

# Genomes: Variation, Adaptation, Personalized Genomics Research

# 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**

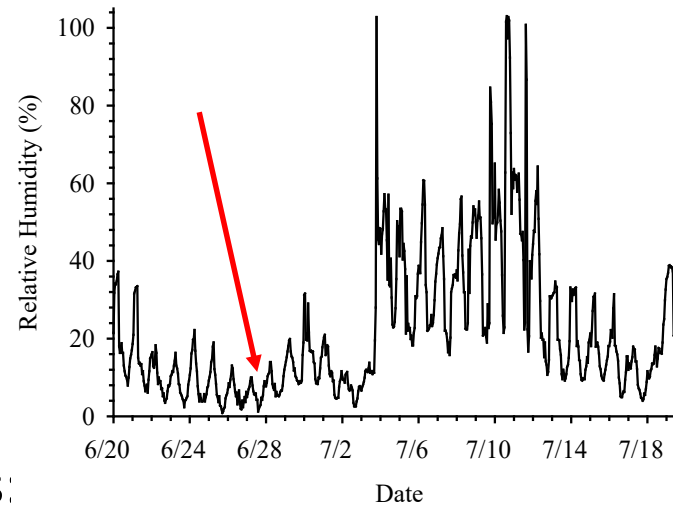
- Environmental physiology
- Insect physiology
- Experimental evolution

# Environmental Physiology of Desert Invertebrates

Adaption to water stress:



**Driest Day Ever Recorded (Anywhere)**  
Lake Mead, 2011

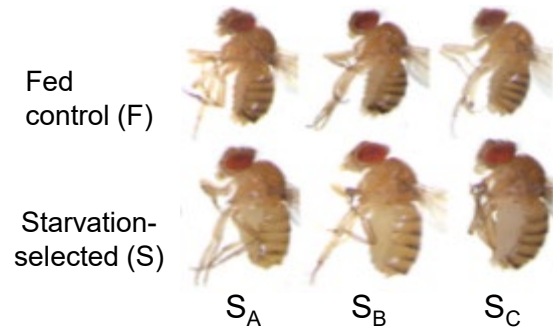


Adaptation to high temperatures:

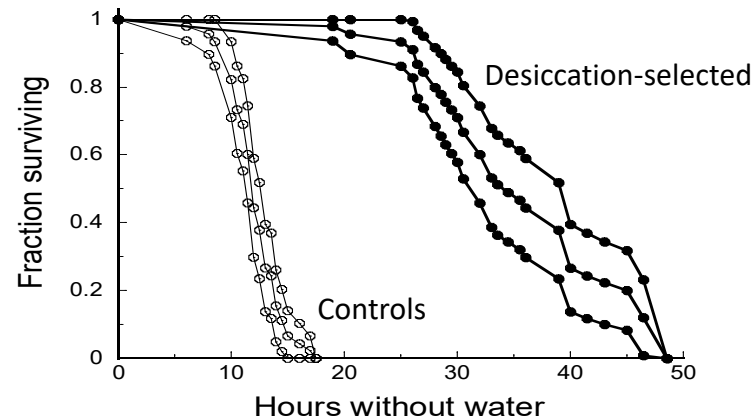


# Experimental Evolution Research Using Fruit Flies

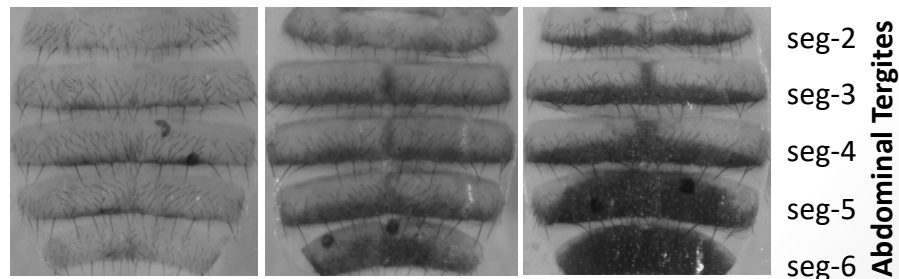
Starvation resistance:  
- a fly model for obesity



