Effective slide design

the good, the bad, the ugly

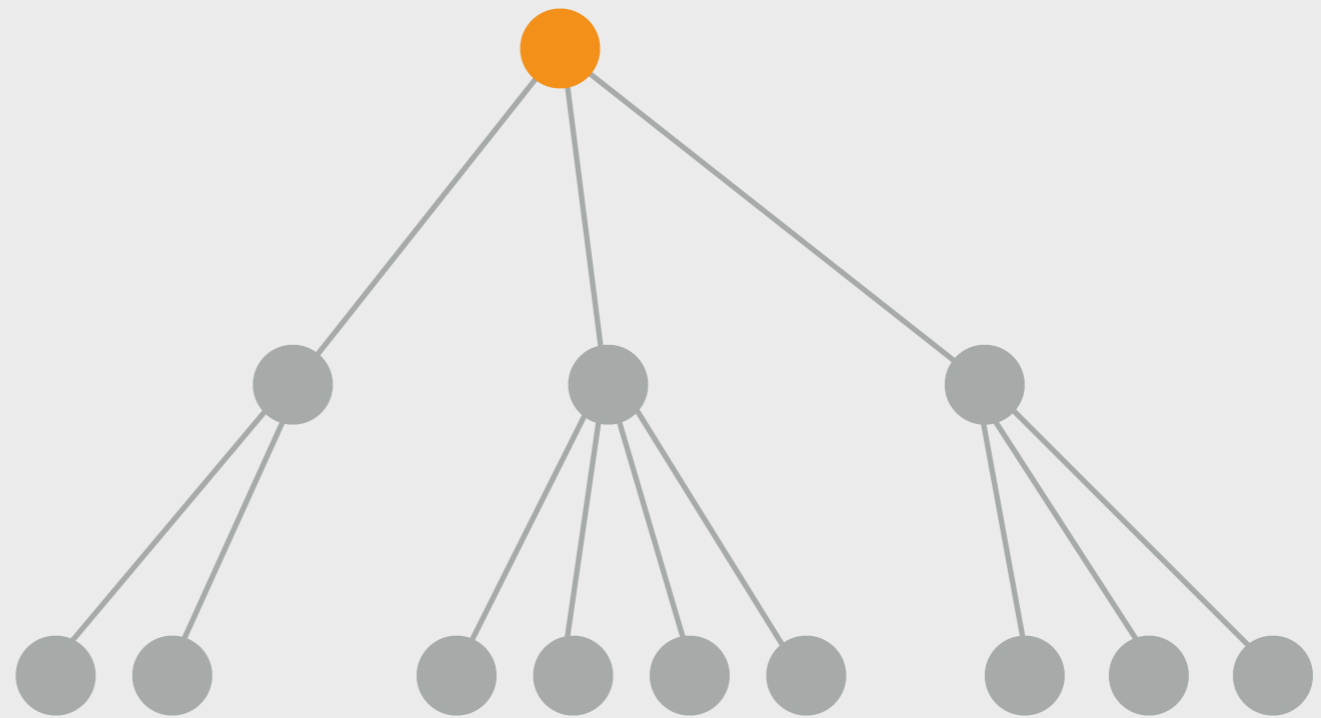Justin Bois
BE 159, Jan 31, 2018

Scientific information is often organized in a hierarchical structure

Scaling is achieved through shuttling of two BMP ligands

Main message

Main points

Subpoints

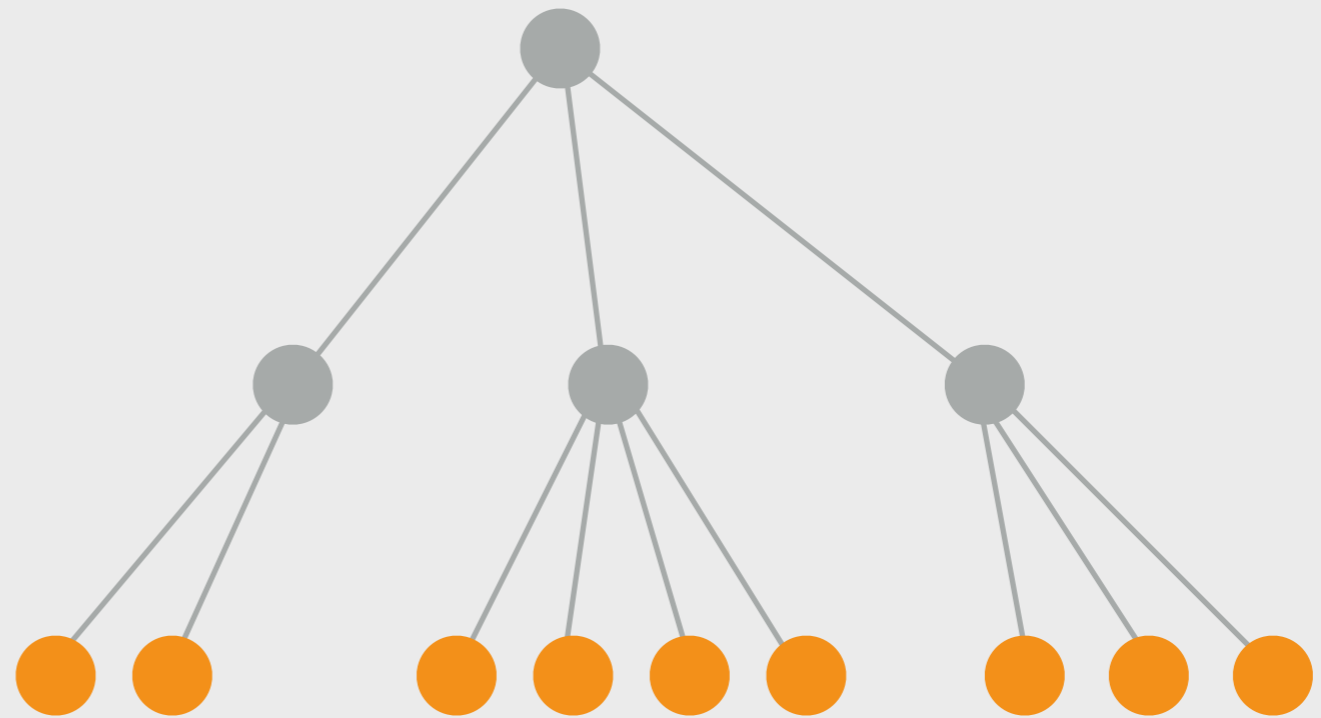# Scientific information is often organized in a hierarchical structure

Main message

Main points

shuttling is required for scaling

Two ligands are necessary

experimental evidence

Subpoints

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

- 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

Transparent!

