

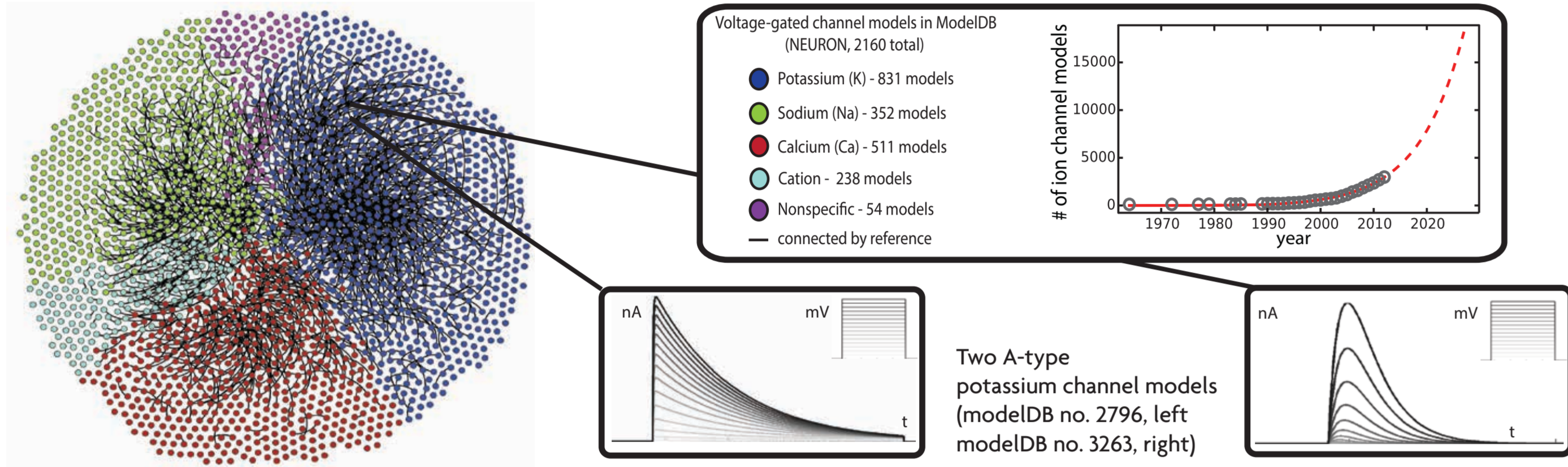
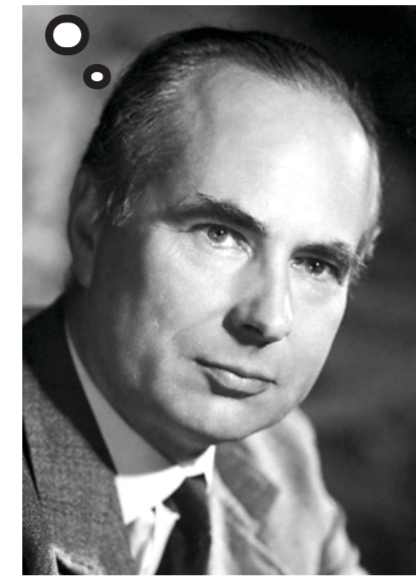
Are you lost in a sea of ion channel models?

The online database ModelDB has over 700 neuron models in the NEURON language and over 2000 individual ion channel models. Let's say you set out to find an A-type potassium channel to include in your simulation, and you see that there are 173 channel models to choose from! What now?

Will you choose a channel model at random? What are their differences? Will you go through the 173 papers to see which one best fits your needs?

