

*DEep Submergence Science Committee Meeting  
The Ramada Plaza Hotel  
Whitcomb Ballroom  
1231 Market Street, San Francisco, CA 94103  
December 12, 2004*

**Executive Summary**

The Deep Submergence Science Committee (DESSC) met on December 12, 2004 at the Ramada Plaza Hotel in San Francisco. The meeting was co-Chaired by outgoing Chair, Patty Fryer, and incoming Chair Debbie Kelley. The meeting began with presentations by the Principle Investigators who used submergence vehicles in 2004. Funding agency representatives provided budget information as well as agency priorities. A variety of reports were made by the National Deep Submergence Facility (NDSF) operator to summarize facility operations, planned activities, and system upgrades. A discussion on tools and assets took place to get community feedback on the need for a rock drill capability. A presentation on ABE/Sentry and its capabilities was made by WHOI. DESSC activities, future plans and issues were reported including discussions on long-range planning, public outreach and educational activities.

The meeting concluded with status reports on new vehicle design efforts. WHOI submitted a proposal for a replacement deep diving Human Occupied Vehicle (HOV) to NSF in March 2004. Funding was awarded in the summer 2004 for Phase One of the project. High-risk items will be addressed in the initial phase. Upon successful completion of Phase One the project would continue with vehicle construction. If all goes on schedule, the vehicle would be ready for service in 2008. There was a report on WHOI's development of a Hybrid ROV (HROV). The HROV timeline shows the system ready for service in 2007.

**Summary of Meeting Action Items:**

Debbie Kelley will appoint a DESSC Subcommittee to establish criteria for considering new assets for inclusion into the National Deep Submergence Facility. The Subcommittee will present their initial recommendations at the spring DESSC meeting.

**Appendices List:**

*Appendices*

I	<a href="#">Meeting Agenda</a>
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II	<a href="#">Participant List</a>
III	<a href="#">DESSC Chair Report</a>
IV	Principal Investigator Reports
a.	<a href="#">ALVIN PI Reports</a> (5.45 MB)
b.	<a href="#">Jason2/DSL120 PI Reports</a> (4.23 MB)
c.	<p><a href="#">Other Facility (Non-NDSF) PI Reports</a> (7.44 MB)</p> <ul style="list-style-type: none"> <li>• <a href="#">Ring of Fire (Embley) - Movie Clip #1</a> (8.79 MB)</li> <li>• <a href="#">Ring of Fire (Embley) - Movie Clip #2</a> (9.42 MB)</li> </ul>
V	Agency Reports
a.	<a href="#">NOAA Report</a> (3.9 MB)
b.	<a href="#">NOAA/HURL Report</a> (2.32 MB)
VI	<a href="#">NDSF Operator Reports</a> (8.5 MB)
VII	<a href="#">Rock Drill Report</a>
VIII	<a href="#">ABE Presentations</a>
IX	Other Deep Submergence Facility Reports
a.	<a href="#">SIO/MPL</a> (1.61 MB)
b.	<a href="#">COMRA</a> (1.55 MB)
X	Education and Outreach Reports

a.	<a href="#">R2K Lecture Series</a> (2.89 MB)
b.	<a href="#">MATE Report</a> (1.99 MB)
c.	<a href="#">REVEL Report</a>
XI	<a href="#">NDSF Vehicle Request Summary - 2004 &amp; 2005</a> (1.19 MB)
XII	<a href="#">NDSF Vehicle Requests - 2006 and Beyond</a>
XIII	<a href="#">HOV Project Status</a>
XIV	<a href="#">HROV Status Report</a> (2.69 MB)

## MEETING SUMMARY REPORT

**Introductory Remarks, Meeting Logistics, Introductions** - Patty Fryer, Deep Submergence Science Committee (DESSC) Chair, called the meeting to order at 0830 on Sunday, December 12, 2004. The meeting was held at the Ramada Plaza Hotel in San Francisco, CA. The agenda for the meeting is included as *Appendix I*. The items of the agenda are reported in the order addressed. The list of attendees is included as *Appendix II*.

Patty Fryer began by giving a report on the year in review. Her viewgraphs are included as *Appendix III*. Two DESSC meetings were held in 2004, one in Portland, OR in January and a spring meeting at Woods Hole Oceanographic Institution (WHOI). Alvin and the ROVs have had a busy year of operations. Plans for a Human Occupied Vehicle (HOV) to replace Alvin were announced at the Portland DESSC meeting. The design and construction effort will be carried out in two phases, progress will be evaluated at the end of phase one (final sphere design and fabrication) and phase two (final vehicle fabrication and testing) will proceed based on the review. Science programs could begin with the replacement HOV in mid-2008 if all stays on schedule. WHOI is also designing a new full-ocean depth capability with a hybrid ROV (HROV). Patty extended thanks to WHOI and the agency representatives for their dedication of time, talent, and resources to making these new assets a possibility. Patty also extended thanks to the UNOLS Office for their support of DESSC activities.

Lastly, Patty commented on DESSC membership changes. Five members are completing terms on the committee: P. Fryer (Chair, UH), R. Embley (PMEL), A-L. Reysenbach (PSU), W. Ryan (LDEO), and T. Shank (WHOI). Additionally, three ex-officio DEESC members are leaving: R. Pittenger, D. Fornari, and S. Pomponi. There were many well-qualified nominations for the committee positions. Remaining on the committee is D. Kelley (UW, incoming Chair), D. Mindell (MIT), M. Chaffey (MBARI), and H. Edmonds (UT). DESSC new members include (approved by the UNOLS Council, Oct. 14) J. Karson

(Duke), W. Chadwick (OSU), J. Reynolds (UAF), K. Scott (USF), and C. Young (UO). New ex-officio WHOI members include Bob Detrick (replacing RADM Pittenger), Maurice Tivey as NDSF Chief Scientist (replacing Dan Fornari) and Tim Shank. Chris German will become the NDSF Chief Scientist after January 2006.

**Principle Investigator (PI) Reports** - Deb Kelley moderated the next portion of the meeting a provided introductions of the PIs who used the NDSF and other deep submergence vehicles in 2004.

**Alvin PIs** –PI reports for Alvin cruises in 2004 are summarized below. All of the presentations are included in *Appendix IVa*.

Hans Schouten, Maurice Tivey, and Dan Fornari - January 28, 2004 to February 24, 2004 –Dan Fornari presented the report. The NSF-funded cruise was to survey the near-bottom character of the Central Anomaly High. Alvin was used for detailed bottom mapping and sampling. Towed camera night operations were carried out. The work area was at NEPR (9o 25' – 55'N). During the cruise they tried out the 1200 km light with success. Dan presented many images and bathymetry from the cruise. They did a lot of mosaicing. The Alvin Imagenex data was very detailed.

Bill Seyfried – January 28 to February 24, 2004 – Bill Seyfried presented the report. He participated in the Schouten cruise with four NSF-funded Alvin dives. His work was to conduct in-situ measurements of pH & dissolved H<sub>2</sub>, H<sub>2</sub>S in hydrothermal vent fluids and dispersed flow in biologic communities. They carried out time series deployments of chemical sensors. Placing the sensors was a complex ordeal. Bill showed images of what things look like after they were retrieved. They would like to have longer deployments to evaluate the biochemical effects at the site.

Karen Von Damm – March 15 to April 1, 2004 – Karen provided the report. The NSF funded cruise included 11 Alvin dives to carry out Pacific IntegRATED hydrothermAl Time-sERIES Studies (PIRATES1). Information about the cruise can be found at <<http://epr2004.sr.unh.edu/>>. The project title is “Temporal Variations in Hydrothermal Fluid Chemistry at 9-10/N East Pacific Rise: Elucidating Ties to Crustal and Biological Processes.” The overall goal of the project is to link cause and effect in the mid-ocean ridge hydrothermal systems, focusing on the composition of the vent fluids because vent fluids are the medium of energy transfer from the crust to the biological communities. Vent fluids are also sensitive indicators of changes on relatively short times scales (months) of conditions within the upper oceanic crust. The cruise accomplishments included:

1. Sampled all of the high temperature hydrothermal vents between 9/46.3'N - 9/50.8'N.
2. Sampled specific areas of diffuse flow
3. Collected co-coordinating chimney samples for geochemical and microbiological studies.
4. Collected preliminary data on fluid flow velocities.
5. Deployed Hobo recording temperature probes in high temperature vents.
6. Collected coordinating megafauna samples.
7. Nighttime program of off-axis coring for pore water work.

