Effective slide design

the good, the bad, the ugly

Justin Bois

BE 159, Jan 27, 2021

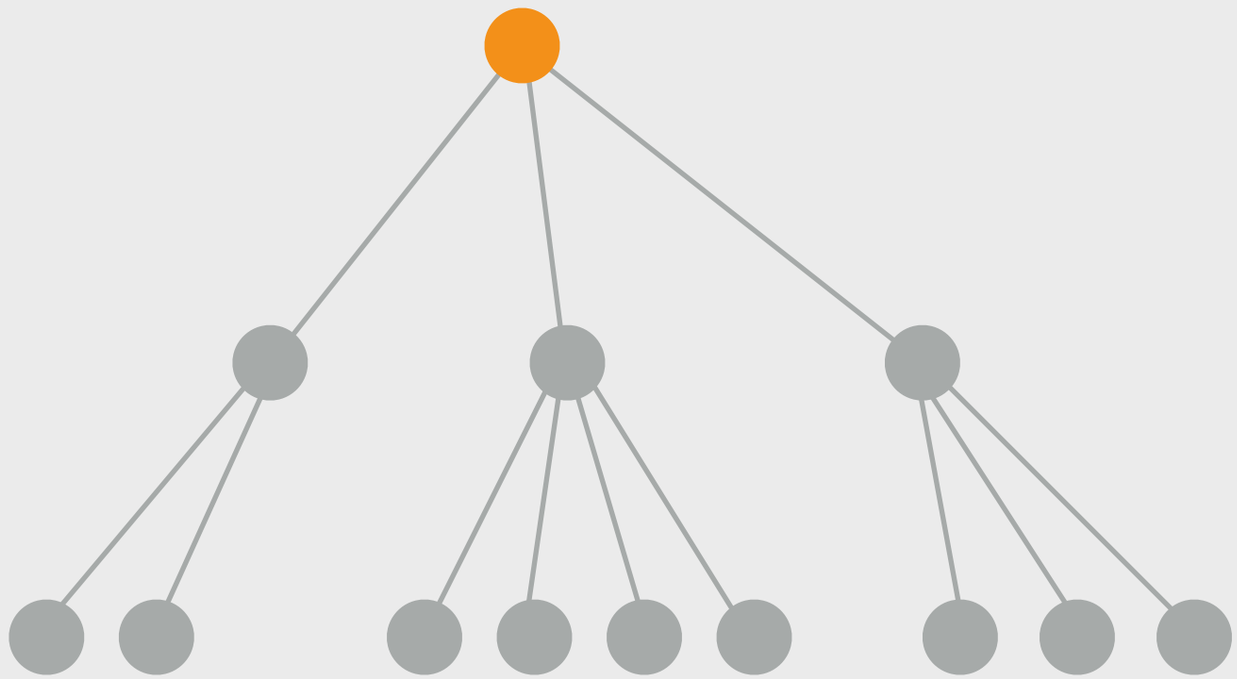
Scientific information is often organized in a hierarchical structure

Main message

Main points

Subpoints

Wnt signaling acts through
fold change of β-catenin levels



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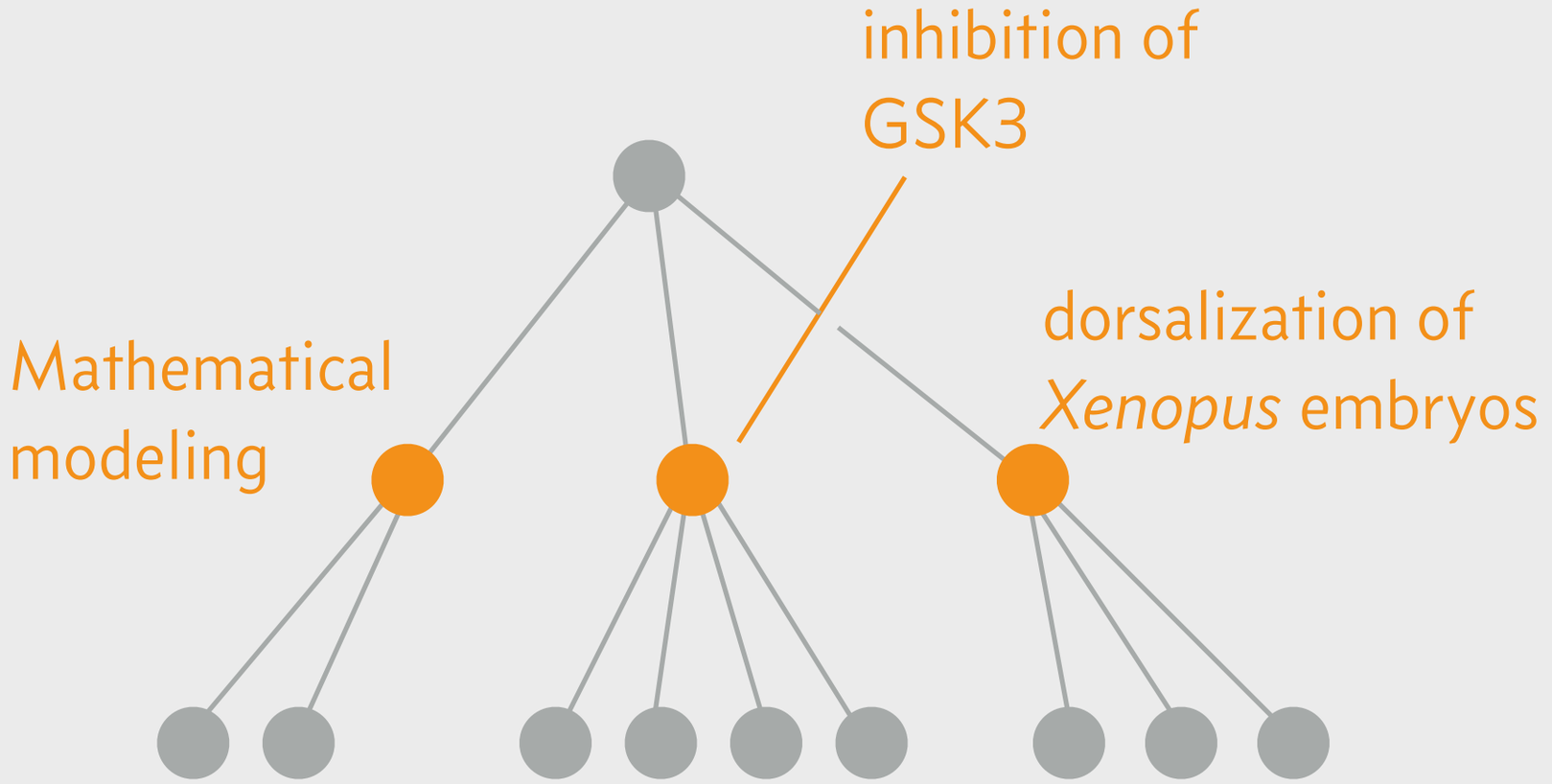
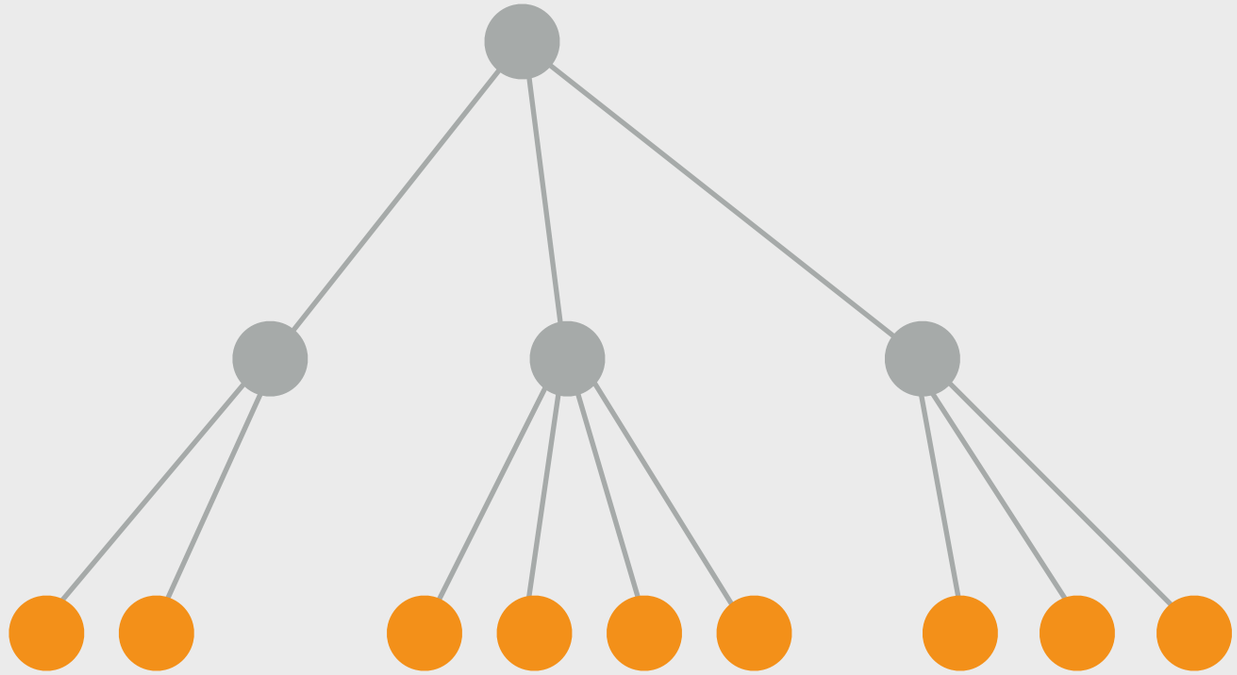


Each subpoint (or subsubpoint) is a single idea

Main message

Main points

Subpoints



One idea, one slide.