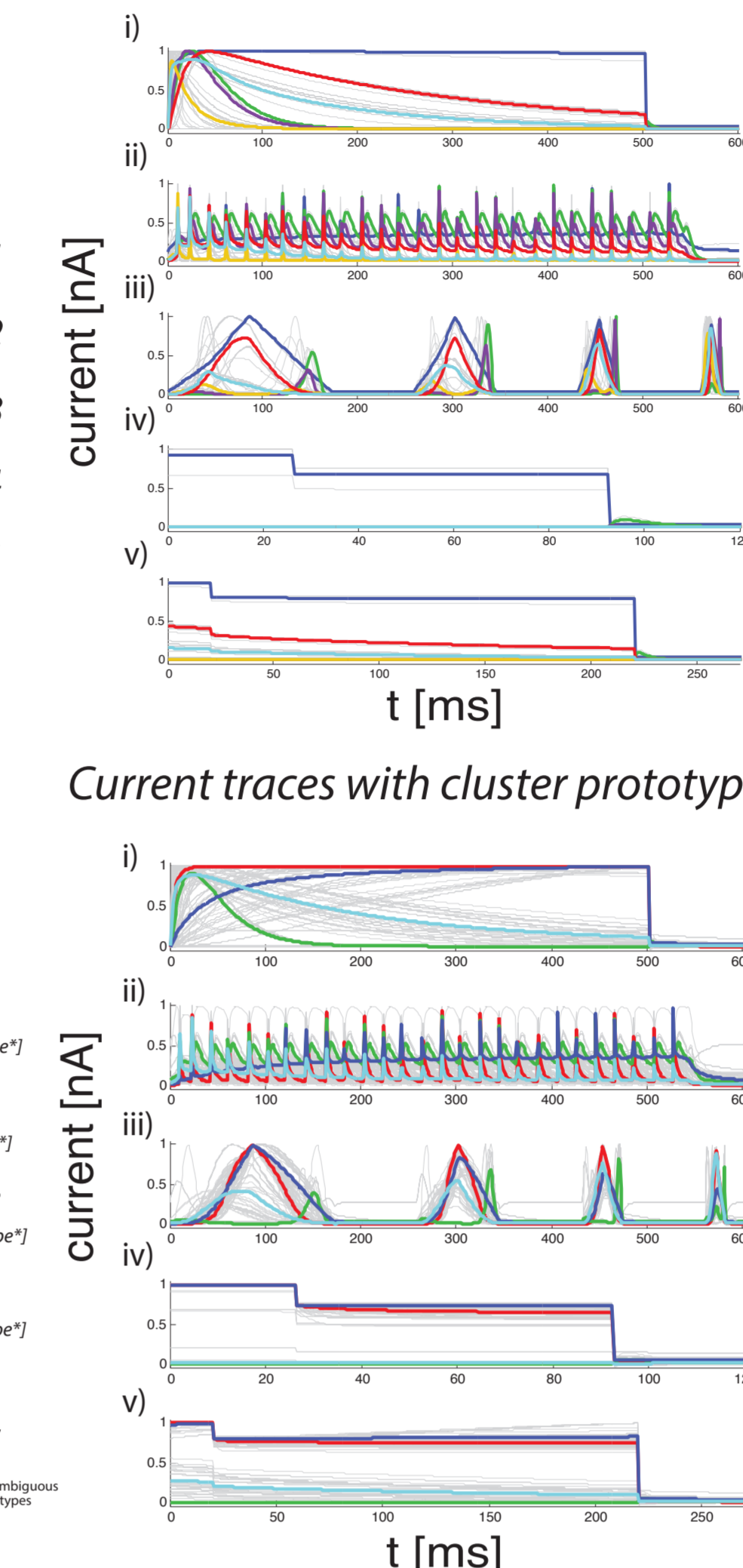
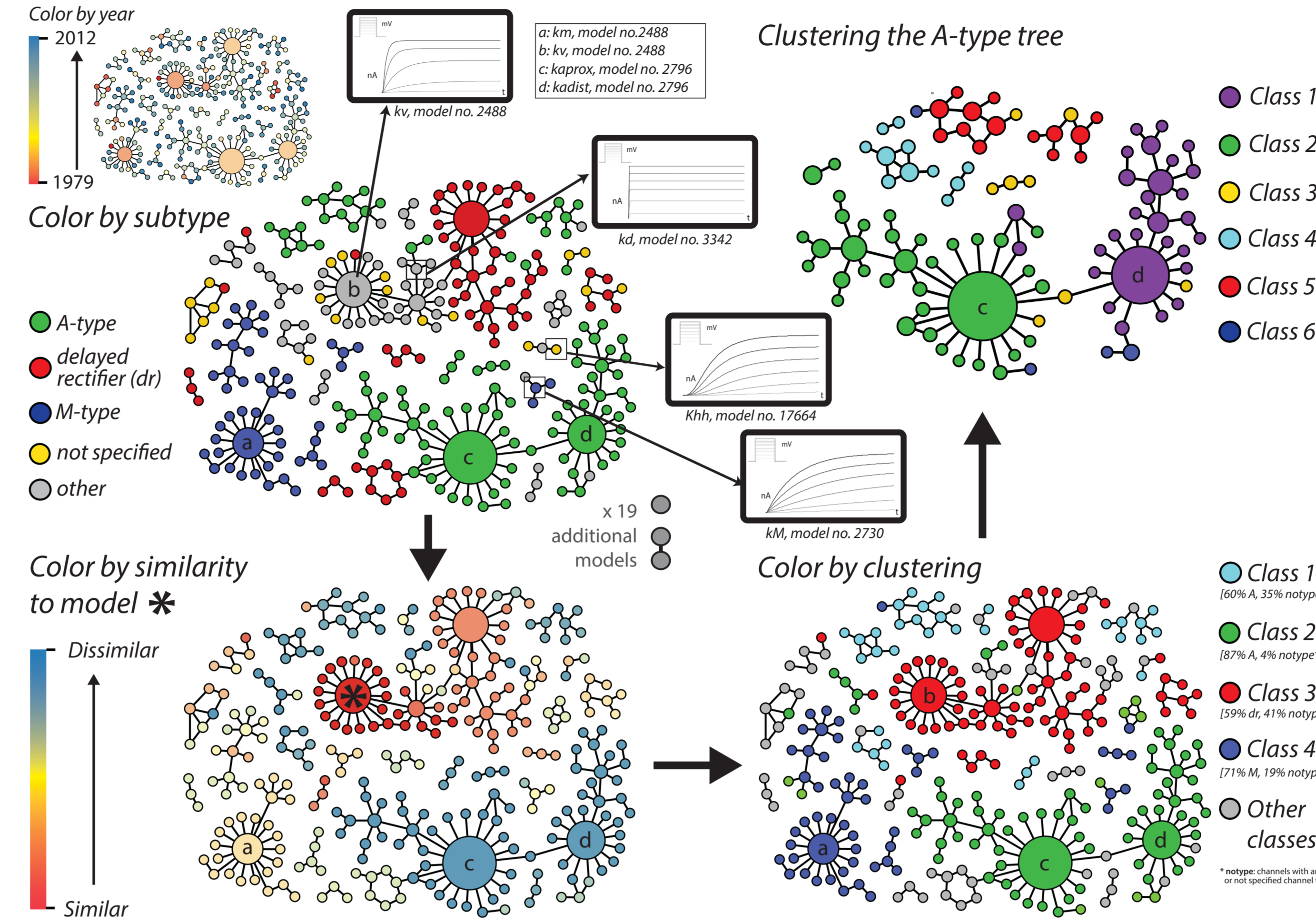
This situation can be very frustrating. But don't worry, we can help!

