

DRAFT

**UNOLS Deep Submergence Science Committee (DeSSC)
Annual Community Meeting
Sunday, December 11, 2016**

Location:

Golden Gate University (2nd Floor Room 2201 – 2202)
536 Mission Street, San Francisco, CA 94105

Meeting Minutes

Appendices:

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II: NOAA Report
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IV: New-Users and Early Career Scientist Presentations - Part I
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XVI: DeSSC's New-User Program
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XVIII: DESCEND-2 Workshop
XIX: Hawai'i Undersea Research Laboratory (HURL) <i>Pisces</i> operations in and future plans
XX: U. Hawaii ROV
XXI: DeSSC Subcommittee on Telepresence-Enabled Science Missions
XXV: Scripps Institution of Oceanography ROV
XXVI: Schmidt Ocean Institute ROV

Introductory Remarks, Meeting Logistics, Introductions - Peter Girguis, DeSSC Chair, called the meeting to order at 9:00 am. He introduced DeSSC members who were in attendance and also members who were joining the meeting via WebEx. DeSSC members, Dave Emerson, Amanda

Demopoulos, and Anna-Louise Reysenbach joined the meeting remotely. Anna-Louise is the new incoming DeSSC Chair. She had intended to attend the meeting in person, but unfortunately a winter storm in Portland, OR has impacted travel plans.

The meeting participant list is available at:

https://www.unols.org/sites/default/files/DeSSC_Dec2016_Attendance.pdf.

NDSF/DeSSC Highlights and Accomplishments - Peter Girguis provided the report. His slides are available as *Appendix I*.

Pete became DeSSC Chair at a very active time with the loss of *ABE* and the upgraded *Alvin* coming on-line. Pete reviewed the current DeSSC membership and expressed the need for a vice chair. He provided a 5-year retrospective of DeSSC activities and the National Deep Submergence Facility (NDSF):

- AUV *Sentry* entered into service after the loss of *ABE*
- DeSSC provided community feedback into the *Alvin* upgrade project.
- NDSF hosted a booth at the AGU meeting with a life-size *Alvin* Mock-up – Pete feels that more show-n-tell items like this would be helpful.
- DeSSC developed a process for photo accreditation and attribution.
- Issues regarding data management were addressed.
- DeSSC launched an annual early career program that is now held each December.
- Provided feedback on *Jason*'s new launch and recovery system.
- Organized *Alvin*'s Science Verification Cruise (SVC).
- Promoted NDSF data archiving.
- Developed and hosted the DESCEND-2 workshop
- A video workshop was held.

Meeting Displays & Posters – Pete encouraged everyone to visit the posters and artwork on display at the meeting.

Brief Introductions of Students, Early Career Scientists, and NDSF New-Users – The participants of Saturday's DeSSC new-user program introduced themselves.

Agency Introductions and Reports

National Science Foundation (NSF) Report - Brian Midson provided the NSF report. Some of the topics he discussed included:

- NSF supported the recent upgrade of *Jason*.
- *Alvin/Atlantis/Telepresence* Chief Scientist Training Workshop (CSTW) – Brian is interested in feedback from the CSTW that was held this summer. He is interested in seeing if the participants become new users of the NDSF assets.
- This year NSF supported deep submergence science operations beyond the NDSF. They used the University of Hawaii vehicles and vessel when *Kilo Moana* was unavailable.
- The National Academies report, *Sea Change*, recommended how OCE could rebalance its science and infrastructure budget. The goal is to lower the budget for infrastructure so that more funds are available to support science. NSF continues to work on this.
- Rachel Orange is a new Science Assistance in NSF/OCE's Integrative Programs Section (IPS)
- The federal Continuing Resolution is extended for a few more months.

Navy Report - Tim Schnoor provided the report. The Navy's new ships, *Armstrong* and *Sally Ride*, are coming on-line this year. A variety of Science Verification Cruises are planned to evaluate the science capability of the ships.

National Oceanic and Atmospheric Administration (NOAA) Report - Alan Leonardi provided the NOAA report. Since time was short, he encouraged everyone to review his slides to see NOAA's activities: **Appendix II** <https://www.unols.org/sites/default/files/201612desap02.pdf>.

