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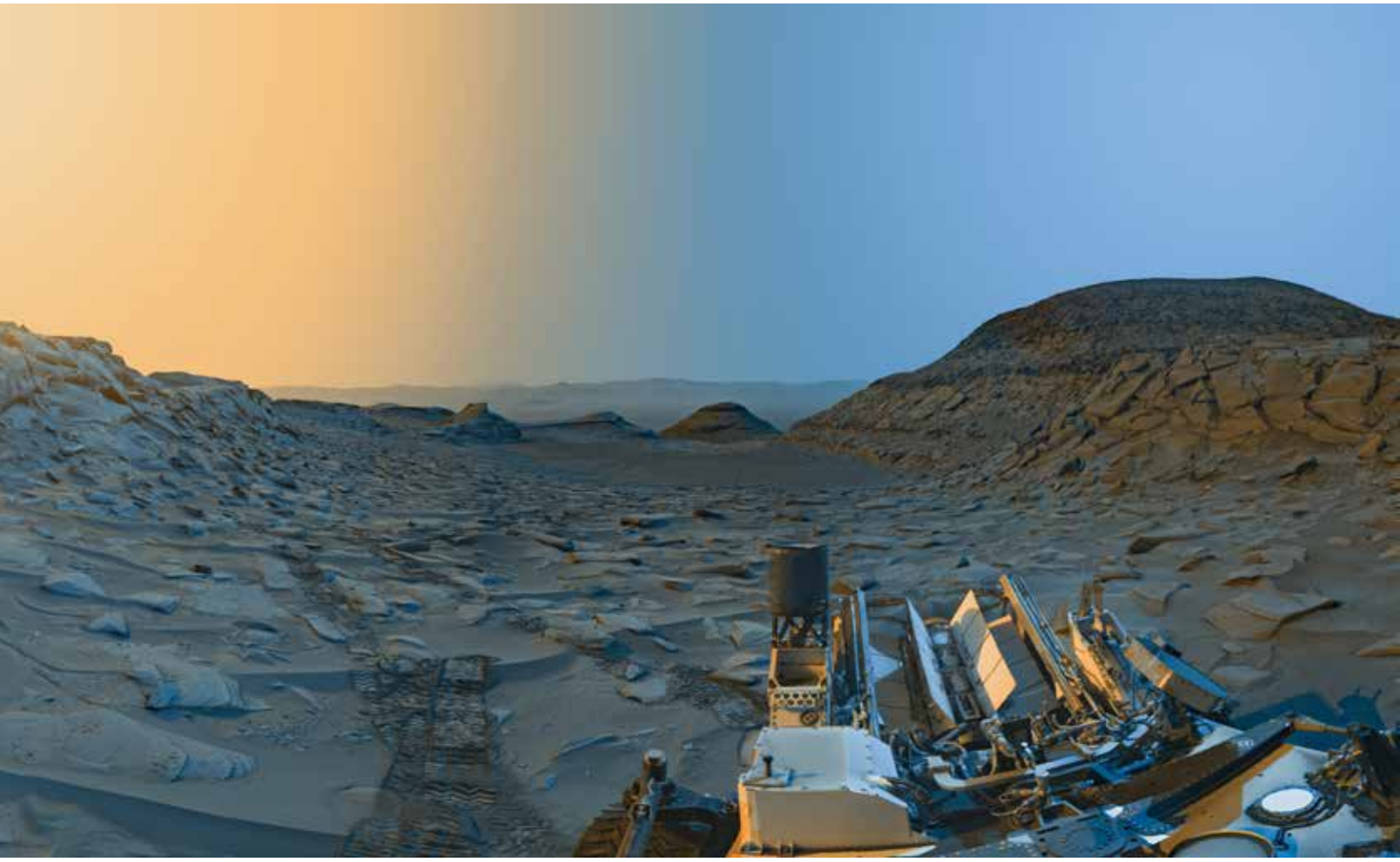
Mars Has Far Fewer Minerals Than Earth Does



This panorama was merged from two colorized images of Marker Band Valley in Mars's Gale Crater taken by Curiosity on 8 April 2023, one in the morning (right) and one in the afternoon local time. Credit: NASA/JPL-Caltech

Whereas nearly 6,000 different minerals are known to exist on Earth, after more than 50 years of investigations, only 161 minerals have been recorded on Mars—a dramatically lower number for a planet that shares much in common with our own. According to a new study, the difference is because fewer pathways for minerals to form exist on Mars than on Earth, even though both planets began on very similar trajectories for mineral evolution.

Following on research to catalog mineral formation and evolution on Earth, *Hazen et al.* conducted a systematic study of all Martian minerals revealed through the past half century of Mars missions and analyses of Martian meteorites. Whereas earlier work identified 57 primary and secondary mineral-forming mechanisms on Earth, the new study identified just 20 modes of mineral formation on Mars.

Early in the planets' histories, minerals on Earth and Mars formed in similar ways. For instance, the first minerals on both planets likely crystallized directly from cooling magma. Hydrothermal activity likely also led to many new minerals on each planet. However, Earth's array of minerals went through extensive stages of diversification billions of years ago with the onset of plate tectonics and the proliferation of life—processes not known to have occurred on Mars.

Although there are undoubtedly many mineral phases on and below Mars's surface that have yet to be observed, the researchers note that the total count of Martian minerals is still likely an order of magnitude smaller than Earth's. (*Journal of Geophysical Research: Planets*, https://doi.org/10.1029/2023JE007865, 2023) **—Rachel Fritts,** *Science Writer*