

# Genomes: Variation, Adaptation, Personalized Genomics Research

# Investigating collective cell behaviors

- **Dr. Joseph Campanale**
- Assistant Professor
- School of Life Sciences
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- Website: [Campanale Lab](#)

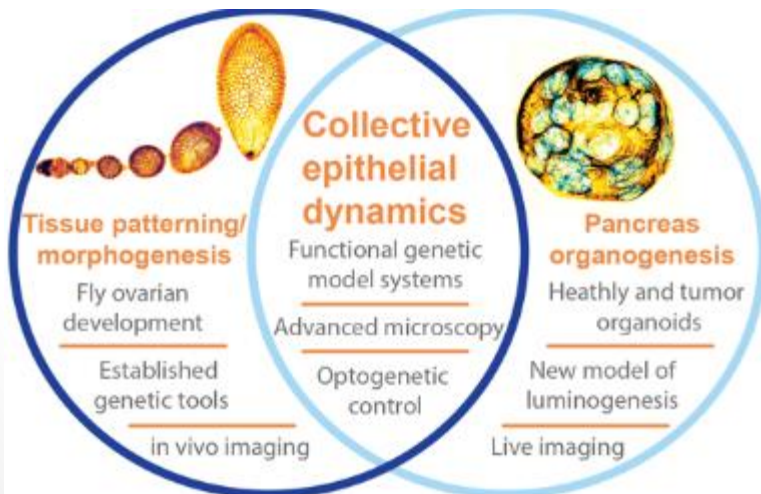


Fig.1: Using flies and mammalian organoids to study collective epithelial dynamics deployed in development.

## Expertise

- Collective cell migration
- Cancer cell biology
- Developmental biology
- Fruit fly genetics
- Pancreatic organoid morphogenesis
- 4-Dimensional live cell microscopy

# How do cells coordinate collective movements to establish barriers?

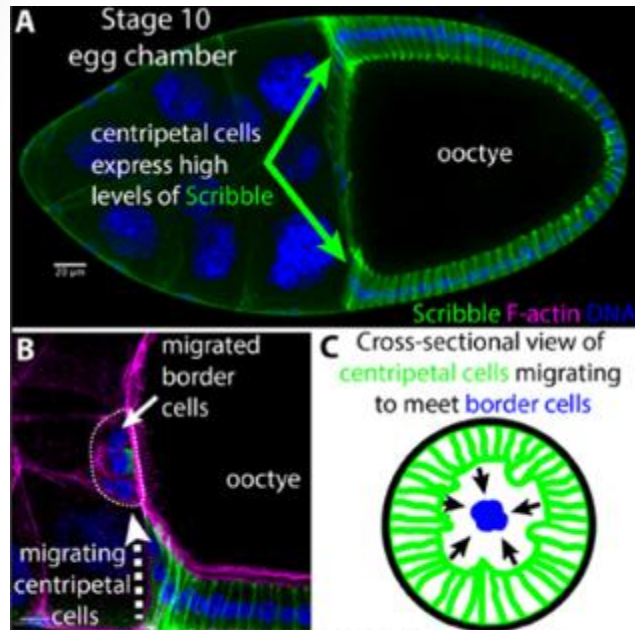


Figure 3. Centripetal cells in the stage 10 egg chamber overexpress scribble (A,B) and migrate toward border cells (C).

Centripetal cells (CFCs) found in fruit fly eggs offer an unexplored *in vivo* model of epithelial sheet migration. My lab uses these untapped experimental pace to understand the basic principles of how cells migrate as sheets *in vivo* and answer questions such as: 1) What role does epithelial cell polarity signaling play in CFC movement; and 2) Does polarity signaling regulate CFC cell-cell adhesion during migration?

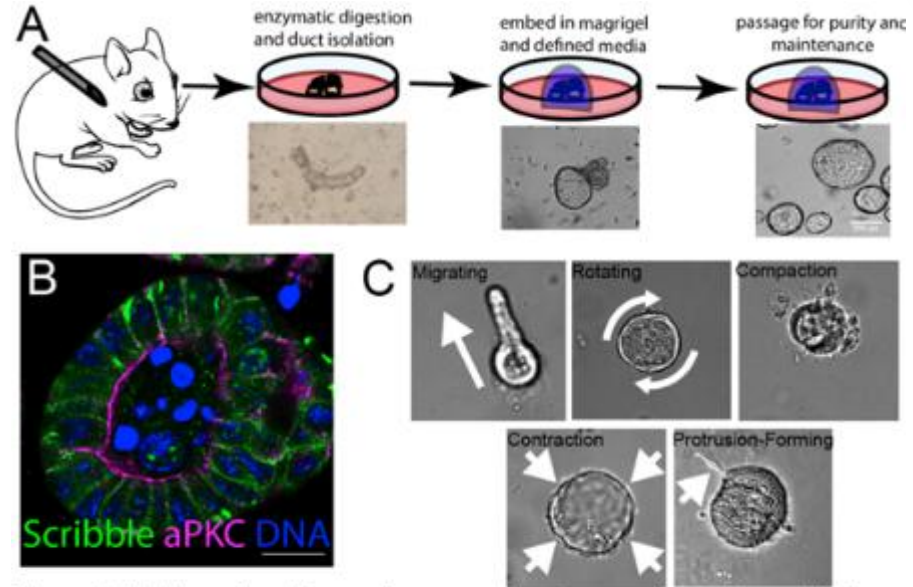


Figure 4. (A) Normal or diseased pancreas ducts are cultured in matrigel before maintenance. (B) Normal organoids are apicobasally polarized and (C) exhibit a range of behaviors during development.

Polarity complex interactions are well-established in many epithelia; however we lack a detailed understanding of their functions and regulation across organs. We aim to discover the role of polarity in pancreas morphogenesis using live imaging, organoid culture, and developmental biology to ask: 1. What epithelial behaviors drive pancreas development? 2. What mechanistic roles do polarity complex proteins play in controlling these behaviors? 3. What emergent cell properties underlie duct morphology? And 4. Are these properties mechanically controlled?