C. elegans

- Well-established model organism
- Has 302 neurons
- Easy to manipulate
- Can put opsins in single neurons using a host of available genetic tools
- Cannot sense and light, so experiment is cleaner
- It is transparent, so no need for fiberoptic wires.

C. elegans is an ideal organism for optogenetics

Complete set of genetic tools

Simple nervous system

Have no light sensing

Transparent!

C. ELEGANS: AN IDEAL ORGANISM FOR OPTOGENETICS

- Complete set of genetic tools
- Simple nervous system
- Have no light sensing
- Transparent!

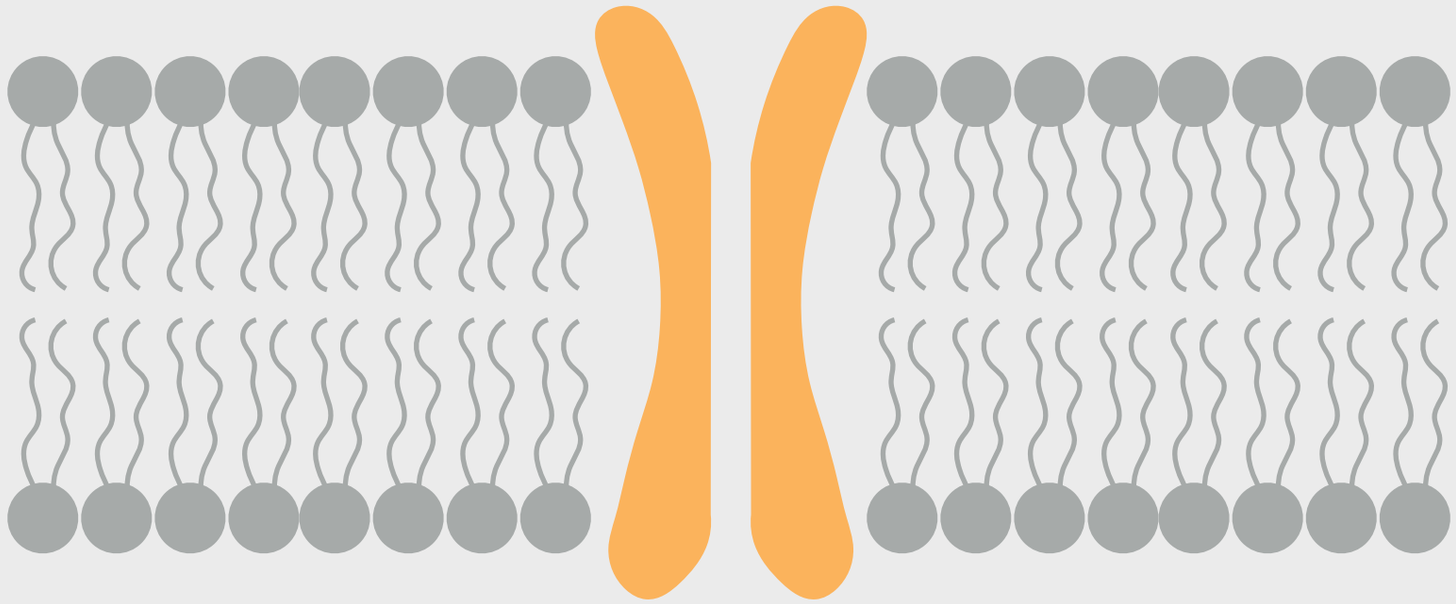
C. elegans: an ideal organism for optogenetics

- Complete set of genetic tools
- Simple nervous system
- Transparent!

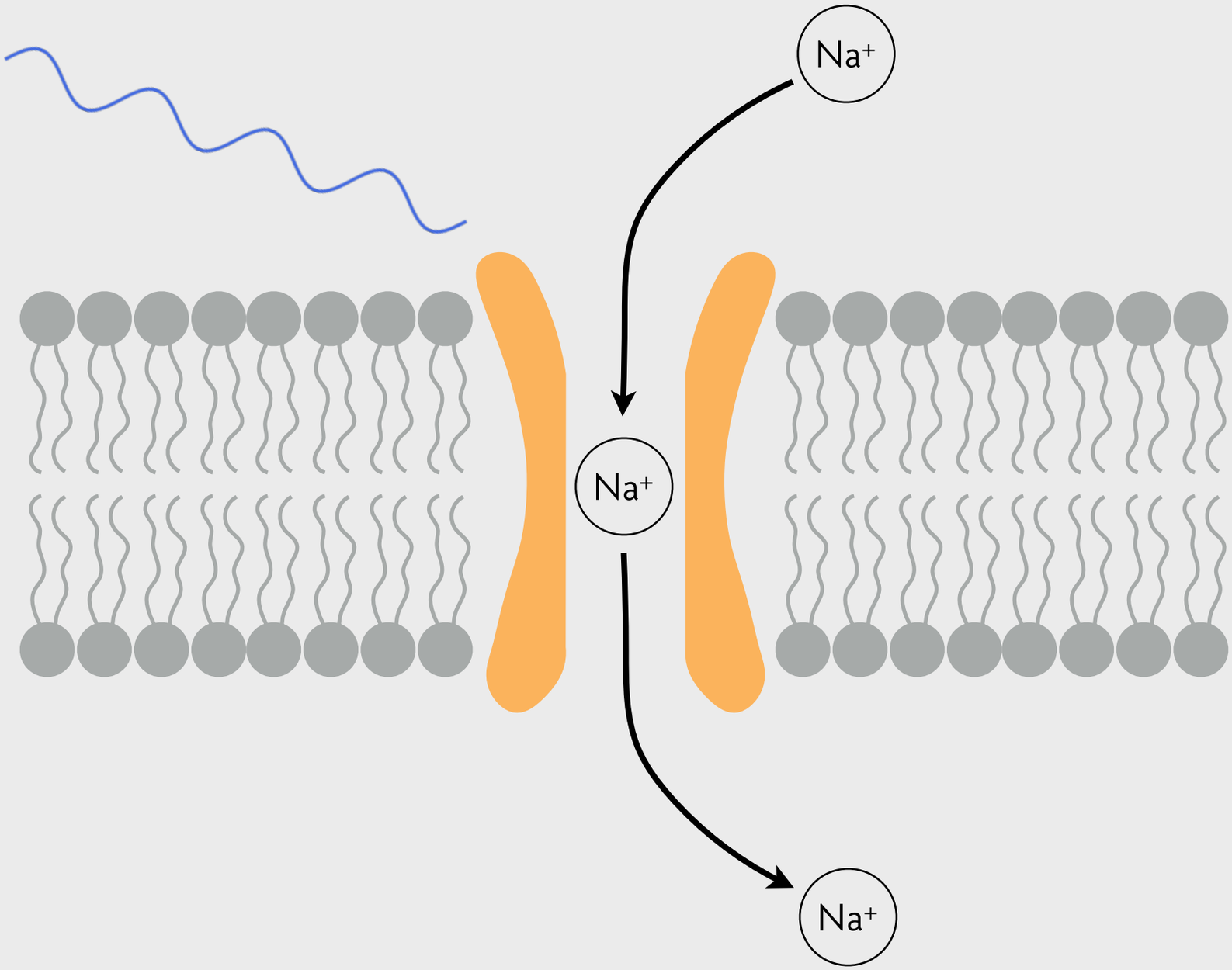
Use color sparingly to highlight

How does proximity of the Channelrhodopsin to motor neurons affect response?