So many!



Aims:
Make sense of the abundance of ion channel models that currently exist
Help you choose the right model to emulate a specific ion channel type in mind

Potassium (voltage-gated models)



How does this help you?

The Kv dendrogram

Begin with hundreds of models to choose from
Narrow your search down to a few distinct classes

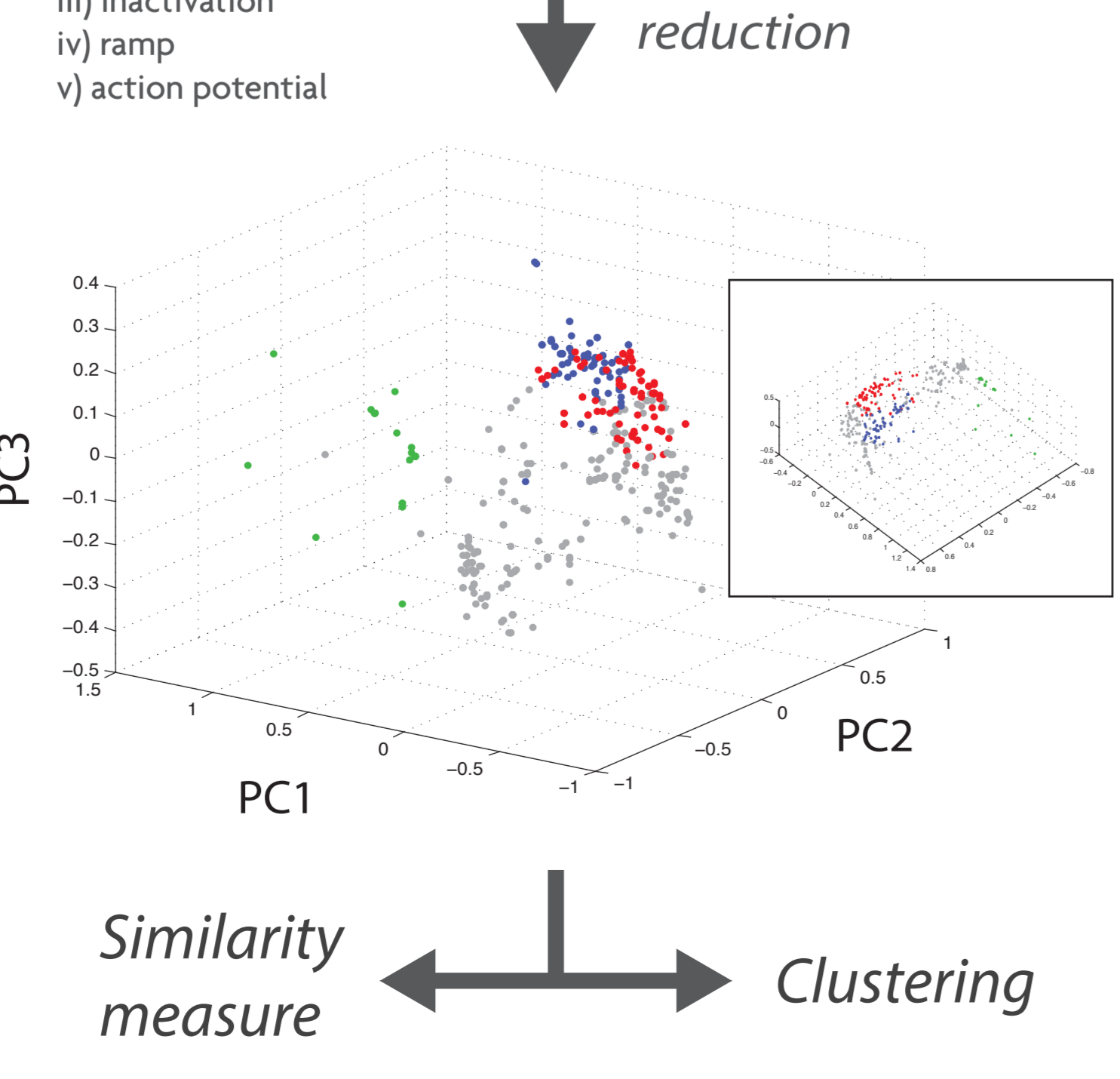
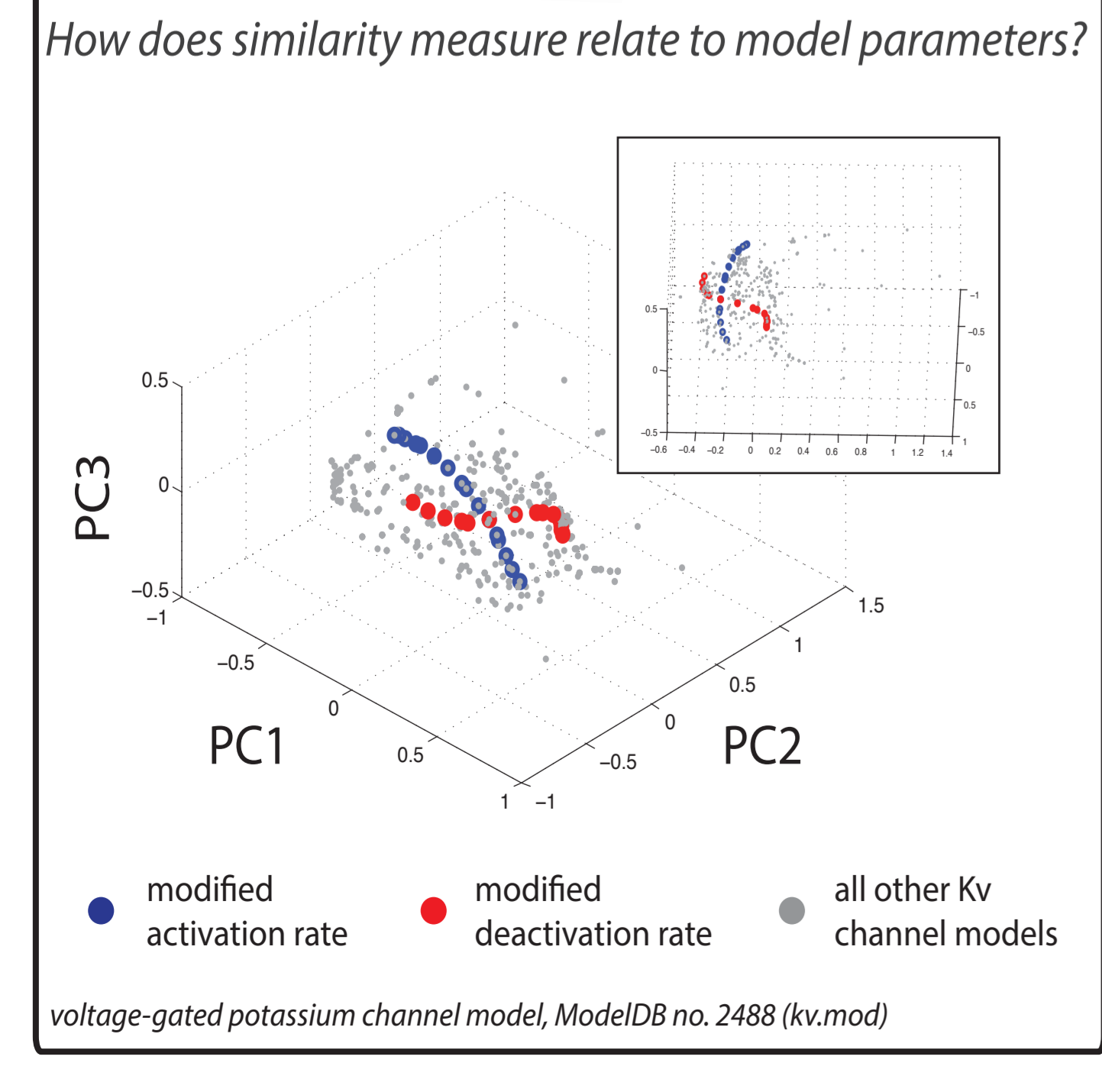
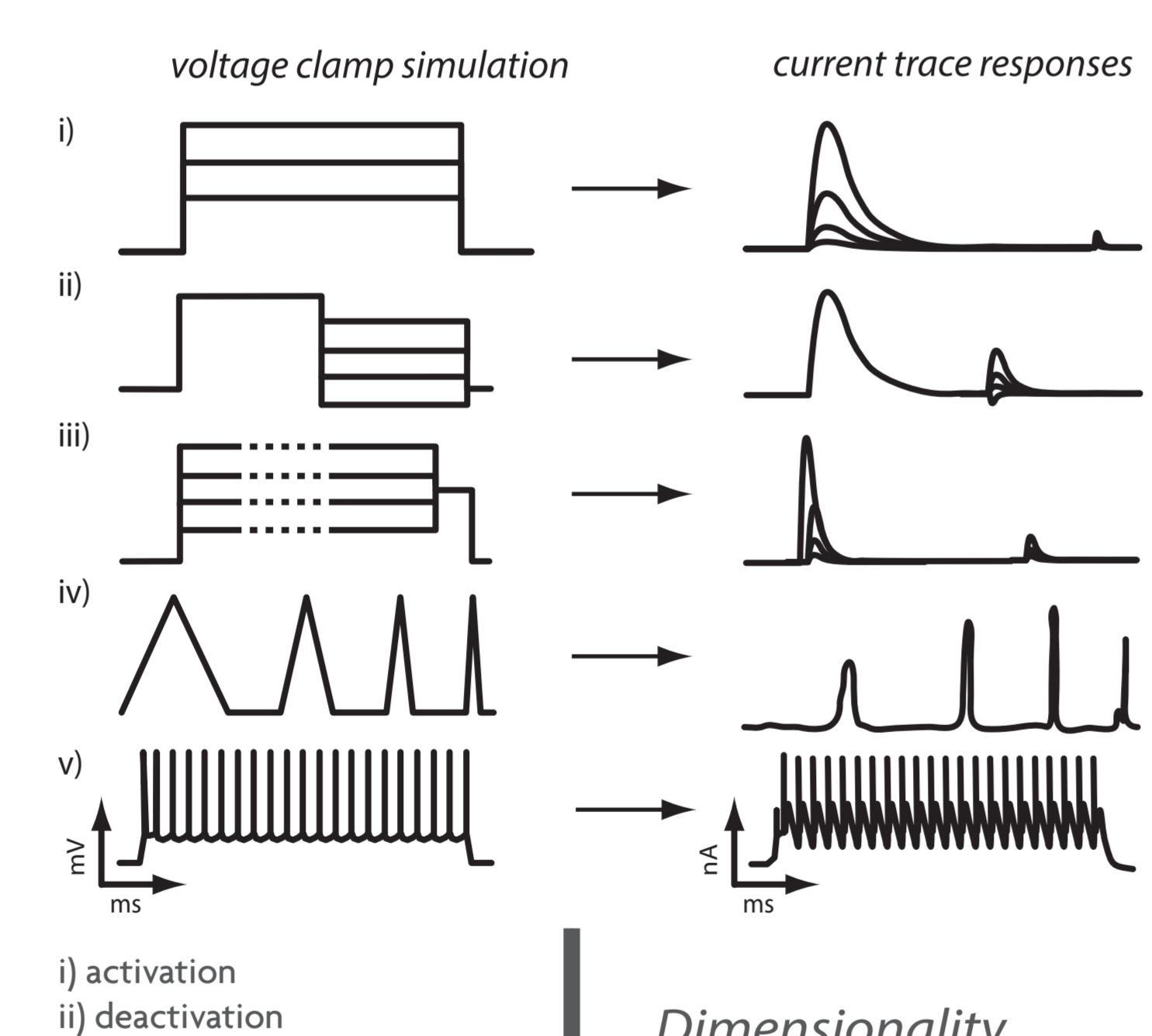
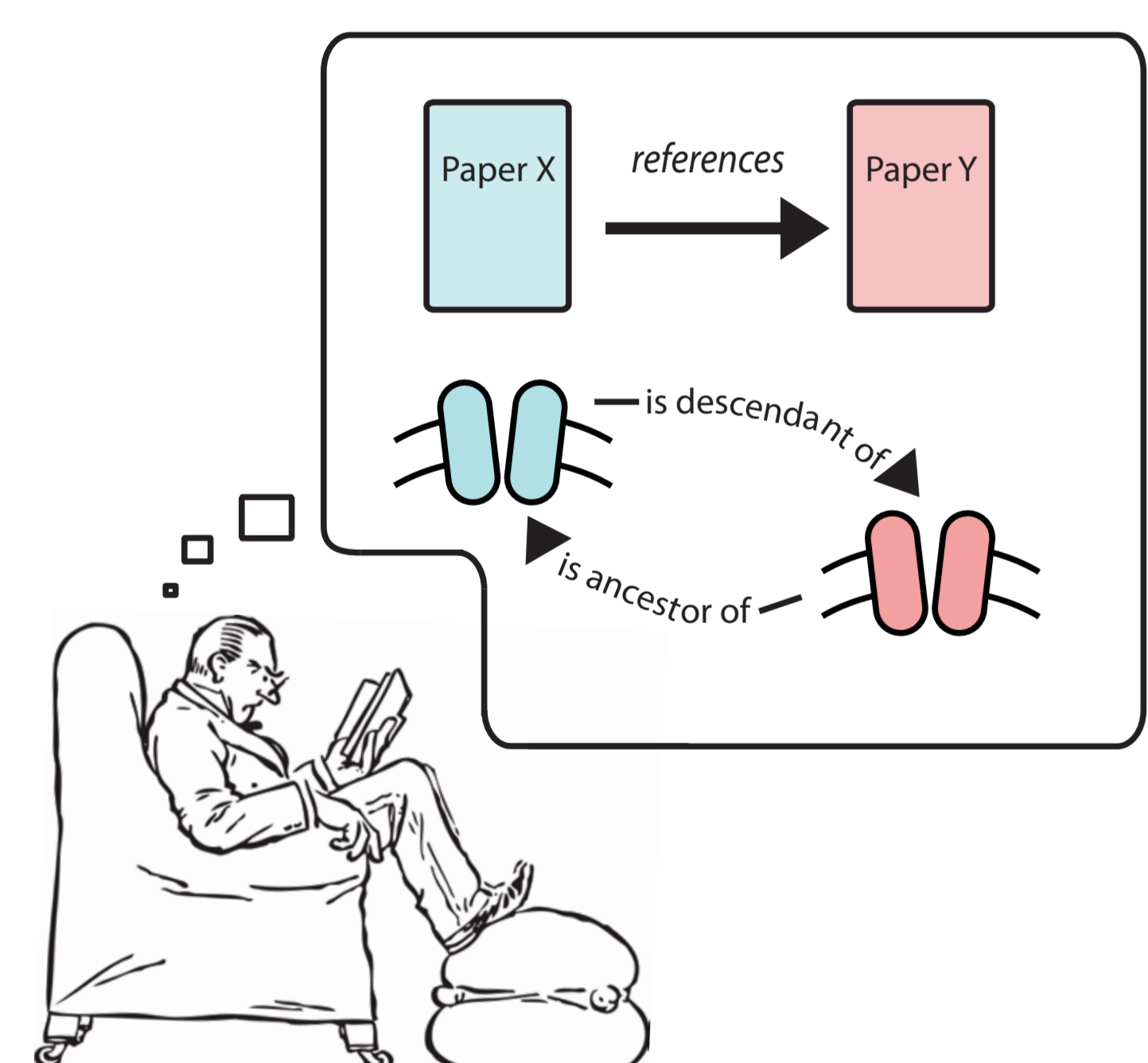
