

**UNOLS DEep Submergence Science Committee**  
**Annual Planning Meeting**  
**Moscone Center, Room 220**  
**San Francisco, CA**  
**Sunday, December 12, 1999**  
**Appendices**

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**Introduction - DESSC Chair's report:**

Patty Fryer, DESSC Chair, opened the meeting at 8:30 am by welcoming the meeting participants. Newly appointed DESSC members – Joris Geiskes and David Mindell were introduced. Patty reviewed the agenda. One of the tasks facing the DESSC in the coming year will be revising their terms of reference to bring them up to date and to also reflect the expanded role of the committee. These minutes reflect the order in which the meeting agenda was addressed. The agenda is included as [Appendix I](#) and a list of meeting participants is included in [Appendix II](#).

Some highlights of the year included the DESCEND workshop which was well attended by the submergence community of scientists and engineers. Deep submergence activities included 12 science cruises aboard ATLANTIS with an additional four flyaway ROV programs aboard other ships. Patty encouraged the community to think about deep submergence science directions for the out years. She presented maps showing a summary of ALVIN and ROV days on station for funded and pending programs for 2001 and beyond, see [Appendix III](#).

**1999 Science Reports - Presentations by Principal Investigators:**

Brief reports from Science PIs who had used ALVIN and/or the ROVs over the past year were presented. Viewgraphs and other material from the science reports are included as [Appendix IV](#).

**Bob Vrijenhoek** – Information from Bob Vrijenhoek's report is contained in [Appendix IV-A](#). Bob began by reviewing the overall objectives of his work with hydrothermal vents. He reviewed the questions addressed by his studies on evolutionary systematics, phylogeography, and metapopulation processes. Over the years, they have sampled from vent sites around the world including the East Pacific, West Pacific and Atlantic, see map. In January 1999, an ALVIN dive program was conducted on the Southern East Pacific Rise. Bob showed a map of the sites sampled on the cruise. Many new species were discovered. Bob reported that there were some technical difficulties on the cruise. Fuel consumption was a concern, and as a result, Bob in his role as chief scientist had to work with the Captain and crew in conserving fuel. SeaBeam problems were experienced on the cruise, but the science party was able to make do. The system problems need attention. Even with the problems, Bob reported that the cruise was very successful.

**John Lupton** – John Lupton was on the same cruise ATLANTIS cruise as Bob Vrijenhoek in January 1999. He conducted a ten-dive program. His viewgraphs are included in [Appendix IV-B](#). The cruise had a very full schedule with night operations and a busy biology and chemistry element. John showed a site map of the research area along the Southern East Pacific Rise. New sampling sites were shown in red and black indicated revisited sites. John showed a few sampling results for the 31.1S site. They worked with

Dick Hey at this site who had surveyed the area extensively in 1998. Plume studies were examined. A vent field was discovered and found to be similar in nature to the ones found at Axial Seamount. The vents were rich in magmatic gases and which may indicate a magma system near the surface. Although there were only two pilots throughout the cruise, crew support was very good.

**John Sinton** – John Sinton's ATLANTIS program, the STOWA Cruise began in late January and continued until early March. His viewgraphs are included as *Appendix IV-C*. The cruise involved three elements, volcanology, mussels, and ABE. John's program was involved with the volcanology portion of the cruise. DSL 120 was used first and approximately 160 km<sup>2</sup> of seafloor was imaged in four days. This was followed by ALVIN 23 ALVIN dives (three dives were funded by Cindy Van Dover's program). 24 ALVIN dives had been planned, but one day was lost to weather. John reported that this was a very successful program. Five pilots supported the operations. ALVIN bottom time per dive was approximately 5.5 hrs. There were 92 wax core and dredge stations and 232 rock samples were collected. The real time data collected from DSL-120 was a good source for dive planning. John reported that the final processed data was not available at the end of the cruise, but expected that WHOI now has it. The only problem that could be reported was with the number of external 35m cameras available. John wished to convey the message that this was a successful program.

**Cindy Van Dover** – Cindy Van Dover conducted a three-dive ALVIN program on the same cruise as John Sinton. Her program focused on diversity at mussel beds. Mussel pots were used for sampling and worked very well. Cindy reported that they were able to get five good samples from the six collected.

