Electrophysiology on the Leech



Hirudo Verbana (medicinal leech)

Brandon Stevenson

Francisco Madamba



Example of P Cell





Time (Seconds)

Receptors thought to play a role in learning



Glutamate receptors and synaptic plasticity

Voglis and Tavernarakis, 2006

STDP in Mammals

STDP in leech



Dan and Poo, 2005

Grey and Burrell, 2010

Hurdo verbana



Ventral Face of Leech Ganglion





(Gu, 1990)



How to sort out between the 400 different ganglions?

- 1) Whether the cell fires tonically or not.
- 2) The characteristic resting membrane potential (RMP) and the characteristic action potential (AP) of the cell which includes AP amplitude, duration, and frequency.



Sample traces from the sensory cells demonstrating the differences in action potentials Plan

1) Single cell electrophysiology





Todd, 2010

Application of STDP



Time (Seconds)



Long-Term Depression



Time (Seconds)

How does our data compare?





Bi and Poo, 1998

Difficulties

- 1) Insufficient Time:
 - 1) Rig set up
 - 2) Ganglion dissection
 - 3) Matlab usage
- 2) Equipment
 - 1) Noise
- 3) Exact quantification of variables:
 - 1) Time
 - 2) Hyperpolarization
- 4) Reliable Spikes:
 - 1) Not always getting spikes
 - 1) Had to change extent of hyerpolarization