17/12/2015 – The surprising return of Tigerholm

So, there is a paper by Tigerholm et al. that seems to build a detailed model from a wide array of sources. Many currents including INaK etc. and Navs 1.7,8 and 9.

17/12/2015 – Where we at

We have the code to run populations.

I need to code up biomarker analysis.

Waxman papers give human specific models of Nav 1.7 and 1.8. (Han and Vasylyev papers).

# I think I’ve found a paper (A *de novo* gain-of-function mutation in *SCN11A* causes loss of pain perception) that can characterise Nav 1.9.

# Nav 1.6 might be a significant player too, need to do more reading.

# Will need to see if there are human specific characterisations of potassium channels in the literature.

# Temperature of recordings in each case is an issue.

09/10/2015 – Sum up of week

I have learnt the basics of using NEURON through Python, and using NMODL to build ion channels.

I have implemented the 4 Choi Waxman currents in NMODL and can put them into a Neuron soma model and simulate the results.

Caveat: I haven’t exactly implemented Nav 1.8 as written in the paper due to the weird exp(dt) function that I can’t track down due to missing supplementary material from Sheets 2007 (as per email to J Physiol).

Next week’s jobs are:

1) Go through the 2014 Davidson paper and compare the model’s results again the data there (mimic current protocols and plot results).

2) Start coding i/o and biomarker functions in Python. Biomarkers could also be done in Matlab, but Python would be cleaner and more interesting as a learning exercise.

3) Read some Bostock.

05/06/2015 – Varying parameters using NEURON

This post might be useful: <http://www.neuron.yale.edu/phpbb/viewtopic.php?f=23&t=1584>

As might the paper by Friedrich et al. (saved). Software for parameter optimisation in NEURON + Python, but same need to drop multiple parameter sets into an existing model.

03/06/2015 – Using NEURON

Going through tutorial at: <http://www.neuron.yale.edu/neuron/static/docs/elementarytools/rctlbut3.htm>

02/06/2015 – Installing NEURON

Installed NEURON, and compiled the Kovalsky model on it. Real time GUI seems nice for exploration, but I’m not sure what I can control from the command line.

However, seems like controlling NEURON through Python has significant work behind it, so this might be a way to do populations through NEURON.

This could be important because NEURON appears to be fundamentally non-compartment based, and actually calculates state variables along each compartment. So just jamming a model into CVODE won’t give the same results and will run into trouble if we start adding axons to a basic soma model.

Questions:

1. How can I control simulations through either Python or the NEURON command line?

2. How do I build models and currents?

3. Can I do population simulations. Models possibly need to be compiled before use, but maybe I can push parameters to them for each run, or compile many models?

4. How do I run a simulation?

5. How do I save simulation results?

GENESIS? I’m tempted to stick with NEURON, it seems bigger and better supported and I’d rather spend all my time on one tool than try to learn a bit of two, especially when I don’t know what NEURON’s weak points are yet!

Once I know what NEURON can’t do it’ll be easier to evaluate whether GENESIS can do that or if I need to roll my own.

02/06/2015 – Reading plan

I need to get a general overview of pain research, who the big names and big papers are, what the broad topics are. Then I can discuss with Steve on the 12th.

Begin: Devor group webpage. Wikipedia on Pain, Neuropathic Pain, and Peripheral Neuropathy. Then track down links to big papers.

“Neuropathic pain is caused by damage or disease affecting any part of the nervous system involved in bodily feelings”

Two roots emerge from the spinal cord. The anterior root carries motor signals from the brain. The posterior root travels to the posterior root ganglion, AKA the DRG. This carries signals from the peripheral nervous system to the brain.