



FRED HUTCH

A burst of lineage-specific genetic innovation in *Drosophila* actin-related proteins for testis-specific function

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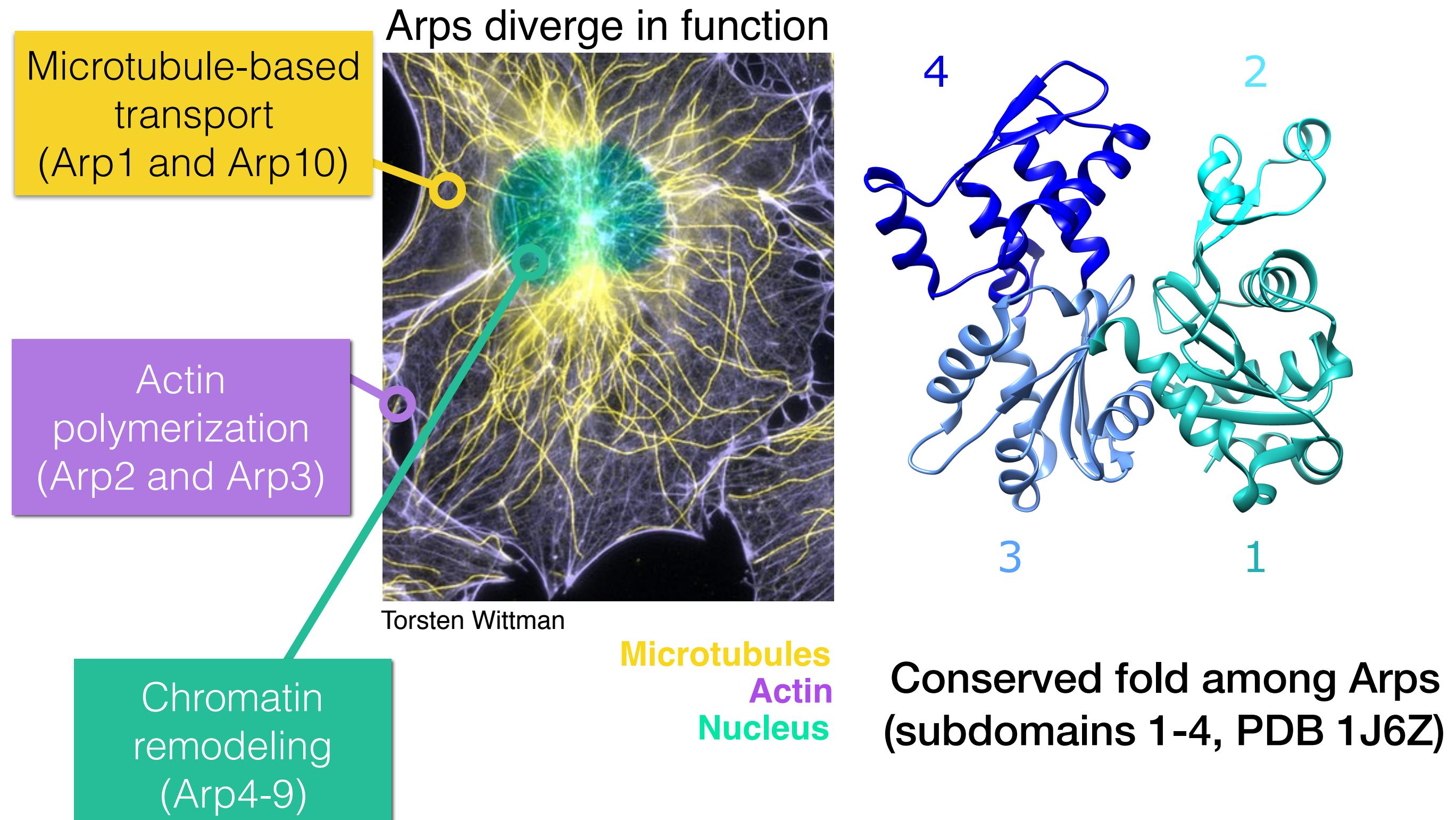