Use color sparingly to highlight



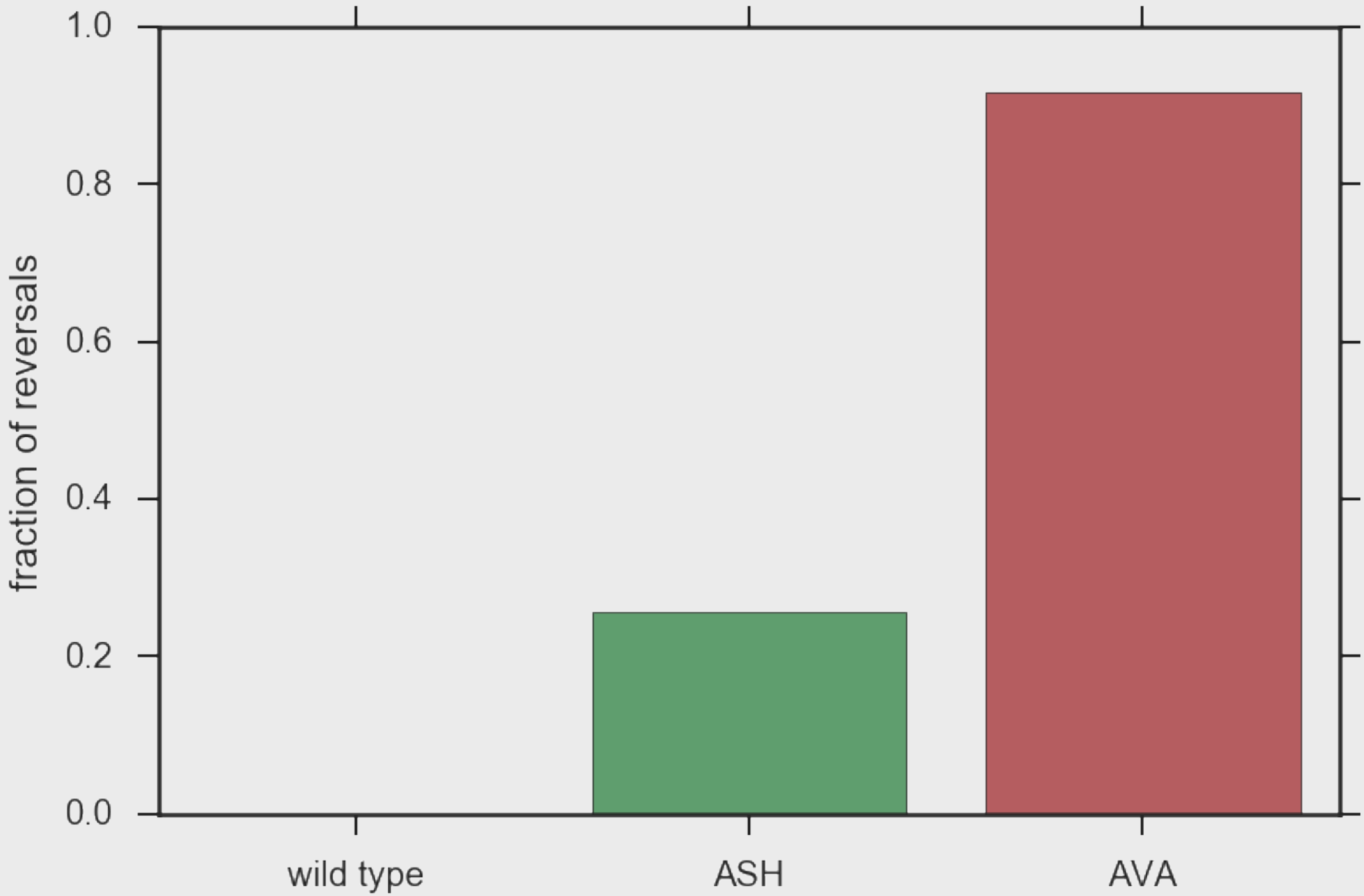
Use flat, recognizable, sparse graphics



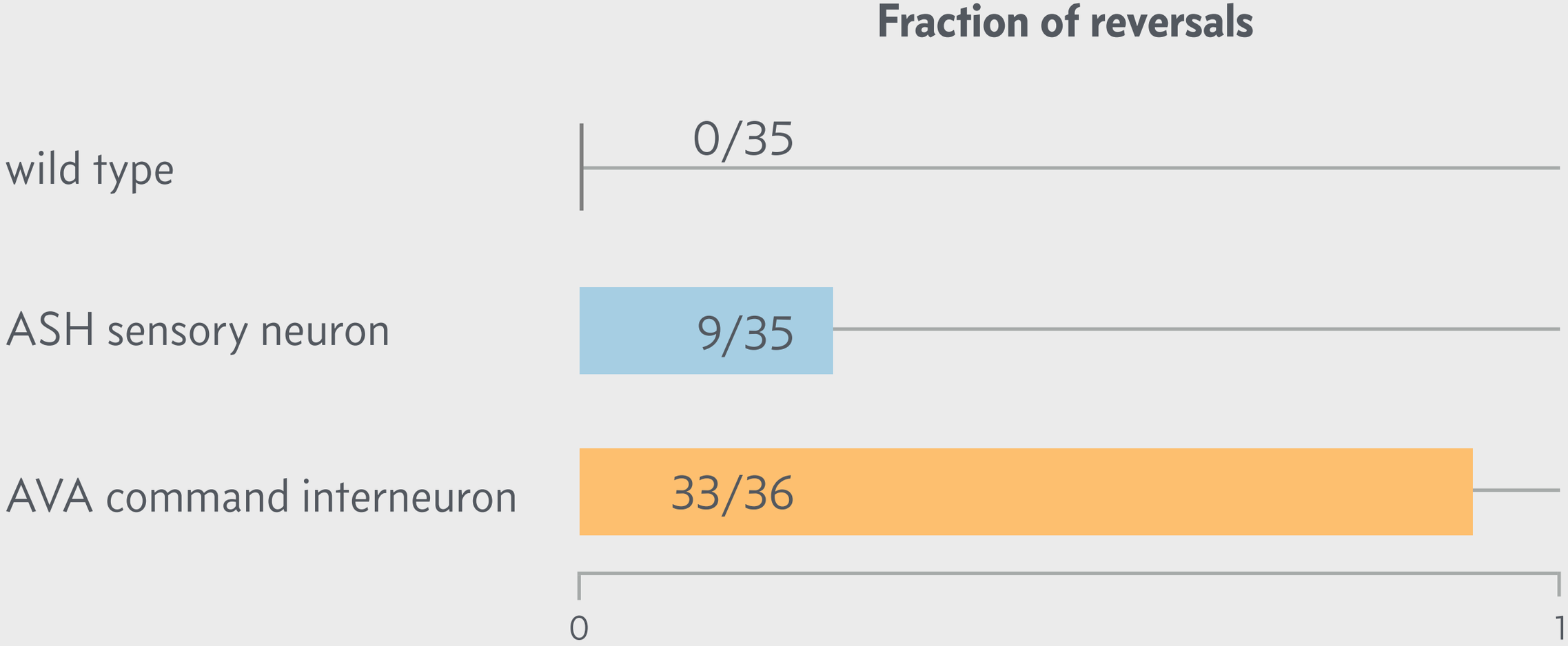
Citations should be small, just legible without strain