C. elegans: an ideal organism for optogenetics

- Complete set of genetic tools
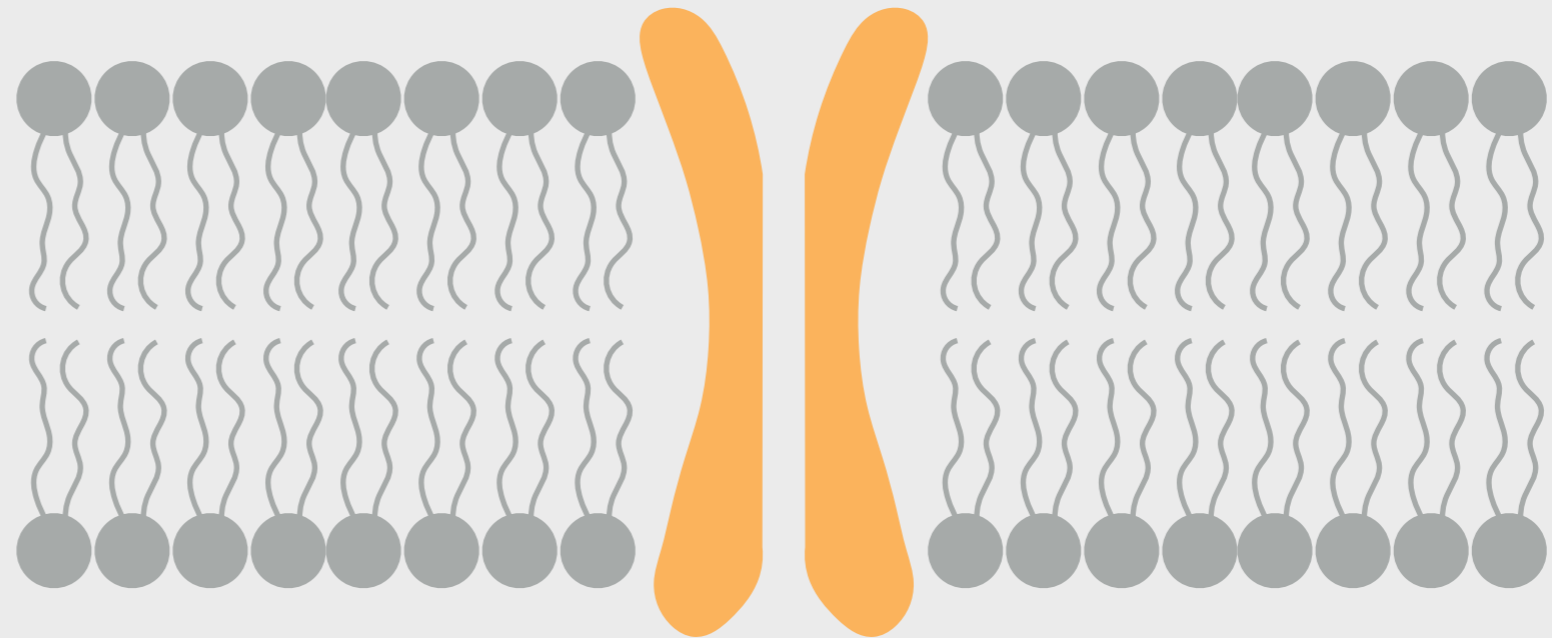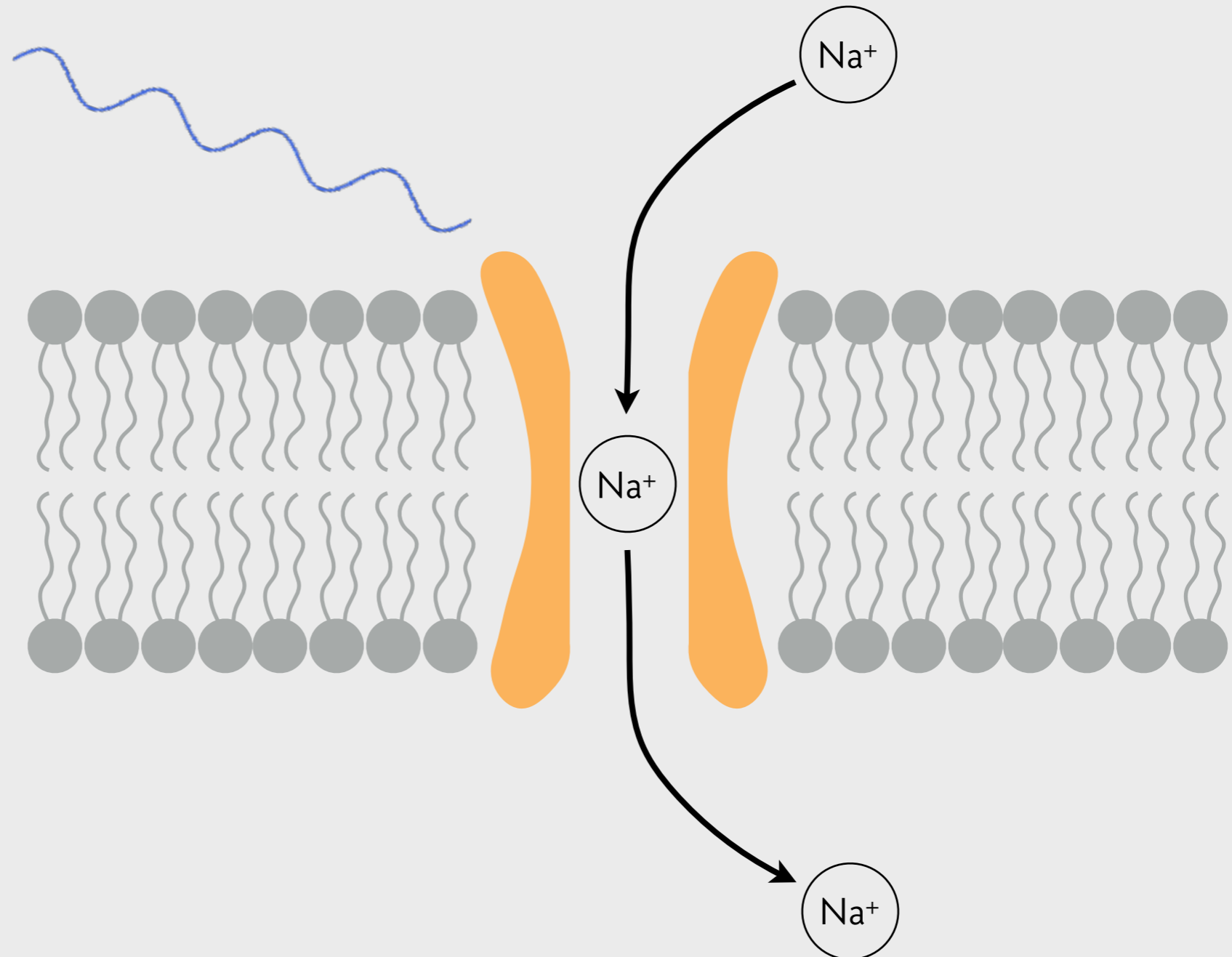
- Simple nervous system

