CS 182
Sections 101 & 102

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with thanks to

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Annoucements

- a1 is due at 5pm on Tuesday
- Remember to submit it on bSpace
- We'll get to hw questions in a minute

- a2 out on Tuesday

Where we stand

- Last Week
  - Brain basics
  - Neural development
- This Week
  - Connectionist modeling
  - Psycholinguistics
- Coming up
  - Brain imaging, Neural nets, and Backprop

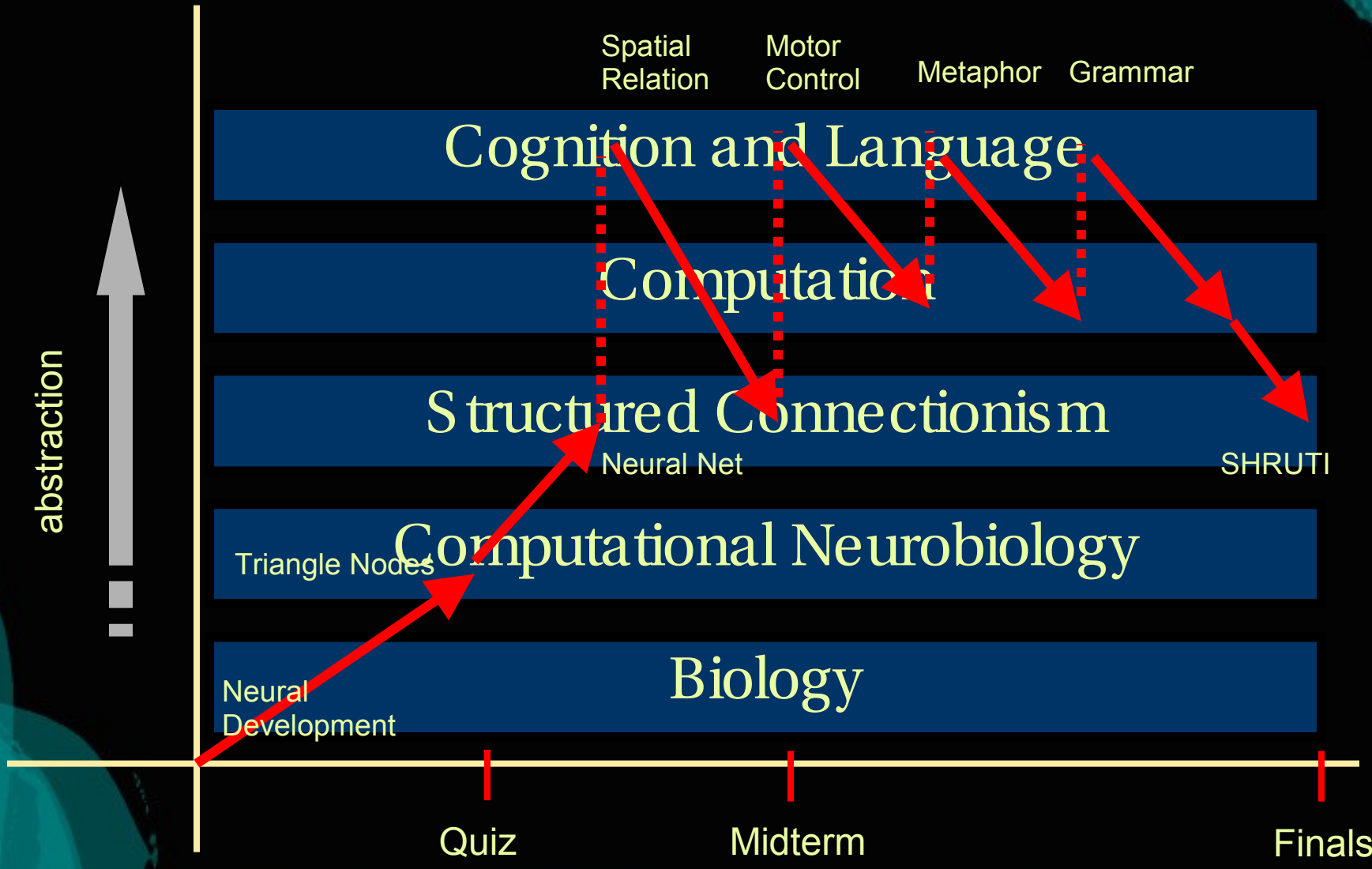
a1 questions?

- I realize some of the wording is confusing…

Review questions

1. Why is there a delay between neural firings?
2. What is a “homunculus”?
3. Name a place where human neurons have fixed neural wiring, down to the level of individual neurons
4. How are neurons like amoebas?
5. How is a growing fetus like evolutionary history?

