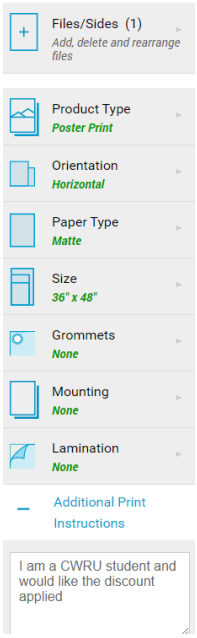
Poster options available to CWRU students **Last updated: October 2019**

Due to the recent changes in poster printing options and the end to poster printing at the Freedman Center at KSL, the DoGS Council has put together a list or resources and examples for current poster printing options that are available to students. We are currently aware of three options available**: FedEx, the Office of Student Acitivites and Leadership, and the Map Collection at the Cleveland Public Library**. Details on each option are listed below.

<u>FedEx</u>

- Link for online ordering: https://www.fedex.com/apps/printonline/?intcmp=BAL-1001276-81-1-962-1110000-US-US-EN-PRINTONLINELOCL-1-LPOFFICE-EN-1&defaultCenter=5686#!upload/large/pid%3D1466693799380%401446218320816%40false/false
  - You can also go to Thwing Student Center in person to place your order. The hours are 8am-8pm Monday-Friday and 10am-6pm on Saturday. Their phone number is (216) 229-2111
- Prices vary per size and paper type, here are the lowest approximate prices (matte paper).
  - 16” x 20”
    - $21.75
  - 18” x 24”
    - $21.75
  - 22” x 28”
    - $36.25
  - 24” x 36”
    - $43.50
  - 36” x 48”
    - $87.00
  - In general, matte paper is $7.25/square foot and glossy is $12/square foot. There is also an option to laminate the poster, but this may not look the best over matte paper. People have said it makes viewing difficult due to a glare from the laminate.
  - As a CWRU student, there is a discount you can apply. When you are done selecting your poster specifications, click “Additional Print Instructions” and add a note stating you are a CWRU student (see image on right).
    - Your price will no longer be displayed on the page and you will receive an additional email after the order is placed to confirm your discount. The discount is approximately 20%.
    - You will need to pay in person if the discount is applied. They take SpeedTypes as well.



- Posters are printed and ready for pick-up in 1-2 days max.
- Examples of printed posters are on the following page, if you would like to see them in person, they are outside of Millis 122/124

Morphogen-coordinated cell migration encodes positional information for pattern formation along the DV axis in *D. melanogaster* cellularization embryos

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Introduction

The Morphogen French Flag model:

- Morphogen gradients encode positional information for pattern formation in a threshold dependent manner.
- Cells receive positional information by reading the local morphogen concentrations, which requires the cell to be static without division and migration.

In Biological systems:

- Most developmental fields are dynamic with cell migrations, divisions or other morphogenetic movements.
- Cells follow a stereotyped migration pattern in *D. melanogaster* cellularization embryos, which was previously considered a static developmental field (Soriia VE, Keranen et. al., 2006).

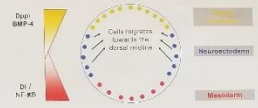

Figure 1. Cross section of a Drosophila blastoderm embryo. Dl and Dpp morphogens (triangles) specify the germ layers along the DV axis.

Question and hypotheses:

- Question: How do morphogens coordinate cell fate specification and cell movements during cellularization?
- Hypotheses: 1. Dpp gradient regulates the coordinated cell migration during cellularization; 2. Cell migration affects gene patterning along the DV embryonic axis.

