Synesthesia

Olivia Steidl
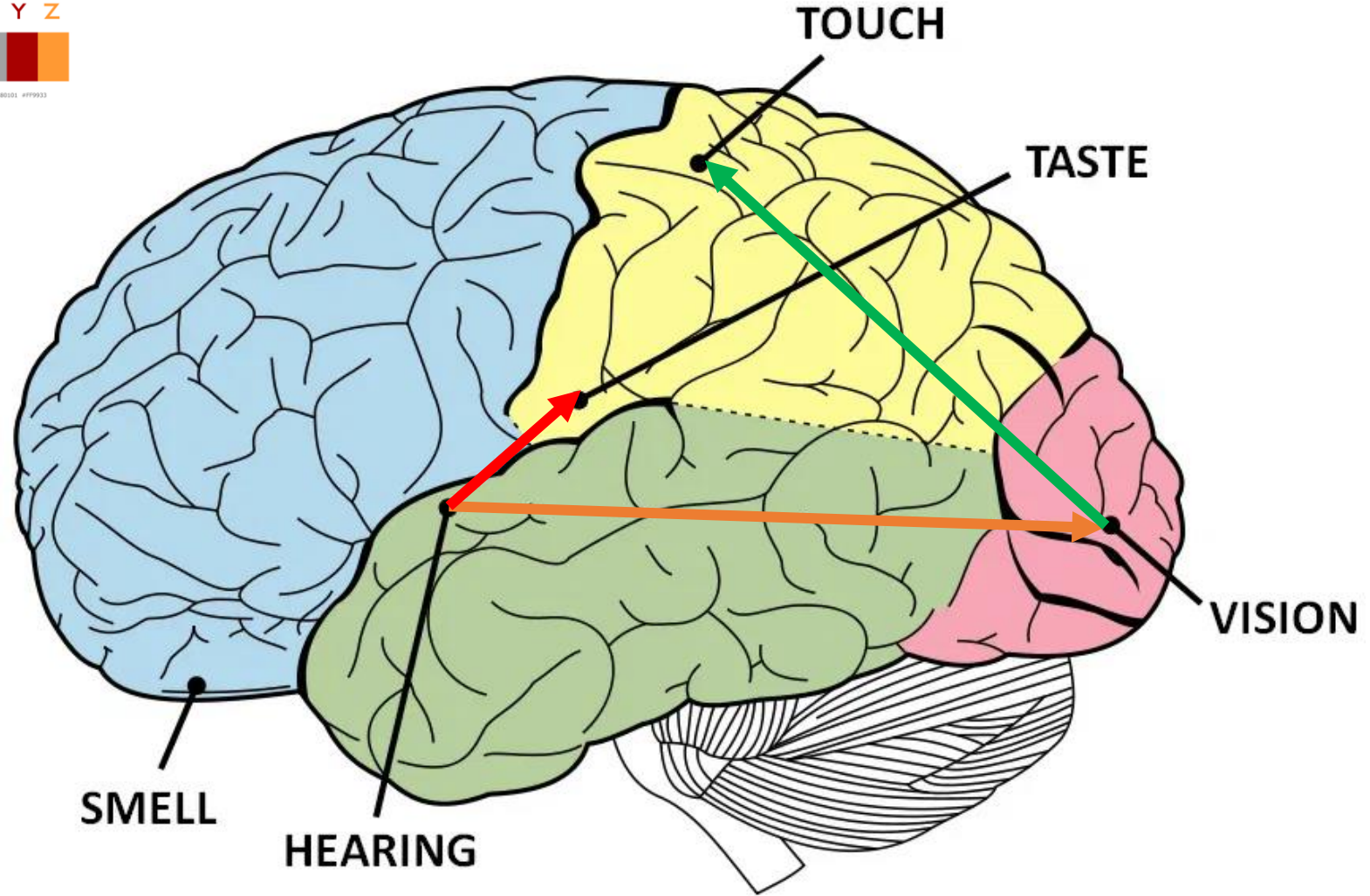