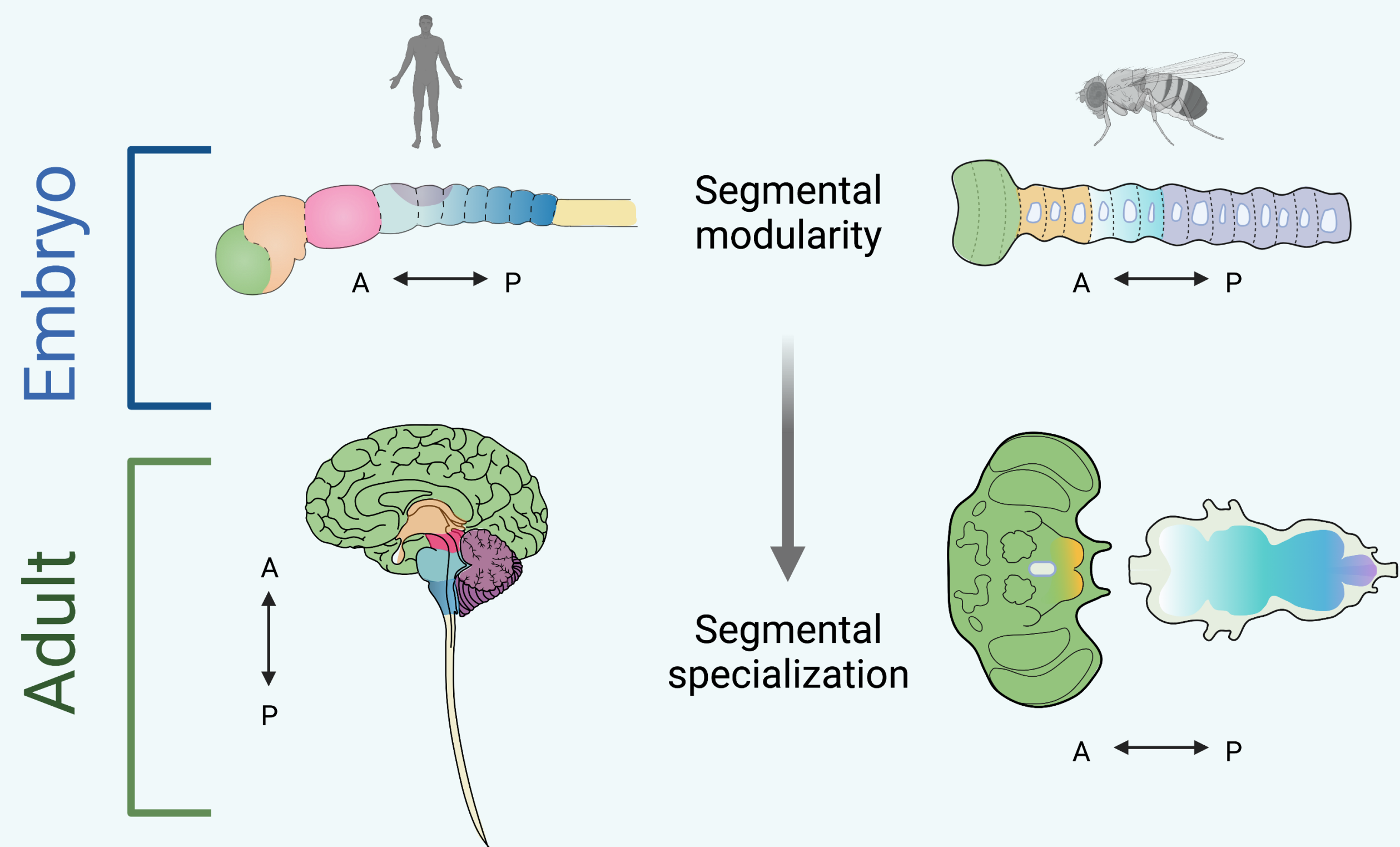


The neurogenetics of behavioral circuit specialization along the anterior-posterior axis