Main Methodology

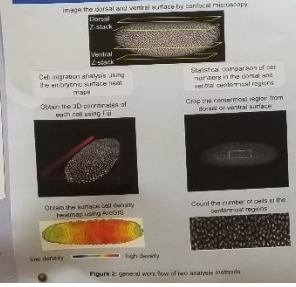

Figure 2. general work flow of two analysis methods

Results

Cells migrate to the dorsal midline, generating a high cell density region on the dorsal surface at late cellularization stage

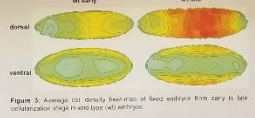

Figure 3. Average cell density heat-maps of fixed embryos from early to late cellularization stage in wild type (wt) embryos.

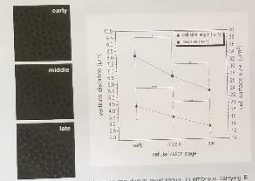

Figure 4. Cell imaging analysis of the dorsal most region in embryos carrying E-cadherin::GFP construct (E-cad::GFP) during cellularization. The left panel shows the expression of E-cad::GFP from early to late stage. (if an earlier time point is the late stage, the yellow color indicates E-cad::GFP). The right panel shows the statistical analyses of cell areas. * p < 0.05, ** p < 0.01, *** p < 0.001.

Dpp attracts cells to its high activity regions

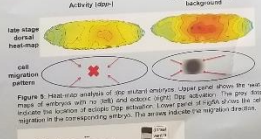

Figure 5. Heat-map analysis of dpp mutant embryos. Upper panel shows the heat-maps of embryos with no (left) and ectopic (right) Dpp activation. The grey dots indicate the location of ectopic Dpp activation. Lower panel of right shows the cell migration in the corresponding embryo. The arrows indicate cell migration direction.

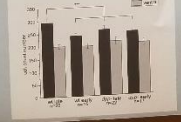

Figure 6. Statistical analysis of the cell counts between wt and dpp- embryos from early to late stage. Each bar indicates the cell counts in the centermost region of dorsal or ventral embryos in subset. ***p<0.001

Dorsal (Dl) gradient is necessary for the Dorsoventral cell density difference

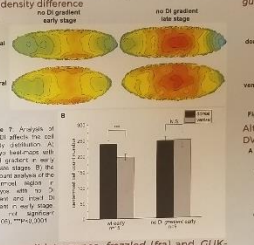

Figure 7. Analysis of how Dl affects the cell density distribution. A) embryo heat-maps with no Dl gradient in early and late stages. B) the cell count analysis of the centermost region of embryos with no Dl gradient and intact Dl gradient in early stage. N.S.: not significant (P>0.05), ***p<0.001

Two candidate genes, *frazzled (fra)* and *GUK-holder (gukh)* are identified as morphogen downstream effectors regulating cell migration

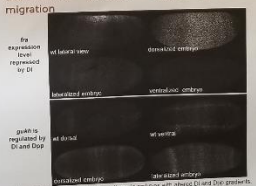

Figure 8. *fra* and *gukh* expression patterns in dl-cross with altered Dl and Dpp gradients.

Fra and Dl regulate the E-cad distribution

Figure 9. E-cad distribution analysis. A-D) wt and Dl or Fra mutants altered E-cad mapping in wt and mutant embryos. E) the co-localization of Fra and E-cad. Red signals for E-cad staining. Green stands for Fra staining. Gray shows the co-localization.

Cell migration pattern is altered when either *fra* or *gukh* is mutated

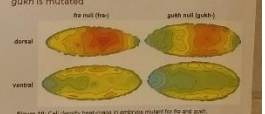

Figure 10. Cell density heat-maps in embryos mutant for *fra* and *gukh*.

Altered cell migration in the mutant embryos affects DV gene expression profile

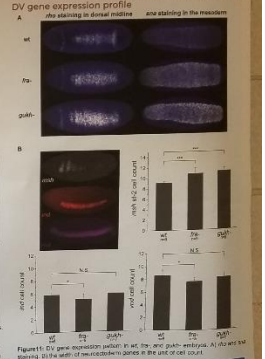

Figure 11. DV gene expression pattern in wt, *fra*- and *gukh*- embryos. A) *sog* and *twi* staining. B) the width of two ectoderm genes in the unit of cell count.