Courtney Sarah

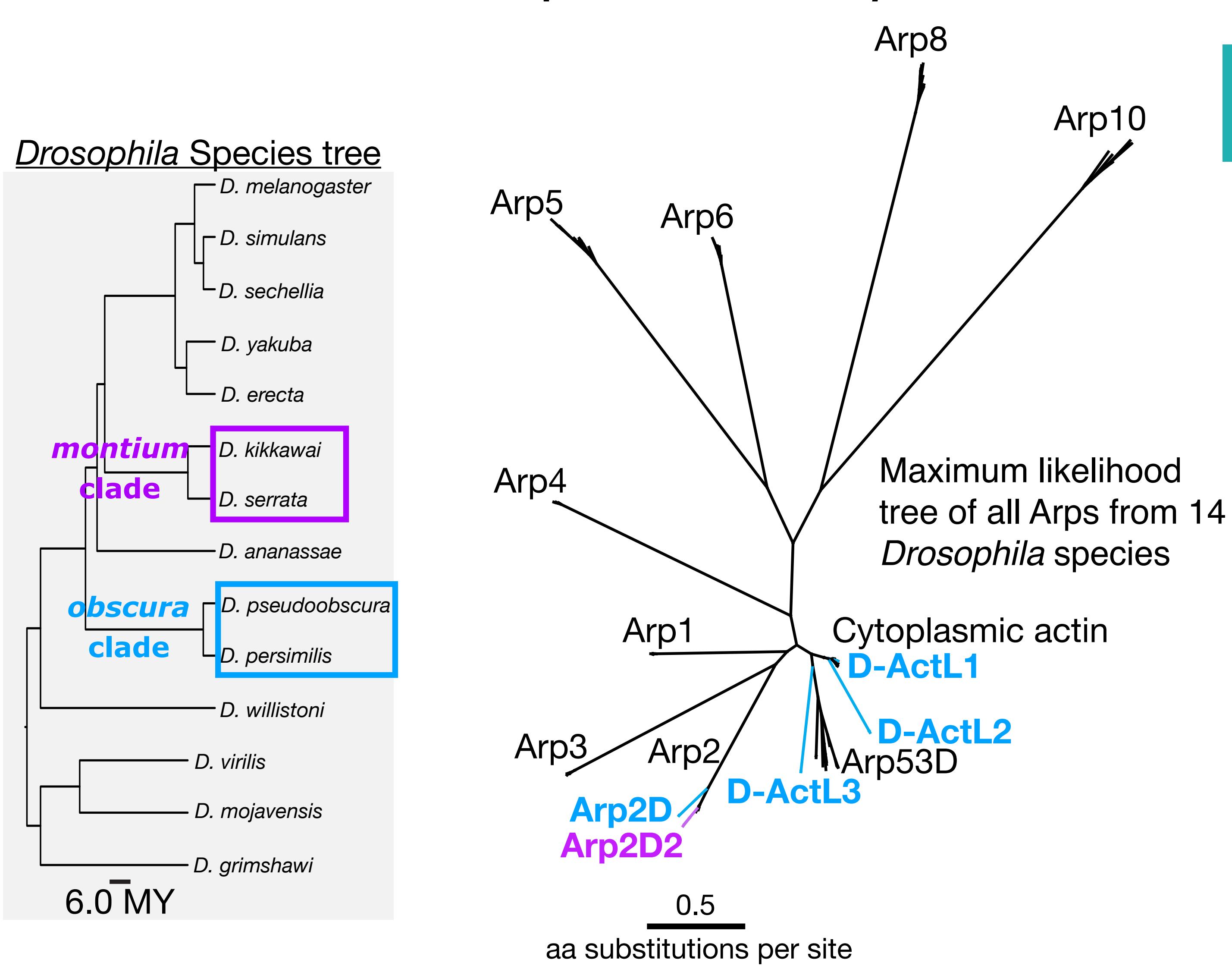
Arp Evolution in *Drosophila*

The superfamily of actin-related proteins (Arps) is highly conserved, originating prior to the last common ancestor of eukaryotes, and performs diverse functions.

Actin-related protein superfamily



We have found that the Arp superfamily exhibits rare diversification via duplication in *Drosophila*.