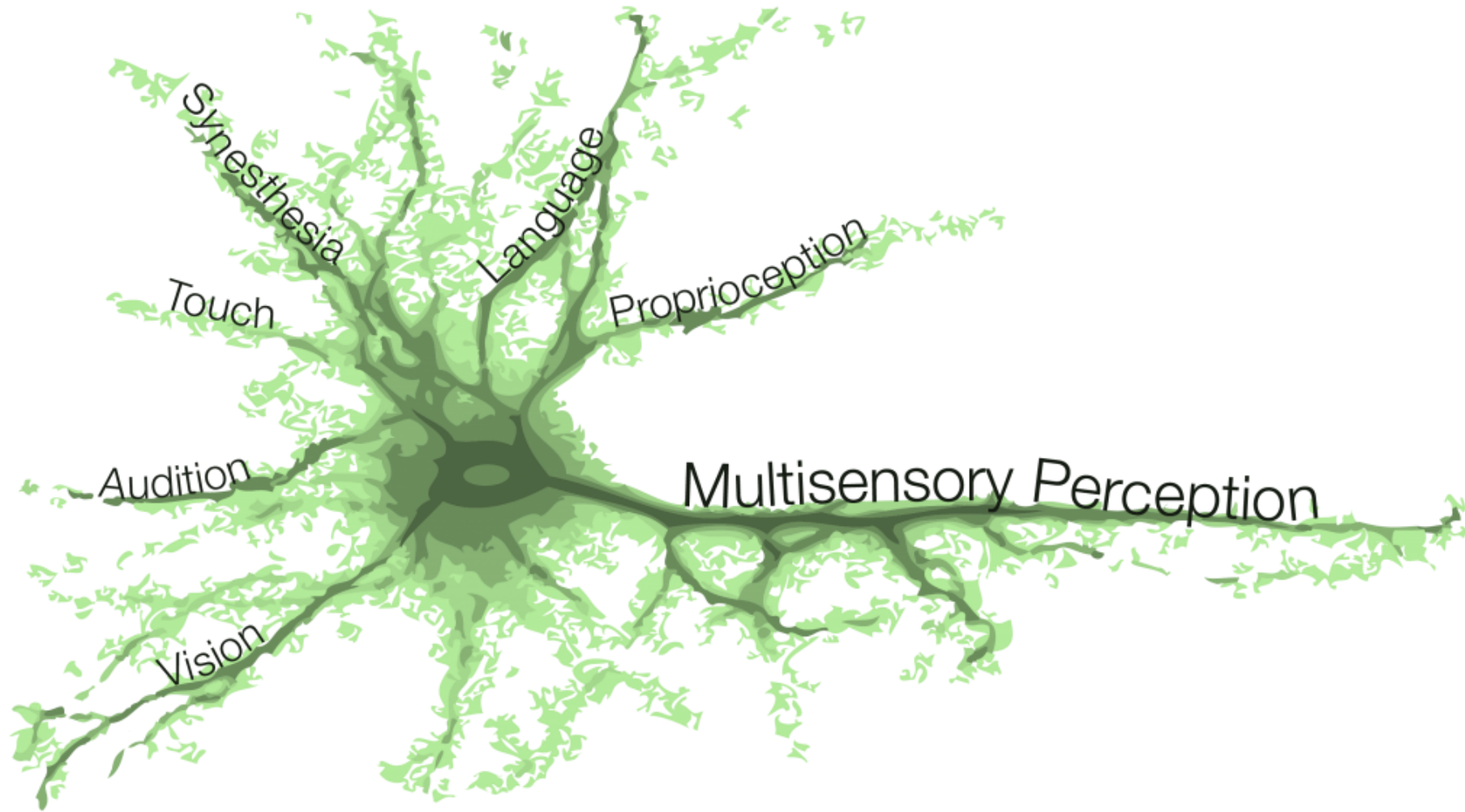
What is synesthesia?