Desiccation resistance:  
- understanding responses to desertification



Pigmentation:  
- phenotypic correlations of melanization



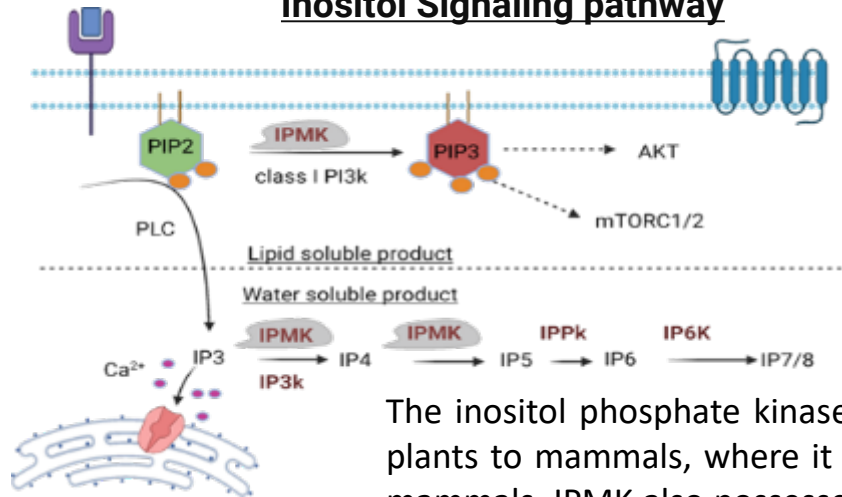
# Cell Signaling Lab

- **Dr. PRASUN GUHA**
- Assistant Professor
- NIPM and School of Life Sciences
- Email: [Prasun.guha@unlv.edu](mailto:Prasun.guha@unlv.edu)
- Website: <https://guhalabs.faculty.unlv.edu/>

## Expertise

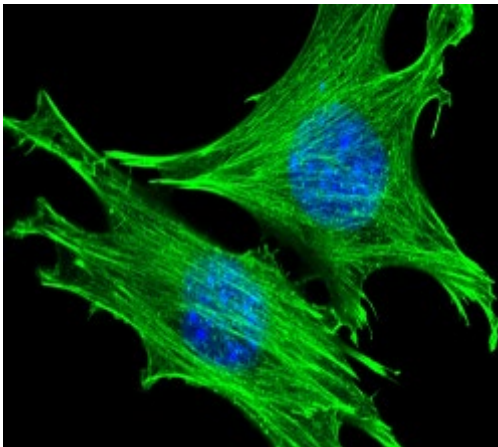
- Cancer Biology, Inflammatory biology, Neuroscience, and Cell and Molecular biology.
- Major focus is genomics and cell signaling
- Understanding the molecular mechanism of inositol signaling in controlling nuclear function

## 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.

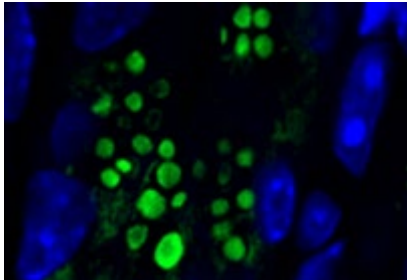
## Confocal imaging of actin cytoskeleton staining (Green)



## 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.

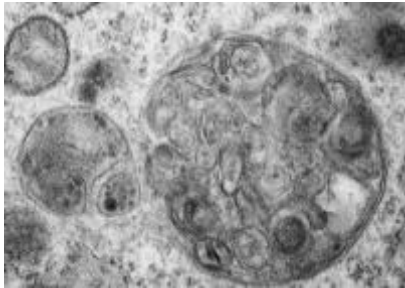
### Confocal Imaging of Intestinal Paneth cell granules in green



### 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.

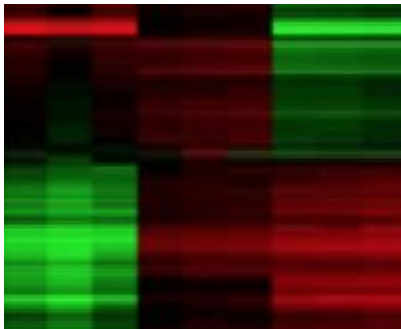
### Transmission electron microscopy of Autophagic vesicle