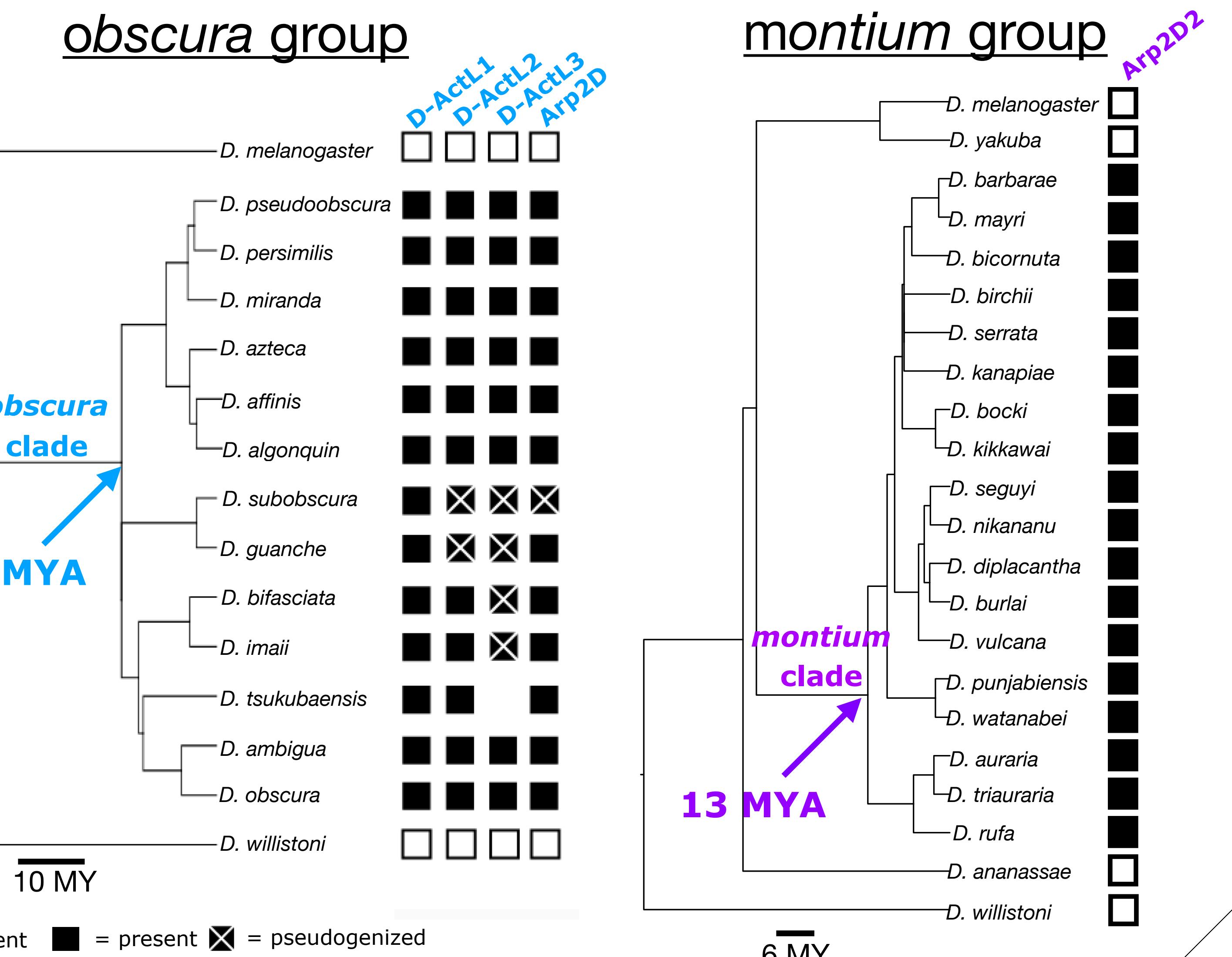
Arp2D and Arp2D2:

- present in the *obscura* and *montium* groups in *Drosophila*, respectively
- unknown functions

Questions:

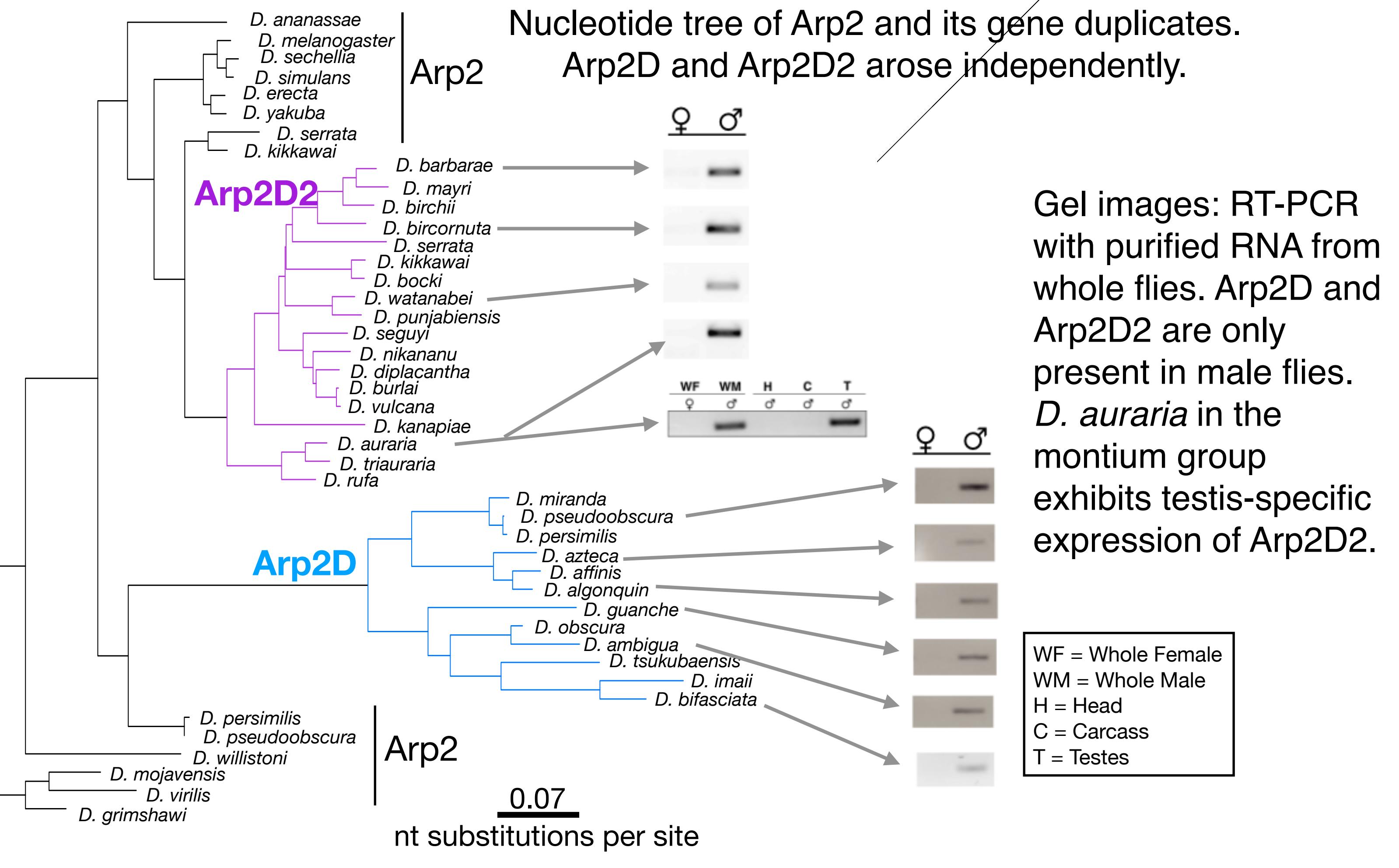
- How old are these duplicates?
- Where are the Arp2 duplicates expressed?
- What is driving Arp evolution?

Origin of Arp Duplicates



Targeted sequencing of Arp loci in *obscura* and *montium* groups in *Drosophila* showing presence, absence, and pseudogenization of Arp2 duplicates Arp2D and Arp2D2.

