Karla Ximena González Platas

Genomic Sciences Undergraduate Student

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Professional Profile

I am an undergraduate student in Genomic Sciences with a strong interest in the molecular mechanisms of gene regulation and host-pathogen interactions. My research focus lies at the interface of molecular microbiology and functional genomics, with particular emphasis on bacterial regulatory systems, nanomachines, and protein-protein interactions. I integrate experimental and computational approaches to address molecular mechanisms underlying host-pathogen interactions, and I have solid training in genetics, omics sciences, molecular and cell biology, biochemistry, machine learning and bioinformatics. I approach research with critical thinking, ethical responsibility, and a strong commitment to scientific rigor, aiming to contribute to a better understanding of infectious diseases and their impact on human health.

Education

National Autonomous University of Mexico (UNAM) – Center for Genomic Sciences (CCG)

B.Sc. in Genomic Sciences   *2023 – Present*

Research Interests

Protein and structural bioinformatics, host-pathogen interactions, protein-DNA and protein-protein interactions, docking and modeling, transcriptional regulation, functional genomics, molecular microbiology, bacterial genetics, bacterial immunity, and microbial cell biology.

Professional Skills

Collaboration in interdisciplinary research environments, scientific communication, research project development, critical and creative problem-solving, mentoring and teaching, time management, adaptability, and resilience.

Research Experience

Genomic Engineering Program, CCG-UNAM   *March 2025 – Present*

Ph.D. José Eduardo Soto-Guzmán

I am currently investigating the Type III Secretion System (T3SS) of *Salmonella enterica* by identifying the docking site between the ATPase InvC and the effector-loading chaperone SicP. I integrate computational and experimental approaches, including protein structure modeling using AlphaFold, plasmid-based genetic manipulation, bacterial transformation, construct sequencing, and photo-crosslinking assays, strengthening my skills in molecular microbiology, structural bioinformatics, and protein-protein interactions analysis.

Functional Regulation Laboratory, Computational Genomics Program, CCG-UNAM   *February 2025 – Present*

Ph.D. Daniela Elizabeth Ledezma-Tejeida

My research focuses on the coevolution of DNA-binding domains (DBDs) of transcription factors and their corresponding transcription factor binding sites (TFBSs) in *Escherichia coli*. The goal is to assess whether evolutionary changes in DBDs correlate with sequence variation in TFBSs, providing evidence for functional coevolution. I perform sequence analysis, data visualization, and programming in Python and Bash, and carry out statistical analyses in R using bioinformatics tools such as RSAT and BLAST, contributing to my training in computational genomics and functional protein evolution.

Genomic Ecology Program, CCG-UNAM   *February 2024 – September 2024*

Ph.D. María Esperanza Martínez-Romero (Supervisor: Ph.D. Pilar González-Román)

I participated in a project on symbiotic fungi associated with the prickly pear cactus *Opuntia* and the cochineal insect *Dactylopius coccus*, aimed at investigating their potential role in the digestion of plant polysaccharides. I

performed fungal isolation, culture, and preservation, DNA extraction and PCR, metabolite analysis using HPLC, and inoculation experiments to assess fungal growth and enzymatic activity. The project provided evidence supporting a functional role for plant-derived symbiotic fungi in polysaccharide degradation and metabolic processes within the carmine cochineal.

Synthetic Biology Program, CCG-UNAM *February 2024 – June 2024*

Ph.D. Ayari Fuentes-Hernández (Supervisor: M.Sc. Sofía Roque-Romero)

I participated in a project on synthetic bacterial communities, focusing on how ecological and evolutionary interactions determine microbial resistance, sensitivity, and antagonism. I designed and monitored bacterial cultures, generated growth curves, and evaluated antibiotic resistance patterns. Additionally, I applied mathematical modeling in experimental evolution and analyzed metabolites associated with microbial interactions, contributing to an understanding of the factors governing the dynamics of this bacterial community.

Technical Skills

Molecular Biology and Wet Lab

- Molecular cloning and site-directed mutagenesis (PCR, Gibson Assembly)
- Bacterial culture, transformation, and electroporation
- DNA extraction, gel electrophoresis and Sanger sequencing
- Photo-crosslinking assays
- Protein analysis (SDS-PAGE and Western blot)
- HPLC-based sample analysis

Computational Biology and Bioinformatics

- Sequence analysis and regulatory genomics (BLAST, RSAT)
- Structural protein modeling and comparative genomics (AlphaFold)
- Data analysis, visualization, and scripting (R, Python, Bash, Perl, C++; Linux)
- RNA-seq and gene expression analysis (DESeq2, edgeR, limma-voom; clustering, enrichment)
- Machine learning for genomic data (MLP, SVM, Random Forest)

Tools, Platforms, and Scientific Writing

- Git/GitHub, Jupyter Notebooks, SnapGene, Visual Studio, Conda, LaTeX, Overleaf, Notion, Obsidian, Markdown

Languages

Spanish (Native) | English (Full Professional Proficiency)

Honours, Scholarships and Awards

- **National Award Recipient** — Olimpiada del Conocimiento Infantil (National Knowledge Olympiad), Mexican Ministry of Education (SEP). *2017*
- **Merit-based Scholarship Recipient** — Olimpiada del Conocimiento Infantil, BBVA Foundation and Mexican Ministry of Education (SEP). *2017–Present*
- **First Place, Chemistry Olympiad** — XL State Interdisciplinary Academic Competition (State of Puebla High Schools), Puebla, Mexico. *2023*
- **Third Place (National Level), Chemistry Olympiad** — XIX National Interdisciplinary Academic Competition, Puerto Escondido, Mexico. *2023*
- **Perfect Score (Highest National Rank)** — Undergraduate Entrance Examination, National Autonomous University of Mexico (UNAM). *2023*

Talks and Posters

- **Poster presentation** — *Quantification of coevolution between DNA-binding domains and transcription factor binding sites in Escherichia coli*. Academic Meeting, CCG-UNAM. *2025*
- **Invited Speaker** — Opening Ceremony of the 2023–2024 Academic Year, UNAM. *2023*

Teaching Experience

- **Biology Instructor** — UNAM Admission Preparation Course *2023–Present*
- **Teaching Assistant, *Calculus I*** — B.Sc. in Genomic Sciences (one semester) *2025*

Professional References

- **José Eduardo Soto Guzmán, Ph.D.**
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- **Daniela Elizabeth Ledezma Tejeida, Ph.D.**
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- **María Esperanza Martínez Romero, Ph.D.**
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- **Ayari Fuentes Hernández, Ph.D.**
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