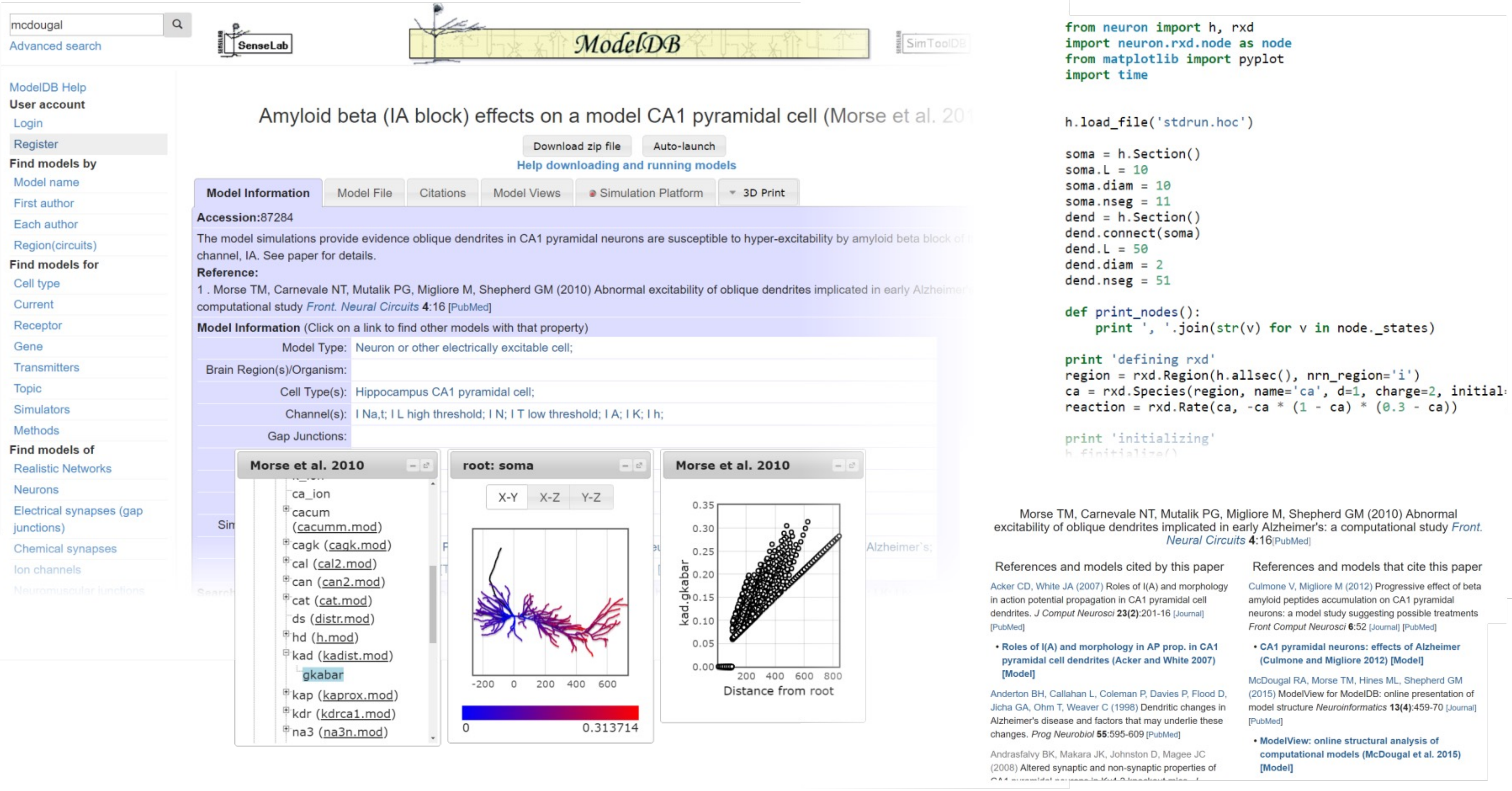
Using resources from ModelDB and NeuroMorpho.Org

28 June 2022

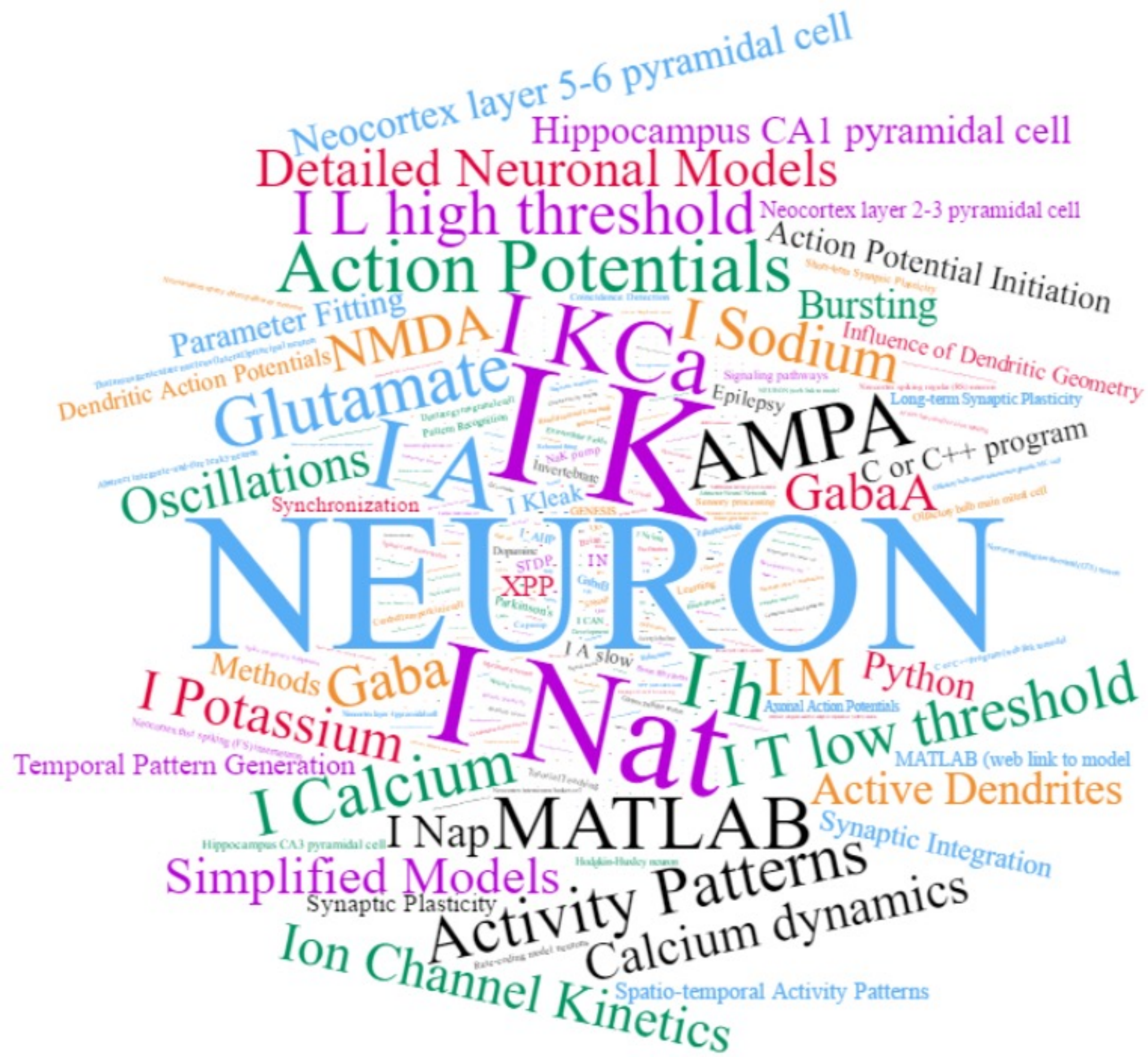


modeldb.yale.edu

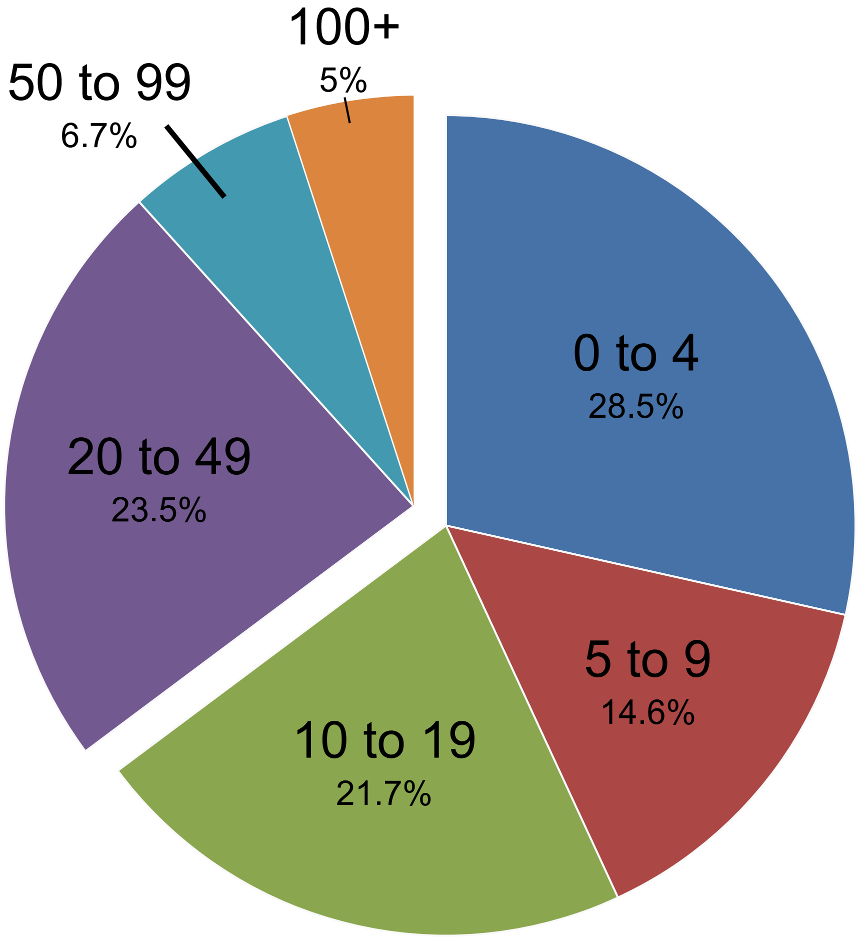
McDougal, R. A., Morse, T. M., Carnevale, T., Marenco, L., Wang, R., Migliore, M., ... & Hines, M. L. (2017). Twenty years of ModelDB and beyond: building essential modeling tools for the future of neuroscience. *Journal of computational neuroscience*, *42*(1), 1-10. doi:10.1007/s10827-016-0623-7

What is in ModelDB?