Cindy continued her report by discussing her cruise to the Northern EPR at 9-degrees N in November 1999. Three ALVIN dives were made, also to study mussel beds. Six mussel pot samples were successful collected. She reported that they are also interested in recruitment, i.e. what draws animals to sites? They are investigating the possibility that sulfide might be the attraction. Cindy reported that they have developed a sulfide generator, AKA, "stink pots." The sulfide generator was tested and left at the 9N site.

Cindy reported on a few problems experienced with her cruise. The ship's laboratory sinks were in poor condition and as a result she was required to carry out work on deck, sometimes in the rain. Also, Cindy reported that her dive series was taxed with a pilot training dive.

**Dana Yoerger** – Dana Yoerger also participated in the same cruise as John Sinton and Cindy Van Dover. He was involved in the ABE portion of the cruise. Dana showed the vehicle track lines. Imagenex was used successfully for imaging the sea floor. Dana showed examples of images obtained from Maria Cormier's data. Video was also obtained using ABE. They were able to do some mosaicing. ABE's hill climbing capability was successfully demonstrated. At the request of Rodey Batiza, bottom sampling was tried using ABE. Wax coring was successful. By the end of the cruise, ABE was being deployed over the ship's side and operated all night. There are still a few glitches with the system. Battery problems were experienced with ABE and it cost some bottom time. The bow thruster also experienced failure problems. Dana noted that if there were a fatal problem with the vehicle, the system would drop its weights and surface.

**Jeff Karson** – In March/April, Jeff Karson had an ATLANTIS cruise to the Hess Deep. His viewgraphs include maps of the study area and are provided as *Appendix IV-D*. The program conducted a nested survey using DSL-120, Argo II and ALVIN. The Hess Deep has very steep walls and offered a challenging terrain for the systems to operate. Excellent data was obtained using DSL-120 and they were able to adequately plan for follow-on dives. Over 200 samples were collected during operations using ALVIN. Argo II was used at night for surveying steep slopes. Jeff reported that the support provided by the pilots was excellent. They were able to examine crustal structures and spectacular outcrops. From images, they were able to mosaic and study dikes. Pre-cruise planning efforts lead to a very successful cruise. Dan Fornari and Andy Bowen provided very helpful information on the operational feasibilities. The at-sea crew support was terrific. The only problem he encountered was that he had expected to be able to perform more night-time work than possible under existing crew over-time limits.

**Marta Torres** – Marta Torres reported on her program, TECFLUX 99, aboard ATLANTIS in June/July. Twelve ALVIN dives were carried out. Marta's viewgraphs are included as *Appendix IV-E* and show the

study area. GEOMAR collaborated on the program and conducted night camera tows from F/S SONNE. The study area was Hydrate Ridge, Cascadia. Marta reported that this is a complicated system to study since it is very dynamic. Additionally, North Hydrate Ridge is very different from the South. Coring is very challenging in the North. Bubbling occurs at the summit of North Ridge and there seems to be tidal, [temporal] effects on this system. The South was thought to be a more diffusive site, but is more dynamic than originally suspected. There are soft mounds, that if poked produce bubbles. Marta showed a graph which illustrates the highly heterogeneous distribution of methane flux. These data were collected simultaneously by benthic landers deployed over bacterial mats, clam field, and background sediment. Marta noted that the only way to examine this system is to use many tools. Marta showed a viewgraph of the tools used. A variety of instruments were used to sample benthic fluxes, temperature changes and gas composition. She made a plea for the development of pressurized corers so that gas hydrate samples can be recovered intact.

**Miriam Kastner** – Miriam Kastner reported on her September 1999 cruise on ATLANTIS. Her viewgraphs are included as *Appendix IV-F*. The title of her program is "Active C Flux on the Cascadia Accretionary Prism: In-situ Measurement of Hydrocarbon Sequestration as Gas Hydrates and Authigenic Carbonate Deposits." Co-PIs on the cruise were Bobb Carson, Miriam Kastner, and Doug Bartlett (Hans Jannasch). They attempted to quantify the amount of gas moving through the water column into the atmosphere. Borehole site 892 was studied and the evidence of flow is convincing. They designed and engineered a carbonate chamber to be placed over the borehole. It was deployed during their cruise and will remain on the borehole for a year before retrieval. Miriam experienced battery problems with ALVIN on this cruise (the worst she has ever encountered) and expressed hope that the problem will be addressed.