# Environmental Biology Research

**Dr. Allen G. Gibbs**

Professor

School of Life Sciences

Phone: 702-895-3203

Email: [allen.gibbs@unlv.edu](mailto:allen.gibbs@unlv.edu)

## **Expertise**

- Environmental physiology
- Insect physiology
- Experimental evolution

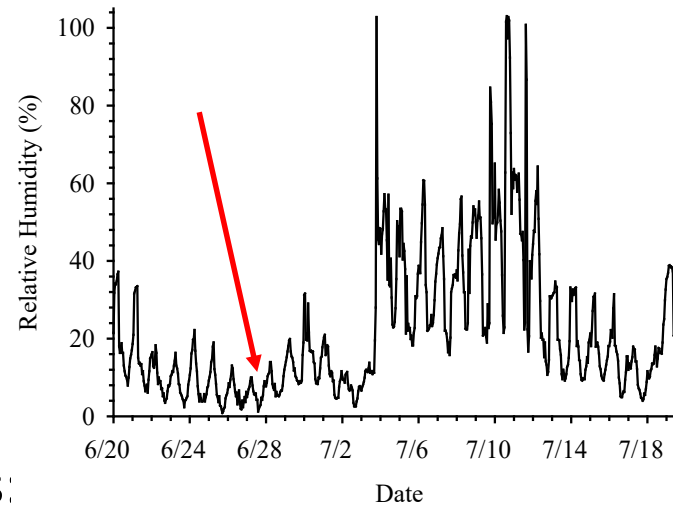
# Environmental Physiology of Desert Invertebrates

Adaption to water stress:



## Driest Day Ever Recorded (Anywhere)

Lake Mead, 2011



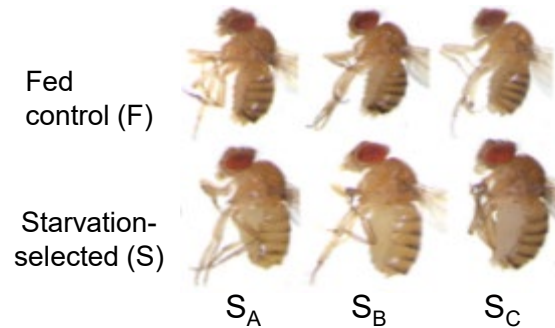
Adaptation to high temperatures:



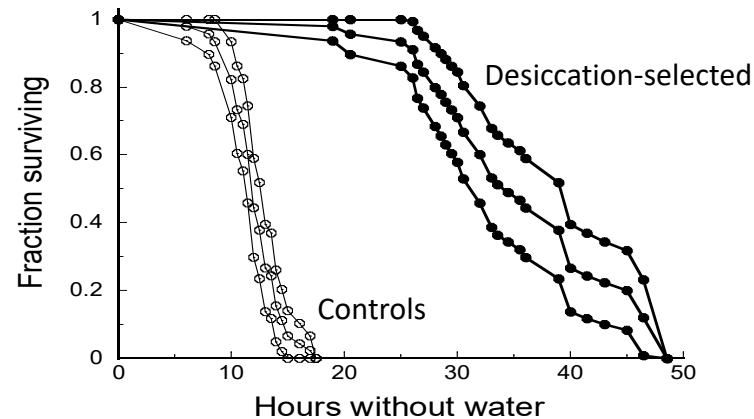


# Experimental Evolution Research Using Fruit Flies

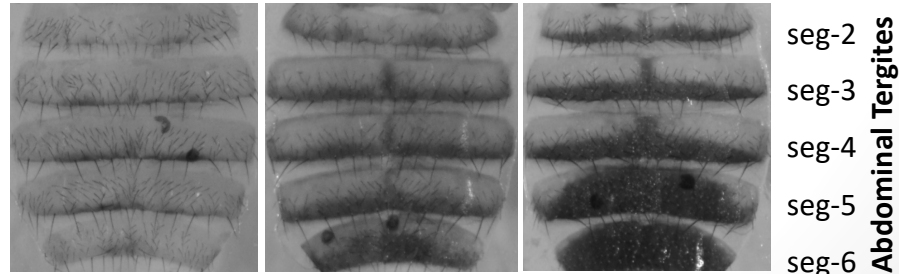
Starvation resistance:  
- a fly model for obesity



Desiccation resistance:  
- understanding responses to desertification



Pigmentation:  
- phenotypic correlations of melanization



# Guha Lab

- **Dr. Prasun Guha, Ph.D.**
- Assistant Professor
- NIPM/School of Life Sciences
- Email: [prasun.guha@unlv.edu](mailto:prasun.guha@unlv.edu)
- Website: <https://guhalab.faculty.unlv.edu/>

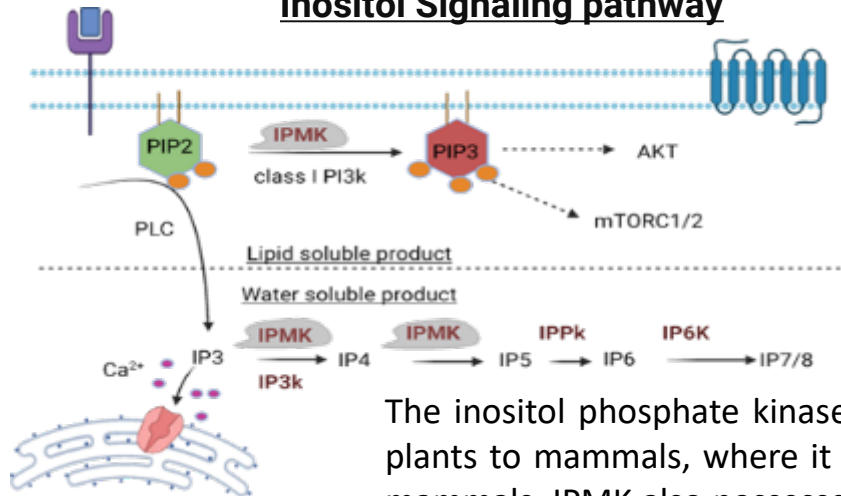


**Expertise: Guha lab has primarily two major focuses.**

**A]** The lab aims to integrate cell signaling and epigenetic mechanisms of Crohn's disease, with special emphasis on the leaky gut.