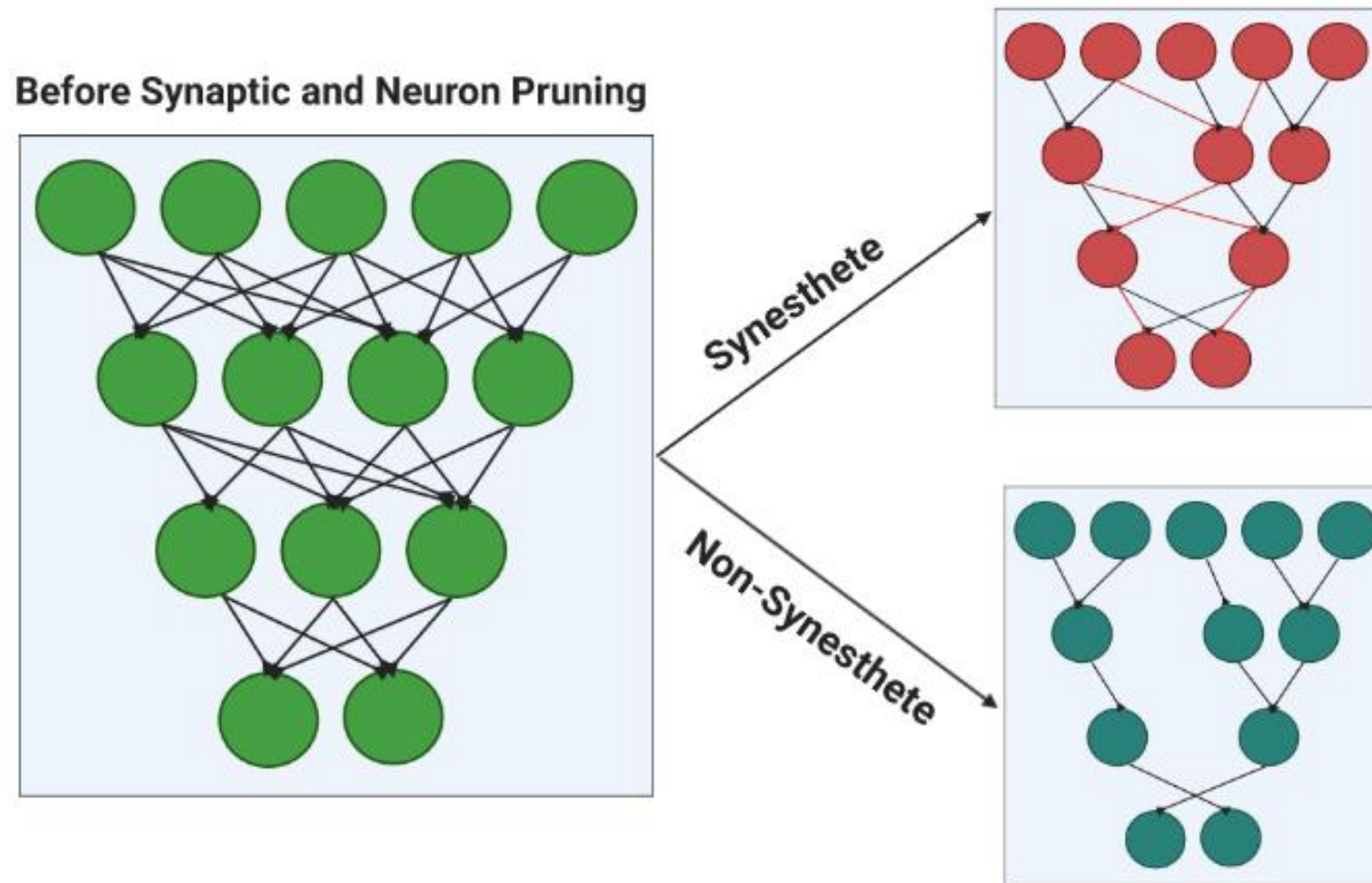Grapheme-color

Chromesthesia

Mirror-touch

Lexical-gustatory

What makes synesthesia interesting?

Deepens understanding of sensory and perception pathway

What causes synesthesia?

