

Meeting Minutes
UNOLS DEep Submergence Science Committee (DESSC)
Annual Community Meeting
Marriott Marquis, Golden Gate Salon A
55 Fourth Street, San Francisco, CA
Sunday, December 12, 2010

Executive Summary:

The Deep Submergence Science Committee (DESSC) met on December 12, 2010 at the Marriott Marquis in San Francisco, CA. The meeting was chaired by Peter Girguis. Federal agency representatives provided budget information as well as agency priorities. A variety of reports were made by the National Deep Submergence Facility (NDSF) operator summarizing facility operations, planned activities, and system upgrades. Principal Investigators who used submergence vehicles in 2010 provided cruise highlights and assessments. The afternoon session focused on the status of the *Alvin* Upgrade project, plans for a new *Jason* Launch and Recovery System, and NDSF vehicle imaging.

Meeting Presentations

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Meeting Summary Report:

Introductory Remarks, Meeting Logistics, and Introductions – Peter Girguis, Deep Submergence Science Committee (DESSC) Chair, called the meeting to order at 0830 on Sunday, December 12, 2010. The meeting was held at the Marriott Marquis in San Francisco, CA. The agenda for the meeting is included as *Appendix I*. The list of attendees is included as *Appendix II*.

Peter provided a summary of DESSC activities from the past year and future plans. In 2010, the AUV *ABE* was lost at sea and flaws in *Alvin*'s hull were discovered. During the repair period, *Jason* filled in and supported some of *Alvin*'s cruises. On the positive side, *Sentry* came on line and is now part of the NDSF. Additionally, the *Alvin* Upgrade project successfully completed its Final Design Review.

Pete reported that four DESSC members have terms that are ending. The outgoing members include Bill Chadwick, Deb Kelley, Jeff Karson, and Craig Young. New members who are replacing the outgoing members are Vicki Ferrini, Mandy Joye, Evan Solomon, and John Wiltshire.

Because *ABE* was accidentally lost at sea, DESSC had to rigorously debate the entry of *Sentry* into NDSF. DESSC drafted a document with their recommendation.

Over the past year, DESSC has addressed the question on "How do we better credit members of the community for their deep submergence imaging products?" Pete and Chris German have been working on a model that would allow credit and attribution to be easily assigned. The issue of copyright is more complex.

Another issue that was discussed at the Spring DESSC meeting was the decline in demand of ship time. There are far fewer new investigators. We need to think about how to get more people involved. We need to encourage the broader community to use the vessels – access.

Pete reported that with the support of NSF, we have organized an NDSF booth hopefully to gather new users. Pete encouraged the meeting participants to visit the booth. There will be a once in a lifetime raffle of an *Alvin* viewport.

Agency Reports:

National Science Foundations (NSF) - Brian Midson provided the NSF report. The new NSF OCE Division Director is David Conover. He is coming from SUNY and his research expertise is in Fisheries Biology. NSF has advertised the position for a new ship operations manager. This would be a replacement for Linda Goad.

NSF intends to construct three Regional Class Research Vessels (RCRVs). Letters of intent to construct and operate the vessels have been requested. NSF expects to post the solicitation for operators in January 2011.

NSF is now on a Continuing Resolution (CR) and there is the potential for a year-long CR.

The *Alvin* Upgrade project is moving forward with good progress. There is a good partnership with the Navy and NAVSEA for continued certification of the new vehicle. The plan would be to have a dual certification with both ABS and Navy certification. The new commitment from the Navy for certification will take time to implement.

National Oceanic and Atmospheric Administration (NOAA) – No report. A NOAA rep was unavailable for the meeting.

Navy - Tim Schnoor provided the report. Although Navy doesn't support much deep submergence research that uses the NDSF assets, the Navy owns *Alvin* and the support ships. The Navy is building two new Ocean Class Research Vessels (OCRVs).

UNOLS Announcements - Annette DeSilva provided the UNOLS report. Her slides are included as *Appendix III*.

It has been a busy and challenging year for the ship operators. In addition to the regular scheduled operations, there were 3 major event response efforts: Chilean earthquake, Haiti Earthquake, and BP Oil Spill in the Gulf of Mexico

In response to the Gulf of Mexico Oil Spill 274 days of UNOLS Ship Days were scheduled on six ships. This required major adjustments in schedules. \$277K in instrumentation/Additional Technician Support was required. In addition to the ships, deep submergence assets were also used, *Nereus* and *Alvin*. Jon Alberts, UNOLS Ex Secretary has been maintaining steady communications with BP regarding the future use of UNOLS vessels for this initiative.