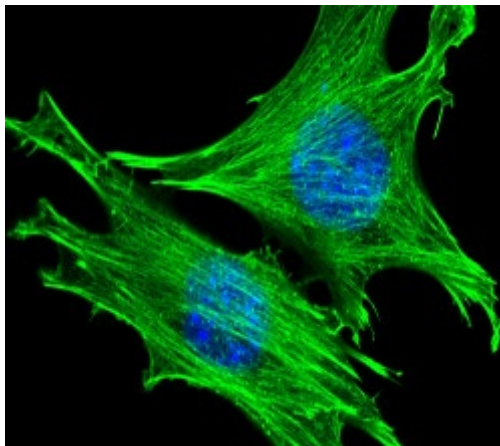
**B]** Our 2<sup>nd</sup> lab interest is to unravel the role of inositol signaling influencing nuclear functions.

## Inositol Signaling pathway



The inositol phosphate kinase function of **IPMK** is conserved from plants to mammals, where it converts IP3 to IP4 and IP4 to IP5. In mammals, IPMK also possesses phosphatidylinositol 3-kinase (PI3K) activity, generating phosphatidylinositol (3,4,5)-trisphosphate (PIP3), a second messenger that promotes cellular growth and cancer progression. We are interested in exploring the physiological importance of IPMK and inositol signaling in cell and animal models.

## Confocal imaging of actin cytoskeleton staining (Green)

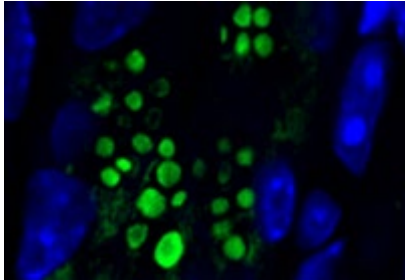


## Cell Migration

The primary threat for cancer is the phenomenon called metastasis. Cell migration and invasion are critical for metastasis. We are interested in studying the mechanism of cell migration.



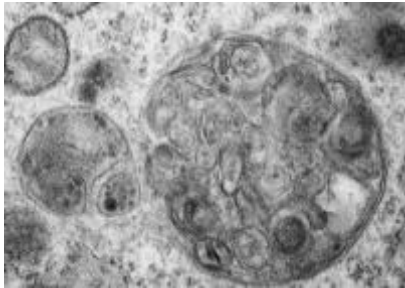
### Confocal Imaging of Intestinal Paneth cell granules in green



### Crohn's Disease

According to GWAS study and mutation analysis IPMK is linked to intestinal carcinoid and crohn's diseases. Our lab is currently investigating role of inositol signaling in intestinal function.

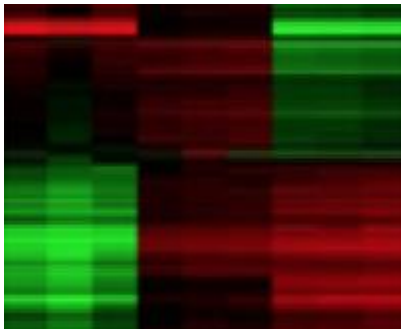
### Trans mission electron microscopy of Autophagic vesicle



### Autophagy

Autophagy is fundamental to maintaining cellular homeostasis and is linked to cancer and neurodegenerative disorders. However, the role of autophagy in controlling nuclear function is unknown. Our lab is currently investigating how autophagy impacts nuclear events.

### Gene expression analysis



### Genetics & Epigenetics

The nucleus is the brain of any cell. Our lab's major interest is to study how nuclear function influences disease progression, emphasizing cancer and neurodegenerative disorders.

# Han Lab

Dr. Mira Han

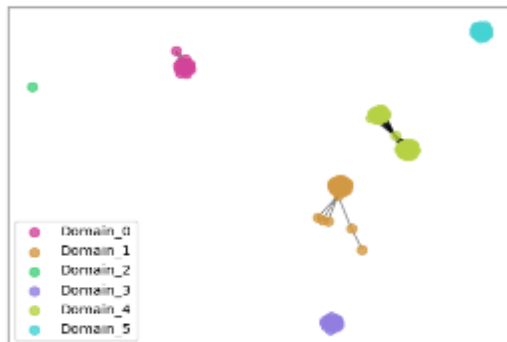
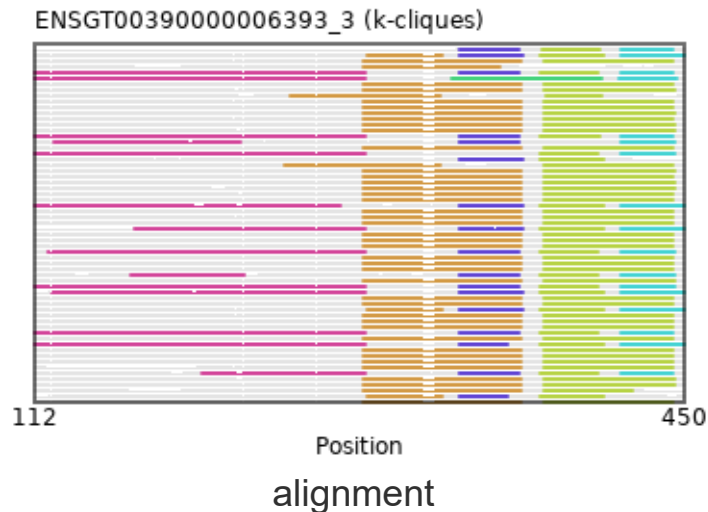
- Associate Professor,
- School of Life Sciences
- Phone: 702-774-1503
- Email: [mira.han@unlv.edu](mailto:mira.han@unlv.edu)