Before Synaptic and Neuron Pruning
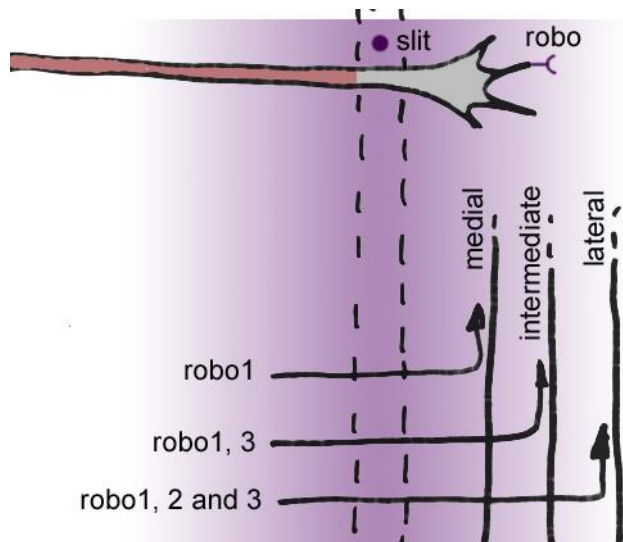
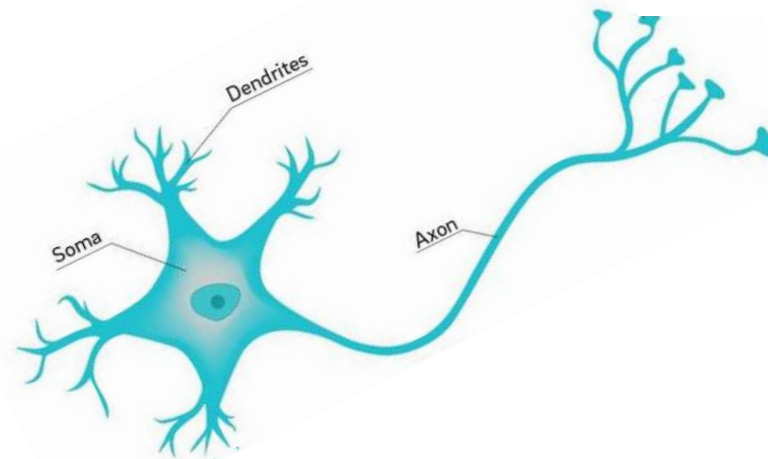Synesthete

Non-Synesthete

Errant synaptic pruning
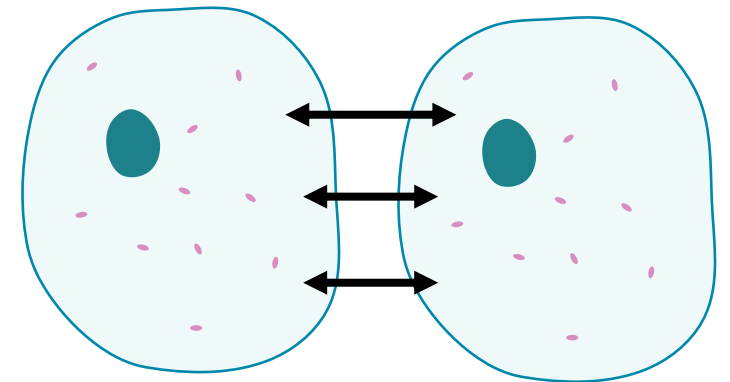
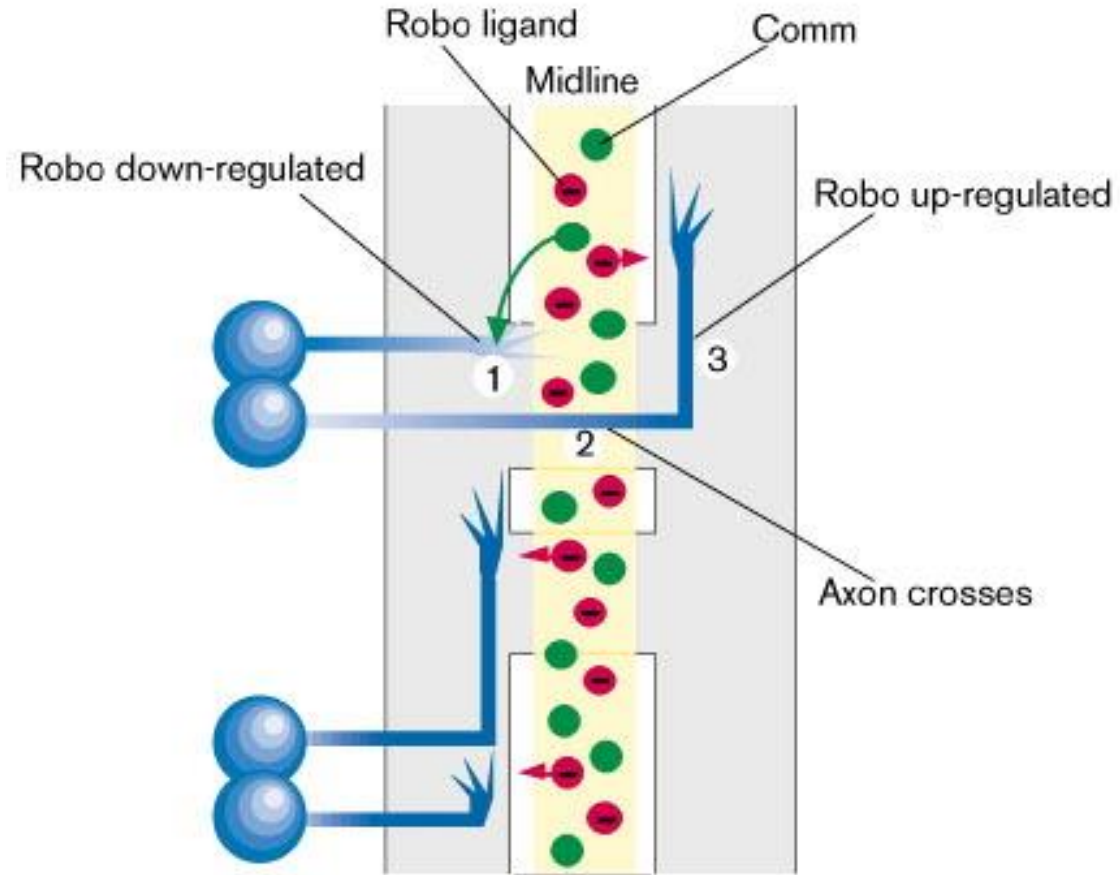# What gene is mutated in synesthesia?

