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Detecting Signs of Life and its Origin on Other Planets

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To search for biology on other worlds, it is important to have working definitions of what constitutes “life” and “non-life”. However, the distinction between biotic and abiotic is often unclear, since we are still learning about the limits of life, and also because abiotic systems can become highly complex when devoid of biological influence. Although Earth provides a variety of examples of what biology can look like, examples of the critical steps between abiotic and biotic systems are lacking because the prevalence of life on our planet has contaminated / erased its record of prebiotic conditions. However, prebiotic chemistry may still be a current or formerly active process on other worlds with detected chemical gradients and organics, such as Enceladus, Ceres, or Mars. I will discuss how astrobiologists approach the search for life on other planets, and will describe some of the difficulties in distinguishing living and non-living systems. In particular I will share some of our lab work on simulating gradients in hydrothermal vents that could support life or its origin, and prebiotic chemistry experiments that aim to bridge the gap between geochemistry and the emergence of biochemistry.

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