Expertise

- Molecular Evolution
- Genomics of transposons
- Next generation sequence analysis

# Han Lab – molecular evolution

Evolution of domain architecture and interdomain linkers across 148 Amniote genomes



Domain homology across proteins

Database of homologous domains and linkers

mirahan.faculty.unlv.edu

Query Results "ENSGT00680000099553\_8"

Found:

- ENSGT00680000099553\_8

ENSGT00680000099553\_8

ENSPYP00000003888 (view gene)

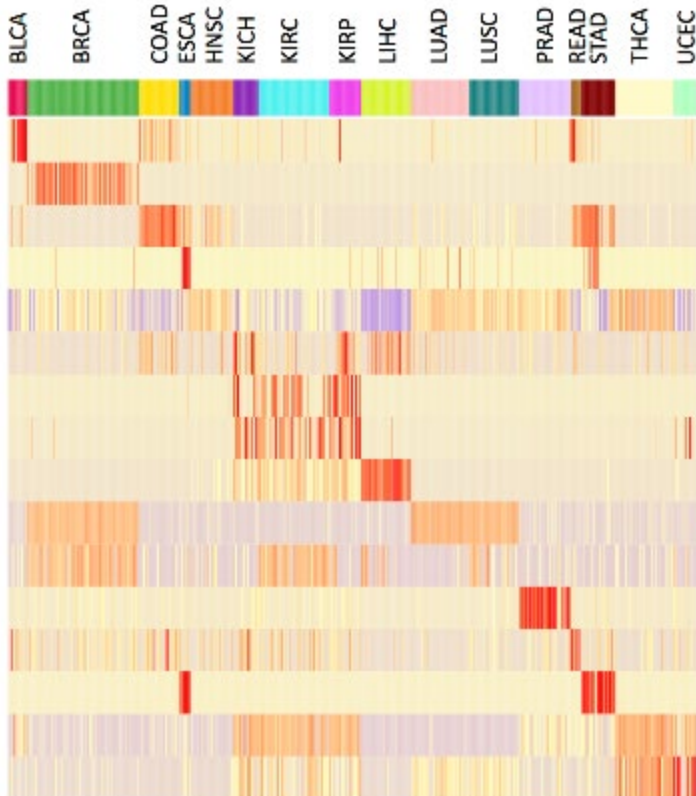
```
-----  
-----MQNQH-SGVNQLGGVFVNGRPLPDSTRQKIVELAHSGARP  
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KIAQYKRECPISFAWEIRDRLSECVCNDNIPSVSSINRVL ENSGT00680000099553_8_Domain_0  
YDKLRML ---NGQTGSWGTTPGMYPGTSPGQPTQ--DGCQG (144, 283)  
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ENSMFAP00000012817 (view gene)

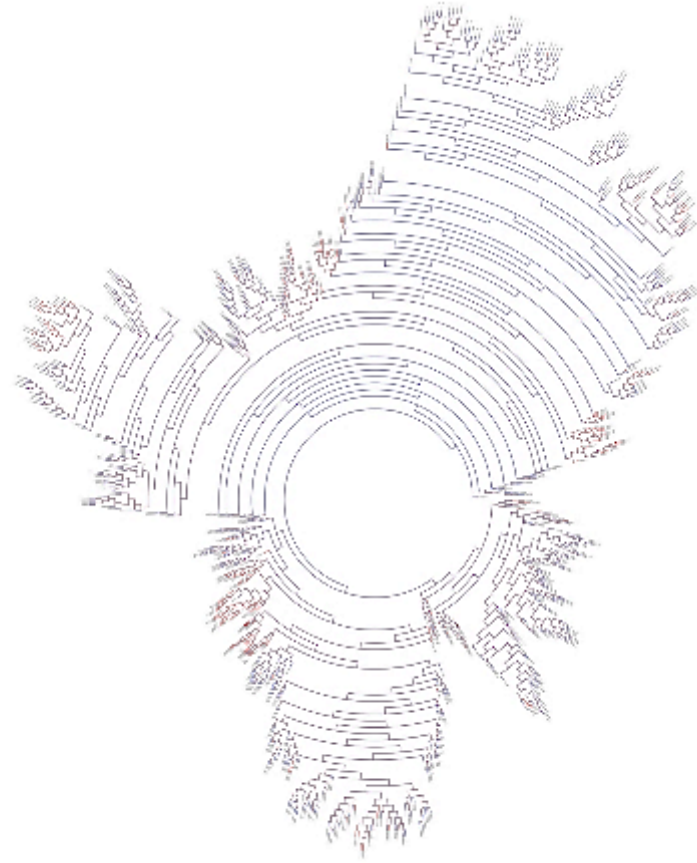
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-----  
-----LSSGH-SGVNQLGGVFVNGRPLPDSTRQKIVELAHSGARP  
CDISRTLO-----VSNQCVSKILGRYYETGSTRPRAIGGSKPRVATPEVVS  
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YDKLRML ---NGQTGSWGTTPGMYPGTSPGQPTQ--DGCQGGGGGENTNSISSNGED  
SDEAQRHLQLKRKLQRNRTSFTQEQIEALEKEFERTHYPQVFARERLAQKIDLEA  
WFSNRRAKWRREEKLRNQRRQASNTPSHIPSSSFSTSVYQPIQPTTPVSSFTSGSMLG  
RTDTALTNTYSALPPMPSFTMANNLPMQ-DSFPLVCQ-----FQKFEVNLICLMTG  
QDYI-----SDYGDTTIELSEKKEKWLLEALQFYNCVLYCTIGE  
GMDLKQGPLYTEGTISVGTNLHFGIQTFIHFGVLFVNGHLYVIMKKKNVVDNDV  
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# Han Lab – transposon genomics

