

Lab Y

Model DB



Spike timing detection in different forms of LTD (Doi et al 2005)

Accession: 49305

To understand the spike-timing detection mechanisms in cerebellar long-term depression (LTD), we developed a kinetic model of Ca dynamics within a Purkinje dendritic spine. In our kinetic simulation, IP3 was first produced via the metabotropic pathway of parallel fiber (PF) inputs, and the Ca influx in response to the climbing fiber (CF) input triggered regenerative Ca-induced Ca release from the internal stores via the IP3 receptors activated by the increased IP3. The delay in IP3 increase caused by the PF metabotropic pathway generated the optimal PF-CF interval. The Ca dynamics revealed a threshold for large Ca²⁺ release that decreased as IP3 increased, and it coherently explained the different forms of LTD. See paper for more and details.

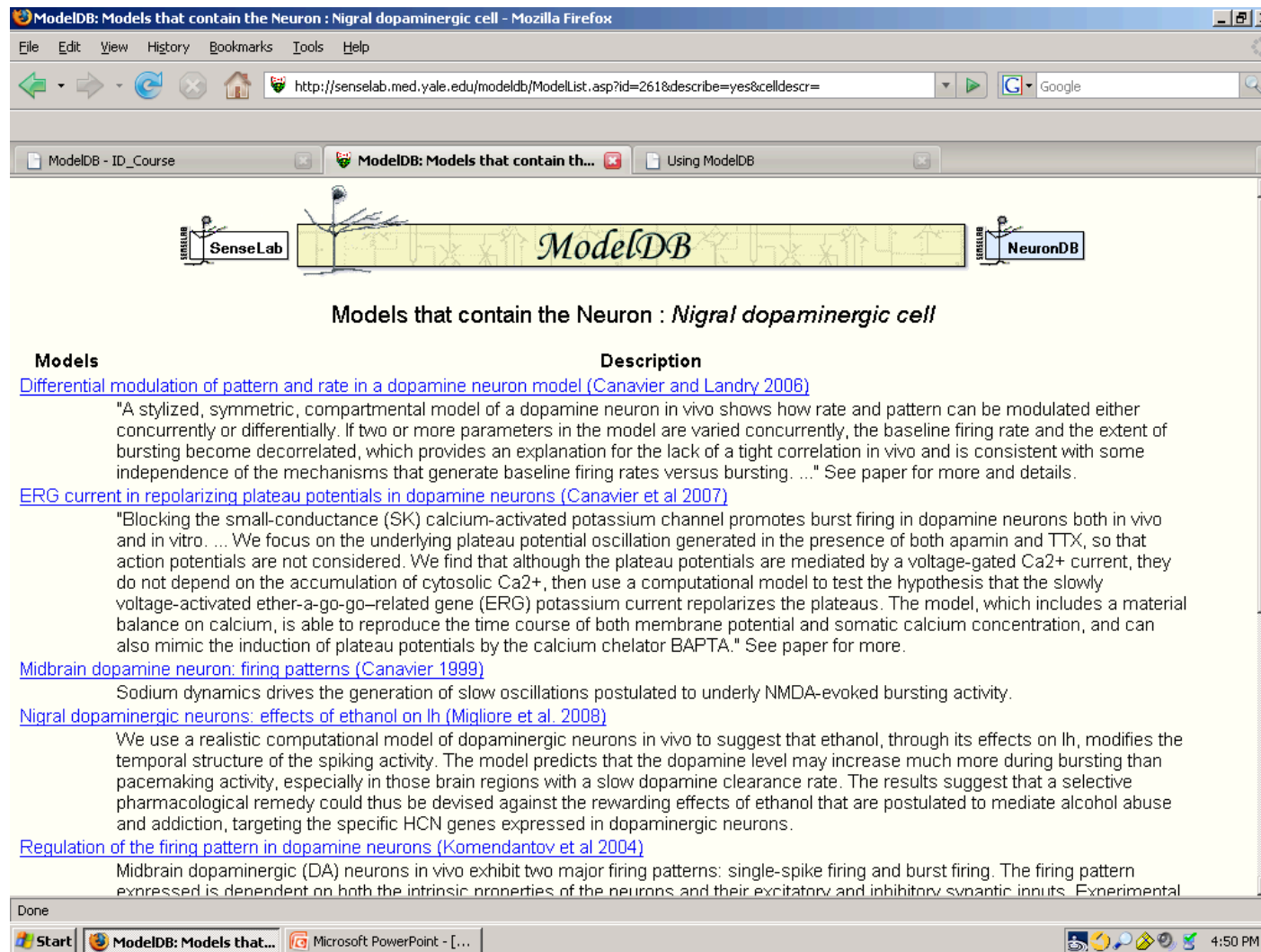
Reference: Doi T, Kuroda S, Michikawa T, Kawato M (2005) Inositol 1,4,5-trisphosphate-dependent Ca²⁺ threshold dynamics detect spike timing in cerebellar Purkinje cells. *J Neurosci* **25**:950-61 [\[PubMed\]](#)

Citations [Citation Browser](#)

Model Information *(Click on a link to find other models with that property)*

Model Type:	Synapse ;
Brain	
Region(s)/Organism:	
Cell Type(s):	Cerebellar purkinje cell ;
Channel(s):	I Calcium ;
Gap Junctions:	
Receptor(s):	
Transmitter(s):	Glutamate ;

Homework Y.1 : Substantia Nigra



ModelDB: Models that contain the Neuron : Nigral dopaminergic cell - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://senselab.med.yale.edu/modeldb/ModelList.asp?id=261&describe=yes&celldescr=