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

Topics covered included:

- UNOLS Fleet News – Design, UNOLS Designations, Mid-life Refit activities
 - Two new Ocean Class Ships:
 - R/V *Neil Armstrong* (WHOI) entered service in May 2016
 - R/V *Sally Ride* (SIO) – designated a UNOLS Vessel on October 28th, and entered service in November 2016
 - Mid-Life Refits/SLEPs:
 - R/V *Thompson* is in its mid-life period.
 - Planning for a 2018 mid-life of *Revelle* has begun.
 - Regional Class Research Vessels – Construction funds are pending. Pending the funding, the first ship could enter service in 2021.
- Annette reviewed the UNOLS workshops that were held in 2016. It was a busy year for UNOLS.
- Chief Scientist Training Workshops (CSTW) /Initiatives continue. In 2016 there were seven CSTW cruises. UNOLS has been tracking the cruise training participants:
 - 152 Participants in CSTWs over 6 years (2011 – 2016)
 - 25 Participants submitted a total of 47 projects as lead PI, 7 projects were funded.
 - Total of 89 Requests = 902 ships days

A UNOLS ad hoc committee has been formed to evaluate pregnancy at sea policies, sexual harassment, and medical form issues and provide recommendations. Committee members are listed in the slides. The actions completed include:

- Surveyed all UNOLS ship operators and gathered information on procedures and policies regarding medical history forms, pregnancy and nursing mothers, and harassment prevention procedures.
- MTS Sexual Harassment Prevention Video - This video is available to UNOLS ships.
- Created a UNOLS home page banner titled: “Discussing the Gender Climate at Sea” with links to various reference documents
- Guidelines and Recommendation Document drafted - dated August 11, 2016, ver: 3.
- UNOLS *Research Vessel Safety Standards*- 10th Ed. Chapter 6- Personal Behavior and Individual Safety. Also Appendix E added on Harassment Prevention.

Lastly, UNOLS has adopted a policy regarding Unmanned Aerial Systems (UAS) on UNOLS Vessels. The policy is included in the slides.

New-Users and Early Career Scientist Presentations - Session I – Participants from the DeSSC New-Users Program each presented one slide with information about their background, research interests, and collaborative opportunities. The slides are included as *Appendix IV*.

Discussion:

- Dan Fornari – The Ridge Program offered a way for people to collaborate. This is now lacking and we need to think about ways we can do this in the future. Dan thinks that UNOLS could do this in the future. Webinars are useful, but in-person workshops have a lot of benefit.
- Pete Girguis - There is a lack of forums for people to speak. He is a huge fan of this.
- Dan Fornari – There needs to be a better way for people to learn where the ships are going to work. It is hard for the community to know where the research will be in the out years.
- Brian Midson – This is analogous to the Regional planning model that was recently initiated for R/V *Langseth*.
- Phil McGillivray – He would be happy to help coordinate Polar science collaborations for deep submergence.

Break

NDSF Vehicle Operations Summary - Lisa Smith (WHOI) provided a summary of NDSF operations. Her slides are included as *Appendix V*.

Alvin operation highlights included:

- 127 operating days
- 4 cruises - MAR, Continental Slope, EPR, Guaymas
- 45 dives, 328 hours submerged
- The average bottom time: 5.0 hours
- The average dive depth: 2,427 m
- The “nested” survey strategy with *Sentry* and *Alvin* has proven to be very effective in accomplishing mission objectives. Guidelines have been developed for concurrent *Alvin-Sentry* dive operations.
- The first acoustic transfer of still images from *Alvin* to *Atlantis* was used during the Early Career Scientist (ECS) and Gregg cruises. Low-res images were sent from the sub to surface, and sub/ship SMS channel employed for dedicated science communications via text.
- They used prototype new DSP&L video cameras
- First use of sensitive sample bio box during the Seyfried cruise

Jason operation highlights included:

- 117 operating days
- 6 cruises - Catalina Basin, Juan de Fuca, Cascadia, Axial, off San Diego
- 80 dives, 521 total hours
- On bottom: 326 hours
 - Longest dive: 33 hours
 - Average dive: 6.5 hours
- Six successful single-body cruises
- Numerous heavy lifts to 3,800 lbs.
- Increased payload:
 - 520 lbs. science skid
 - 4,000 lbs. through-frame lift skid

- Two Schilling Titan 4 manipulators offer increased reliability
- Operated on new ships – *Sikuliaq* and *Sally Ride*
- Redesign of control vans is underway for capacity to operate from one van.