**Geoff Wheat** – Geoff Wheat reported on his September ATLANTIS cruise, CORKs 99. His viewgraphs are included as *Appendix IV-G*. At sea goals included downloading temperature and pressure data, retrieving data loggers, thermister strings and Osmosamplers, conducting in situ calibration, logging boreholes for temperature, collecting fluids in boreholes and plugging boreholes. ALVIN was used during the day and the control vehicle was used at night. They weren't able to get everything accomplished, but additional dives have been awarded. Operational challenges included coordination between two research groups (in terms of bunks and baskets). Bunk space is always going to be at a premium on multi-program cruises. They noted that the pull strength of the wire used was less than the pull of the wire on retrieval of the instruments in the depth of water they were working in (2600m water depth) and that this may be a general problem for future operations. There were temperature effects on the wireline tools. Operational successes included the joint operations of the control vehicle and ALVIN. The vehicle was very good at reentering the 3.5" borehole with a 2" instrument at a water depth of 2600 m. Heavy gear was handled with ALVIN. Geoff showed graphs of the Osmosampler's data. They will continue to analyze the fluids.

**Dana Yoerger** – Dana Yoerger reported on Bob Ballard's cruise in the Mediterranean and Black Sea aboard R/V NORTHERN HORIZON. Biblical archaeologists from Harvard University also collaborated on the project. During NR-1 operations to examine the wreck of Dakar off Israel, Phoenician shipwrecks were discovered. In this 1999 cruise, Jason and DSL-120 were used on the expedition to examine these wrecks. Jason's imaging was mosaiced and Dana showed the image of one of the wrecks. A closed loop system was used in the operations. Automated mosaicing software development is in progress.

**Bill Seyfried** – Bill Seyfried reported on his ATLANTIS cruise in September at Juan de Fuca. The title of his program is "In-Situ Measurement and Monitoring of Dissolved H<sub>2</sub>, H<sub>2</sub>S, and pH in Mid-Ocean Ridge Hydrothermal Fluids." Bill's viewgraphs are included in *Appendix IV-H*. Four ALVIN dives were carried out. PIs for the program were Bill, Kang Ding and Meg Tivey. They field-tested an array of electrochemical sensors at the Endeavor site for measurement of dissolved gases and high temperature vent fluids. Bill reviewed their testing strategy. The Bradley ICL was used as a sensor interface with the submersible. The cruise participants and their responsibilities during the cruise are included in the appendix. Kong Ding discussed the sensor and reviewed the results of in-situ measurement of vent fluid chemistry. He showed the comparison of dissolved H<sub>2</sub>S concentrations measured by using different methods and noted that they are fairly similar. They are able to see the real time relationship between dissolved gases and temperature from a single vent site.

**Marv Lilley** – Marv Lilley discussed his work with seismicity and magma chambers. He discussed He<sup>3</sup> and CO<sub>2</sub> measurements at Endeavor Main Field before and after the June 1999 earthquakes. With the exception of the Dante site, He<sup>3</sup> was significantly higher in 1999 than in previous years. In all cases, CO<sub>2</sub> was higher in 1999 at all sites. Marv's CO<sub>2</sub> chart and John Lupton's He<sup>3</sup> chart are included in *Appendix IV-I*.

**Jim Cowen** – Jim Cowen reported on his THOMPSON cruise in August/September. His viewgraphs are included as *Appendix IV-J*. The main objective of the program is to extract proxies of biological data. Last year they used ALVIN to deploy systems to collect particulates. This year they used Jason for retrieval of the systems. There were four work sites with 9.5 days on station and nine Jason lowerings. Two Jason lowerings were aborted. Total Jason bottom time was 74 hours. One of the concerns in planning the cruise program was the awkwardness of the particulate collector systems in terms of handling; they are large and heavy. They worried that the elevator would not be able to support their needs. With patience and skill the Jason pilots were able to recover their systems. Early manipulator/connector failures were fixed. Jim praised Jason and the tireless/creative/skilled crew in their support of the program. Jim reviewed the Jason dive summary very briefly (see Appendix IV-J). He noted that they were able to get many experimental deployments that would not have been possible using ALVIN. Temperature could be measured within the diffuse sites without influence from the ambient temperature.

A question was asked about the comparison between ALVIN and Jason operations. Paul Johnson commented that Jason worked very well this year. The project could have been carried out using ALVIN very effectively, but would have required repeated operations and large bottom time. They are two very different vehicles.