Phylogenetics & Expression of Arp Duplicates



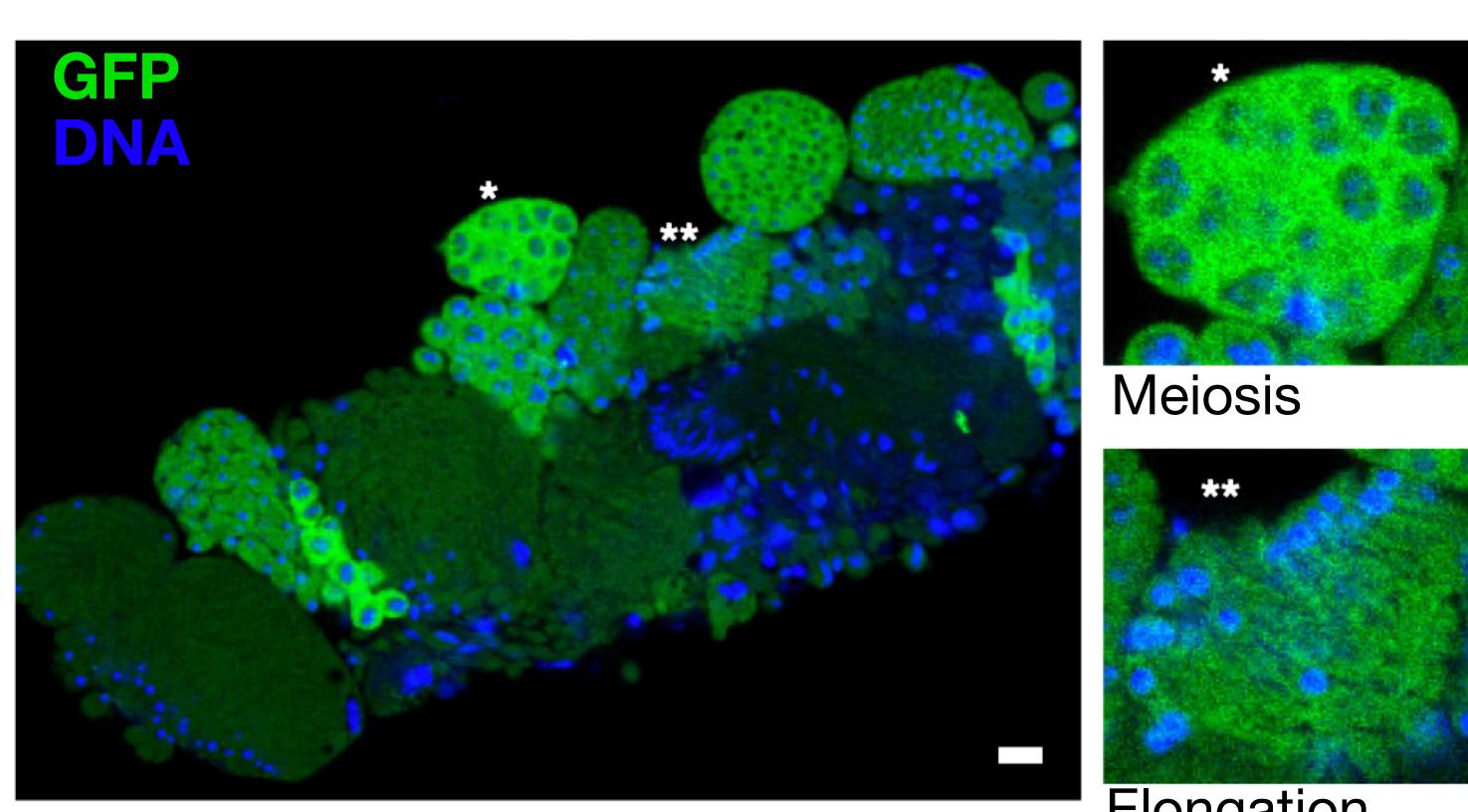
Transgenic *D. pseudoobscura* flies expressing Arp2D-GFP