ModelDB - ID_Course ModelDB: Models that contain th... Using ModelDB

SenseLab ModelDB NeuronDB

Models that contain the Neuron : *Nigral dopaminergic cell*

Models	Description
Differential modulation of pattern and rate in a dopamine neuron model (Canavier and Landry 2006)	"A stylized, symmetric, compartmental model of a dopamine neuron in vivo shows how rate and pattern can be modulated either concurrently or differentially. If two or more parameters in the model are varied concurrently, the baseline firing rate and the extent of bursting become decorrelated, which provides an explanation for the lack of a tight correlation in vivo and is consistent with some independence of the mechanisms that generate baseline firing rates versus bursting. ..." See paper for more and details.
ERG current in repolarizing plateau potentials in dopamine neurons (Canavier et al 2007)	"Blocking the small-conductance (SK) calcium-activated potassium channel promotes burst firing in dopamine neurons both in vivo and in vitro. ... We focus on the underlying plateau potential oscillation generated in the presence of both apamin and TTX, so that action potentials are not considered. We find that although the plateau potentials are mediated by a voltage-gated Ca ²⁺ current, they do not depend on the accumulation of cytosolic Ca ²⁺ , then use a computational model to test the hypothesis that the slowly voltage-activated ether-a-go-go-related gene (ERG) potassium current repolarizes the plateaus. The model, which includes a material balance on calcium, is able to reproduce the time course of both membrane potential and somatic calcium concentration, and can also mimic the induction of plateau potentials by the calcium chelator BAPTA." See paper for more.
Midbrain dopamine neuron: firing patterns (Canavier 1999)	Sodium dynamics drives the generation of slow oscillations postulated to underly NMDA-evoked bursting activity.
Nigral dopaminergic neurons: effects of ethanol on Ih (Migliore et al. 2008)	We use a realistic computational model of dopaminergic neurons in vivo to suggest that ethanol, through its effects on Ih, modifies the temporal structure of the spiking activity. The model predicts that the dopamine level may increase much more during bursting than pacemaking activity, especially in those brain regions with a slow dopamine clearance rate. The results suggest that a selective pharmacological remedy could thus be devised against the rewarding effects of ethanol that are postulated to mediate alcohol abuse and addiction, targeting the specific HCN genes expressed in dopaminergic neurons.
Regulation of the firing pattern in dopamine neurons (Komendantov et al 2004)	Midbrain dopaminergic (DA) neurons in vivo exhibit two major firing patterns: single-spike firing and burst firing. The firing pattern expressed is dependent on both the intrinsic properties of the neurons and their excitatory and inhibitory synaptic inputs. Experimental

Done

Start ModelDB: Models that... Microsoft PowerPoint - [...]

4:50 PM

Y.1

ModelDB: Nerve terminal currents at lizard neuromuscular junction (Lindgren, Moore 1989) - Microsoft Internet Explorer provided

http://senselab.med.yale.edu/modeldb/ShowModel.asp?model=10360

File Edit View Favorites Tools Help

SenseLab ModelDB ID_Course ModelDB: Nerve ter... PubMed Home

Nerve terminal currents at lizard neuromuscular junction (Lindgren, Moore 1989)

Accession: 10360

Loose patch clamp measurement of presynaptic ionic currents at lizard neuromuscular junction compared with computer simulations.

Reference: Lindgren CA, Moore JW (1989) Identification of ionic currents at presynaptic nerve endings of the lizard. *J Physiol* **414**:201-22 [PubMed]

Citations [Citation Browser](#)

Model Information (Click on a link to find other models with that property)

Model Type: [Neuromuscular Junction](#);

Brain Region(s)/Organism:

Cell Type(s):

Channel(s): [I_{Na}](#); [I_K](#);

Gap Junctions:

Receptor(s):

Transmitter(s):

Simulation Environment: [Neuron](#);

Model Concept(s): [Ion Channel Kinetics](#); [Action Potentials](#);

Implementer(s): [Hines, Michael](#);

Search NeuronDB for information about: [I_K](#); [I_{Na}](#);

Model files [Download zip file](#) [Auto-launch](#) [Help downloading and running models](#)

[lindgren89](#) Lindgren and Moore. (1989) Identification of ionic currents at presynaptic nerve terminal of the lizard.

Start ModelDB: Nerve termi... Microsoft PowerPoint - [...]

Internet 100% 4:52 PM



Site of impulse initiation in a neuron (Moore et al 1983)

Accession: 9852

Examines the effect of temperature, the taper of the axon hillock, and HH channel density on antidromic spike invasion into the soma and spike initiation under dendritic stimulation.

Reference: Moore JW, Stockbridge N, Westerfield M (1983) On the site of impulse initiation in a neurone. *J Physiol* **336**:301-11
[\[PubMed\]](#)

Citations [Citation Browser](#)

Model Information (Click on a link to find other models with that property)

Model Type:	Neuron or other electrically excitable cell;
Brain Region(s)/Organism:	
Cell Type(s):	Spinal motor neuron;
Channel(s):	I_{Na,t} ; I_K ;
Gap Junctions:	
Receptor(s):	
Transmitter(s):	
Simulation Environment:	Neuron;
Model Concept(s):	Action Potential Initiation; Simplified Models;
Implementer(s):	Hines, Michael ;

Search NeuronDB for information about: [Spinal motor neuron;](#) [I_K](#); [I_{Na,t}](#);

Model files [Download zip file](#) [Auto-launch](#) [Help downloading and running models](#)

Moore, Stockbridge, and Westerfield. (1983) On the site of impulse initiation

About Entrez

Text Version

Entrez PubMed

Overview

Help | FAQ

Tutorials

New/Noteworthy 

E-Utilities

PubMed Services

Journals Database

MeSH Database

Single Citation

Matcher

Batch Citation Matcher

Clinical Queries

Special Queries

LinkOut

My NCBI

Related Resources

Order Documents

NLM Mobile

NLM Catalog

NLM Gateway

TOXNET

Consumer Health

Clinical Alerts

ClinicalTrials.gov

PubMed Central

[Limits](#) [Preview/Index](#) [History](#) [Clipboard](#) [Details](#)Display [Abstract](#) Show [20](#) Sort By [Send to](#)[All: 1](#) [Review: 0](#) ☐ 1: [J Physiol](#). 1983 Mar;336:301-11.[Related Articles, Links](#)**On the site of impulse initiation in a neurone.**[Moore JW](#), [Stockbridge N](#), [Westerfield M](#).