**Bob Embley** – Bob Embley reported on the NeMO Net project and his Jason cruise in September on Thompson. His viewgraphs are included in *Appendix IV-K*. The goal was to deploy a seafloor unit that could talk to the surface moored buoy and then signal to the GOES satellite. The sea floor unit was located at a site that had recently been surveyed by ROPOS. The camera system was quite large and a bit difficult for Jason to handle, but it worked fine. An image came back about every five days. Temperature data was sent back every day. The pictures can be viewed on the NeMO website. They now have the ability to get real time data back to the shore.

Bob continued by reporting on the Acoustic Extensometer Project. The plan was to deploy twelve instruments across the valley floor at south Cleft to monitor horizontal strain. The instruments were not ready to be deployed during the September cruise, but they are committed to getting them in place this year, perhaps using R/V RON BROWN.

Bob reviewed the accomplishments in 1999 using Jason. Imagenex high-resolution bathymetry of the deployment site was obtained. They have deployed 12 benchmarks and made pressure measurements at each for vertical deformation monitoring. Three HOBO high-temperature probes have been deployed at south Cleft vent sites. Instrument acoustic modems are being field-tested. The results from prototype extensometer instruments have been published in December 1999 GRL.

**Dana Yoerger** – Dana Yoerger reported on Alan Chave's H<sub>2</sub>O cruise on THOMPSON. The goal of the cruise was to recover and redeploy the H<sub>2</sub>O junction box and IRIS seismometer using Jason. To recover the box, a lift line was dropped from Medea and connected by Jason. They were able to put the junction box down exactly where it had been and reinstall it. The junction box is roughly 1500 lbs. and 2.5m long. It was in 5000m of water. A lot was learned about deployment environments during this operation. Pre-cruise planning is essential.

**National Deep Submergence Facility Operator's Report** – Dick Pittenger provided WHOI's operator's report and began with a recap of ALVIN dive statistics from 1964 to 1999, see *Appendix V*. There have been 3,502 total dives with a cumulative total depth of 7,191,806 meters. WHOI has been trying to raise

the awareness of the importance of deep submergence science in the political world. They provided Congressman Jerry Lewis with a first hand look at ATLANTIS and ALVIN. WHOI gave Rita Caldwell a dive on ALVIN. She will use some of the images from this dive in her presentation at AGU.

**NDSF Vehicle Operations Summary** - Rick Chandler continued the WHOI report with a review of 1999 operations, see *Appendix VI*. Annual operating costs in 1999 was \$4,057,650 for the facility. Use of the facilities in 1998 and 1999 was high. Rick presented a chart showing the ALVIN dives lost vs. completed since 1985. In 1999 there were 335 ATLANTIS operating days and 175 ALVIN dives. The average dive depth was 2,386 m with average dive duration of 8.1 hours. Average bottom time was 5.3 hours. Fifteen science programs were carried out. Some of the highlights of the year included 38 dives on the Southern East Pacific Rise. The first dives north of 50-degree latitude were conducted in Gulf of Alaska. 1999 saw the first use of an IMAX camera in ALVIN.

In 1999, there were six ROV programs for a total of 48 vehicle lowerings. A total of 834.6 bottom hours were achieved and 371.8 miles were covered. Highlights of the year included successful use of the SM2000 multibeam sonar, 57,324 electronic still camera photos were taken, 45 transponders were launched, nine elevators were used and there were two EXACT deployments.

Dick Pittenger continued with a report on ATLANTIS projects completed in 1999 and the funded projects to be completed. Some of the major items completed in 1999 included replacement of the anchors, installation of an ozonator in the potable water system, overhaul of the engines, and replacement of all fuel injectors. The complete list of ATLANTIS items is contained in *Appendix VII*. Close to 100 ATLANTIS improvement items have been completed in the summer and fall. Dick reviewed the projects still to be completed. Bow thruster noise, lab power distribution and drains are still issues. Dick invited the community to provide any additional comments to WHOI. Dick addressed the fuel consumption issue. The work on the southern East Pacific Rise in 1999 represented the ship's most remote journey and there was no fuel usage history to rely on. WHOI wanted to avoid buying fuel at Easter Island since the last time they purchased fuel from the island salt water was in the fuel. As a result, WHOI tried to implement fuel conservation measures.

The other issue addressed by Dick was overtime. On Jeff Karson's cruise the science party expected to do 24 hour operations. Dick reported that this is a budgetary issue. WHOI tries to provide quality service at a reasonable price. In the future, Jon Alberts will address ship support and overtime with PIs during their pre-proposal stage as well as during pre-cruise planning. Some of the problems can be solved by better communication. More information provided at the pre-cruise stage would be helpful.