Sentry operation highlights included:

- 124 operating days
- 4 cruises - MAR, Bahamas, Cont. Slope, EPR, Guaymas Basin
- 36 dives, 515 hours in water
- Total survey time: 423 hours
- Average dive time: 14 hrs.
- Longest dive: 37 hours
- 1,125 km of survey
- Longest continuous transect: 85 km
- Vessels used: *Atlantis*, NOAA *Pisces*
- Located *El Faro* VDR
- New batteries – able to Multibeam for 28 hours, camera 50+ hours
- Working on significant upgrades to real-time data display and mission re-planning
- Automated metadata capture system

PI Reports – PIs who used *Jason*, *Sentry* and *Alvin* in 2016 provided brief reports about their respective cruises. Details about each cruise are included in the slides.

PI Mark Kurz:

Vehicles Used: *Sentry*, *Alvin*

Ship: *Atlantis*

Slides are included as ***Appendix VIa***

Additional details:

- Only 9 dives were completed due to a propulsion problem with ship
- There was a cartoonist on board
- This was Mark's first *Alvin* dive

PI Anne Dekas:

Vehicles Used: *Sentry*, *Alvin*

Ship: *Atlantis*

Slides are included as ***Appendix VIb***

Additional details:

- Early Career Chief Scientist Training Workshop
- Included Telepresence and shoreside element at URI
- Network of new collaborators and future NDSF users.

PI Jeffrey McGuire:

Vehicles Used: *Jason*

Ship: *Sikuliaq*

Slides are included as ***Appendix VIc***

Additional details:

- Used *Jason* on a new ship

PI Allison Fundis – Presented for Ian Kulin

Vehicles Used: *Jason*

Ship: *Sikuliaq*

Slides are included as ***Appendix VIId***

Additional details:

- Provided overview of Ocean Networks Canada activities.
- They repaired a cable damaged by a fishing vessel
- This was *Jason*'s first single-body cruise

PI Deb Kelley:

Vehicles Used: *Jason*

Ship: *Sikuliaq*

Slides are included as ***Appendix VIe***

Additional details:

- Smaller science party than past Global cruises, reduced to 12 people.
- Deck was very full and had to hang *Jason* over the side
- Tried 12-hours on and 12 hours off, but it didn't work well

PI Bruce Appelgate:

Vehicles Used: *Jason*

Ship: *Sally Ride*

Slides are included as ***Appendix VIIf***

Additional details:

- Learned a lot about mobilizing the vehicle
- Very ambitious cruise
- Telepresence was used
- DP on the new ship is very good
- There were 25 science berths

PI William Seyfried:

Vehicles Used: *Alvin*

Ship: *Atlantis*

Slides are included as ***Appendix VIg***

Additional details:

- There were issues associated with being funded out of NSF/DEB because the funding for ship time wasn't included in the budget.
- Bill acknowledged the contributions from artist Lily Simonson and a French filmmaker.

PI Daniel Fornari:

Vehicles Used: *Alvin* and *Sentry*

Ship: *Atlantis*

Slides are included as ***Appendix VIh***

Additional details:

- Trish Gregg was the chief scientist. This was her first time.
- Dan showed the imaging capability. It is high quality and available quick.
- There are some issues with pre-cruise planning that we need to deal with.
- Acquired 40 minutes of video and lots of stills.

