By David Real / Belo Interactive
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ABOARD THE MARS DESERT RESEARCH STATION, Utah – Finding butterflies in the harsh Utah desert seems just as unlikely as finding one on Mars.

But NASA scientist William J. Clancey says he has collected plenty of butterflies – and that they will help land a human crew on Mars before 2020.

A butterfly – elusive, ephemeral and precious – is the term he uses for scientific data before it becomes scientific theory.

During a two-week stay at the Mars Desert Research Station in Utah, the 49-year-old New Jersey native led a team of six explorers in a setting that simulated, as closely as possible, a scientific colony on the Red Planet.

The crew even donned fabricated spacesuits with bulky gloves and balky radios.

Then they tried to navigate using a handheld GPS unit. The Global Positioning System, which uses a network of satellites to pinpoint a position on Earth, usually displays 15 digits on a small screen to mark a location.

How did things go during a simulated space walk on the Martian surface?

“It’s ridiculous,’’ Dr. Clancey said. “Manipulating a GPS unit in the field, wearing gloves, is absurd. We can’t push the buttons, we can’t read the screen, we can’t coordinate the map with the units. And why are we dealing with all these numbers? That’s what a computer is supposed to do.’’

Add another butterfly to the collection.

His solution is to build a mobile exploration system that integrates voice recognition and computer systems with GPS and artificial intelligence programs.

Talk to the computer over the microphone in the spacesuit helmet, and the computer talks back, with directions to the location wanted. When astronauts return to their rooms back at the space Habitat, maps showing the route they took have already been printed by the computer.

Such a problem may seem obvious, but others are not. That’s where Dr. Clancey feels he has an edge, using an approach he learned after his formal schooling.

He received his bachelor’s degree in 1974 at Rice University in Houston, where he was a roommate with this reporter. He then earned his doctorate from Stanford University in 1979 in computer science, specializing in Artificial

Intelligence. He currently works at the NASA Ames Research Center in Mountain View, Calif., and for the University of West Florida in Pensacola.
But he learned a new holistic approach to solving problems when he started a 10-year career in 1987 at the Institute for Research for Learning in Palo Alto, Calif.

The new techniques turned regular problem-solving on its head. Instead of making computes smarter, the task was to study people in the workplace and help them do their jobs – a discipline called cognitive science. It not only drew on computer science, but psychology, neuroscience, anthropology and sociology.

The approach assumes that work is a creative process, which is neither routine nor mechanical, and that the informal, social aspects of work contribute to job success.

In other words, people are the key. Rather than throw computer technology at people, Dr. Clancey said, the researcher lives and works alongside them and involves the workers in designing a solution.

The implication was that traditional ideas about Artificial Intelligence computing and problem-solving were wrong. Computers could beat the world's top chess champions, but only because chess was a game with a fixed set of rules and legal moves.

In most other applications – such as exploration of Mars – the mission changes dynamically, but traditional problem-solving approaches didn't.

"If you've got a bunch of people building computer systems based on a theory of knowledge and memory and learning that is wrong – and putting that into work – they are rigidifying the workflow and how people solve problems," Dr. Clancey said. "They're preventing the work from getting done."

To solve problems that crop up at the Habitat, run by the Mars Society, Dr. Clancey is observing scientists who are working under simulated conditions that future astronauts may face on Mars.

"I'm studying the Hab, its layout, what people do, where they do it, and when they do it," Dr. Clancey said. "We're dealing with the total system."

He used time-lapse photography to record the movements of the crew on the main floor of the Hab from 7:30 a.m. to 11:30 p.m. daily. He also manually documented the activities of each crew member every 15 minutes for two days. The goal? Find more butterflies that could reveal future problems and solve them on Earth before astronauts face them on Mars.

When NASA turns its attention from the International Space Station, which should be completed in 2005, a mission to Mars could be the next major project for the space agency, Dr. Clancey said.

“It’s the closest planet to us, and one where we can walk on the surface and we can build houses and we can live,” he said. “Mars has areas that look like there were seas. It has water. It has ice.

“And it might have had life. It might still have life.”

With a national commitment, explorers could be on the surface of Mars within 10 years, he said.

The effort would require great strides in scientific hardware – some of which has not yet invented.

Dr. Clancey said the situation is similar to that faced by President John F. Kennedy when he challenged America to reach the Moon by the end of the decade, saying that the effort would rely on “using materials not yet developed.” Those materials were ready in time for the Apollo 11 to land on the Moon in 1969.

“That’s the way we look at Mars,” Dr. Clancey said. “That we will be using materials, using an understanding of gravity and human physiology, methods of automating life-support systems, and exploration – not yet developed. But we have confidence that we have the pieces and can put it together.”