### 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)

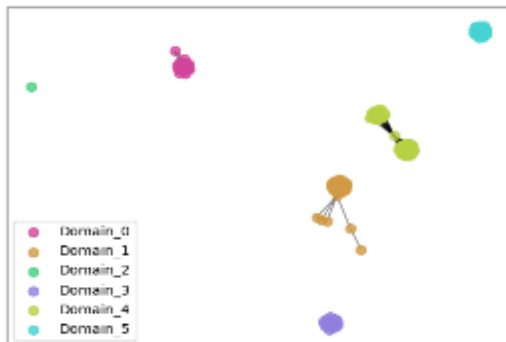
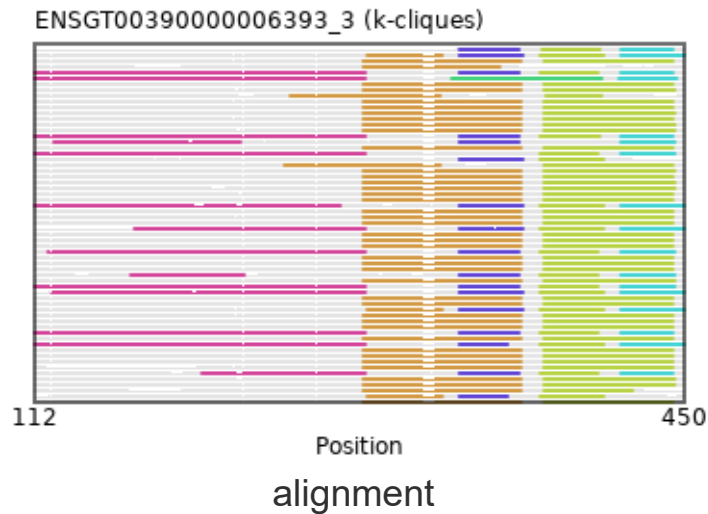
Expertise

- 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)

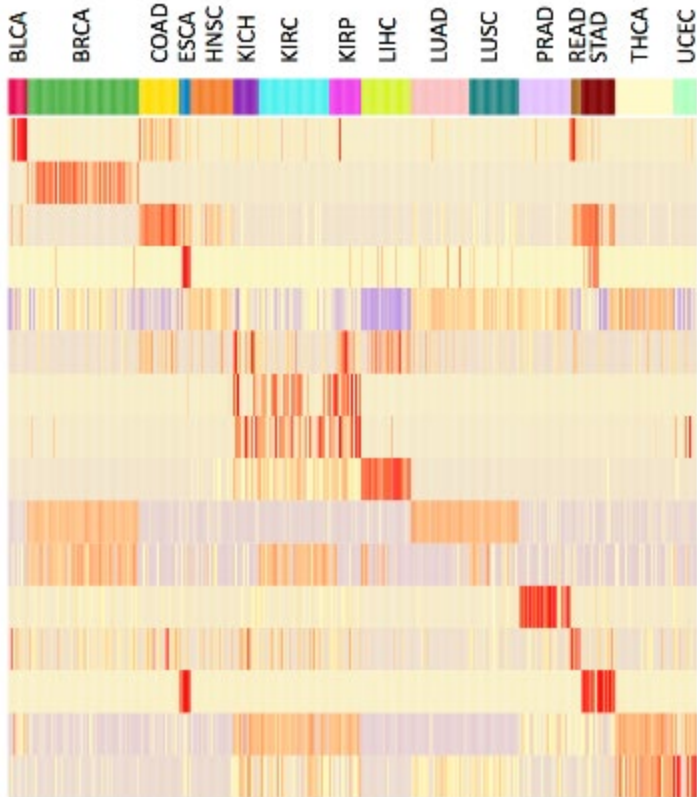
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-----  
-----MQMNH-SGVNQLGGVFVNGRPLPDSTROKIVELAHSGARP  
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YDKLRML---NGQTGSWGTTRPGWYPGTSVPGQPTQ--DGCQQ(144, 283)  
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ENSMFAP00000012817 (view gene)