Non-NDSF PI Reports:

PI Brendan Roark:

Vehicles Used: *Pisces*

Ship: *KOK*

Slides are included as ***Appendix VII***

Additional details:

- Amy Baco-Taylor was the coPI.
- Over the last two years they had carried out the operations using AUV *Sentry* on *Sikuliaq* and *Kilo Moana*
- In 2016 *Kilo Moana* had some mechanical issues and their cruise was cancelled. They had to figure out how to accomplish their goals. *Pisces* was an option.
- A lot of planning had to be reconsidered and revised to use *Pisces*.
- They had initially planned 75 hours on station
- They had to overcome a lot of challenges and were able to solve all of the problems.
- They had to very rapidly change their permits.
- They had two subs at their availability.
- Details about the cruise are included in the appendix.
- This program took a huge amount of work by Rose Dufour, Brian Midson, and HURL. The science team accomplished everything that they needed to get done.

PI Chris German:

Vehicles Used: *Nereid Under Ice (NUI)*

Slides are included as ***Appendix VIII***

Additional details:

- *Nereid Under Ice* cruise to the Arctic
- *First deep dive cruise for NUI*
- Project titled, “Oases for Life Beneath Ice Covered Oceans”
- AUV & ROV dives with NUI
- Sep 09 – Oct 23, 2016
- AUV Dives (NUI 014, 015):
 - 3 x multi-beam map surveys [500m x 500m blocks]
 - 2 x stereo-photo surveys [100m x 100m blocks]
- ROV Dive (NUI 016) - Into the eye of a F7 Storm
- 3hrs on bottom
 - 3 x Push cores
 - 3 x Biology samples
- First HDTV highlights: web.who.edu/oases-for-life/

Lunch Break

National Facility Operators Report (WHOI)

NDSF Announcements - Rob Munier provided the report. His slides are included as ***Appendix IX***. Rob introduced the new NDSF people. Kerry Strom is now the WHOI ship scheduler and Anthony Tarantino is the operations coordinator for *Alvin*.

Rob explained the important process of post cruise assessment. WHOI will place an increased focus on pre-cruise planning.

Rob reported on some of the major highlights of this year:

- *Jason*'s upgrade was accomplished with the objective to enable routine operation and maintenance of OOI's cabled array. The investment was \$2.4 million.
- The Early Career Scientist Cruise provided an opportunity for new users to experience *Alvin* and *Sentry* operations.
- *Sentry* was used to find the flight data recorder for *El Faro*
- R/V *Neil Armstrong* is in its first science year and supported six Science Verification Cruises. ROV operations were carried out using ROV *Kraken*. The ship is now in its warranty yard period.

***Nereus* Legacy Fund Report** - Rob Munier provided an update on the activities that are being supported by the *Nereus* Legacy Fund.

There are six projects:

- Sentry ASV Tender
- Engineering 6,500 m *Alvin*
- Data Convergence & Telepresence
- *NUI* Transition
- Hadal Technology

Details are included in his slides (Appendix IX).

Summary of Upgrades to NDSF vehicles: *Sentry*, *Jason*, and *Alvin* - Andy Bowen provided a report on the vehicle upgrades. Full details are included in his slides (see ***Appendix X***).

Sentry news and upgrades:

- Staffing:
 - Sean Kelley is now the "*Sentry* Operations Manager."
 - Carl Kaiser retains program management responsibility but will scale back time by approximately 1/3 as Sean comes up to speed.
 - One new hire complete and one is underway to replace attrition losses
 - There is significant cross training underway for *Alvin* Ops personnel to work with *Sentry* at sea
- There were upgrades to the propulsion and control and data pipelines.
- An 850 kHz Sidescan Sonar was purchased with private money and is now ready for routine use on *Sentry*.
- Metadata – There are new scripts configured to read all possible data from instruments (e.g., serial number, calibration constants). This should be in every dive report by the end of the year for some sensors. Autonomous Surface Vehicle (ASV) tending demo is planned for early 2018. WHOI internal funding supports this.

Jason Upgrade

- Modifications were made to the *Jason* system to enable routine operation and maintenance of OOI cabled array components
 - The new *Jason* frame has through-frame lifts up to 4,000 lbs.
 - See the slides for the tool skid options and the Overboard Handling System *Thompson* layout.
 - The LARS Crane has a 20-ft reach in Sea State 4. There is a 14,000 lbs. capacity.
 - The winch carries 5,200 m of 0.842" cable. It can be converted back to original 0.681" cable using the original drum and level wind.

