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Astrogenomics: A convergence of disciplines spawning inspiration

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Abstract

The talk highlights the latest scientific advances emerging at the interface of genomics and astrobiology. Today, astrobiologists have the tremendous energy and enthusiasm of pioneers who are discovering new lands, and genomics is playing an important role in this quest. First, genomics can assist astrobiologists study the origin and evolution of life on Earth as a surrogate for understanding how life could have emerged elsewhere in the universe. Current hypotheses suggest that inorganic compounds such as hydrogen, methane, iron and sulfur were early sources of energy for life on earth, and microbial genomes, especially from chemoautotrophs that live at extremes of pH, radiation, temperature and darkness, are being plundered for clues as to the origin of life on Earth and for their mechanistic implications for life elsewhere. Detection of extra-terrestrial life will be arguably the single most important discovery in human history. Secondly, because the metabolic activities of microbes in early evolution made Earth habitable for plants and animals and are also indispensible for the maintenance of life on Earth today, it is anticipated that microbes will play key roles in terraforming Mars and moons in our solar system. Genomics will be used to tease out the essential genes and metabolisms needed to tailor-make microbes via synthetic biology for functions in extra-terrestrial environments and for planetary biotechnological applications. Thus, even if life is not found elsewhere, the coming decades should prove incredibly exciting for astrogenomics, driving inspiration and innovation and stretching the boundaries of what is possible.

Biography

David Holmes is currently director for the Center of Bioinformatics and Genome Biology at the Fundacion Ciencia y Vida and is also a full professor at Andres Bello University in Santiago, Chile. He obtained his Ph.D in biochemistry at the California Institute of Technology, USA and has over 200 publications including a scientific citation classic.