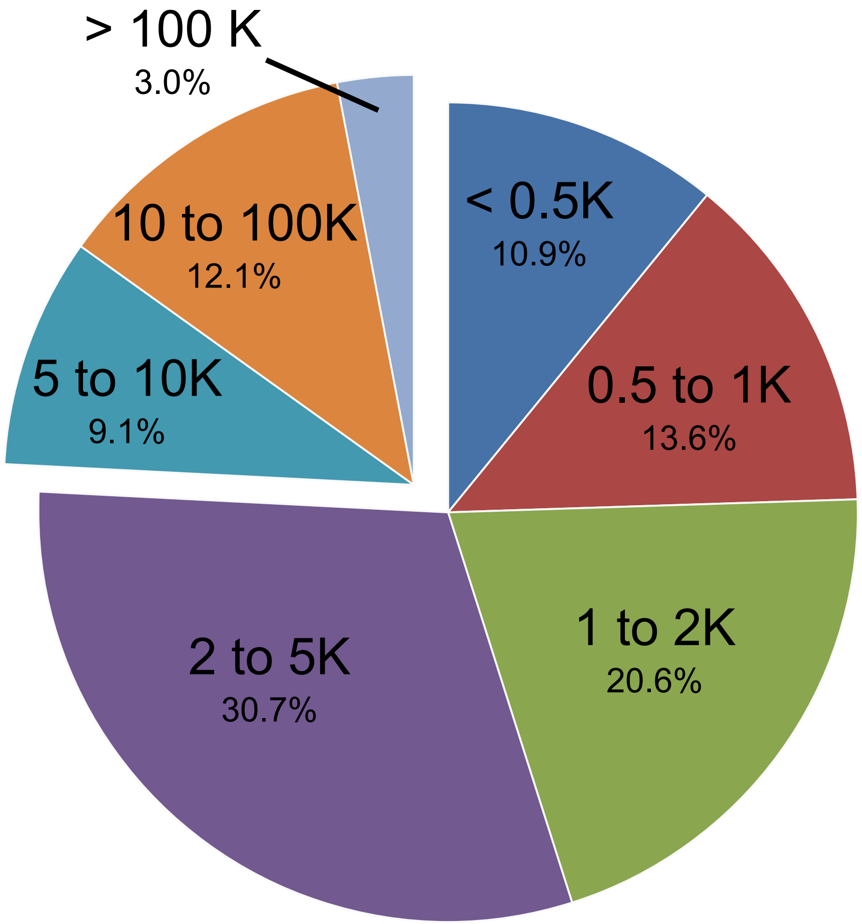
- Models for:
    - 198+ cell types
    - 21+ species
    - 62 ion channels, pumps, etc
    - 214 topics (Alzheimer's, STDP, etc)
    - 25+ mammalian brain regions
- 1746 published models from 105 simulators/programming languages
- 789 NEURON models.
- 531 network models.



Model counts are as of June 26, 2022.



Files per Model



File Size

Distributions from ModelDB, Fall 2013. A model was counted as having 0 files if it was not hosted on ModelDB.

Only reuse what you understand

The easiest way to replicate someone else's results – a first step toward building on them – is to get their model code from a repository such as ModelDB.

But beware:

- They may be solving a different problem than you (with respect to species, temperature, age, etc).
- Their code may have bugs.

To reduce the risk of problems:

- Read the associated paper.
- Compare the model and results to other similar models.
- Examine the model with ModelView and/or psection.
- Test ion channels individually.
- Collaborate with an experimentalist.

Live demo

- https://modeldb.yale.edu

Amyloid beta (IA block) effects on a model CA1 pyramidal cell (Morse et al. 2010)

Download zip file | Auto-launch

[Help downloading and running models]

Model Information | **Model File** | Citations | Model Views | Simulation Platform | 3D Print

Download the displayed file

- /
  - CA1_abeta
    - translate
    - readme.html
    - cacumm.mod
    - cagk.mod *
    - cal2.mod *
    - can2.mod *
    - cat.mod *
    - distr.mod *
    - h.mod
    - ipulse2.mod *
    - kadist.mod
    - kaprox.mod
    - kdrca1.mod
    - na3n.mod
    - naxn.mod *
    - zcaquant.mod
    - aBeta.hoc

```
This is the read
Morse TM, Carnev
Abnormal Excitab
Alzheimer's: a c

The model code was contributed by Tom Morse.  It was created (see
paper for details) from earlier models (especially Migliore et
al. 2005 and ca
modifications ar
interaction with
to be installed

To recreate figu
auto-launching t

Under unix syste
----------------
In the expanded
command "nrnivmo
run the simulati

Under Windows sy
----------------
Compile the mod
A double click o
mosinit.hoc
will open the simulation window.

Under MAC OS X:
---------------
```

Other models using cagk.mod:

- A model of unitary responses from A/C and PP synapses in CA3 pyramidal cells (Baker et al. 2010)
- CA1 pyramidal neuron: effects of R213Q and R312W Kv7.2 mutations (Miceli et al. 2013)
- CA3 pyramidal neuron (Safiulina et al. 2010)
- CA3 pyramidal neuron: firing properties (Hemond et al. 2008)
- Neuronal dendrite calcium wave model (Neymotin et al, 2015)

Other models using naxn.mod:

- CA1 pyramidal neuron: effects of R213Q and R312W Kv7.2 mutations (Miceli et al. 2013)
- CA1 pyramidal neuron: functional significance of axonal Kv7 channels (Shah et al. 2008)
- CA1 pyramidal neuron: rebound spiking (Ascoli et al.2010)
- CA1 pyramidal neuron: schizophrenic behavior (Migliore et al. 2011)
- CA1 pyramidal neuron: signal propagation in oblique dendrites (Migliore et al 2005)
- CA1 pyramidal neurons: binding properties and the magical number 7 (Migliore et al. 2008)
- CA1 pyramidal neurons: effect of external electric field from power lines (Cavarretta et al. 2014)
- CA1 pyramidal neurons: effects of Alzheimer (Culmone and Migliore 2012)
- CA1 pyramidal neurons: effects of Kv7 (M-) channels on synaptic integration (Shah et al. 2011)
- CA1 pyramidal neurons: effects of a Kv7.2 mutation (Miceli et al. 2009)
- Ca1 pyramidal neuron: reduction model (Marasco et al. 2012)
- Effect of the initial synaptic state on the probability to induce LTP and LTD (Migliore et al. 2015)
- Effects of electric fields on cognitive functions (Migliore et al 2016)
- Neuronal morphology goes digital ... (Parekh & Ascoli 2013)
- Spine head calcium in a CA1 pyramidal cell model (Graham et al. 2014)

Amyloid beta (IA block) effects on a model CA1 pyramidal cell (Morse et al. 2010)

Download zip file | Auto-launch

Help downloading and running models

Model Information | Model File | Citations | Model Views | Simulation Platform | 3D Print

Accession:87284

The model simulations provide evidence oblique dendrites in CA1 pyramidal neurons are susceptible to hyper-excitability by amyloid beta block of the transient K+ channel, IA. See paper for details.

Reference:

1 . Morse TM, Carnevale NT, Mutalik PG, Migliore M, Shepherd GM (2010) Abnormal excitability of oblique dendrites implicated in early Alzheimer's: a computational study *Front. Neural Circuits* **4**:16 [PubMed]

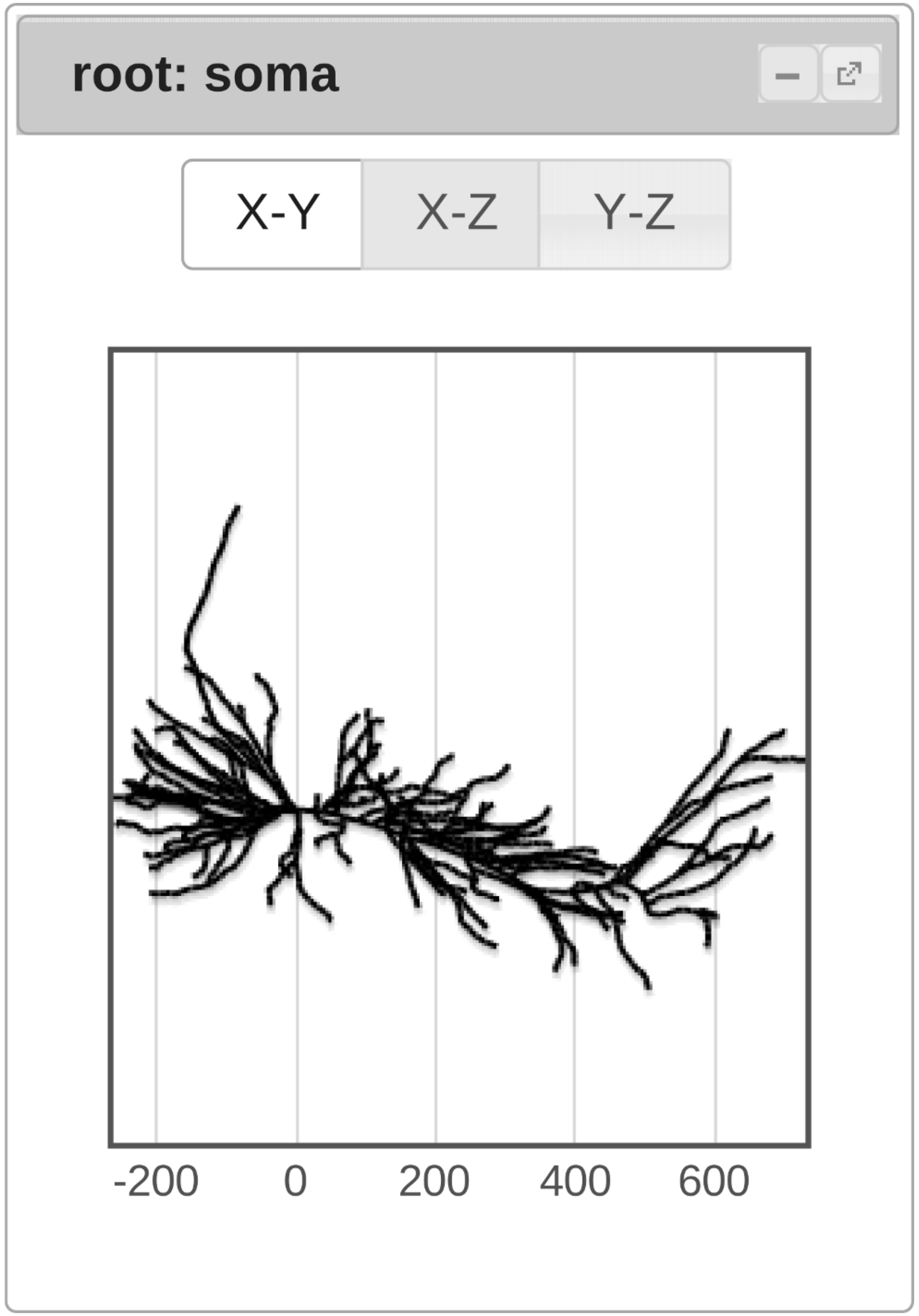
Model Information (Click on a link to find other models with that property)