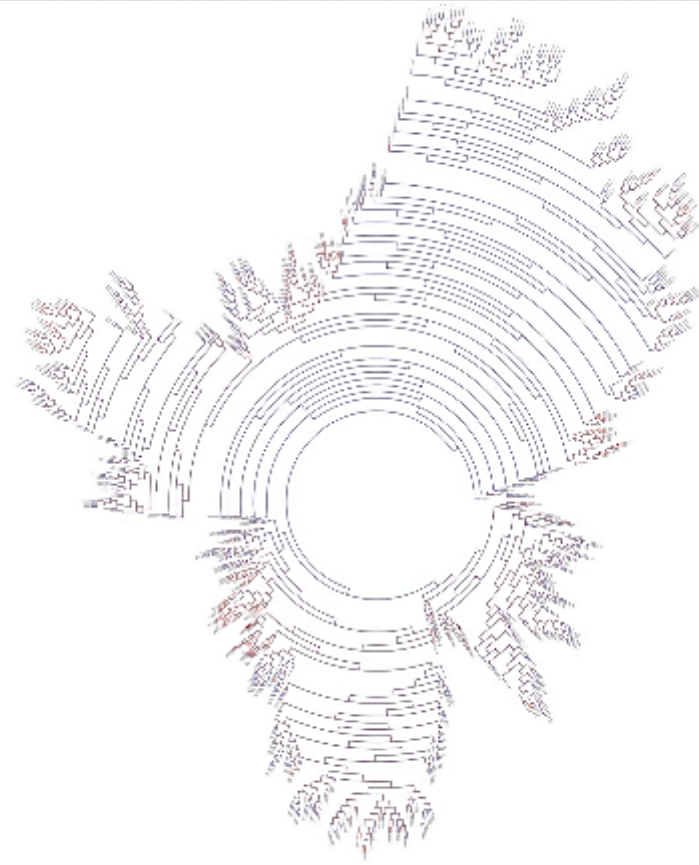
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YDKLRML---NGQTGSWGTTRPGWYPGTSVPGQPTQ--DGCQQEGGGENTNSISSNGED  
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WFSNRRAKWRREEKLRNQRRQASNTPSHIPSSSFSTSVYQIPQPTTPVSSFTSGSMLG  
RTDTALTNTYSALPPMPSFTMANNLPMQ-DSFPLVCQ-----FQFKFPEVNLICLMTG  
QDYI-----SDYGDTTIELSEKKEKWLLEALQFYNCVLYCTIGE  
GMDLKQGPLYTEGTISVGTNLHFGIQTIFHFGLVFNHGHLVIMKKKNVVDNNDV-----
```

# 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

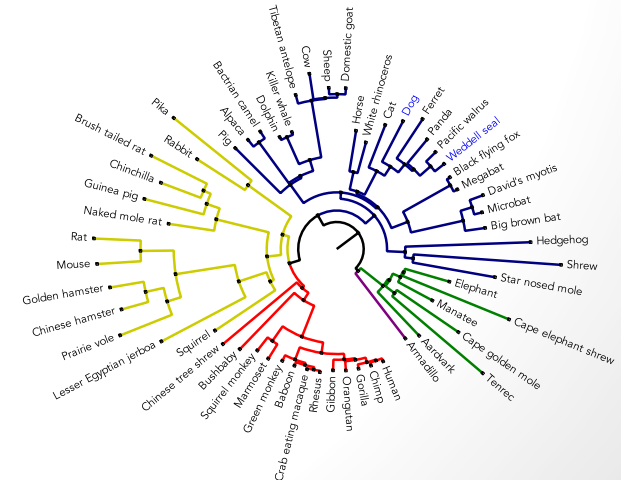
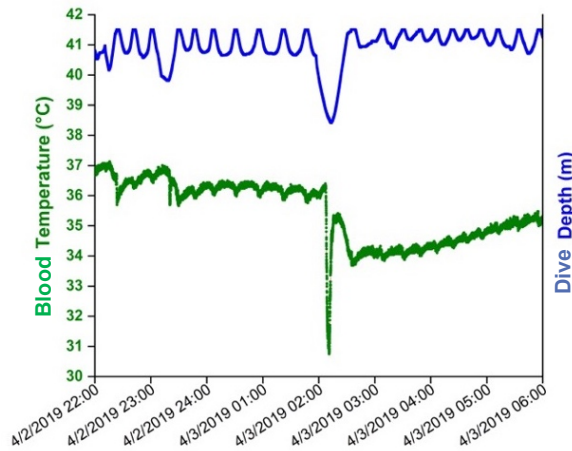