Subclass	# models	Example reference	Neuron types, brain areas	Animal models
1	29	modelDB no. 2796, kadist.mod Migliore et al. (1996)	pyramidal cell (CA1, CA3, prefrontal cortex, ...)	rat, mouse (in vitro), guinea pig, ...
2	36	modelDB no. 2796, kprox.mod Migliore et al. (1996)	pyramidal cell (CA1, CA3, prefrontal cortex, ...)	rat (in vivo), mouse (in vitro), guinea pig, ...
3	26	modelDB no. 19591, ka_chan.mod Gabbiani et al. (1994)	pyramidal cell (CA1), granule cell (cerebellum), ...	rat (in vivo, in vitro), mouse (in vitro), ...
4	21	modelDB no. 2733, ka.mod Bhalla & Bower (1994)	mitral, granule cell (olfact. bulb), mossy cell, basket cell (OFC), Golgi cell (cerebellum), ...	rat (in vivo), mouse, rabbit, ...
5	15	modelDB no. 3548, kamt.mod Wang et al. (1996)	mitral, granule cell (olfact. bulb), Golgi cell (cerebellum), ...	rat (in vivo), mouse (in vitro), ...
6	4	modelDB no. 28316, Ia.mod Saraga et al. (2003)	pyramidal cell (CA1), olfactory sensory neuron, ...	rat (in vivo), mouse (in vitro), tiger salamander, ...

