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NASA's Mars 2020 Rover Mission: Exploration and Sample Caching on Ancient Mars

J.F. Bell III (ASU)

The Mars 2020 Rover will be NASA's next mobile mission to the surface of Mars, launching in July/August 2020 and landing in February 2021. The mission's main goals are to; (1) Determine whether life ever existed on Mars; (2) Characterize the Climate of Mars; (3) Characterize the Geology of Mars; and (4) Prepare for Human Exploration [1]. In addition, a major mission objective is to be the first step (identifying and caching samples) in the Mars robotic sample return campaign identified in the most recent Decadal Survey of Planetary Science [2]. A community process has narrowed the choice of landing sites down to three: Gusev crater (including regions studied by the NASA Spirit rover from 2004-2010), Jezero crater (which houses a delta), and Northeast Syrtis Major (which contains geology and mineralogy consistent with a groundwater system). All of these sites are presumed to contain at least some regions dating back to ancient (Noachian) Mars, a time when conditions may have been most favorable to habitability and life. To study the geology of the landing site and to select the ~20-40 samples to be cached for future return, the rover carries a payload consisting of: (a) imaging from multispectral/stereo/zoom cameras, a color microscopic imager, and 20 other cameras for science and engineering; (b) active emission (LIBS) and passive reflectance spectroscopy of selected points; (c) a ground-penetrating radar that will provide cm-scale resolution of the subsurface; and (d) arm-mounted instruments designed to measure and map the elemental composition and search for the presence of organics on small (few cm diameter) surface targets. This presentation will review the expected science and exploration return from the Mars 2020 mission, including expectations for science discoveries about ancient Mars that can eventually be gleaned from the samples returned to Earth.

[1] <https://mars.nasa.gov/mars2020/> [2] <https://www.nap.edu/catalog/13117/vision-and-voyages-for-planetary-science-in-the-decade-2013-2022>