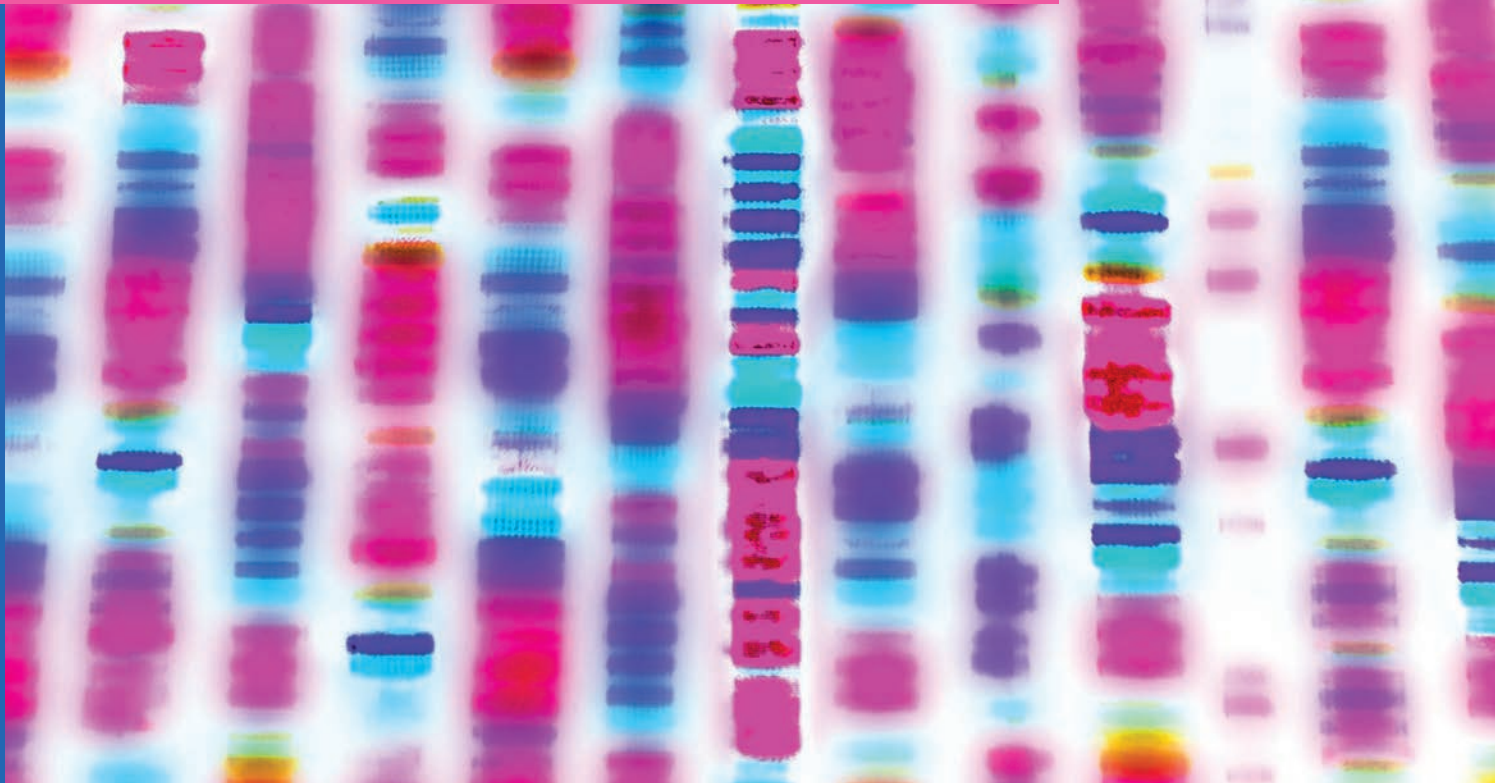


College students discover and “adopt” proto-genes through a new Pitt program. RIGHT: Representation of a DNA sequence.



# ORIGIN STORIES

## UNDERGRADS WITNESS NEW GENES

ARISING | BY JENNY BLAIR

**B**randon Garcia, a student at Florida’s Rollins College, hadn’t had any particular plans to visit Pittsburgh until a professor told him about an unusual opportunity. The marine biology major wound up spending the summer of a lifetime at Pitt, advancing new discoveries about evolution.

Garcia and Pitt undergraduate Aaron Zhang, a pre-med, were the first students to benefit from a prestigious CAREER Award from the National Science Foundation (NSF) granted to Anne-Ruxandra Carvunis in January 2022. The five-year grant enables the pioneering evolutionary biologist to loop gifted undergraduates into her research. Carvunis is an associate professor of computational and systems biology in Pitt’s School of Medicine. Earlier this year, she was one of the recipients of a Chancellor’s Distinguished Research Award.

The students studied proto-genes—sequences of genetic material that arise from “dark matter” in the genome and encode sim-

ple proteins. Proto-genes may sometimes give birth to novel genes that let organisms adapt quickly to changing conditions. Of thousands of these mysterious sequences, very few are understood.

“I basically, selfishly, don’t want to be the only person interested in this question,” says Carvunis, with a laugh. “I want many young people to bring their bright minds and help me solve this.”

She says her quest to understand the origins of new genes started with an original hypothesis, published in *Nature* in 2012, according to which the birth of brand-new (de novo) genes “involves the existence and translation of transitory genetic elements called proto-genes.”

Carvunis’ NSF-funded Adopt a Proto-Gene initiative aims to get young researchers interested in proto-genes, improve evolutionary literacy and encourage STEM careers. Part of the idea is to empower them with the experience of making the very first discovery about an unstudied proto-gene.

One portion of the grant funds training for college educators in virtual and in-person workshops that introduce them to experimental techniques with proto-genes in yeast. Armed with those skills, the instructors, in turn, teach them to students at their home institutions. Then undergrads can “adopt” a proto-gene and study it in their college labs, generating useful data for the burgeoning field.

And every summer, two students will get to do it in the Carvunis lab.

Garcia and Zhang explored the lab’s vast collection of genes and proto-genes. And, as the rising seniors investigated how proto-genes influence the functioning of yeast, they designed and executed a research experiment requiring them to use bioinformatics and practice various wet-lab techniques that incorporate cloning, microbial phenotyping and high-throughput robotics.

When they ultimately presented their work to the Carvunis lab team, they were thrilled by the enthusiastic response.

“It was just super satisfying and super rewarding to see that our efforts actually meant something. Dr. Carvunis was so visibly excited,” recalls Zhang. “It was hard not to smile.”

Garcia was smiling too. He says it’s rewarding to know that all the data they managed to compile and gather in just a couple of months will be useful to the lab: “It’s a very good feeling. I don’t think it’s a feeling that I will forget.” ■