

## **7 Good Reasons Why There Might Be Life On Other Planets**

### **Reason #1: Extremophiles on Earth**

One of the big questions is whether life could evolve and survive on a world radically different than Earth. The answer appears to be yes, if you consider that even Earth harbors extremophiles, or organisms that can survive in extremes of heat, cold, poisonous (to us) chemicals, and even in vacuum. We've found creatures who live without oxygen around the edges of super-heated volcanic vents at the bottom of the ocean, and we've found life in the brackish pools of the high Andes, as well as the ice-covered lakes of the arctic. There are even tiny creatures called tardigrades that can survive in the vacuum of space. So we have direct evidence that life can thrive in pockets of alien atmosphere on Earth. In other words, we know life can survive in conditions we've seen on other planets and moons. We just haven't found it yet.

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### **Reason #2: Evidence of chemical precursors to life on other planets and moons**

Life on Earth probably evolved from chemical reactions that eventually formed cellular membranes and proto-DNA. But those original chemical reactions may have started with complex organic compounds — such as nucleic acids, proteins, carbohydrates, and lipids — in the atmosphere and ocean. There is evidence that these "precursors to life" exist on other worlds already. Titan has some in its atmosphere, and astronomers have spotted them in the rich environment of the Orion Nebula too. Again, we haven't actually found life, but we've found the ingredients that many scientists believe contributed to the development of life on Earth. If those ingredients are common throughout the universe, it's likely that life has emerged in places other than our home planet.

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### **Reason #3: Rapidly-expanding number of Earthlike planets**

Over the past decade, planet hunters have found hundreds of exoplanets, many of them gas giants like Jupiter. But new techniques for planetary detection have allowed them to detect smaller, rocky worlds like Earth. Some are even in the "Goldilocks zone" around their stars, meaning they orbit at a distance that could produce temperatures similar to those on Earth. Given how common exoplanets beyond our solar system have turned out to be, it seems likely that one of them plays host to some form of life.

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### **Reason #4: Sheer diversity and tenacity of life on Earth**

Not only did life evolve on Earth under extremely difficult conditions, but it somehow managed to survive megavolcanoes, meteorite strikes, ice ages, droughts, ocean acidification, and radical atmospheric changes. We've also seen incredible diversity of life on our planet in a relatively short period of time, geologically speaking. Life is pretty tenacious. Why couldn't it take hold on one of Saturn's moons, or in another star system?

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### **Reason #5: Mysteries surrounding how life originated on Earth**

Though we have theories about how life originated on Earth, involving those complex carbon molecules I mentioned earlier, there is ultimately a mystery about how those chemicals came together to form fragile membranes that eventually became cells. This mystery has been deepened the more we know about how incredibly hostile the environment on Earth was when life evolved — the atmosphere was packed with methane, and the planet's surface boiled with lava. One common theory is that simple, single-celled life actually evolved elsewhere — perhaps Mars — and came to Earth inside meteorites. This theory is called panspermia, and suggests that life on Earth arose due to life on other planets.

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### **Reason #6: Growing evidence that oceans and lakes are common, at least in our solar system**

Life on Earth originated in the ocean, so it follows that this might be the case on other worlds. Now there is strong evidence that water once flowed freely on Mars, and Saturn's moon Titan has seas of methane as well as rivers flowing across its surface. Jupiter's moon Europa is believed to be one, massive ocean, warmed by the moon's core and completely covered in a thick, protective layer of ice. Any of these worlds might have harbored life at one time, or currently.

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### **Reason #7: Evolutionary theory**

People often use the Fermi Paradox to explain why we'll never find intelligent life in the universe. On the other side is evolutionary theory, which suggests that life adapts to its environments. Though Darwin and his contemporaries were hardly thinking of life on exoplanets when they came up with evolutionary theory, it does suggest that where life can take hold, it will. And if you consider that our environment isn't just planets, but also solar systems and interstellar space, an unorthodox interpretation of evolutionary theory suggests that life will adapt to outer space too. We may one day be meeting creatures who've evolved in ways we never dreamed possible — or we may become those creatures ourselves.

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