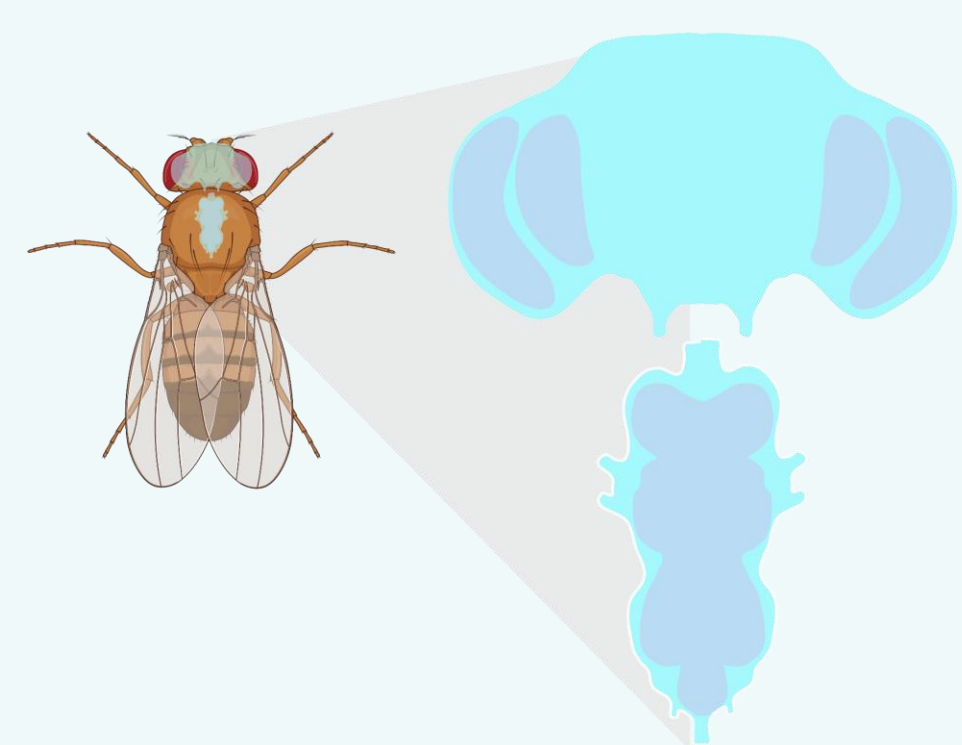
Nicole Leitner and Yehuda Ben-Shahar
Department of Biology, Washington University in St. Louis

BACKGROUND

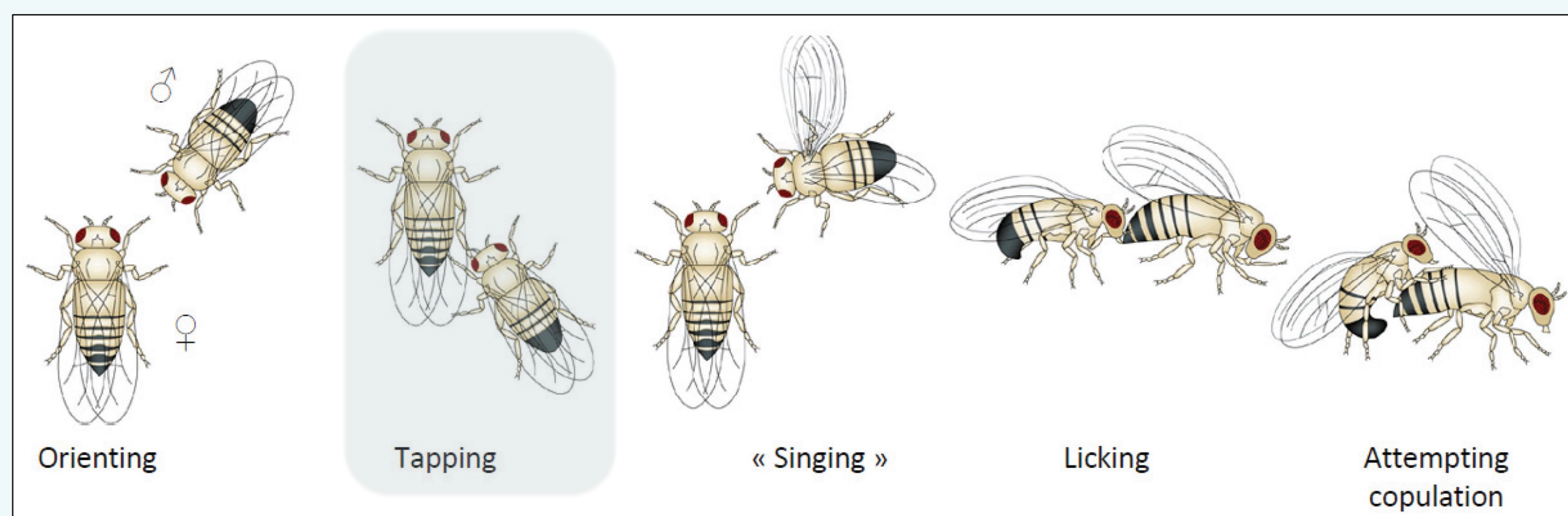


How do homologous neural circuits become specialized in the adult brain?