Model Type:	Neuron or other electrically excitable cell;
Brain Region(s)/Organism:	
Cell Type(s):	Hippocampus CA1 pyramidal cell;
Channel(s):	I Na,t; I L high threshold; I N; I T low threshold; I A; I K; I h;
Gap Junctions:	
Receptor(s):	
Gene(s):	
Transmitter(s):	
Simulation Environment:	NEURON;
Model Concept(s):	Dendritic Action Potentials; Active Dendrites; Detailed Neuronal Models; Pathophysiology; Aging/Alzheimer`s;
Implementer(s):	Carnevale, Ted [Ted.Carnevale at Yale.edu]; Morse, Tom [Tom.Morse at Yale.edu];

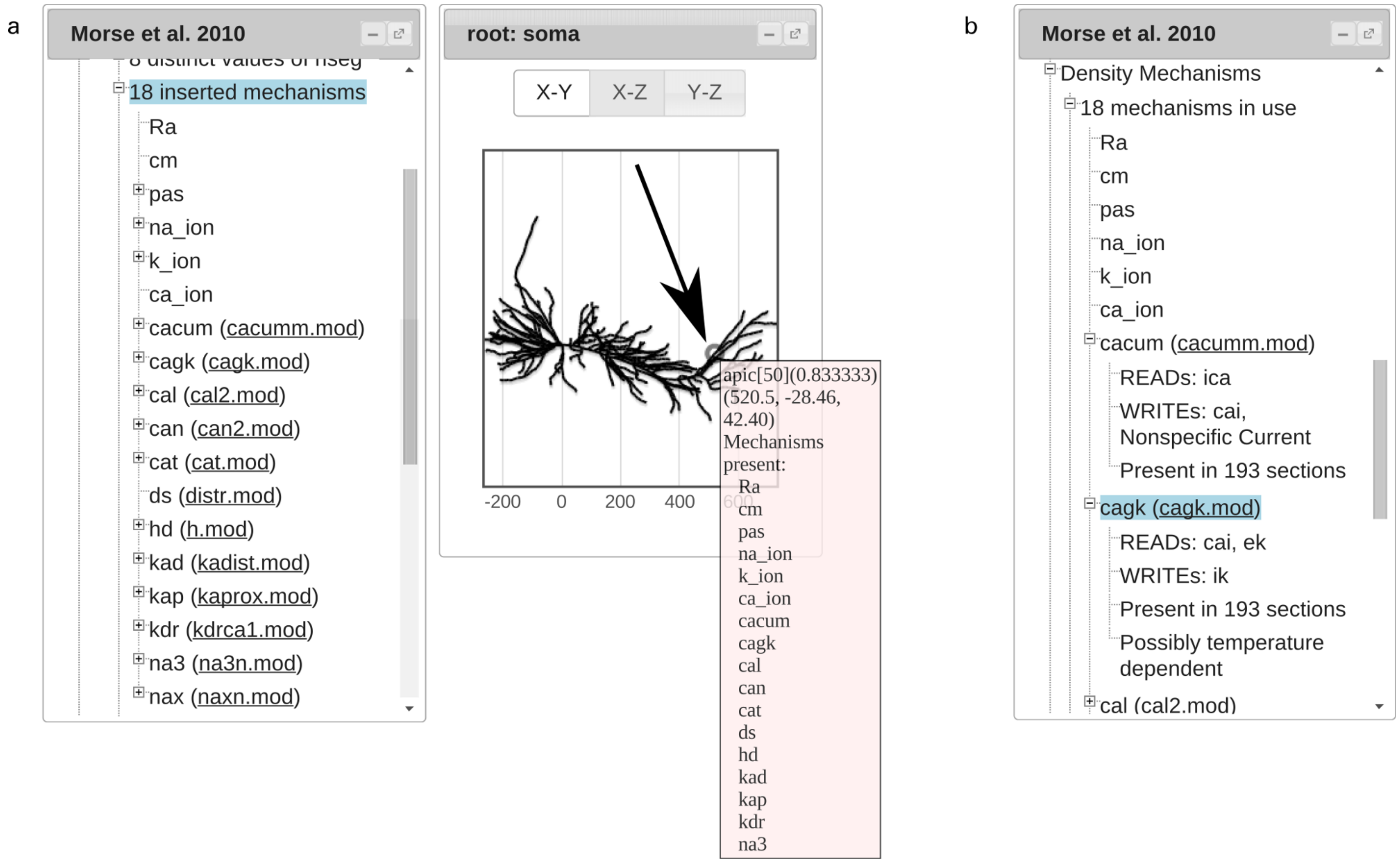
Search NeuronDB for information about: Hippocampus CA1 pyramidal cell; I Na,t; I L high threshold; I N; I T low threshold; I A; I K; I h;

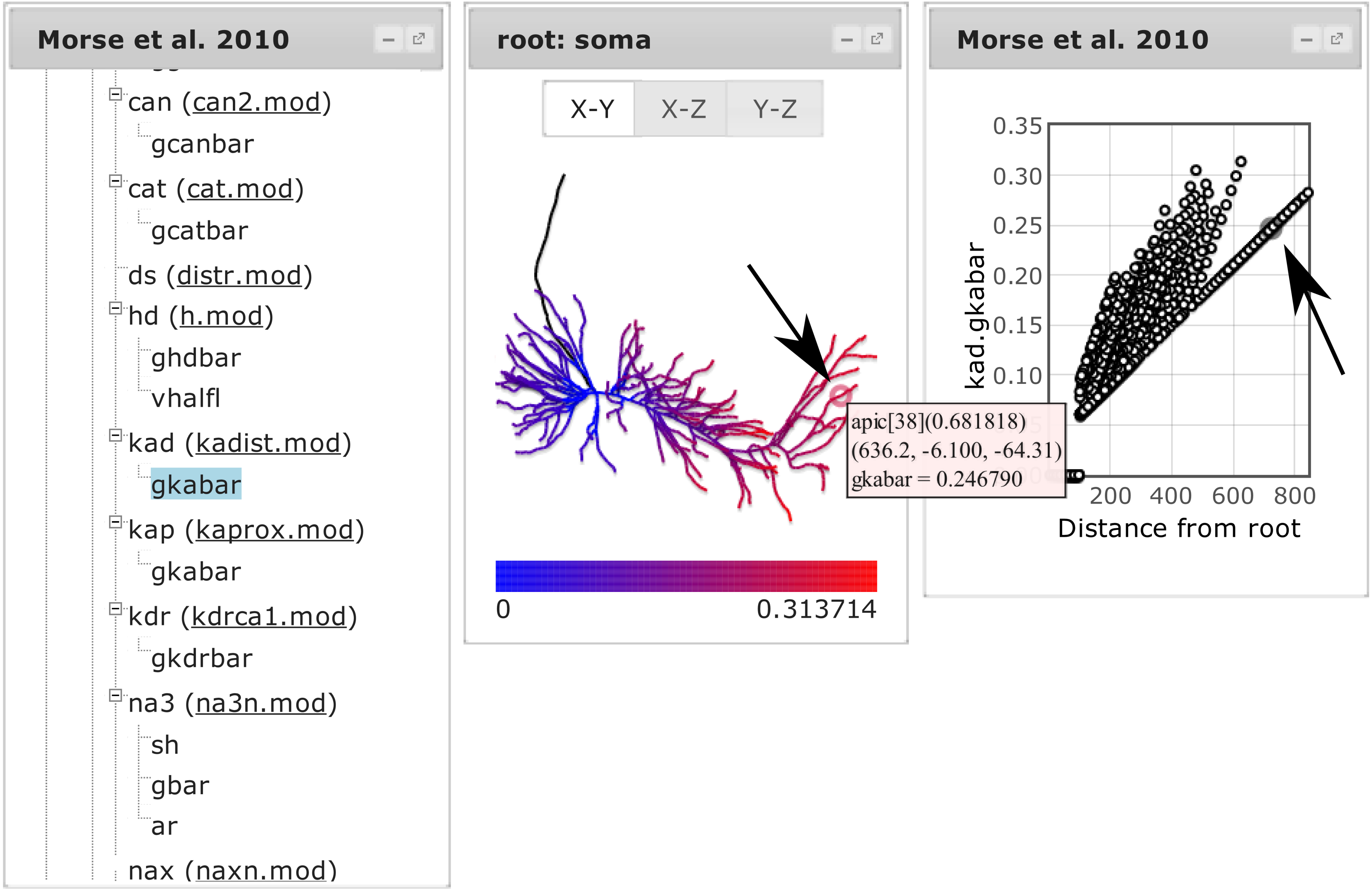
Morse et al. 2010

- 194 sections; 974 segments
- ⊞ 1 cell with morphology
- 0 artificial cells
- 0 NetCon objects
- 0 LinearMechanism objects
- ⊞ Temperature: 35°C
- ⊞ Density Mechanisms
- ⊞ 1 point processes (0 can receive events) of 1 base classes
- ⊞ 7 files shared with other ModelDB models
- ⊞ References



