

Researcher studies gene families to explore diversity and evolution

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Theoretical biologist Stephen Proulx studies gene families to explore how genomes become diverse and evolve. The Iowa State University assistant professor uses mathematical tools and computer models to determine how environmental and evolutionary factors -- like seasonal change, migration and sexual preference -- structure a genome.

One path to diversity in a genome involves the proliferation of genes into multi-gene families.

"The growth of a gene family can occur through rare errors in DNA replication," Proulx said. "Sometimes in error, a single gene is duplicated on a chromosome, and the duplicated copy can emerge as a new functional gene. Although that gene may have a new function, it's not fundamentally different from the original gene."

Proulx wants to be able to explain that process. "We also want to know if changing the size of gene families is a way by which an organism becomes more complex," he said.

In a recent paper published in the journal *Evolution*, Proulx and colleague Patrick Phillips, professor, University of Oregon, Eugene, show that the process of gene family expansion can begin even before a gene is duplicated. The first step in the process involves specialization of different variants of a gene that can then take on different functions once the gene is duplicated by chance.

The article was recently featured as a "Hidden Jewel" on the Faculty of 1000 Web site, a journal review site that posts expert opinions on current research papers. Proulx thinks it has generated considerable interest in the biological community because it shows how the process of adaptation can play a role in generating organismal complexity.

Proulx's model calculates the exact conditions under which evolutionary pressures cause genes to diverge.

"One of the things I'm trying to do is provide an ecological and environmental context for genome evolution," he said. "And what I continue to see is that these ecological factors can play a really large role."

Source: Iowa State University of Science and Technology

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