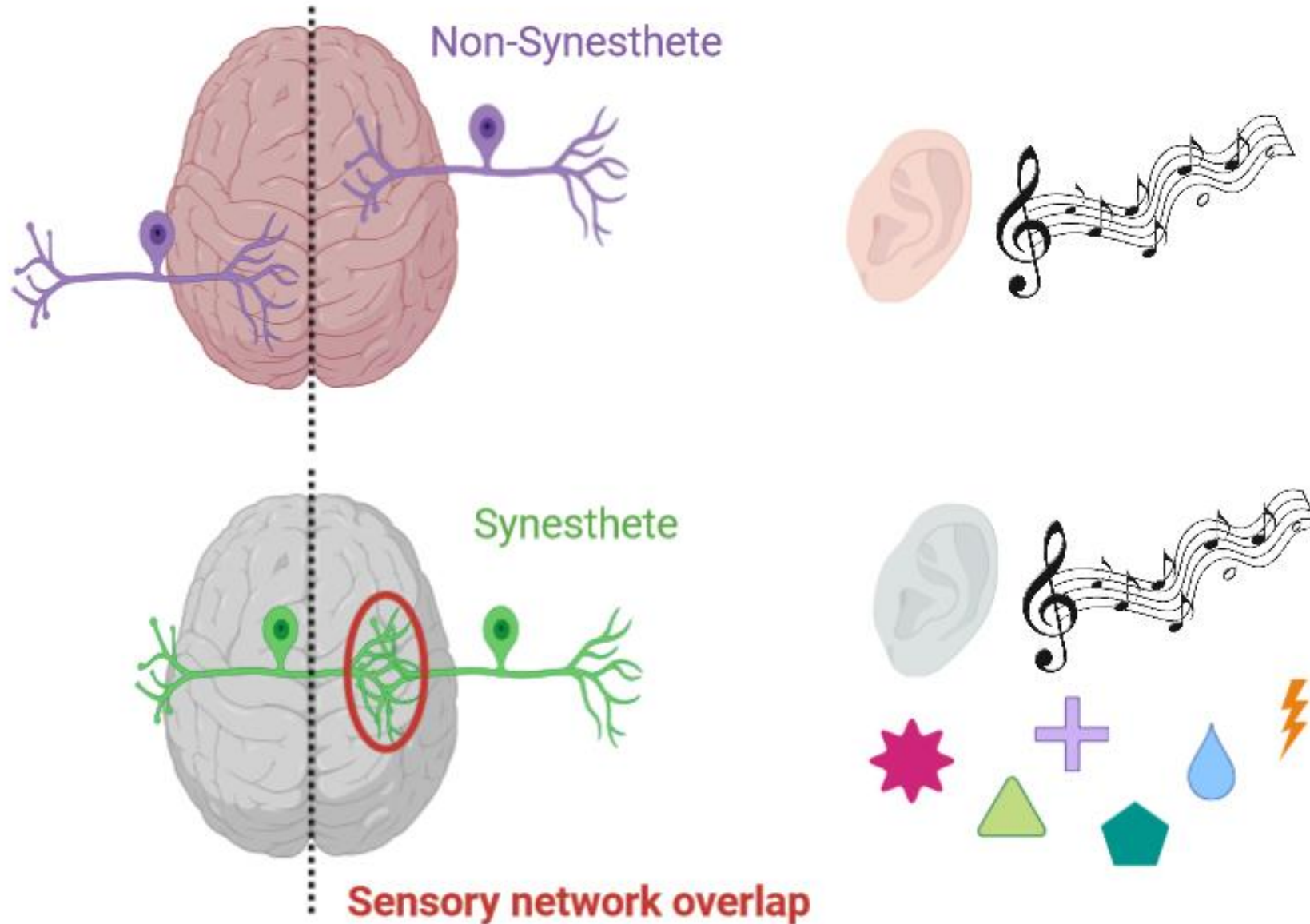


An abstract painting featuring a dense, textured composition of vibrant colors. The palette includes bright yellows, oranges, pinks, purples, blues, and greens, all rendered with thick, expressive brushstrokes. The overall effect is one of intense energy and sensory richness, characteristic of synesthesia.