- Control Van Upgrade – The control van infrastructure is at the end of its life. Andy showed the single van layout.
 - The single van will accommodate 3 *Jason* team and 2 scientists
 - The remainder of the science participants will be at a remote station
 - The remote station will have 2 x 65” split screen monitors to duplicate views in the single van
 - There will be live communications with van to alleviate confusion
 - There is also a dual van layout (see slides)

Next Andy reviewed the *Alvin* upgrades that include:

- New service release design – enables faster ascent/descent rates, longer available bottom time, and removes need for basket weights (more available basket space).
- New science basket – improves performance, enables variations of science space for unusual basket shapes, quick front-end basket interchanges, extendable basket (similar to *Jason*)
- New sensitive sample bio-box – provides positive latching with excellent sealing and insulation
- SubC 1Cam Alpha HD video/still camera – now available as HD video source to in-hull recorders and observer monitors
- Magnetometer added to sensor suite
- Acoustic modem – installed on *Alvin* and *Atlantis*. Enables acomms data transfer between ship/sub (images, SMS text, or data sets). Provides *Atlantis* with resident acomms capability, with dedicated acomms station in the Main Lab.
- Upgrade to Sonardyne USBL – the new 6G (sixth generation) system. Provides *Atlantis* with resident capability compatible with *Alvin*, *Jason*, and *Sentry*.
- Independent *Alvin* navigation computer station in *Atlantis* Main Lab – provides a means for topside observers to monitor *Alvin* navigation during dives.
- New *Alvin* elevator with syntactic foam floatation

Discussion:

- Deb Kelley – Has there been any discussion of getting rid of the *Jason* van? Andy – No. They are going to retain one van.
- Pete Girguis – For the smaller ships is there a chance to use the lab for ROV controls and then use a van for people?
- Dan Fornari – If you are going through this effort of reducing the footprint, maybe it is time to look at the van for other use.
- Andy Bowen – Maybe. For now they have reduced the vans required from two to one van. However, people can still use the 2-van option.

Deep Submergence Scheduling - 2017 Operations and beyond - Kerry Strøm provided the report. Her slides are included as *Appendix XI*. Details about NDSF vehicle schedules for 2016, 2017, and beyond are provided along with maps showing operating areas.

2016:

- *Alvin* Schedule = 127 days
- *Jason* Schedule = 117 days
- *Sentry* Schedule = 139 days

2017:

- *Alvin* Schedule = 86 days
- *Jason* Schedule = 189 days

- *Sentry* Schedule = 139 days

Information about requests submitted for 2018 through 2021 is included in the slides. *Alvin* will be required to have an overhaul in 2019. Hopefully this will coordinate with an *Atlantis* refit period.

In the coming years, the UNOLS Global vessels will undergo mid-life refit periods. R/V *Thompson* mid-life refit (2016/17) will be followed by R/V *Revelle* refit in ~2018. Funds pending, R/V *Atlantis* refit could take place in 2019-20. The Fleet will be down one global vessel from 2016 to 2020. Using NDSF assets on new vessels is critical for healthy schedules.

NDSF Vehicle Debrief Interviews & Post Cruise Assessment Reports:

Summary of issues identified in NDSF debrief interviews and corrective actions – After each cruise that uses *Alvin*, *Jason*, and/or *Sentry* a debrief interview is conducted. The interviews include the cruise chief scientist, the NDSF Chief Scientist (Adam Soule) and a DeSSC Member. The DeSSC members who participate in the debriefs include:

- For *Alvin* cruises – Amanda Demopoulos
- For *Jason* cruises – Dave Emerson
- For *Sentry* cruises – Vicki Ferrini and Scott White

Scott White provided a summary report from all of the debrief interviews conducted in 2016 along with the corrective actions that were taken by WHOI/NDSF. Slides are included as **Appendix XII** and include details about observations, issues, and suggestions. WHOI's corrective action is provided as red text. Additionally there are bar charts that summarize the Post Cruise Assessment Reports from the cruises that were debriefed. Andy Bowen offered WHOI comment.