- 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?
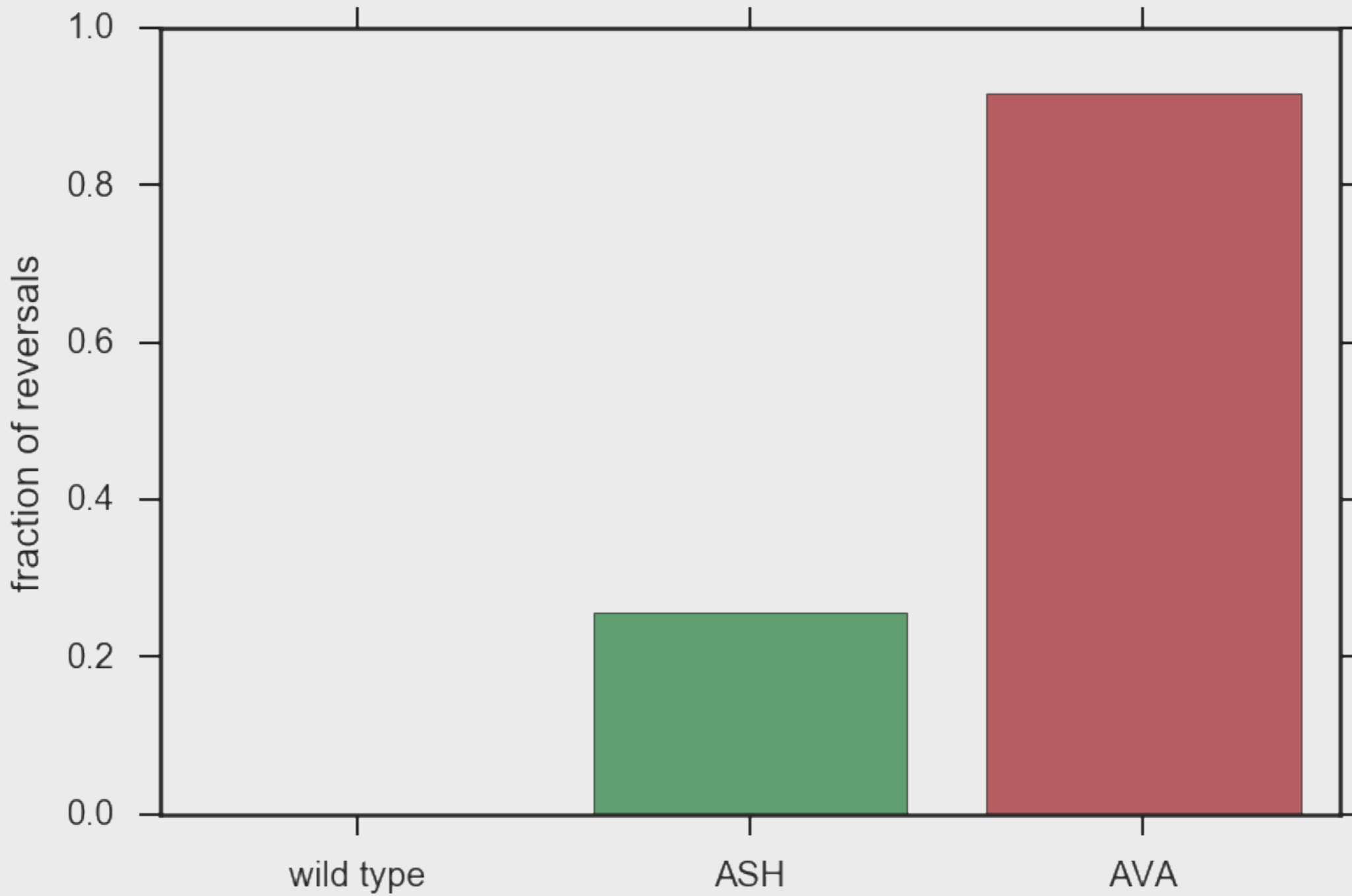
Use color sparingly to highlight

Use flat, recognizable, sparse graphics

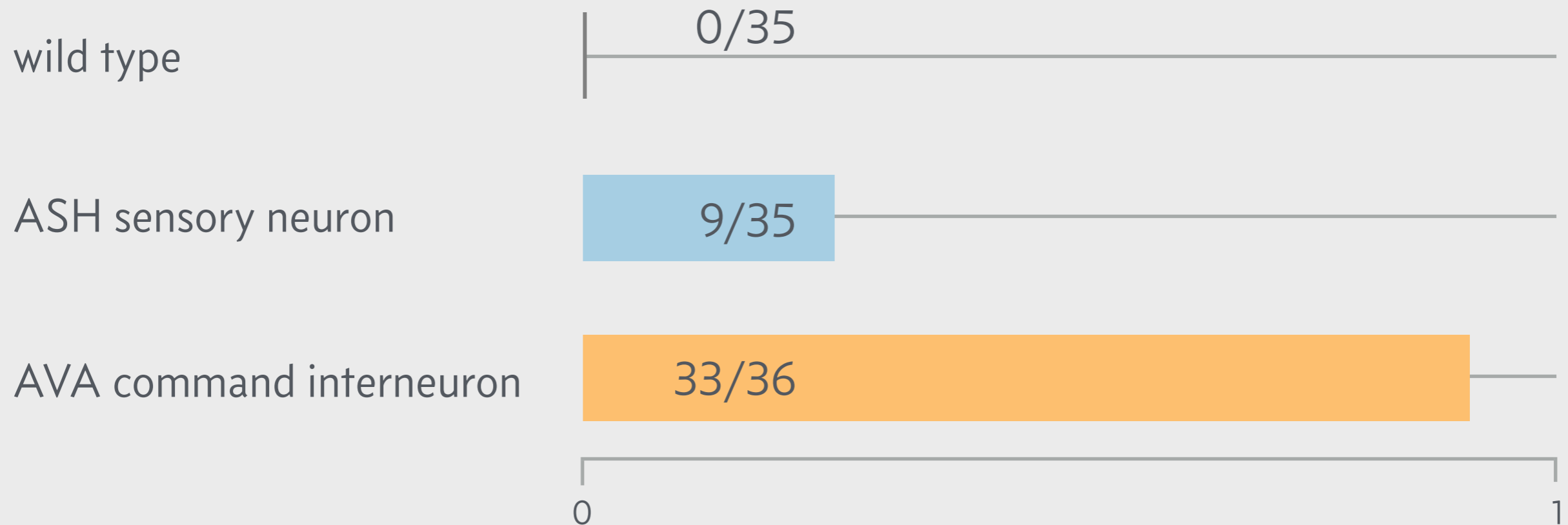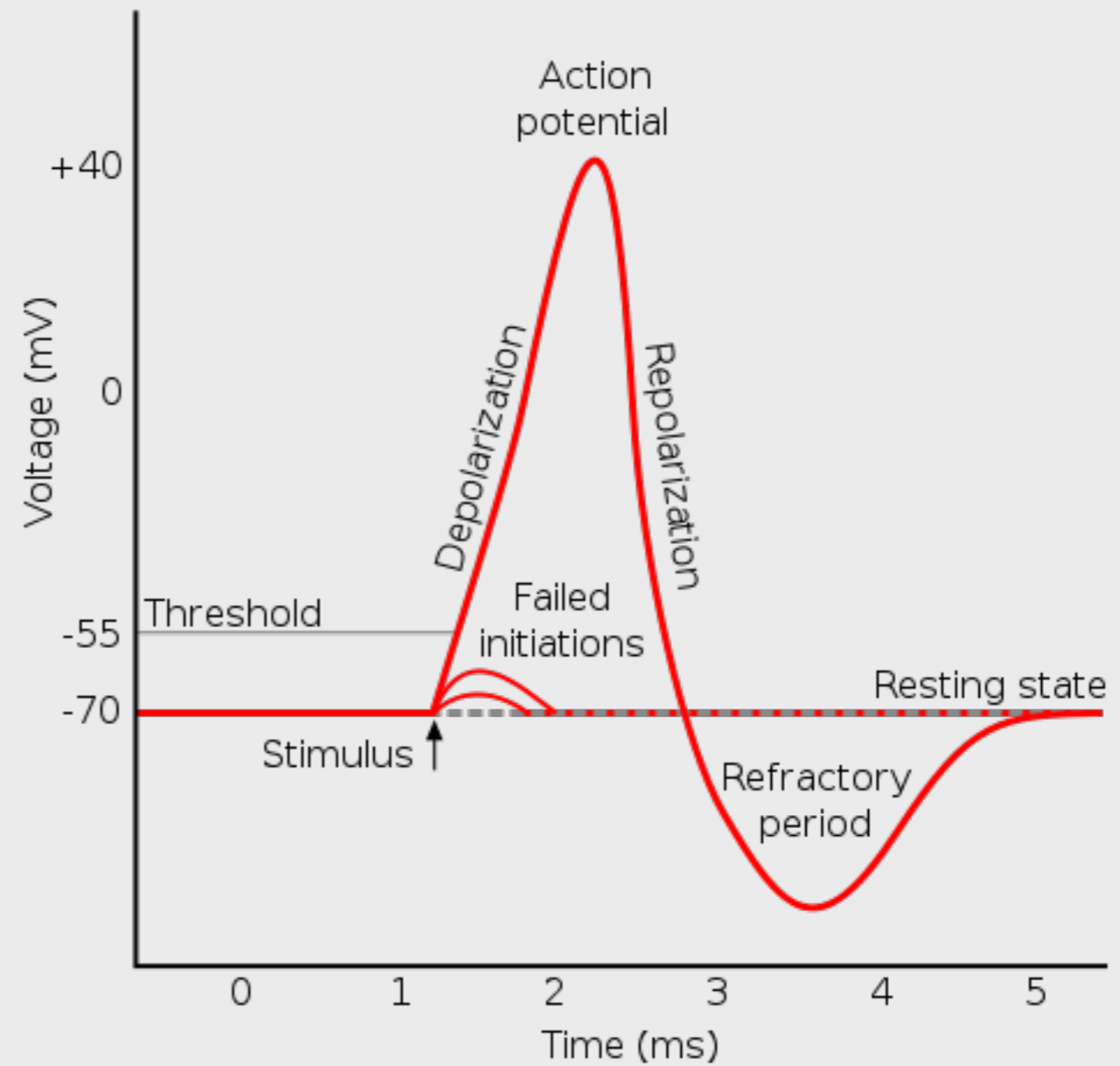# Citations should be small,
just legible without strain