All 11 Alvin dives were successfully completed. The results show that vent fluids in the 9/50'N area remain extremely hot (389°C). Some of these vent fluids have extremely low chloride concentrations (<1/2 seawater) and vent fluids in the 9/46-47'N area continue to increase in chlorinity. The Fe concentrations in fluids from M vent dropped by 30% between Nov 2003 and Mar 2004.

Richard Lutz, Tim Shank, and Maya Tolstoy – April 6-30, 2004 – Tim Shank gave the report on the NSF-funded Pirates II Expedition at 9°50'N East Pacific Rise. The project was a multi-disciplinary collaborative effort integrating time series experiments at diffuse flow vents to examine the biotic and abiotic factors driving species succession in vent communities. The cruise included 16 Alvin dives and an OBS night program. They deployed 3 exclusion cage experiments to examine invertebrate re-colonization and succession in vent habitats. Mussel denuding effectively “resets” species succession to an earlier state such that communities emerging from denuded areas should resemble earlier succession stages. Tim’s slides describe the various field activities. They conducted downlooking photographic and high-resolution bathymetric surveys to generate full-length 3-dimensional “mosaic maps” of the transect area at 9°50'N. An In Situ Electrochemical Analyzer (ISEA) was used to measure dissolved chemical species. Photos of the ISEA were presented. The cruise also included Maya Tolstoy’s night program to recover previously deployed (9) OBS, then deploy (12) additional OBS for a one-year deployment. There was also an education program as part of the cruise. They conducted 5 SEAS (Student Experiments At Sea) experiments. Twelve teachers participated, reaching approximately 800 middle school and high school students.

Debbie Kelley, Kevin Brown, and David Hilton – May 23 to June 7, 2004 – Debbie reported on their NSF-funded cruise titled “Sulfide-Microbial Observatory Cruise” to Endeavour. Her component of the cruise consisted of six Alvin dives and accomplished the following:

- Recovered two incubators from Mothra after 1-year deployment. Both worked for entire duration with >600,000 temperatures measured on each instrument.
- Mapped a significant portion of Mothra at ~ 5 m resolution with Imagenex
- Follow-on geology dive established Mothra as the largest field on Endeavour > 600 m
- Reinstalled new incubator for follow-on experiment in same hole
- Supported Dive and Discovery outreach effort
- Cleaned up Main Endeavour Field
- Dedicated transponder recovery dive

The second component was to support Kevin Brown and David Hilton’s program. They had five dives to test chemical flow sensors; two dives at Endeavour and 2.5 dives at Nootka. There was one night dive by Pat Hickey to retrieve equipment. Debbie extended her thanks to the Alvin support group.

Tom Shirley, Amy Baco-Taylor, Peter Etnoyer, and Randy Keller - July 30 to August 23, 2004 - Randy Keller presented the report. This was a NOAA Ocean Exploration cruise to the Gulf of Alaska. It was a multidisciplinary program with 18 Alvin dives. An objective was to complete a multibeam survey of 5 seamounts. The Alvin dives were to collect volcanic rocks for microbial studies. CTD casts were

conducted to collect uncontaminated deep water. The Baco-Taylor component of the cruise was to survey the distribution and for collection of deep-water corals for taxonomy & genetics. Etnoyer's objectives were to do parallel video belt transects and deep-sea coral collections. Tom Shirley's work was to quantify the role of deep-sea corals as habitat for other organisms. Randy showed a map of the study area and bathymetry of one of the seamounts. He reported that Alvin bottom time was a problem. They had plans to cover as much bottom as possible. Most dives ended because of battery duration. His last slide showed the duration of each dive, most were less than 7 hours. It is a serious concern.

Janet Voight – August 28 to September 4, 2004 - Debbie Kelley presented Janet's slides. The cruise was an NSF funded program titled, "Invertebrates at Seafloor Deployments of Wood." The goals were to recover small deployments made in 2002 by the ROVs Jason and Tiburon at Endeavour, two Gorda Ridge sites, and a non-vent site. All deployments were recovered using Doppler Navigation; no transponders were used. This was 100% effective, despite the small deployments. One launch had to be delayed for two hours due to the balkiness of the towline motor. Once the problem was fixed, the dive time was extended and all goals were accomplished.

Karl Booksh and Katrina Edwards – November 5-26, 2004 - Marv Lilley gave a brief report on the cruise. There were 13 NSF-funded Alvin dives at NEPR. The Booksh component was for testing of chemical instruments (Raman Spectrometers, resistivity and hydrogen sensors) in hydrothermal fluids and collection of hydrothermal fluid samples. The Bach/Edwards component was for In-situ incubation studies of Fe and S oxidizing microorganisms on mineral surfaces. Incubators were installed on axis and off axis (up to 1 km) in the 9°28-9°50 area. They recovered a variety of samples including basalt glass, chimney sulfides, and hydrothermal sediments. Marv echoed the battery concern. They lost an hour of dive time due to batteries by the end of cruise. All in all, the cruise was a success.

Miriam Kastner – February 27 to March 7, 2004 - Miriam Kastner reported on her NSF-funded cruise to recover osmotic samplers from ODP CORK sites and redeploy osmotic samplers and download pressure data. This was in support of the program for long-term continuous monitoring of pressure, fluid chemistry, and hydrology in instrumented boreholes at the Costa Rica Subduction. The program included collaborations between SIO, MBARI, University of Victoria, and UAF. Miriam showed a slide of the work area. Osmo sampler installation sketches were presented along with data from sites 1255 and 1253. Her last chart shows the Costa Rica margin seafloor temperature measurements.

**Jason2 and DSL120A PI Reports** – The PI ROV presentations are included as *Appendix IVb*.

Rob Pockalny, James Natland, and Roger Larson – January 9 to February 16, 2004 – Rob provided a report on their Jason2/DSL120 cruise, "Deep Endeavors" on R/V Thompson in the southern east Pacific. The goal was to test models of crustal accretion. They conducted six days of DSL120 surveys with three deployments for a total of 98 hours survey time. There was 16 days of Jason2 time with eight deployments for a total of 283 hours of bottom time. Sampling included 192 rock samples and five push cores. There were two elevator lowerings. Rob's presentation includes images and bathymetry maps. Rob reported that there were bow thrusters overheating problems on R/V Thompson at speeds less than 1 kts. The cause may have been because UW was still working out the "kinks" with their new Dynamic

Positioning system, or the thrusters are underpowered for this type of work/weather conditions. Rob suggested some system improvements:

- Real-time mosaicing for DSL120 very good
- Jason spare parts are needed
- First-time users should get some experience
- Improved navigation flags are needed (confidence limits?)
- Laser spacers
- Improved lighting/strobes for high-def camera

Fernando Martinez – April 6 – May 9, 2004 – Fernando reported on his NSF-funded Kilo Moana cruise using DSL120 in the Eastern Lau Spreading Center. This was a collaborative research project for “Investigating the Interrelationships between Crustal Structure, Volcanism, and Hydrothermal Activity Along the Back-Arc Eastern Lau Spreading Center (ELSC).” The objectives included:

- Obtain a nested-resolution mapping of the entire ELSC to examine the tectonic structure and volcanism along axis.
- Carry out a continuous survey of hydrothermal activity along the entire ridge.
- These data are to be used to identify sites for more focused surveys by subsequent cruises and eventually determine the focus area for this ISS

Fernando showed a map of the research area. His slides show the nested sidescan sonar surveys using DSL120A and the Simrad EM120.

Jennifer Reynolds – July 10 to August 16, 2004 – Jennifer reported on the NURP-funded Jason2 program in the Gulf of Alaska on Reville. A map showing the work area was presented. There were two components of the cruise: 1) To study distribution of deep-sea corals and associated communities in the Aleutian Islands, and 2) to study primitive plutonism in an island arc. Participation included representatives from National Fish and Wildlife Service and Alaska Dept of Fish & Game. Thirteen dives were conducted with average dive duration of 18.71 hours and 13.96 hours average bottom time. Collections included 467 bio samples and 119 rock samples. The coral studies were very successful. The only problem was a major winch failure during a dive. It was repaired and all went well.

