

Exploring a Planet – Know Before You Go

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Exploration of an extraterrestrial body should progress from INTEGRATIVE INTERROGATION: Satellite observations, imaging, mapping, systematic scientific comparison with terrestrial and known lunar/martian sites, to ENLIGHTENED RECONNAISSANCE: Testing complex robotic (with/without humans) systems on the Moon before going to an asteroid or Mars, to TIGHTLY TARGETED INQUIRY: Applying the investigative/integrative power of human explorers in concert with intelligent robots.

Earth's solitary Moon preserves billions of years of Solar System history, unsullied by plate tectonic and climatic forces that continually reshape the surface of Terra semi-Firma. The lunar surface has, however, been modified by magmatism and impacts – chronostrati-graphic event markers for telescope-based geologic mapping of the Moon. Apollo surface investigations confirmed many of those interpretations and produced significant surprises as well.

Mars is about half the size of Earth and lacks oceans, but on the Martian surface are features analogous to those on Earth: polar caps, volcanoes, canyons, impact craters, dunes, drainage channels, clouds, dust storms. Orbital (Mars Global Surveyor, Mars Express) and robotic (Mars Exploration Rovers) missions are yielding abundant new data and stimulating insights.

Those results are integrated into astronaut training: 1) Analogous planetary features and processes, image and map analysis; 2) Geological/astrobiological surface and subsurface sampling techniques, sample analysis; 3) Geophysical methods; 4) Developing predictive criteria (water, past or present biotic material). Whether on this planet or another, fortune favors the prepared mind.