

## **MARS EXPLORATION USING BIOMORPHIC FLYERS**

Sarita Thakoor(1), Butler Hine(2), Steven Zornetzer(2),  
(1)Jet Propulsion Laboratory, CalTech, Pasadena, CA 91109  
sarita.thakoor@jpl.nasa.gov  
(2)NASA, AMES Research Center, Moffett Field, CA 94035

MARS imagery obtained by the Mariner, Viking and Pathfinder Missions suggests existence of abundant liquid water (considered essential for life as we know it) but it is not clear what went wrong with the Martian climate to have turned it to the desert that it is today. Getting to know closely and understand our sister planet MARS is crucial to learn lessons for preserving and nurturing humanity by avoiding a similar fate for Earth. This apart, of course fundamental scientific curiosity, the lure of mining the many resources on MARS, finding extant or extinct life and perhaps someday establishing a human colony on MARS are other clear motivators. Flight offers a means for covering large spans, several hundred kilometers quickly to provide a close-up birds eye view of the planetary terrain. Exploration that can just be dreamed of today could be a reality if we could engineer a way to fly on MARS and navigate through hard terrain to image/study sites of interest. MARS offers a real challenge to conventional flight, due to several reasons. Its rare atmosphere about a hundredth that on Earth; lack of magnetic compassing for navigation, the limited telecom or navigational infrastructure yet in place, are all challenges for successful flight on MARS. We are using the principles found in successful, nature-tested, bioinspired navigation mechanisms for example, to implement such specific functions that are hard to accomplish by conventional methods on MARS. We will describe a few example specific sites on MARS whose exploration requires imperatively the ability of covering several 100 kilometers and will illustrate how autonomous biomorphic flyers can enable terrain following and imaging of such new sites rich in science information.