# Synesthesia

Olivia Steidl

# What is synesthesia?



# What do synesthetes experience?

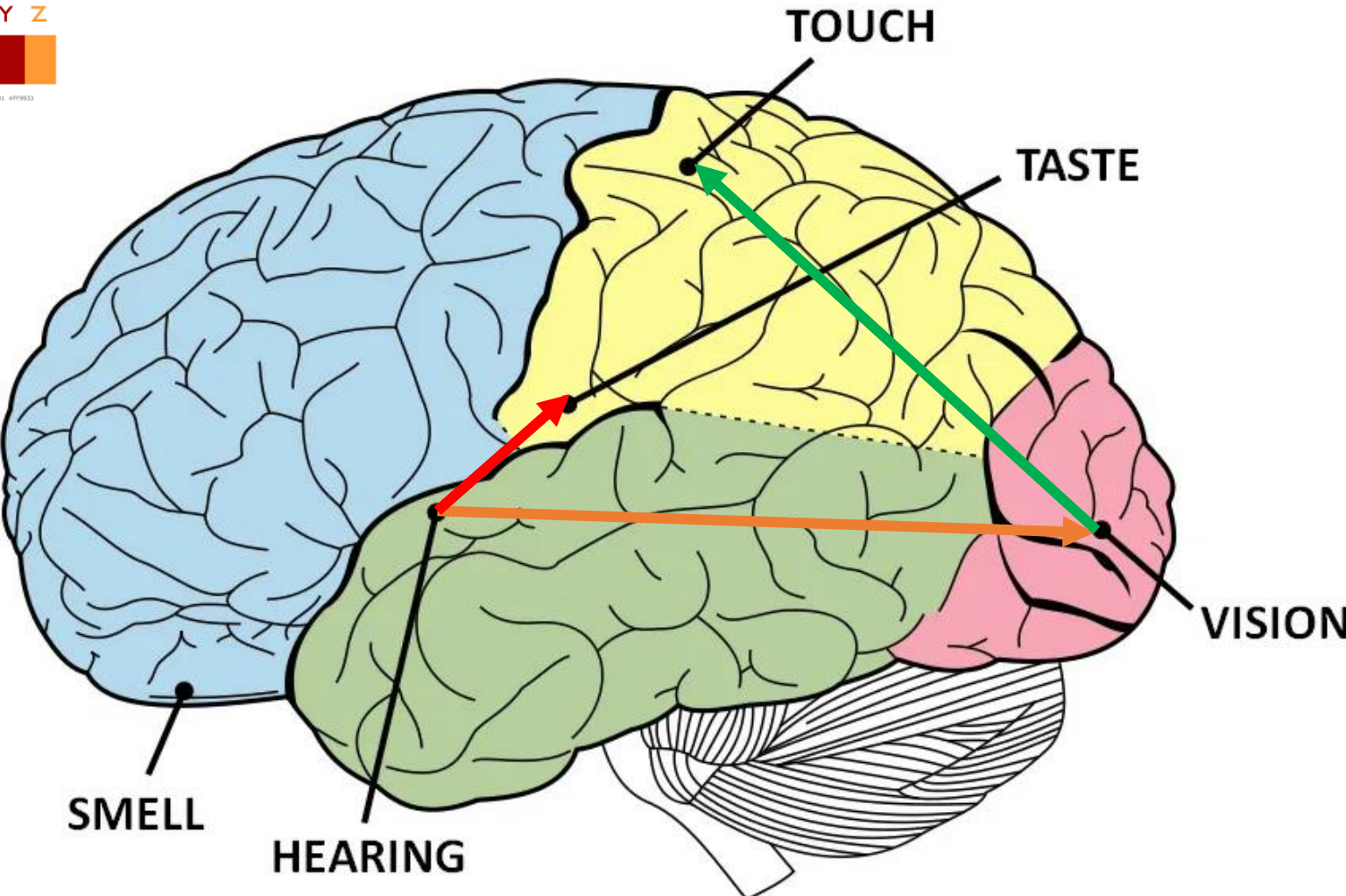


Grapheme-color

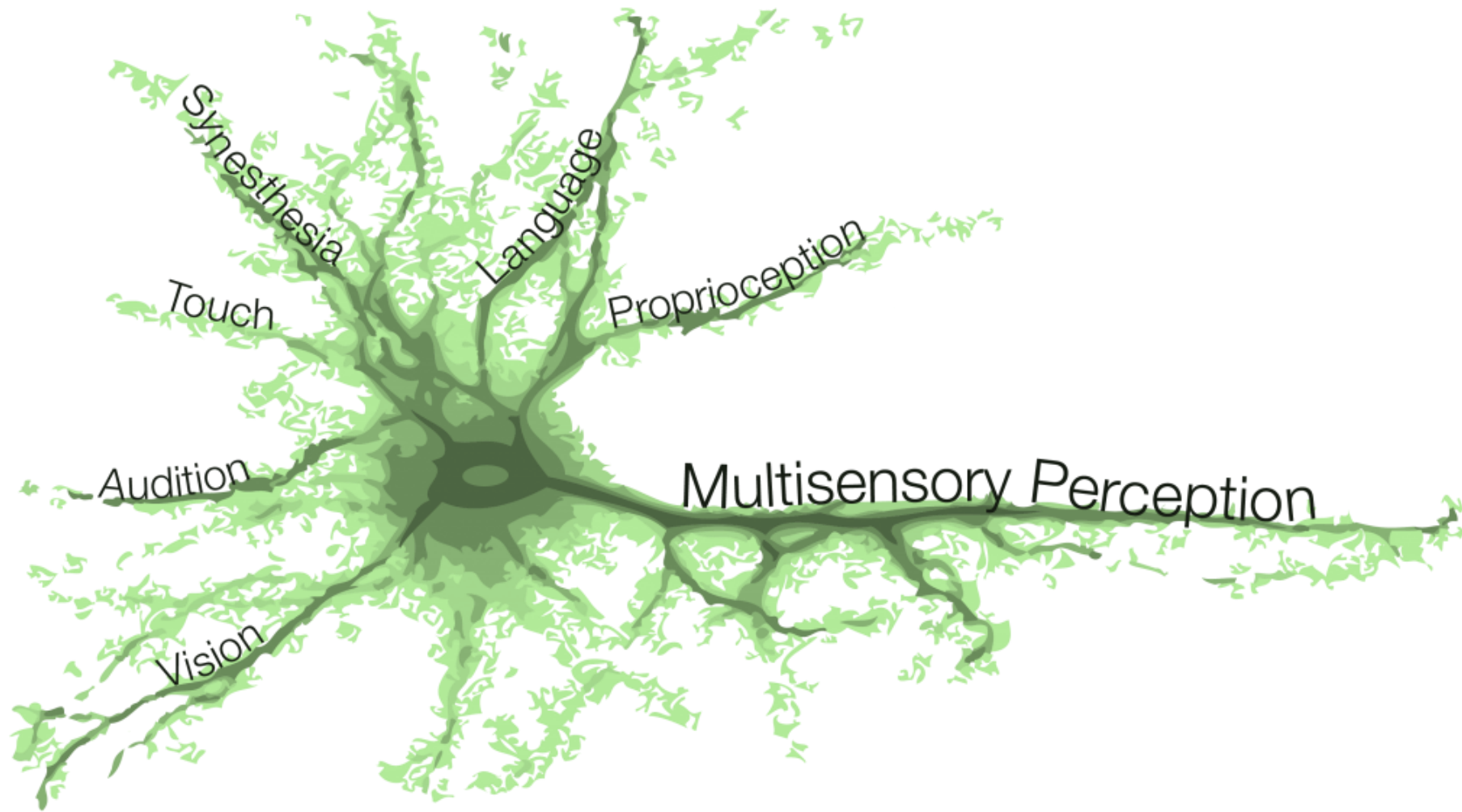
Chromesthesia

Mirror-touch

Lexical-gustatory

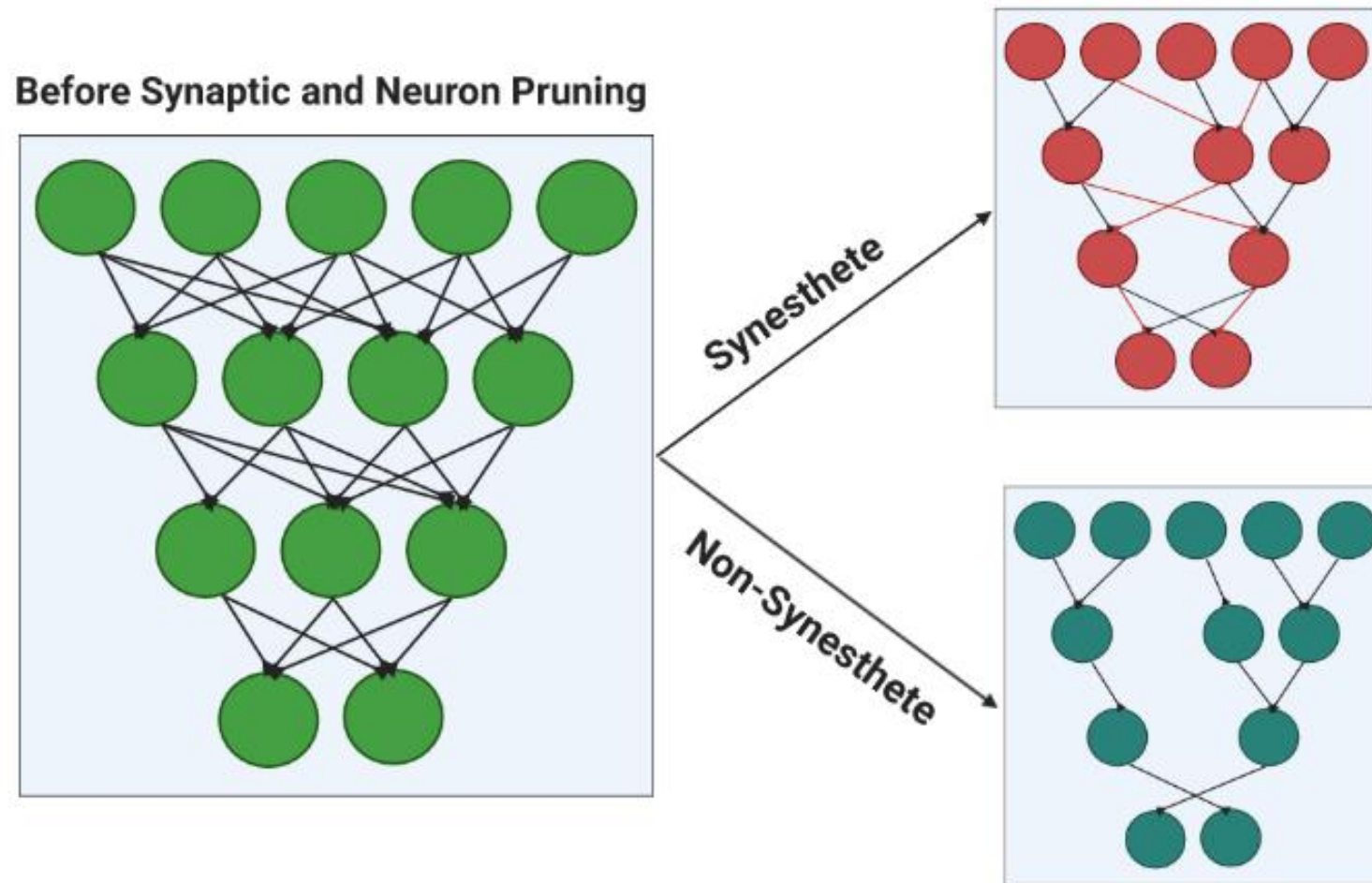