Discussion:

- Post-processing of *Sentry* bathymetry data was discussed:
 - Carl Kaiser – The *Sentry* group cannot send additional people for extra processing.
 - Brian Midson – We need to manage expectations of what to expect as a data product. He hasn't seen sufficient demand to support extra post-processing. The need for extra post-processing should be articulated in advance.
 - DeSSC can revisit this in the spring.
- Dan Fornari – It would be useful if the ship and vehicle operators had a conversation about pre-cruise planning. Pete Girguis – Schmidt Ocean Institute should be included.

Presentation to Pete Girguis – UNOLS, DeSSC, and NDSF expressed their deep appreciation to Pete Girguis for his leadership as DeSSC Chair. The community has greatly benefitted by Pete's efforts and initiatives that were introduced. Pete was presented with a piece of pottery made from seafloor mud.

Break

Video Standards and Data Management:

Establishing Community Standards for Underwater Video Acquisition, Tagging, Archiving and Access - Vicki Ferrini provided the report. Her slides are included as **Appendix XIII**.

Underwater video imagery has become a critical data stream. It is acquired by many groups on many platforms: ROV, HOV, and AUV. Video archives have the potential to provide broad significant scientific benefit. The oceanographic community has yet to fully capitalize on modern technologies for managing, streaming, discovering, and tagging video for scientific research, citizen science, and public engagement. The overarching goal is to move the community towards broad public access to distributed video content for scientific research and public outreach.

A workshop was held in June. There were more than 40 participants (+ ~30 remote). They reached a consensus on best practices. Recommendations were reached on recording, metadata, and access.

Conclusions:

- There is lots of excitement about underwater video.
- Several challenges and opportunities remain (long-term storage, at-risk media, and annotation approaches)
- Ongoing coordination and collaboration will be important in moving community toward common goals

Web services linking NDSF and IEDA - Vicki Ferrini provided the report. Her slides are included as *Appendix XIV*.

Vicki discussed the Interdisciplinary Earth Data Alliance (IEDA) as a model for integrating EarthCube technology resources and engaging the broad community. They were funded in the summer 2015.

Project Goals include:

- Standardize vehicle metadata
- Improve access to NDSF data and metadata
- Enable cross-vehicle searches
- Inform NDSF metadata practices

Vicki reviewed the web services offered with screen shots of the user interfaces (see slides).

NDSF Data Management Update – Jon Howland (WHOI) provided the NDSF Data Management Update. His slides are included as *Appendix XV*.

A *Nereus* Lagacy Fund (NLF) award was made for “Data Convergence & Telepresence.” The project funds supported:

- Development of unified data processing and data access systems
- Study/white paper on use of telepresence/ telecommunications for operational and engineering purposes

Key elements of the Data Convergence effort include:

- Common code base - There is a drive for all three vehicles to rely on a common code base. Currently there are essential differences in code driven by vehicle differences, operational methods, differing requirements, and vehicle-specific operational tempo. The goal is to have common products and delivery mechanism.
- Processing – All vehicles now using variants of the same post-processing code. *Jason* and *Alvin* systems are modeled upon *Sentry* with essential differences. Further effort will work out details and responsibilities and resolve differences as appropriate.

- Data QA/QC and delivery - Currently very different between the vehicles. They have decided to evaluate OpenVDM, which is used by NOAA, URI, SOI, and others.

The second part of the NLF award, is studying Telepresence use for operational/engineering purposes (not just science and outreach). WHOI has employed Willis Pelagian to perform a cost/benefit study that looks at:

- Can we reduce NDSF at-sea manpower requirements?
- Increase services/efficiency?
- New methodologies and technological opportunities
- Wide ranging surveys of community with cooperation from NSF, NOAA, UNOLS, SIO/HSN, URI/ISC, others

WHOI expects a draft report by the end of the month.

Telepresence has been included in the *Sally Ride/Jason* Science Verification Cruise. They also decided to push the OpenVDM experience into this cruise. Science was the primary focus of the telepresence effort. Five days into the cruise, dive data was transparently moving to an accessible repository with some QC/QA being performed, as well as ashore via HiSeasNet/Port Office.

