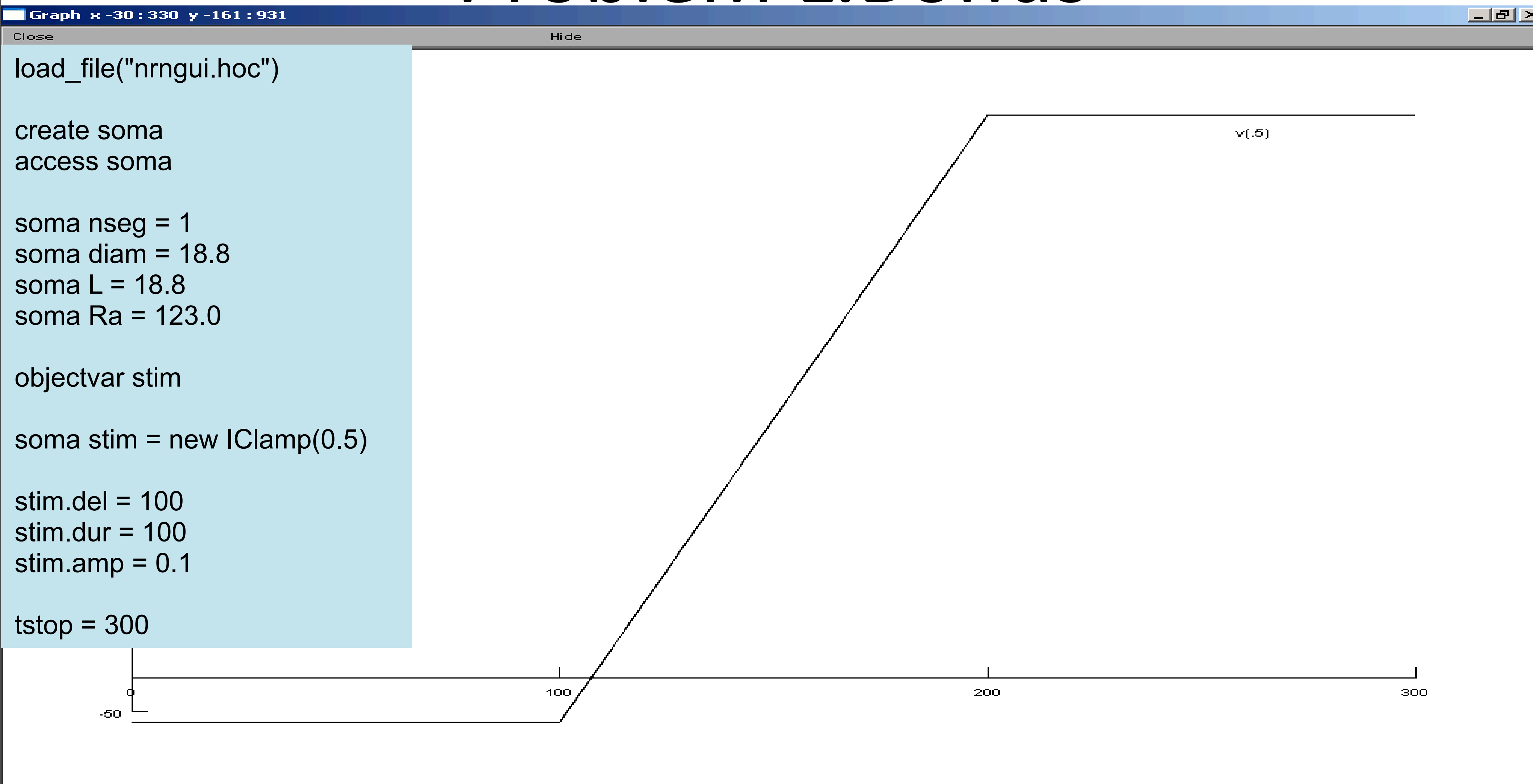
Lab L

Bonus

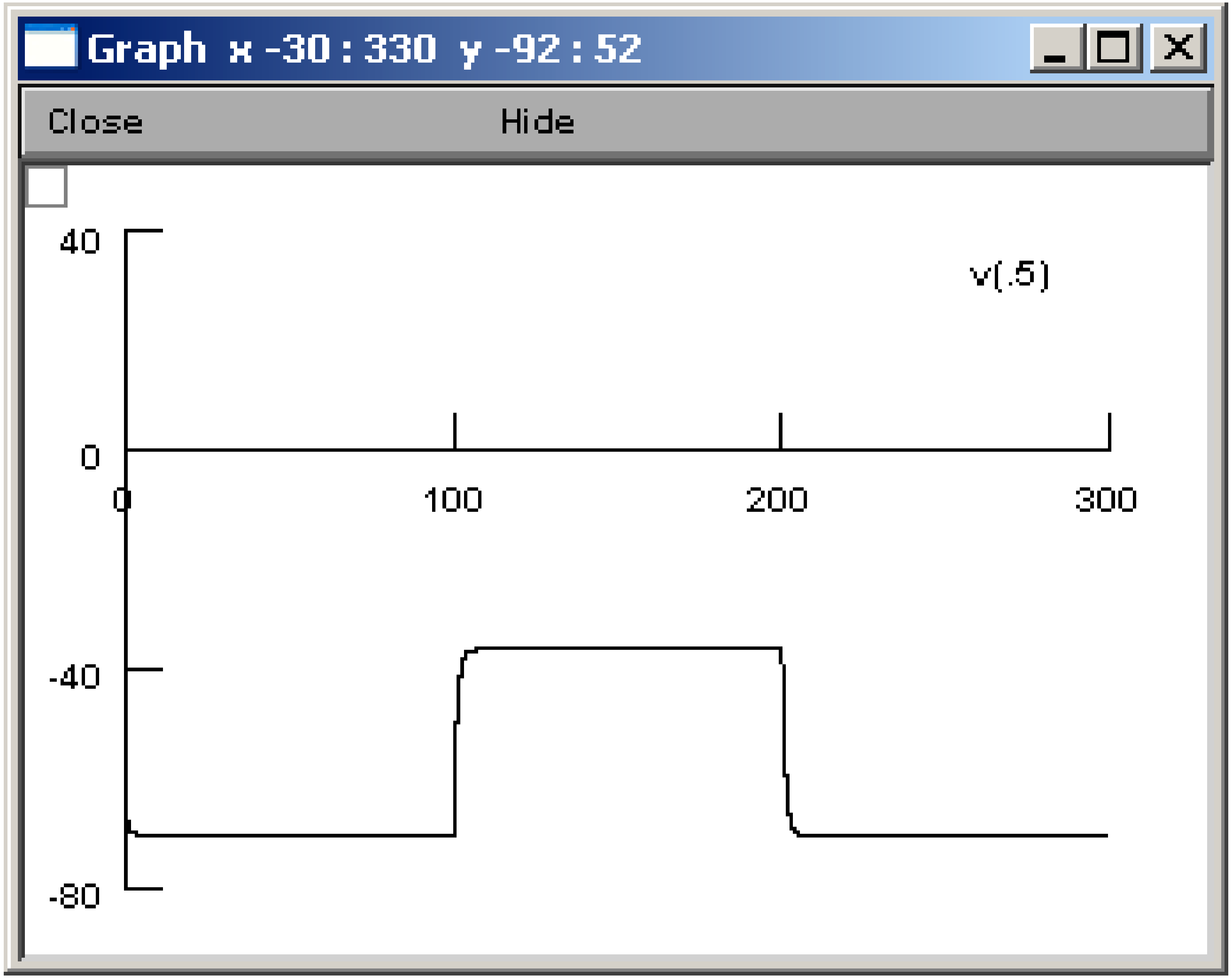
Problem L.Bonus



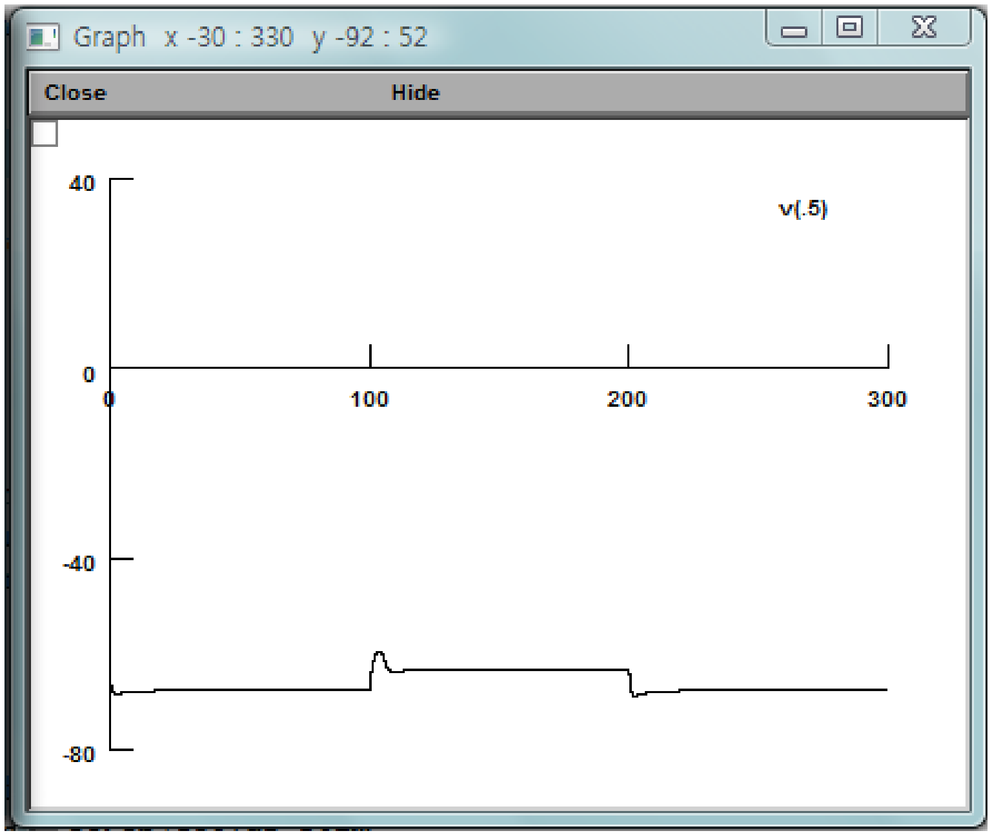

```
load_file("nrngui.hoc")

create soma
access soma

soma nseg = 1
soma diam = 18.8
soma L = 18.8
soma Ra = 123.0

objectvar stim

soma stim = new IClamp(0.5)

stim.del = 100
stim.dur = 100
stim.amp = 0.1

tstop = 300
```

- Removed “soma insert hh.”