11
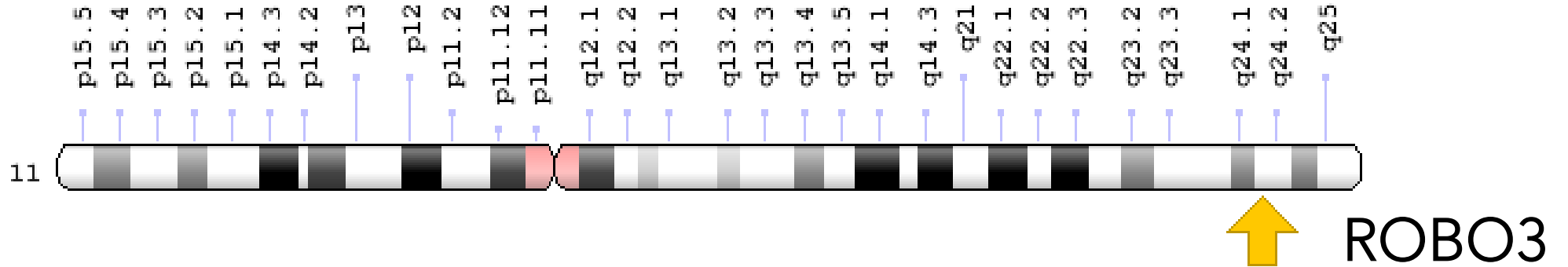
ROBO3

Biological Process

Cellular Component

Molecular Function

What pathway is ROBO3 involved in?

Commissural axon guidance across the midline

What other genes interact with ROBO3?