McDougal et al, *Neuroinformatics* 2015


a
Morse et al. 2010
18 inserted mechanisms
Ra
cm
pas
na_ion
k_ion
ca_ion
cacum (cacumm.mod)
cagk (cagk.mod)
cal (cal2.mod)
can (can2.mod)
cat (cat.mod)
ds (distr.mod)
hd (h.mod)
kad (kadist.mod)
kap (kaprox.mod)
kdr (kdrca1.mod)
na3 (na3n.mod)
nax (naxn.mod)
root: soma
X-Y
X-Z
Y-Z
-200
0
200
400
600
apic[50](0.833333)
(520.5, -28.46, 42.40)
Mechanisms present:
Ra
cm
pas
na_ion
k_ion
ca_ion
cacum
cagk
cal
can
cat
ds
hd
kad
kap
kdr
na3
b
Morse et al. 2010
Density Mechanisms
18 mechanisms in use
Ra
cm
pas
na_ion
k_ion
ca_ion
cacum (cacumm.mod)
READs: ica
WRITEs: cai, Nonspecific Current
Present in 193 sections
cagk (cagk.mod)
READs: cai, ek
WRITEs: ik
Present in 193 sections
Possibly temperature dependent
cal (cal2.mod)



Morse et al. 2010
can (can2.mod)
gcanbar
cat (cat.mod)
gcatbar
ds (distr.mod)
hd (h.mod)
ghdbar
vhalfl
kad (kadist.mod)
gkabar
kap (kaprox.mod)
gkabar
kdr (kdrca1.mod)
gkdrbar
na3 (na3n.mod)
sh
gbar
ar
nax (naxn.mod)
root: soma
X-Y
X-Z
Y-Z
apic[38](0.681818)
(636.2, -6.100, -64.31)
gkabar = 0.246790
0
0.313714
Morse et al. 2010
0.35
0.30
0.25
0.20
0.15
0.10
kad.gkabar
200
400
600
800
Distance from root

Morse et al. 2010

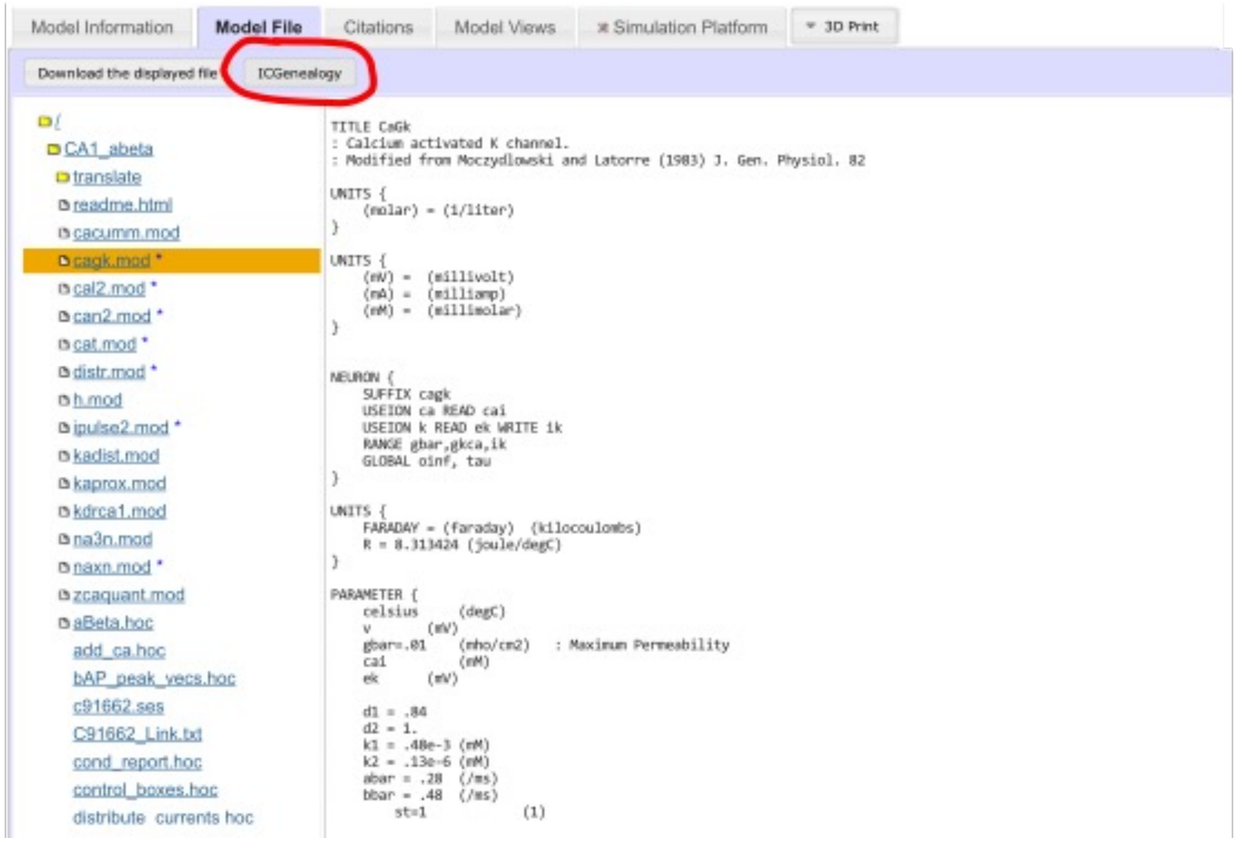
- 7 files shared with other ModelDB models
  - cagk.mod
    - A model of unitary responses from A/C and PP synapses in CA3 pyramidal cells (Baker et al. 2010)
    - CA1 pyramidal neuron: effects of R213Q and R312W Kv7.2 mutations (Miceli et al. 2013)
    - CA3 pyramidal neuron (Safiulina et al. 2010)
    - CA3 pyramidal neuron: firing properties (Hemond et al. 2008)
  - distr.mod
  - cal2.mod
  - can2.mod
  - cat.mod
  - ipulse2.mod
  - naxn.mod

Morse et al. 2010

firing properties (Hemond et al. 2008)

  - distr.mod
  - cal2.mod
  - can2.mod
  - cat.mod
  - ipulse2.mod
  - naxn.mod

- References
  - Paper in Front. Neural Circuits
  - ModelDB Entry
- Run Protocol
  - Compiling
    - cd CA1_abeta
    - nrnivmodl
  - Launching NEURON
    - nrngui -python
  - Running
    - from neuron import h
    - h.load_file("mosinit.hoc")
    - h.fig1and2()



General data

- **ICG id:** 2464
- **ModelDB id:** 87284
- **Reference:** *Morse TM, Carnevale NT, Mutalik PG, Migliore M, Shepherd GM (2010)*: Abnormal Excitability of Oblique Dendrites Implicated in Early Alzheimer's: A Computational Study.

Metadata classes

- **Animal Model:** rat
- **Brain Area:** hippocampus, CA1
- **Classes:** KCa
- **Ion Type:** K
- **Neuron Region:** unspecified
- **Neuron Type:** pyramidal cell
- **Runtime Q:** Q4 (slow)
- **Subtype:** not specified