(1) Reduce your search from hundreds of possible channel models to a few main classes, narrowed down by user-specified criteria
(2) Find the best available ion channel model for your neuronal simulation. OR if it does not exist yet, add it to the database so it can be compared to other models and used by others.

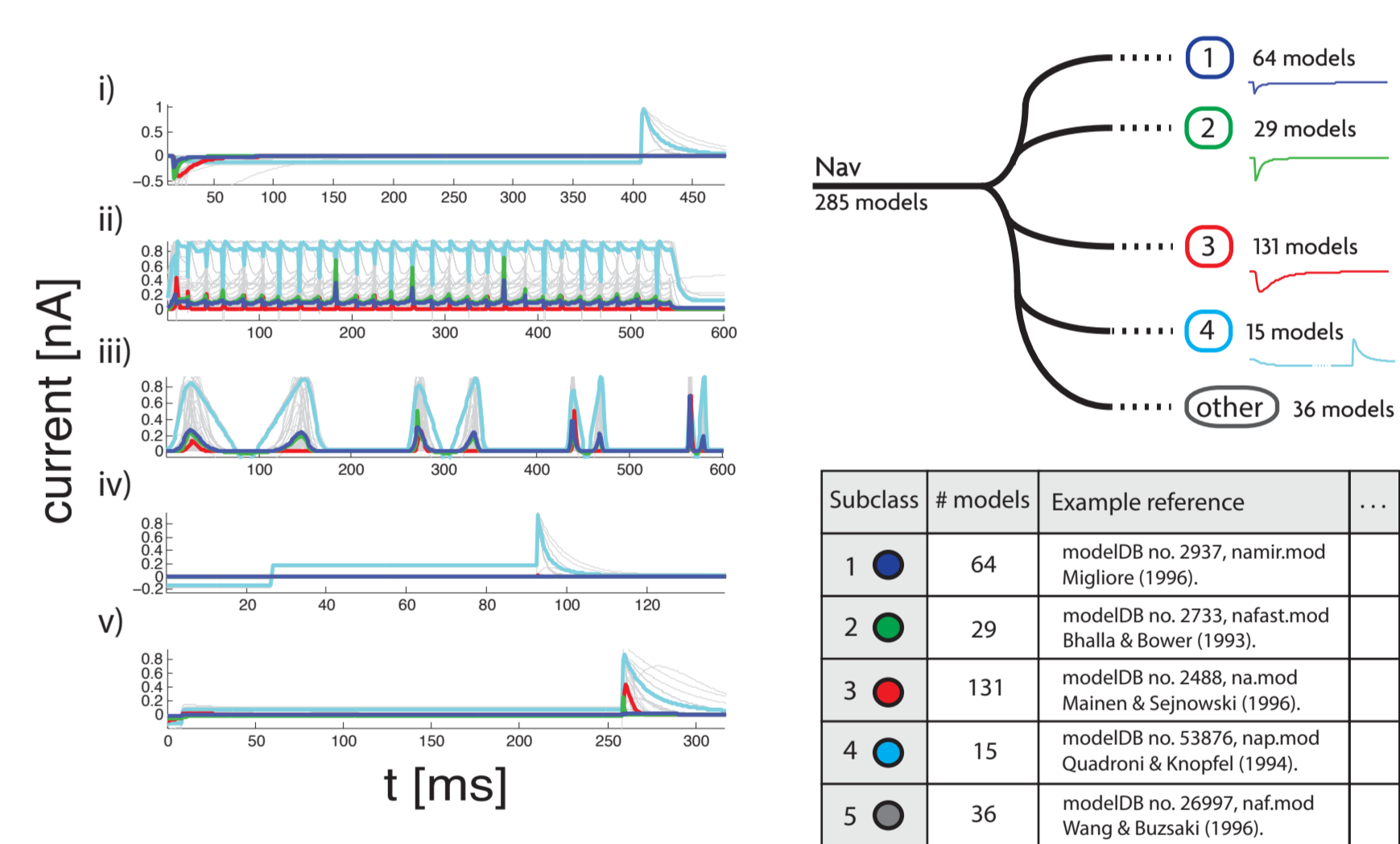
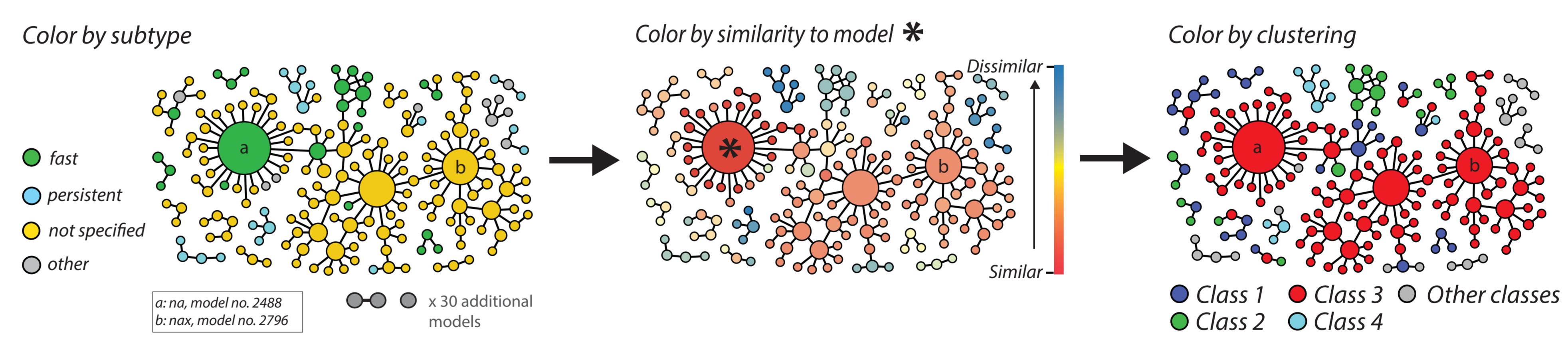
Methods: Data extraction and analysis

