



# Announcements

## Research Workshop

- Thursday September 28th from 7-8pm in SAC 312
- Morris Water Maze paper available on website/email

## Research seminar

- October 11th from 7-10 pm SAC Ballroom A
- Information on website: [you.stonybrook.edu/neuroscienceaxis](http://you.stonybrook.edu/neuroscienceaxis)

## Healthcare, Research & Human Services Job and Internship fair

- Friday, October 13th
- 12-3pm SAC Ballroom A



# Computational Neuroscience



# What is computational neuroscience?

Uses computational methods to understand nervous system functioning

Incorporates fields of physics, electrical engineering and computer science



# Origin of Computational Neuroscience

Foundations in work of Hodgkin & Huxley, Hubel & Wiesel, David Marr and Louis Lapicque

Hodgkin & Huxley created first biophysical model of an action potential.

Computational modeling of realistic neurons began with Wilfred Rall



# Fields within Computational Neuroscience

- Single-neuron modeling
- Behaviors of networks
- Development, axonal patterning and guidance
- Cognition, discrimination and learning
- Sensory processing
- Consciousness
- Memory and synaptic plasticity
- Computational clinical neuroscience

# Hubel and Wiesel's experiment

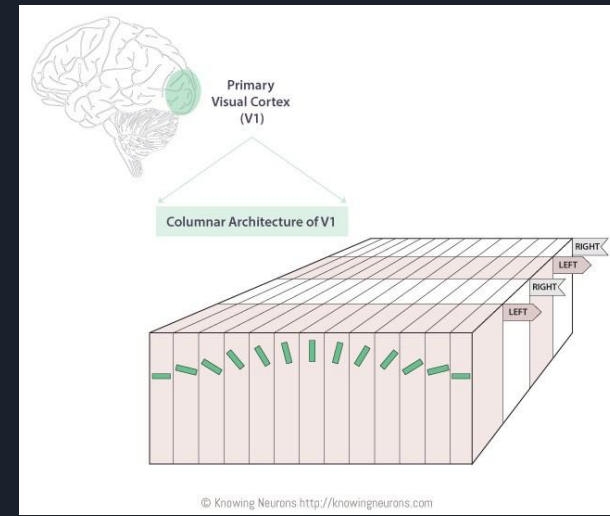


# Hubel and Wiesel's experiment

Important discoveries of their experiment:

- Neurons only fired when the line was in a particular place
- Neurons responded differently depending on the angle of the light

This experiment helped to provide the basis for how we understand the processing of visual information at the neuronal level and how the visual neurons are organized in the brain.





# Neuron models: Hodgkin-Huxley

Their model gave a basic understanding of how the flow of information looks like within a nerve cell

Used squid giant axons and laws of circuits to create models of action potentials

Concluded that changes in permeability were dependent on membrane potential and not current





# How can we use computational neuroscience

## Teaching:

- Students can use programs such as MATLAB and NEURON to simulate experiments that otherwise cannot be conducted

## Psychiatry

- Integrative approach allows us to understand how we think, interact and behave

## Prosthetics

- Combined with neural engineering to help implants and prosthetics to work better



# Demonstrations in Computational Neuroscience

Jess- Motor processing and Myasthenia Gravis

Arth- hodgkin-huxley model and threshold stimulus

Stephanie- code for HH model



Next GBM: 10/4

Neuroscience of Mental Health

Learn about the biological basis of mental illness and de-stress with  
arts and crafts!