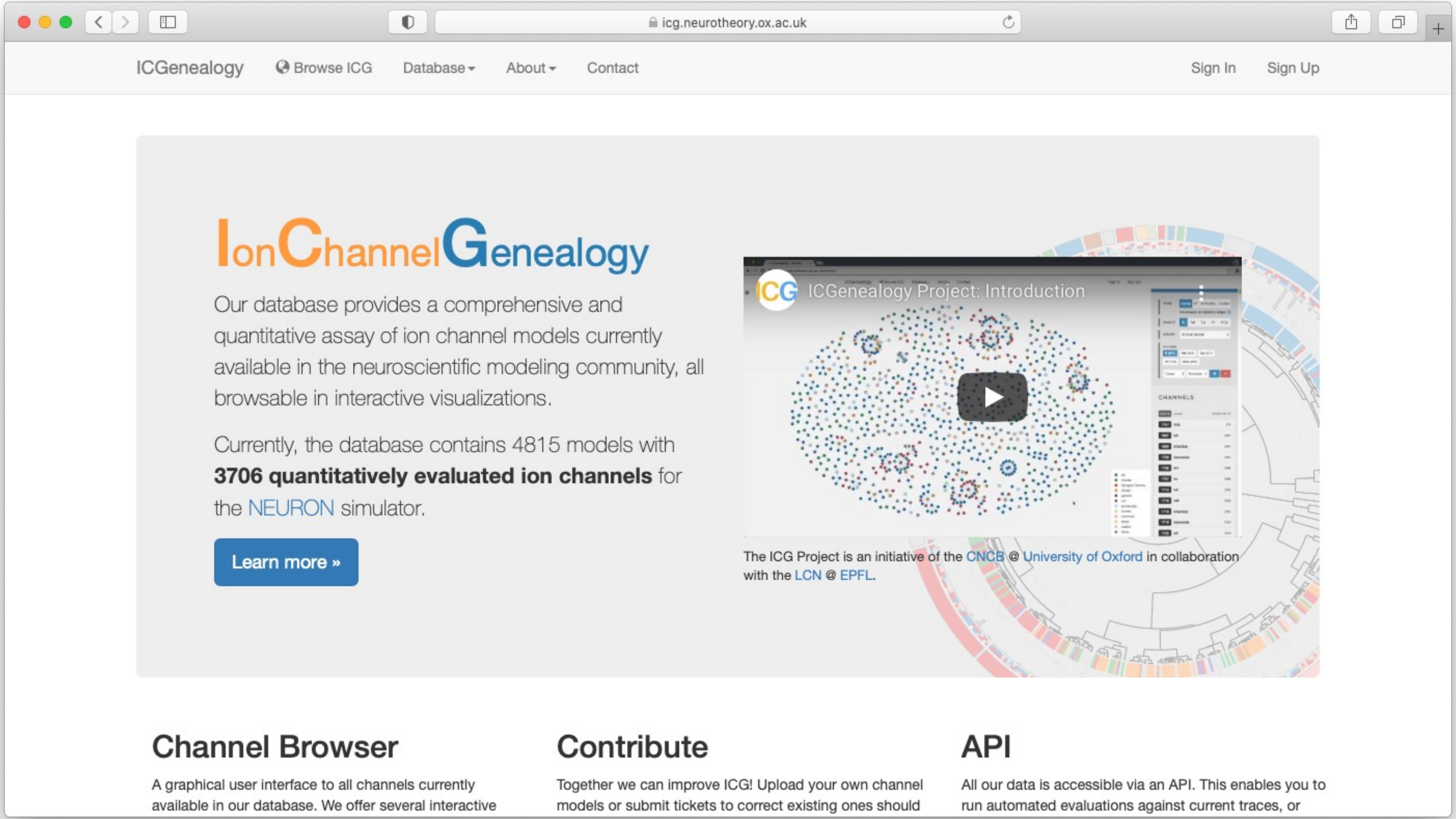
Metadata generic

- **Age:** 7-14 weeks old.
- **Comments:** Calcium activated k channel, modified from moczydlowski and latorre (1983). From hemond et al. (2008), model no. 101629, with no changes (identical mod file). Animal model taken from chen (2005) which is used to constrain model. Channel kinetics from previous study on hippocampal pyramidal neuron (hemond et al. 2008)
- **Runtime:** 76.722

ICGenealogy: ion channel metadata

When viewing most mod files describing an ion channel, an ICGenealogy button appears. Clicking this button loads the corresponding page of the ICGenealogy derived, information about the underlying data, etc) and response curves.

See Podlaski et al., 2017. doi:10.7554/eLife.22152.001


icg.neurotheory.ox.ac.uk
ICGenealogy
Browse ICG
Database
About
Contact
Sign In
Sign Up
IonChannelGenealogy
Our database provides a comprehensive and quantitative assay of ion channel models currently available in the neuroscientific modeling community, all browsable in interactive visualizations.
Currently, the database contains 4815 models with 3706 quantitatively evaluated ion channels for the NEURON simulator.
Learn more »
ICGenealogy Project: Introduction
The ICG Project is an initiative of the CNCB @ University of Oxford in collaboration with the LCN @ EPFL.
Channel Browser
A graphical user interface to all channels currently available in our database. We offer several interactive
Contribute
Together we can improve ICG! Upload your own channel models or submit tickets to correct existing ones should
API
All our data is accessible via an API. This enables you to run automated evaluations against current traces, or

ModelDB for meta-literature review

- Every model can be considered a review of the literature.
- ModelDB reveals what has been modeled in each cell type.
- Comparing models shows what mechanisms are considered critical by the community.

Hippocampus CA1 Pyramidal Cells

IA

- 47 models: 2796, 7386, 9769, 19696, 20212, 32992, 44050, 55035, . . .

IK,Ca

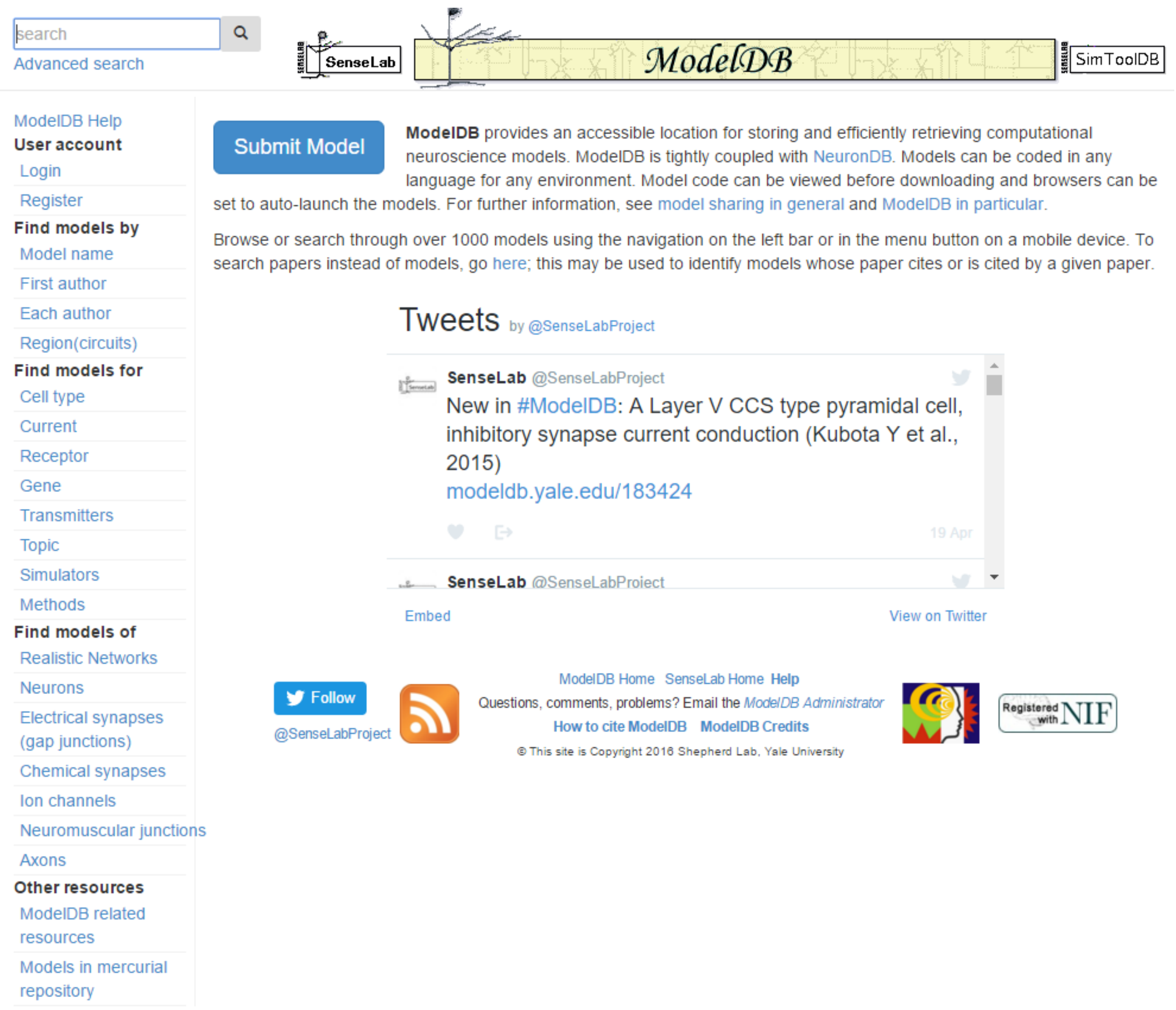
- 11 models: 20212, 87284, 115356, 119266, 123927, 125152, . . .

IM

- 16 models: 2937, 20212, 66268, 112546, 115356, 118986, 119266, . . .

26 currents, 6 transmitters, 10 receptors

Sharing your models



ModelDB Help
User account
Login
Register
Find models by
Model name
First author
Each author
Region(circuits)
Find models for
Cell type
Current
Receptor
Gene
Transmitters
Topic
Simulators
Methods
Find models of
Realistic Networks
Neurons
Electrical synapses (gap junctions)
Chemical synapses
Ion channels
Neuromuscular junctions
Axons
Other resources
ModelDB related resources
Computational neuroscience

Submit New Model

Required information:

Your full name: Modeler or Contributor name

Your email address: Email

Zip file of model code: Choose File No file chosen

Read-Write access code (15 character max): Access code
Used as a password to only access this model

PubMed ID(s) or citation(s) associated with the model:
Only required for publicly shared models.
Citation(s) can be in any bibliographic format.

You may Submit with just the above information, but **to make your model more discoverable, please fill out as much of the next section as you can.** *Note: Your model will remain private until you request the ModelDB administrator make it public.*

Let us find ModelDB keywords for you!

Click the button to automatically find, approve, and populate model entry keywords based on your paper abstract.

Additional information: *More information will help your model more discoverable*

search

Advanced search

SenseLab

SimToolDB

ModelDB Help

User account

Login

Register

Find models by

Model name

First author

Each author

Region(circuits)

Find models for

Cell type

Current

Receptor

Gene

Transmitters

Topic

Simulators

Methods

Find models of

Realistic Networks

Neurons

Electrical synapses (gap junctions)

Chemical synapses

Ion channels

Neuromuscular junctions

Axons

Other resources

ModelDB related resources

Computational neuroscience ecosystem

Automatic keyword identifier

×

Please paste your paper abstract here.

The integrative properties of cortical pyramidal dendrites are essential to the neural basis of cognitive function, but the impact of amyloid beta protein (abeta) on these properties in early Alzheimer's is poorly understood. In animal models, electrophysiological studies of proximal dendrites have shown that abeta induces hyperexcitability by blocking A-type K+ currents (I(A)), disrupting signal integration. The present study uses a computational approach to analyze the hyperexcitability induced in distal dendrites beyond the experimental recording sites. The results show that back-propagating action potentials in the dendrites induce hyperexcitability and excessive calcium concentrations not only in the main apical trunk of pyramidal cell dendrites, but also in their oblique dendrites. Evidence is provided that these thin branches are particularly sensitive to local reductions in I(A). The results suggest the hypothesis that the oblique branches may be most vulnerable to disruptions of I(A) by early exposure to abeta, and point the way to further experimental analysis of these actions as factors in the neural basis of the early decline of cognitive function in Alzheimer's.

Cancel Submit

Required

Your full n

Your email

Zip file of

Read-Write

Used as a pa

PubMed ID

Only required

Citation(s) ca

You may ... **out as much of the next section as you can.** *Note:*

Your model w

Let us find ModelDB keywords for you!

Click the button to automatically find, approve, and populate model entry keywords based on your paper abstract.