5 levels of Neural Theory of Language

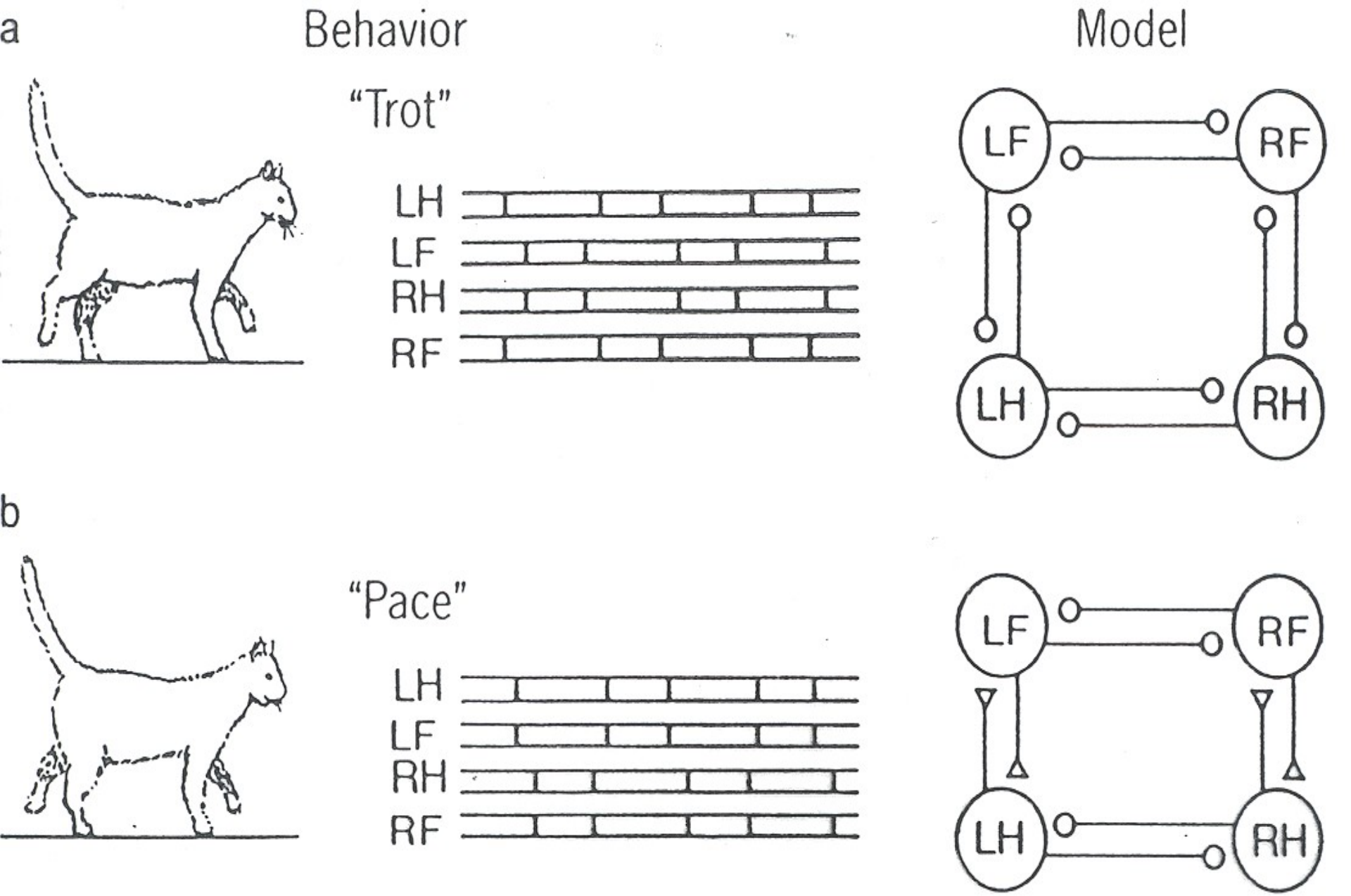


Key Points from last week

- What are the main parts of a neuron?
  - Cell body and dendrites receive signals
  - Axon sends signals to other neurons
  - Synapse is link between axon and another cell body or dendrite
- What are the two ways in which neural signals are transmitted?
  - Electrical signals within cell
  - Chemical signals outside of cell
- All this is only GENERALLY true

A neural spike

- What is a neuron's resting potential? How is it maintained?
  - “Pump” protein moves Na+ out of cell, and K+ into cell
  - K+ slowly leaks out of cell, so net charge in cell is negative: -70 mV
- What causes a spike?
  - Receiving neurotransmitters opens some Na+ channels; voltage goes up a little
  - If voltage goes over -50mV, many gates open



Gaits of the cat: an informal computational model

Brain Maps

- Can you name a few maps in the brain?
  - Vision
    - Many maps!
  - Hearing
  - Touch
  - Motor control
- Maps on more than one input signal
  - Vision maps have bands for color and orientation

Key Points from last lecture

- How do neurons develop?
  - Pre-neuron cells split into neurons
  - Neurons migrate
  - Neuron axons follow chemical clues to destinations
  - Pruning of synapses
- What is a chemical gradient? How does a neuron use one?
  - Some plasticity
    - Activity dependent fine tuning
    - Long term memory

Key Points from last lecture

- What is the neural plate? the neural tube?
  - The neural plate is a layer of cells that will become neurons
  - In early development, the embryo curls up laterally, so the neural plate is curled into a tube
- What is a critical period? Can you name one?
  - A period outside of which certain learning cannot occur
  - There are critical periods at least for:
    - Language
    - Vision

Key Points from last lecture

- When you consume alcohol, thousands of neurons die. How does your brain deal with this?
  - Duplicated, inhibited connections
  - New neurons don't (usually) grow, but new connections can grow
- Humans come pre-wired for learning
  - Some plasticity
    - Activity dependent fine tuning
    - Long term memory
- Pre-wiring biases the way we learn