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Stranger than Fiction: Life in the Extremes

Picture yourself lounging on a white sand beach, feeling the warm sun on your face, filling your lungs with the fresh air, and sipping a cool drink of bottled water. For most people, this is an ideal place, causing us to gripe and complain when the weather is too cold, or to change our laws to reduce our production of carbon when the air becomes less breathable.

Many microorganisms, however, have another point of view. For them, ideal conditions may be a boiling pool of acidic waters filled with heavy metals. Others prefer the water around them to be salty to the point of saturation. Others find oxygen to be a toxin. So what do these "extremophile" microorganisms teach us about ourselves, about the origins of life, and about how living organisms adapt to environmental changes?

My work examines the cellular mechanics of extremophilic microorganisms, exploring what similarities exist between these organisms and us, as well as what similarities exists between all such "extremophiles" regardless of what specific extreme environment they inhabit. In focussing on the what is in common, rather than the obvious differences, I am trying to reveal the basic principles that allow life to exist. In this way, I am working to better understand the origins and evolution of life, and what microorganisms can tell us about the co-evolution of planets and life.

I will present our work on a range of topics:

Why can extremophile microorganisms repair their DNA after damages that result in human cancers, using the same types of DNA repair proteins that are found in humans?

Can certain microorganisms stay alive for hundreds, or even thousands, of years trapped inside salt crystals?

How can microorganisms help clean up heavy metal contamination?

What can both modern extremophiles and fossilized microorganisms tell us about the origins and evolution of life on Earth (and the possibilities for life on other planets)?

Welcome to the world of the extreme!