Additional information: *More information will help your model more discoverable*

Model Name

search

Advanced search

SenseLab

SimToolDB

ModelDB Help

User account

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Register

Find models by

Model name

First author

Each author

Region(circuits)

Find models for

Cell type

Current

Receptor

Gene

Transmitters

Topic

Simulators

Methods

Find models of

Realistic Networks

Neurons

Electrical synapses (gap junctions)

Chemical synapses

Ion channels

Neuromuscular junctions

Axons

Other resources

ModelDB related resources

Computational neuroscience ecosystem

Automatic keyword identifier: results

×

Deselect keywords that do not describe the model, then press the button to accept the rest.

- [x] **Neuron or other electrically excitable cell**
- [x] **Dendritic Action Potentials**
- [x] **I Potassium**
- [x] **Action Potentials**
- [x] **Calcium dynamics**
- [x] **I A**
- [x] **Active Dendrites**
- [x] **Aging/Alzheimer`s**

Accept selected keywords

Requirec

Your full n

Your email

Zip file of r

Read-Write

Used as a pa

PubMed ID

Only required

Citation(s) ca

You may Submit with just the above information, but **to make your model more discoverable, please fill out as much of the next section as you can.** *Note: Your model will remain private until you request the ModelDB administrator make it public.*

Let us find ModelDB keywords for you!

Click the button to automatically find, approve, and populate model entry keywords based on your paper abstract.

Additional information: *More information will help your model more discoverable*

Model Name

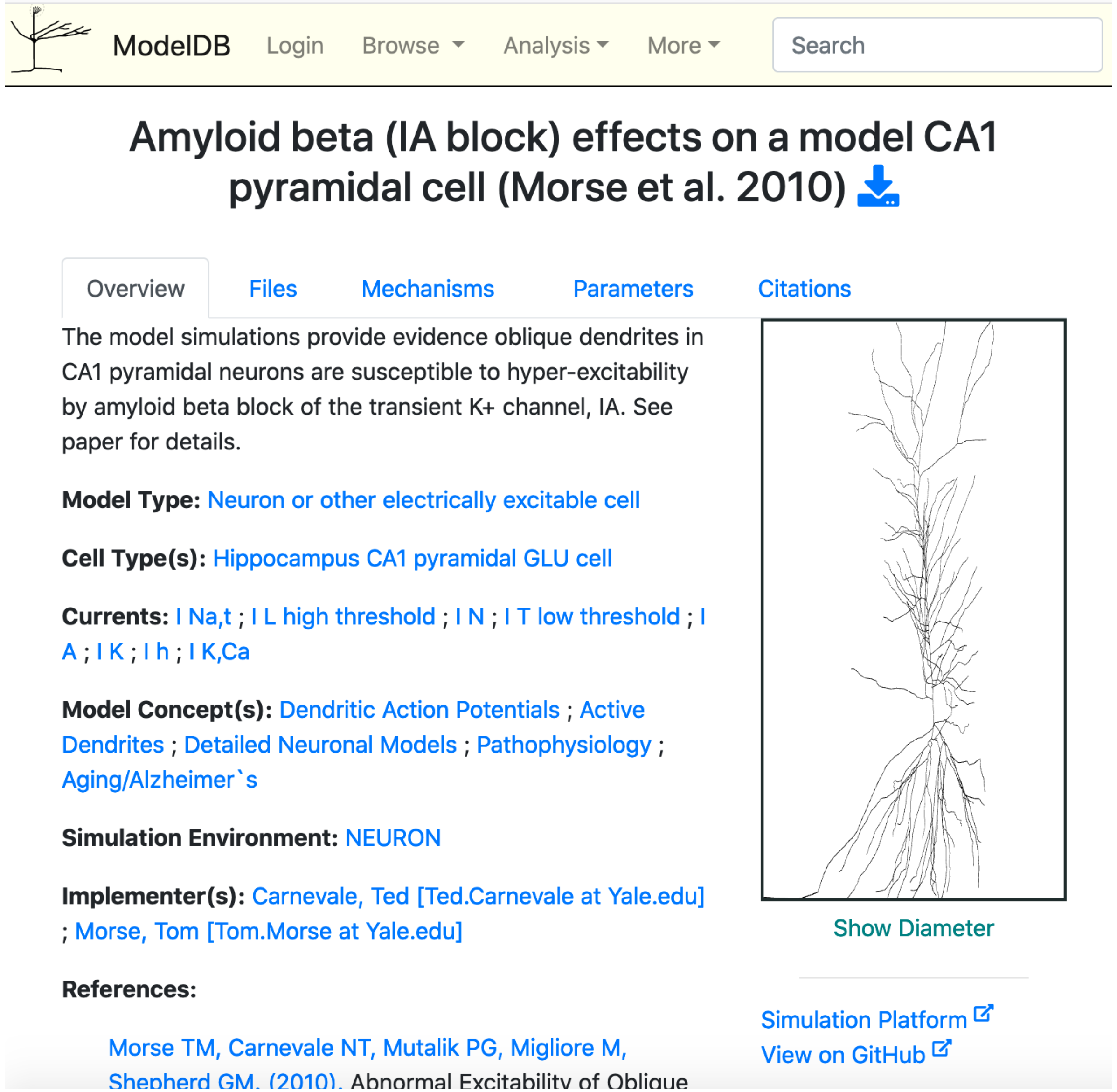
Other Neuron	
Model Neurotransmitters	▼
Other Neurotransmitter	
Model Receptors	▼
Other Receptor	
Model Currents	x I Potassium x I A ▼
Other Current	
Gap Junctions	▼
Gene	▼
Other Gene	
Model Type	x Neuron or other electrically excitable cell ▼
Other Model Type	
Model Concept	x Dendritic Action Potentials x Action Potentials x Calcium dynamics x Active Dendrites x Aging/Alzheimer`s ▼
Other Concept	
Simulator software	▼
Other Simulator	
Region Organism	▼
Implemented by	▼

Live demo

- Load and run ModelDB 2488

ModelDB redesign

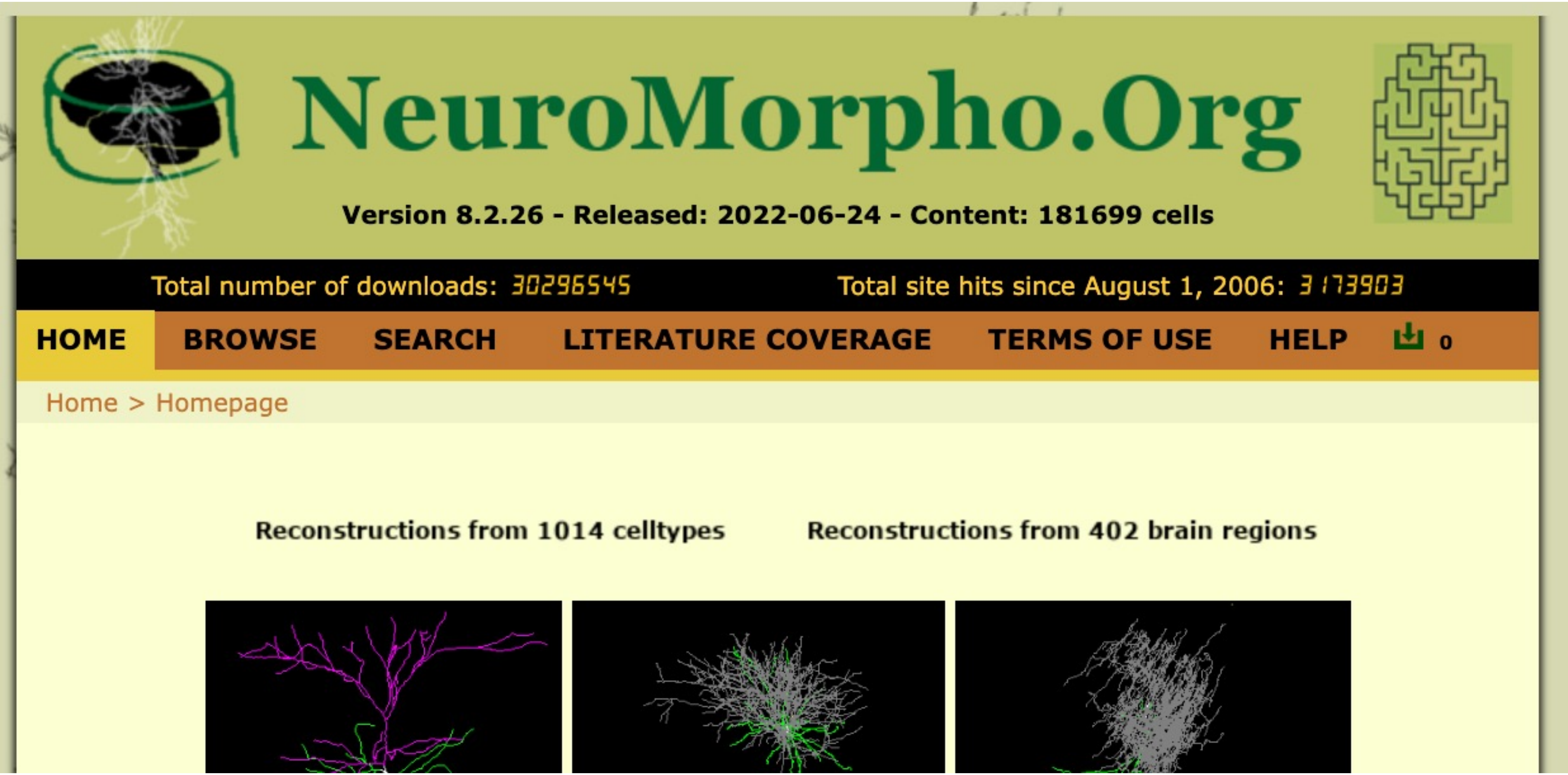
- Updated look.
- More integrated ModelView data, with support for more simulator types.
- More network information.
- More emphasis on analysis.
- Mobile device friendly.
- Simpler API.
- Public GitHub https://github.com/mcdougallab/modeldb
    - submit issues and pull requests.
- Current status: see http://modeldb.science



ModelDB survey

- If you’ve used ModelDB before, please fill out this survey to let us know how it worked for you and what we can do to make it better:

- https://tinyurl.com/modeldb-survey-2022



181,699 reconstructions · 1014 cell types · 402 brain regions

Not everything was made for you

Not every morphology was reconstructed with the intent of being in a simulation.