Conclusions

1. Dl and Dpp regulate the stereotyped cell migration through *fra* and *gukh*
2. Our results suggest DV morphogens and Fra affect cell-cell interactions through E-cad.
3. Cell migration affects the gene expression patterning along the DV axis even in the presence of intact morphogen gradients

A bioinformatics approach for identifying genes involved in aging

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Case Western Reserve University

Introduction

- Despite their close evolutionary relationship, *Drosophila melanogaster* and *Drosophila simulans* have accumulated genetic differences over millions of years to result in gene regulatory network changes and a differential stress tolerance[1].
- Stress tolerance is an indicator of lifespan and neurodegeneration
  - *Drosophila* strains selected for long lifespans have increased stress resistance than the wild type[2]
  - *catalase* gene mutants have higher resistance to oxidative stress, longer lifespan, and reduction in neurodegeneration than the wild type[3]
- Combining separate regulatory networks into a single genome could potentially dysregulate aging.

Methods

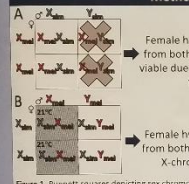


Figure 1. Punnett squares depicting sex chromosome distribution of *D. melanogaster* (mel) and *D. simulans* (sim) hybrid progeny. All hybrids have the same autosomes, half from each parental species. Hybrid and pure species flies were then assessed for longevity with an aging curve. A) Female progeny receive Xsim paternally. (B) Progeny receive Xsim maternally. We are able to make this cross due to a special *D. melanogaster* line we isolated, which overcomes the behavioral rejection of *D. simulans* females towards *D. melanogaster* males. Female hybrids are viable when reared at low temperatures.

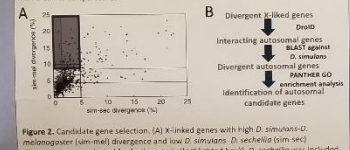


Figure 2. Candidate gene selection. (A) X-linked genes with high *D. simulans-D. melanogaster* (sim-mel) divergence and low *D. simulans*- *D. sechellia* (sim-sec) divergence were selected for further study (highlighted box)[4]. *D. sechellia* was included in the analysis to avoid polymorphisms specific to *D. simulans*. (B) Autosomal genes that interact with the X-linked genes were identified through the *Drosophila* Interactions Database (DroID). Divergence was assessed through a Basic Local Alignment Search Tool (BLAST) search. Overrepresented Gene Ontology (GO) terms were identified with a Protein Annotation Through Evolutionary Relationship (PANTHER) search.

Results

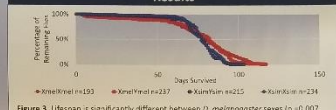


Figure 3. Lifespan is significantly different between *D. melanogaster* sexes ($p = 0.007$, 95% CI), but not *D. simulans* sexes ($p = 0.89$, 95% CI). Lifespan is different between sexes of different species ($p < 0.001$, 95% CI).

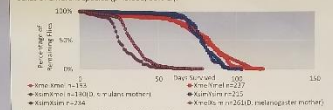


Figure 4. Lifespan is significantly different between both types of female hybrids and single species sexes ($p < 0.001$, 95% CI). Longevity also differs between types of female hybrids ($p < 0.001$, 95% CI).

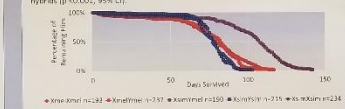


Figure 5. Lifespan is significantly different between male hybrids and single species sexes ($p < 0.001$, 95% CI).

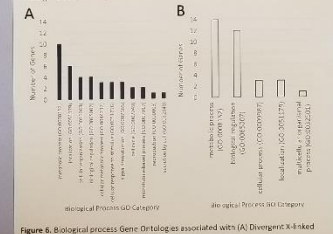


Figure 6. Biological process Gene Ontologies associated with (A) Divergent X-linked genes and (B) autosomal candidate genes.