L.4 soma.diam = 5, Inserted only passive channels (no HH channels)

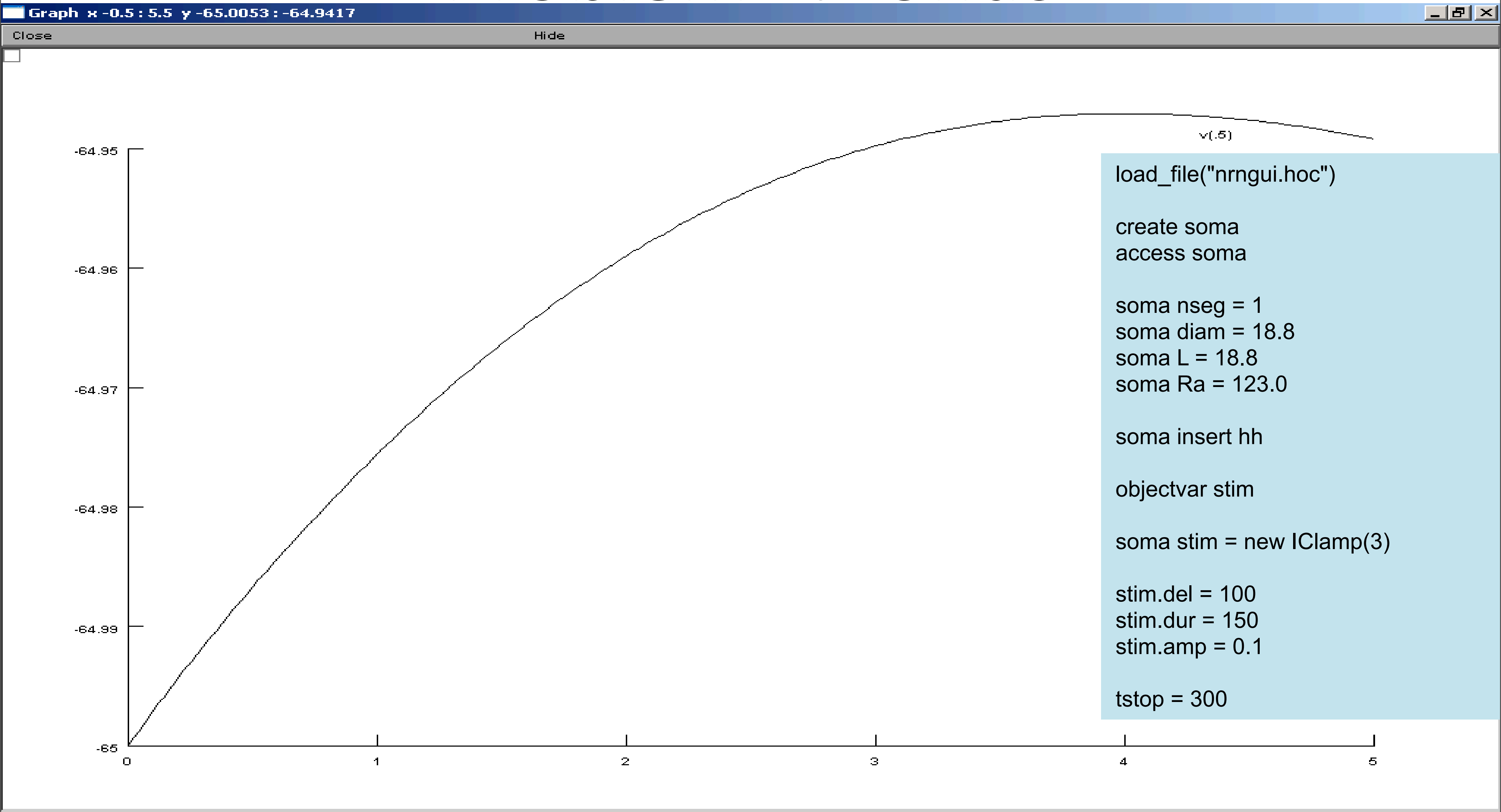


Homework L.*Bonus



- oc>create soma
- oc>access soma
- oc>soma nseg=1
- oc>soma diam=18.8
- oc>soma Ra=123.0
- oc>soma L=18.8
- oc>insert hh
- oc>insert pas
- oc>objectvar stim
- oc>stim=new IClamp(0.5)
- oc>stim.del=100
- oc>stim.dur=100.
- oc>stim.dur=100
- oc>stim.amp=0.1
- oc>tstop=300