**ALVIN Upgrades** – Barrie Walden reviewed ALVIN upgrade projects, see *Appendix VIII*. Current projects include addition of an in-hull digital camera. An SM2000 multibeam sonar has been tried (on loan) and is working very well. A new one is on order. The video route upgrade has a lot of capabilities and community feedback is needed. WHOI is experimenting with ring laser gyros and they expect to be ready to purchase one within the next six months. Development of the virtual ALVIN software package that WHOI had hoped would allow pre-cruise power consumption scenarios has been slow going. The software company is working on the final version which is due soon. Prototype development of a steerable elevator is expected soon and they hope to have positive results by June. Pressure proofing to the inductively coupled link (ICL) is underway. Barrie provided additional details on the video route upgrade (see appendix). ALVIN planned projects include a Doppler/Ring laser gyro navigation system, in hull digital cameras, and replacement of the quartz viewer port lights with HMI lights. The HMI lights require less power.

Barrie reviewed the projects being considered for ALVIN's overhaul. He indicated that ideas and priorities are welcome from the community. The overhaul list under WHOI consideration includes:

- Hard mount observer video controls
- Modify interior floor space arrangement
- Science basket modifications
- Lateral thruster with DP system
- Battery monitoring

- Manipulator upgrades
- Acoustic modem to allow ALVIN information to be sent to ship while submerged.
- External still camera changes

Barrie explained that the external still camera images are the ones used for publications. He has examples of high grab images taken from video and asks that the community look at these images to determine if they are adequate to replace the external 35 mm camera images. Mounting of these cameras is difficult and they take up science space.

Barrie continued by discussing the magnetic media. WHOI would like to shift to digital tapes. The Hi-8 tapes need to be transferred to another media as soon as possible to avoid degradation. There is a significant difference in cost between Hi8 and digital. The Hi8 video tape costs \$8.29 while the digital video tape costs \$30.90. For 175 dives/year for ALVIN the estimated Hi8 cost is \$17,409 vs. \$64,890 for digital. WHOI would like to shift over the ALVIN to digital because they feel that it would provide a better product. They will wait to convert the Jason media until further evaluation. On the support ship, there will be a capability to convert media for the science party before they leave the ship.

### ***Lunch Break***

**NDSF Tethered Vehicle Upgrades** - Andy Bowen provided a report on the NDSF Tethered Vehicles upgrades in 1999 and plans for 2000 and beyond, see *Appendix IX*. The 1999 upgrades included overhaul of the hiab crane, overhaul of the traction winch, and purchase and testing of the Deep Simrad SM2000 sonar. The full list of items is included in the Appendix. Plans in 2000 include replacement of the tool van, specification and purchase of a neutrally buoyant umbilical, evaluation of digital video recording media, and completing the first year of the ROV upgrade effort.

Andy reviewed the DSL-120 status. Dock trials of DSL 120 vehicle tow dynamics have been conducted. Further evaluation and improvement is ongoing. They hope to improve slow speed dynamics. EDREX97 data processing has been completed and the sidescan and bathymetry has been reprocessed. Andy gave the full list of data reprocessed or in process. They should soon be completed with the reprocessing backlog. Generation of new DSL-120 intermediate data has been completed. Bathymetry re-processing with new flat bottom tables is undergoing evaluation and testing.

Andy reviewed the upgrades planned for the NDSF ROVs Jason II, ARGO II and DSL-120. Jason II upgrades are intended to improve manipulative capabilities, increase sample and equipment payload capability, increase speed and thrust, increase depth rating to 6500 meters and include tether management. The full list of upgrades is included in the appendix.

Andy reviewed the schedule for the upgrade implementations for DSL 120, Argo II, and Jason II. System specification/development began in 1999. Sonar electronics has gone out to bid and results are expected by October. There is a possibility that the system could be tried during Donna Blackman's ATLANTIS cruise as night operations. A six-month conversion to Jason II is expected during 2001 with a three month standdown. Andy provided a Jason II design overview. The design includes swing arms, a sample drawer, six thrusters, six video cameras, and high speed data transmission. There is a hydraulic system for powering the arms as well as some payloads. It was commented that the vehicle design appear to have everything in a forward-looking mode, why not look at the sides? Andy replied that the swing arms will somewhat address this. It was also questioned on why the multibeam sonar is located on the top of system. Andy replied that it is forward looking with a 400 m range. A tilt mechanism will be added. The sample drawer configuration was also a concern since it implements a height restriction. Andy said that for tall items you need to use the arms and put a basket on the arms. The drawer does offer freeing up area in front of the vehicle for other work. The drawer can be removed depending on the mission.