1 kb Endogenous promoter 1 kb Eye marker P-element

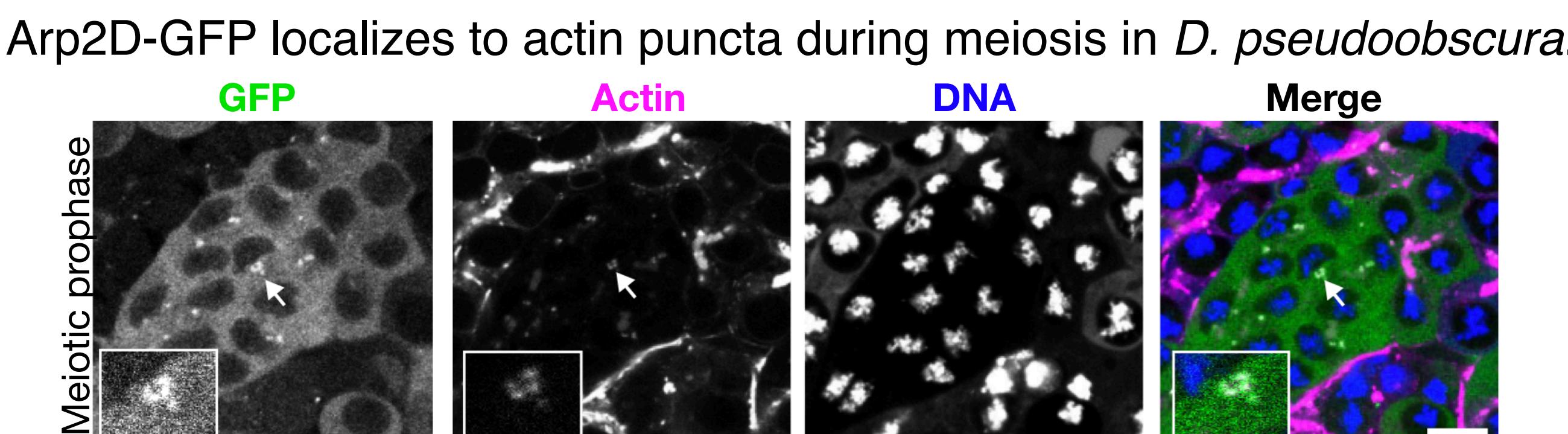
Mitosis Meiosis Elongation
Testis

Dissected testes exhibit Arp2D-GFP expression during and after meiosis.