Axon guidance

Zinc ion binding

Early nervous system development
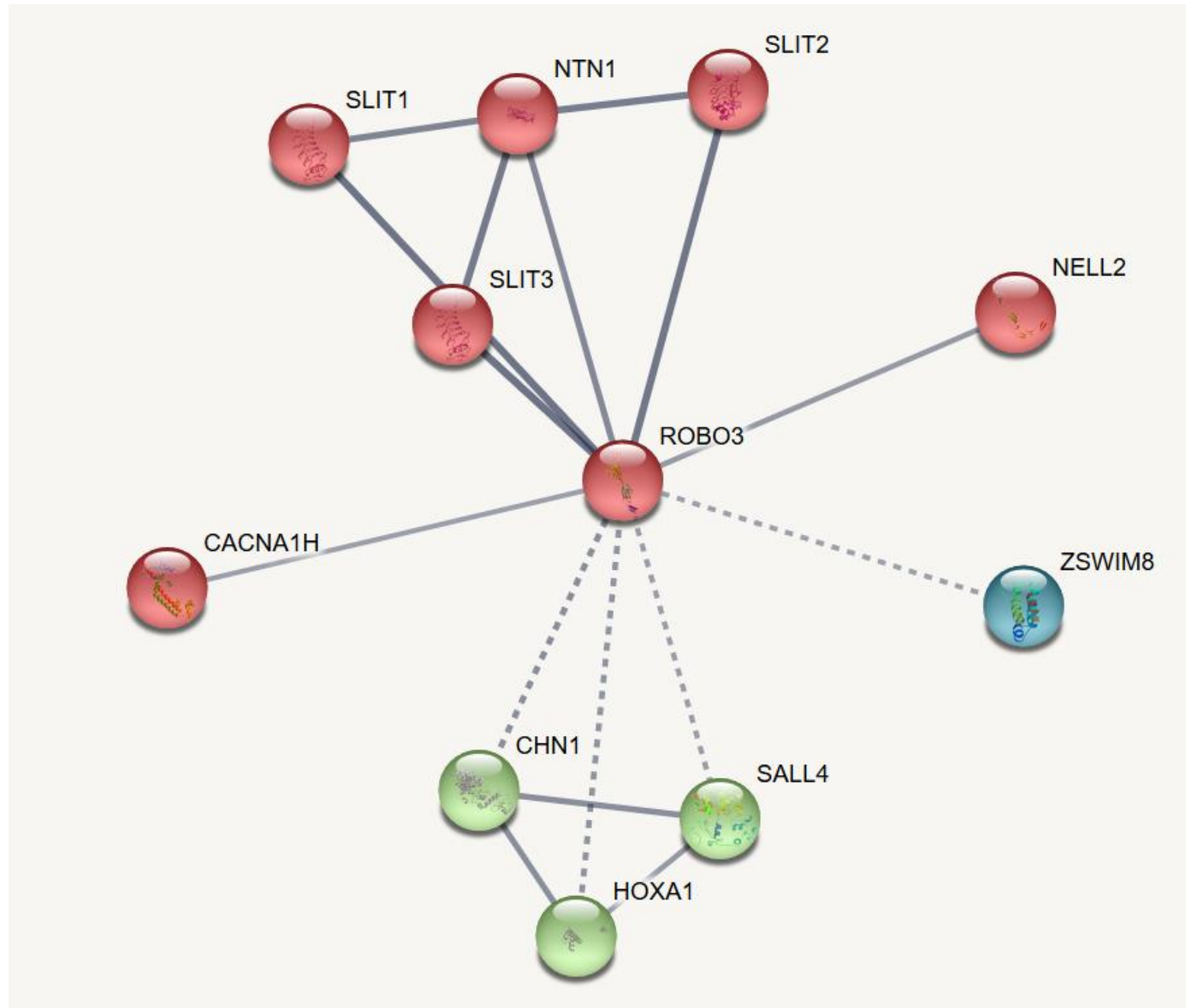
How conserved are ROBO3 homologs?

Human — IG3, ISet, ISet, IG3, ISet, fn3, fn3, fn3 — 1386 AA

Nematode — IG3, ISet, ISet, ISet, ISet, fn3, fn3, fn3 — 1296 AA

Fruit Fly — ISet, ISet, ISet, IG3, ISet, fn3, fn3 — 1395 AA

Mouse — IG3, ISet, ISet, IG3, ISet, fn3, fn3 — 1402 AA

Frog — IG3, ISet, ISet, IG3, ISet, fn3, fn3, fn3 — 1424 AA

Zebrafish — IG3, ISet, ISet, IG3, IG3, fn3, fn3, fn3 — 1419 AA

How are ROBO3 homologs related?