Last year the UNOLS Council established two Goals: 1) Strengthen the Relationship between UNOLS and the Antarctic Research Programs and 2) Greening the Fleet.

In October a New UNOLS Standing Committee, the Ocean Observing Science Committee (OOSC) was formed. The committee will be modeled after the DESSC committee and is charged with providing advice from a science user perspective on plans, access, and use of NSF funded observatories.

In terms of fleet operations in 2011, the projected ship time is low. This year the demand for ship time has declined substantially to an all time low. To better understand the situation, UNOLS plans to conduct an on-line survey.

Recognizing the need to better inform the broader community about UNOLS and the academic fleet, the UNOLS Council established as a 2010/2011 Goal to "Explore Options for Establishment of a UNOLS Speaker Series." The speaker series would highlight UNOLS ships and oceanographic research.

Some of the UNOLS outreach initiatives include:

- Proposed Chief Scientist Training Workshop.
- UNOLS 101 Slide Presentation – This is on the UNOLS website. It can be used as a class lecture for general oceanography course
- Volunteer Opportunities Webpage – This is a web site where students and others can volunteer to participate on a cruise.
- UNOLS Traveling Poster

National Facility Operators Report (WHOI):

NDSF Announcements - Rob Munier provided the WHOI/NDSF announcements. His slides are included as *Appendix IV*. The slides include information about:

- Personnel changes

- Vehicle Operation statistics
- NDSF Highlights:
 - Robust utilization of NDSF assets
 - Formal acceptance of *Sentry* into NDSF
 - *Alvin/Sentry* and *Jason/Sentry* in combination
 - Mid-water use of *Sentry*
 - Rapid response to emerging events
 - Vehicle upgrades and enhancements
 - Successful FDR for RHOV
- NDSF Lowlights:
 - Loss of ABE
 - Pressure housing failures on *Sentry* and *Jason*
 - Loss of *Alvin* cruise due to NAVSEA inspection issues
 - Certain performance issues
- NDSF Issues and Actions

The issues of NDSF accreditation and copyright were discussed.

Rob explained that there is a need for standard accreditation when NDSF imagery is used for public outreach. As a solution they propose:

- Chief scientist to designate institutions and PIs for accreditation
- List to be incorporated on cruise metadata form
- NDSF will provide accreditation data along with imagery in response to outreach request

Accreditation data will be maintained on a cruise by cruise a basis and there will be no impact on the copyright policy. As for the copyright policy, WHOI archives and retains copyright of all imagery data.

Discussion:

- John Delaney – He applauds the approach, but there is so much data that is coming in. How can they assess the quality of data in a quick way? Rob – Focus will be on getting the data to the science groups. John – quality is crucial.
- Copyright policy – OOI has a different set of policies. They have an open data policy. WHOI retains the data. From here on in, OOI will hold the copyright, but WHOI will hold the data.
- John Sinton – Why is data collected with public funds copyrighted at all? Rob – he thinks that if there is a small fee to be made for archiving. Andy Bowen – He doesn't know the legal framework, but he thinks that WHOI is being consistent with it. John Delaney - The ocean observing, rule is that data will be available to all immediately. The data isn't useful unless it is archived, this takes money. WHOI cannot charge unless they have copyright. It is good to have the data in a central repository.
- Pete Girguis – The copyright establishes ownership and allows the use of intellectual property. Commercial entities are leery about using non-copyrighted data because of the ownership issues.
- John Delaney –You need to have a control even for open source data. The need for copyright is important if you want some control over the data's use.

- John Delaney – We need to consult with lawyers on this. For OOI there is the need to have real-time data flowing. If we try to control that, it raises a different problem. We need to work with the right groups. NSF needs to take some role in this.
- Pete Girguis – We will talk about this further at DESSC. He would really like to hear from the community and Chris German on this topic.

Break

Summary of Upgrades to NDSF vehicles - Andy Bowen provided a summary of the vehicle upgrades. His slides are included as *Appendix V*.