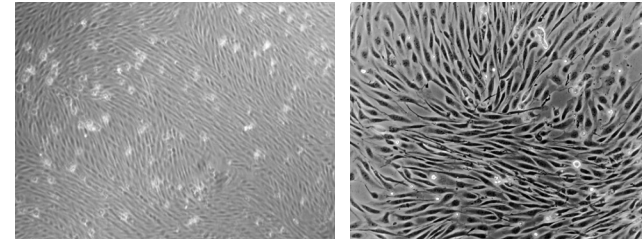
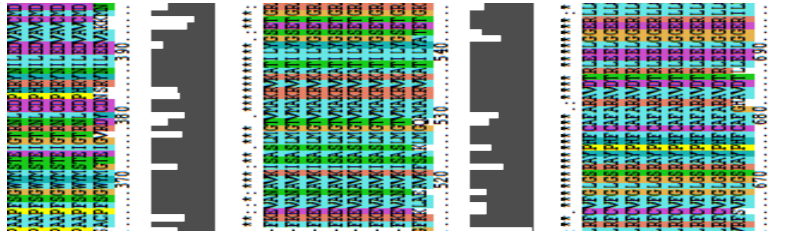
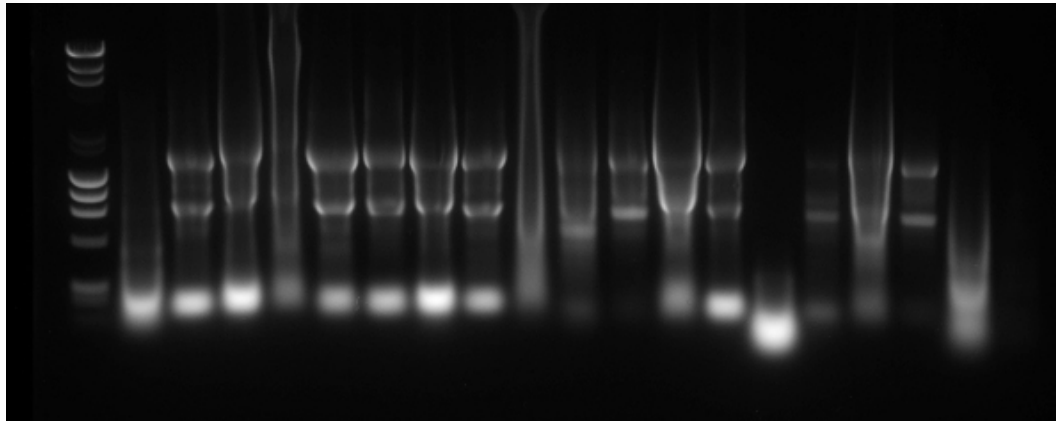
Phone: 702-895-4521

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

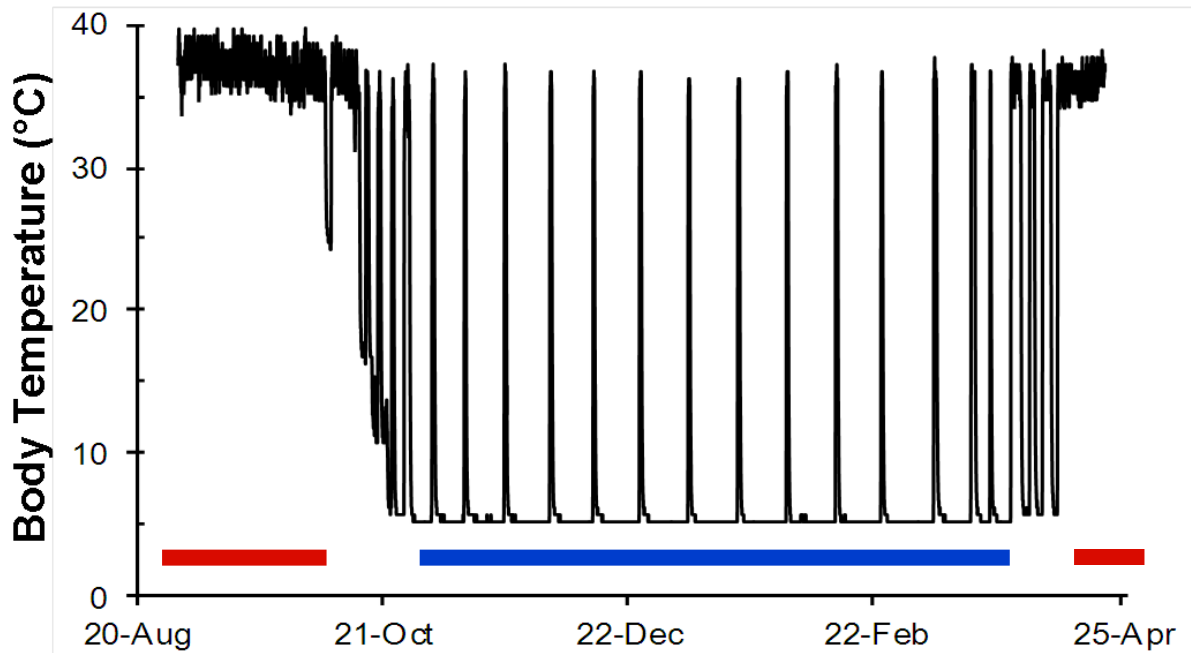
## **Expertise**

- 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



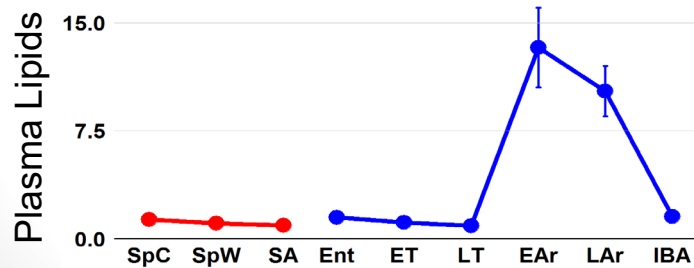
# Metabolic control of small hibernators



SUMMER



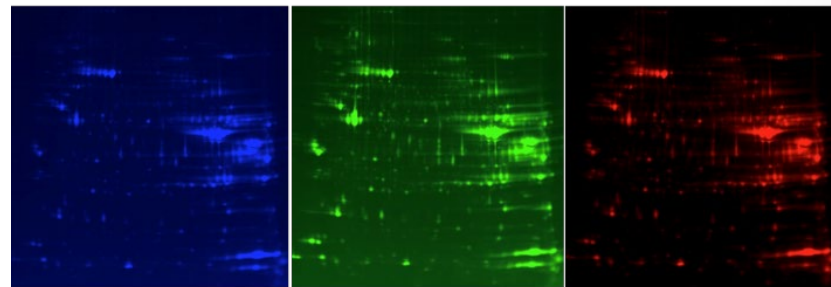
WINTER



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

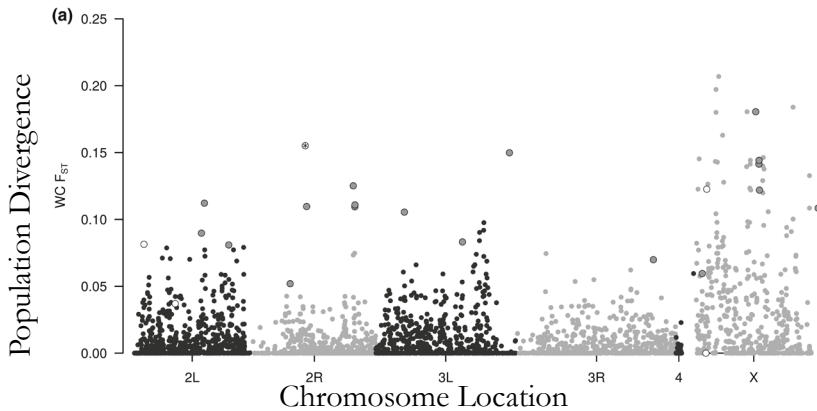
donald.price@unlv.edu