In the preceding paper (Moore & Westerfield, 1983) the effects of changes in membrane properties and non-uniform geometry on impulse propagation and threshold parameters were investigated. In this paper the contributions of these and other parameters to the site of initiation of an impulse were determined by computer simulations using the Hodgkin-Huxley membrane description, the cable equations, and geometry appropriate for a simplified motoneurone with a non-myelinated axon. Antidromic invasion of action potentials into the soma was found to depend upon (a) the ionic channel rate constants (determined by the temperature), (b) the abruptness of the transition from the small-diameter axon to the larger diameter (and increased load) of the soma-dendrite, (c) extensions of active properties into the dendrite, and (d) density of ion channels. The location of the apparent site of initiation of impulses was not necessarily at the site of synaptic input nor the nearest active membrane. Its position depended upon (a) the fraction of the dendritic tree with excitable membrane, and secondarily on (b) the stimulus strength. Even with uniform excitability in the active membrane, the apparent site of initiation could be moved a considerable distance from the soma and the site of stimulation by appropriate choice of the various parameters noted above.

Publication Types:

- ◆ [Research Support, U.S. Gov't, P.H.S.](#)

PMID: 6308224 [PubMed - indexed for MEDLINE]

Homework Y.5

Figures

Close

Hide

1B : cool to 6.3 DegC

Figure 1A

Figure 1B

Figure 1C

Figure 1D

Figure 2A

Figure 2B

Figure 3A

Figure 3B

Figure 3C

Figure 4A

Figure 4B

Figure 4C

Figure 5A

Figure 5B

Figure 5C

Figure 5D

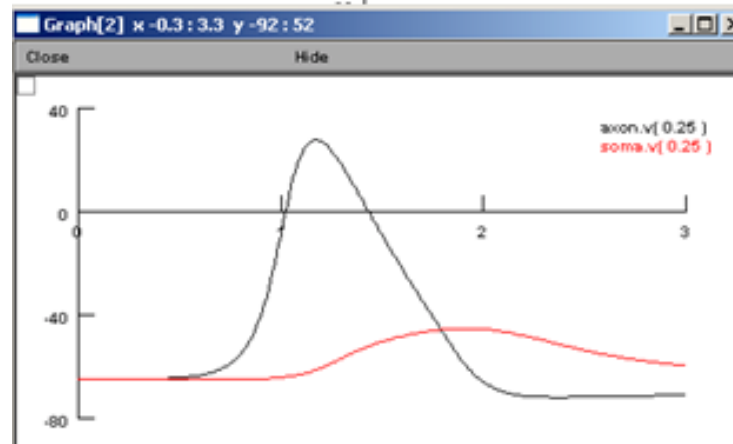
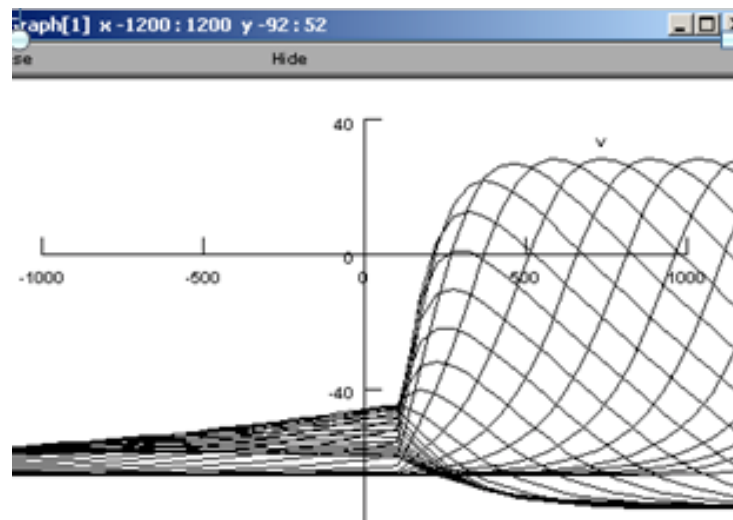