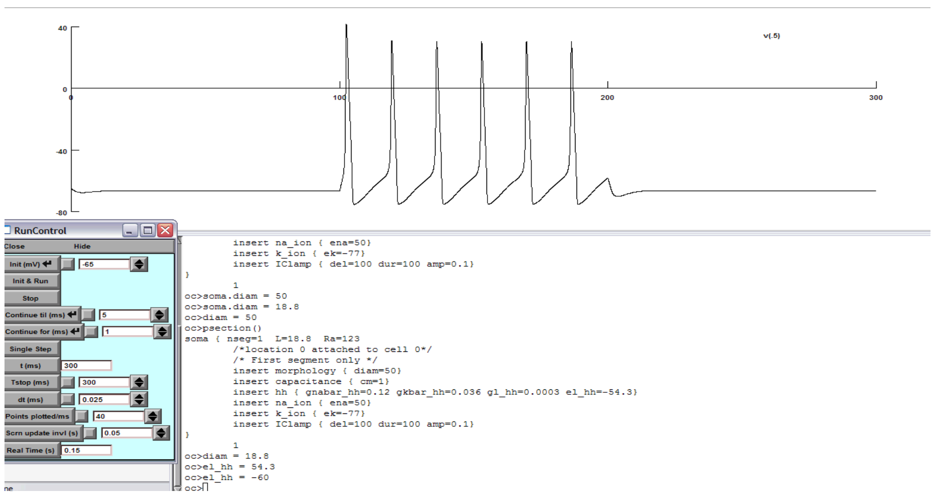
Problem L.Bonus

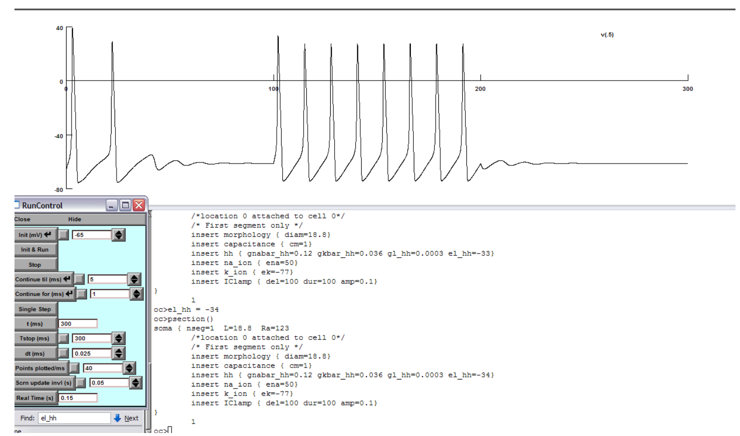



```
load_file("nrngui.hoc")

create soma
access soma

soma nseg = 1
soma diam = 18.8
soma L = 18.8
soma Ra = 123.0

soma insert hh

objectvar stim

soma stim = new IClamp(3)

stim.del = 100
stim.dur = 150
stim.amp = 0.1

tstop = 300
```

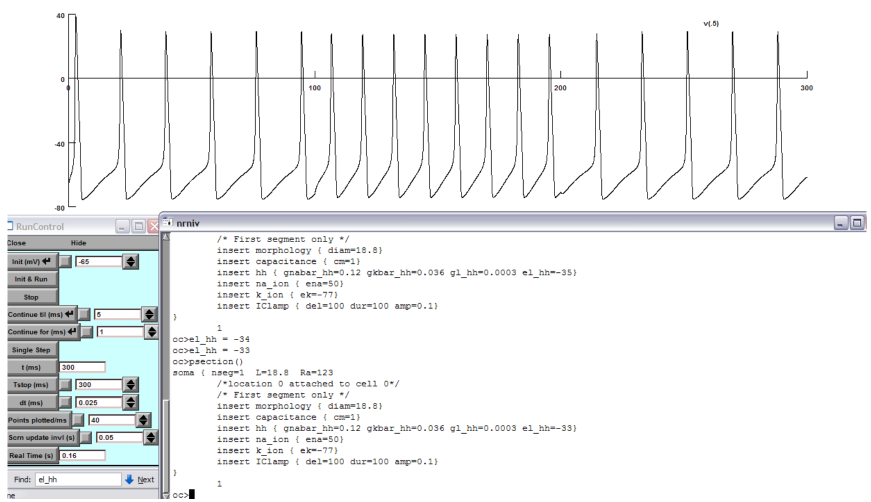
- soma stim = new IClamp(3) from IClamp(0.5).

L.3 – Effect of changing leak current reversal potential to -60mV, -34mV and -33mV



