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Understanding Prokaryotic Genome Evolution and Diversity

Status	Past
Competition	Competition I
Sector	Environment
Genome Centre	Genome Atlantic
Project Leaders	Ford Doolittle

Project Description

How has life evolved? Our project examined the molecular evolution of bacteria (prokaryotes) in order to parse the mechanisms of life at its most basic level. Specifically, our research sought to understand the role that the lateral transfer of genes, or blocks of genes, between lineages and species plays in the evolution and adaptation of bacteria.

For example, bacteria have not developed over time, according to classical Darwinian natural selection, as an offshoot of the so-called tree of life. Instead, genes are transferred from one bacterium to another, in a pattern that's more like a web.

In the process of studying bacteria, our group has become one of the major players on the world scene in the development of methods for reconstructing gene and genome history from sequences. Our focus and capacity in computational approaches to comparative microbial genomics is now as strong as any in the world

We have also contributed some of the most interesting recent experimental data bearing on recombination and lateral gene transfer in the wild, and have developed several important methods for the pursuit of research in 'metagenomics', a relatively new field of genetic research that enables studies of organisms not easily cultured in a laboratory and those in their natural environment.

We are now focused on applying our theory and metagenomic methods to solving practical problems in the area of bioremediation. Many genes devoted to the metabolism of toxic substrates are cobbled together by lateral gene transfer, the key research focus of this project.

Many of these genes will be marketable as "biomarkers" in the substantial and rapidly growing bioremediation monitoring sector. Knowledge gained will have many private sector applications, including environmental remediation, novel green industrial processes, and the understanding and management of infectious diseases.

Fast Facts

Highlighted outcome: group has become a major player in several key areas: the study of genomes recovered from environmental samples ('metagenomics'); recombination and lateral gene transfer in the wild; gene and genome history reconstruction from sequences; and comparative microbial genomics

Number of research personnel employed by the project: 52

Number of peer reviewed publications published: 74, 5 chapters in books or contributions to collections, 48 abstracts, and 116 invited presentations