March 2, 2016

**Synaptic Transmission Refresher**

**Noise/Interference**

- Noise/Interference
- 1) Noise in the recording system
- 2) Electrical interference
  - AC power lines, radio & TV transmitters, fluorescent lights, computers, mechanical vibrations, etc.

The signal to noise ratio is what’s important. (Nerve 3 APs vs MRO APs)

**Real Electronic Noise**

- 1) Thermal Agitation $\sqrt{4kT\Delta f}$
- 2) Shot noise

**Real noise**

**Oscilloscope screen**

10 ms/div

**Signal interference (periodic)**

- Power line (most common)
- Magnetic pick up
- Real noise
  - Electromagnetic radiation

**Transient power surge**

10 ms/div

Types of Interference

- Electrostatic
- Electromagnetic
- Electromagnetic radiation

**MRO lab report**: see “Writing”, example short papers grading rubric on Blackboard site.

**Short scientific paper (brief communications)**

**Abstract**: Summarize, purpose, results, conclusion in short paragraph

**Very short introduction**: 2-3 paragraphs

- [Focus on experiment; cite ideas or facts not your own.]

**Brief Methods from lab handout (can refer to lab handout for details)**

**Results**: Present your data with good text descriptions of figures

- (Make a story out of it)

**Discussion**: Answer lab reports questions in a narrative, rather than just a list of answers
Electrostatic noise

Stationary capacitance

Electrostatic Coupling
\[ I = C \frac{dv}{dt} \]
\[ V = RC \frac{dv}{dt} \]

Solution:
1) Keep power lines far from recording leads
2) Surround conductors with grounded metallic surface
3) Sometimes have to unplug a device (lights)

Electrostatic coupling solution

Electromagnetic coupling

Magnetic pick up

10 ms/div
Electromagnetic coupling

Electromagnetic coupling solution

Grounds at different levels

Electromagnetic Radiation - high frequency, can be filtered

Solution

10 ms/div
Summary

1) Carry out the experiments in a grounded enclosure or surface.
2) Ground all metallic objects passing through the cage and enclose all wiring in a grounded wire shield.
3) Make the leads between the amplifier and preparation as short and direct as possible. Twist input leads together.
4) Avoid ground loops.

Synaptic Transmission Refresher

- Synaptic transmission
  1) signal transmission between NS components and effectors
  2) A site of plasticity for learning and memory
  3) A site of action for disease, psychoactive drugs

Types of Chemical Synaptic Transmission

- direct, fast ionotropic
- indirect, "slow metabotropic"
Ionotropic Transmission

Stimulate presynaptic axon

Steps in ionotropic chemical synaptic transmission

Release of Transmitter

Snake Neuromuscular Junction Model
Freeze-fracture of NMJ

Ca\textsuperscript{2+} channel complexes

EM section of NMJ

Brain Synapse

Few vesicles at each synaptic site