Alvin Upgrades include:

- Integration of USBL
- Personnel - All ALOPS personnel now qualified as pilots and there are exchanges with Jason ops
- Initial integration of new NDSF HD cameras
- New SeaKing forward-looking sonar
- Basket swap between dives
- New Doppler spare (600 KHz)

Jason Upgrades include:

- New Schilling T4 manipulator
- Designed and built cruise-specific gear for science users
- Integrated HD and file-based recording system, improved on HD control system
- First use of Reson multi-beam and associated processing pipeline into Jason system
- Video telemetry upgrade
- Successful use of rock drill

Sentry upgrades include:

- New Equipment added
- Two short-notice mobilizations in support of Deepwater Horizon disaster via NSF-Rapid
- Demonstrated effective mid-water survey
- Google-Earth interface for photo and bathymetry interpretation
- Collaborative survey and joint operations with both Alvin and Jason
- Control system refinements including better bottom-following and logging of vehicle state data
- Acomms command interface development

Deep Submergence Scheduling: 2011 and Beyond - Eric Benway provided the report. His slides are included as *Appendix VI*.

In 2011 *Alvin* will be out of service for the upgrade period. There are 165 *Jason* days. There are gaps between cruises, but these are for shipping. *Sentry* has 95 days.

For 2012 there are 77 funded and 272 days pending for *Alvin/Jason* requests. This includes HOV sea trials and the science verification cruise (60 days).

Eric provided a 2013 and beyond projection (see slides). There is potentially 63 days for OOI.

NDSF 2010 Vehicle Operations Summary – Rick Chandler provided a review of the NDSF 2010 operations. His slides are included as *Appendix XIa*.

For *Alvin*, 5 cruises were completed with 73 dives. One cruise is underway, 6 dives. Eight dives were lost to weather at Juan de Fuca and in the Gulf of Mexico. One dive was lost to mechanical problem. Highlights include:

- HD imaging equipment installed
- USBL continues to improve
- Final dives before upgrade

For *Jason*, six cruises were completed with 64 lowerings. Highlights included:

- Successfully completed Cowen cruise on short notice; major sensor integrations, multiple simultaneous elevator operations, bore hole data collections
- Demonstrated ability to deploy and recover heavy packages via *Medea* drop and via wire
- Navigated by USBL to within one meter of a target
- Drill sled operations and change over completed at sea with no down time
- Located signs of oil damage from DWH oil spill on sea floor in GOM
- Worked in high current conditions in the Gulf Stream

For *Sentry*, four cruises were completed with 41 dives. One cruise is underway, 6 dives. Highlights included:

- Extensive bathymetric mapping on the Galapagos Rift
- Responded in ~10 days to support Camilli cruise, Gulf of Mexico
- Entered NDSF in July
- Multiple vehicle operations with *Jason* (OOI cruise) and Cherokee ROV (Haakon Mosby Mud Volcano)
- Water column oceanographic surveys (DWH plume dispersion, bubble plumes on Hydrate Ridge, CH₄ flux from HMMV)
- Second short-notice mobilization to support Fisher et al. RAPID project to GoM (*Alvin* & *Sentry*)

PI Reports: Principle Investigators (PIs) who used the NDSF vehicles were invited to provide brief summaries of their science cruises.

Alvin PI reports are included as *Appendix VII*. The following individuals provided reports:

John Sinton (*Alvin* and *Sentry*):

- They had 26 *Alvin* dives planned. The *Alvin* team responded very well
- The *Alvin* team was wonderful. They were delighted to not just sit on the bottom.
- 300 rock samples and covered a lot of tracks
- *Sentry* provided a nice bottom map. Galapagos spreading center.
- They used *Sentry* as a night program. There was one major glitch, but they took care of it in an extremely quick manner.
- It was extremely useful to have a *Sentry* map before an *Alvin* dive. Great to have a *Sentry* overlay on the Nav.
- There are a number of talks this week that use this data.

- *Alvin* didn't miss a day. It took a lot of coordination. Capt Colburn was very helpful. Can't remember when they had a better cruise. Bruce did a great job.
- Navigation was the best he ever had – still could be better.
- Discussion
 - Peter Rona – What was the instrument used on *Sentry*? Sinton – Reson for Nav. There were bugs early on, but it was getting better.
 - Jeff Karson – what nav systems were used? Sinton - Transponder net. *Alvin* was USBL. They kept *Sentry* near the ship.
 - Mike Perfit – What kind of resolution were you getting? Sinton- 2 meters, but there was 1-meter grid as well.