# What makes synesthesia interesting?



**Role of enhanced perception in learning and memory**

# What causes synesthesia?



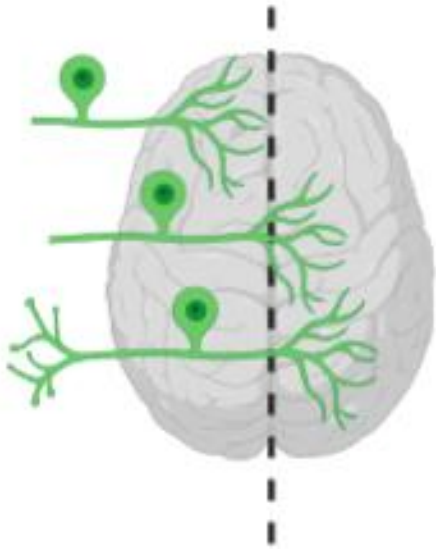
**Errant synaptic pruning**

# What gene is mutated in synesthesia?

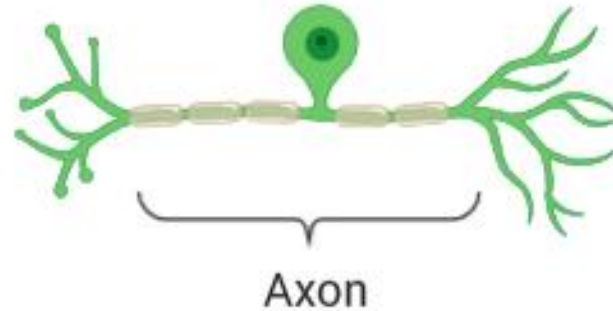


## ROBO3

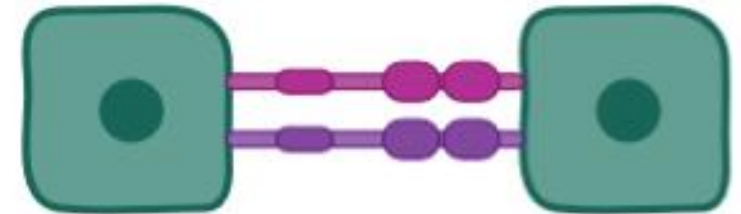