Transposons in host regulation and disease



Tissue specific transposon expression



Predicted NANOG binding based on ancestral reconstruction of RLTR13D6 transposons

# Integrative Physiology

**Dr. Allyson Hindle**

Assistant Professor

School of Life Sciences

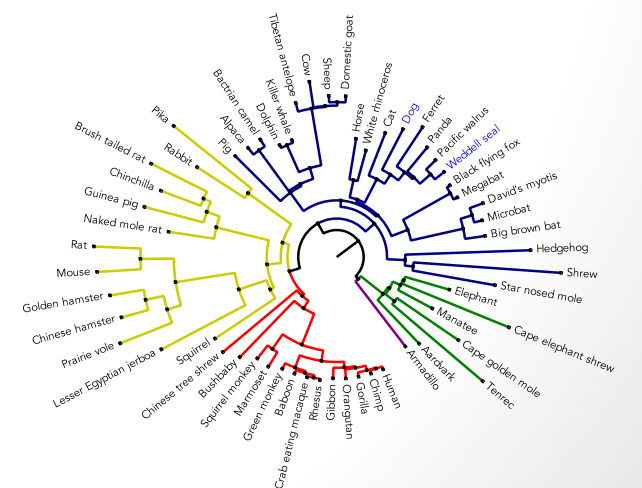
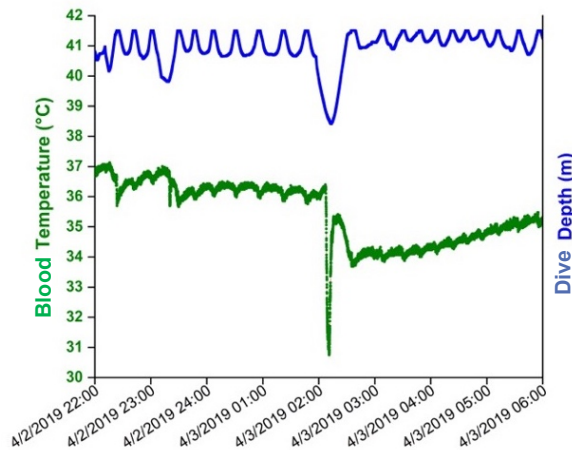
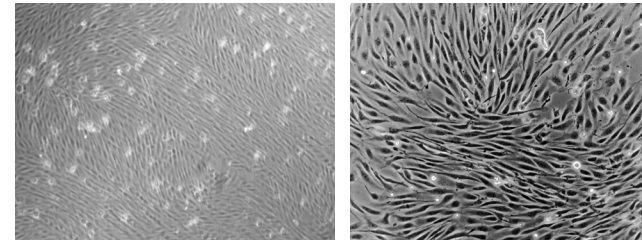
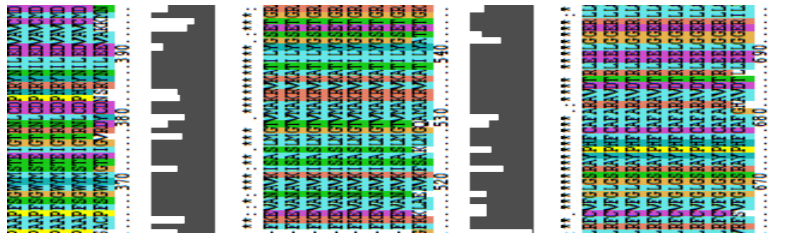
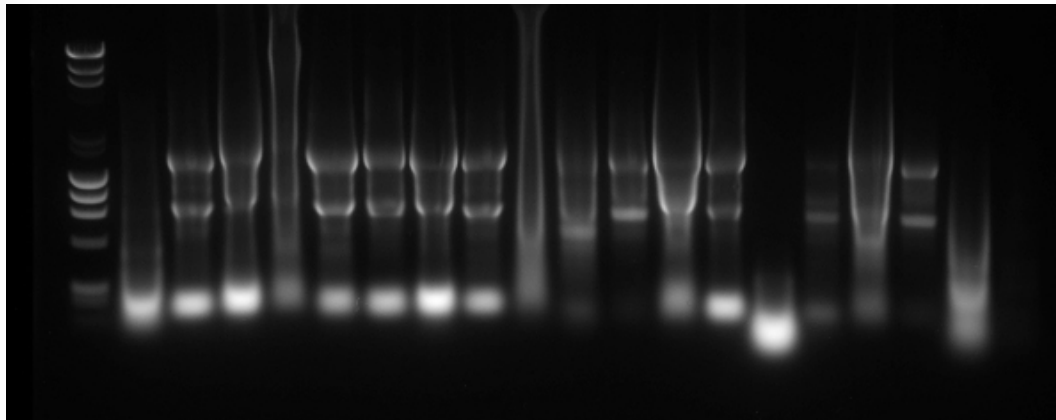
Phone: 702-895-4521

Email: [allyson.hindle@unlv.edu](mailto:allyson.hindle@unlv.edu)

## **Expertise**

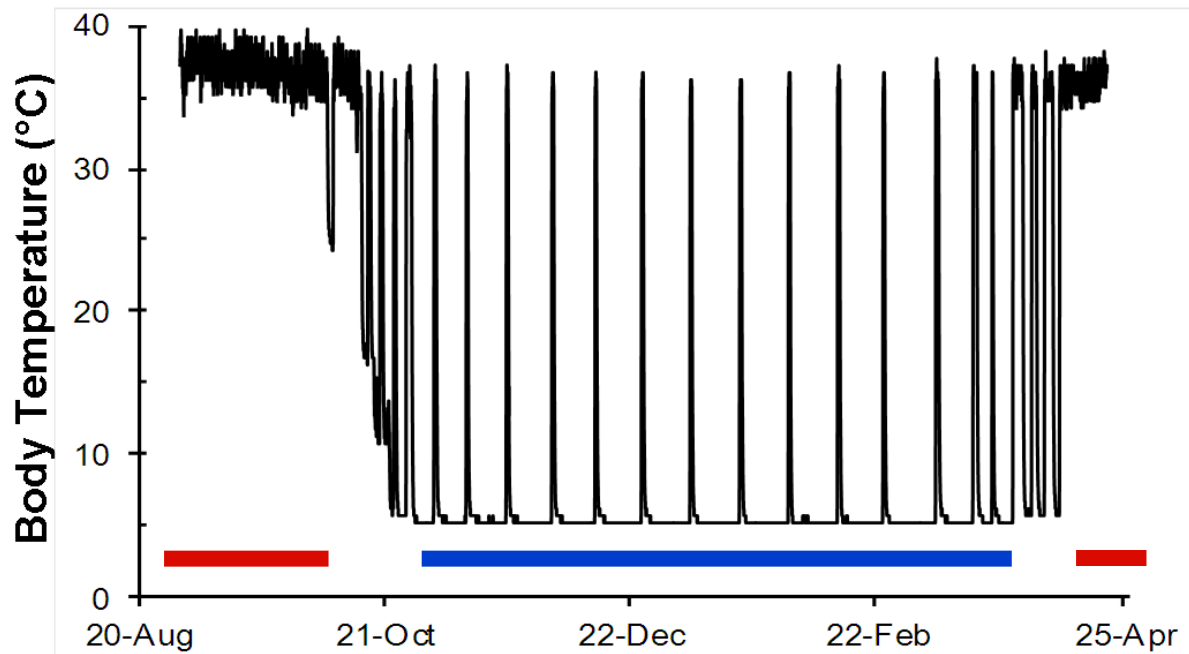
- molecular mechanisms of hypoxia tolerance in hibernating and diving mammals
- cardiovascular and blood pressure regulation
- comparative genomics, biomarker discovery and bioinformatics
- cell line resource development for non-model systems

# Cardiovascular protection of deep divers

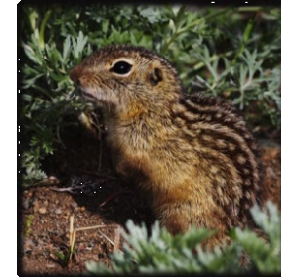




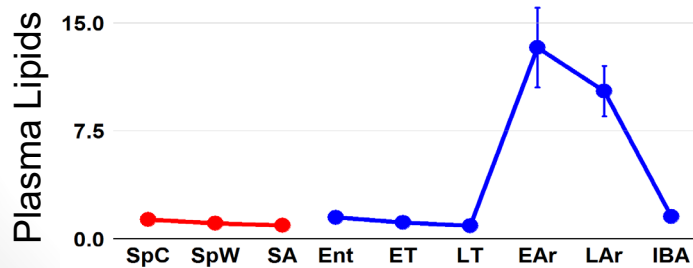
# Metabolic control of small hibernators



SUMMER



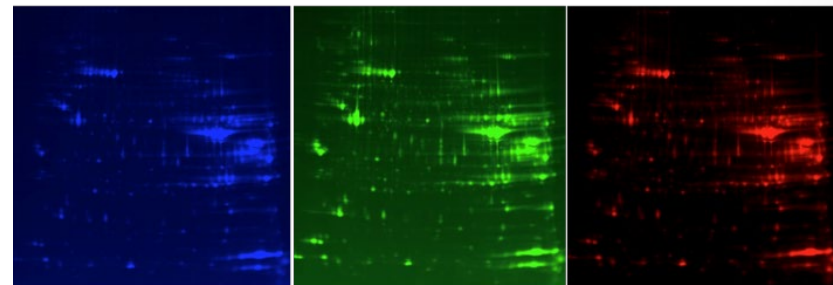
WINTER



REFERENCE

SQUIRREL 1

SQUIRREL 2



Cy2

Cy3

Cy5

# Computational Biology

- **Dr. Qian (Chris) Liu**
- Assistant Professor of Nevada Institute of Personalized Medicine (NIPM)
- School of Life Sciences
- Email: [qian.liu@unlv.edu](mailto:qian.liu@unlv.edu)
- Website: <https://www.unlv.edu/people/qian-liu>, <https://qgenlab.org>