Oka, et al., *Nature*, 2015

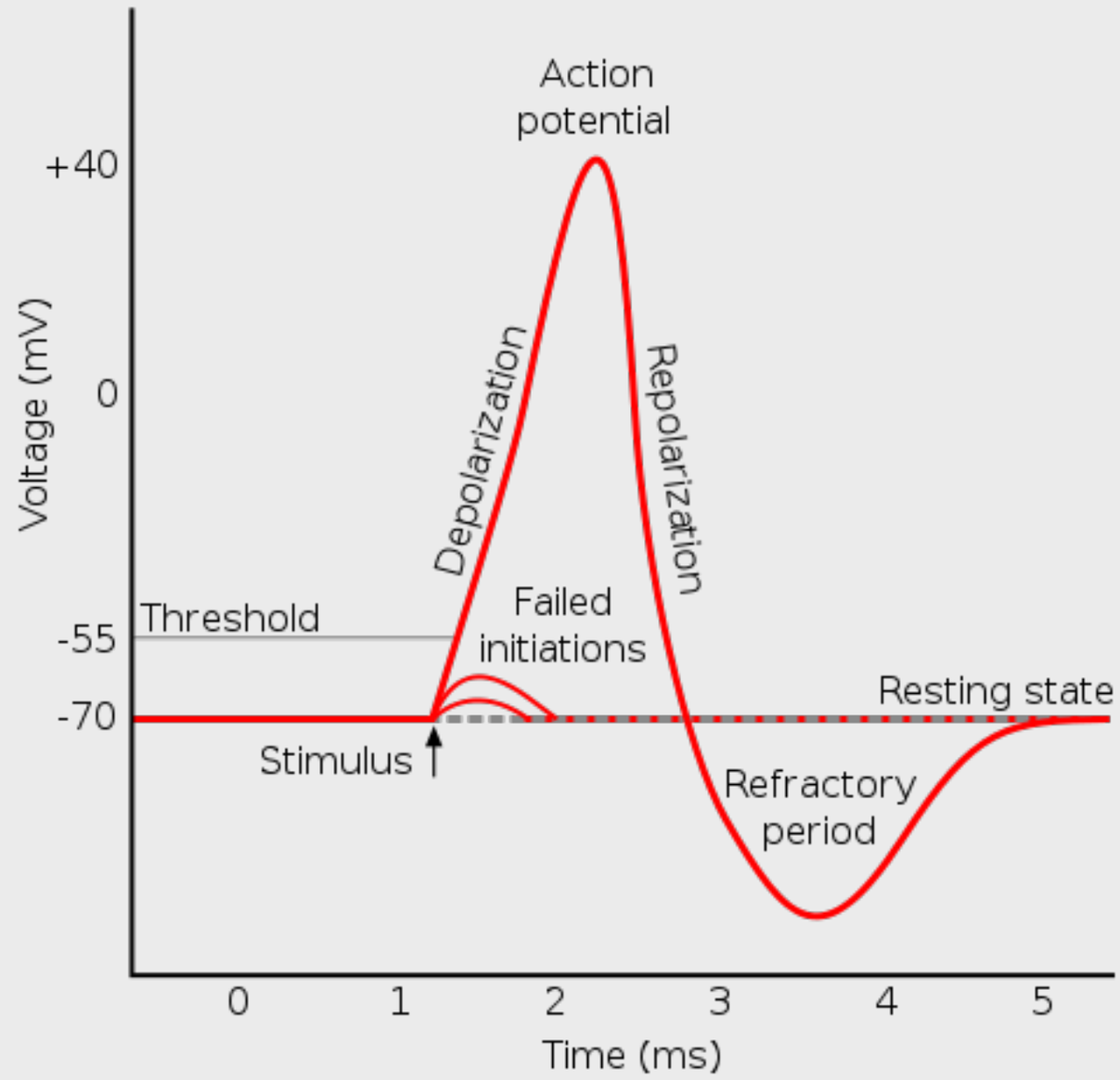
This is a bad bar chart



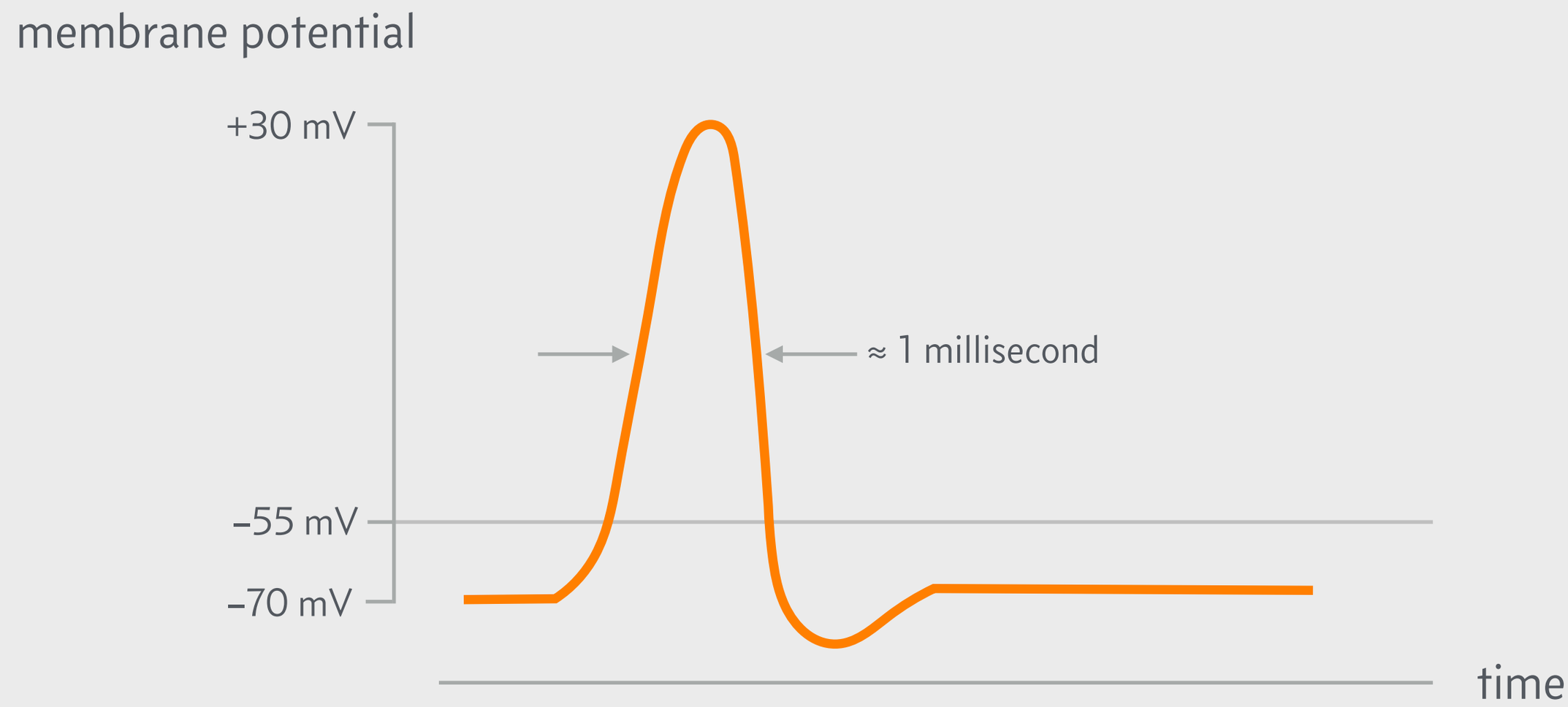
The command interneuron shows the strongest response



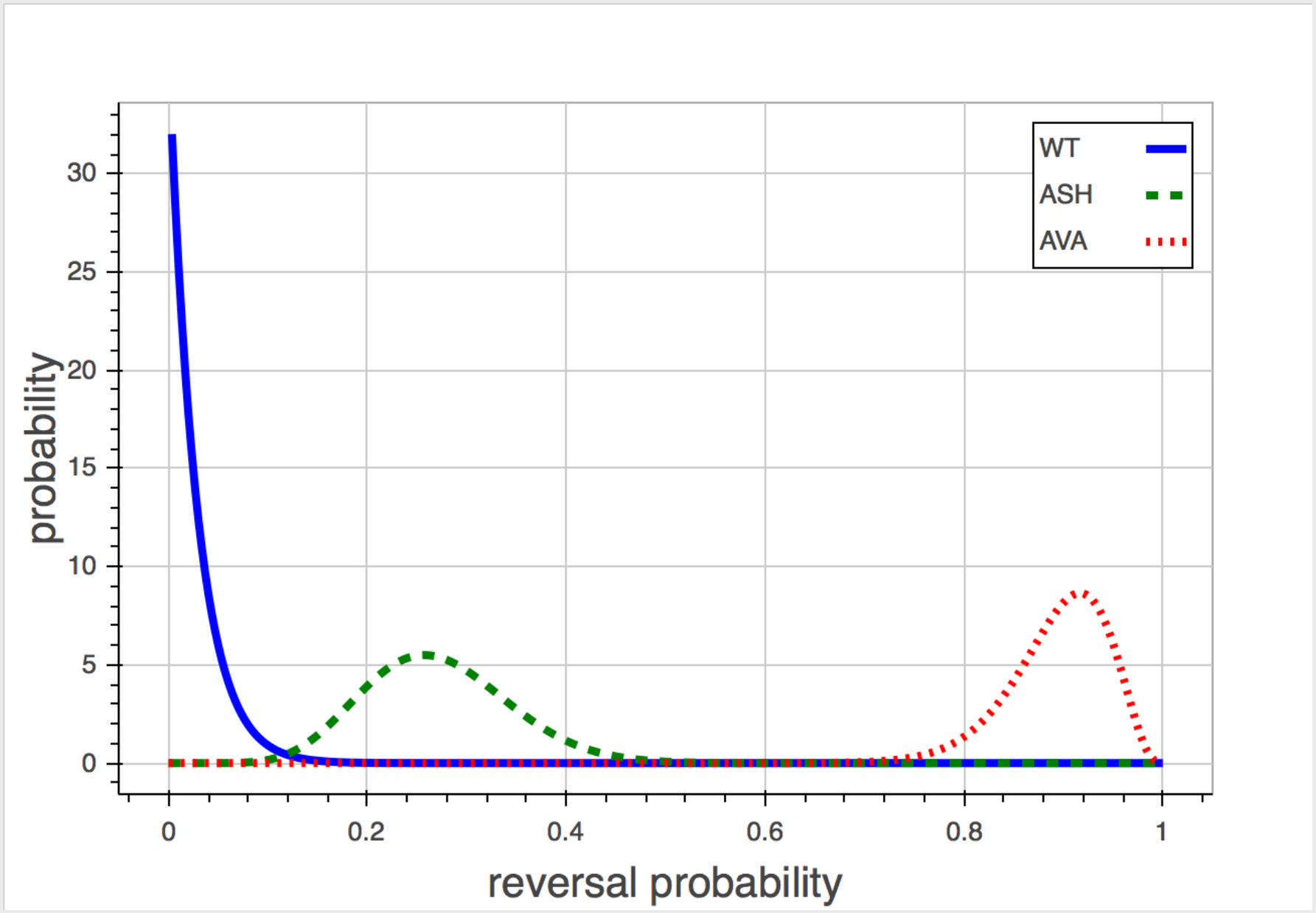
This is a bad schematic of an action potential