Maurice Tivey – presented by Andy Bowen.

- This was a CORK optical communication project.
- See the slides with images of the optical communicator on *Alvin* and on the ODP guide cone (also on the CTD).

Marv Lilley and Ray Lee – Pete Girguis provided the report. No slides.

- It was an eventful expedition.
- Lost many dives due to weather
- One scientist was injured and had to be returned to shore.
- It was the first cruise after the *Alvin* inspection, and had no problems.
- Ray and Pete are looking at creatures. They had some in situ samplers that were lost.
- They did some work at Axial.
- Dove at middle valley – microbiological – qualitatively has changed a lot.
- Complements to the *Alvin* group. – they are very helpful in running their equipment
- All in all went well and did fantastic job. – Don't lose this.

Mandy Joye – Pete gave the presentation. Her cruise reflections are in the slides. She referred to the *Alvin* team as the “Dream Team.”

Jason PI Reports are included as *Appendix VIII*. The following individuals provided reports. Refer to their slides for details:

Bill Chadwick on *Kilo Moana*.

- Their work area was NW Rota north of Guam.
- The lowlight was the CTD winch failed, the ship lost power, and there were bow thruster problems.
- The highlights:
- Bottom mapping between 2010 and 2009 shows the landslide.
- There are two species of shrimp that were studied – The landslide had very dramatic difference in their response. One multiplied and the other declined.
- There were a lot of eruptions at the site. Bill showed a video.

Jim Cowen – Tina Lin presented.

- Tina discussed all of the changes that were required to move from *Alvin* to *Jason* on very short notice. All of the electronic interfaces had to be changed.
- They lost 4 days, but the *Jason/Alvin* crew on board made a huge and innovative effort

- They had a lot of accomplishments.

David Butterfield – *Thompson/Jason*

- At the rate of growth of the caldera, it could possibly erupt again before 2016
- HD video of the sampling was presented.

John Delaney reported on the Enlighten cruise.

- Almost 50% of the cruise time they had *Jason* and *Sentry* operating at the same time.
- They worked at the Hydrate ridge
- A Terabyte of data was collected. There were valiant efforts by the ship to manage the data.
- If you can access the Enlighten10 web page, you can stream the data right to your computer.
- There is a video of them loading out the ship for the cruise. The 4 minutes represent 4 days of staging. John encouraged everyone to view the video.
- *Sentry* coverage was shown.
- They have still images of the entire field.
- 21 students participated in the cruise from UW, ASU, OSU, and UK.
- Dana Yoerger was a real treasure.

Lunch Break

NDSF Cruise Experiences through the Eyes of New/Young Investigators - Pete Girguis explained that it is a goal of DESSC to engage new users. We want to hear from new NDSF users. We want to learn the reasons early career scientists may be hesitant to request NDSF vehicles. Pete collected feedback from early career scientists, Melitza Crespo-Median (*Appendix IX*) and Rick Peterson (*Appendix X*). He summarized their feedback – see appendices.

Pete encouraged the meeting participants to encourage their students to participate in the DeSSC annual meeting. He would like to hear from the early career scientists on how we can improve things. Send your comments along.

Discussion:

- Mike Perfit – How do you get new PIs involved. Maybe hold a special meeting that has a high profile. Encourage them to share their thoughts. It would cost money.
- Mike Prince – The Chief Scientist Training Workshop run by Clare Reimers is a very good model of how to engage early career scientists.
- Mike Perfit – A lecture series is a good idea.
- Pete Girguis will try to have the next DESSC phone meeting focus on this.
- Deb Kelley – There are very few grad students at the DESSC meeting. We have to bring the students to this venue.
- Brian Midson – What would it take to get the students here? Everyone – Money.
- Brian – Next year’s meeting will be right on the cusp of rolling out the upgraded *Alvin*. We need to bring in the people who will use the vehicles in the future. Mike Perfit – If students are provided with some travel support funds for the meeting, they might attend.
- Students need to know the importance of the DESSC meeting.

NDSF Vehicle Debrief Interviews – DeSSC conducted debrief interviews with the 2010 NDSF vehicle users. The slides summarizing the debrief details is included as *Appendix XIb*.