Biological Process



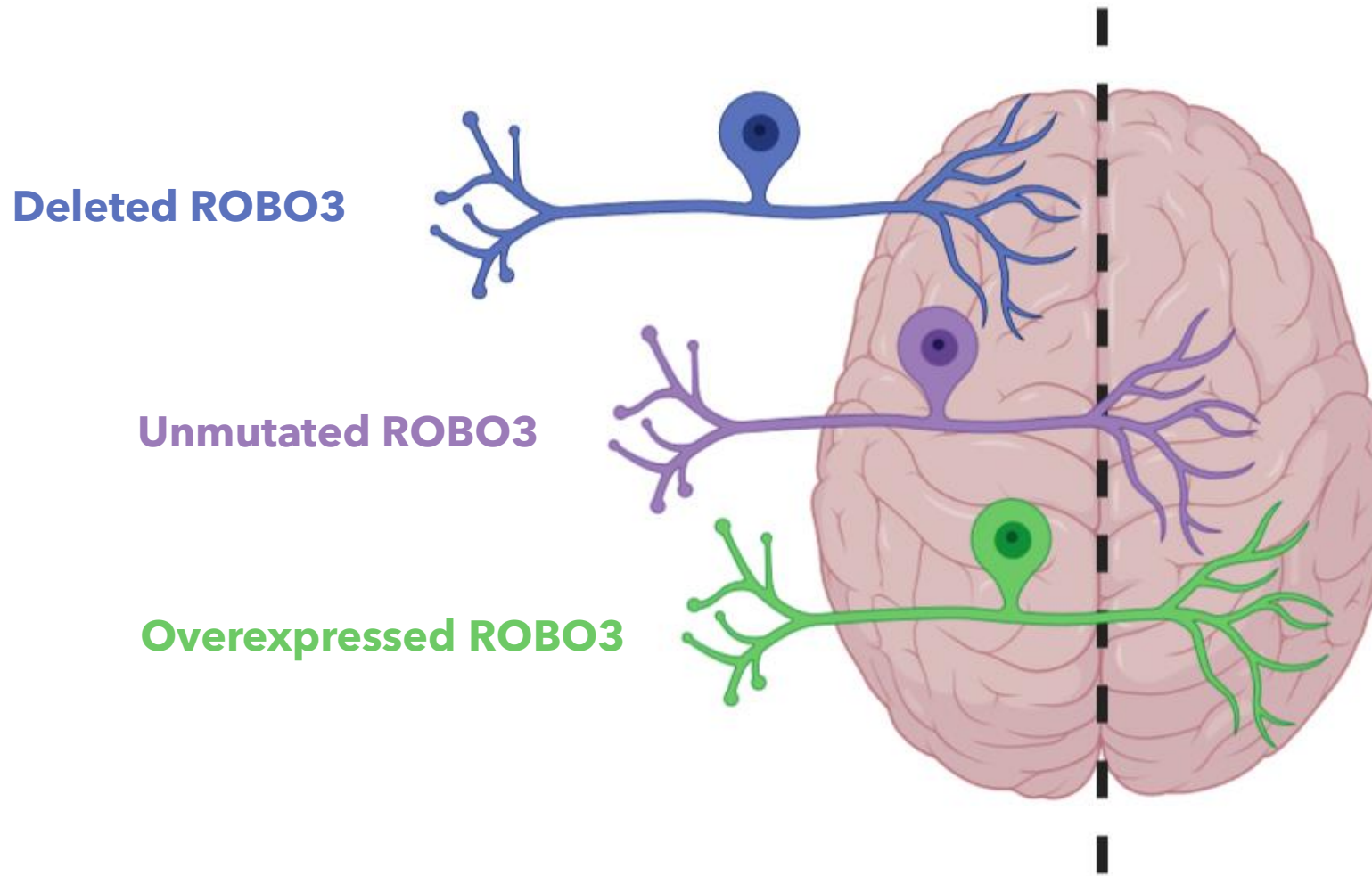
Cellular Component



Molecular Function



# What pathway is ROBO3 involved in?



**Axon guidance** across the midline

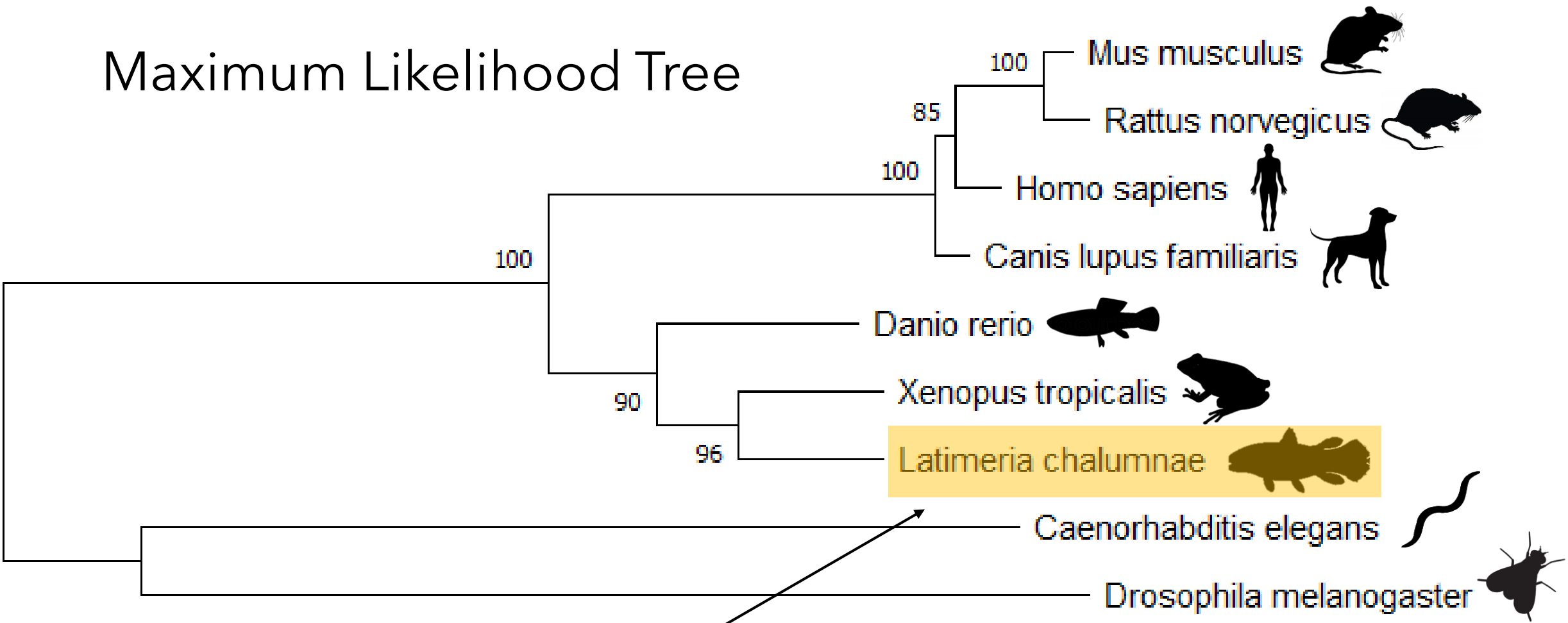
# How conserved are ROBO3 homologs?





# How are ROBO3 homologs related?

Maximum Likelihood Tree



0.20

ROBO3 is an ancient gene?

# What other genes interact with ROBO3?

**Axon  
guidance**

**Early nervous  
system  
development**



**Zinc ion  
binding**

# What is the gap in knowledge?

What role does ROBO3 play in **axon guidance** as it relates to enhanced learning through **color perception**?

**Hypothesis:** ROBO3 mutants will be able to learn information received through color perception more quickly than unmutated model organisms

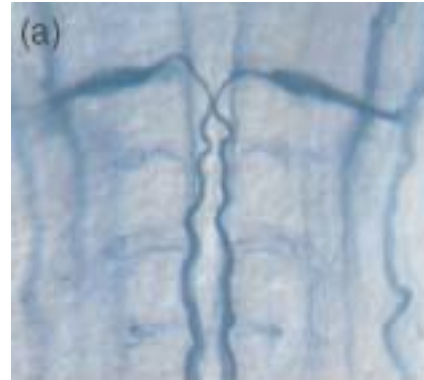
# What model organism can simulate ROBO3 phenotypes?



