PROJECT FACT SHEET

New Software Gives Researchers a Better Understanding of Evolution

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In 1859, Charles Darwin proposed that all living things were joined together on an ever-evolving "Tree of Life." In recent years, researchers have been following Darwin's vision. However, there are significant roadblocks. For example, researchers cannot always tell whether genes in organisms were inherited from their common ancestors or transferred into their genomes from other organisms. As a result, all living things carry some genes whose histories are incongruent, a phenomenon that has the potential to lead to a better understanding of evolution.

Andrew Roger, Associate Professor of Biochemistry and Molecular Biology at Dalhousie University, is looking at genetic incongruence in a novel light. Dr. Roger and his colleagues understand that genes are transferred between organisms in several different ways. They can be shared vertically (through successive generations), but also laterally (from two separate and coexisting cells). However, it is difficult to determine how cells have received the genes they carry, and researchers wonder what role this transfer has in generating novelty in evolution.

"Concaterpillar," a new software package created by Jessica Leigh, a Ph.D. student working with Dr. Roger, helps to untangle the complicated genetic histories of living things by detecting and quantifying incongruent genes. That is, Concaterpillar can provide a clearer picture of how incongruent genes co-exist and what these genetic "conflicts" mean.
The development of this software is significant. "Concaterpillar can take us further along the path of realizing Darwin's dream of a fully resolved tree of life, by providing a more nuanced picture of genetic interrelationships," notes Leigh.

Leigh and Roger used the study to evaluate 60 separate proteins and successfully identified genetic connections between them that were not previously understood. This is particularly significant because this family of proteins contains several known pathogens.

Understanding where organisms receive their genes, and how they transfer them, is an important scientific goal. However, it is also an important medical goal. We become resistant to antibiotics through genetic transfer, and research like this can help scientists understand genetically inherited diseases, and work towards innovative therapies.

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