Oka, et al., *Nature*, 2015

This is a bad bar chart

The command interneuron
shows the strongest response

Fraction of reversals

wild type	0/35
ASH sensory neuron	9/35
AVA command interneuron	33/36

0   1

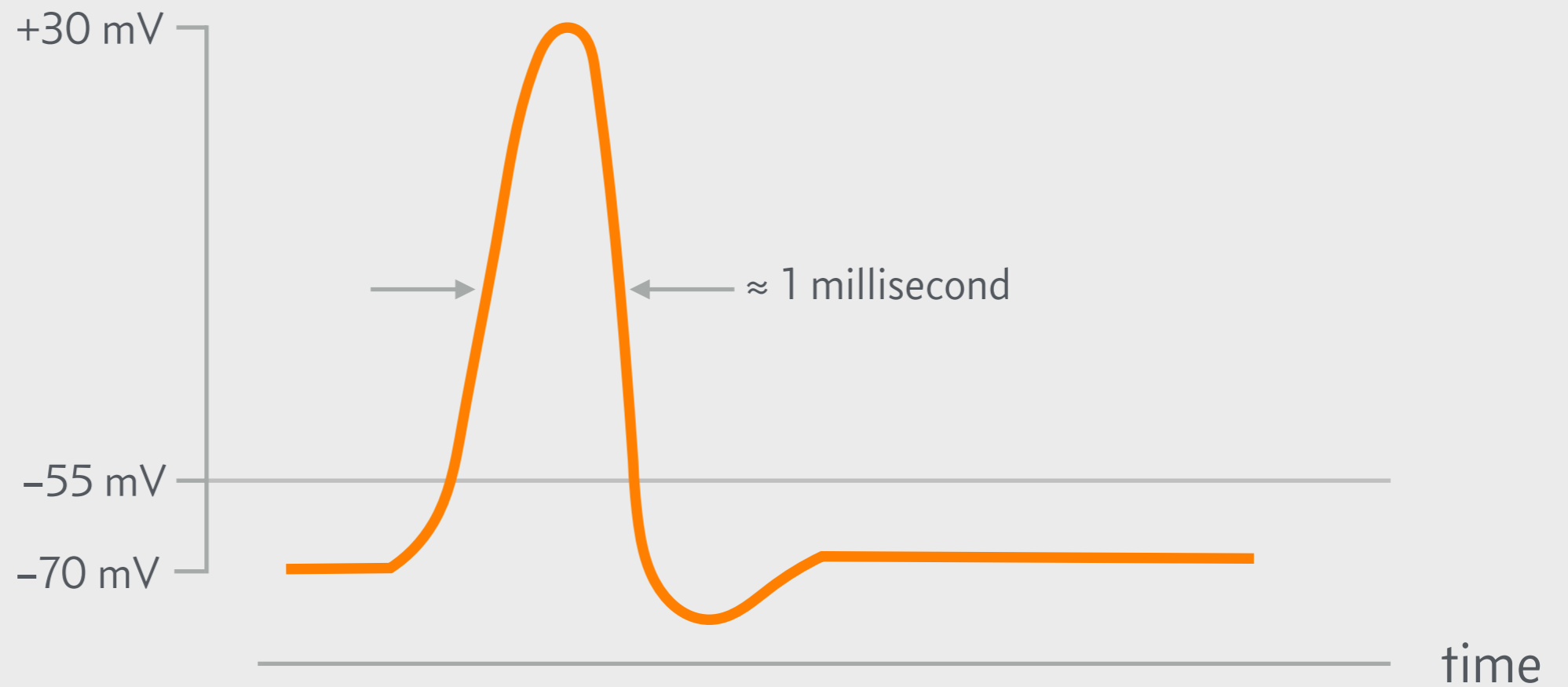# This is a bad schematic of an action potential

Induced charge difference mimics an action potential
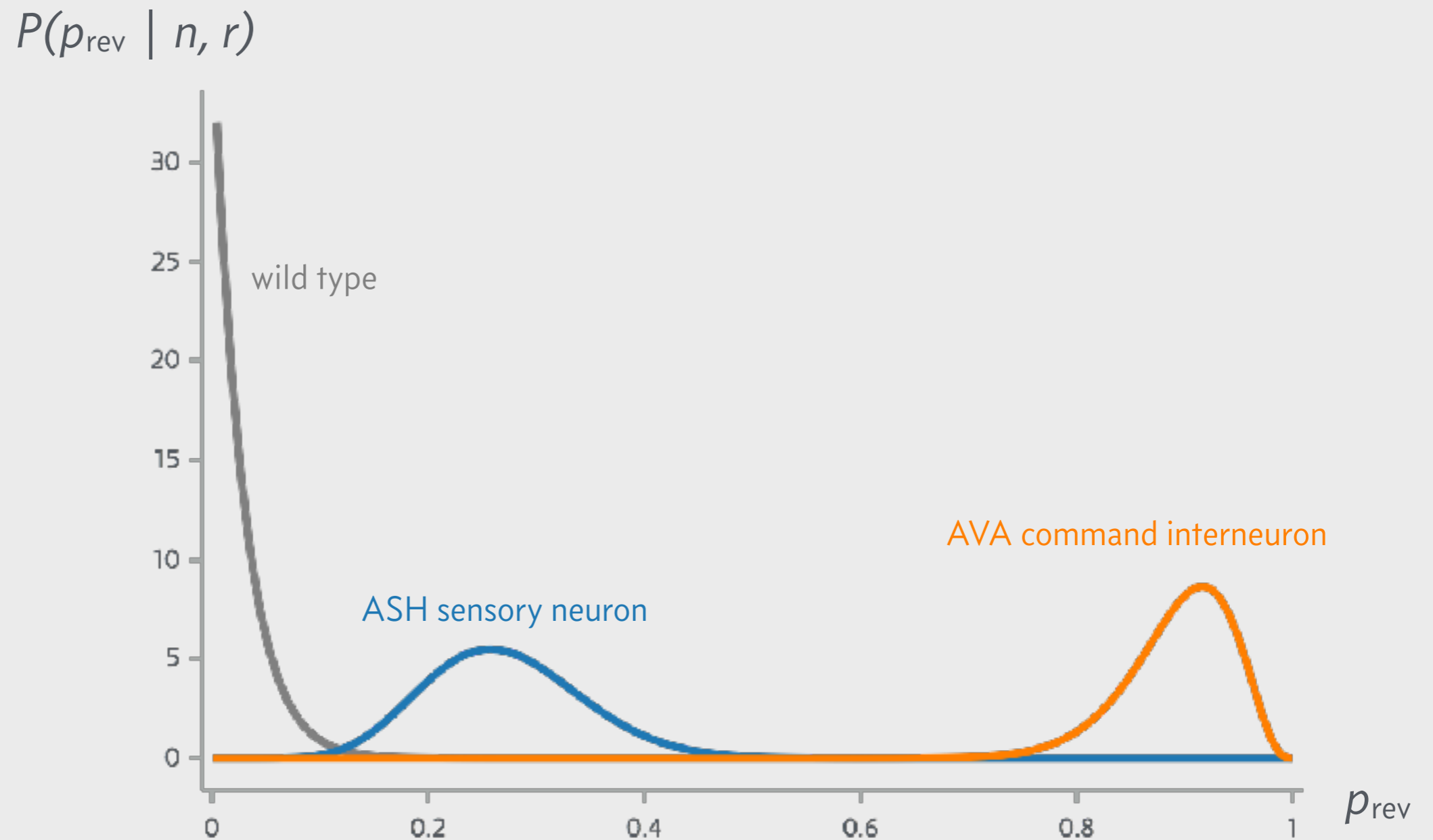
membrane potential