Tony Rathburn – July 10 to August 16, 2004 - Elena Perez provided the report for Tony Rathburn. The project titled, “Unimak Expedition: Mapping, Sampling, and Exploration of the Seafloor Offshore Unimak Island, Alaska” was a NURP-funded Jason2 and tow cam cruise on Reville. During the cruise they discovered a new methane seep and possible new deep-sea seep community associations. They created the first detailed multibeam map of the area and discovered new deep-sea coral habitats. They were the first to characterize the relationships between seafloor geology, geochemistry and the mosaic of biological communities in the region. Jason2 is a powerful, versatile and reliable system; however, on the negative side, the Jason2 camera & video system provides only low-resolution images. The still camera (higher resolution) did not work, and had limited capability. The low-resolution images cannot be used for publication. This long-standing problem of low priority for high-resolution images must be solved. They need high resolution, digital video and still cameras that can zoom and tilt to produce useable

images. Secondly, the ROV on-deck turn-around time of 8 hours (for a series of short dives) was not made known ahead of time. Advertised turn-around of a few hours presumes a series of long dives for pilot rest.

Randy Keller – July 10 to August 16, 2004 – Randy reported on his component of the Revelle cruise with Tony Rathburn cruise. They created the first multibeam map of a seamount (Derickson Seamount) in the Great Magnetic Bight. The seamount and surrounding seafloor are being faulted by the bending of the Pacific Plate entering the trench. Randy showed a slide of the location of the Derickson seamount along with its multibeam map. Of their four days of ship time, Three days were spent in the water.

Rob Reves-Sohn and Susan Humphris – October 25 to November 9, 2004 - Debbie Kelley provided a summary of Rob Reve-Sohn and Susan Humphris cruise titled, “Seismicity and Fluid Flow of the TAG Hydrothermal Mound - Leg 4.” Jason2 was used from support ship, R/V Knorr. Accomplishments of the cruise included:

- Temperature probe recovery (19 of 21 deployed)
- Tide gauge recovery
- High-temperature fluid samples
- Shrimp and crab samples
- SM2000 microbathymetry survey
- Water column hydro plume survey
- Chimney geological samples
- Push core samples
- Instrument testing (plume detection laser and sonar)
- Valley footwall visual survey and gabbro sampling

They felt that this was an excellent cruise and exceeded their planned objectives. They credited the NDSF operators for their support. A couple suggestions were made. The thrusters on Medea would have roughly doubled their working efficiency on-station. Additionally, upgrading the resolution of video cameras (to digital still resolution) would have improved their ability to work on-station and post-process imagery.

Maurice Tivey – November 14 to December 17, 2004 - Dan Fornari reported on Maurice’s cruise, “Magnetic and Structural Studies of a Lower Crustal Exposure of Ocean Lithosphere: Kane Megamullion, Mid-Atlantic Ridge 23°30’N,” which was underway aboard R/V Knorr at the time of this meeting. They plan to carry out eight Jason2 dives at four sites, including one test dive. They also plan to carry out eight ABE dives and 28 dredges. The objective of the cruise is to investigate three basic questions about the structure and evolution of slow-spreading ocean crust and at the same time to obtain site-survey data for a proposed ODP program. Maurice’s slides show the Jason2, ABE and dredge locations. A sample of ABE’s CHIRP subbottom profile was presented.

**Other Facility PI Reports** – The PI presentations are included as *Appendix IVc*.



Control Vehicle (CV) – Debbie Kelley presented the slides provided by Fred Spiess on the MPL Control Vehicle. The vehicle specifications are provided in the slides. CV was used to replace seafloor transponders and conduct precision vertical deformation surveys for seafloor geodetic studies offshore Lima Peru in December 2003, and on the submerged south flank of Kilauea volcano in August/September 2004.

ABE – Mike Jakuba presented a summary of ABE operations in 2004. There were three operations. The first cruise was carried out at Juan de Fuca Ridge in support of a Russ McDuff's program. Eight dives were made at the Mothra Vent field. The second cruise was at Lau Basin in support of Charlie Langmuir's program to find and map new vent sites. ABE was deployed from Kilo Moana and conducted surveys at six sites. Mike showed the trackline using a three-phase nested survey approach. The vehicle was flown only a few meters off the ocean bottom. The third ABE cruise is in support of Maurice Tivey's program on Knorr.

Bill Chadwick – NeMO 2004 overview – Bill reported on the work conducted using ROPOS in 2004. There was one ROPOS dive at Endeavour for the University of Washington. There were also five ROPOS dives in seven days at the Axial site. Operations included turning around the NeMO Net (Buoy, RAS, BPR), fluid sampling at high- and low-temperature vents, and repeated pressure transects to monitor volcanic inflation.

Before continuing, Debbie Kelley thanked the NOAA group for retrieving their equipment after it was stranded on the seafloor.

Hawaii Undersea Research Program (HURL) Operations – Jody Webster provided the report for Donald Potts. In 2001, there was a Melville cruise to the Hunan Gulf for operations to obtain high Resolution bathymetric images (using SeaBeam and DSL120) of the drowned coral platforms and to provide detailed images of the pinnacles, platforms, and any platform cross-cutting erosional features. They used Jason to sample the reef complexes in each drowned platform, both along and across the platform, to estimate depths of the platform tops relative to sea level for each coral assemblage and to collect samples. There have also been operations to study Hawaii's drowned coral reefs. Pisces, Makalii, and ROV Tiburon were used in these operations. The research provides new evidence for rapid sea-level rise. Lastly, Jody reviewed objectives for 2005 and 2006, which include research at the windward reefs and possibly future work in NWHI.

Submarine Ring of Fire – Bob Embley – Bob reported on his Submarine Ring of Fire 2004 cruise on R/V Thomas G. Thompson with ROPOS on March 27 to April 17, 2004. The operations were for exploratory interdisciplinary investigations of active hydrothermal and volcanic processes of Mariana Arc submarine volcanoes. Support was provided by NOAA Office of Ocean Exploration, the Natural Sciences & Engineering Research Council of Canada, and the Pacific Marine Environmental Laboratory/VENTS Program. The work included 14 dives at seven volcanoes. During the cruise, they were able to capture an eruption in progress. Bob showed two movie clips. The first showed a plume and they were able to sample the sulfides. The second movie clip was taken at 1600 meters showing liquid Co<sub>2</sub> bubbles. They were able to sample these. The bubbles stick onto the ROV and tend to eat into the plastic. The Biology

was extraordinary. Bob commented that it was an extraordinary set of dives.

NEPTUNE - John Delaney – John reported on the various activities in support of the NEPTUNE observatory effort. Keck has funded work by UW, MBARI, University of Oregon, SIO, and PGC. John presented a map showing where various work has been conducted or is planned. This included EM300 mapping and installation of pressure sensors, seismic array, fluid/microbial sampling/in situ sensors, and a buoy-acoustic modem observatory. He showed a detailed map of the Endeavour Proto Neptune Observatory. At Endeavour, the first seafloor seismic observatory has been installed and consists of seven short-period seismometers, all of which have worked. In the 2003 to 2004 period over 10,000 earthquakes have been reported. At the Nootka site, a WHOI buoy is deployed with real-time transmission.

## Mid Morning Break

### Agency and UNOLS Reports

National Science Foundation (NSF) - Dolly Dieter provided the report for NSF. The Agency has taken a budget cut of 1% to 2 % for 2005. It will be the decision of the Director as to what should be cut. The ship schedulers will have a very difficult job adjusting their schedules to meet the budget reductions.

Dolly reported on facility renewal efforts. NSF has funded the upgrade of Jason to Jason2. They are approaching the third year of funding for the Hybrid ROV (HROV) development effort. NOAA is very involved with this as well. The Navy is also providing support for this effort in the area of tether technology. Lastly NSF and NOAA have provided funding for an Alvin Replacement effort. WHOI submitted a proposal for a replacement human occupied vehicle (HOV). NSF is funding this entirely and it will be conducted with a two-phase approach. Phase II will only proceed if Phase I (sphere fabrication) is successful. A Replacement HOV advisory committee has been formed to oversee the effort. Information about the project is available on the UNOLS website at [http://www.unols.org/committees/dessc/replacement\\_HOV/replacement\\_hov.html](http://www.unols.org/committees/dessc/replacement_HOV/replacement_hov.html). Community input is encouraged.

