LABORATORY OF GENOME SCALING

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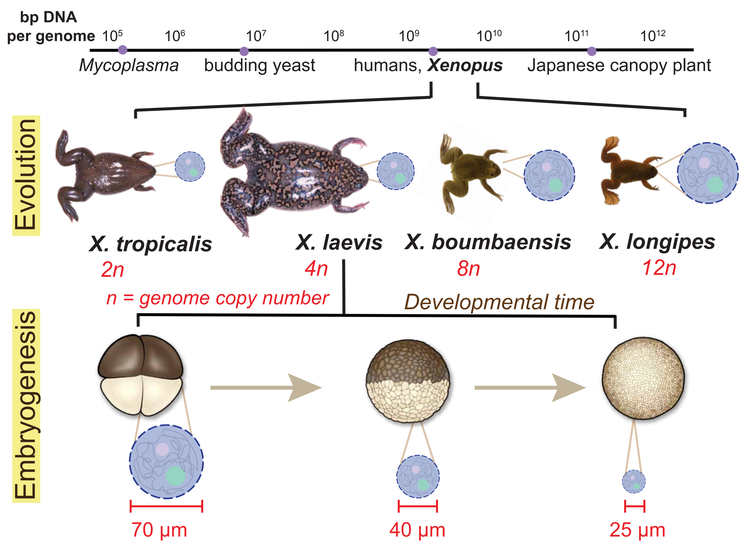
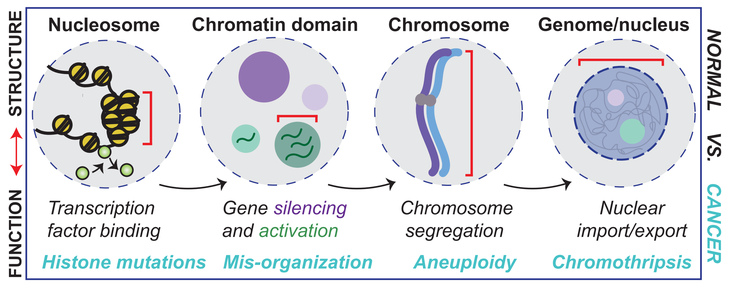
How do genomes adapt to changes in size?



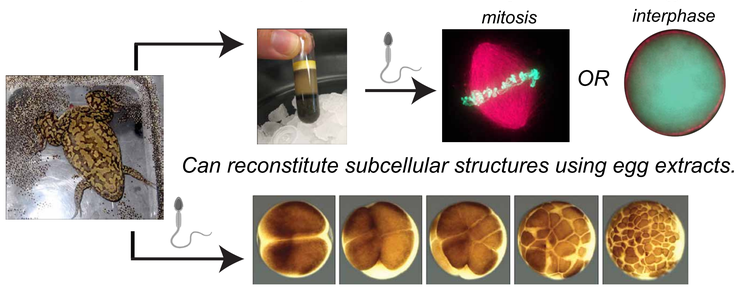
3D genome organization across scales



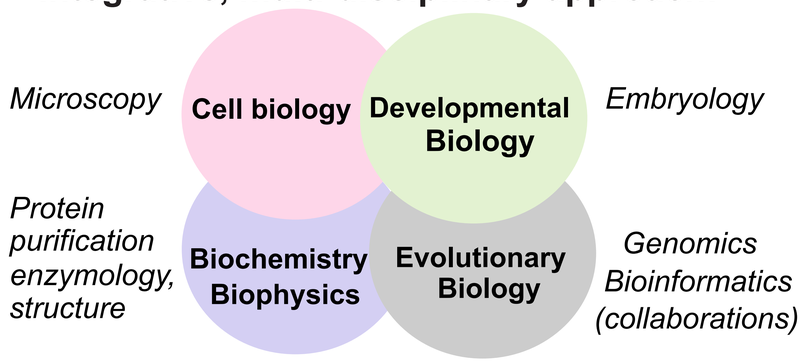
Biological scaling:

What are the causes and consequences of a change in size?
What are the evolutionary constraints on size?

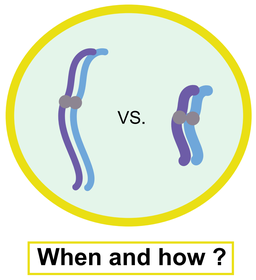
Xenopus extracts allow us to reconstitute genomes as a function of cell cycle and developmental stage.