+30 mV

≈ 1 millisecond

−55 mV

−70 mV

time

This is an ugly, noisy plot
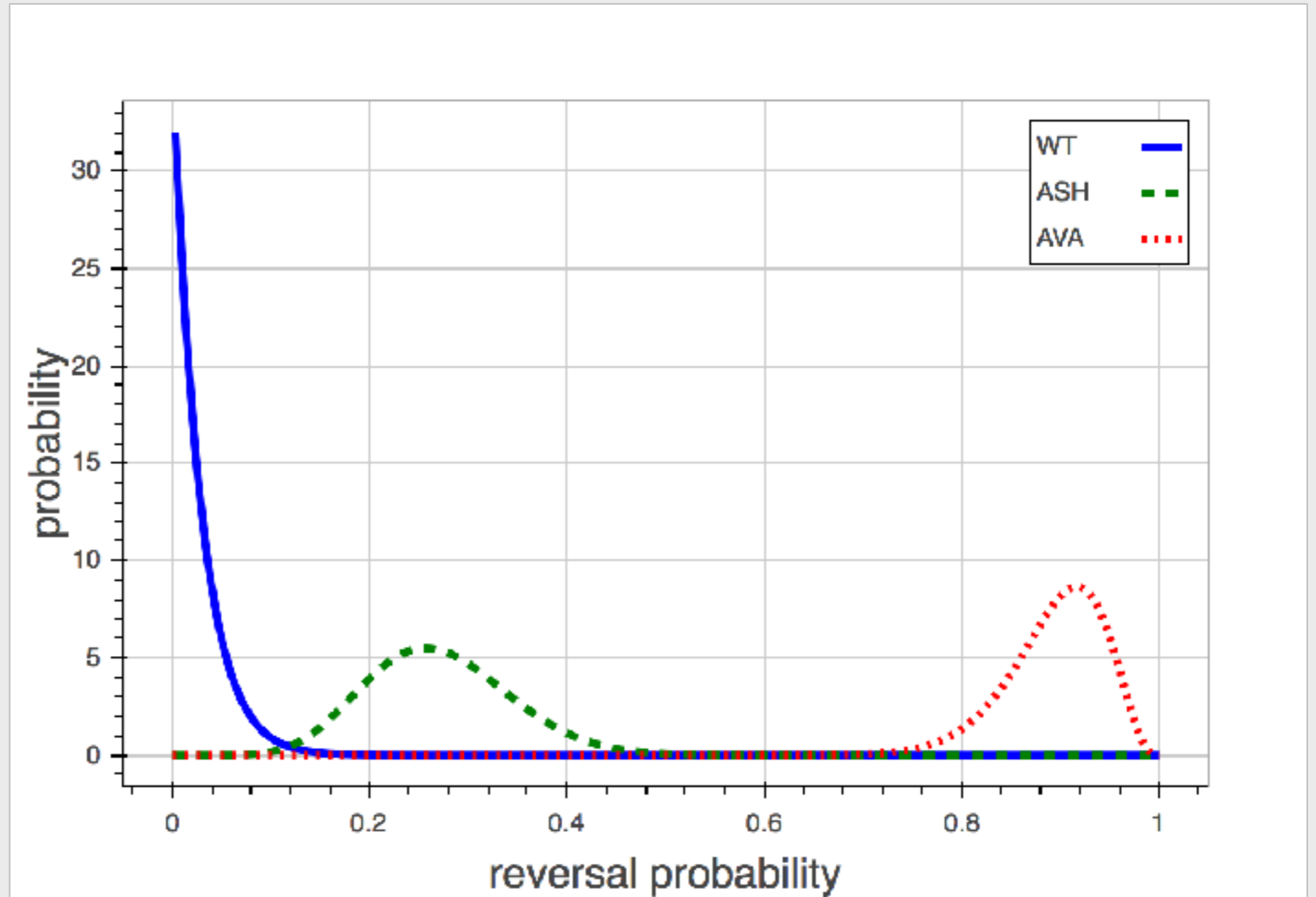
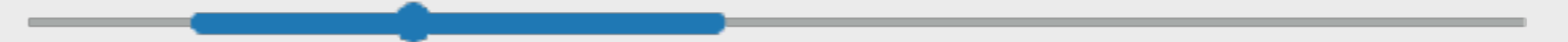# A Bayesian analysis give a complete description of reversal probability

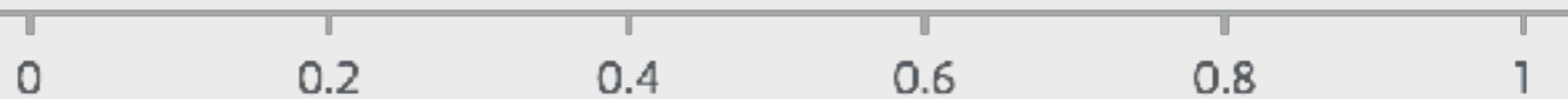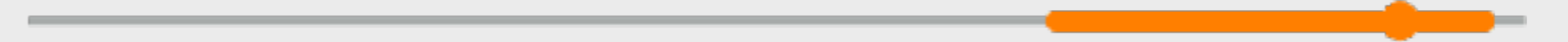# For the science of this talk, this is ideal