**SEA CLIFF – ALVIN Engineering Study** - Bob Brown reported on the SEA CLIFF engineering study, see *Appendix X*. Although they had hoped to be completed with the study, one of the subcontractors is running behind. SEA CLIFF has been moved from Otis Airforce base to WHOI. The TURTLE and SEA CLIFF spare parts will be transferred over to WHOI in early 2000. There is still the issue of whether WHOI will have to pay an unshelving cost for removal of the parts from the Navy. These specifics are



being worked out. A couple of SEA CLIFF components are being used on the NDSF vehicles. The sonar system was being used prior to transfer. The batteries had to be removed from SEA CLIFF for safety reasons. Everything else on SEA CLIFF is intact.

The SEA CLIFF study will study the following options:

- Improvements to the 4500 m ALVIN
- Use of SEA CLIFF as it is
- Basic conversion of ALVIN to 6000 meters using SEA CLIFF components
- Frame up new design of 6000 meter vehicle.

As part of the study, a survey of ALVIN users has been completed and received excellent comments. A study of all other 6000 m HOVs has been completed. Specifications for improving ALVIN have been developed. The outstanding items of the study are in costing out of options and completing the final report.

**NDSF Outyear Planning of Funded, Unscheduled Programs** – Jon Alberts provided a report on cruise planning and stated that the Web form is working well. Shozo Tashiro, a JAMSTEC deep submergence pilot, visited WHOI for six months to learn about their operations. Jon presented the 1999 schedule, see *Appendix XI*. The schedule is busy in 2000. ALVIN will return to Woods Hole in December to begin its overhaul. There are four ROV programs that will be carried out on other ships.

Next Jon showed a summary of the 2001 ship requests for ALVIN & ROV operations. Programs are requested for times throughout the year. Then he showed the proposed upgrade period for the facilities along with the corresponding weather windows. There are two options being considered for the DSL upgrades; Plan A would implement the upgrades in mid-year and Plan B implements the upgrades at the end of the year. WHOI would like the DESSC to advise on this situation and recommend the preferred option. With ALVIN's overhaul period in the first six months of the year, approximately 80 dives could be scheduled in 2001.

### **Agency Reports:**

**National Science Foundation (NSF)** – Don Heinrichs gave the report for NSF. Although NSF's final budget has not been approved, they anticipate a 2% increase for facilities. The total NSF budget will likely see a major increase. The Biocomplexity RFP has been advertised and might be of interest to the deep submergence community. A major portion of the budget increases will go to these programs. The final decisions on how funds will be distributed within the Ocean Sciences section are unclear. Last year NSF spent approximately \$30M on facility support. This year the fleet operations proposals are up to approximately \$40M. This increase was not anticipated and as a result, cost efficiencies as well as perhaps deferring some programs are being considered. It is likely that more than \$30M will be spent, but not as much as \$40M. The research section is looking at level funding and no major shifts are expected.

Don continued by reporting that NSF has completed a year-long review of the Academic Research fleet. The review found that fleet operations and management are in a good state. The primary initiative for NSF and UNOLS should be support to science – service to science. The UNOLS Office will be moving to Moss Landing Marine Laboratories on 1 May. Hosting the Office was competitively bid to the UNOLS operator institutions. The MLML proposal is under agency review at this time. The Academic Fleet Review recommended that the new UNOLS Office operate under a cooperative agreement. The agreement is being drafted by the agencies. NSF has asked that the UNOLS Council review the recommendations of the fleet review and examine their taskings.

Don closed his report by noting that the science of deep submergence is very healthy. Don will retire at the end of the year. Mike Reeves will be his replacement. The meeting participants applauded Don Heinrichs' many years of service to their community.

**National Undersea Research Program (NURP)** – Barbara Moore gave the NURP report.

NOAA/NURP will continue to honor their commitment to the National Deep Submergence Facilities of \$500K. These funds are awarded on a competitive basis within NURP. In 2000, funding went to support Alaska operations. In 2001, there are two competing proposals one of which is in the Gulf of Mexico. Barbara reported that the other method of NURP facility funding is by individual centers supporting programs with their own center funding.