Establish relationship between all ion channel models in the ModelDB database

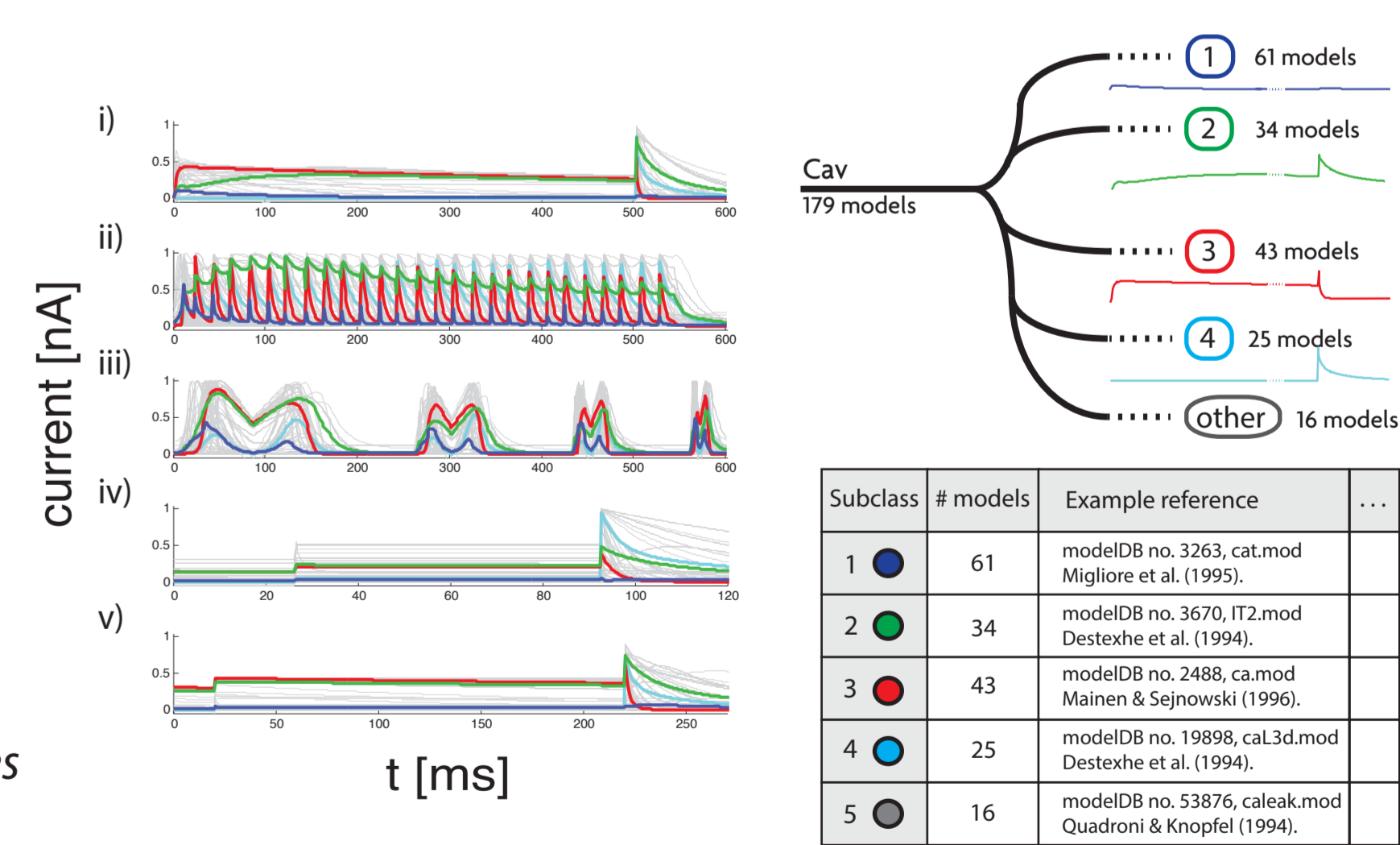
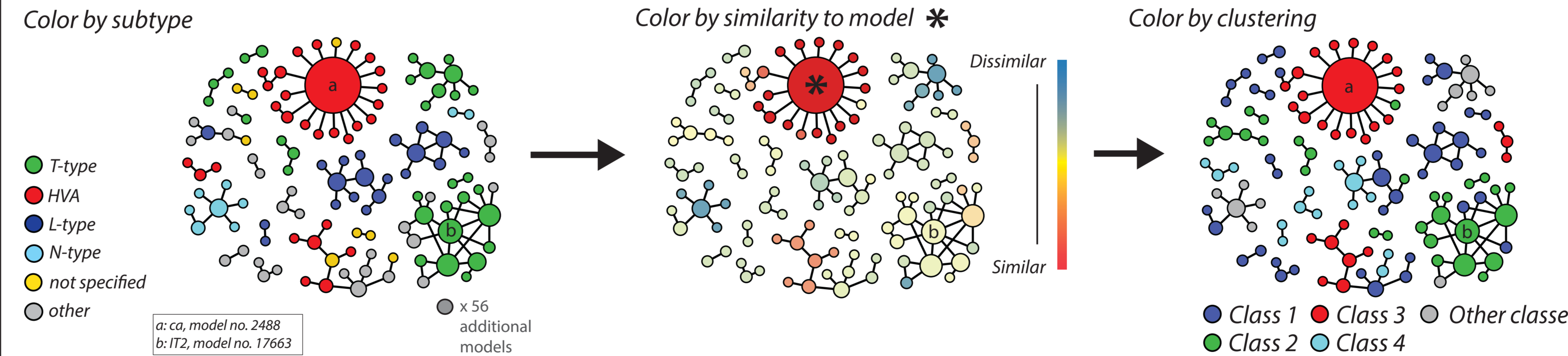
Develop a standardized way to quantify the differences between channel kinetics