Probability of reversal

wild type

ASH sensory neuron

AVA command interneuron

0   0.2   0.4   0.6   0.8   1

Let professionals pick your colors
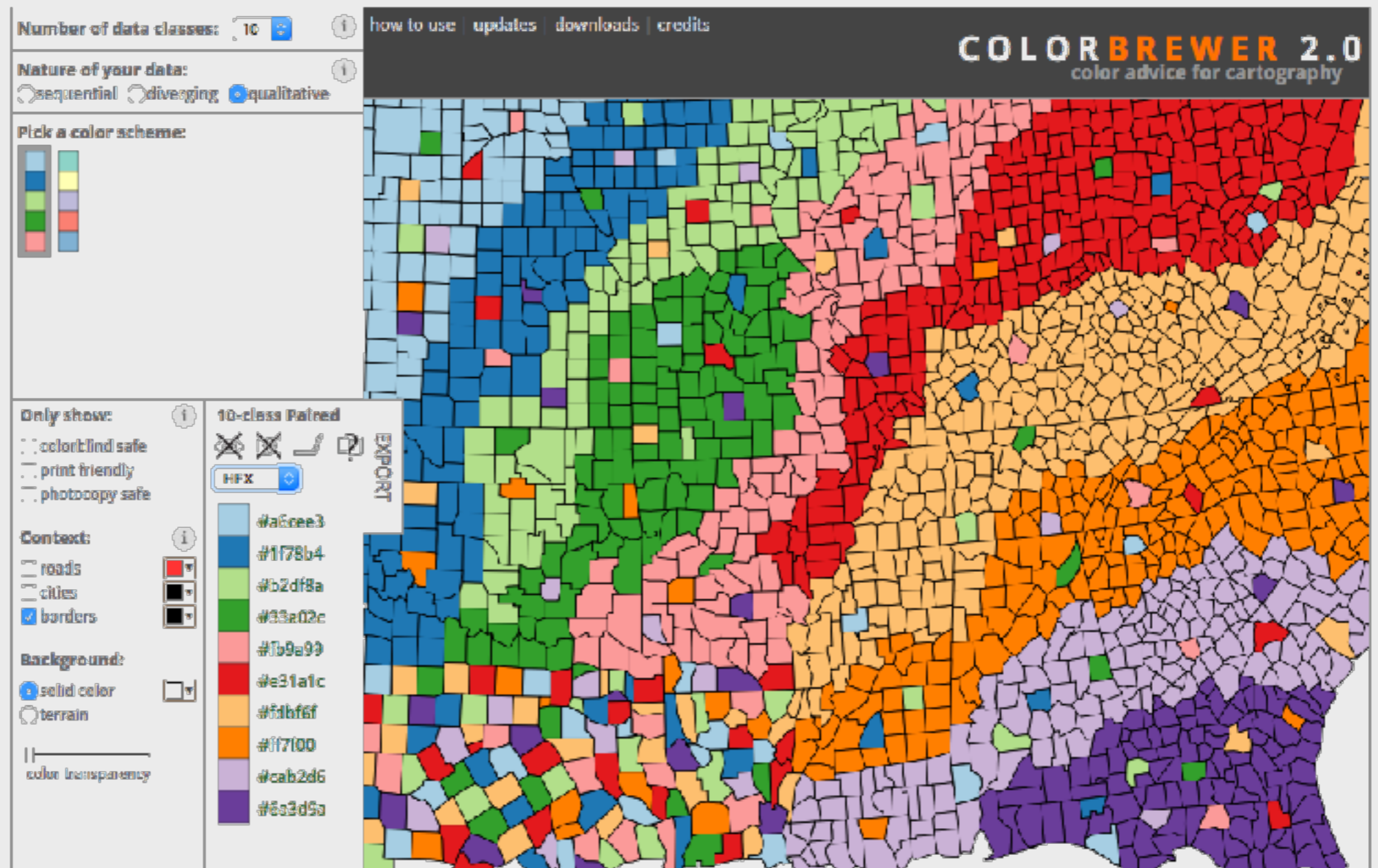
The *C. elegans* reversal circuit is well-mapped and simple
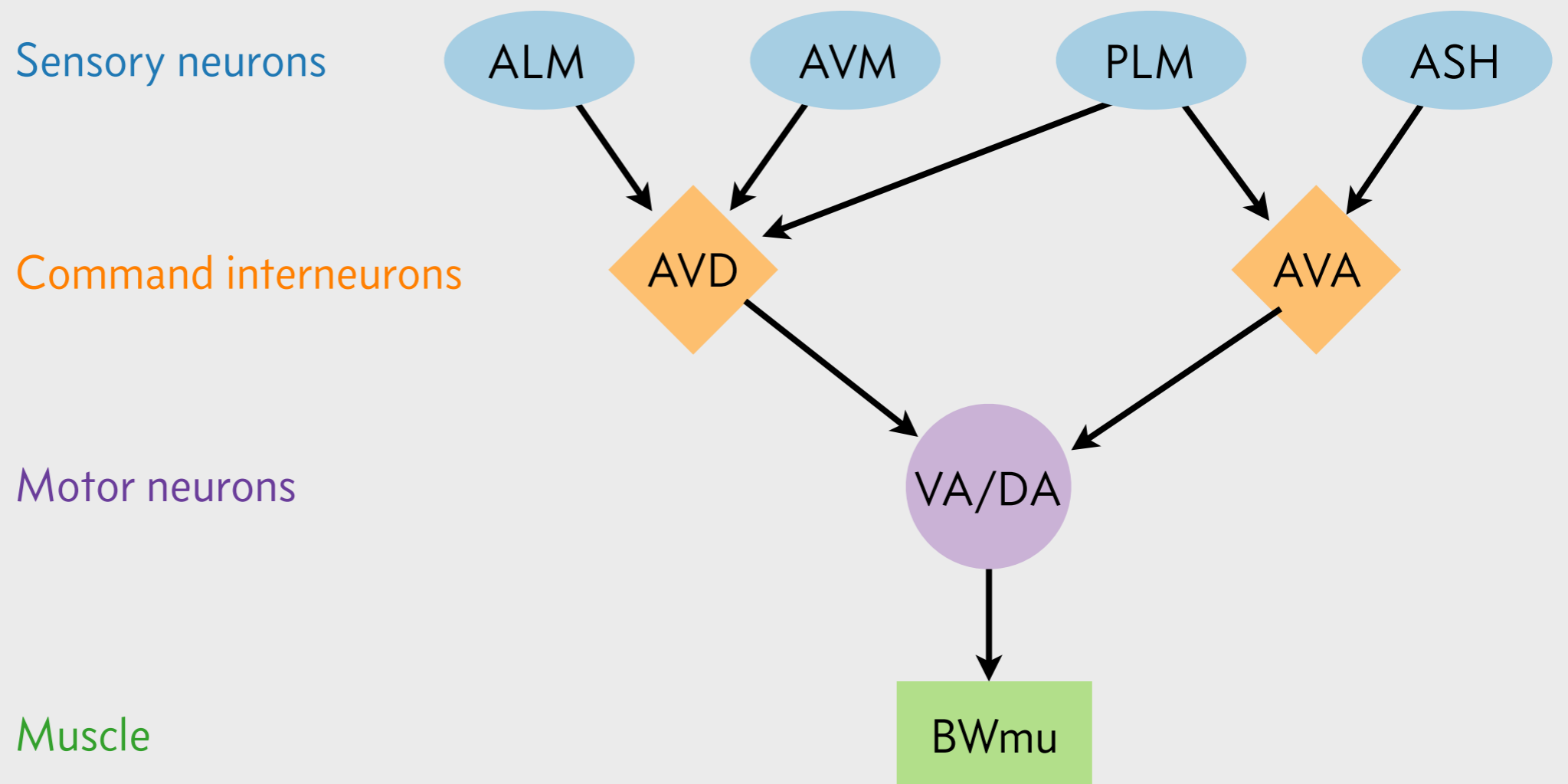
Sensory neurons

