

## Letter of Interest

**Title:** Development of a robotic sampler for underground and confined environments

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**Description:** Acquisition of samples from areas that are either hazardous or difficult to access has been a focus of robotics programs in the field of radioactive and chemical waste remediation for the past 20 years. As requirements for lighter, smarter, and more flexible tools increase, however, new approaches for robotic applications will be developed. The proposed sampler will be asked to perform the following tasks:

- collect channel samples for geoscience investigations (channel samples are surface samples of an outcrop or drift).
- collect water samples from either open flows or from small drillholes intersecting flowing fractures (this may require the ability to install small packers to isolate the flow from contamination from the surface of the drift).
- drill and collect biological samples aseptically from boreholes extending up to about 2 m into the rock.
- has built-in chambers to sample at multiple levels and to preserve the biological samples under original conditions during transportation.

Potentially, such a sampler might also be used to check for unsafe ground conditions prior to entry by maintenance personnel.

### **Infrastructure Requirements:**

Needed facilities in the underground are relatively small in that the underground will be used primarily as a testing facility. Depending upon the method for communication between the controller and the robotic sampler, some installation of wiring or antennas may be necessary in selected locations.

### **Potential Cooperators:**

The proposed work is complementary to programs that are now being conducted at JPL and substantial synergism between efforts to develop robotic samplers for the space program and this work is anticipated. Discussions are already underway with Dr. Yosef Bar-Cohen at JPL regarding the drilling/coring operations. Samplers to be flown on future missions to the Moon or Mars may face problems similar to those encountered in the deep underground of Earth.