Biomorphic Explorers: Innovative ideas from simple organisms

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This talk is aimed at stimulating discussion and generating ideas of how to solve problems relating to scientific research by understanding the ways in which simple living systems solve problems such as site selection, sample acquisition, sample handling and measurement. While it is easy to admire the complex highly evolved strategies used by advanced animal forms, many of these are very sophisticated "machines" and thus difficult to mimic or copy. Here I put forth the notion that there may be important lessons learned from systems that are equally successful without the advantages of muscles, skeletons, and complex sensory systems. These systems solve the problems of survival in more basic ways - ways that may be instructive to us as planetary scientists. In this presentation, I will deal with a variety of levels of structural sophistication, ranging from simple single cells organisms (prokaryotes and eukaryotic protists) to rather complex plant systems, focusing on the various ways in which success is achieved, and simple survival tasks are accomplished. The tasks of interest are dispersal, site penetration and alteration, and survival.

Dispersal is a major accomplishment of life on Earth, and key to its success - both plants and microbes have a variety of mechanisms that take advantage of wind transport. For simple small organisms, site selection is not so important as getting adequate dispersal so that the sites can be inhabited. Site penetration is an important part of survival for bacteria and plants: part of the site penetration ability is often the capacity to alter the surface or substrate on which they land. Bacteria and plant seeds have a variety of mechanisms for attaching to, and eventually penetrating, the surfaces. These mechanisms may offer interesting alternatives for examination of the subsurface, sample acquisition and handling, and perhaps other areas. Finally, survival under harsh conditions is a feature common to many prokaryotes and eukaryotes that have solved seemingly complex problems such as moving on, into or under protective surfaces.