## Expertise

- Deep Learning
- Bioinformatics
- Modification Detection
- Long-read Data Analysis
- RNA-Seq Data Analysis
- Protein Functional Analysis

## Research interests

Dr. Liu currently works on the development of deep learning/machine learning-based tools to conduct long-read data analysis.

This includes, but not limited to, the estimation of short tandem repeats, DNA modification detection, RNA modification detection, and RNA-seq data analysis. Besides, Dr. Liu is also interested in functional analysis of proteins.

The ultimate goal of Dr. Liu's research is to accelerate and facilitate genetic discoveries for human disease studies.

# Behavioral & Evolutionary Genetics

**Dr. Donald K. Price**

Professor of Biology

School of Life Sciences

702.895.5077

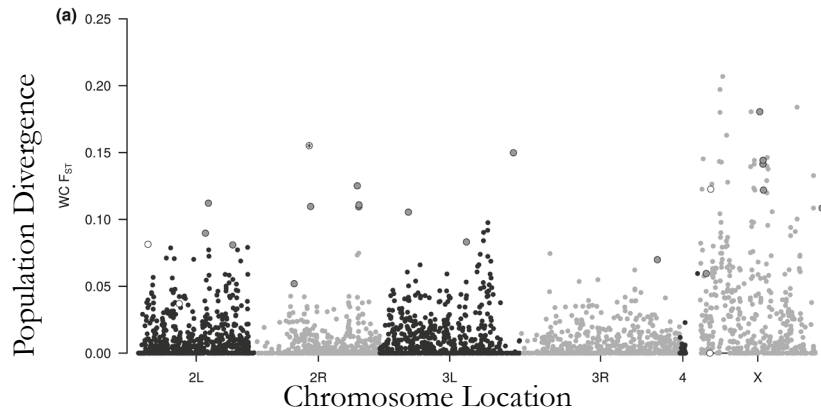
[donald.price@unlv.edu](mailto:donald.price@unlv.edu)

## **Expertise**

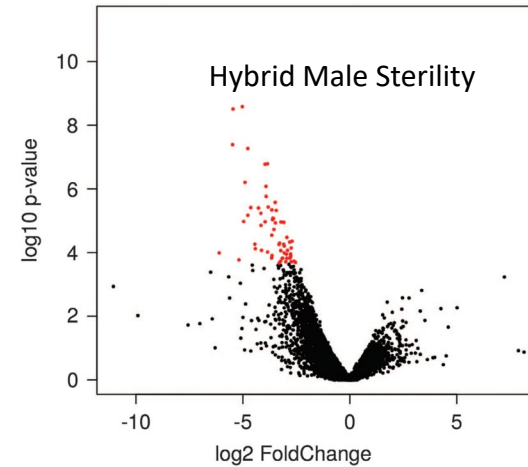
- **Behavioral Genetic Analysis**
- **Quantitative Genetics**
- **Genome-wide Gene Expression Analysis**
- **Adaptative Comparative Genomic Analysis**
- **Hawaiian Evolutionary Biology**
- **Biodiversity and Speciation**

# Evolutionary Genetics

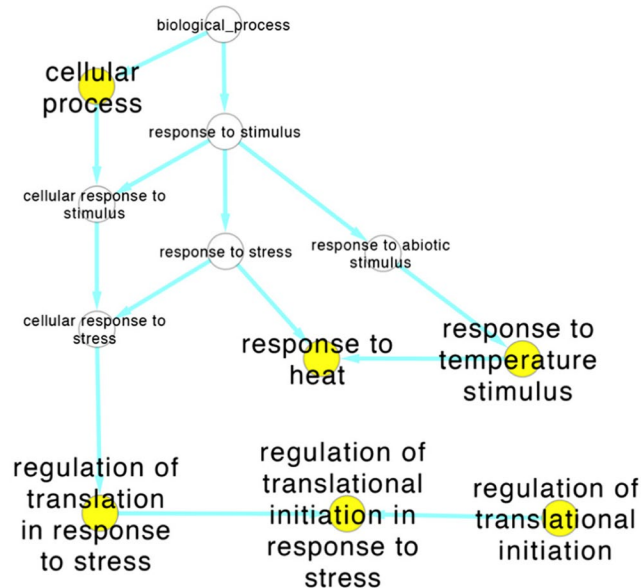
## Population Genomic Analysis of Adaptation



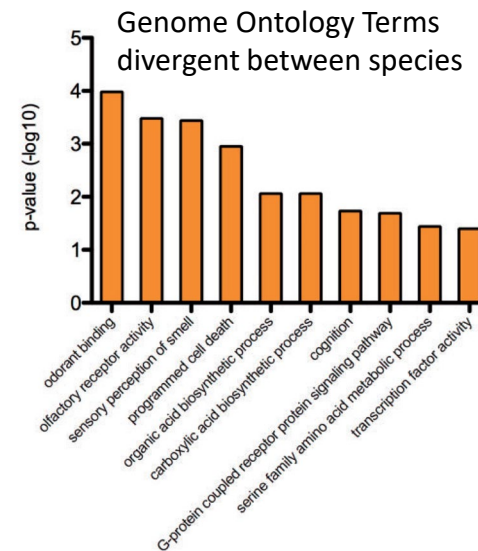
## Genome-wide Gene Expression Analysis



## Genomic Analysis of Physiological Adaptation

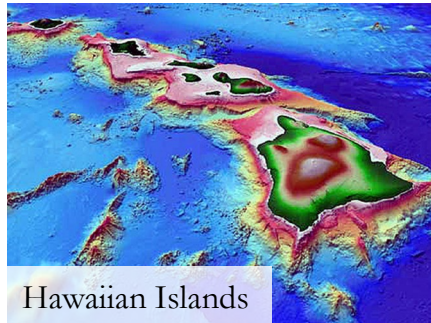