Figure A

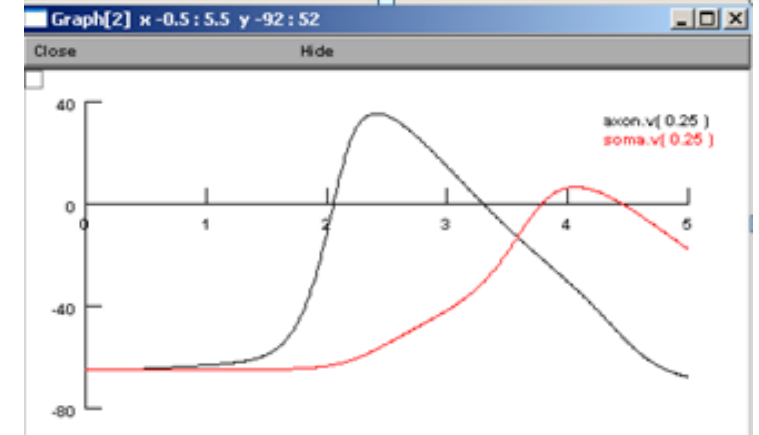
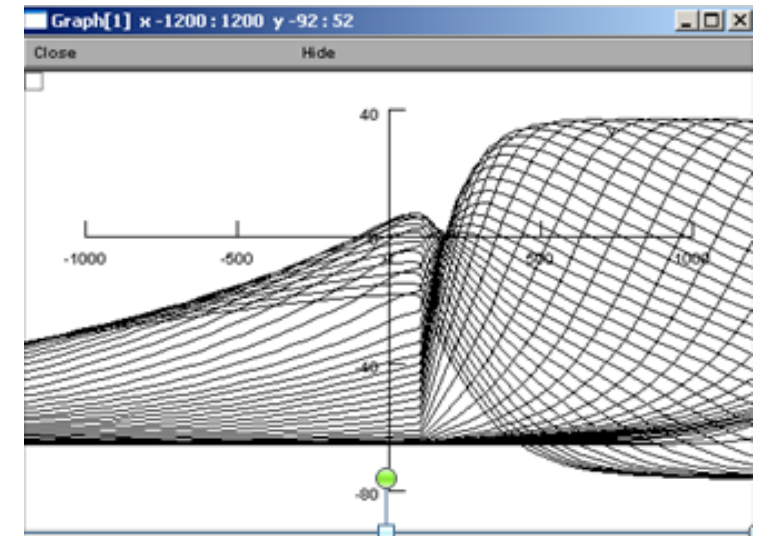
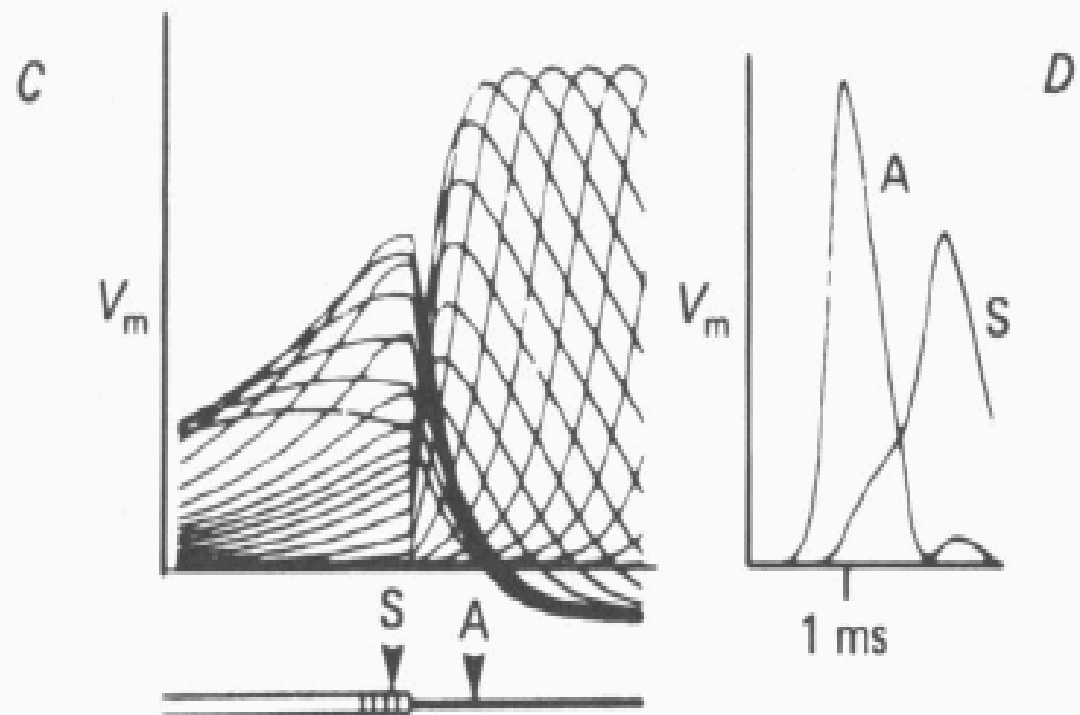
