# Ulises Hernández

## *PhD Student*

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I am a PhD student interested in studying the properties that arise during evolutionary processes and how they are related with the diversity of traits found in biological systems. I look forward to pursuing a position where I can use my coding and bioinformatics skills to broaden our understanding of biological processes.

## EDUCATION

***PhD in Ecology and Evolutionary Biology*** • *University of Arizona, Tucson, USA* ***2021-present***

- Cumulative GPA 4.0
- Graduate representative (2023)

***MSc in Mathematical and computational modeling*** • *UASLP, SLP, México* ***2019-2021***

- Cumulative GPA 9.7 out of 10

***BSc in Biophysics (High GPA graduated)*** • *UASLP, SLP, México* ***2015-2019***

- Cumulative GPA 9.44 out of 10
- Undergraduate representative (2018-2019)

## RESEARCH EXPERIENCE

***University of Arizona****, Tucson, USA* ***08/2021 - Present***

I studied the effect of epistasis on the accumulation of deleterious mutations in human genomes. I designed and coded computer simulations to test whether weak epistasis could decrease mutation accumulation in human populations.

- Design forward population genetics simulations in C that capture the interplay between mutation accumulation and population density.
- Work in an analytical approach using Markov Chain analysis to reduce the time and expenses to test our hypothesis.
- Mentor an undergraduate student to extend our simulations to study recessivity and population bottlenecks.

***Instituto de Física,*** *San Luis Potosí, México* ***08/2018 - 08/2021***

I studied the effect of developmental properties such as modularity and robustness in evolutionary processes. I designed *in silico* experiments to test how the modularity of a gene regulatory network (GNR) relates to its robustness and the effect that such association has on the phenotypic properties of an organism.

- Design data oriented forward population genetics simulations in C++ to study complex non linear developmental processes and their evolutionary outcomes.
- Design *in silico* analysis of how mutations alter the function of a biological system.
- Propose and implement a new approach to reduce the time to map genotype to phenotype. This step allowed us to study big systems using short computation times.

***Instituto de Física,*** *San Luis Potosí, México* ***08/2020 - 12/2020***

I studied the genes involved in the development of Retinoblastoma disease in a population of the center of Mexico.

- Perform DNA PCRs and genome sequence data analyzes to find genes associated with retinoblastoma disease

***University of Notre Dame,*** *South Bend, USA* ***06/2018 - 08/2018***

I designed and tested new microfluidic devices that permit studying the effect of drug treatment in the development of biological organisms in real time.

- Conduct fruit fly dissections and microfluidic devices testing.
- Create a new design to study the response of developmental tissues to drug treatment in real time using affordable devices.

## JOURNAL PUBLICATIONS

1.- Hernández, U., Posadas-Vidales, L., & Espinosa-Soto, C. (2022). On the effects of the modularity of gene regulatory networks on phenotypic variability and its association with robustness. Biosystems, 212, 104586.

2.- Espinosa-Soto, C., Hernández, U., & Posadas-García, Y. S. (2021). Recombination facilitates genetic assimilation of new traits in gene regulatory networks. Evolution & Development, 23(5), 459-473.

3.- Levis M. K., Kumar N, Apakian E, Moreno C, Hernandez U, Olivares A, et al. (2019) Microfluidics on the fly: Inexpensive rapid fabrication of hybrid PETL-glass microfluidic devices for combined live imaging and multimodal perturbations of multicellular systems. Biomicrofluidics, 13(2), 024111.

## TEACHING EXPERIENCE

***ECOL 599-001 - Population genetics Ind study group*** • *University of Arizona, Tucson, USA* ***Fall 2023***

- Co-instructor. Teaching and designing lectures for a graduate level course in population genetics.

***ECOL 426 - Population genetics*** • *University of Arizona, Tucson, USA* ***Spring 2022***

- Teaching Assistantship. In charge of leading discussion sessions and helping students with their questions.

## SKILLS

***Coding and bioinformatics***

- Programming in C (4 years), C++ (3 years), R (4 years), Python (1 year) and Matlab (1 year).
- Genome sequence analysis and demographic inferences
- Evolutionary simulations (SLiM and own code)

***Theoretical biology and mathematical modeling***

- Population genetics
- Networks and gene regulatory networks dynamics and analysis
- Differential equations analysis
- Stochastic processes

***Experimental techniques***

- DNA purification and PCR

## SCHOLARSHIPS AND GRANTS

***GSPC TRAVEL GRANT*** • *University of Arizona, Tucson, USA ($1 500)* ***2023***

- Grant awarded to present research progress in an international conference.

***CONACYT national scholarship*** • *CONACYT, México ($ 14 500)* ***2019-2021***

- Monthly scholarship awarded to Master's students. id: 2019-000037-02NACF

***CONACYT undergraduate research scholarship*** • *CONACYT, México ($ 7 500)* ***2017-2019***

- Scholarship awarded to undergraduate students to conduct part-time research. id: CB-2013/223311

***PODEMOS scholarship*** • *University of Notre Dame, US ($ 2 500)* ***2018***

- Scholarship to fund an undergraduate to conduct a research internship at the University of Notre Dame.

***Salvador Nava Martínez scholarship*** • *México ($ 600)* ***2016***

- Scholarship awarded to high GPA undergraduate students.

## AWARDS

***Alumno de excelencia académica*** • *San Luis Potosí, México* ***2016-2019***

- Award given each year by every major program to the students with the best GPA per generation

## POSTER PRESENTATIONS

***SMBE 2023 Annual Meeting, Ferrara, Italy.***

- Work titled 'Mutational meltdown revisited'

***SMBE 2023 Satellite Meeting on 'Molecular Evolution in Small Populations', Princeton University***

- Work titled 'Mutational meltdown revisited'

***XIII National Congress, I International Congress of the Mexican Society of Developmental Biology 2018***

- Work titled 'Patterning delivery with a PETD microfluidic device'

## LANGUAGES

***Spanish (Native)***

***English (Proficient)***

- TOEFL IBT TEST (2020): 107 points total score.

## SPORTS

***BRAZILIAN JIU JITSU***

- Competitor of Jiu Jitsu Team "Cobras Bujutsu". San Luis Potosí, México. 2018 - 2020.

***BOXING***

- Member of University Boxing Team "Águilas". UASLP, 2017.

***BASKETBALL***

- Captain of High School Basketball Team "Mapaches". CBTIS 121, 2015.

## PROFESSIONAL REFERENCES

Professor Joanna Masel. University of Arizona. masel@arizona.edu

Professor Carlos Espinosa-Soto. Instituto de Física. UASLP. email: c.espinosa@ifisica.uaslp.mx