## Expertise

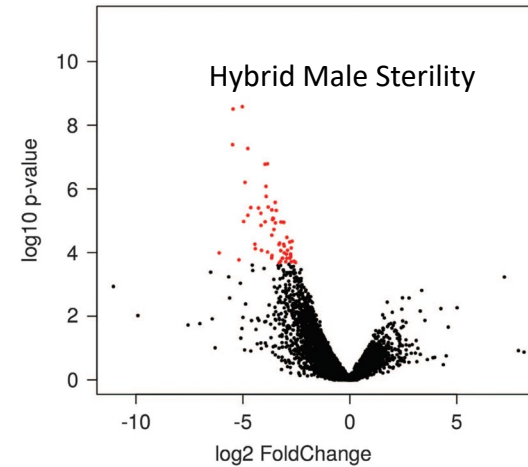
- Behavioral Genetic Analysis
- Quantitative Genetics
- Genome-wide Gene Expression Analysis
- Adaptative Comparative Genomic Analysis
- Hawaiian Evolutionary Biology
- Biodiversity and Speciation

# Evolutionary Genetics

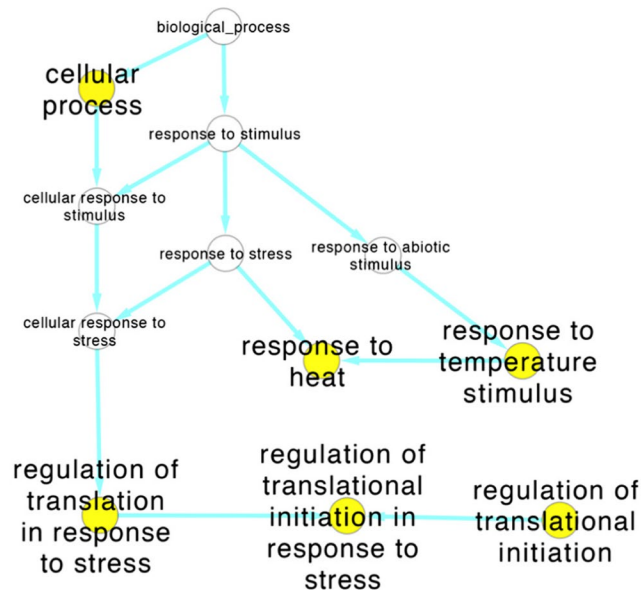
## Population Genomic Analysis of Adaptation



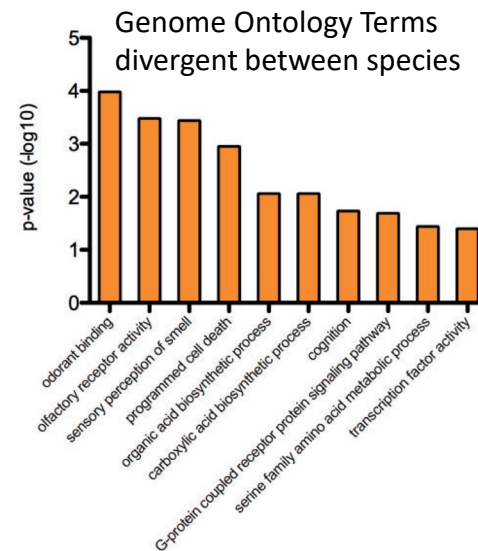
## Genome-wide Gene Expression Analysis



## Genomic Analysis of Physiological Adaptation



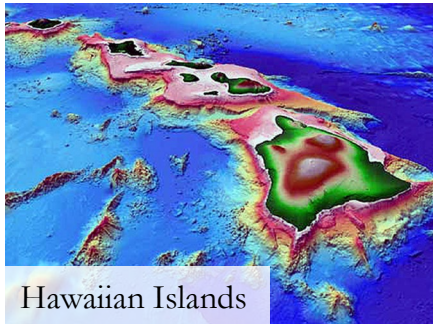
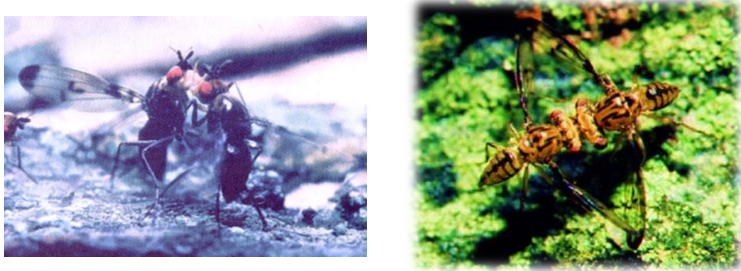