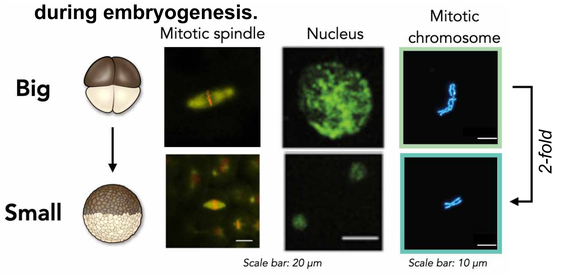
Integrative, multi-disciplinary approach:



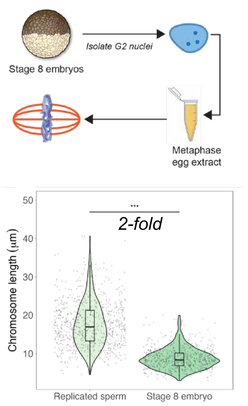
Project 1: Mitotic chromosome scaling



Subcellular structures scale with decreasing cell size during embryogenesis.

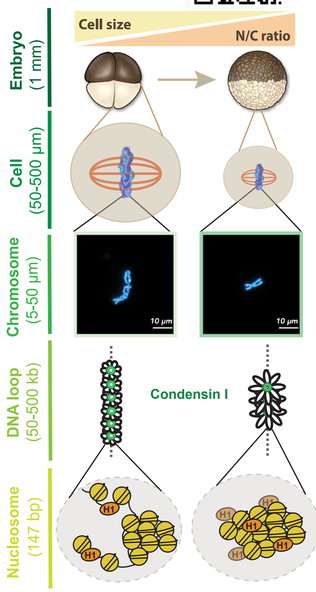


Egg extracts recapitulate mitotic chromosome scaling *in vitro*.



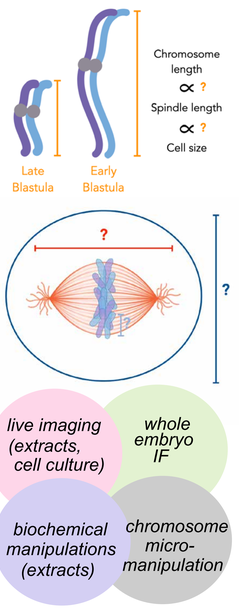
Model: mitotic chromosomes scale to N/C ratio and cell size.

link to full paper (eLife, 2023)

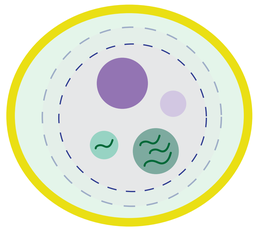


Next steps: WHY?

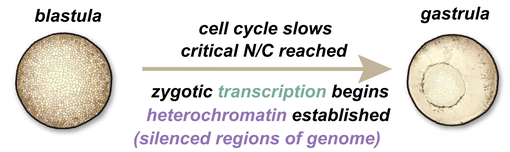
Model: *mitotic chromosomes need to scale with spindles in order to promote faithful chromosome segregation.*

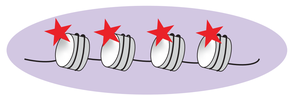


Project 2: Heterochromatin domain scaling



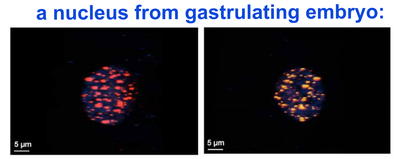
3D genome organization is established during the mid-blastula transition (MBT).





H3K9me3 (epigenetic mark)

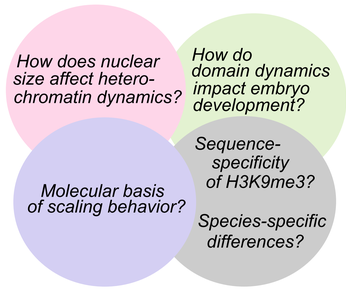
a nucleus from gastrulating embryo:



H3K9me3 — 3D segmentation

How does ploidy affect heterochromatin establishment in the embryo?

Next steps:



Other questions:

- **How are huge genomes packaged into chromatin?**
- **How do huge genomes protect themselves from DNA damage?**
- **How are huge genomes organized to prevent DNA entanglements?**

Zhou Lab philosophy:

The Zhou Lab will consist of a team of people-scientists with a shared goal of producing and communicating thought-provoking, rigorous scientific stories through the following core values:

creativity **wellness** **growth mindset**
transparency **curiosity** **intellectual freedom**
community-building **critical thinking** **joy**
belonging **imagination** **active mentorship**

Have questions about projects and/or my mentorship style?
Feel free to reach out! ***coral.zhou@ku.edu***