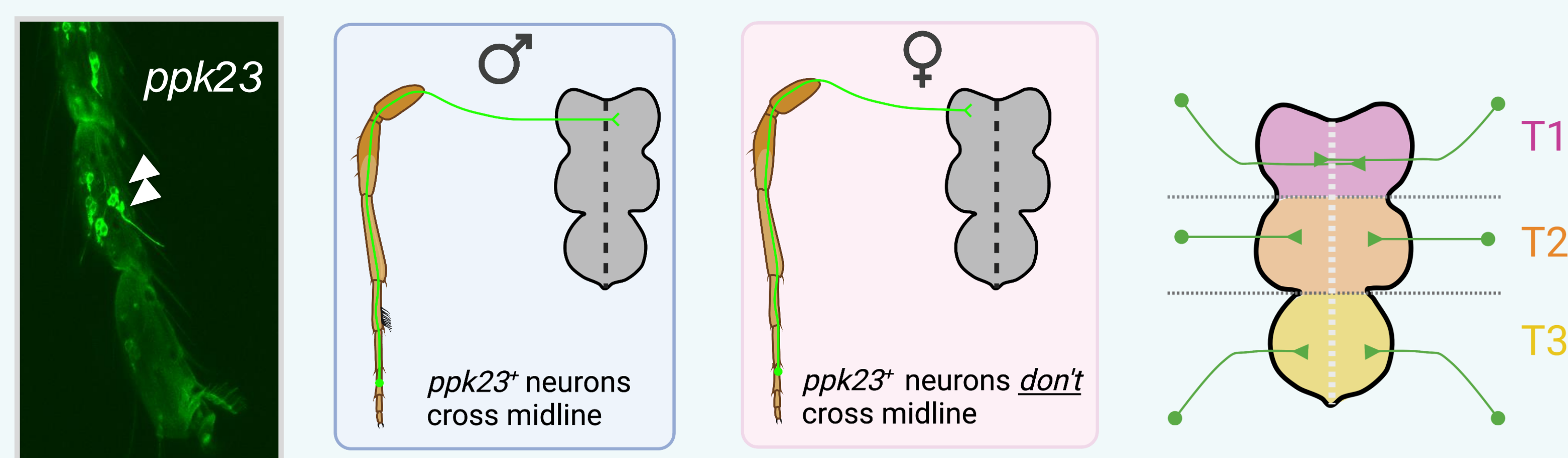
STUDY SYSTEM



Pheromone-sensing (*ppk23*⁺) leg neurons are important for male courtship



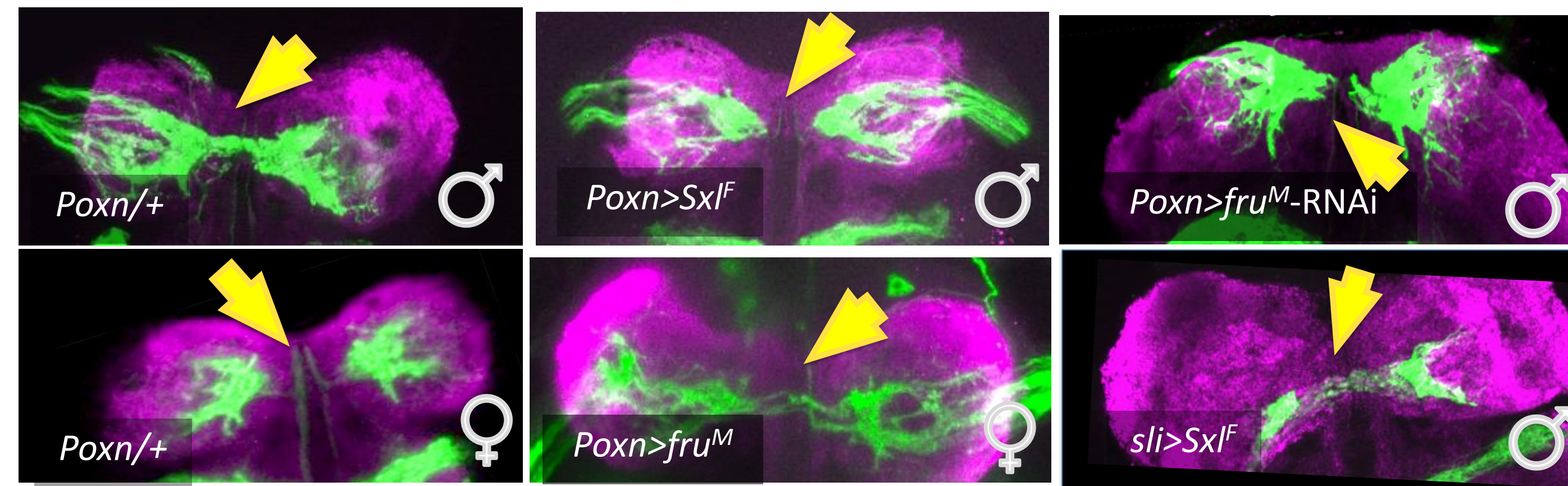
ppk23⁺ neurons are sexual dimorphic and segmentally specialized