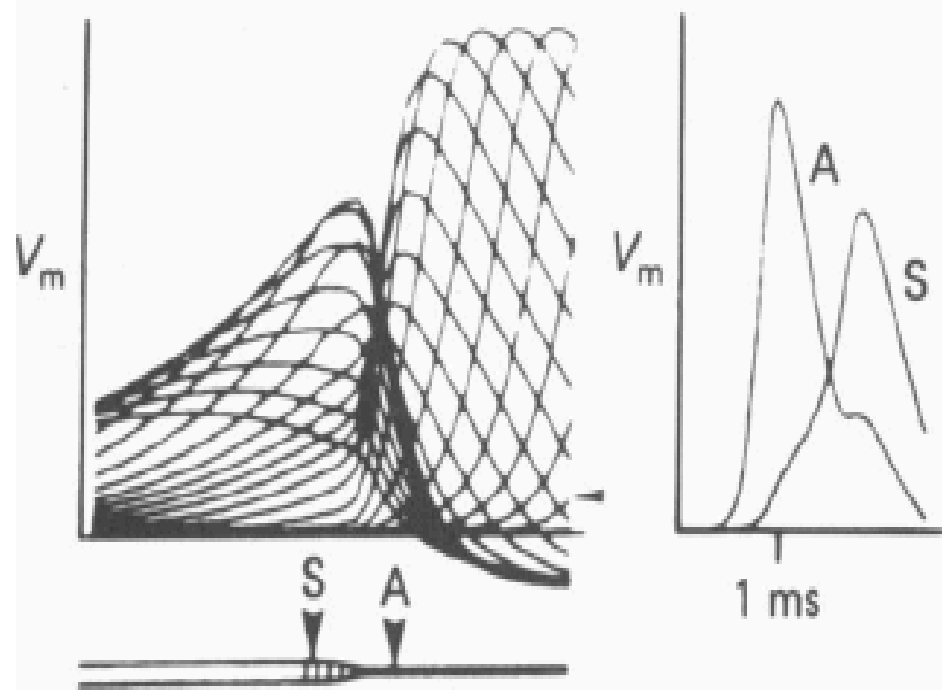
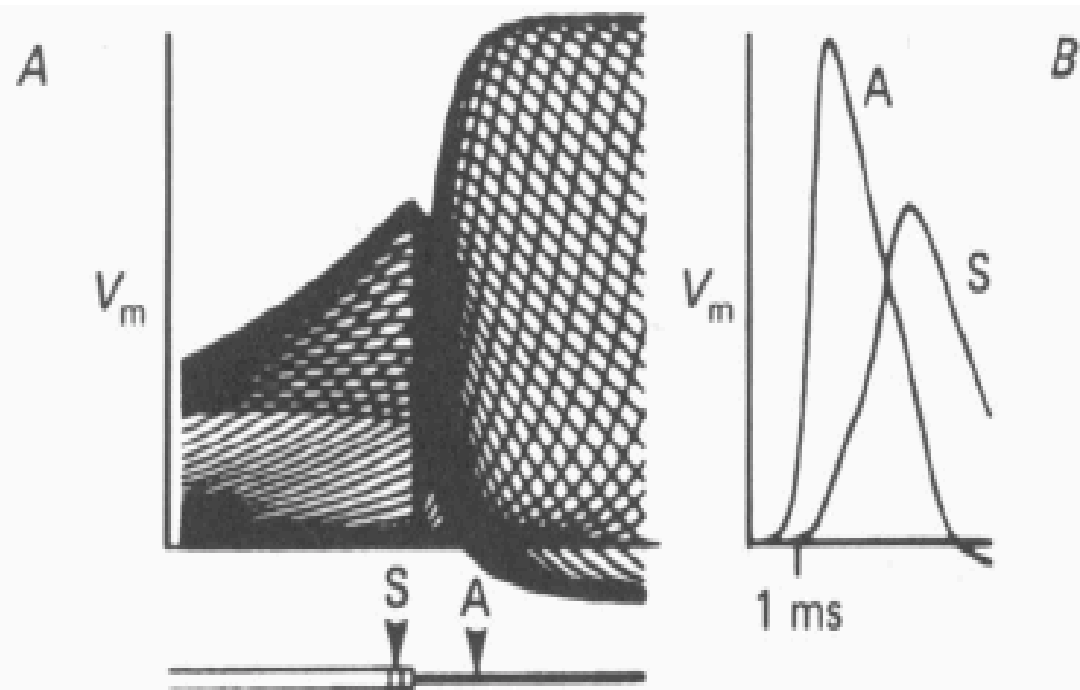
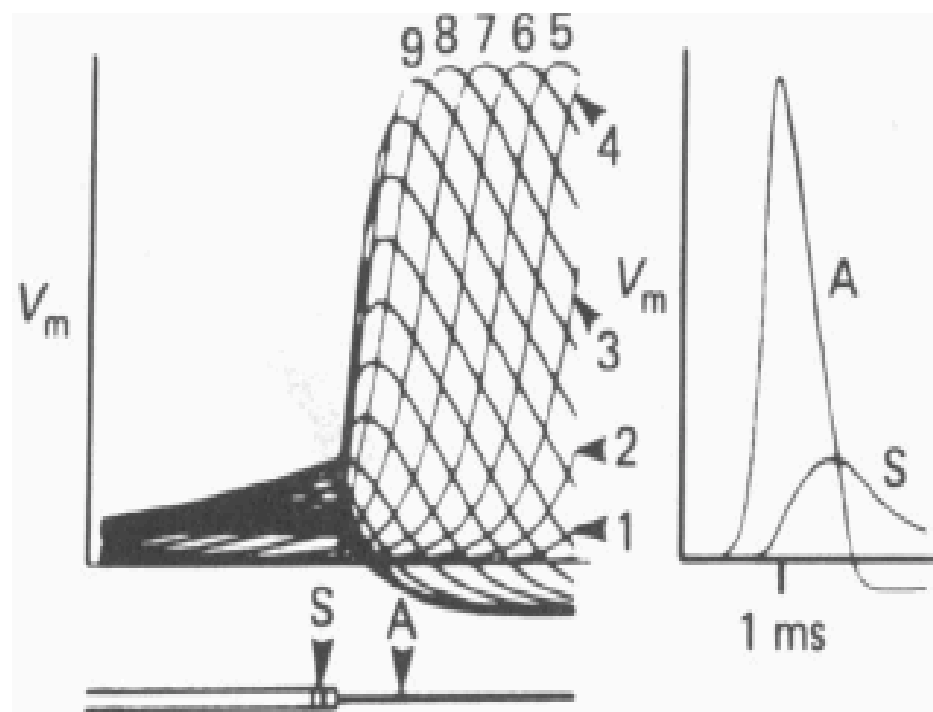
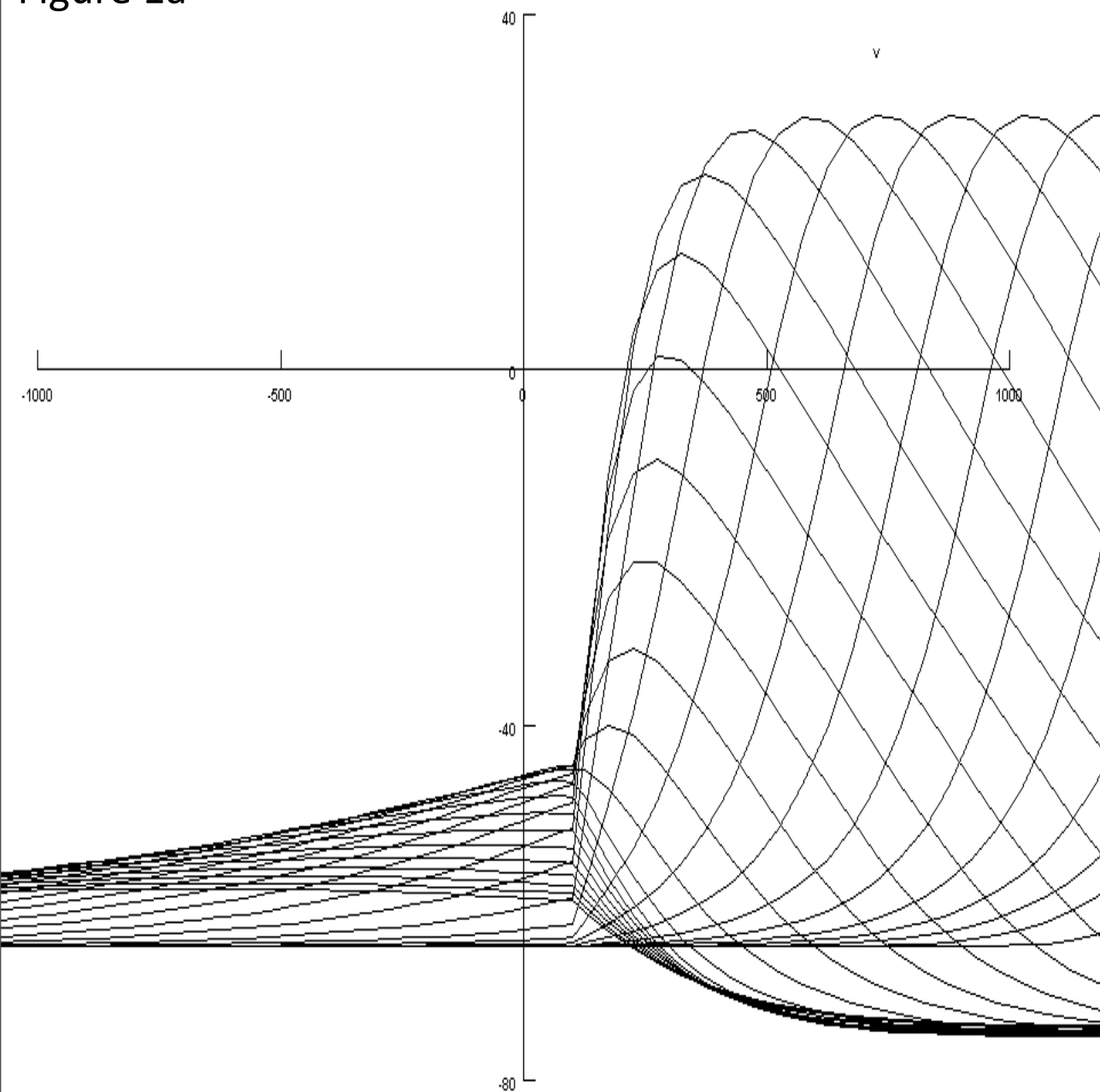