National Oceanic and Atmospheric Administration (NOAA) - Barbara Moore provided the report for NOAA and explained that there are two deep submergence programs within NOAA, the National Undersea Research Program (NURP) and the Office of Ocean Exploration (OE). Her slides are included as *Appendix Va*. NURP consists of six regional NURP Centers and the National Institute of Undersea Science and Technology. They fund peer-reviewed research targeted at the research needs of NOAA's resource managers. They provide scientists with advanced underwater technologies (HOVs, ROVs, AUVs, mixed gas diving and technical diving) and the required operational support. The Ocean Exploration program defines exploration as discovery through disciplined diverse observations and the recording of findings, as opposed to observations to test a specific hypothesis. They fund internal and external projects focused on gaining a broad perspective of the Nation's underwater resources by conducting experiments and expeditions to unknown or poorly known areas.

NOAA, Navy, and NSF fund the National Deep Submergence Facility through a Memorandum of Understanding (MOU). Barbara showed a chart indicating the NOAA funding levels for ALVIN from 1998 to 2005. The funding peaked in 2002 with support at \$2.01M. 2005 support is projected at \$1.1M.

In 2004, NOAA conducted two projects in the Gulf of Alaska and Aleutian Islands using NDSF facilities. These totaled 17 Alvin dives and 43 Jason days. NOAA proposed projects with the NDSF vehicles in 2005 include work in the Galapagos for vent studies with 10 Alvin dives. There is also five Alvin dives proposed off the East Coast of the U.S. to study deep-sea coral ecosystems. Other NOAA deep submergence projects in 2005 include Pisces dives at American Samoa, New Zealand for vents and deep corals studies. Hercules dives are also planned in the Gulf of Mexico and Atlantic to study deep coral ecosystems.

A NOAA Ocean Exploration ship has been acquired. The priority capabilities for the ship include mapping, science class ROV, and broadband transmission optical data. The ship was transferred from the Navy on 9/11/04. They are currently developing the requirements document and plan to begin the shipyard work in September 2005 with operations slated to begin in September 2007. The OE 2005 proposal decisions are planned for late December 2004 to early January 2005.

**NOAA/HURL** - John Smith continued the NOAA report by reporting on HURL activities (*Appendix Vb*). Keith Crook retired and John is serving as the acting Science Director.

The 2003 accomplishments included:

- 64-day expedition to the NWHI
- Featured on Discovery Channel & History Channel
- Continuation of projects in the Main Hawaiian Islands
- Record number of dives (84 Pisces, 67 ROV)
- HURL and collaborative PI research on Essential Fish Habitat in the NWHI & MHI gaining recognition and funding

2004 projects included 51 Pisces dives and 24 ROV dives in the main Hawaiian Islands including studies of deep-water benthic algae, deep-water precious corals, mesopelagic boundary layer structure, glacial sea level lowstand, and temporal evolution of Loihi hydrothermal system since the 1996 seismic event.

Pisces IV and Pisces V have a 2000-meter depth capable. They are continually upgrading the science and operational gear. The goal is to make them as identical as possible with a complete set of spares.

A SeaBeam 210 system has been installed on the RV KoK. It is a 12 kHz deep-water multibeam sonar with 16 beams and no sidescan backscatter. It is a hybrid system, one of a kind.

The 2005 HURL Expedition to American Samoa includes 50 panel-approved dives for eight PI's from eight different institutions. Approximately 20 plus dives are planned pending final funding approval.

HURL Goals for the near future include:

- Continue HURL's expansion of impact and presence into the Pacific with extended expeditions ~every other year
- Seek additional funding for collaborative projects with NURP dives (both US and foreign)
- Explore making the HURL facilities more of a national asset shared between the NURP centers and any others
- Upgrade capability of submersibles, ROV, multibeam, crew, and ship as funds allow
- Pursue the establishment of a pool of additional NSF/OCE funds for non-NDSF vehicles as recommended by the 2004 NRC/NAS future of deep submergence report (up to 10% of NDSF budget)
- Provide the ability to host and operate a new Jason2 type ROV at a second location of geographic relevance, also as recommended by the same report

UNOLS Report – Mike Prince reported on UNOLS activities. The agencies through the Federal Oceanographic Facilities Committee (FOFC) are developing an update to the 2001 long-range fleet plan. Efforts are moving forward to implement the plan. NSF is moving forward with Regional Class ship acquisition. They have asked for UNOLS input in prioritization of the Regional Class Science Mission Requirements. NSF is partnering with NAVSEA to develop Regional Class performance specifications. By next year NSF and NAVSEA will have contracted with two design/build teams to develop ship designs. The first Regional Class vessel could be constructed by 2008, with an additional ship every two years for a total of three ships.

Ocean Class ship acquisition plans are also in progress. NSF has taken the lead with acquisition of the Alaska Region Research Vessel (ARRV). The ARRV construction has been approved for the Major Research Equipment (MRE) account for support in FY06 [NOTE- this date has slipped]. The detail design of the ARRV is near completion. The ship is slated to come on line in 2008/2009.

There are four additional new Ocean Class vessels in the FOFC plan. RADM Cohen, CNR, announced at UNOLS Annual meeting that the Navy would support construction of the Ocean Class ships. He is a proponent of the X-Craft hull design, a high-speed catamaran. It would accommodate multiple vans and have a helicopter capability. The CNR wants UNOLS to carefully consider this platform. This design will be evaluated in comparison to the SWATH and monohull. ONR has asked UNOLS to recommend a hull form by February 2005.

NSF is replacing the Ewing with a modern seismic vessel. An oversight committee has been formed to advise on the conversion effort. There are plans from LDEO to designate the seismic ship as a National Facility. In turn, there would be a UNOLS standing committee formed to provide oversight, similar to the DESSC. The new ship will be named after Marcus Langseth. Marcia McNutt will chair the subcommittee to form a new standing committee and draft their terms of reference.

The current Global Class vessels are reaching the age at which mid life refits are normally carried out. UNOLS has formed a committee to begin updating the SMRs for the Global ships. The SMRs will be useful as operators consider the items to include in their mid-life periods.

Ship scheduling has been a difficult process. In 2004, ship utilization was an all time high. In 2005, at the request of the agencies, large ships will be limited to schedules of no more than 280 days. The down time should be spent in homeport.

The Arctic Icebreaker Coordinating Committee (AICC) has been addressing two major issues. The MOA between NSF and the US Coast Guard is under review and how future science operations will be supported on the Healy is a concern. The other area of concern is with Polar Sea and Polar Star. The Polar Sea has been condemned for at least two years for engine repairs. Polar Star is the only asset available to support the Deep Freeze operations. Estimated costs to support the refits of the Polar Class ships are very high.

At the fall Annual Meeting Bob Knox completed his service on the Council. Peter Wiebe was elected to serve as the new UNOLS Chair and Marcia McNutt was elected to the chair-elect position.

In closing, Mike encouraged everyone to visit the UNOLS Booth #333 at the AGU Conference.

**National Facility Operators Report** - Bob Detrick (WHOI) opened the National Facility Operator's report. Slides for the report are contained in *Appendix VI*. He first addressed the various NDSF personnel changes that took place over the last year:

- Bob Detrick replaced Dick Pittenger as WHOI's Vice President for Marine Facilities and Operations.
- Liz Caporelli replaced Jon Alberts as Marine Operations Coordinator.
- Dan Fornari stepped down as Chief Scientist of Deep Submergence; now Director of WHOI's Deep Ocean Exploration Institute.

NDSF Chief Scientist –WHOI formed a search committee and the position was nationally advertised in Spring 2004. Candidate interviews took place in summer 2004. Maurice Tivey was offered and accepted Chief Scientist position through the end of 2005. Chris German will assume the Chief Scientist position in 2006.

NDSF Vehicle Operations Summary - Rick Chandler provided a summary of the NDSF vehicle operations. The year 2004 marked Alvin's 40th year of operation with over 4,000 dives. The vehicle has spent more than 27,000 hours in the water. In the first eleven months of 2004, Alvin has had 213 operating days for nine science cruises with 102 dives. The average dive time has been 7.5 hours with 4.7 hours average bottom time per dive. The average dive depth has been 2,473 meters. Two dives were lost this year due to mechanical problems and weather. The current operations group includes three pilots and six technicians. There are plans to bring on new pilots in 2005. The annual budget for Alvin is \$2.4M

Dudley Foster commented on the Alvin battery problems that were identified earlier in the meeting. Alvin uses lead acid batteries. There are three batteries and at any given time the third battery undergoes recharging. Normally this is phased so that one is new and one is half way through its charge. During the

Gulf of Alaska cruise two batteries were in need of recharging. The batteries were recharged for Marv Lilley's cruise and they are not sure why they lost power. In 2005 the batteries should all be re-celled.