Conclusions

What did we learn about aging from hybrids that was not known before?

- Lifespan is regulated by interactions between X-linked genes and autosomes.
- These interactions are disrupted in hybrids and result in dysregulated aging.
- *D. melanogaster* X-linked gene(s) that regulate longevity are recessive
- There is a maternal effect on hybrid longevity
- We found that among the 111 X-linked genes that are divergent in these species 16 have human orthologues and Gene Ontologies consistent with aging.
- The 27 autosomal gene candidates have human orthologues and Gene Ontologies related to metabolism, cellular biosynthetic processes, and gene expression, which could potentially impact aging.

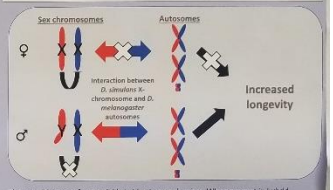


Figure 7. Diagram of potential hybrid aging mechanism. When present in hybrid females, the X-chromosome from *D. melanogaster* (red) inhibits interactions between *D. simulans* (blue) autosomal genes that would permit increased longevity. Due to lack of an X-chromosome from *D. melanogaster* in male hybrids, *D. simulans* X-linked and *D. melanogaster* autosomal genes can interact causing increased longevity.

Ongoing Research

We are currently performing experiments using RNAi to target the autosomal candidate genes and validate if disruption in the interaction between the divergent X-linked genes and autosomal gene partners modifies aging as in the *Drosophila* hybrids. We are testing if stress response differs in RNAi flies through starvation, desiccation, and heat stress assays. Neurodegeneration is also being assessed through a negative geotaxis assay and quantification of neuron death in the brain. We will determine lifespan through an aging curve as seen here. Since the specific function of various genes we identified are unknown, our study has the potential to uncover novel genes previously not linked to aging through influencing stress resistance and neurodegeneration.

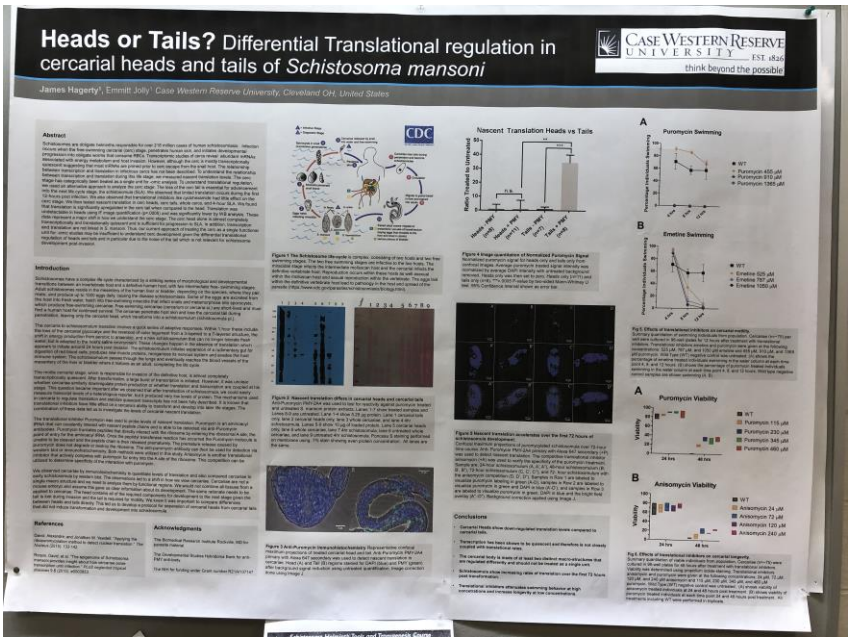
1. Parsons P (1975). The Comparative Evolutionary Biology of the Sibling Species, *D. melanogaster* and *D. simulans*. Q. Rev. Biol. 50: 151–169.
2. Service P et al. (1988). Resistance to Environmental Stress in *D. melanogaster* selected for postponed senescence. Physiol. Zool. 61: 390–395.
3. Sykiotis G and Bohmann D. (2007). Keap1/Nrf2 Signaling Regulates Oxidative Stress Tolerance and Lifespan in Drosophila. Dev Cell 14: 76-85.
4. Sousa-Neves R, Reed A. (2016). An Analysis of Genetic Changes during the Divergence of Drosophila Species. PLoS One 9: e104485.