Figure B



Hide

Figure 1a



Close

Hide

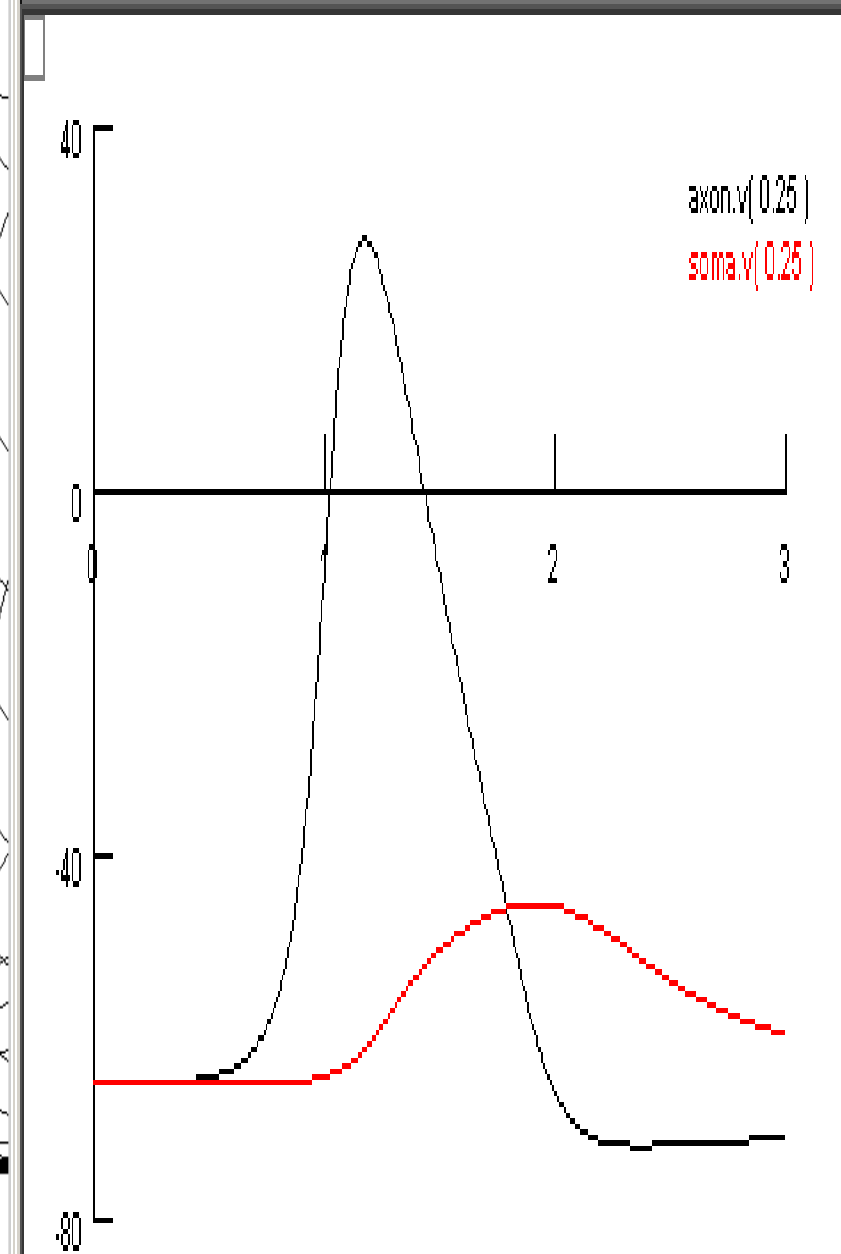