Rick showed a pie diagram that broke down the various disciplines of Alvin 2005 dives. The greatest number of dives were in support of Geology and Geochemistry research. All 2004 dives were in the Pacific, including the Gulf of Alaska.

There were five UNOLS vessels used in support of NDSF 2004 operations:

- R/V Atlantis (8 Alvin legs)
- R/V Knorr (2 Jason II legs)
- R/V Revelle (2 Jason II legs)
- R/V Thompson (Jason II, DSL-120 leg)
- R/V Kilo Moana (DSL-120 leg)

Next Rick reviewed 2004 ROV operations. There were 193 ROV operating days in support of seven science cruises. Operations were carried out from 32S to 53N. There were 46 vehicle lowerings (39 Jason2, 7 DSL-120a) with 1,224 hours on the bottom. Highlights included the longest Jason2 lowering to date with 71 hours on the bottom. The first combined Jason/ABE operations were carried out. The annual ROV budget is \$3.3M.

Andy Bowen reviewed tethered vehicle activities in 2004. Improvements and upgrades included:

- Replacement control vans (planning underway for swap 12/05)
- Designing new shop area (Blake Lab renovations)
- New Medea
- Surface location beacon (GPS/Iridium)
- SM2000/DSL120a test/evaluation
- Science pan & tilt (with camera)
- First use of slack-tensioner
- Homer probes
- New corers
- Fall WHOI dock trial/maintenance period
- Auto altitude (DVL or Simrad altimeter as input)
- Initial evaluation of Jason to Medea navigation
- New DVD duplication station

Support ship issues were discussed. The dynamic positioning (DP) systems on the support ships are a major concern. There is variability in DP operations from vessel to vessel with possible problems with ship propulsion systems. This is a concern and should be strongly considered in new ship design efforts. DP is essential for ROV operations. Problems may also be associated to a lack of consistent crew training/experience in use of the DP systems. Other issues include:

- Operators moving cruises without discussing ramifications on ROV ops
- Lack of consistency among ship operators with respect to mob/demob and shipboard crew/tech expectations; billing procedures; definition of an in-port day
- Security for vessels in port. Everyone needs to keep up on this.
- U.S. Customs require original signed 4455 Certification of Registration; (URL for the form on the WHOI web site below) <[http://www.whoi.edu/marine/ndsf/cruise\\_planning/forms/intl\\_ship\\_summ.pdf](http://www.whoi.edu/marine/ndsf/cruise_planning/forms/intl_ship_summ.pdf)>

Discussion – A few questions and comments were made regarding the NDSF vehicles.

- Dan Fornari commented that imaging has been an area of concern and they are investigating possible improvements.
- Peter Rona asked if the endurance of Jason2 has gone down as compared to Jason. Andy replied that the endurance reflects how the vehicles have been used. The endurance capability hasn't been reduced.
- Marc Chaffey asked if there are any plans to upgrade the HDTV. Andy replied that there are no plans in the immediate future.

**DESSC Lunch Meeting:** A meeting was held during the lunch break and included members of DESSC, agency representatives, and the NDSF operator. Introductions were made and participants included:

- 1) Bill Chadwick (DESSC)
- 2) Marc Chaffee (DESSC)
- 3) Annette DeSilva (UNOLS)
- 4) Bob Detrick (WHOI)
- 5) Dolly Dieter (NSF)
- 6) Hedy Edmonds (DESSC)
- 7) Dan Fornari (WHOI)
- 8) Patty Fryer (DESSC)
- 9) Jeff Karson (DESSC)
- 10) Debbie Kelley (DESSC)
- 11) David Mindell (DESSC)
- 12) Barbara Moore (NOAA)
- 13) Mike Reeve (NSF)
- 14) Jennifer Reynolds (DESSC)
- 15) Tim Shank (WHOI)
- 16) Craig Young (DESSC)

The meeting discussion focused on the process for bringing new assets into the National Facility. Dan Fornari began by stating that WHOI has expressed an interest to include ABE as an asset in the National Facility. WHOI is looking for guidance on how this vehicle should be considered for inclusion. Open discussion followed:

- Deb Kelley – DESSC should consider if this is an asset that should be made available to the community.

Should there be a call for proposals for new assets?

- Marc Chaffey and Dave Mindell commented that ABE is a very capable AUV and is unique in its capabilities.
- Marc Chaffey – There would need to be a learning period for the community to become familiar with the vehicle. Once the capabilities become understood, interest in using the vehicle would be better known.
- ABE is deployed on cruises with a 3-person support team. In order for the vehicle to be adequately maintained and ready for service, there needs to be some assurances of funding. If DESSC were supportive of including ABE in the facility, WHOI would write a proposal for support of the transition of the vehicle into the Facility.
- Bob Detrick – ABE is at the state in its maturity where it is appropriate to consider it for the facility.
- David Mindell – ABE has been operated as a research tool. It probably cannot be turned over to the facility immediately and would require transition support. He questioned WHOI's plans for their new AUV under development, Sentry. This system is not yet mature.
- Dan Fornari indicated that WHOI has given a lot of thought about requesting that ABE be brought into the NDFS. They think that now is the right time for the transition.
- The question was asked about why should an AUV be considered. Instead, why not bring in the hybrid ROV. Dan replied that ABE is supporting important science and is available to the community. He doesn't see the need to wait two years for the HROV to come on line.
- Bill Chadwick asked what would be the benefit of the having ABE in the facility. How would it be different from how it is currently made available? Dan Fornari replied that it doesn't have to be a part of the facility for community use.
- David Mindell commented that ABE has never gone to sea without Dana Yoerger. A facility should not require a support from a PhD in order to operate.
- Mike Reeve stated that bringing ABE and other facilities into the NDSF has come up several times. The broad topic must be addressed and it is a DESSC responsibility. Mike requested that DESSC advise the agencies on the process for considering new assets into the National facility.
- Patty Fryer indicated that she feels ABE fit all of the third party tools criteria.
- Deb Kelley commented that there appears to be a need for ABE. It is a matter of how to make it accessible to the community.



- Tim Shank asked if ABE could fall into the category of shared use equipment. Mike Reeve indicated that this is a good point.
- Hedy Edmonds brought up the point that there are other operations that would like to have their assets be included as National facilities.
- Annette DeSilva commented that this is a broader issue that impacts more than just the deep submergence community. Bringing another asset into the Facility without new money for support spreads existing funds for all facilities thinner. DESSC's recommendations regarding new assets for inclusion in the National Facility would be need to be brought before the UNOLS Council.

As a first step DESSC agreed to establish a criteria for considering the addition of assets to the National Facility. Debbie Kelley indicated that she would form a subcommittee to draft the criteria. Mike Reeve stated that only non-WHOI people should be on the subcommittee. Debbie will call for volunteers.

## **End DESSC Lunch Meeting**

## **Resume Community DESSC Meeting:**

## **National Facility Operators Report (Continued)**

Archive Update – Dan Fornari provided an update on the NDSF archiving. He discussed the frame grabber capability for Alvin, Jason2, and WHOI Ships and showed examples of the system. The Frame-Grabber imaging system provides Web access to video imagery co-registered with vehicle navigation and attitude data for shipboard analysis, planning deep-submergence research cruises, and review of data following research expeditions. As of October 2004, there are more than 256,000 images available for viewing from 200 dives. Dan provided the URLs for the Frame-grabber for Alvin and Jason2 and WHOI Ships. The Main Entry Point URL is:

<[http://www.whoi.edu/home/research/data\\_center.html](http://www.whoi.edu/home/research/data_center.html)>. The Entry Point URLs for Alvin, Ships and Jason2 is:

<[http://4dgeo.whoi.edu/alvin/FG\\_cruises.html](http://4dgeo.whoi.edu/alvin/FG_cruises.html)>

<[http://4dgeo.whoi.edu/shipdata/SDG\\_shipdata.html](http://4dgeo.whoi.edu/shipdata/SDG_shipdata.html)>

<[http://www.whoi.edu/marops/vehicles/jason/van\\_cruises.html](http://www.whoi.edu/marops/vehicles/jason/van_cruises.html) >

Dan provided a summary of income from NDSF vehicle imagery/data and WHOI outreach. There have been about 350 requests for visual material in 2004. The requestors include the National Academies, National Science Foundation, Office of Naval Research and NOAA, John Wiley and Son Publishers, Grolier, McGraw Hill, Dorling Kindersley Publishing in the United Kingdom, Geo Magazine, and Popular Mechanics magazine in South Africa. WHOI has also provided materials for many exhibits and special presentations at locations such as the American Museum of Natural History in New York City, Museum of Science in Boston, The Ocean Institute in Dana Point, CA, the Hull Museum in London, and

museums in Austria and Germany. They have also responded to dozens of educators around the country sharing information with their classrooms. The total 2004 income received to date is \$27,898. It takes approximately 1/2 FTE at WHOI to deal with NDSF imagery issues.