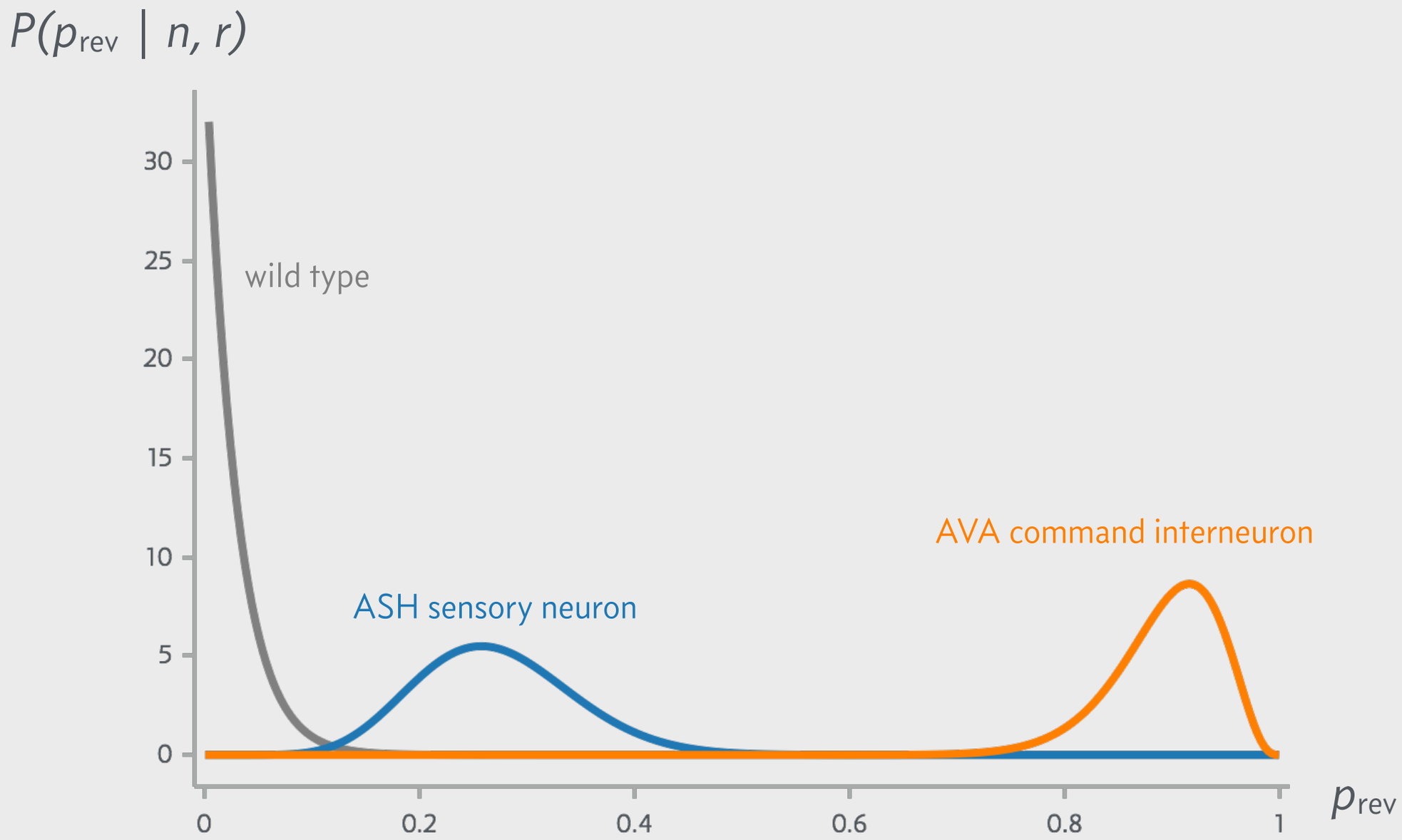
Induced charge difference mimics an action potential