Figure 1b

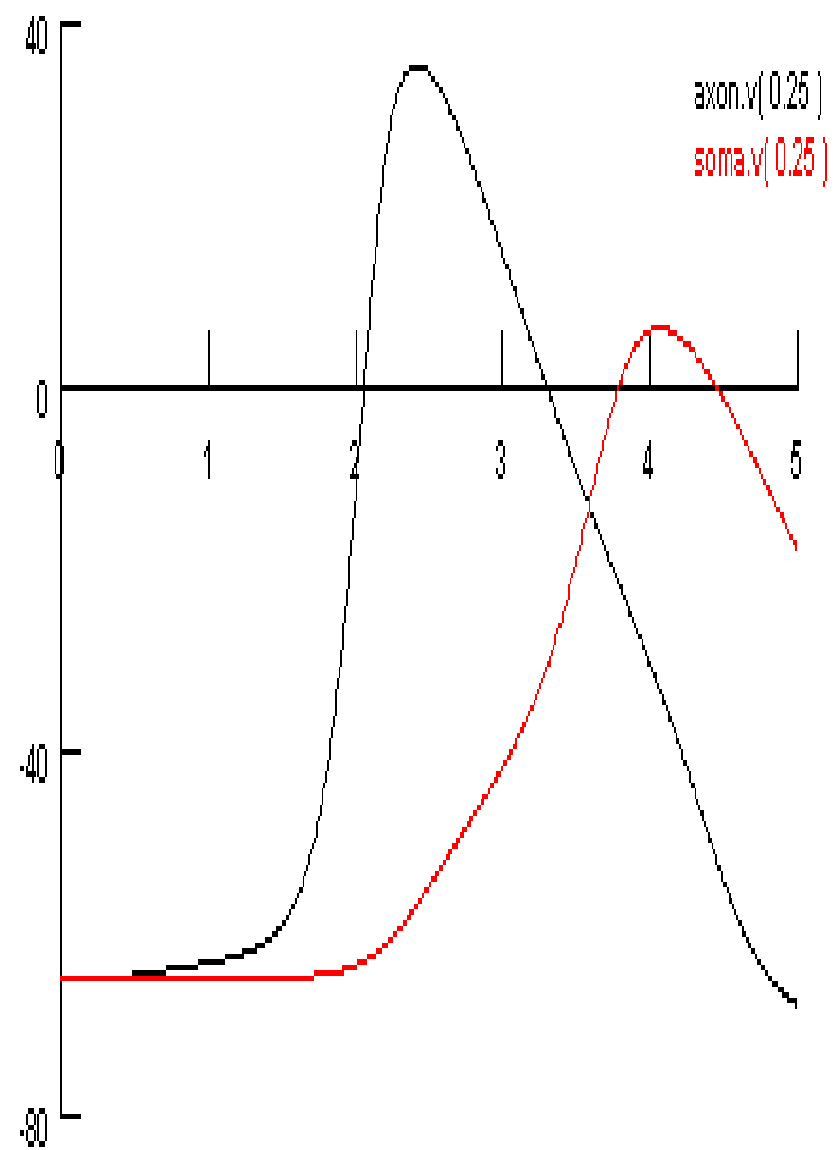
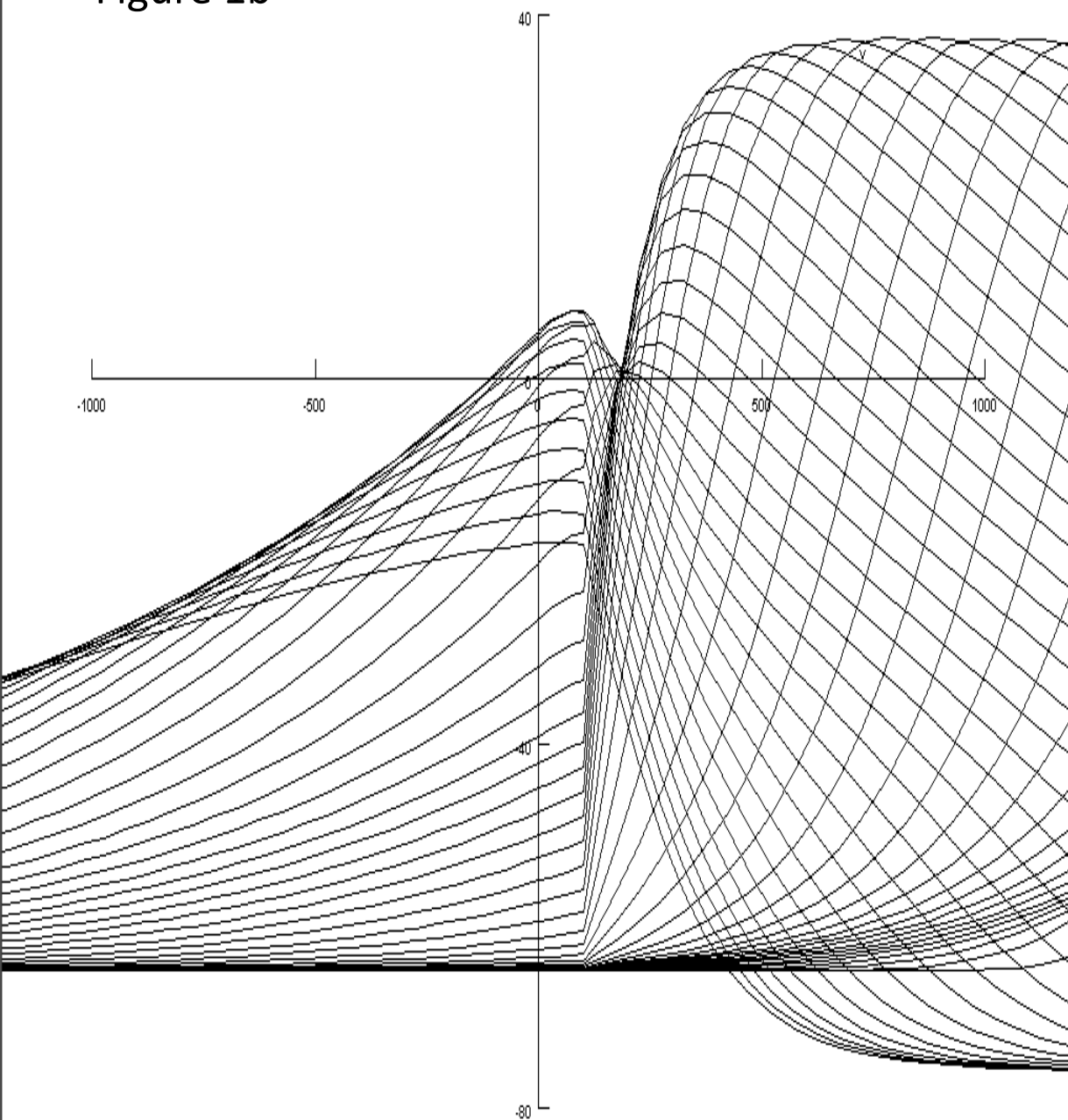