Status of internal WHOI Access to the Sea Task Force (as related to NDSF) - Bob Detrick presented the Task Force recommendations. An internal WHOI Task Force was charged with developing a vision for the types of ships, vehicles, and ocean observing systems that will be required over the next 10-15 years. There were four working groups on Ships and Ship Operations; Vehicles and NDSF; Ocean Observatories and Observing Systems; and Scientific Data Management. They completed their report in July 2004. The Recommendations include:

- DESSC, UNOLS and the funding agencies need to consider how NDSF will evolve over the next 5-10 years in light of the increasing numbers of tethered and autonomous vehicles in the community and the expected increase in demand for deep submergence assets by ocean observatories.
- Future vehicle needs include new HOV; HROV/AUV; ALVIN rescue vehicle; and observatory-capable ROV, AUV.
- NDSF needs to establish data protocols and procedures to insure the quality of data collected by NDSF vehicles, and develop the proper tools to process, archive and serve these data to potential users.
- NDSF needs to more closely integrate the Alvin and ROV operations groups to emphasize the common elements shared by all vehicles.
- NDSF management and DESSC continue to work together to identify ways of obtaining candid feedback from users of NDSF vehicles.

### **Upgrades to the National Deep Submergence Facility (WHOI-DSF Personnel)**

Annual request for upgrades to science sensors and operational capabilities of NDSF vehicles – Tim Shank provided a summary of his community survey regarding biology system and sensor upgrades that was conducted earlier in the year. The survey was posted on March 12, 2004. Over a period of two months, 37 individuals responded (Macro-ecology = 28, Microbiology = 4, Bio-instrumentation/engineers = 2, Geology & Geophysics = 3). Tim presented the results from the biologists only. A sampling of these results are provided below:

Vehicles used by survey participants:

- 73% used HOVs in the past 2 years (1% never)
- 63% used ROVs in the past 2 years (7% never)
- 41% used Towed Vehicles in the past 2 years (38% never)
- 24% used AUVs in the past 2 years (67% never)

The survey asked which tools and samplers were used most often and their importance for future research:

- 74% - Vacuum Samplers (70% very important)
- 63% - Manipulator Claw (61% very important)

- 59% - Sediment push cores (36% very important)
- 56% - Bioboxes (54% very important)
- 56% - Nets and Scoops (28% very important)
- 40% - Water chem/in situ sensors (57% very important)
- 37% - Quantitative faunal samplers (30% very important)

The survey asked which tools and samplers were the highest priority for Alvin and for Jason2. Tim presented these results. For both Alvin and Jason2 the water chemical/in situ sensors ranked as the highest priority. Tim summarized the comments regarding vacuum samplers, biobox collection boxes, and imaging systems:

#### Vacuum Samplers:

- 60% of respondents have used one in the past three years
- Only 22% satisfied with current samplers available with Alvin
- Optimal size chamber is 2 liters (37%)
- Eight to as many as possible chambers desired (56%)
- Chambers must be free of contamination, thermally insulated, removable,
- Adjustable for size (50%)

#### Biobox Collection Boxes:

- 63% of respondents have used one in the past 3 years
- 55% are not satisfied with currently available boxes
- Boxes must free of contamination (61%), thermally insulated (58%)
- Compartmentalized (58%)
- Adjustable for size (56%)
- Provided by the NDSF (73%)
- 55% of biologist use boxes not provided by themselves
- Good sealing mechanisms, Clear lids, Easy to drain are priorities

#### Imaging Systems (Alvin/Jason2)

- Important to current research 85% / 92%
- Importance to upgrade 78% / 78%
- Satisfied with overall quality 49% / 35%
- Camera configuration 57% / 60%
  - Camera resolution 71% / 67%
  - Lighting intensity 57% / 60%
- Importance to quantify 75% / 87%

Imaging system upgrade suggestions included:

- Jason2: “Computer decoded holography; 3D diffractive elements instead of lenses; High-res digital still on Jason2, Record the zoom and angle of the cameras,
- Alvin: Record all Alvin channels, access to High Definition, better resolution pan and tilt on Alvin, Move the Alvin 3-chip off the arm”

### Biological Mapping:

- Prior use of the vehicle to map: 56% for Alvin, 25% for Jason2
- Importance to navigation resolution upgrade: 91%
- Importance of image resolution upgrade: 95%

Comments regarding mapping included: “Doppler navigation has been a great help with Alvin.” Upgrade suggestions included, “The most important thing for biologists in mapping...is that the images be geo-referenced...funding should be put into continued navigation improvements” and “Make high-accuracy navigation standard rather than a costly option.”

The survey included an open forum section. *Appendix VI* includes selected quotes. Tim encouraged the community to take the survey <<http://www.surveymonkey.com/s.asp/u=99909386548>>. Tim will post the results on the web.

Suction Samplers – Andy Bowen reported on the new DSG multi-chamber “Slurp” suction sampler. A graphic of the active sample carousel is included in his slides. They were funded for the design of a new Jason2 slurp system. The system is being made so that it will be compatible with both Jason2 and Alvin. The system included an insulated carousel. They hope to have ready in time for the Lau Basin cruise.

Doppler and Gyro – Andy continued with a list of Doppler and gyro upgrade plans. These include:

- New spare 300 kHz DVL for use with DSL120 or Jason2.
- New spare 1200 kHz DVL for use with Alvin.
- New spare Ixsea Octans FOG for use with DSL120 or Jason2.
- Funds are available for purchase of a spare Ixsea Octans FOG for Alvin.

Near-Bottom High resolution Sonar – Andy listed the sonar upgrade plans:

- Alvin:
  - o Imagenix model 881, 675 kHz for profiling
  - o Sunwest SS300 CTFM for OA
- Jason2:
  - o Imagenix 855 675 kHz for profiling
  - o Imagenix 855 675 kHz for OA
- Shared Use (Jason2/DSL120a):
  - o Simrad SM2000 multibeam

Navigation – Louis Whitcomb reported on the status of the NDSF navigation systems. He provided a list of current navigation sensors and their capabilities along with planned future navigation sensors. They are

moving toward uniform navigation data products for all NDSF vehicles. Louis reviewed what's new in 2004 navigation systems, their development status and provided examples. Full descriptions are provided in his slides. They included:

- Doppler Post Processing and Renavigation
- High-Altitude Doppler Navigation
- ADCP Profiling
- Scanning Sonar Bathymetric Processing
- Micro-Modem LBL Evaluation
- High Frequency LBL Evaluation
- Inertial Navigation: Objective is to provide 100% navigation coverage on-bottom and in the mid-water.
- Long-Baseline Acoustic Navigation (LBL) Improvements
- Synchronized LBL Networks to Support Multiple Vehicle
- Combined Acoustic Navigation and Communication with acoustic Modems
- Real-Time 3-D Visualization of Navigation and Scientific Data

Louis showed a composite bathymetric map of the EPR Bio-9 Area (9 50'N, 104 17.5'W). The composite bathymetry map is not a traditional use for Alvin and the community should consider if this should be a standard capability. All agree that the data should be as good as possible so that years from now when you look at it, it would be valid.

R/V Atlantis Improvements Plans - Liz Caporelli reviewed the R/V Atlantis maintenance plans and improvements for the December 2004 to January 2005 period in San Diego. These include installation of a High Seas Net antenna and the beginning of the test period of the system. They will begin the first phase of the lab HVAC system upgrade with installation of variable speed fan control in the main lab. They will complete repairs to # 1 Generator and will overhaul the # 2 large propulsion diesel engine.