**Office of Naval Research** - There was no ONR report; however, Dan Roland who will be involved with ONR's deep submergence facility programs was introduced.

**Report on the DESCEND Workshop** – Patty Fryer gave a brief summary of the DESCEND workshop for the people who were not present. The goal of the workshop was to define future submergence science directions and identify the facilities needed to meet these directions. The process of how to obtain the needed facilities still needs to be addressed. We also need to determine how to help the agencies get the addition funds needed to increase the capabilities of the submergence assets. The steering committee has suggested that in addition to a final report, a glossy foldout brochure be produced summarizing the workshop findings and recommendations. This would be in addition to the full report. The brochure could be useful in convincing colleagues and congressmen of the importance of submergence science.

Patty presented the major science issues that were identified in the workshop. These included:

- Biological diversity, complexity and dynamics.
- Lithosphere formation, evolution and destruction.
- Fluids and material and energy fluxes.
- Etc

Next, Patty reviewed technology needs identified in the workshop:

- An appropriate increase in the level of submergence science and facility funding
- Dedicated vehicles for observatory science
- Chemical and biological sensors with direct read-out in real time
- General use instrumentation with compatibility across vehicle platforms
- Low-cost modular vehicles capable of multidisciplinary applications
- UNOLS-type coordination and funding model
- Proposal pressure
- Metadata coordination

Patty reviewed the draft DESCEND report outline which includes the following sections:

- Executive summary
- Introduction
- Results of the science breakout sessions
- Results of the technology breakout sessions
- Recommendations
- Follow-up
- Appendices

Patty reported that during the wrap-up session of DESCEND there was a strawman vote of the participants to answer a couple of questions: (1) Do we need increased accessibility to existing facilities? and (2) Do we need additional assets? The participants answered yes to both questions. Consequently, additional funds are needed.

There are a few areas that will require follow-up to the meeting. A technology follow-up meeting has been suggested. A community based submergence science steering group to perform the function of a coordinating committee has been recommended. It has been suggested that DESSC or an expanded DESSC could serve in this capacity.

Patty went on to suggest that the workshop report needs an overall theme that catches the reader's



attention, a real "motherhood" theme. With tongue firmly in cheek, Patty presented a suggestion for a report title. Because submergence science provides the means by which to study critical problems in marine and biological science throughout the world oceans, a logical title could be: World, Ocean, Marine and Biological Science or "WOMB" Science.

When the laughter subsided, Patty encouraging suggestions and comments from the audience. A lively discussion followed and it basically became a brainstorming session. The focus of the discussion was on the major submergence science issues. The comments, questions, and suggestions from the meeting participants are listed below:

- The question was asked of whether the report should be a focussed program vs. a list of science objectives?
- Titles for the report were suggested:
  - "Mission to the deep ocean floor."
  - Biosystematics of Inner Space "BS"
  - H2O Earth as a Living Planet "HELP"
- It was commented that we need to capitalize on the tools needed and maintain a focus on the diversity of deep submergence.
- There has been a lot of effort been put into the NEPTUNE program. Their report is coming together. There is also the RIDGE 2000 workshop. The results of these workshops should be applied to DESCEND.
- We need to convince not only the funding agencies of the science and technology needs, but also the political world.
- The report must focus on both the technology needs as well as the science directions.
- Knowing all of the good science that needs to be done, we need to be assured that we will have the facilities needed for the next 5 to 10 years. How do we effectively package this message?
- We need to make the use of deep submergence vehicles as self evident as the need to have ships. A theme is needed that brings forward the science objectives.
- It was suggested to stress the exploratory needs of the ocean. We spent the 20<sup>th</sup> century exploring the continents, now it is time to explore the deep ocean. The discovery aspect should be pursued.
- It was also commented that although discovery is a good path to take, the scientific element needs to remain to make the report viable within the community.
- It was suggested that the community be able to look over the draft, this would stimulate the community and help them make suggestions. The draft report can be posted on the web.
- It was recommended the we look at successful programs and explore the techniques they used to promote their program.
- To increase submergence science visibility and funding potential, broaden the umbrella. Expand DESSC.

As the discussion period ended, the meeting was adjourned to executive session. Patty asked that the DESSC stay to discuss the recommendations of the meeting participants and strategies for follow-on activities to DESCEND. She thanked the participants for their input and asked them to stay tuned for

further DESCEND activities.

*The meeting was adjourned at 3:00 pm*