Figure 1c

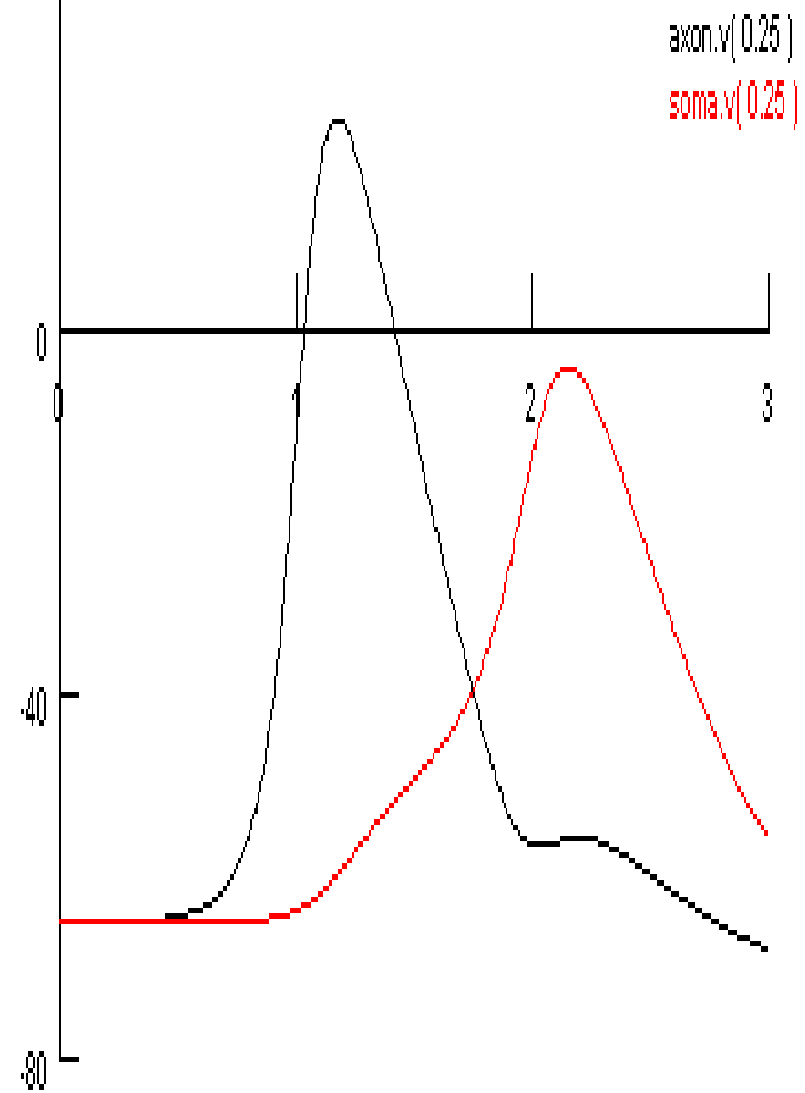
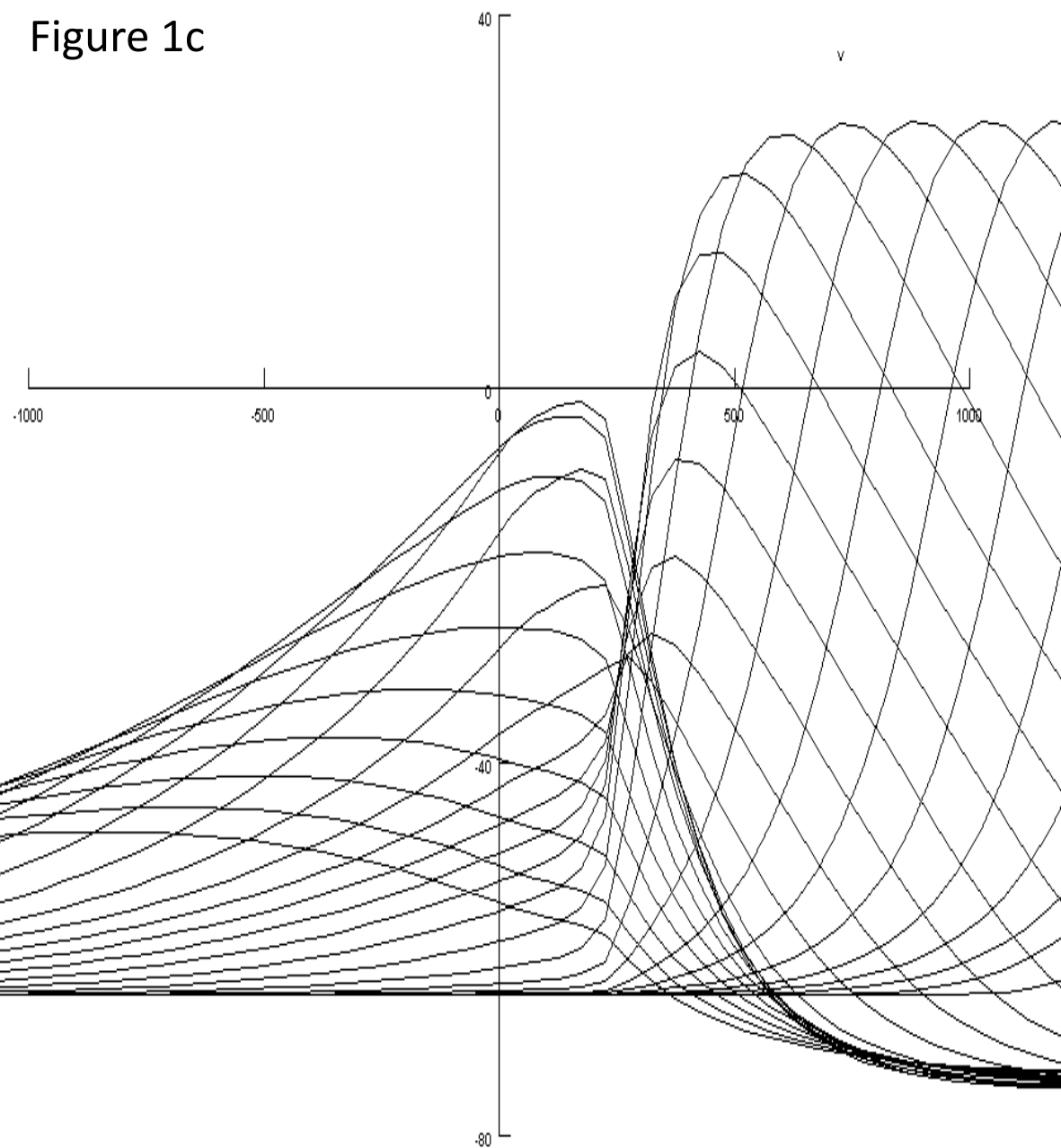


Figure 1d