Sodium (voltage-gated)

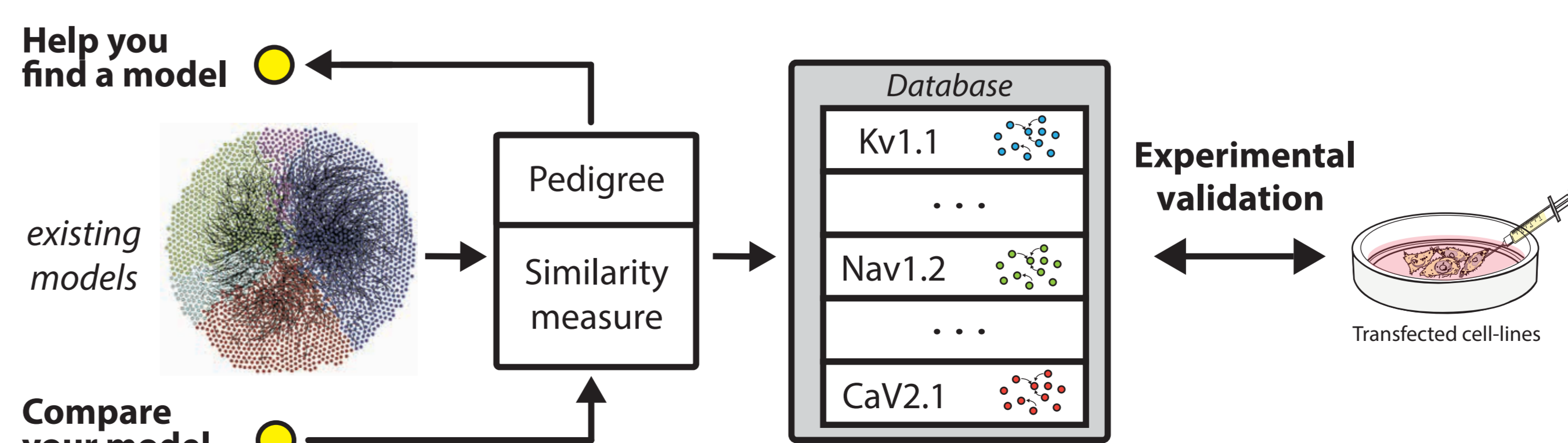


Calcium (voltage-gated)



A useful tool for YOU

- Online tool, possibly integrated into ModelDB
- Classification and visual organization of available models helps you find the model class suiting your needs
- New channels: automatic computation of similarity to all other known ion channel models, clustering into a subtype
- Experimental validation to determine the biological realism of your model



References

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