Potential factors affecting the quality of the data:

- histology
  - staining, amputation, shrinkage
- physics
  - diameter
- spines

Before using a morphology found online, always read the associated paper(s) to make sure you understand any limitations of the reconstruction.

For example, why did they make this? Were they studying a disease (e.g. Alzheimer's) that alters morphology?

Qualitative tests

Look for orphan sections and bottlenecks.

Insert pas, set Ra and g_pas = pas.g low. Inject large depolarizing current at soma. Examine a PlotShape of v.

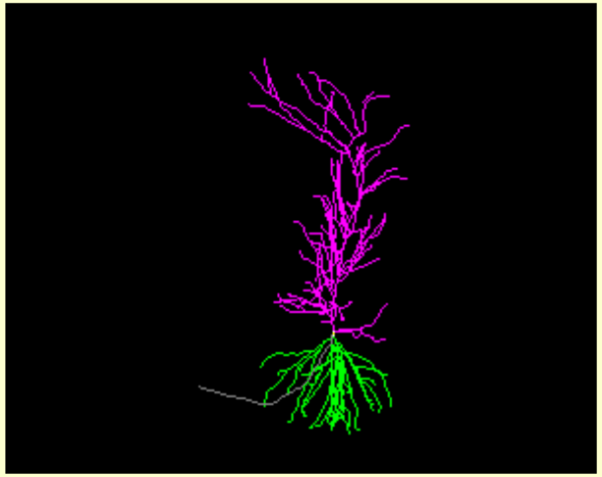
Look for z-axis drift and backlash.
Rotate the cell on a PlotShape and look for abrupt jumps.

Are diameters constant or varying? Are they reasonable?

NeuroMorpho.Org

Version 8.0 - Released: 6/29/2020 - Content: 131960 neurons

HOME BROWSE SEARCH LITERATURE COVERAGE TERMS OF USE HELP 0



Morphology File (Standardized)
Morphology File (Original)
Log File (Standardized)
Log File (Original)

Get above files zipped

3D Neuron Viewer - Java, legacy
3D Neuron Viewer - WebGL, novel
Animation

Standardized:
Always SWC

Original format:
Could be anything

Details about selected neuron	
NeuroMorpho.Org ID :	NMO_00227
Neuron Name :	c91662
Archive Name :	Amaral
Species Name :	rat
Strain :	Sprague-Dawley
Structural Domains :	Dendrites, Soma, Axon
Physical Integrity :	Dendrites Complete, Axon Incomplete
Morphological Attributes :	Diameter, 3D, Angles
Min Age :	33.0 days

http://tinyurl.com/neuromorpho-c91662

Metadata

NeuroMorpho.Org ID :   NMO_00082
Neuron Name :   n401
Archive Name :   Turner
Species Name :   rat
Strain :   Fischer 344
Structural Domains :   Dendrites, Soma, No Axon
Physical Integrity :   Dendrites Complete
Morphological Attributes :   Diameter, 3D, Angles
Min Age :   2.0 months
Max Age :   8.0 months
Gender :   Male/Female
Min Weight :   200 grams
Max Weight :   350 grams
Development :   young
Primary Brain Region :   hippocampus
Secondary Brain Region :   CA1
Tertiary Brain Region :   Not reported
Primary Cell Class :   principal cell
Secondary Cell Class :   pyramidal
Tertiary Cell Class :   Not reported
Original Format :   CVAPP.swc
Experiment Protocol :   in vivo
Experimental Condition :   Control
Staining Method :   biocytin
Slicing Direction :   coronal
Slice Thickness :   80.00 µm
Tissue Shrinkage :   Reported 25% in xy, 75% in z Corrected 133% in xy, 400% in z
Objective Type :   oil
Magnification :   100x
Reconstruction Method :   Neurolucida
Date of Deposition :   2005-12-31
Date of Upload :   2006-08-01

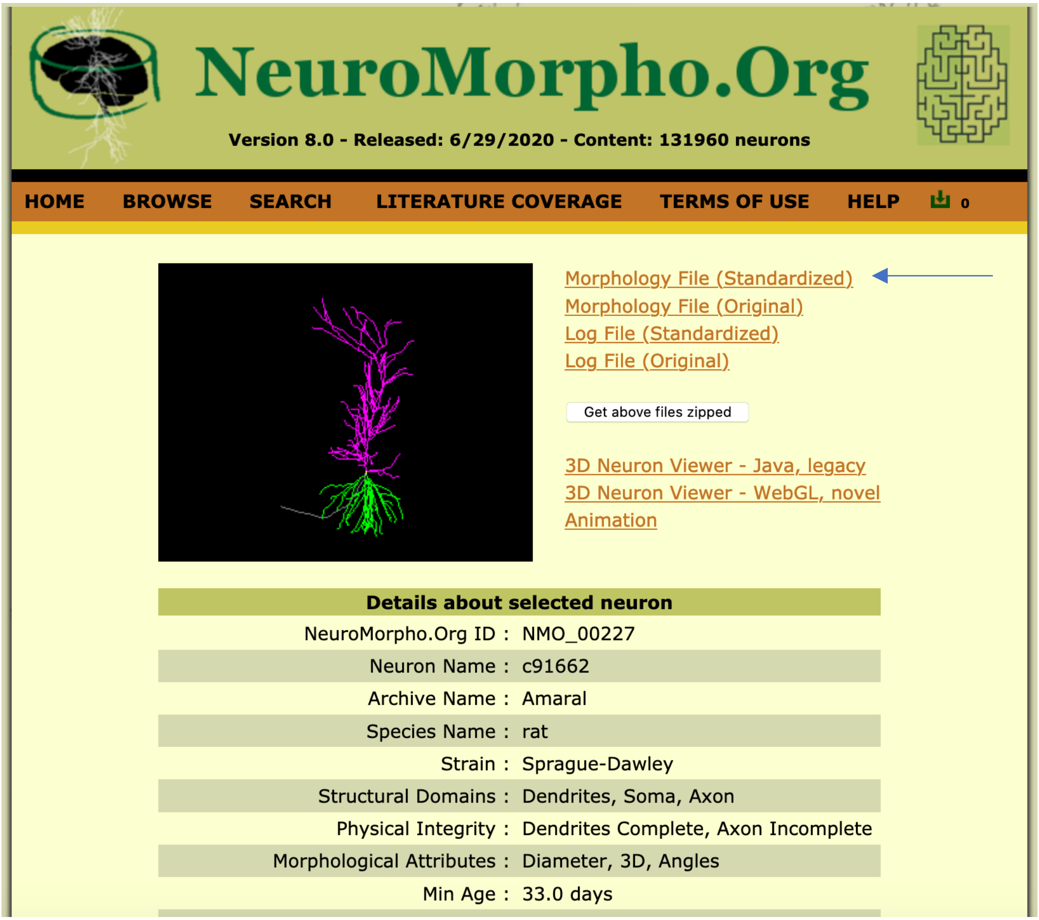
Soma Surface :   903.25 µm2
Number of Stems :   7
Number of Bifurcations :   113
Number of Branches :   233
Overall Width :   363.7 µm
Overall Height :   717.18 µm
Overall Depth :   364.21 µm
Average Diameter :   1.16 µm
Total Length :   22216.3 µm
Total Surface :   84796.1 µm2
Total Volume :   30674.3 µm3
Max Euclidean Distance :   668.56 µm
Max Path Distance :   1893.37 µm
Max Branch Order :   25
Average Contraction :   0.7
Total Fragmentation :   5460
Partition Asymmetry :   0.56
Average Rall's Ratio :   1.78
Average Bifurcation Angle Local :   89.59°
Average Bifurcation Angle Remote :   75.23°
Fractal Dimension :   1.07

THE JOURNAL OF COMPARATIVE NEUROLOGY 391:335–352 (1998)

Dendritic Properties of Hippocampal CA1 Pyramidal Neurons in the Rat: Intracellular Staining In Vivo and In Vitro

G.K. PYAPALI,[1,2] A. SIK,[3] M. PENTTONEN,[3] G. BUZSAKI,[3] AND D.A. TURNER[1,2,4*]
[1]Department of Neurosurgery, Duke University, Durham, North Carolina 27710
[2]Durham Veterans Affairs Medical Center, Durham, North Carolina 27710
[3]Center for Molecular and Behavioral Neuroscience, Rutgers, The State University of New Jersey, Newark, New Jersey 07102
[4]Department of Neurobiology, Duke University, Durham, North Carolina 27710