Maximum Likelihood Tree

- 100 — Mus musculus
- Rattus norvegicus
- 85
- 100 — Homo sapiens
- Canis lupus familiaris
- 100
- Danio rerio
- 90
- Xenopus tropicalis
- 96 — Latimeria chalumnae
- Caenorhabditis elegans
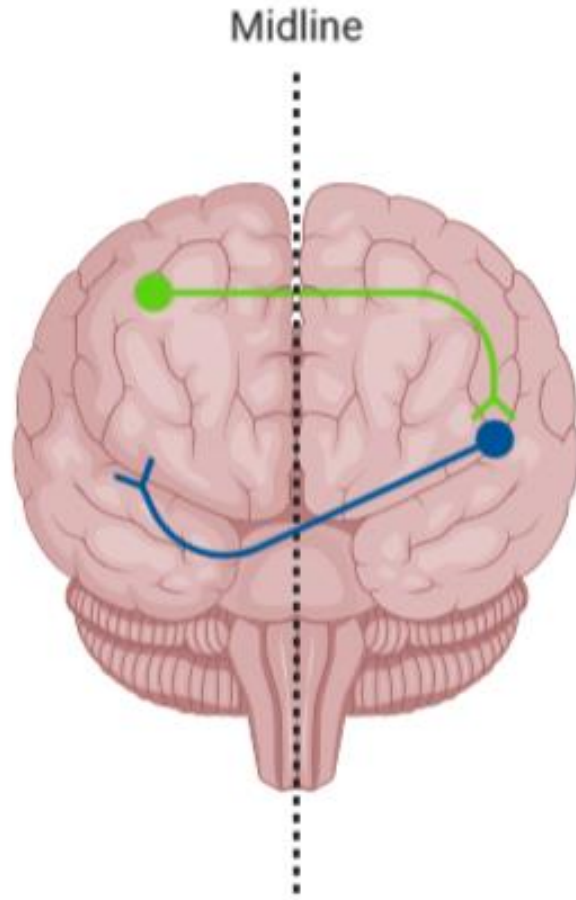- Drosophila melanogaster

