THE LEAKS OF LIFE

In the study of evolution, there are few questions as immense as the origins of life's spectacular diversity. In the microscopic peculiarities of a tiny fly, Mark Rebeiz, a PhD assistant professor in the Department of Biological Sciences at the University of Pittsburgh and faculty member in the computational biology PhD program run by Pitt's School of Medicine and Carnegie Mellon University, may have found an important new clue to this mystery.

The mystery started to unravel as Rebeiz wondered how genes evolve new ways to be expressed.

"One of the big ideas that came out of the human genome [sequencing project] is that it's not new genes that made something as complex as us, but the rearrangement of existing genes," says Rebeiz.

In 2011, Rebeiz began peering into the developmental mechanisms of fruit fly vision. Studying relatively recent evolutionary developments in the fly's optic lobe, Rebeiz realized that sometimes the DNA's transcriptional switches—stretches of DNA that activate genes—which are meant to trigger a gene in one location on the body, can "leak," causing activation elsewhere.

"The evolution of development is all about these switches. Once one starts to leak, an old switch is modified to generate a second expression pattern," says Rebeiz, who was awarded a 2011 Alfred P. Sloan Foundation Fellowship.

What he'd really like to understand now, Rebeiz says, is how whole networks consisting of multiple switches evolve to generate complex animals.

"Science is all about finding the biggest unanswered questions you can sink your teeth into. It makes it a joy to come into the lab every day."

—Justin Hopper

—Photo by David Scharf/Photo Researchers