Issues to be addressed on R/V Atlantis in 2005 include:

- Plan Bow Thruster overhaul for dry-dock period early 2006
- Continue with upgrades to LAB HVAC System
- Continue to modify lab drains
- Continue program to renew weather-tight doors
- Modify the radar platforms to minimize mast interference per Revelle's design

### **Third Party Tools:**

**Rock Drill** – Patty Fryer introduced the topic of a rock drill for ROV use. Her slides are included as *Appendix VII*. She first gave a brief history of how the drill has been used in the past to support research. Monterey Bay Aquarium Research Institute (MBARI) owns the drill and has used it with their ROVs. The MBARI rock drill was used recently in 2004 to support operations at Endeavour. Patty provided some of the comments from drill users. It is a proven useful tool. It seems like the appropriate time to bring it up for discussion and consider it as a third party tool.

Patty reviewed the costs associated with acquiring a drill. NSF has made an initial investment of approximately \$100K to support the MBARI drill. The cost for conversion so that the drill could be used on Jason2 was approximately \$80K. MBARI would want some level of reimbursement for their cost of the drill. A new drill is estimated to cost approximately \$500K. MBARI desires to transfer the drill to the community. Leasing the drill from MBARI is not compatible with MBARI's engineering needs. The costs of the transfer remain at issue.

The issues that would need to be addressed in order to move forward with the transfer include:

- Cost (to be worked out between funding agencies and MBARI)
- Horizontal versus vertical drilling configuration - Is the current configuration adequate (horizontal)?
- Accessibility and transferability
- The drill is currently useful for large ROVs (Jason2, Tiburon, and possibly ROPOS). The replacement HOV design could consider accommodations for the drill.

Patty reviewed the drill operation and maintenance requirements. Mobilization and demobilization is estimated at five workdays. Aboard ship, the pre-use prep time is approximately eight hours depending on the intended use. Upon recovery, about 12 hours are required for cleaning/greasing. There is also considerable time and cost requirements for shore side inspections, modifications as needed for special use, and any major modification to accommodate new capabilities.

Patty reviewed the pros and cons of adding the drill to the NDSF. The advantages include having the infrastructure and experienced personnel support. The disadvantages are that it would place increased demand on personnel time and costs to the facility. If the drill were to be transferred to an individual operator and used as a third party tool, the operator would need expertise/experience in its operation, support personnel, and liaison with the user community and operators of ROVs/subs

Patty Fryer opened the floor to discussion and asked the meeting participants their thoughts on whether the drill should be a community tool:

- Chuck Fisher – Can the costs be reduced by coming up with better ways for maintenance? Marc Chaffey replied that much of the maintenance expenses apply to post-cruise cleaning efforts. More expensive specialized parts that are more easily cleaned and maintained might reduce costs.
- Patty Fryer asked for a raise of hands for those in favor of a community drill. It appeared that there were more people with hands up.
- David Mindell indicated that it is difficult for the community to come up with a recommendation without a clear picture of the cost. Additional cost information would be useful.
- Jennifer Reynolds – The community should identify the characteristics that are needed in a new drill and then estimate its cost. This is needed for a real cost analysis.

- John Delaney – We should think about the whole spectrum of tools that may be desired, like a chain saw. We should see how the drill fits with the overall picture of desired equipment.
- Mike Perfit posed the question of what if the drill went away tomorrow. How would the people who need a drill be served? If a drill is needed now, one should be acquired. Thought should also be given to standardized drills that could be applicable for new vehicles.
- Dan Walsh commented that industry has drills and corers that are commercially available.
- Dolly Dieter - Drilling and coring equipment has been a complex issue. Everyone seems to want something different. What are the priorities? Will this drill meet the needs for the next five years? This year there have been at least five proposals for drills. DESSC really needs to set priorities.
- Patty Fryer commented that the general feeling among DESSC members was that the cost for the MBARI drill seemed relatively low for the capability. We need to think about whether this capability should be offered to the community. Should this opportunity be taken?
- Barrie Walden asked if MBARI wanted to transfer their drill? Steve Etchemende replied that yes they want to transfer it. It puts high demand on their personnel. Sometimes they lose the personnel for long cruises when they are only needed for only a few days of the cruise for drilling operations. If it were folded into the NDSF, the support personnel would already be at sea.

Patty Fryer asked for a show of hands to indicate that having this type of drill capability for the next three years important. A show of hands indicated that there is interest. Patty said that the details of how to acquire this capability are an issue that should be considered by the agencies, MBARI, and NDSF operator.

**ABE** – Dan Fornari provided a summary of WHOI’s Autonomous Underwater Vehicles, ABE and Sentry and an approach towards providing routine access. His slides are included as *Appendix VIII*. ABE has carried out 144 dives in 12 cruises since 1994. It has surveyed 2267.8 km with 1275.2 hours of bottom time. A variety of ABE-based research has been reported in science literature including journal articles, engineering publications, EOS articles, and AGU abstracts.

ABE/Sentry capabilities include:

Endurance: 15-30 hrs (depending on payload and terrain)

Speed: 1.5 kts (3 kts Sentry)

Navigation: LBL referenced to GPS augmented with DVL, PHINS-INS (Sentry)

Standard Sensors: Two 3-axis flux gate magnetometers, Scanning sonar, multibeam, CTD, Optical backscatter, Digital Still camera, Optional sensors, eH (redox potential), One 3 axis current meter, Sub-bottom profiler, I/O Flexibility for user-supplied sensors.

Dan explained why WHOI feels that ABE/Sentry merits becoming a Facility. The vehicle offers state-of-

the-art mapping products and vehicle technology developed over a decade of at-sea operations. Trained, experienced people support the system. There are well-established data pipelines, documentation and technical expertise in providing users with products. Including the system in the Facility would offer synergism in technology and manpower with all the other NDSF assets. They have shown that AUV data acquisition can be applied to many different oceanographic problems.

Dan explained that a different mode of operation is needed to sustain future AUV operations for science. With the present "project-based" mode of ABE operation, there are no funds available for general maintenance/shore-side support of ABE/Sentry. With no base support, the development of new sensors and capabilities for ABE/Sentry may be hampered.

A facility structure for support of ABE/Sentry could increase deep submergence community access to AUV technology and promote synergy between complementary vehicle operations. It would provide general maintenance/shore-side support for ABE/Sentry. It would also facilitate development of an ABE/Sentry operational group by providing more continuity of funding and facilitate the development of new sensors and capabilities for ABE/Sentry. Lastly it would remove ABE/Sentry operational costs from science proposals, streamlining the proposal process.

DESSC is being asked to consider whether ABE/Sentry should be operated as a facility. If ABE/Sentry is operated as a facility, should it become part of the NDSF or operated as a facility outside of the NDSF?

Debbie Kelley reported that the DESSC met during the lunch break to discuss this issue. As a first step they will form a subcommittee to develop the criteria for considering new assets for inclusion into the NDSF.

## **Break**

**Operational Summary and Collaborations with Other Deep Submergence Activities** - Facility Operators were invited to provide written reports prior to the meeting or bring literature about their facilities to the meeting. Two electronic reports were submitted and are included as appendices.

The Scripps Institution of Oceanography (SIO)/MPL facility report is included as *Appendix IXa*. It provides information about their deep submergence work vehicles including the Control Vehicle and ATV. Operations in 2004 are included in the report.

China Ocean Mineral Resources R & D Association (COMRA's) facility report is included as *Appendix IXb*. It provides information about recent scientific programs and technology developments. They are a governmental organization that coordinates the activities of deep-sea bed exploration and exploitation in China. COMRA has two vessels at sea this year in the Pacific conducting exploration work. The total length of the two cruises will be about 450 days. Their assets include AUVs and an ROV. The ROV just completed construction and is at sea trials. They are constructing a 7,000m HOV and it will be ready for sea trials in 2006.



## **Outreach, Education and Archeology**

Archeology - David Mindell very briefly reported that Ocean Exploration would constrain their archeology operations to only the US EEZ areas.

RIDGE Lectureship Program - Dan Fornari reported that there have been a total of eight Distinguished Lecturer programs in the last two years. It has been a very successful program. Details are provided in *Appendix Xa*. Lecturers have included:

- Charlie Langmuir
- Andy Fisher
- Meg Tivey
- Cindy Van Dover
- Ed Baker
- Melanie Holland
- Debbie Kelley
- Ken Macdonald

In other RIDGE news, Donna Blackman will be the next R2K chair.

