

VInTG: Vertically Integrated Training With Genomics

The goal of our IGERT is to train graduate students with a modern blend of genome-enabled biology and taxon-centered expertise, with specific emphasis on how the genome and the environment interact to give rise to diversity.

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Jonatas Cruz

Cancer is a disease of the genome. Genomic lesions in tumors vary in their contribution to tumorigenesis. My project uses bioinformatic programs to identify “driver mutations” in genes that are part of metabolic pathways that would be the best targets for drug design.

Beryl Jones

What is the genetic architecture that underlies the transition from a solitary to eusocial life style? Eusociality has evolved multiple times among bees, but it is unknown whether the same genetic mechanisms were involved in each origin. I am using the facultatively social tropical bee, *Megalopta genalis*, to examine the genomic mechanisms that underly reproductive division of labor and the evolution of eusociality.



Selina Ruzi

Communities' population dynamics are heavily influenced by dispersal, but little is known about the mechanism for these dispersal events. I am examining the mechanisms that promote ant-mediated seed dispersal of neotropical pioneer tree species. Ultimately, my goals are to understand how chemical cues on seeds interact with the ant's sensory system to promote dispersal.



Our IGERT proposal uses a "back-to-the-future" educational model that asserts that the best way to use genomics to address grand challenges in biology is to have a graduate program that blends state-of-the-art training in genomics and bioinformatics with a vertically integrated, taxon-oriented, perspective. VInTG will use this broad taxon-oriented perspective as a foundation to look out across biology rather than as an excuse for insularity - as more genomes are sequenced, the success of comparative genomics will hinge on a careful understanding of the evolution, ecology, behavior, physiology, molecular biology, and genetics of each organism.

Our first cohort of students are wrapping up their first year in the program. Many are still in residence in Panama for the “STRI semester” where they develop field skills before returning to Illinois to train in bioinformatics and genomic techniques. Here we highlight 6 student projects to showcase the diversity of research being conducted in the VInTG IGERT at Illinois.



Lorena Rios

Ozone is increasing in concentration, and plants exposed to ozone can exhibit reduced yield. However, the effects of ozone on tropical plants have not been studied extensively. I am evaluating growth of *Theobroma cacao* seedlings under ozone and ozone-free conditions, and identifying genes involved in the oxidative stress response. Cacao is one of the few tropical trees to have a fully-sequenced genome.



Cassie Wesseln

The most abundant, well-preserved plant microfossil record is pollen, but many species cannot be taxonomically differentiated. I am using newly-developed mathematical algorithms to differentiate modern maize (*Zea mays*) pollen from its ancestral species, teosinte. The goal of my research is to combine archaeological and genetic approaches to to better understand the history of maize domestication in Central America.

A key component of this IGERT is a partnership between the **University of Illinois** and the **Smithsonian Tropical Research Institute**. STRI's location in the tropics, vibrant research community, diverse field sites, and commitment to long-term monitoring provides our students unparalleled research opportunities. Moreover, STRI's network of field sites are remarkably diverse, yet particularly susceptible to habitat loss and climate change providing our fellows with exposure to leading ecological issues.



Smithsonian Tropical Research Institute

Kelsey Witt

Domestic dogs migrated into North America with Native Americans, yet little is known about their population structure or migration history. I am using DNA extracted from ancient dog remains to test theories about Native American migration history. Inclusion of Panamanian samples allows me to examine patterns of migration from North America into Central America and also from Central into South America through the isthmus.