## Comparative Genomic Analysis



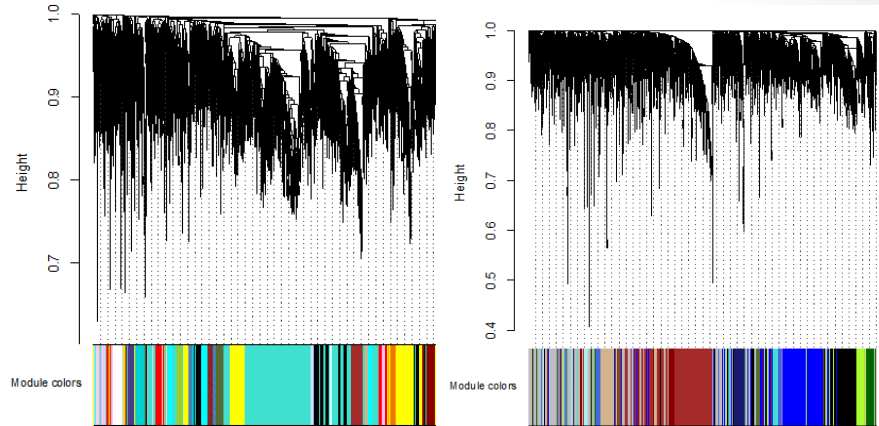


# Behavioral Genetics

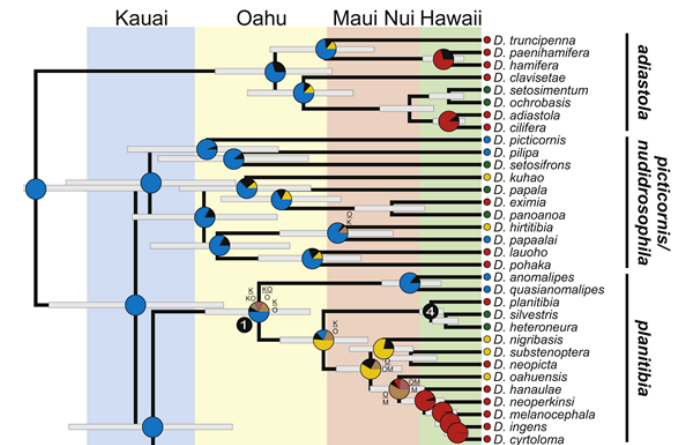
## Hawaiian picture wing *Drosophila*



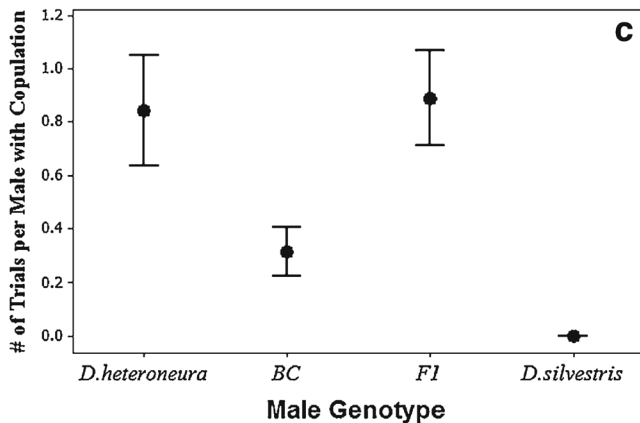
## Behavioral Gene Expression Correlation Networks



## Hawaiian picture wing Phylogenetic Analysis



## Behavioral Reproductive Isolation



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

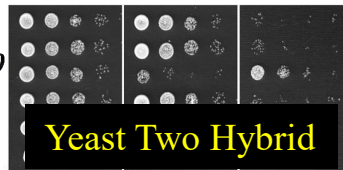
### Expertise

- 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



Gene Gun



Yeast Two Hybrid



Confocal