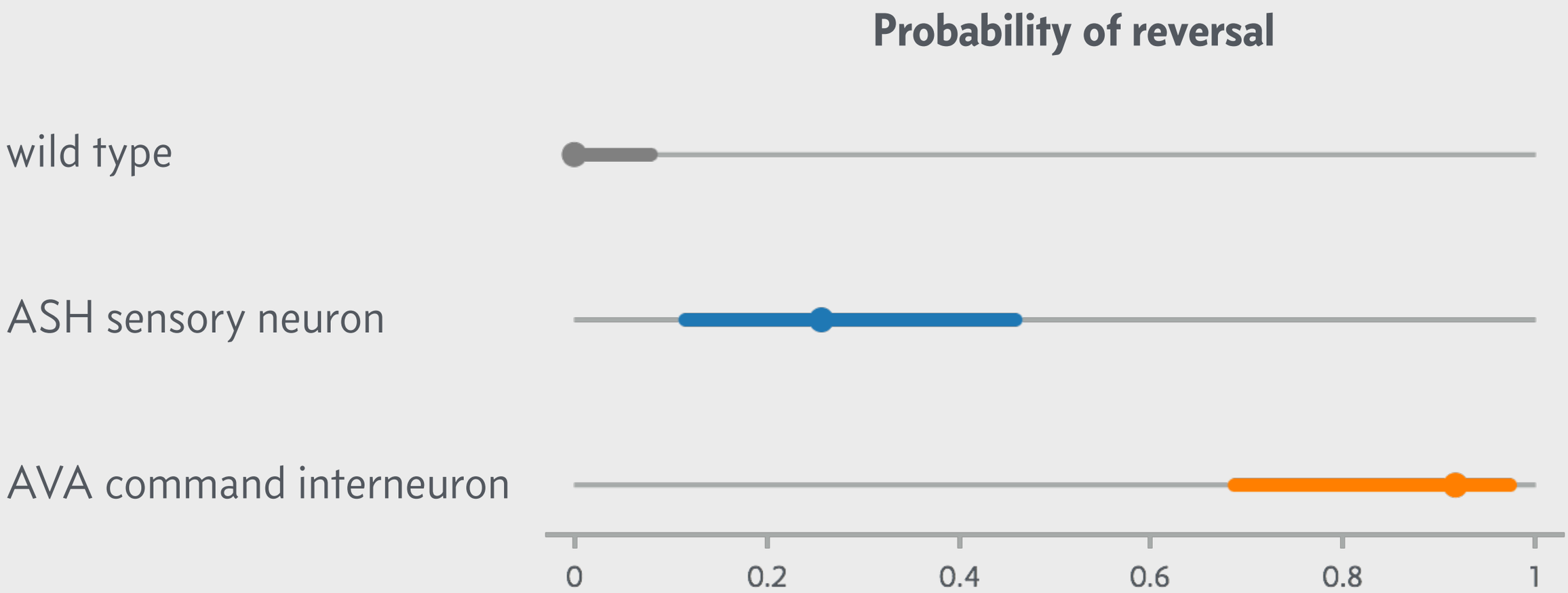
This is an ugly, noisy plot



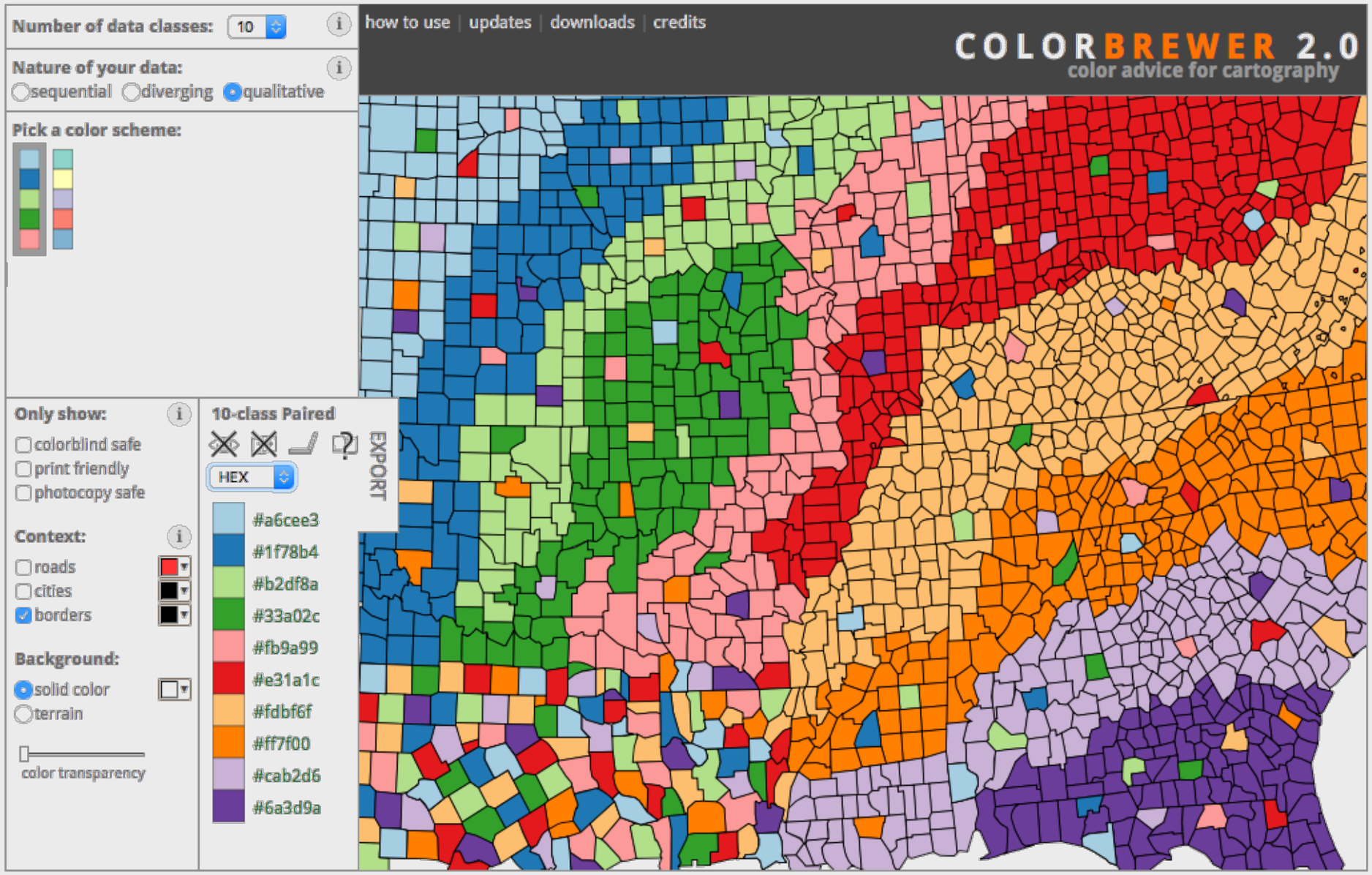
A Bayesian analysis give a complete description of reversal probability



For the science of this talk, this is ideal



Let professionals pick your colors



Support
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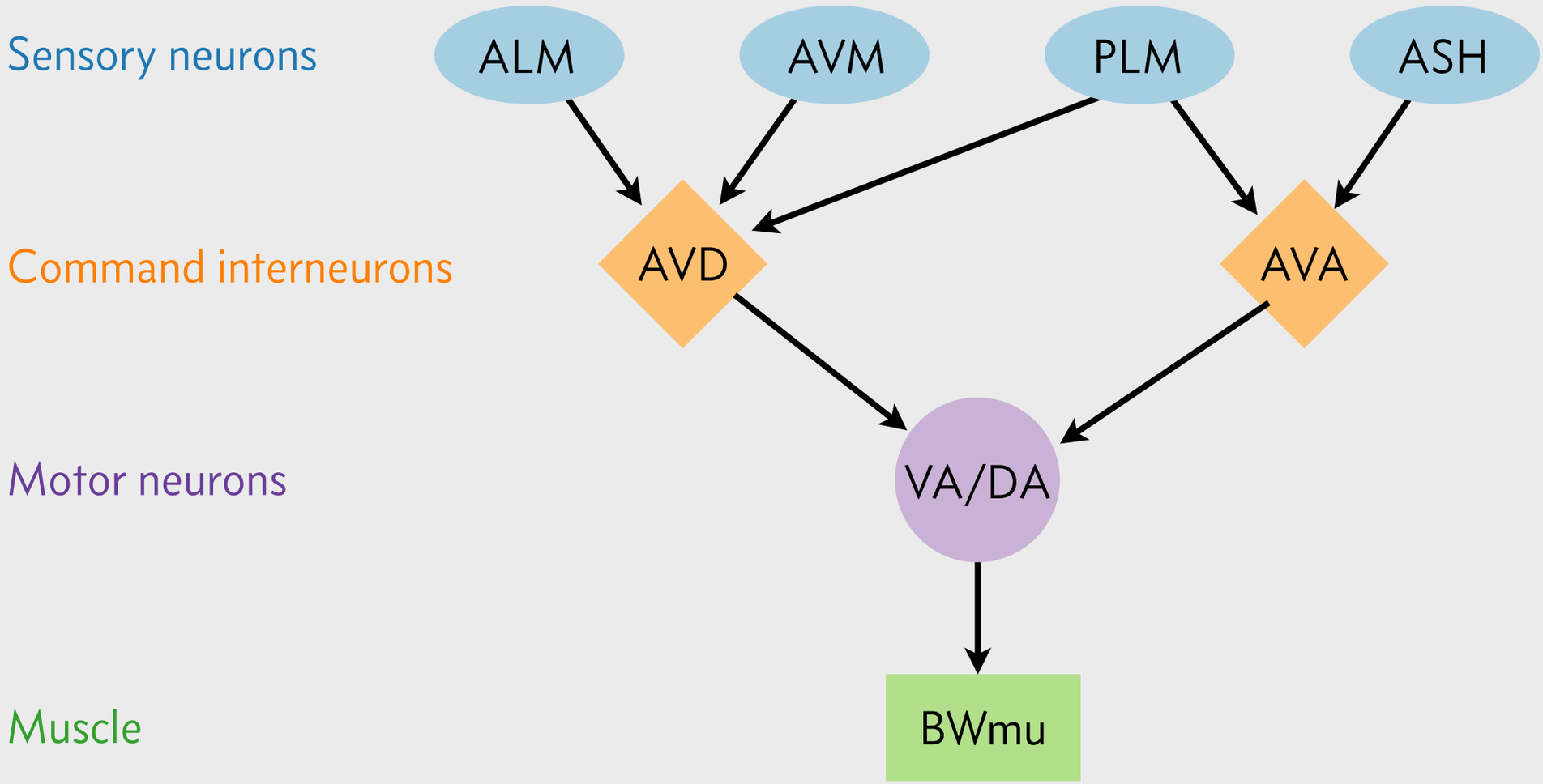
axismaps