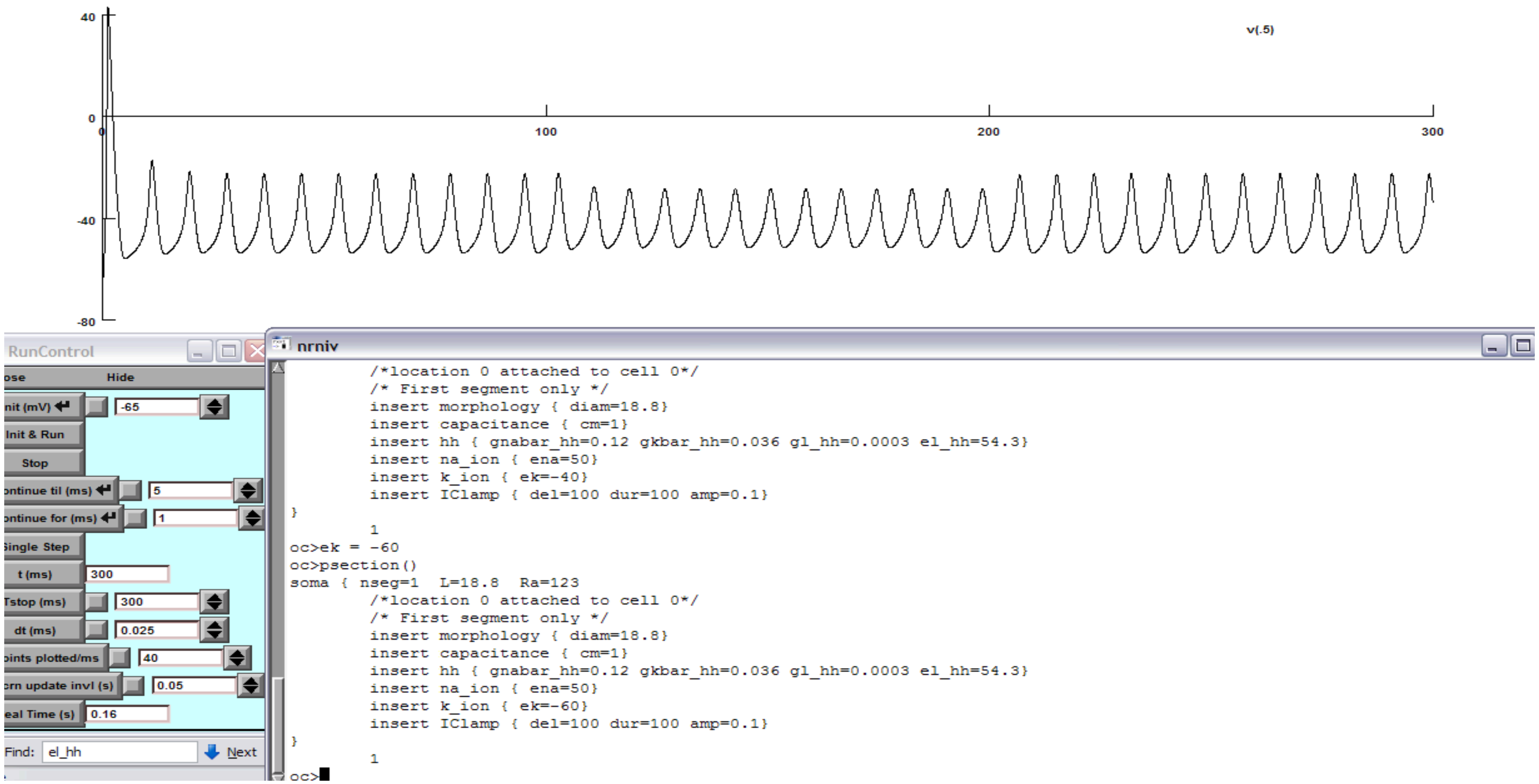


Above -At a lower reversal potential (-60mV) to leak channels have a more ‘hyperpolarizing’ effect (they more strongly counteract depolarizing currents) – resulting in fewer action potentials.



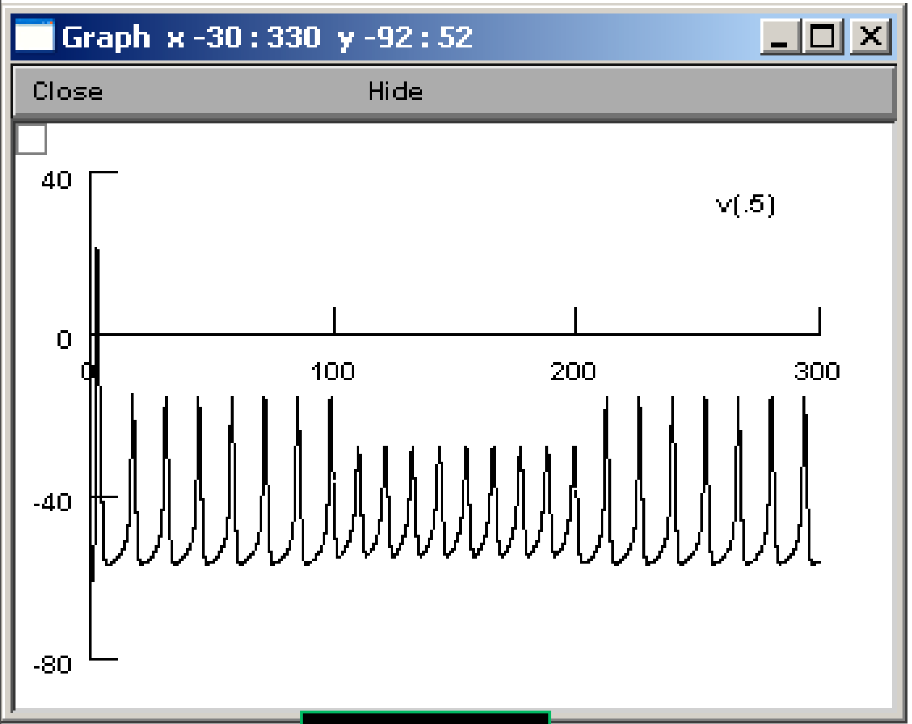
At some point between -34mV (above) and -33mV (right) exists the threshold for leak channels to overcome ENa and EK to drive a continuous train of action potentials.

L.4 – Effect of Increasing EK to -60 (as though astrocyte K uptake was significantly disrupted)

