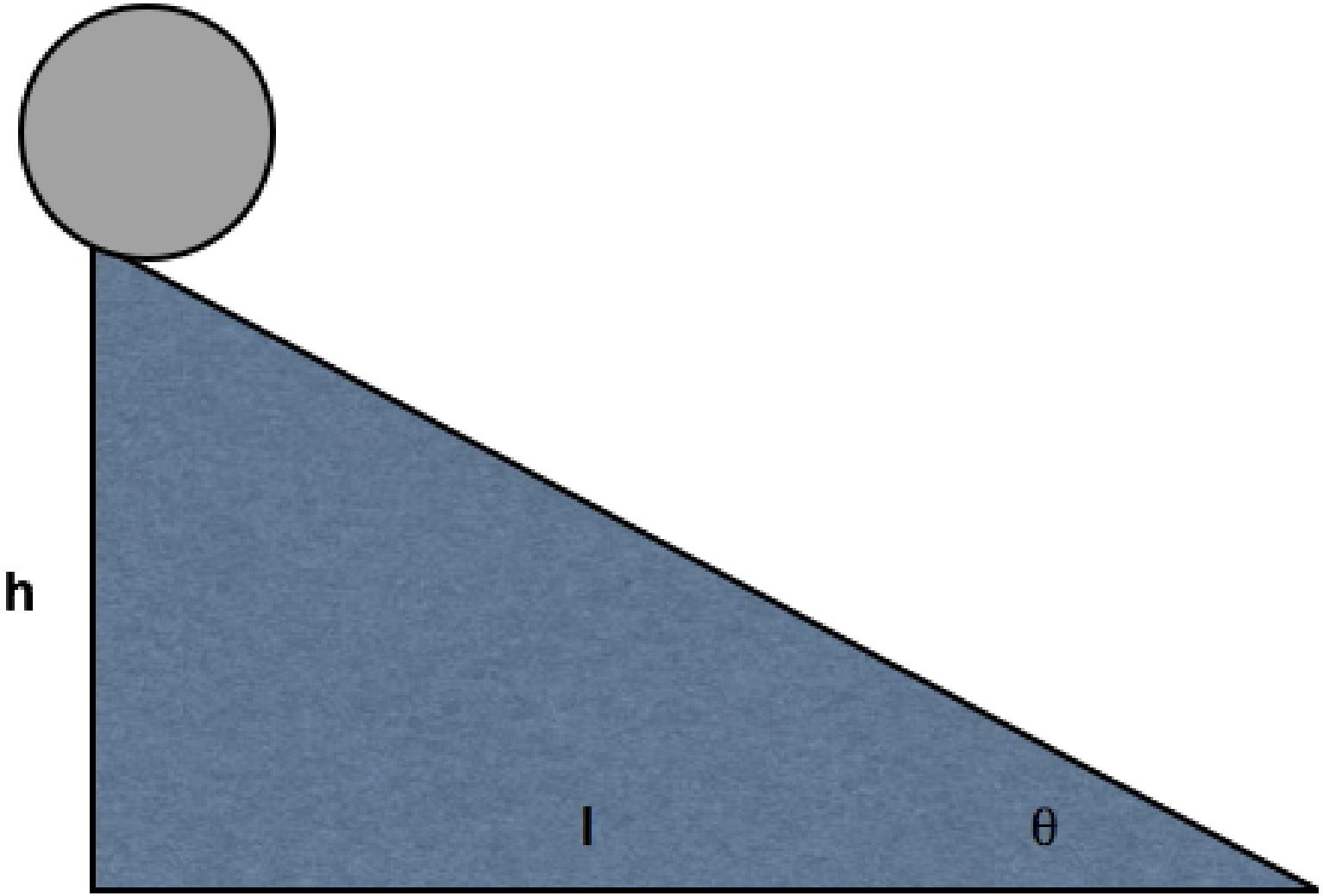
What is neuroscience?