The *C. elegans* reversal circuit is well-mapped and simple



Adapted from WormAtlas

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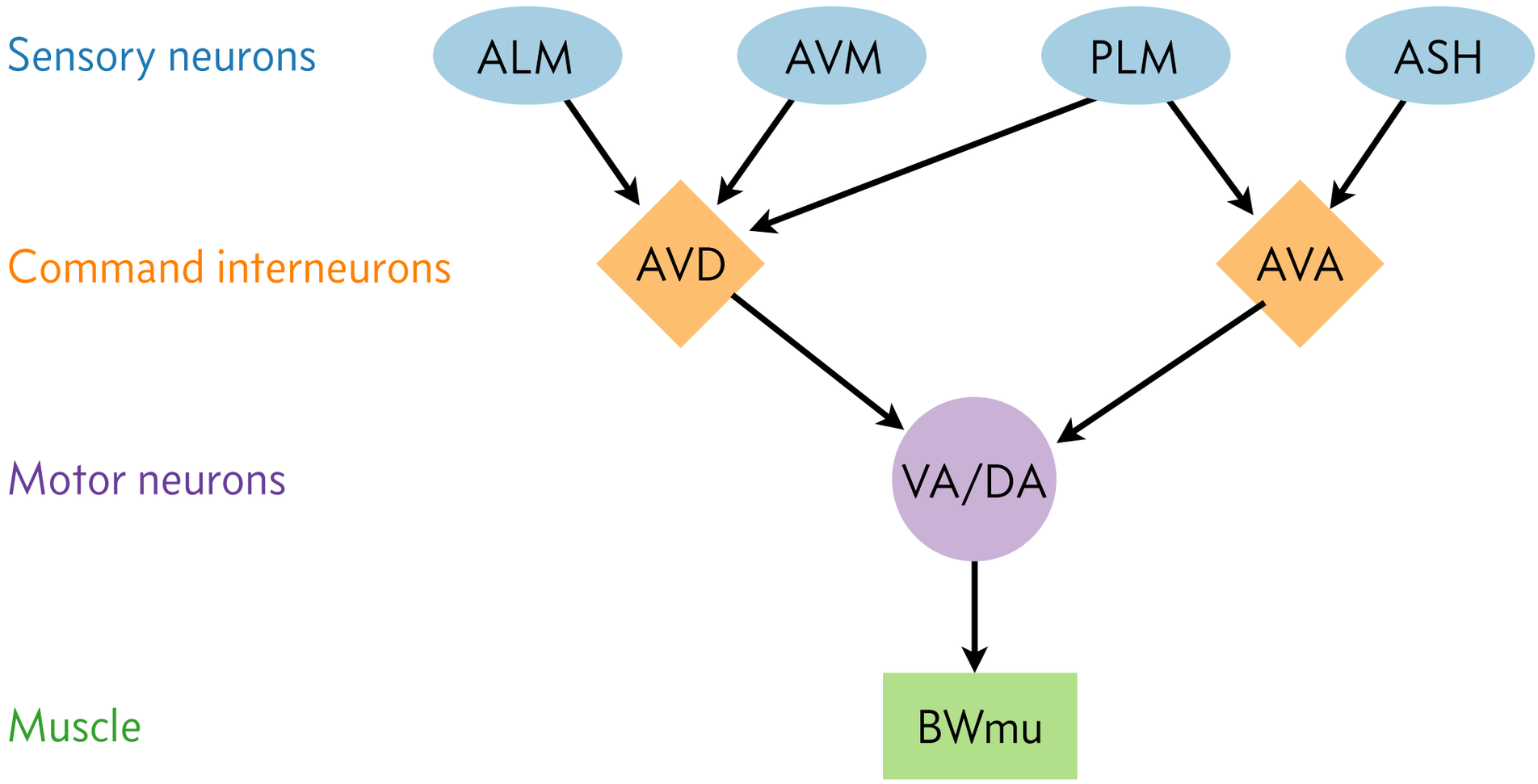
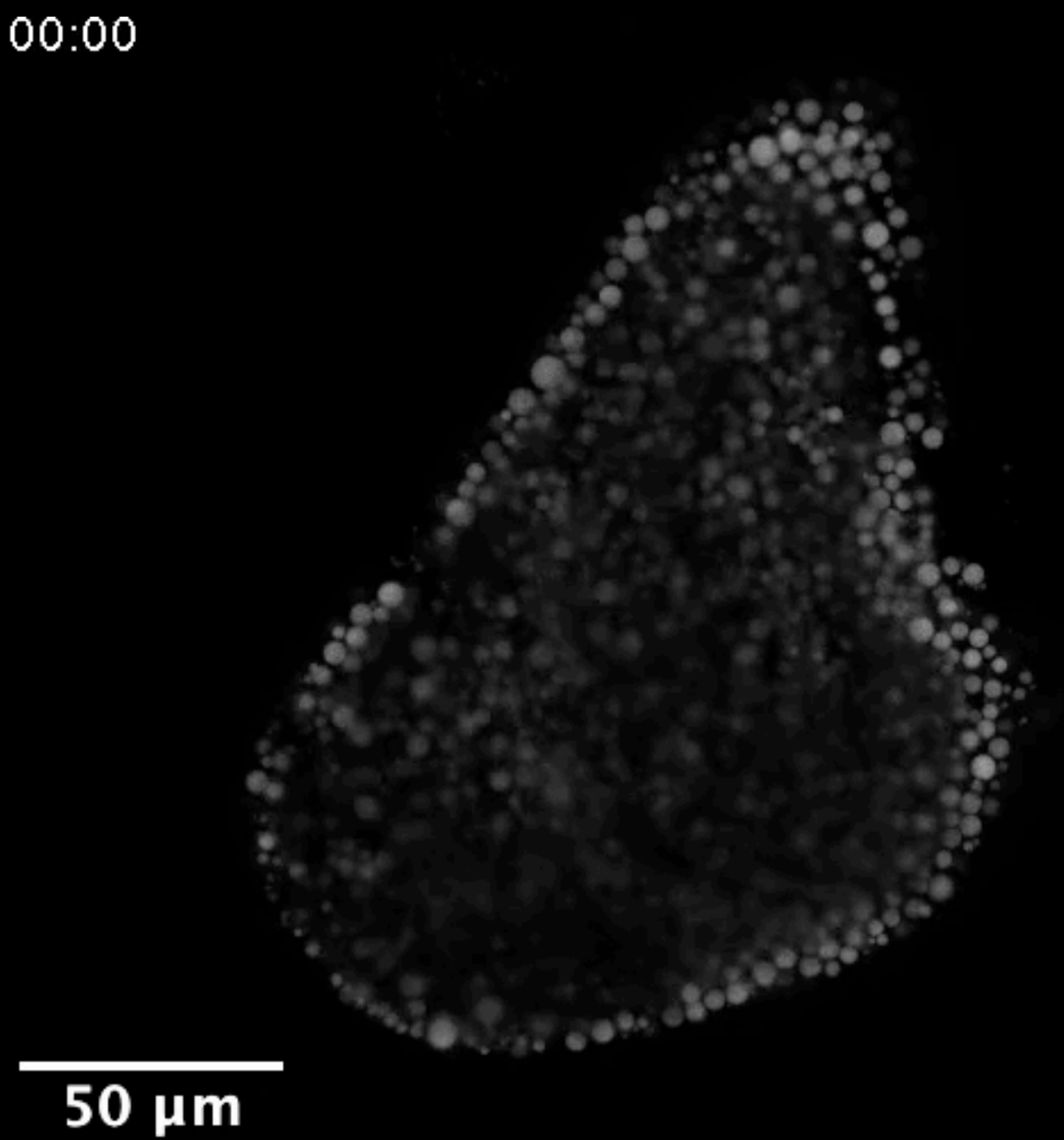


Adapted from WormAtlas

Stage 11 oocytes exhibit fast streaming



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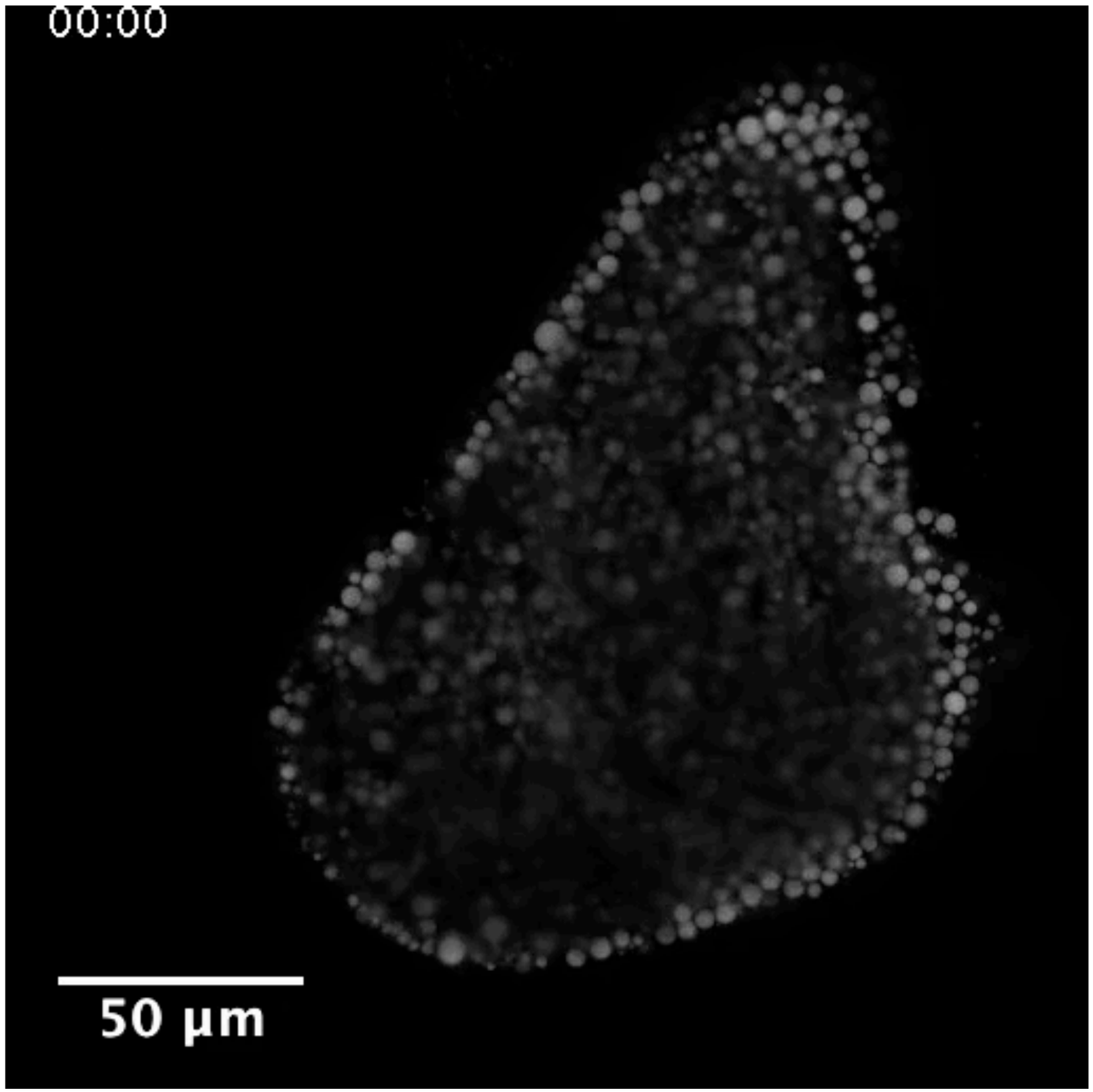