## Comparative Genomic Analysis



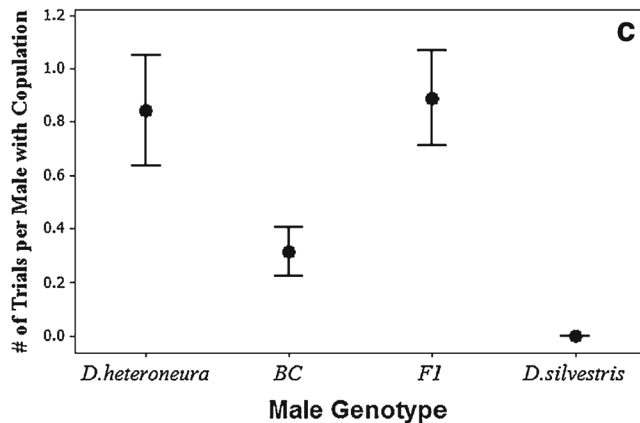
# Behavioral Genetics

## Hawaiian picture wing *Drosophila*

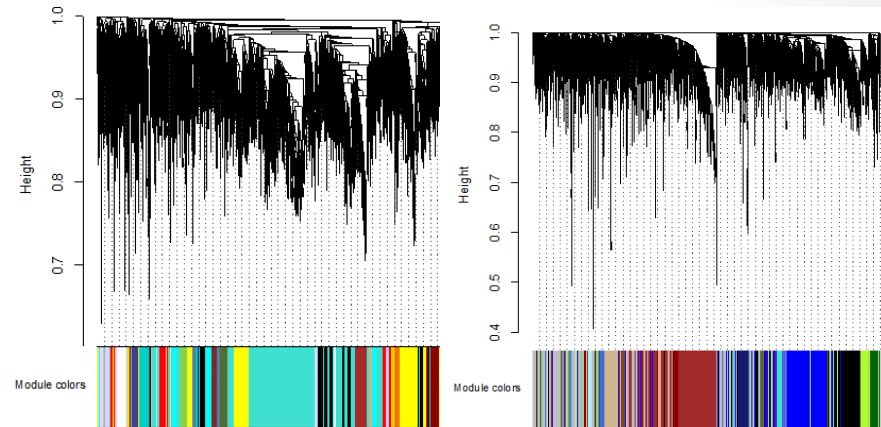


Hawaiian Islands

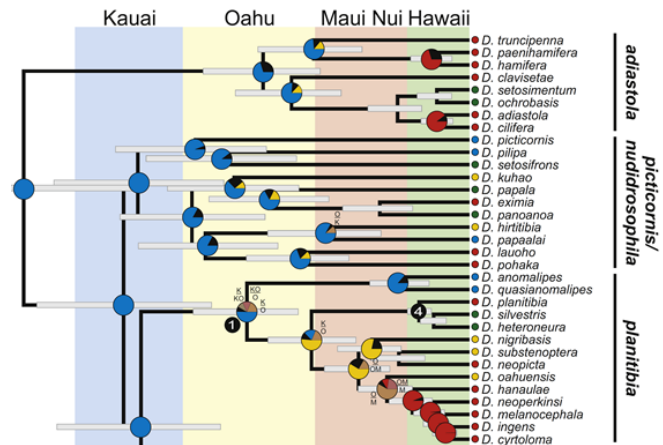
## Behavioral Reproductive Isolation



## Behavioral Gene Expression Correlation Networks



## Hawaiian picture wing Phylogenetic Analysis



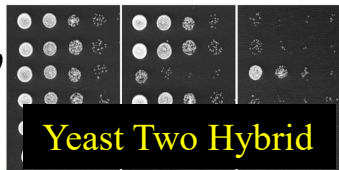
Dr. Jeffery Shen  
Professor,  
School of Life Sciences  
Phone: 702-895-4704  
Email: jeffery.shen@unlv.edu

#### Expertise

- Big Data Analysis to Study Biology, Agriculture and Medicine
- Molecular Mechanisms Controlling Plant Responses to Drought Heat, and Salinity
- Seed Germination, Tissue Culture and Plant Transformation
- Molecular Basis of Leukemia (in collaboration with Dr. J. Cheng at the University of Chicago Medical School)
- Nutrition of Cereal Crops (in collaboration with Dr. Christine Bergman, Ph.D. and R.D. at UNLV)



## Molecular Basis of Drought Stress Responses and Seed Germination



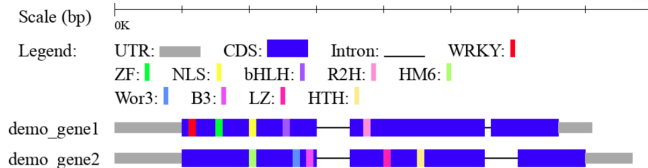
**BMC Genomics**, 2016, 17:102  
**Plant Science**, 2015, 236:214-222  
**Front. Plant Science**, 2015; 6: 1145  
**Trends in Plant Sci**, 2010, 15: 247



for Genome and Transcriptome Analysis

[http://shenlab.sols.unlv.edu/shenlab/software/Tiling\\_Assembly/tiling\\_assembly.html](http://shenlab.sols.unlv.edu/shenlab/software/Tiling_Assembly/tiling_assembly.html)

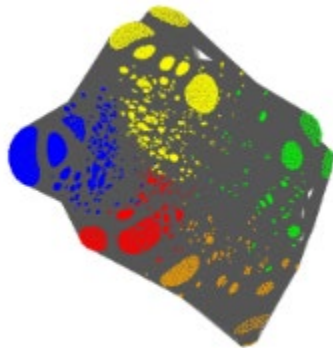