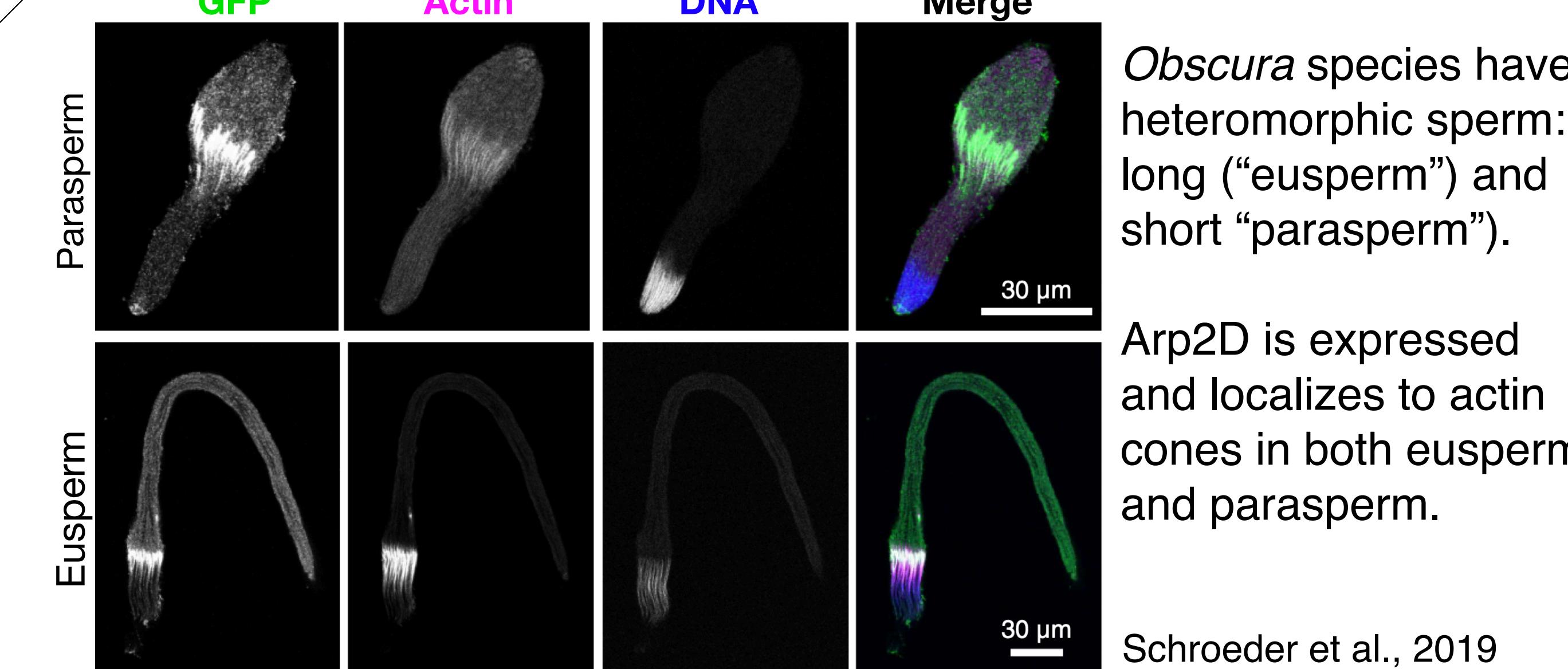
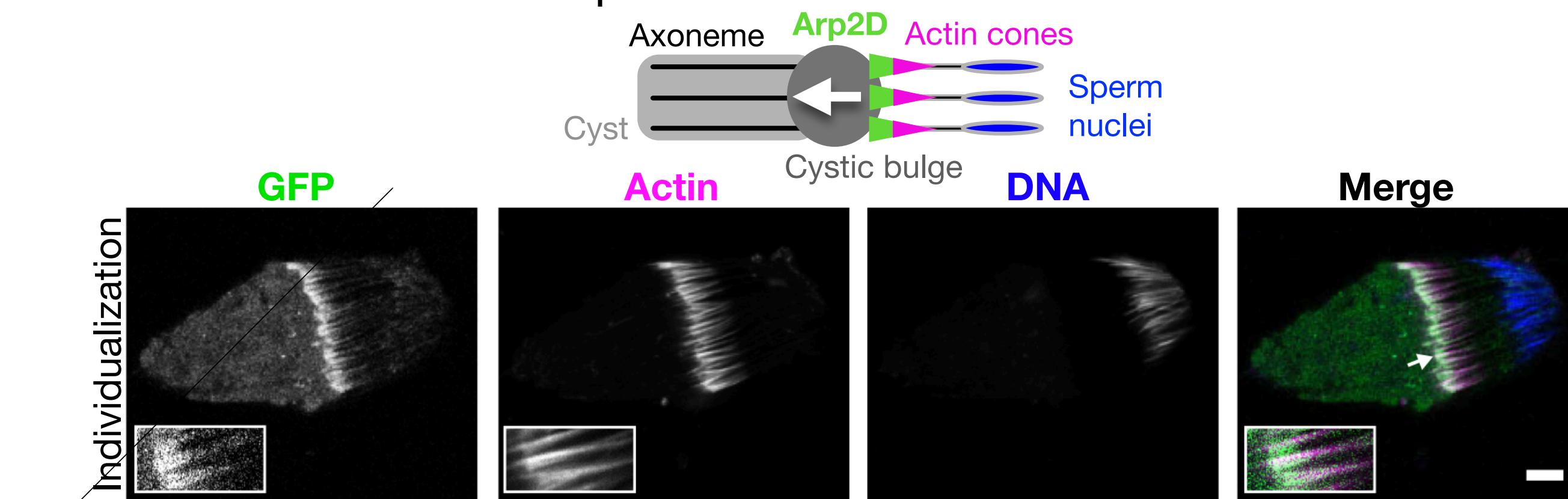
Schroeder et al., 2019



Arp2D Localizes to Actin



Actin cones separate mature sperm bundled in a cyst in a process known as individualization. Arp2D-GFP localizes to the front of the cones



Schroeder et al., 2019

Conclusions

- Arp2D and Arp2D2 are present in the *obscura* and *montium* groups, respectively.
- Arp2D arose 14 MYA, and Arp2D2 arose 13 MYA.
- Arp2D and Arp2D2 arose independently.
- Arp2D, Arp2D2 are expressed in the testis.

Current Questions

- Does Arp2D2 localize to actin similar to Arp2D?
- What function(s) do these duplicates have?
 - Do they replace Arp2 during meiosis?
 - Do Arp2D2 and Arp2D impact male fertility?



K99 pathway to independence