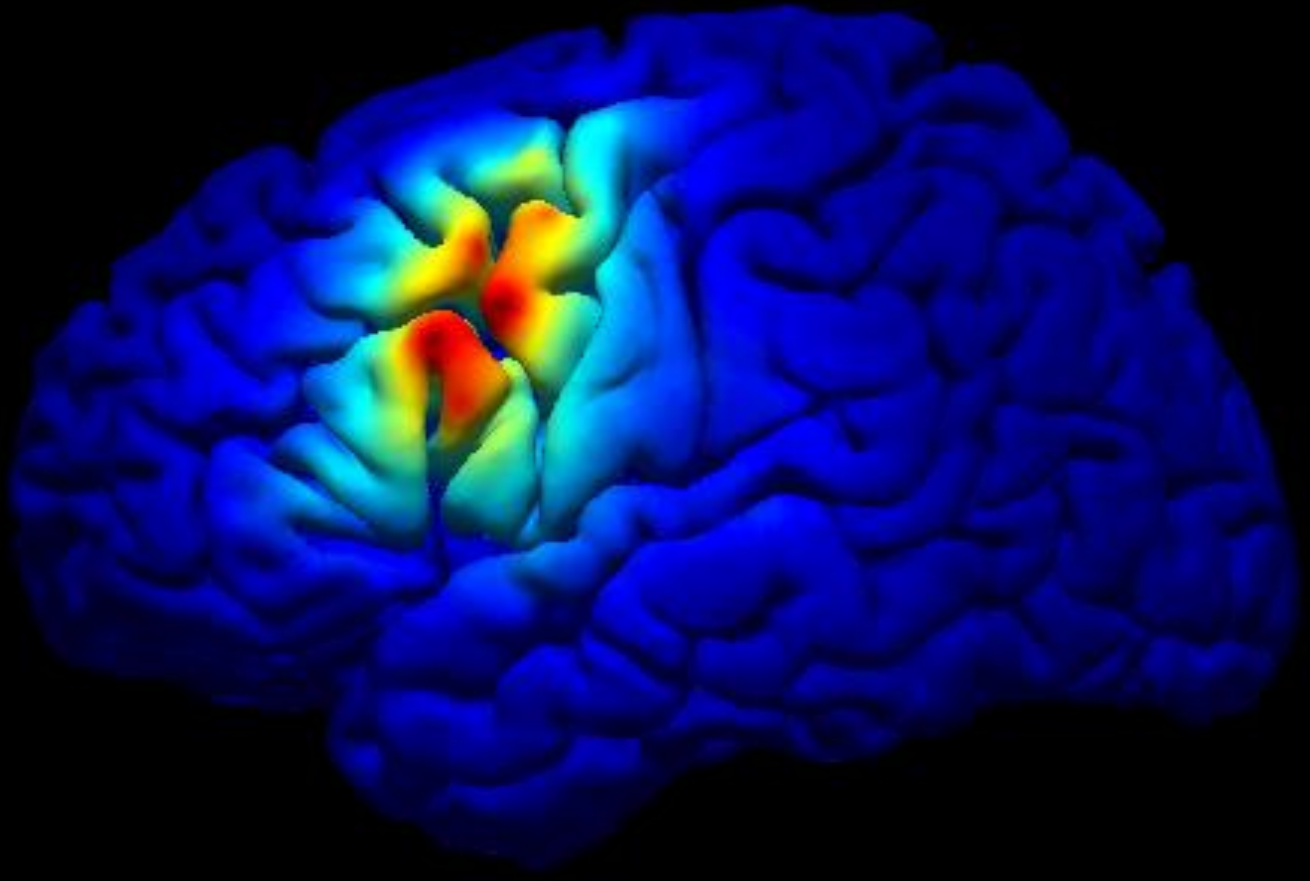
Computational Neuroscience



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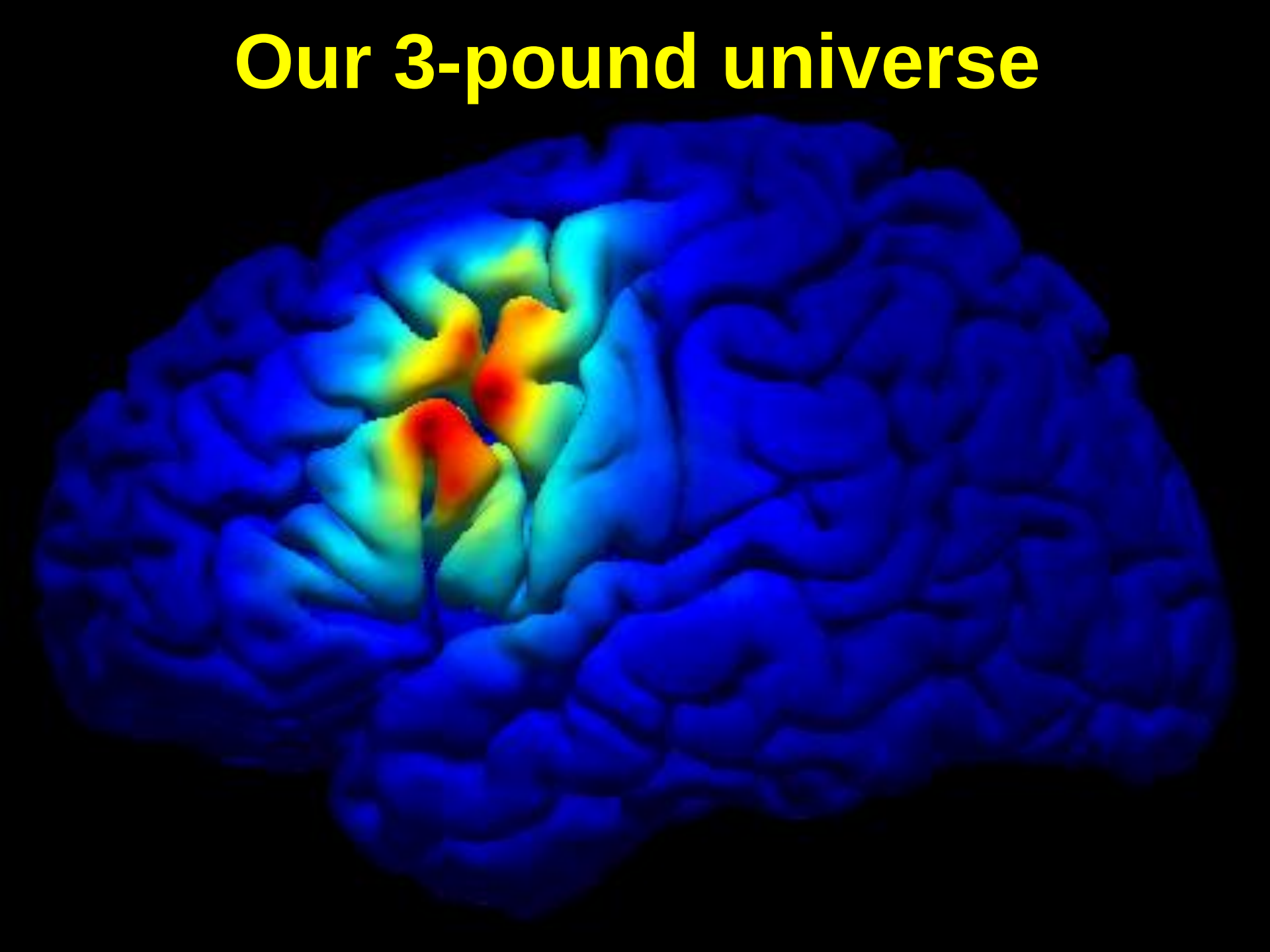
Our 3-pound universe

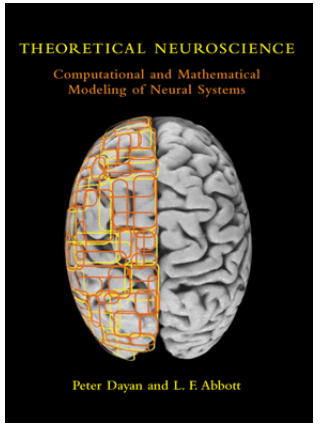


Understanding the Brain using Computational Models

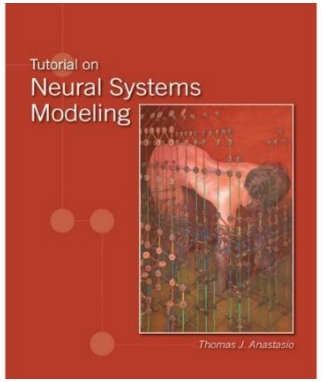
- *Descriptive Models of the Brain*
  - How do neurons respond to external stimuli and how do we describe this quantitatively with a neural *encoding* model?
  - How can we extract information from neurons (*decoding*)?
- *Mechanistic Models of Brain Cells and Networks*
  - How can we *simulate* the behavior of a *single neuron* on a computer?
  - How do we simulate a *network* of neurons?
- *Interpretive (or Normative) Models of the Brain*
  - *Why* do brain circuits operate the way they do?
  - What are the *computational principles* underlying their operation?

Recommended Textbooks

- *Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems* by P. Dayan & L. Abbott



- *Tutorial on Neural Systems Modelling* by T. Anastasio



Course Goals: What you can expect to learn

- **At the end of the course, you will be able to:**

  1. Quantitatively describe what a biological neuron or network of neurons is doing given experimental data
  2. Simulate on a computer the behavior of neurons and networks
  3. Formulate computational principles underlying the operation of neurons and networks in the brain

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Let's begin!

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