Sentry debriefs were conducted by Jeff Karson. Recommendations from these debriefs included:

- WHOI Mgt needs to consider “best effort” for both expeditionary science but also contract work (e.g., OOI)
- Pre-cruise preparation needs to be uniform
- Improve uniformity of navigation for all teams and communicate calibration needs to PI’s
- Recommendations for operational limitations (e.g. sea state) for specific classes of vessels
- Issues with CTD & EdgeTech side-scan need resolution
- Data transmission rate for large-volume data sets needs improvement

Jason debriefs were conducted by Bill Chadwick. The strength of the Jason team is engineering and they continue to improve it. Some of the chronic issues include:

- Communication between NDSF on-shore and at-sea teams (preparation, documentation)
- Better training for renav, multibeam, mosaicing
- Communication in the control van between pilots and the science team
- Data flow to science team during a cruise is sometimes problematic

The *Jason* users appreciated vehicle improvements including:

- HD frame-grabber is very good and can replace Jason DSC camera (but more realtime feedback would be valuable)
- Capability to record HD video to hard disk
- Good vehicle reliability, in general
- Virtual Van now available as stand-alone DVD
- Increased vehicle payload
- Increased flexibility with dive schedules & turn-around times

Alvin debriefs were conducted by Mike Tryon. All the PIs were very satisfied with their Alvin experience and felt that their scientific goals were all met or exceeded. The Alvin team was universally praised for its professionalism. Specific issues are detailed in Mike’s slides.

Andy Bowen provided the WHOI response to the debrief comments. Details of the WHOI response are included in *Appendix XIb*.

Status Report on the *Alvin* Upgrade Project:

Introduction - Brian Midson, NSF, reported that the *Alvin* Upgrade Project underwent its Final Design Review (FDR) in September 2010. The FDR panel has recommended that the project move forward. This allows NSF to provide the final funds to WHOI to support the project. However, the FDR panel identified a few things that WHOI must do including pursuing a dual Navy/ABS certification. This removes the risk of transferring ownership of *Alvin* to NSF. Instead the *Alvin* MOA will be modified to indicate NSF as the sponsor as well as ONR. The other recommendation of the panel was to focus on the final objective of a 6500 m depth capability.

Outcomes of Community Consultation that Informed Final Design (Ergonomics, Imaging)

- Susan Humphris, WHOI, continued the *Alvin* Upgrade report. Susan is the PI on the project. Her slides are included as *Appendix XII*. In January the disassembly of *Alvin* will begin as well as the integration of the new submersible components. The sphere construction is 90% complete.

In Stage 1 of the project *Alvin* is upgraded and the depth rating remains at 4500 m. In Stage 2, the vehicle is upgraded with a 6500 m capability. Matrices of the features that are accomplished in Stage 1 and Stage 2 are in the slides.

WHOI conducted an Ergonomics survey. There were 111 responses. The users wanted to have the most comfort when on the bottom. They didn't care about privacy. A sphere mockup has been fabricated at WHOI.

Susan discussed imaging and illumination. The goal is to double the illumination level of the current *Alvin* lighting. WHOI also conducted an imagery storage media survey. The results are in the slides. Susan encouraged everyone to continue to provide input.

Kurt Uetz continued the presentation. The *Alvin* upgrade vehicle will have a reach double the current vehicle. *Alvin* arrives in January 2011 for disassembly. Sea trials are slated for April 2012 and science verification in May 2012.

Break

Proposed Plans for a new *Jason* Launch and Recovery System - Development of a new Launch and Recovery System (LARS) for *Jason* is underway by WHOI. Matt Heintz provided the new system description and capabilities, status of development of new system, and timeline for completion. Matt's slides are included as *Appendix XIII*. Sketches of the system are included in the slides.

Discussion:

- Jennifer Reynolds – What are the sea state conditions for the new LARS? Matt – It is much safer and should allow higher sea states - Perhaps a 1 sea state increase.
- Jennifer Reynolds – Would this change the turn-around times? Matt – This is one of the biggest drivers for a new LARS.
- Annette – What is the smallest size ship that can handle the new LARS? Matt – The new Ocean Class would probably be the smallest size vessels.
- Mike Tryon – What is the support team size? Matt – The size of the handling team goes down, but you still need a lot of people. You would not reduce the *Jason* team size because of the need for data support. Data has been the growing monster in terms of the team size.
- Pete Girguis – How practical would it be to remove the bottom part of the tele-leg? Matt – This is something that they could consider.
- Matt – He envisions laying cable with *Medea*. If he introduces a new motion compensated crane (the old *Jason* crane), it could be used for the cable laying.