- The study of the nervous system
  - And the behavior it makes possible
- Questions neuroscience asks…
  - What are the parts of the nervous system?
  - How do the parts work? What do they do?
  - Where did they come from?



[Sejnowski 2014]

Why neuroscience is harder than physics



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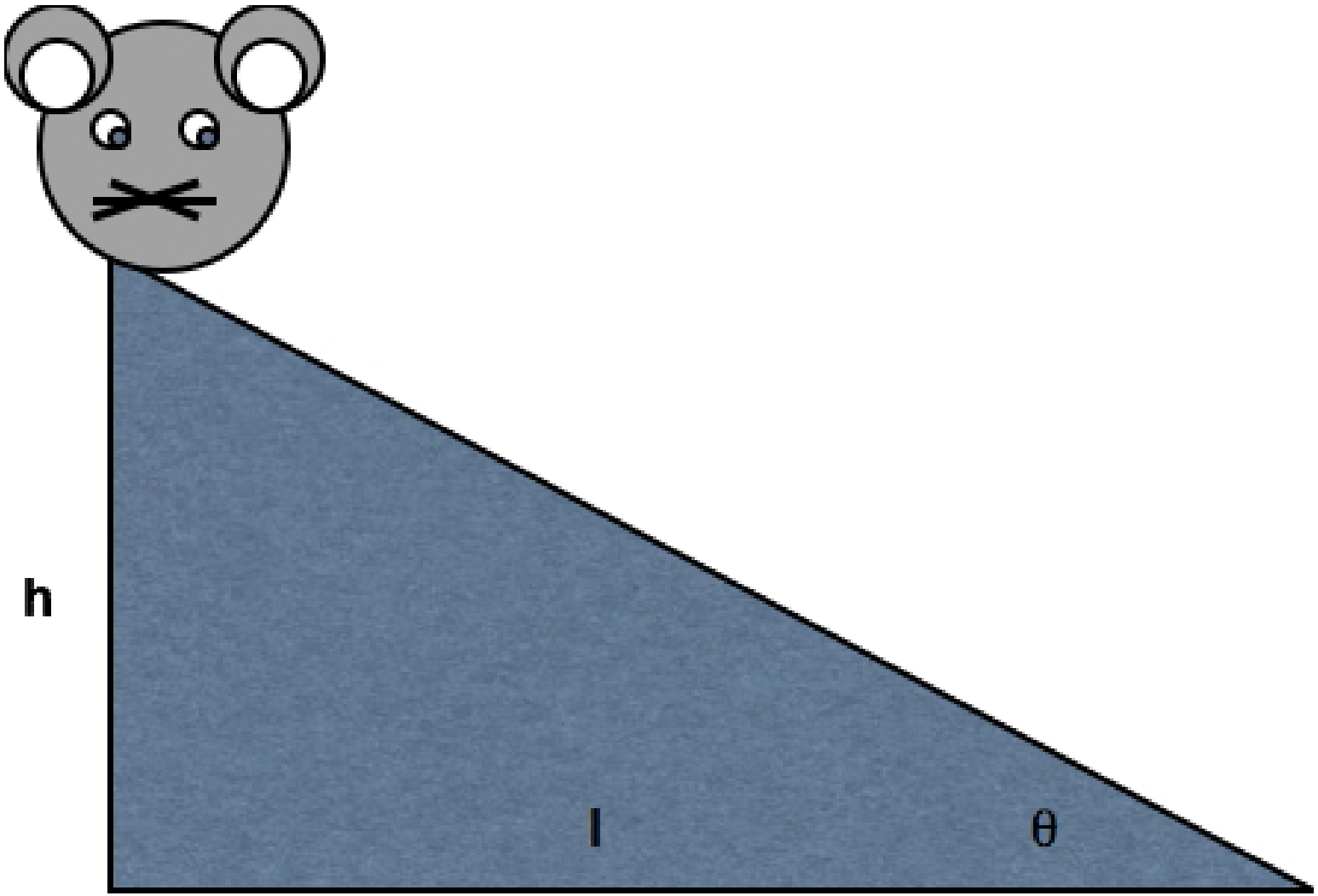


A bit about systems

A bit about systems

- Neuroscience studies the nervous system…
- But 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.*

Systems you know…

- Think of a system you know something about
- What makes it a system?

