

SPOTLIGHT

In the Spotlight—Established Researcher

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Antónia Monteiro is the recipient of the 2025 Outstanding Scientist Award from the Faculty of Science at the National University of Singapore. She also holds the Leo Tan Professorship in Science (an endowed chair at the National University of Singapore). Antónia received the 2018 Investigatorship Award from the National Research Foundation, Singapore.

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1 | With Whom and Where Did You Study?

I studied with Paul Brakefield in Leiden and Vernon French in Edinburgh for my PhD. Paul is a population biologist who is interested in how environments and genes impact phenotypic variation in populations. He collaborated with Vernon, who is a developmental biologist and expert on grafting experiments. Paul taught me about the heritability of traits and how to use artificial selection experiments in conjunction with classical tissue transplantation experiments. Vernon showed me how the transplants could be used to investigate which cells/tissues were inducing phenotypic variation in traits. Later, I did postdoctoral work with Naomi Pierce at Harvard, where I learned how to build phylogenetic trees, and then a second postdoc back in Paul's lab, who had just started a collaboration with Sean Carroll. I visited Sean's lab briefly to learn how to do antibody stainings in the wings of butterflies.

2 | What Got You Interested in Biology? When Did You Know EvoDevo Was for You?

My philosophy teacher in middle school uttered something in class that I found profoundly interesting: She opined that man created God to cope with all the stuff that was difficult to explain (droughts, crops failing, diseases, and so on). This “revelation” made me peel away from catechism class and side with my atheist father in all things that had to do with God and God's “creations.” Both my parents were physicists, however, and I was much more drawn to living beings. Perhaps my biology teacher in high school sealed my fate, as she explained things very well, and this made Biology a favorite subject. I continued studying Biology in college, where I became fascinated with the precision of Mendelian Genetics and the topic of Evolution.

In university, I enjoyed countless field trips to explore Portugal's biodiversity; I was terrible at identifying birds without binoculars, but I found that I could approach butterflies more easily and appreciate their amazing beauty and color patterns. My interest in butterflies and in eyespots was initially what drew me to Paul's lab, even though he worked with a drab little brown species—*Bicyclus anynana*. I started marrying evo to devo with my selection experiments, followed by grafting experiments, and when I started staining wings with antibodies—but the macro perspective only came after I stepped into phylogenetics for my postdoc.

3 | What Is Your Favorite Paper of All Time? Why?

Georg Halder and Walter Gehring's 1995 paper on the ectopic expression of *eyeless* is one of my all-time favorites (Halder et al. 1995). It is part of a set of papers I use every year in my Evo-Devo course. It shows the power of this “master regulator” in inducing whole eyes at novel locations in the body. It beautifully illustrates the idea that complex traits can be quite modular, and dependent on the activity of single genes that are wired to hundreds of downstream genes that work together to build a trait.

4 | What Do You See as the Future of EvoDevo?

I think that with the rise of whole-genome sequencing, CRISPR, and spatial transcriptomics, we are now able to investigate the evolution of phenotypes of interest in almost any organism or clade of our choosing, as well as investigate how changes in the genome lead to changes in transcriptomes and in phenotypes at an unprecedented level. We can break free from the model systems and really tackle the origin and evolution of traits that are interesting but lineage-specific. I also think that EvoDevo has much to contribute to our understanding of the brain and behavior. We can apply the concept of the gene regulatory network to the differentiation of neuron types and the concept of plasticity—that is, associating gene expression and splicing plasticity—to aspects of learning.

5 | In Light of the Transformation of EvoDevo and the Institutional Landscape You Have Seen, What Is Your Advice for Junior EvoDevo Researchers?

I would advise them to pick a topic or a trait that is interesting to them and pursue it to the fullest. I have come to appreciate that the study of almost any biological trait is an entry point to hundreds of unknown mechanisms in biology. These, in turn, can connect you to many other researchers who approach the same problem from a different perspective, and to many other organisms that share that same mechanism. I have been going down the “rabbit hole” of one of these traits, butterfly eyespots, for most of my life and really enjoying the ride.

Reference

Halder, G., P. Callaerts, and W. J. Gehring. 1995. “Induction of Ectopic Eyes by Targeted Expression of the *Eyeless* Gene in *Drosophila*.” *Science* 267: 1788–1792.