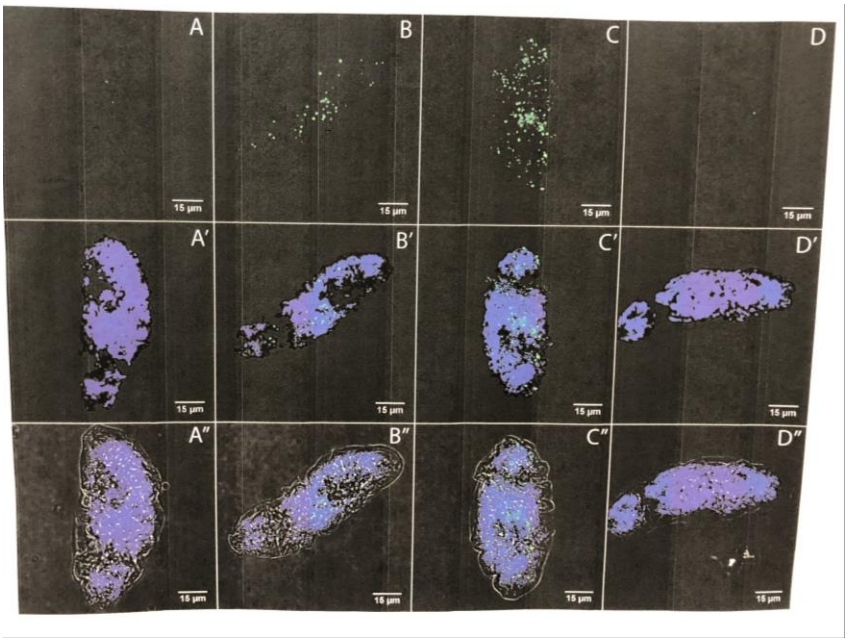
Office of Student Activities & Leadership

- Link for online ordering: https://case.edu/studentlife/activities/services/poster-printing
- Prices vary per size
  - 18” x 24”
    - $8
  - 24” x 31”
    - $9
  - 28” x 36”
    - $10
  - 32” x 42”
    - $11
  - 36” x 47”
    - $12
  - 42” x 54”
    - $15

- Posters are printed on plain paper and are best suited for short-term indoor use.
- A discount is offered to USG-recognized student groups and campus departments and offices when billed to a recognized group or campus SpeedType. All other orders (individuals, local businesses) may be paid by cash or check.
- Students using this option were charged $10.
- Posters must be submitted as a PDF file.
- You will be emailed when your poster(s) are ready to be picked up in the Office of Student Activities & Leadership. Most posters will be printed within one business day; my poster was ready the same day.

Overall, the poster text and images look good. The biggest issue was confocal images.


Heads or Tails? Differential Translational regulation in cercarial heads and tails of Schistosoma mansoni
CASE WESTERN RESERVE UNIVERSITY EST. 1826
think beyond the possible
James Hagerty*, Emmitt Jolly* Case Western Reserve University, Cleveland OH, United States
Abstract
Introduction
Nascent Translation Heads vs Tails
Puromycin Swimming
Emetine Swimming
Puromycin Viability
Anisomycin Viability
Conclusions
References
Acknowledgments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Map Collection at the Cleveland Public Library

- 325 Superior Ave 6th floor, (216)623-2880
- Cost is approximately $40 for think bond paper and $55 for glossy paper.
- We do not know of anyone that has used this method yet. Please contact jmy29@case.edu to let us know your experience.