This equation is ok, but can be confusing and a little hard to read

$$P(p_{\text{rev}} \mid n, r) = \frac{P(n, r \mid p_{\text{rev}})\, P(p_{\text{rev}})}{P(n, r)}$$
$$= \frac{(n+1)!}{(n-r)!r!}\, p_{\text{rev}}^{r} (1 - p_{\text{rev}})^{n-r}$$

We use Bayes's theorem to quantify reversal probability

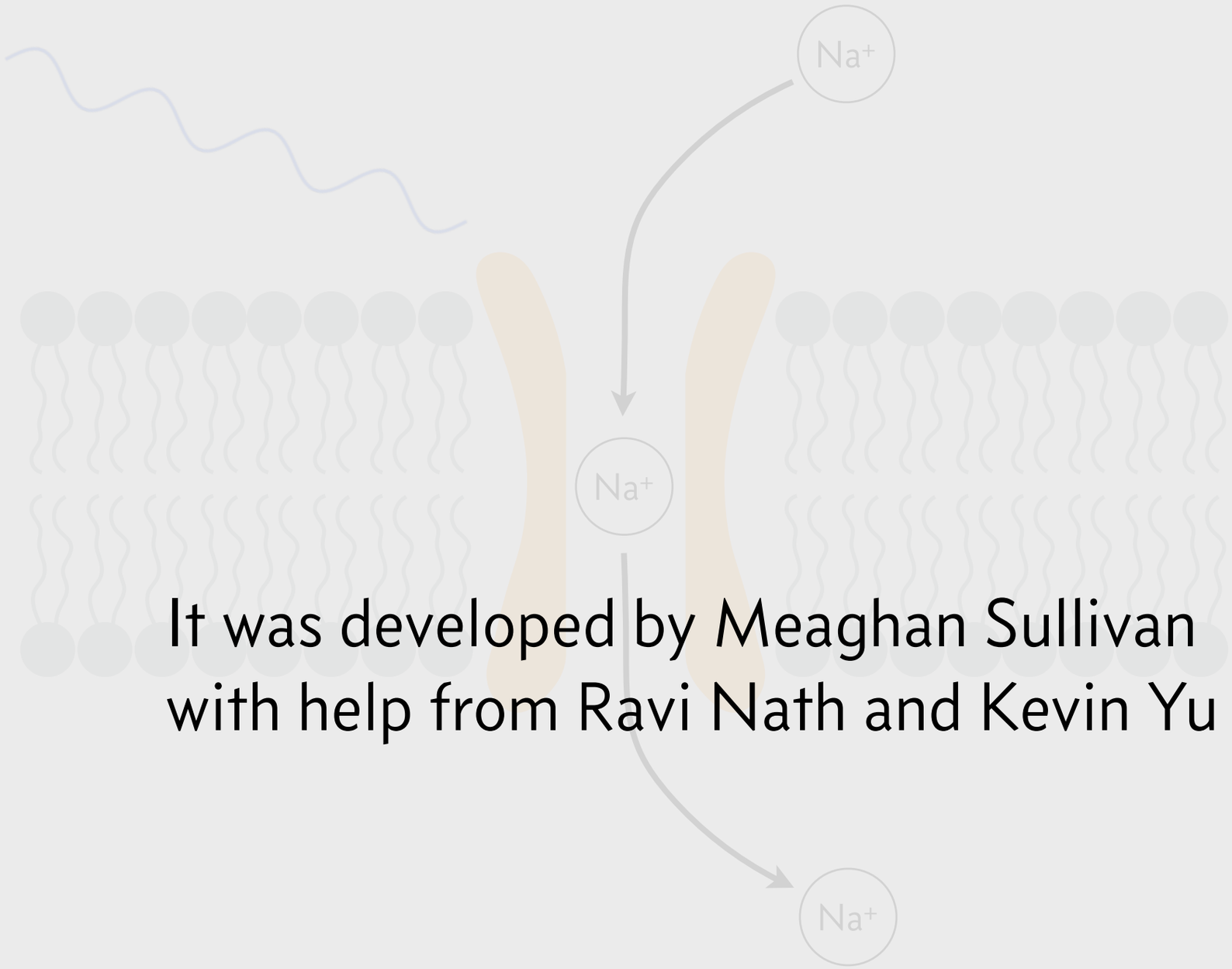
$$P(p_{\text{rev}} \mid n, r) = \frac{P(n, r \mid p_{\text{rev}})\, P(p_{\text{rev}})}{P(n, r)}$$

$$= \frac{\text{Binomial}(r \mid n, p_{\text{rev}}) \times \text{Uniform}(0, 1)}{\text{Uniform}(0, n{+}1)}$$

p_{rev} = probability of reversal
n, r = r reversals in n trials

Your Q&A slide: a simple reminder

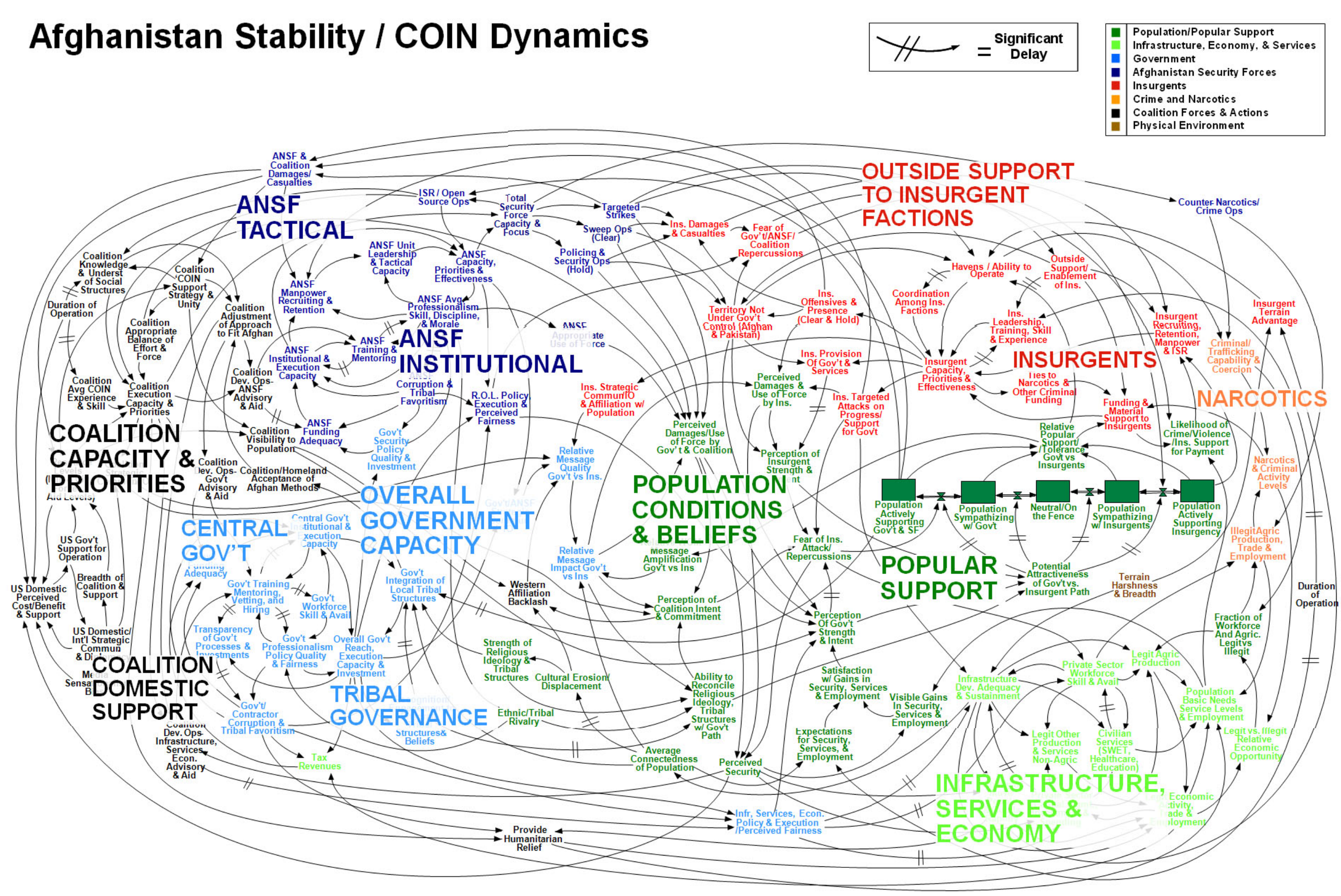
This experiment was conducted
by the students of Bi 1x 2015



It was developed by Meaghan Sullivan
with help from Ravi Nath and Kevin Yu

Why is General McChrystal so angry?

Afghanistan Stability / COIN Dynamics



WORKING DRAFT – V3

Why is General McChrystal so angry?

When we understand that slide,
we'll have won the war.

—Gen. Stanley McChrystal

Former Secretary Mattis is more blunt

PowerPoint makes us stupid.

—then-Gen. James Mattis

(paraphrased from Edward Tufte)

Jean-luc Doumont's work is an excellent resource