How do *ppk23*⁺ neurons integrate information from the segmental and sex pathways to decide whether their axons will cross VNC midline?

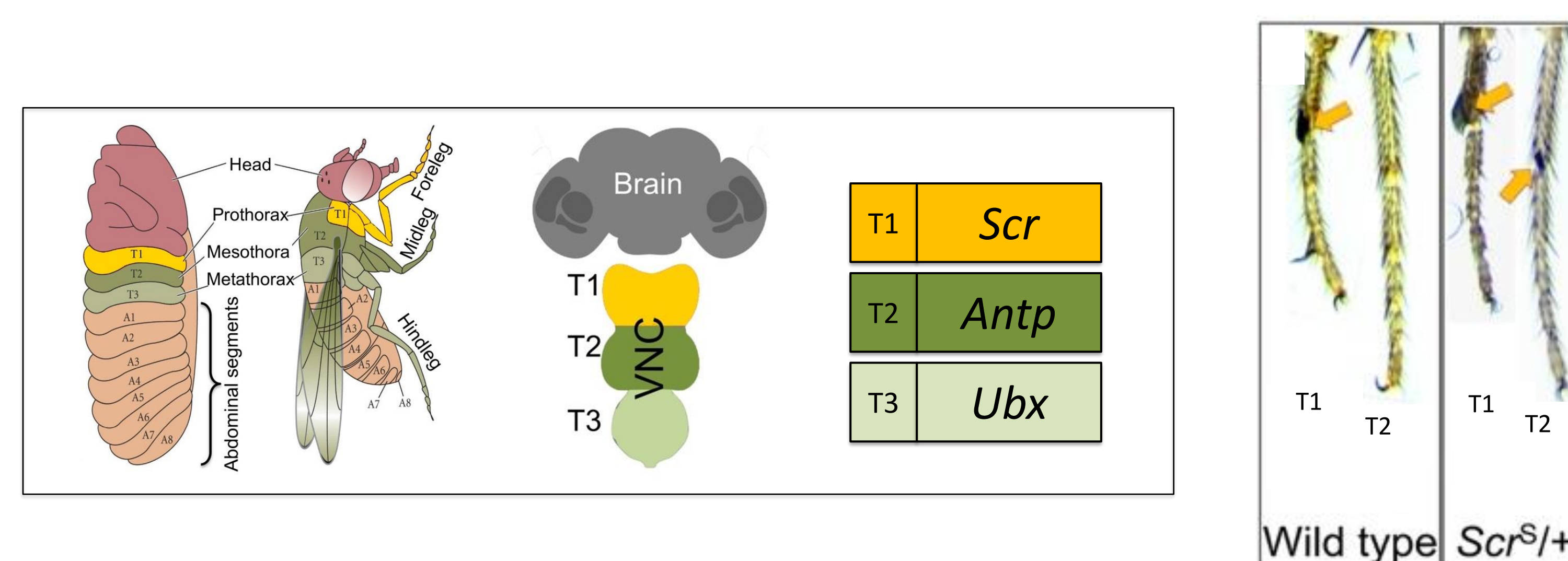
RESULTS

(1) Cell autonomous neuronal sex identity impacts midline crossing in male T1 segment



Feminizing or masculinizing *ppk23*⁺ neurons (*Poxn*-Gal4), but not midline glia (*sli*-Gal4), changes sex-specific midline crossing phenotype in T1 segment

(2) *Hox* gene *Sex combs reduced* (*Scr*) modulates effects of neuronal sex on midline crossing

