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UA part of scientific team fostering new way to explore Mars

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Mankind's fascination with Mars has inspired scientists for generations, beginning with the telescopic observation of the 19th century and more recently the remote exploration through a host of international space missions to our neighboring planet.

But despite some spectacular successes, like the Mars Rover mission, exploring the red planet, with its severe climactic conditions and forbidding terrain from our own Earth which is, on average, about 140 million miles away, has been a tough challenge.

Now, scientists from the University of Arizona, California Institute of Technology, and the U.S. Geological Survey Flagstaff are proposing a new path to interplanetary reconnaissance missions that may better reveal the mysteries of the red planet.

The scientists are proposing a three-tiered, top-down approach in which orbital, atmospheric and ground-level robotic explorers work in conjunction with one another for more detailed analyses of the planet.

The concept is the brainchild of UA planetary geologist James Dohm and Caltech physicist Wolfgang Fink. The two scientists believe the future of space exploration requires that robotic technology move toward this more sophisticated structure.

This multitiered approach will allow for better coordination and improved identification of areas of the planet that are worthy of investigation, they say.

The concept occurred to Dohm and Fink while on a field trip several years ago in Northern Arizona. There, the interaction between Dohm and Fink's different disciplines led to a better understanding as to how the technical aspects of reconnaissance should be integrated with the objectives of science.

"The best way to explore a planet is to emulate a geologist," Fink said.

"Though we can't have humans on Mars yet, we still need to use that concept."

The synthesis between scientist and engineer has become an integral part to improving the goals and success of the mission.

"As a geologist you want to be able to get out there with your pickax," Dohm said. "However, with Mars you simply can't do that. By working with an engineer, they can mimic what I want to do."

A scientist's background will provide a better focus for the objectives of any space mission as the exploration will be driven by a clear goal instead of collecting vast libraries of data indiscriminately, Dohm said.

Though they come from varying disciplines, the collaboration is essential as the engineers must design with surface and environmental considerations in mind.

"You must be able to establish communication, an interface between the different backgrounds," Fink said. "There is enough overlap for collaboration and we have to make each of us more knowledgeable."

This collaboration led Dohm and Fink to challenge the structure of traditional approaches to Mars exploration, which they say have proved to be too limited.

Orbiters offer greater ability to perform regional surveys, but they lack the ability to provide detailed information about conditions on the ground. Ground-based robotic probes explore small areas closely while neglecting other potentially interesting features at other ground locations.

Those limitations forced Dohm and Fink to come up with a way to use a more integrated and "smart" robotics in which orbiters provide a planetary view, can deploy weather balloons for a better look at a region, and if that area holds promise for scientific research, launch ground-based rovers to conduct more detailed exploration of the area.

Though this new mission concept is in its initial phases, and the cost of the system is not yet known, Dohm and Fink hope to construct and ground-test a prototype within the year.