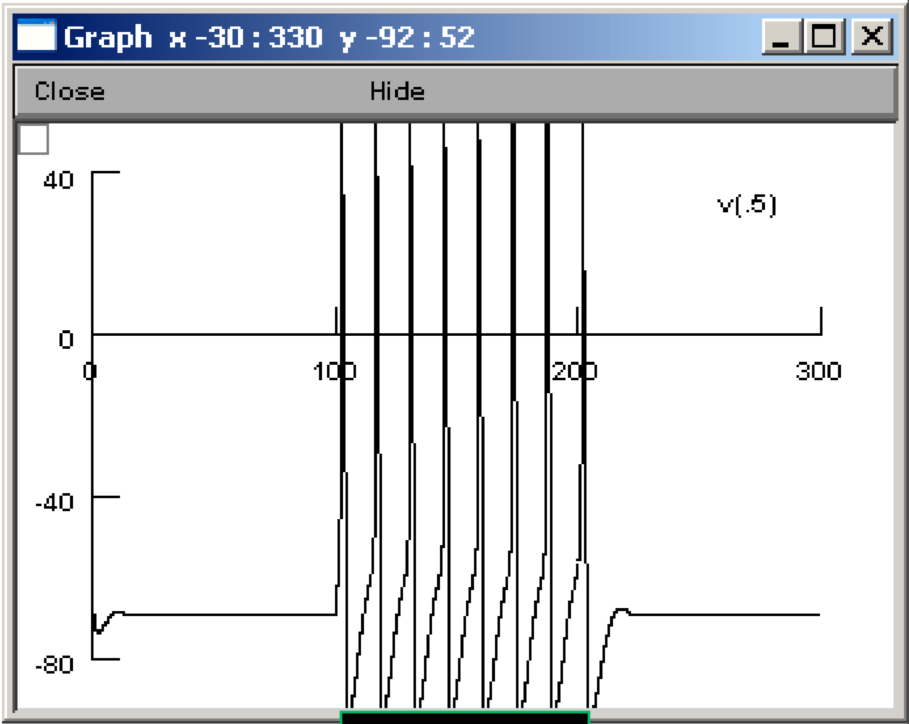


Reducing EK drives a steady stream of small action potentials – as EK is further reduced the ability to drive HH action potentials becomes increasingly impaired, eventually reducing oscillations to a steady line.

Changing Reversal Potentials



ENa = 30
EK = -57



ENa = 70
EK = -97

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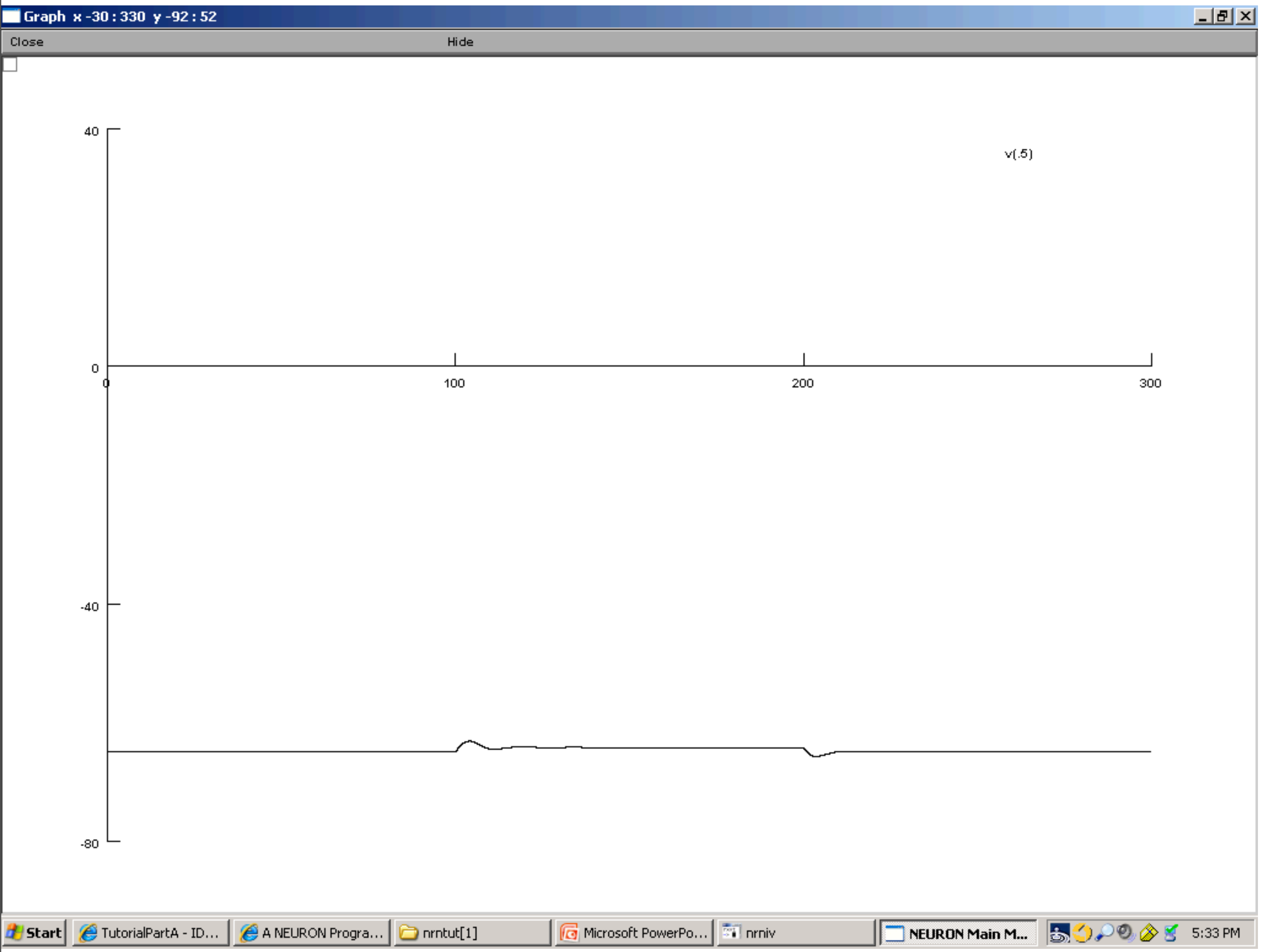


