

“The Habitability of the Solar System in Space and Time”

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About 4.5 billion years ago a supernova exploded causing a nearby interstellar cloud to collapse creating our solar system. What emerged first was our sun blowing the lighter gases outward, allowing the heavier elements to remain in the inner solar system forming our terrestrial planets. We are so lucky to have Venus and Mars, two terrestrial planets that are very similar to the Earth, close in size, with significant atmospheres. Planetary scientists have developed the capability to model how these planets have evolved since their birth and what may happen to them in the distant future. Comparative planetology tells us that terrestrial planetary atmospheres have been in a process of continual change based on the extent of their sources and sinks. We are finding some startling parallels in which both Venus and Mars had environments that would have been habitable for life, as we know it, in their distant past. In addition, we are finding Europa and Enceladus are thought to have an ocean of liquid water beneath their icy crust surface in contact with mineral-rich rock, and may have the three ingredients needed for life as we know it: liquid water, essential chemical elements for biological processes, and sources of energy that could be used by living things. These discoveries are helping our planetary scientists to develop instruments and missions that look for life in our solar system.