Science is For Everyone

Daniel Pollak,
PhD candidate,
Neurobiology

Daniel Pollak fell in love with brain research after seeing a drawing of an action potential in a research paper. "I thought it was really beautiful," he says. "That's pretty much why I'm studying neuroscience." Now, he's hoping to bring that same feeling of joyful discovery to schoolchildren in Pasadena and across the country by creating and promoting citizen science projects that will help kids to fall in love with STEM. "I want to bring laypeople into the scientific process," he explains.

Using a Chen Graduate Innovator grant, Daniel created ERGo!, a citizen science kit that gives school children everything they need to conduct sophisticated electrophysiology experiments using bugs they can find in their backyard. The first kit, which Daniel plans to distribute with a DIY educational neuroscience company called Backyard Brains, enables kids to learn more about how insects' retinas respond to changes in ambient light. "It's a fairly simple preparation, and there's a lot you can learn," Daniel says. "And you can do it on any insect you want, so it opens up the field for wild cross-species comparisons."

As a volunteer with Pasadena Community College's Upward Bound program, Daniel, along with his collaborators, Jahel Guardado (alumnus of PCC and current graduate student in neuroscience at NYU), Dr. Zeynep Turan, and Dr. Etienne Serbe, spent part of his summer running science workshops for local high-schoolers, introducing them to the ERGo! kit and encouraging them to play around with STEM concepts and experiments. "My goal is to make these kids into real scientists," he says. "I want them to get interested, and choose their own projects, and develop a question, and follow it through."

Fly, My Beauties

How does a fruit fly fly? There's more to it than just flapping their wings, says Annie Erickson: to stay aloft, a fly must think fast to avoid obstacles and other fast-moving insects. To study that phenomenon, Annie built a miniature flight simulator: a cylindrical panel of LEDs that creates an immersive environment for a fly, complete with puffs of air to simulate gusts of wind.

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Held immobile on a rod, the fly can zip through the virtual environment and respond to stimuli; meanwhile, Annie and her colleagues can peer through the top of the fly's head to see which neurons are firing as the insect whizzes along. "Fruit flies have relatively small brains, but they're expert fliers," Annie says. "By putting the fly in this virtual reality arena, we can study exactly what's happening when they speed up or slow down, or carry out other aerial maneuvers."

Studying the way flies' brains respond to incoming information and send out quickfire motor signals could provide new insights into how brains process sensory and motor information, Annie says."

It's helpful to start by asking these questions in simple organisms — it lets us identify neurons of interest, and manipulate them in ways you couldn't with a human,"she explains.

Annie Erickson,
PhD candidate,
Neurobiology