soma nseg = 1

soma diam = 1800

soma L = 1800

soma Ra = 1230

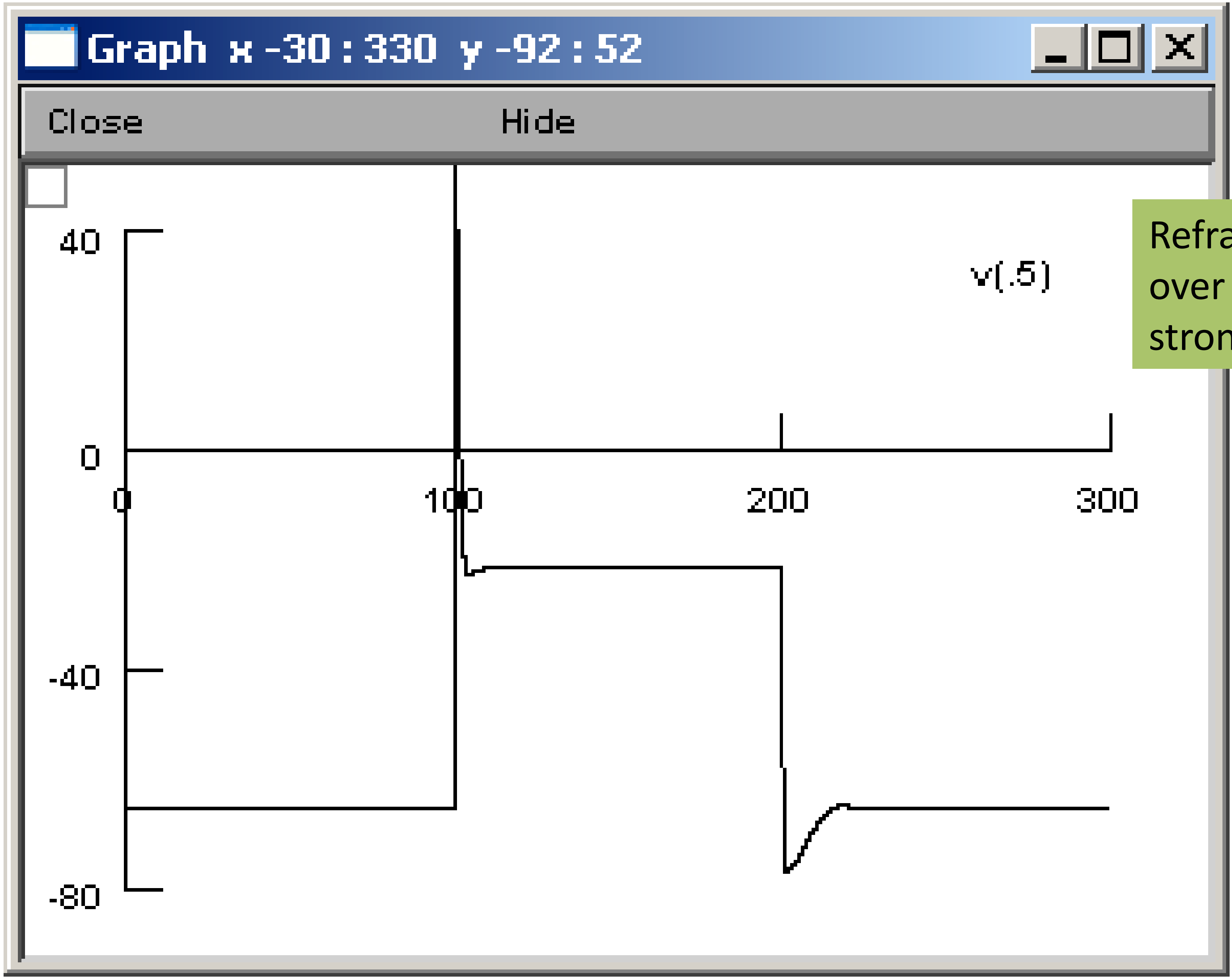
stim.del = 100

stim.dur = 100

stim.amp = 100

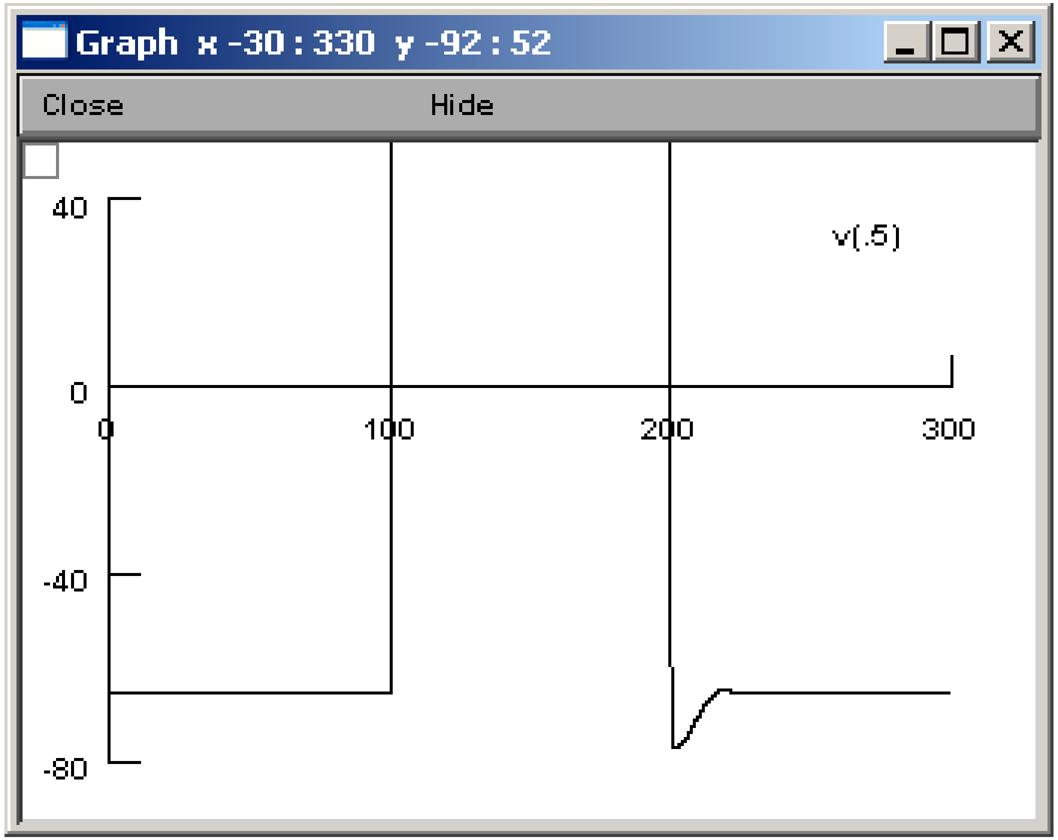
***Although I increased the amplitude by factor of 1000, there is no significant voltage change because the axon is too large.