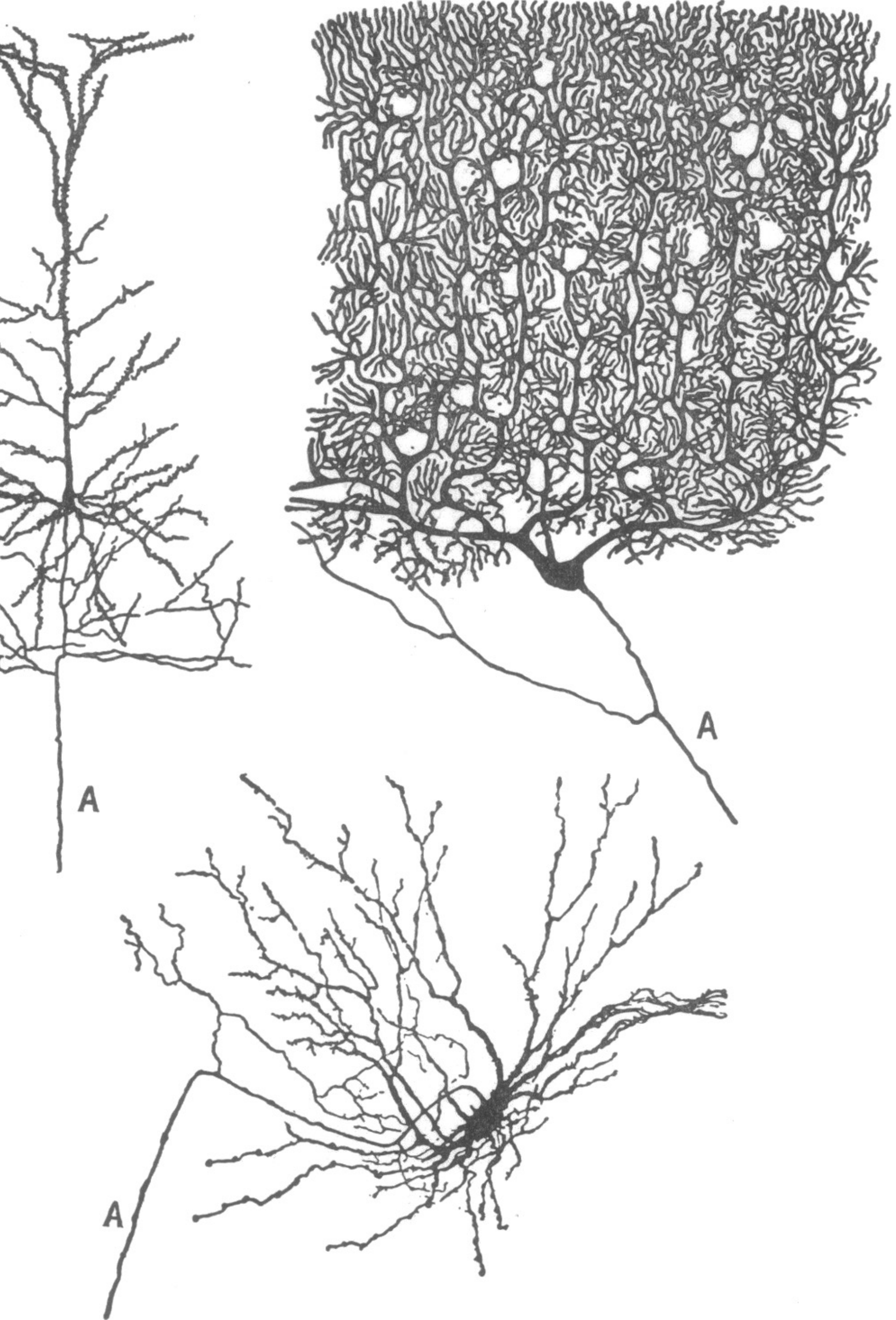
Live demo: C91662




```
# Original file c91662.swc edited using StdSwc version 1.31 on 11/10/13.
# Irregularities and fixes documented in c91662.swc.std.  See StdSwc1.31.doc for more information.
#
# Neurolucida to SWC conversion from L-Measure. Sridevi Polavaram: spolavar@gmu.edu
# Original fileName:C:\Users\praveen\Desktop\Uzma\ErrorArchives\ToBeProcessed\Amaral\asc\c91662.asc
#The original file has a single soma contour that is averaged into 3 soma points
# NEUROMANTIC V1.6.3 (10/18/2013 6:55:13 PM): Saved to c91662-T1.swc
1 1 0.0 0.0 0.0 8.8677 -1
2 1 1.13 8.71 1.2 8.8677 1
3 1 -1.13 -8.71 -1.2 8.8677 1
4 4 -1.86 11.06 -0.47 1.85 1
5 4 -1.94 19.75 -0.65 1.6 4
6 4 -2.52 31.1 -1.23 1.35 5
7 4 -2.94 39.91 -2.02 1.35 6
8 4 -2.55 49.45 -1.47 1.1 7
9 4 -2.61 56.49 -0.77 1.1 8
10 4 -1.17 70.15 -1.59 1.1 9
11 4 2.04 83.45 -1.43 1.1 10
12 4 1.89 91.65 -1.68 1.1 11
13 4 4.35 106.58 -1.57 1.1 12
14 4 5.09 115.06 -1.02 1.1 13
15 4 7.16 126.11 -1.93 1.1 14
16 4 7.13 129.63 -1.58 1.1 15
17 4 9.19 135.02 -2.02 1.1 16
18 4 11.82 145.77 -1.23 1.1 17
19 4 13.47 151.73 -1.73 0.9 18
20 4 14.65 157.05 -0.86 0.9 19
21 4 15.6 164.42 0.15 0.9 20
22 4 17.22 166.37 -0.76 0.9 21
23 4 17.27 175.11 -1.42 0.8 22
24 4 17.43 180.1 -0.87 0.8 23
25 4 18.41 192.2 -0.94 0.8 24
26 4 20.93 207.62 -0.75 0.8 25
27 4 22.64 214.07 -1.18 0.8 26
28 4 26.23 231.47 2.1 0.8 27
29 4 28.89 246.23 3.3 0.8 28
30 4 31.83 252.62 2.17 0.8 29
31 4 33.06 266.68 2.37 0.8 30
32 4 36.17 276.41 2.67 0.8 31
33 4 38.23 281.8 2.23 0.8 32
34 4 43.26 297.81 3.18 0.8 33
35 4 49.51 314.69 4.04 0.8 34
36 4 51.98 319.51 3.66 0.8 35
37 4 55.37 329.56 5.11 0.8 36
38 4 59.09 339.26 5.05 0.8 37
39 4 63.87 351.94 0.9 0.8 38
40 4 65.01 361.5 0.62 0.8 39
41 4 64.84 372.28 0.1 0.6 40
42 4 63.56 393.06 -1.8 0.6 41
43 4 63.28 401.93 -3.07 0.6 42
44 4 62.98 405.13 -3.87 0.6 43
45 4 61.56 411.24 -2.61 0.6 44
46 4 57.99 423.02 -3.47 0.6 45
```

http://tinyurl.com/neuromorpho-c91662

http://tinyurl.com/neuromorpho-c91662-swc

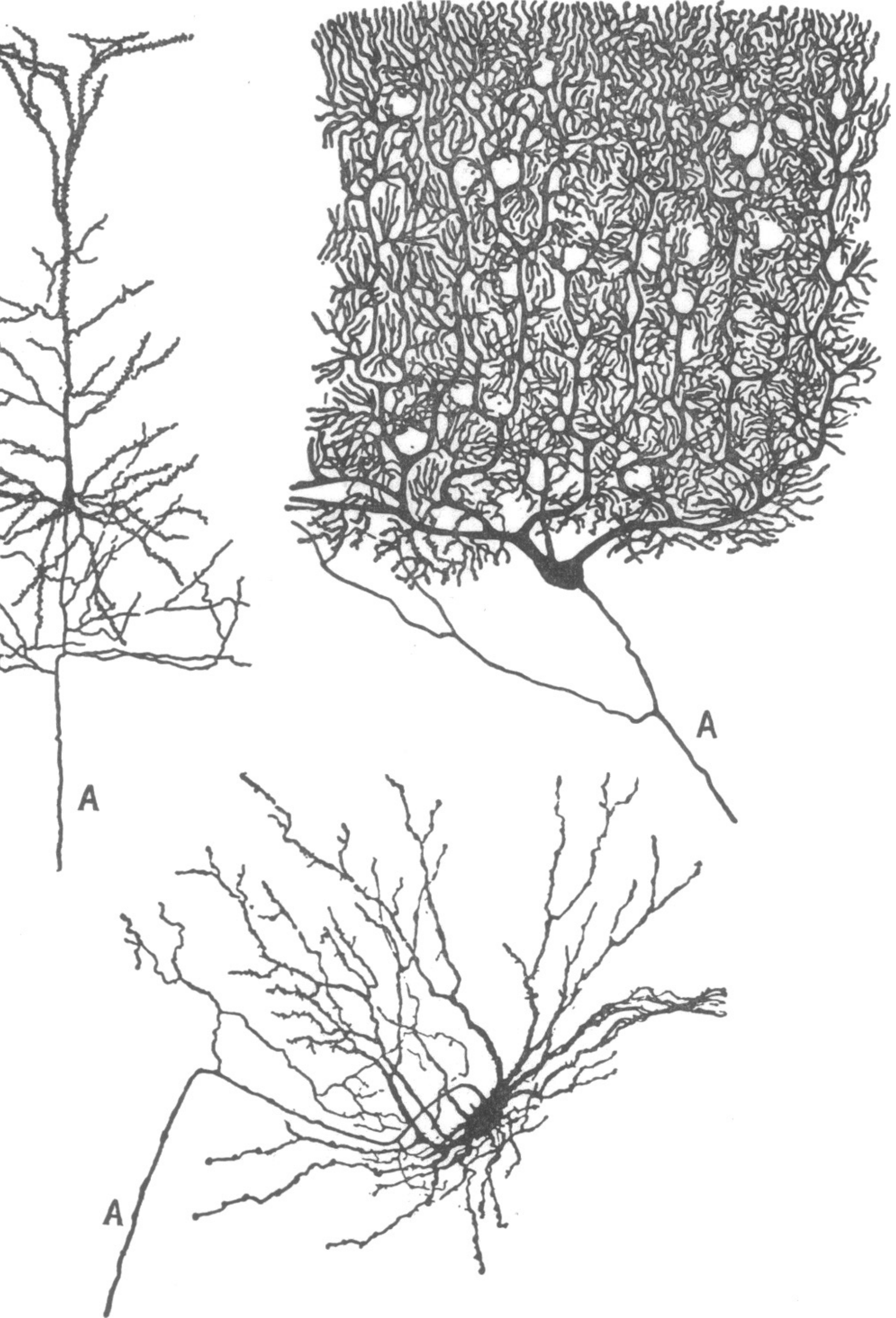


Loading Morphologies

```
from neuron import h
h.load_file('import3d.hoc')

cell = h.Import3d_SWC_read()
cell.input('filename.swc')
i3d = h.Import3d_GUI(cell, False)
i3d.instantiate(None) # or i3d.instantiate(self)
```

Morphology images from Cajal 1909 as reproduced in Rall 1962.



Plotting Morphologies

```
import plotly

ps = h.PlotShape(False)
ps.scale(-80, 40)
ps.variable('v')
ps.plot(plotly).show()
```

Morphology images from Cajal 1909 as reproduced in Rall 1962.