ALM AVM PLM ASH

Command interneurons

AVD AVA

Motor neurons

VA/DA

Muscle

BWmu

Adapted from WormAtlas

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

Sensory neurons

ALM   AVM   PLM   ASH

Command interneurons

AVD   AVA

Motor neurons

VA/DA

Muscle

BWmu

Adapted from WormAtlas
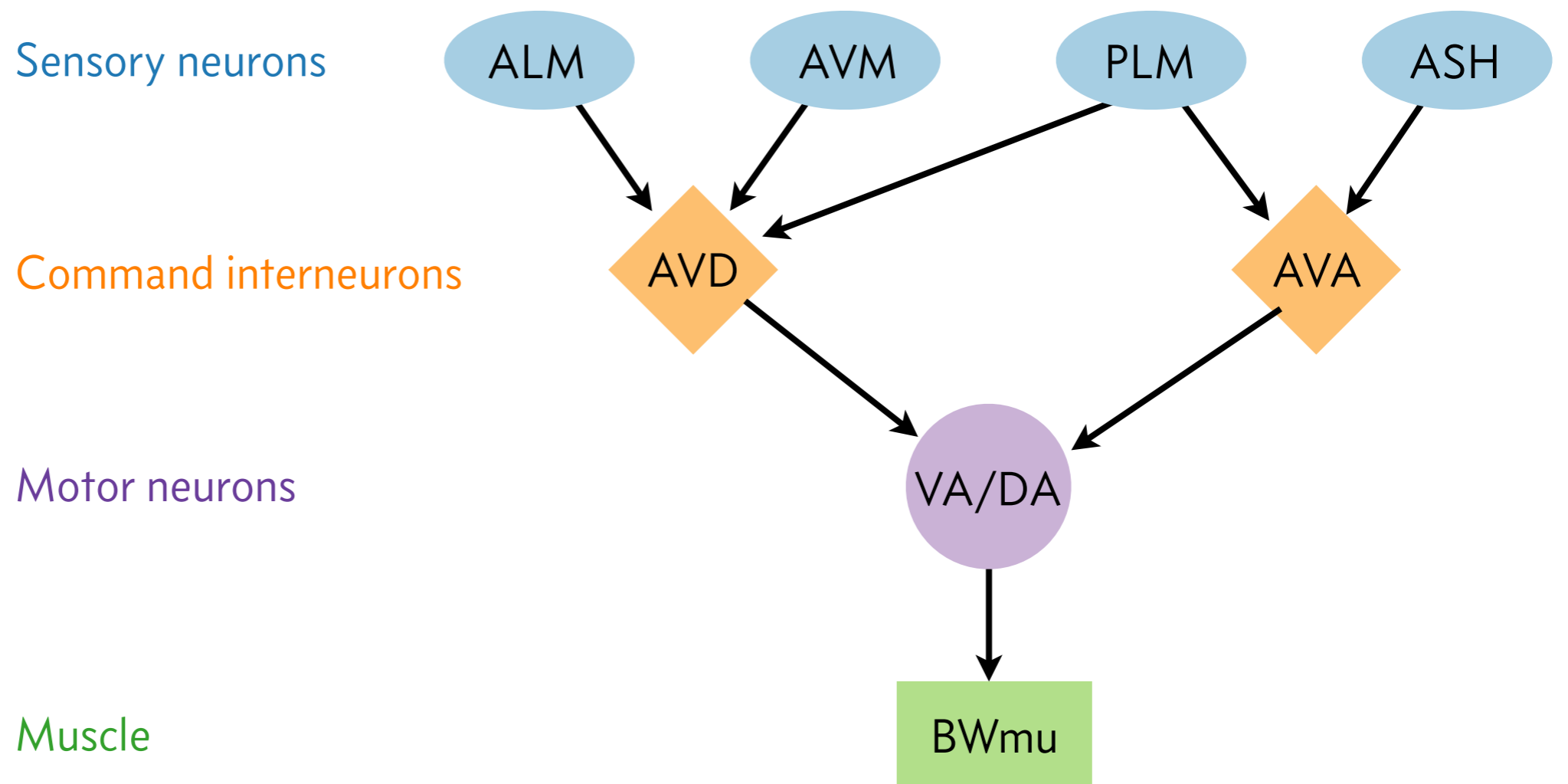
Stage 11 oocytes exhibit fast streaming

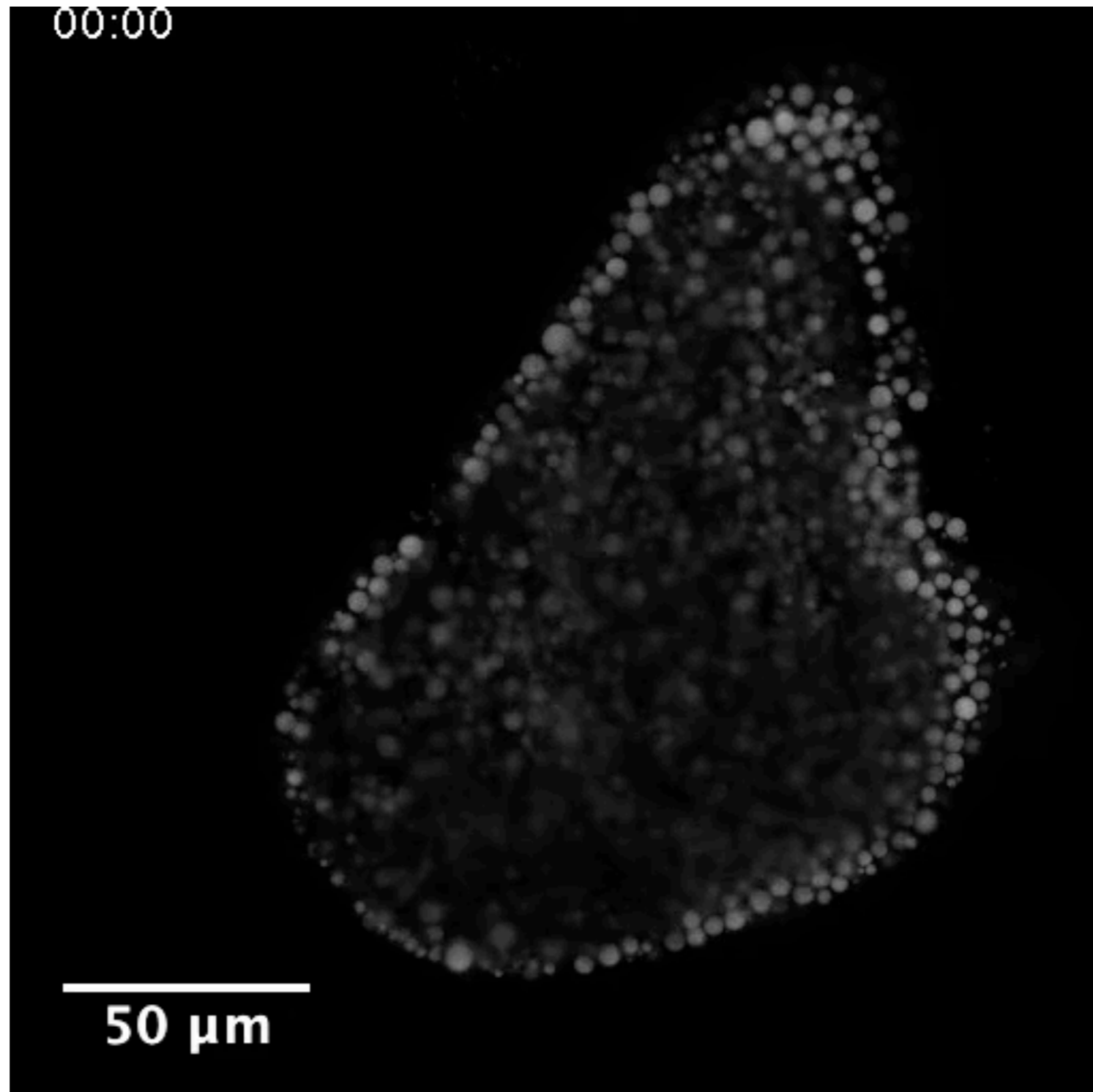00:00
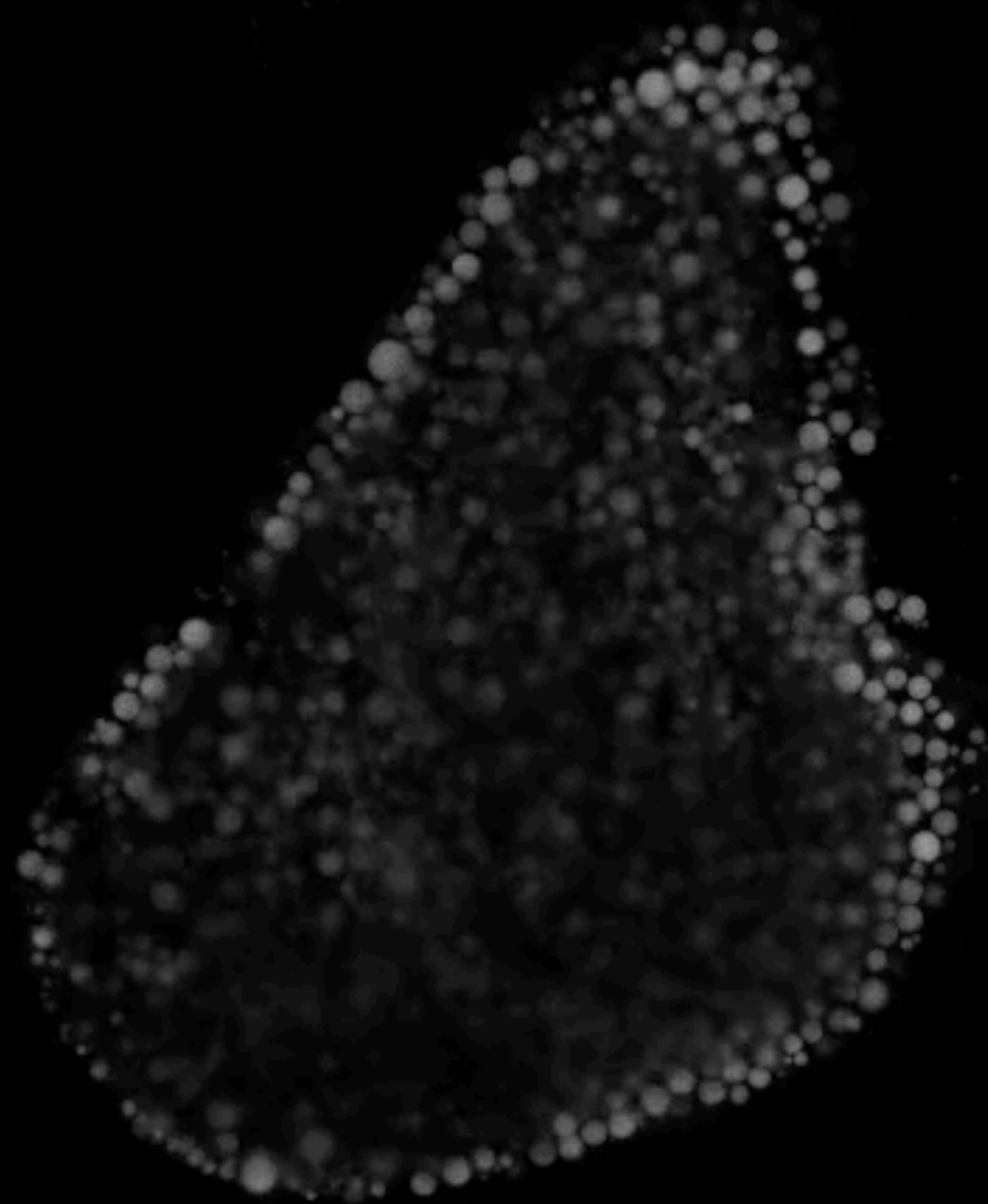
50 μm

