

Abstract Form

Project Number:	600045
Project Title:	Laser Raman Spectrometer
Project Manager/PI:	Sheri White
Lead Scientist:	Peter Brewer
Lead Engineer:	TBD

The LRS project has successfully completed the first 3-year phase, and a second 3-year project is proposed here. In Phase 1 we (Yr.1) accomplished specification, vendor search/testing, and acquisition. Yr. 2 saw design, fabrication and MBARI testing, and by mid-year of Yr. 3 we have carried out 5 successful ROV deployments (using both Tiburon and Ventana) with a maximum depth of 3600m. A first paper has been submitted, and two more are underway. We have successfully initiated in situ calibration protocols, and can now return spectra of exceptional quality from the deep ocean.

Our overarching goals for Phase II are first to make innovative scientific use of the system we have created, second to enhance the system to achieve its full potential, and third to explore future development of lighter, smaller, robust systems for use on other platforms in the community. The development of a critical positioning system is already planned for the second half of 2002. Three more Ventana dives and one Tiburon dive are scheduled for LRS science/technology in late 2002, including deployment of a new optical lens for the probe head.

In 2003 we plan on using the LRS in the Gulf of California for gas vent/hydrate science, and if possible at a hot vent site. In local waters we plan on using the instrument in an international CO₂ sequestration experiment with Japanese and Norwegian colleagues, and to initiate measurements on novel targets such as bacterial mats and in pore waters. These will be challenging. We also plan on a series of laboratory measurements to ensure adequate knowledge of spectra obtained in situ: the Raman signal detects solution speciation, and chemically sophisticated approaches are required.

We will need four trips each consisting of two dive days to accomplish all of the science and engineering goals that we have planned for 2003. Engineering validation and verification of the xyz positioner and the through the lens visualization system will each require two dive days on separate trips. Science experiments occupy the remaining four days.

A number of engineering enhancements must be made to the LRS. "Through the lens visualization" is required so that the target being measured can be clearly identified. This is standard in laboratory instruments, and requires a movable beamsplitter in the optical path. We expect that the camera system available from Kaiser can be adapted for our system. A new and larger probe head pressure case will be required to accommodate this unit. The sample must be illuminated by white light, either with an external LED ring, or by using a beam splitter in the camera optical path, as is standard with reflected light microscopes. The laser beam has sufficient power to dissociate hydrates, or to photo-bleach targets, and thus a controllable laser shutter (or attenuating beamsplitter) will be added to the optical path. The existing fiber optic cables should be replaced with more robust, armored cables (requiring redesign of the penetrating connectors). For signal enhancement in sea water we will explore both Teflon capillary waveguide, and silver (SERS) techniques, for 2004 implementation.

2003 Abstract Form – Internal-Only Projects (no external funding).

Deadline for Abstract submission is 8:00 a.m. on July 22nd.

In 2004 we will propose to use the instrument at northern hot vent sites for in situ measurements of vent plume and mineral geochemistry. Possibilities for future lighter, smaller instruments include the Wang/Haskins Mars Explorer design at Washington University, and the NATO sponsored IFREMER unit.

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Abstract Phase: LABOR Resource Request Form

Project Title: Laser Raman Spectrometer
Project Manager/PI: Sheri White
Lead Scientist: Peter Brewer
Lead Engineer: TBD

Research: IAG					
	Research: SAD/Software Engineer		< 10 days		> 10 days
Development					
x	Development: Electrical Engineer		< 10 days	x	> 10 days
x	Development: Software Engineer		< 10 days	x	> 10 days
x	Development: Mechanical Engineer		< 10 days	x	> 10 days
x	Development: Machinist		< 10 days	x	> 10 days
ITD					
x	ITD: Video Lab/Samples Tech	x	< 10 days		> 10 days
x	ITD: Technical Writer	x	< 10 days		> 10 days
DMO					
	DMO: Ocean Observatory Tech		< 10 days		> 10 days
	DMO: CTD Instrumentation Tech		< 10 days		> 10 days
	DMO: Diver		< 10 days		> 10 days
COO					
	COO: IS Administrator		< 10 days		> 10 days