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Exploration of Mars and the Search for Life

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Mars has been a mystery throughout the history of mankind. Its reddish appearance in the sky caused early civilizations to include Mars in their mythologies. At the end of the 20th Century and at the opening of the 21st Century some of the most sophisticated spacecraft have been at Mars revealing the mysteries hidden in its atmosphere and on the Martian surface. Currently there are five operating spacecraft at Mars returning outstanding data. Three orbiting spacecraft, Mars Odyssey, Mars Reconnaissance Orbiter and Mars Express are returning global imagery, atmospheric measurements, and remote geochemical sensing information about the surface and atmosphere of the red planet. Two Mars Exploration Rovers, Opportunity and Spirit, have provided more than 150,000 images of the surface along with exceptionally high-quality chemical information about the rocks and soils while traveling almost 20 kilometers. With the European Space Agency's Mars Express orbiter, for the first time images are being returned to Earth of the surface of Mars from a .visual perspective. which provide relief information and not the typical overhead imagery of the surface. The relief and elevation differences reveal geomorphological features such as craters, rift-valleys, stream beds, dune fields, glacial features, young volcanoes, ice covered polar caps are showing the new world that exists on Mars. The presence of apparent liquid water along with water ice on the surface of the planet in regions besides the polar caps offers the possibility for the ingredients of life to be present. For many centuries humans on Earth have believed that we were alone in our cosmos. However, recent astronomical and exploration results have begun to suggest life could exist beyond the Earth. The requirements for life to exist on the Earth are: the presence of water, the presence of carbon, energy sources to provide electron transfers, and the body to be geologically active. Mars meets all of these requirements. On Earth the scientific community accepts the presence of past life when the fossil signatures of life (or biosignatures) such as body fossil parts, biofabrics, biominerals, chemical fossils and stable isotopes are present. We are fortunate to have 41 actual samples of Mars available for scientific study in our laboratories today. Within a few of these meteorites are tantalizing signatures of possible biomarkers. With all of the analytical tools and data available to the scientific community today, we are only beginning to unravel the secrets of life beyond Earth.