**DNA Research**, 2015, 22: 319-329  
**Genomics**, 2014, 103:122-134



### Promoter and Coding Region Structures

[http://shenlab.sols.unlv.edu/shenlab/software/TSD/transcript\\_display.html](http://shenlab.sols.unlv.edu/shenlab/software/TSD/transcript_display.html)

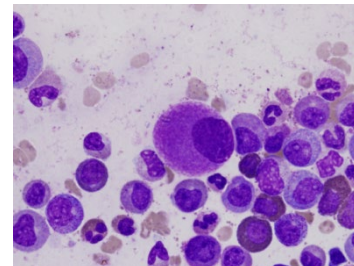
**Bioinformatics**, 2016, 32:2024-2025  
**Plant Cell Environ.** 2017, 40:2004-2016



Signaling  
network Analysis

## Molecular Basis of Leukemia

(in collaboration with Medical School,  
University of Chicago)



Cytogenetically  
normal refractory  
cytopenia with  
multilineage  
dysplasia  
(CN-RCMD)

**Nature Communications**, 2018, 9:1163  
**Leukemia**, 2013, 27: 1291-1300

# High-dimensional Data Analysis

- **Dr. Farhad Shokoohi**
- Assistant Professor of Statistics
- Department of Mathematical Sciences
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- Website: <https://farhad.faculty.unlv.edu>



## Expertise

- Bayesian and Frequentist Analysis
- Mixture Modelling
- Survival Analysis
- High-Dimensional Genomics and Epigenetic
- Sparse Estimation in Finite Mixture of Regressions
- Machine Learning in Medical and Financial Data
- Differential DNA Methylation Analysis in Cancer Epigenetics
- Hidden Markov Models
- Nonparametric and Semiparametric Regression
- Software Development

High-dimensional data analysis across a variety of sectors, including finance, healthcare, genomics, market, among others.