MATE Program – Jill Zande provided an update on the Marine Advanced Technology Education (MATE) program. Her slides are included as *Appendix Xb*. Since 1999, MATE has placed 123 students on research vessels, in labs, and in industry settings as part of their intern program. 53 interns received job offers in marine technology fields as a result of their participation in the internship program. Gavin Eppard, who participated in several MATE internships in 2000 and 2001 will soon be an Alvin pilot and mechanical engineer at WHOI.

MATE ROV competitions began through a partnership with the MTS ROV Committee. They include regional and National events. To date the competitions have involved more than 1,000 students, working in teams. The 2005 competition will take place in Florida.

**REVEL** - Debbie Kelley reviewed the Research and Education: Volcanoes, Exploration and Life (REVEL) program activities. Viewgraphs are included as *Appendix Xc*. The program is facilitated by the University of Washington and supported in part by NSF. REVEL 2004 included seven new REVELers plus one sea-going Mentor. The K-12 teachers came from New Jersey; New York; Washington DC; West Virginia; Washington; and Wyoming. The REVEL 2004 program included a research cruise on R/V Atlantis with Dr. R.E. McDuff as Chief Scientist and the Sea Breeze project science party. The cruise included ABE operations and CTD studies of buoyant plumes. The work area was the Juan de Fuca Ridge, Endeavour. Eight school districts throughout the US participated.

Applications for REVEL 2005 program will be available in January 2005. The operations will include an R/V Thompson and ROV Jason2 cruise planned for September 2005. Science partnership includes work

with Debbie Kelley and John Delaney.

Mike Prince encouraged everyone to let the UNOLS Office know of an education programs that take place on UNOLS ships. The office will provide a link from the UNOLS web page.

**Deep Submergence Scheduling: 2005 and Beyond** – Liz Caporelli reviewed the 2004 NDSF operating areas, the 2005 NDSF scheduled work and vehicle requests for 2006. Her slides are included as *Appendix XI*. In 2004 all Alvin work was in the Pacific for a total of 291 operating days (247 NSF days and 44 NOAA days). 2004 ROV work areas included the Western Pacific, South Pacific, Hawaii, Gulf of Alaska and Atlantic. Four different support ships were used for a total of 193 operating days (143 NSF days and 50 NOAA days).

2005 Alvin operating areas include the Pito Deep, South Pacific, East Pacific Rise, Costa Rico, Juan de Fuca, and New England Seamounts for a total of 280 days. Alvin will return to WHOI at the end of the year to begin its overhaul. 2005 ROV work areas include the Pito Deep, Western Pacific, South Pacific, JdF, and Galapagos Rift. Three different support ships are planned for a total of 238 operating days (204 NSF days, 17 NOAA days, and 17 State).

NDSF requests for 2006 show 131 funded and 142 pending Alvin days plus 128 funded and 194 pending ROV days. This is a lot of Alvin requests, given that the vehicle will only be available for a portion of the year.

Annette DeSilva continued the report by showing the geographic distribution of the 2006 NDSF requests. See *Appendix XII*. The funded Alvin work is in the traditional Pacific locations. The funded ROV days are in the Pacific including operations in the Western Pacific, Hawaii, California Coast, and JdF. There are also funded requests for 2007. Alvin 2007 funded days include work at the Northern East Pacific Rise, JdF, and Atlantic and ROV funded days include work off Hawaii and at JdF.

**Replacement Alvin Update** - Bob Brown provided the replacement HOV project status. His slides are included as *Appendix XIII*. In 2004 WHOI submitted a proposal for a replacement HOV to NSF. The proposal was peer reviewed and Phase I was funded in August. In July 2004 a Replacement HOV Oversight Committee (RHOC) was established and held their first meeting. Karen Von Damm is the chair of the RHOC. The RHOC includes representatives from the science community, submersible vehicle operators, submersible industry, and the U.S. Navy - Naval Sea Systems Command (NAVSEA). Their charge is to obtain community input and advice, provide advice on design and budget priorities, and provide reports to NSF.

Public information about the project is available on the UNOLS web page at [http://www.unols.org/committees/dessc/new\\_HOV/replacement\\_hov.html](http://www.unols.org/committees/dessc/new_HOV/replacement_hov.html). The site includes video clips, vehicle specifications, project timeline, various background documents, press releases, a photo gallery, and provisions for on-line comments and feedback.

The project has been broken into two phases. Phase One includes design and forging of the personnel sphere, feasibility testing for a prospective energy system, and qualification testing for syntactic buoyancy foam. Phase I allows WHOI to start the project by investigating the high-risk items first. The funding that has been provided will get them through this phase. Provided Phase One is successful, the project will move to Phase Two. Phase Two includes completion of the personnel sphere and design and fabrication of the remaining vehicle.

Bob showed the project timeline. According to the schedule, Alvin would end operations in early 2008. Then there would be a short period for Alvin pilot training and familiarity. The replacement HOV would be available for science operations in mid 2008.

**HROV Status Report** - Andy Bowen provided the Hybrid ROV (HROV) project update. He introduced Louis Whitcomb and Barbara Fletcher who are also working on the project. His viewgraphs are included as *Appendix XIV*. The HROV is designed for an 11,000 m depth capability. Andy reviewed the project milestones. The 11KM Floatation development is complete and the workspace design tools are in place. Electric Manipulator development is underway. A prototype LED lighting array has been built and tested. The microfiber tether development progress includes pressure testing of candidates, modeling, and initial field tests. Conceptual vehicle development is underway.

An advisory panel of deep submergence scientists has been established. Their role is to:

- Review and advise on Science Mission Requirements (e.g. capabilities, sensors)
- Provide input regarding established project priorities as they relate to identified risks.
- Assist in planning and advocate for science use during initial missions.
- Recommend public outreach and education opportunities.

The HROV basic design philosophy is to build on previous experience when possible. They will try to identify risks and address them early in the project. They plan to integrate the system into ongoing NDSF operational and WHOI technology developments. Efforts will be made to limit operational team support to four people and minimize the weight/power requirements to keep core system to a single 20 foot ISO shipping container.

Science Mission Requirements include:

- Push coring
- Heat-flow probe (1 to 1.5 M long)
- Hi/Lo temperature probes
- Geotechnical/Geochemical
- Rock sampling/drilling
- Flexible science sensor payload interface
- Biological sampling (grabs/boxes)
- Water Sampling (hot/cold)
- Water column sensing (e.g. methane)
- High resolution bathymetry

Andy reviewed the manipulative capabilities, scientific sensors, proposed scientific interface, and video equipment summary. Details are provided in *Appendix XIV*. Information, status, and pictures of the manufacturing of the ceramic housing were provided. Fiber tether design progress was reported. Two candidate fibers have been identified and are commercially available. They were pressure tested to 17,000 psi in August 2004. Candidate fibers were tested successfully in a 2000m deployment in San Clemente Canyon in November 2004. Images from the microfiber testing were displayed. The HROV lighting requirements include a strobe capability, low power consumption, pressure tolerance, and uniform illumination field. The LEDs have been chosen.

Project goals for CY05 include:

- Complete conceptual development of both vehicle configurations leading to detailed structural design
- Complete manipulator design and have both hardware and software components in test
- Complete fabrication and test of main and auxiliary pressure housings
- Make final choices on propulsion and have fabrication underway
- Purchase of vendor supplied components
- Further tests of microfiber (deep elevator and shallow AUV).

### **Long-Range Planning Issues:**

**Ocean Observatory Facility Needs and UNOLS Fleet Utilization Projections** - John Delaney provided a slide showing the UNOLS fleet utilization projections for 2000 to 2020. The projections indicate that by 2010 there will not be enough ships to support current ship demand. The ocean observatory facility needs are projected to place even greater demand on the fleet. John asked the question of how is the community going to deal with this situation. Observatories are going to fundamentally change the way we do science. He believes that UNOLS, ORION, and NSF need to address the facility issue.

Mike Prince replied that the ORION Office is working to refine their facility needs. They are considering the initial recommendations from the Chave report. They will try to address the science needs as well. The FIC is updating their Fleet Improvement Plan (last update in 1995). The FIC will try to integrate the ORION recommendations. This will likely indicate an increase in ship needs above the FOFC long-range fleet plan. There will be opportunity for community input.

**Other business** – In 2005, the DESSC Meeting will not be held in conjunction with the Fall AGU meeting. Instead, the DESSC meeting will be held at the 2006 Ocean Sciences Meeting, AGU/ASLO in February 2006 in Honolulu, HI

**The DESSC meeting adjourned at 1700.**