**Biology 475/475 Neurobiology**

- Dr Grant Mastick
  - FA 311D, X6168
  - gmastick@unr.edu
  - Send me an email:
    - First assignment will be sent by email on Wed

- Course website
  - [http://med.unr.edu/homepage/gmastick/BIO475page/index.html](http://med.unr.edu/homepage/gmastick/BIO475page/index.html)

---

**BIOL 475 Neurobiology**

A brief overview of course

---

**What is neurobiology?**

- Psychology and the “black box”
  - Behavioral, Cognitive
  - Physiological Psychology

- Biology:
  - Approach of “reduction”: take apart the box
  - Goal: understanding underlying mechanism for nervous system function

- This course: cellular and molecular neurobiology
My main goals

- Integrate cellular and molecular biology topics
- Training in scientific reasoning
  - Hypotheses, experiments, interpretation
- Learn about brain structure and function
  - Understanding how neurons function

Topics in course

- Cell biology of neurons
- Developmental neurobiology
- Neurophysiology
- Sensory and motor functions
- Frontiers of neurobiology

1. Cell biology of neurons

- Neurons: basic parts
  - Cell body
  - Axon: output
    - Long, unbranched
  - Dendrite: input
    - Shorter, highly branched
- Distinct shape for each neuron type
  - Thousands of distinct types of neurons
- How is this regulated?
1. **Cell biology of neurons**

- Incredible specialized cells in nervous system
- Glia example: myelin insulates axons

![Glia cell: Schwann cell, “unrolled”](image)

2. **Development of nervous system**

- The embryonic brain: billions of neurons self-assemble into functional nervous system
- Wiring the brain: the growth cone leads the axon to its target

![Growth cone: “Amoeba on a string”](image)

- Crawls through brain, leaving axon trailing behind
- Navigates using chemical cues to find target cell

3. **Neurophysiology**

- How neurons signal to other cells:
  - Other neurons, muscles, glands, blood vessels
- Critical electrical signal is the **Action Potential**:
  - Firecracker analogy
  - Driven by ions passing through ion channels
  - Electrical signal driven along very long axons to target cells
- Guest lecturer: Dr Jim Kenyon, UNSOM
- Axon computer lab

![Neurophysiology](image)
### 4. Sensory and motor functions

- **Sensory:**
  - Physical (or chemical) cues from outside world
  - Enter nervous system through sensory neurons
    - Light to photoreceptors; smell to chemoreceptors
- **Motor:**
  - Nervous system sends signals to muscles

### Visual processing

- Optical illusion:
  - Retinal ganglion neurons
    - Gather signals from small area of retina
    - Integrate (add up) signals
    - Center-surround

### 5. Frontiers of Neurobiology

- Beginning of understanding on cellular and molecular levels
  - Normal processes
    - Learning and memory
    - What is “learning”?
  - Neurological diseases
    - Guest lectures: Alzheimer's disease, Schizophrenia