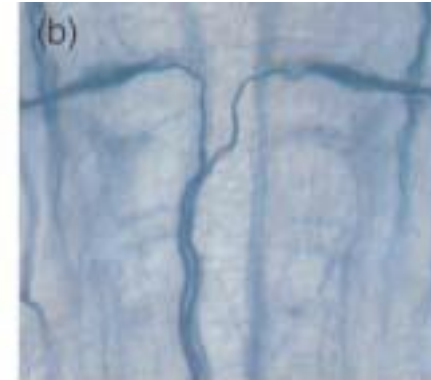
**Zebrafish (*Danio rerio*) brain**



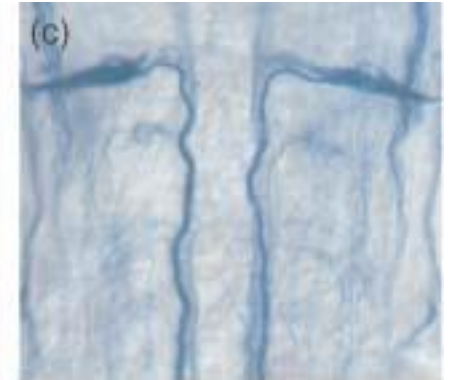
**Unmutated**



**Single ROBO3 Mutation**



**Double ROBO3 Mutation**



**Axons attempting to cross the midline in the zebrafish brain**

Transparent nervous systems, color perception,  
and prior use in learning studies

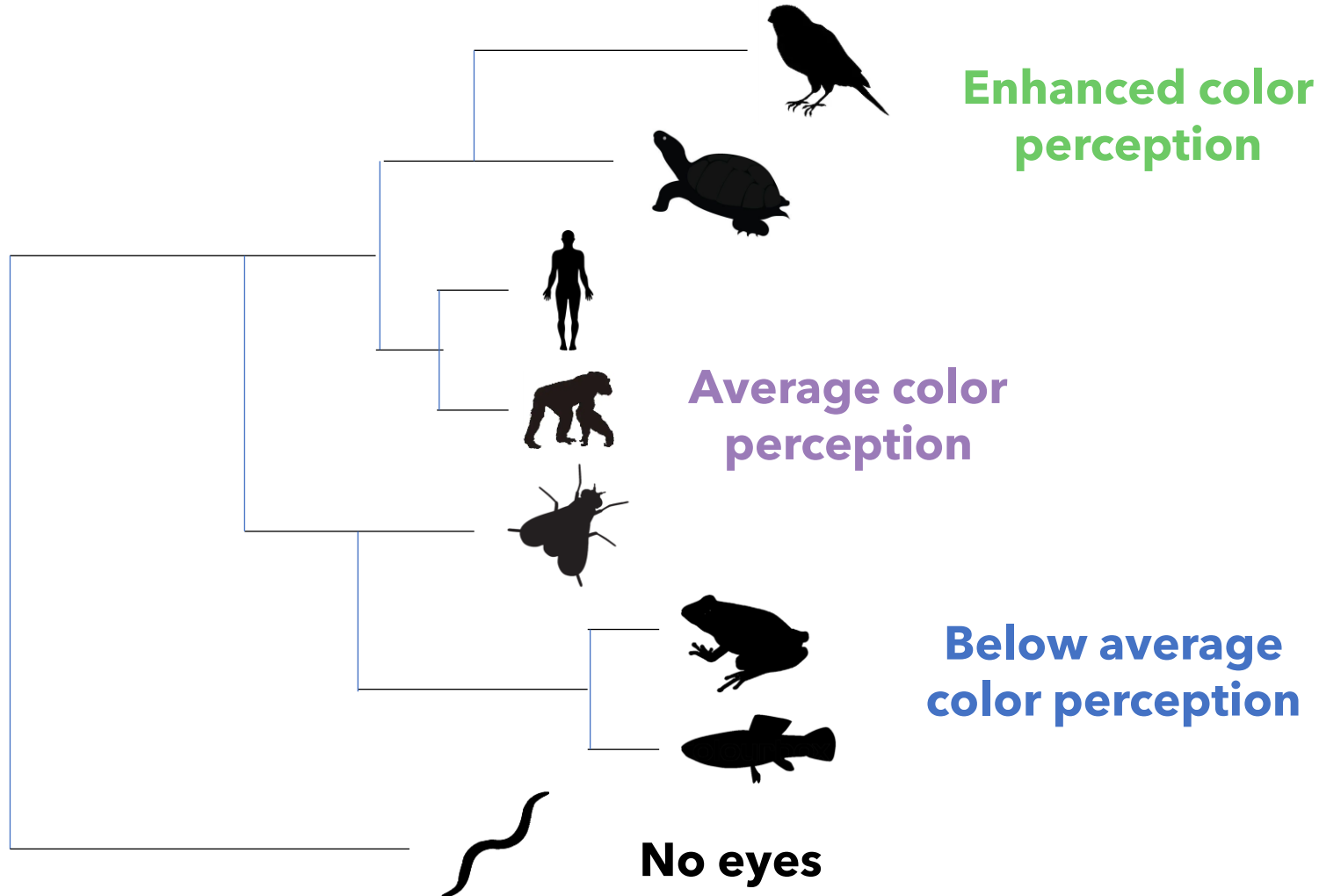
# Aim #1: Identify specific protein domain regions within ROBO3 that contribute to color perception



