Neuronal Excitability
March 11, 2013

Snails as a model systems in neurobiology

Fig. 1. The locomotor pattern is modelled in simple spatiotemporalspikes (100 ms long and 10-20 microvolts) with a frequency of 1-2 spikes per second. Different cells are organised in groups (e.g., A-P, B-P, C-P, and D-P) and the entire pattern is generated by a few, large (200 microns) neurons. Our left snail.

Snail Brain

Large neurons ~ 200 micron diameter
Pond snail brains - *Lymnaea*

Identified neurons in pond snail brains

Snail Buccal Ganglia - control of rhythmic feeding movements

Buccal ganglia neurons
Snail Week 1 Focus: Firing properties of neurons

Action Potentials

Responses to current injection

Silent cell

Tonically firing cell

Firing adaptation, also note spike broadening

Post-inhibitory rebound

note enhanced EPSPs
Burster neurons

Burst frequency control

Burst characterization

“true” bursters vs. driven bursters

Interesting firing properties of neurons

Snail burster neurons

Mouse spinal cord burster neurons

Why do APs get smaller and then big again?

Snail week 2. Ionic mechanisms of excitability

Reduced Na

Reduced Ca

K+ Channel block with TEA

4 mV

50 ms
K+ Channel block with TEA/Cs

Serotonin modulation in an identified V2a spinal interneuron  (3/23/2011, ~9 pm)

K+ Channel block with barium

TEA/CS block progressing over time (5 minutes)