Stage 11 oocytes exhibit fast streaming

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

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

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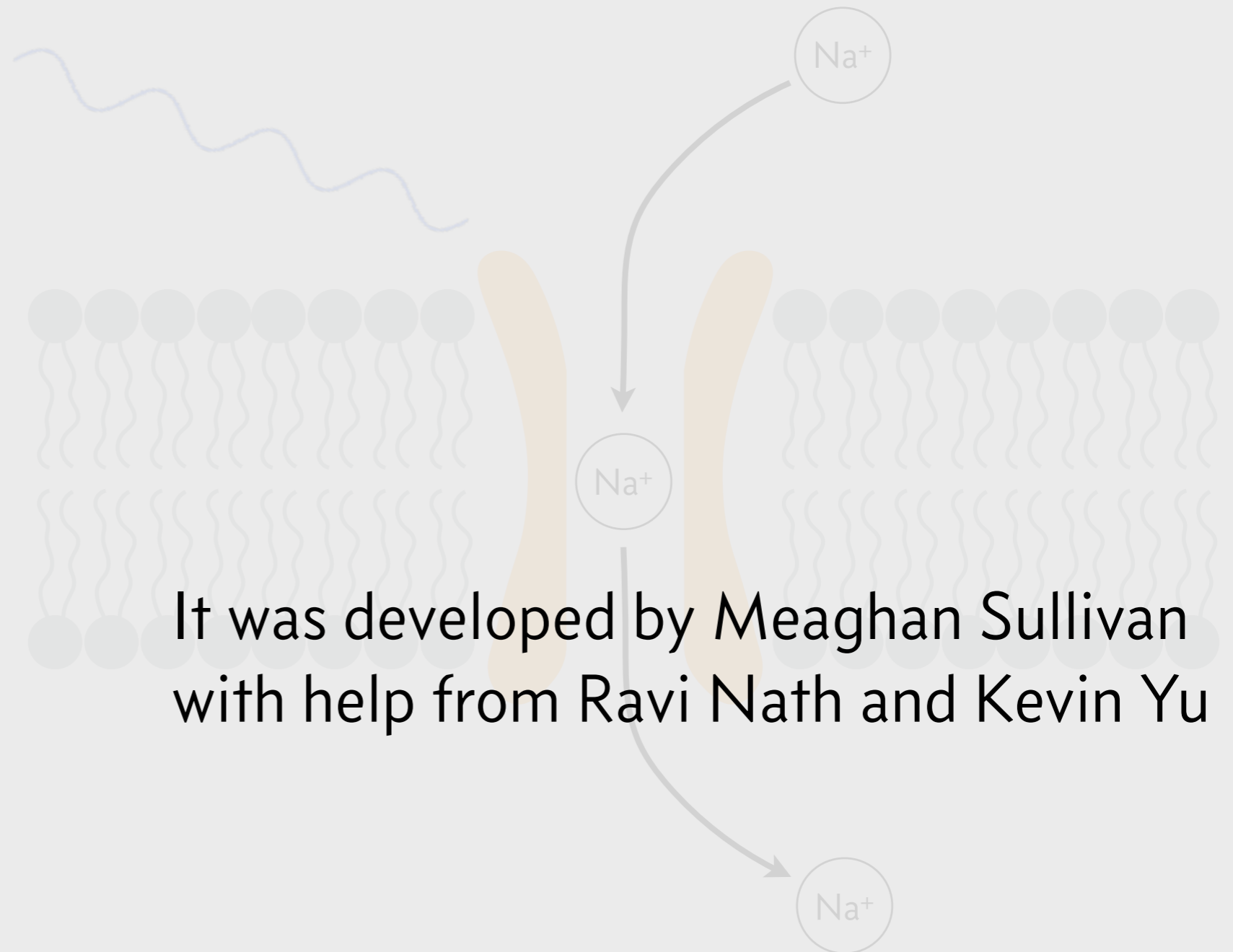
$p_{\text{rev}} = $ probability of reversal

$n, r = r$ 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

Legend:
- Population/Popular Support
- Infrastructure, Economy, & Services
- Government
- Afghanistan Security Forces
- Insurgents
- Crime and Narcotics
- Coalition Forces & Actions
- Physical Environment

// = Significant Delay

WORKING DRAFT – V3

Why is General McChrystal so angry?

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

—Gen. Stanley McChrystal

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