Pfam

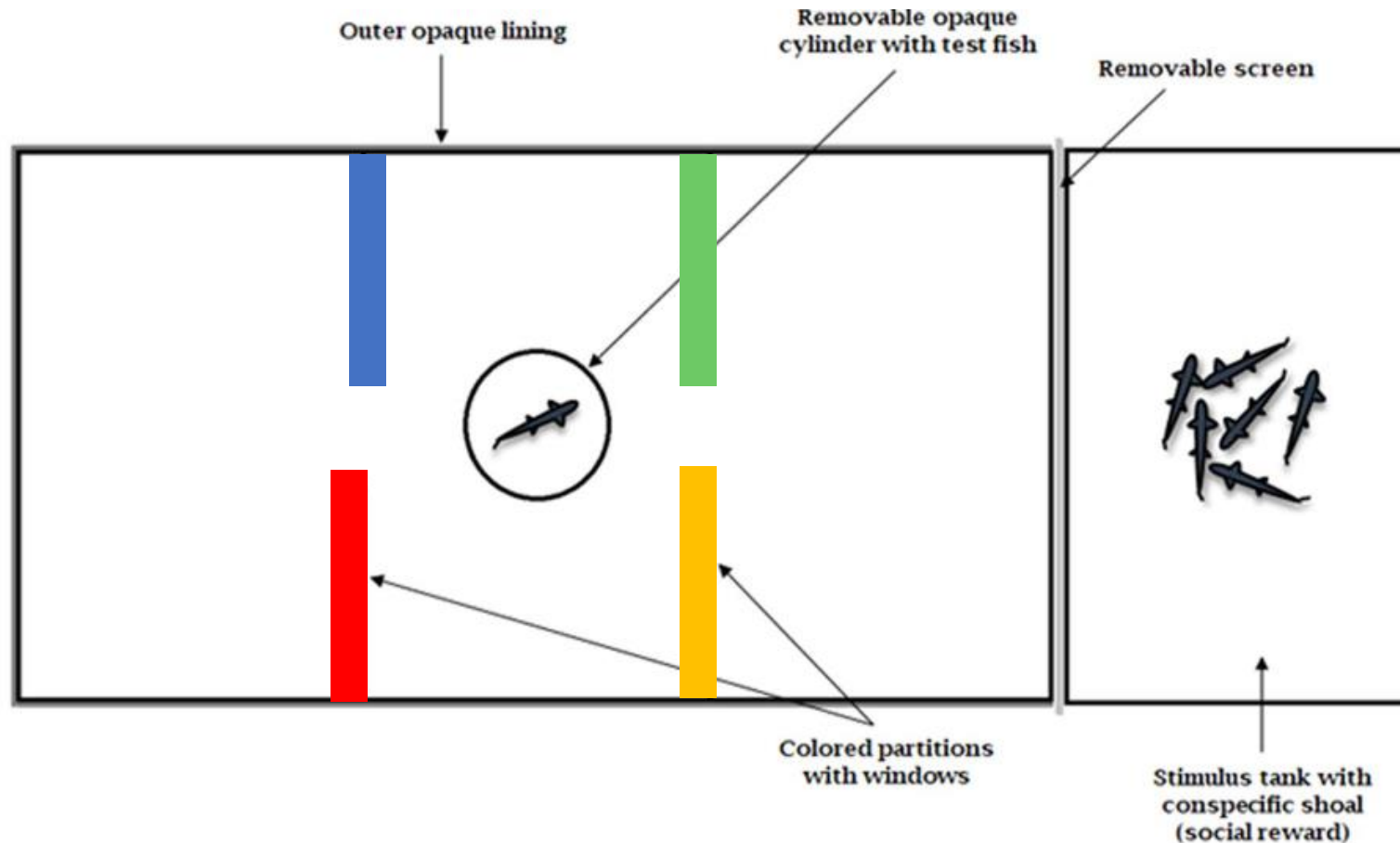


# **Aim #1:** Identify specific protein domain regions within ROBO3 that contribute to color perception



Identify meaningful SNPs based on groupings

# **Aim #1:** Identify specific protein domain regions within ROBO3 that contribute to color perception



Test navigation speed of SNP-targeted ROBO3 mutants against wildtype fish in a color maze adapted from Roy, et. al 2019

# What is the long-term goal?

How does color perception impact learning and memory development for diverse species?