**BMC Genomics**, 2016, 17:102

**Plant Science**, 2015, 236:214-222

**Front. Plant Science**, 2015; 6: 1145

**Trends in Plant Sci**, 2010, 15: 247



### Short Read Assembly Algorithm

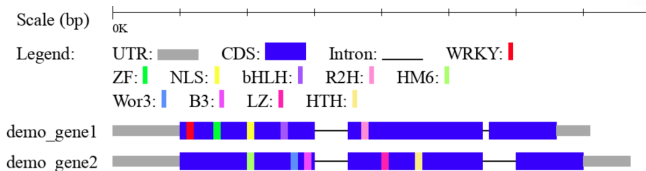


for Genome and Transcriptome Analysis

[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



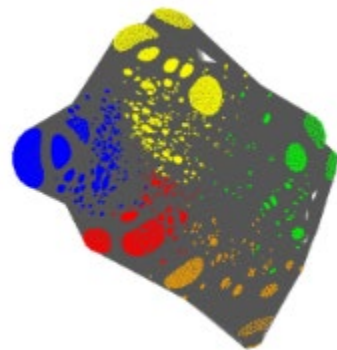
### Promoter and Coding Region Structures

[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

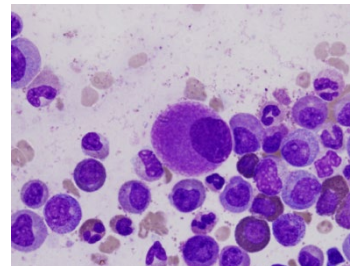
**Plant Cell Environ.** 2017, 40:2004-2016

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