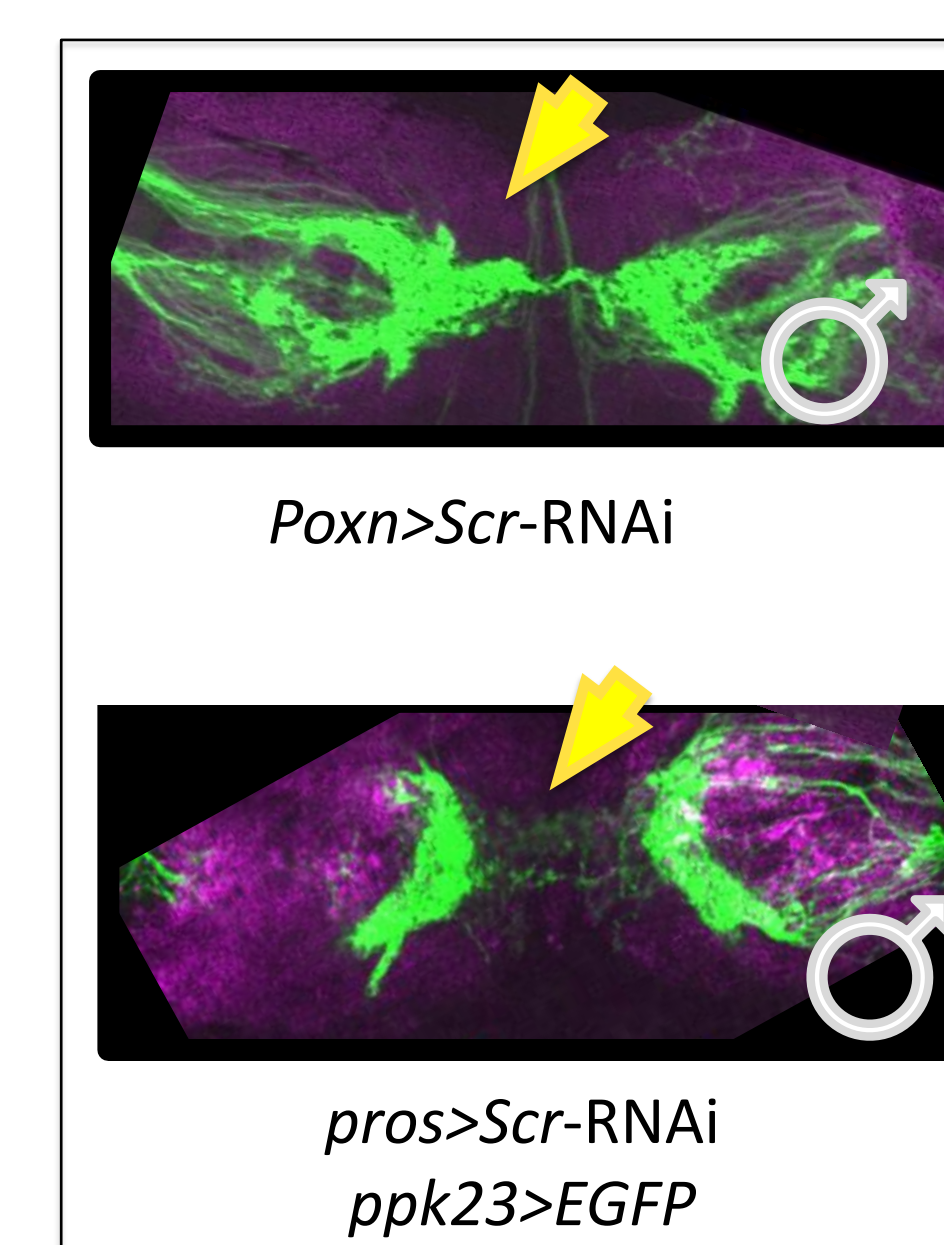


Scr specifies T1 in embryo and adult (left); *Scr*^S GOF mutation causes T2-to-T1 transformation and ectopic, T1-specific sex combs on T2 leg (right)



(3) Effects of homeotic segmentation are non-cell autonomous

UAS-RNAi knockdown of *Scr* in post-mitotic neurons (top) and neuroblasts (bottom) does not affect midline crossing



CONCLUSIONS

- Interactions between sex determination and homeotic segmentation pathways drive axonal midline crossing decisions of *ppk23*⁺ neurons
- Segmental specialization of *ppk23*⁺ neurons arises from the homeotic modulation of gene networks underlying neuronal sex

NEXT STEPS

- When and where during development does the *Hox* pathway interact with the sex pathway?
- How does this interaction transcriptionally or post-transcriptionally regulate midline crossing genes?

ACKNOWLEDGEMENTS

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