NDSF Vehicle Imaging – Status Report and Future Plans - Jon Howland provided the report. His slides are included as *Appendix XIV*. He covered:

- The Project History
- Recent Experience

- Current Status
- Recording Formats & Deliverables for 2011

NDSF's recommendation is to use the AIVL system for hybrid motion/still HDTV capabilities. The prototype was used on multiple *Alvin* and *Jason* expeditions. At Spring 2010 DeSSC meeting, NDSF described plans for fielding the system on both *Alvin* and *Jason* in 2010 season. They faced a big system integration challenge.

Jon reviewed the 2010 *Jason* Timeline. Jason personnel integrated system in Seattle. Unfortunately, the system arrived in Seattle with a broken optical corrector. The original system was returned to AIVL; and an insurance claim was pursued (successfully) for shipping damage. A list of NDSF issues along with resolution of the issues is included in the slides. PI Assessments of the system are also listed in the slides. Samples images were presented.

Plans for 2011 (*Jason*) - AIVL has committed to:

- Delivery of camera/optics/housing for *Jason* (replacement of prototypes)
- Correction of lens zoom speed Software updates
- Provision of hardware/software/user documentation
- First *Jason* cruise ships in March. NDSF and AIVL anticipate resolution of these issues before shipment.

With respect to *Alvin*, optical glass dome problems were experienced with spalling of the glass dome under pressure. This is still under investigation/remediation, but it has prevented use of camera on *Alvin*.

The recording formats and deliverables for 2011 are listed in the slides.

Discussion:

- John Delaney – He believes the *Jason* system should have a logbook, like what airplanes have. We spend \$70k a day for support. He requested that WHOI consider this. On his cruise they were not aware of these problems. How much of the problems could have been avoided if there was a month prep time? Jon Howland – He doesn't know. As far as the logging, WHOI feels that there should be a post dive brief after every dive.
- Deb Kelley – There are programs that analyze the pixels without the eyes. It is very valuable. Jon Howland – Bill Lange's study addresses this.
- Deb Kelley – When you calibrate the cameras, you should also calibrate the HD monitor. Jon H – They now have a monitor in vans.
- Pete Girguis – An instruction set for the system is critical. He would like guidelines on how to focus the camera and what the settings should be.
- Deb Kelley thanked Jon Howland for the efforts WHOI made to correct the problems with the system on their cruise.

Open Forum - Meeting participants had an opportunity to raise questions and provide comments regarding NDSF and DESSC activities. Discussion:

- Bill Chadwick – Why did one group have success with the *Reson* and one did not? Andy Bowen – The assembling and process pipeline diverge. It was two separate problems. There are also cultural issues between the *Sentry* and the *Jason*.

- Pete Girguis – He hearing that it takes longer for *Jason* data processing. Andy Bowen – No, they should be able to produce the data in a reasonable amount of time. Jon Howland – Because we can do many other things with *Jason*, there is more that can go wrong.
- Andy Bowen expressed concern over lower utilization of the UNOLS Fleet and facilities. There are new initiatives to encourage participation. As an operator, this is of concern.
- Deb Kelley – NSF’s announcement from a couple years ago to not propose ship time was damaging. At the R2K meeting they were told not to propose. At panels they have been told that only one or two proposals would be funded. This is discouraging to PIs.
- At the last R2K meeting Barbara Ransom said they would only fund one proposal. They would not fund exploratory science.
- John Delaney –It is a systemic problem. We work in the most exciting world. We must take on the responsibility on. Ocean scientists have to tell the world and our country’s leaders about what we do. We have to solve this ourselves.
- Mike Prince – There are congressman who want to know what should be funded.
- John Delaney – We need to look at NASA and the way they can sell themselves.
- Brian Midson – NSF doesn’t do a good job of self-promotion. We rely on the investigators. NSF has received a lot of accolades on supporting the Gulf. There has been a lot of press lately, but NSF wasn’t recognized in the stories.
- John Delaney – We tend to think about the sea floor, but it is the whole ocean that we need to promote. It is the life support system for the whole community.
- Pete Girguis – Make sure that we are supportive of the larger community. People get catty when someone gets attention. Be supportive. These are exciting times – three new ships are being built.

5:00 pm *Meeting Adjourn*