Non-biological examples

- Solar system
- Climate system
- Economic system
- Internet

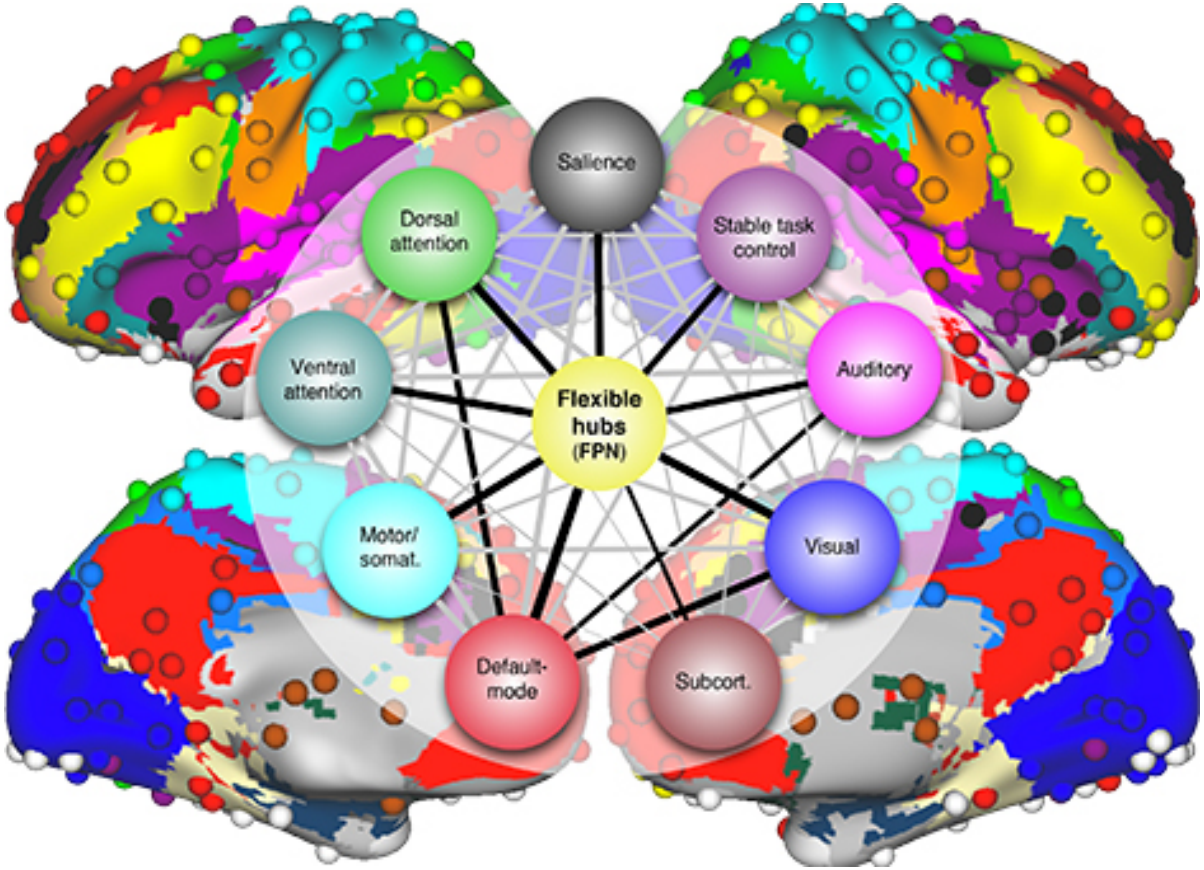
Systems have

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

Systems…

- “Behave” or change state across time
- May 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)
- Naturally occurring systems not “designed” like human-engineered ones
- What information is being processed? What is being controlled?

Next time…

- History of neuroscience
- Methods of neuroscience