0.20
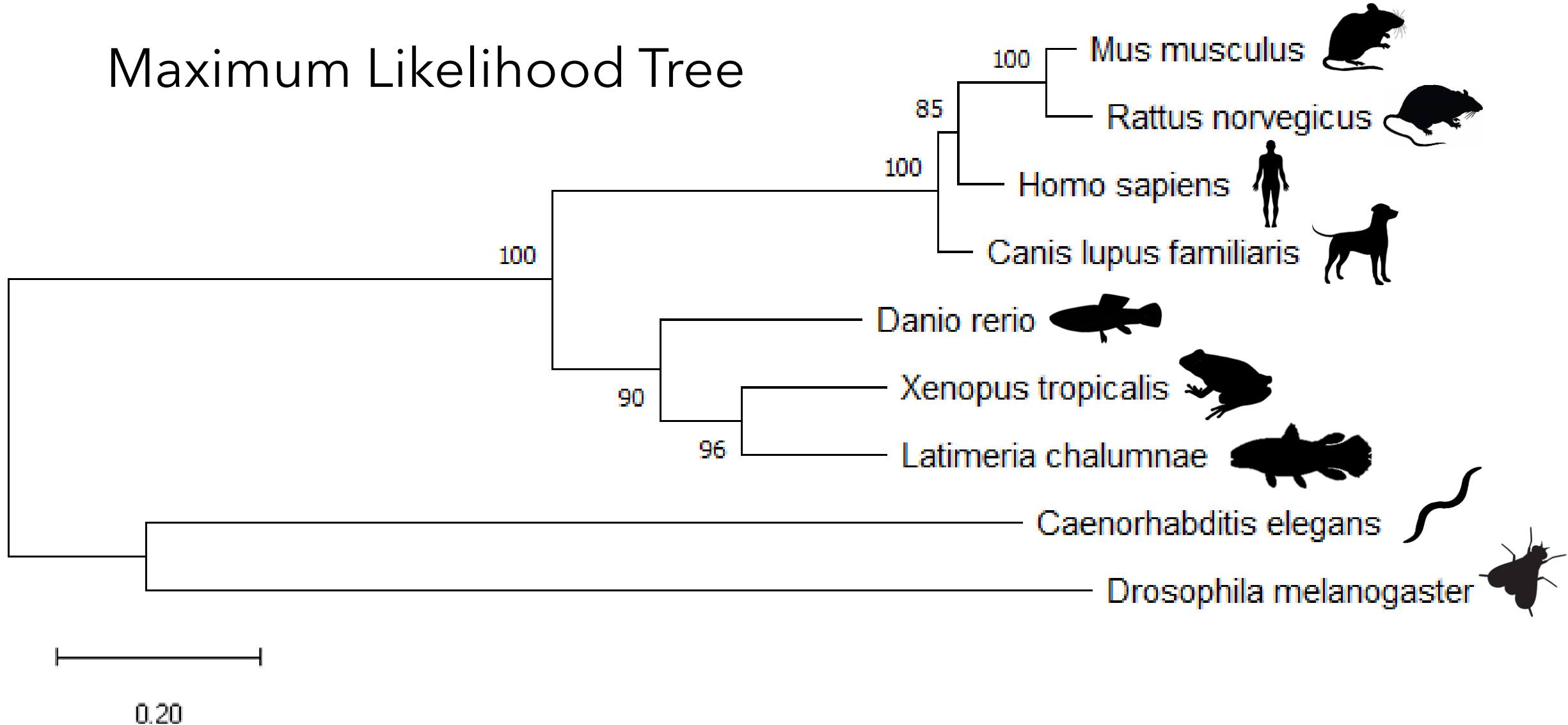
What model organism can simulate ROBO3 phenotypes?
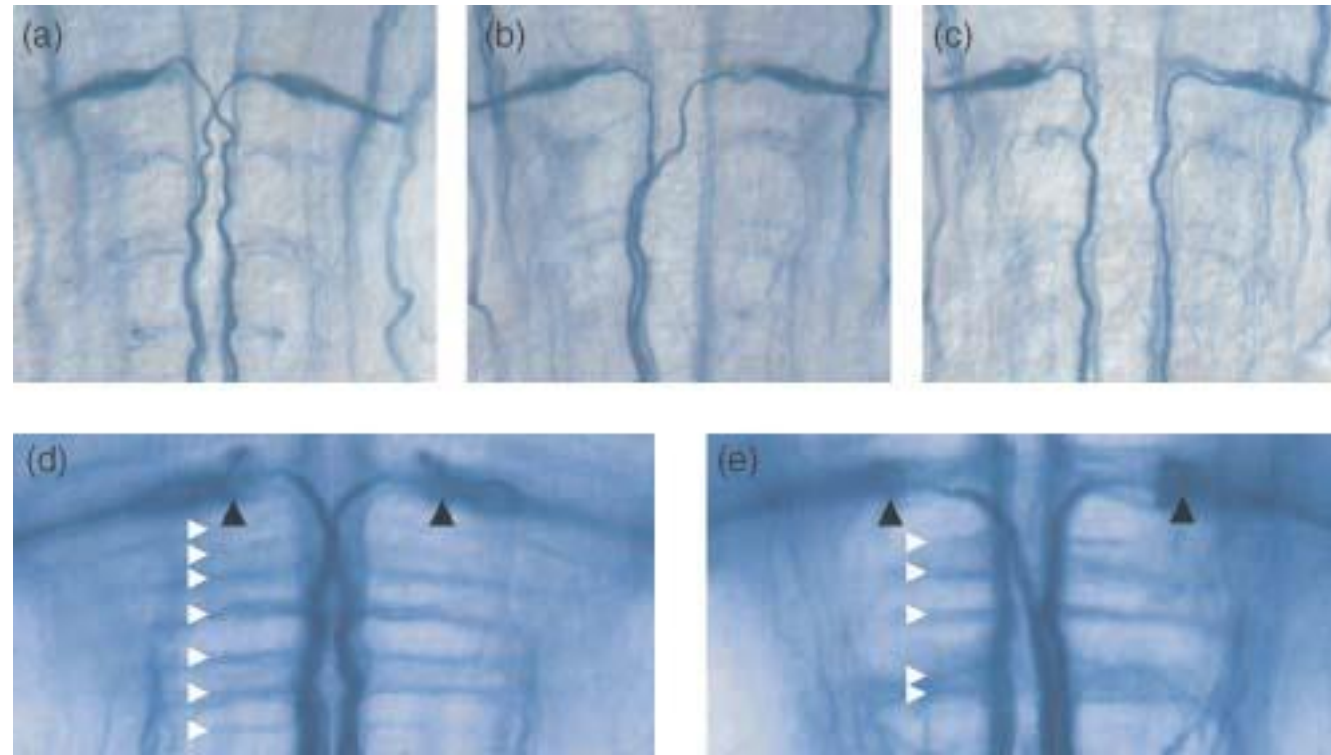
Zebrafish have transparent nervous systems, have a conserved ROBO3 homolog, and can easily be tested for sensory responses

What is the gap in knowledge?

Midline

How does **commissural axon guidance** – influenced by ROBO3 mutations – affect the **overlapping sensory signals** received by humans with **synesthesia**?

What is the long-term goal?

What are the implications of differential sensory neuron development on perception in humans and other organisms?