L.* stim.amp = 10



Refractory period lasts over 100 ms with a very strong injected current

L.4



- Changed the stimulus amplitude to 50nA.
- The model neuron seems to be overloaded with stimulus.

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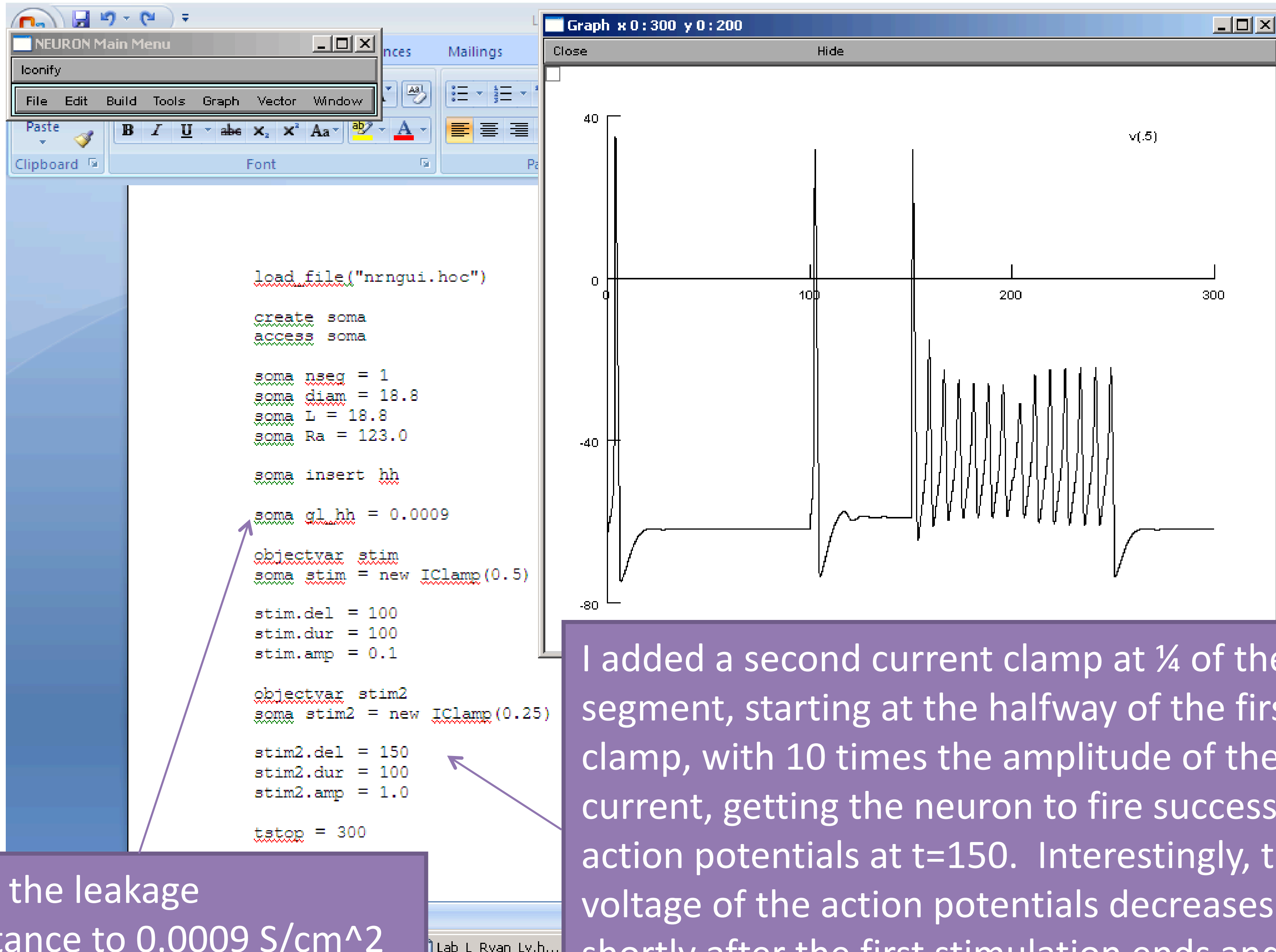

I added a second current clamp at ¼ of the segment, starting at the halfway of the first current clamp, with 10 times the amplitude of the first current, getting the neuron to fire successive action potentials at t=150. Interestingly, the peak voltage of the action potentials decreases until shortly after the first stimulation ends and then increases again, with only the second stimulation.

I tripled the leakage conductance to 0.0009 S/cm^2