Mission renav was performed ashore but was bedeviled by new DVL and associated new formats, both ashore and at sea. Video (GoPro) and audio link was used for troubleshooting. Slack was used extensively for interaction with those ashore, both for science and operations. Multibeam files (sample) were transferred ashore testing a variety of methods.

The preliminary results showed:

- Shoreside support was outstanding and showed potential for operational use of telecommunications.
- The effort at-sea was transferred to effort ashore - both vehicle/data and telecommunications troubleshooting.
- Experience of those doing renav ashore was identical to that at sea.
- Security concerns and restrictive network topology were an obstacle to transparent use of the network. This prevented them, for example, from using phones/Skype for vehicle troubleshooting. This was a cruise specific issue.
- OpenVDM showed potential for use:
 - No science use (not ready)
 - Transparent transfer of nav data ashore
 - Cruise was useful accelerant for evaluation

The immediate plans include review/ release of the telecommunications white paper and review of the OpenVDM experience.

Discussion:

- Dave Carress – With regard to multibeam transfer, can all data go back to shore? Answer – probably not.
- Carl Kaiser – During the *El Faro* cruise they were pushing a lot of data ashore.
- Deb Kelley – What is the interface between the virtual van and this? Are there upgrade plans for the virtual van? Jon Howland – His personnel view is that before we make improvements to the virtual van, we should think of total replacement. Deb – She would add support for that plan.

- Deb Kelley – The importance of metadata must be emphasized. During RIDGE there was a rigorous requirement for metadata. She would like this to be a requirement.
 - Adam Soule – This is something that should have this done automatically.
 - Vicki Ferrini – Some of this can be done automatically.

DeSSC’s New-User Program – Steering Committee member, Vicki Ferrini, provided a summary of this year’s DESSC New-User Program. Her slides are included as *Appendix XVI*.

Organizers of this year’s program were Vicki, Annette DeSilva, Pete Girguis, Anna-Louise Reysenbach, Brian Glazer, and Karyn Rogers. The evening keynote speaker was Maurice Tivey (NSF). The program agenda and breakout topics, along with the session leaders, are included in the slides.

This year there were 34 applicants and 26 of the applicants were selected to participate. The 26 participants came from 20 different institutions (see slides for list).

In total, 45 individuals attended the workshop, 26 new users and 19 community volunteers. There was open discussion of research ideas, grant writing, and technologies. There is a lot of interest in getting field experience. An unplanned component of the program was when Barbara Ransom (NSF) asked each participant to reply to: “If I had a million dollars” in terms of research. The answers were quite interesting.

Vicki thanked Maurice Tivey, the agency representatives, and all of the volunteers for their assistance.

New-Users and Early Career Scientist Presentations - Part II - Participants from the DeSSC New-Users Program each presented one slide with information about their background, research interests, and collaborative opportunities. The slides are included as *Appendix XVII*.

DESCEND-2 Workshop: Findings and Recommendations – Pete Girguis provided a report on the DESCEND-2 Workshop that was held in early 2016. His slides are included as *Appendix XVIII*.

The written DESCEND-2 report is close to completion. The workshop/report focused on three areas, with both short- and long-term goals:

1. Which existing technologies can be better deployed to help address the science questions?
2. Are there existing technologies that are unavailable to the scientific community due to logistical or financial constraints (and how might we alleviate those constraints)?
3. What new technologies are needed to address these long-standing science questions?

Some key overall conclusions include:

- Technologies being developed outside the deep-sea research community can offer solutions to long-standing problems.
- Technology solutions to long-standing problems include:
 - Increased deployment and access to deep submergence vehicle
 - E.g. ROVs and AUVs for near-polar or polar research
 - Dedicated vehicles for forthcoming icebreakers
 - Increased usage of AUV-HOV combination for hypothesis-driven exploration
 - Autonomous data collection when appropriate
 - Computer-aided data analyses
 - Higher-resolution models of deep sea processes

- Continue to push for advances in sensors (OTIC!)
- Cultural changes would benefit deep-sea research
- Improved standardization of - and access to- data archives
- Promote interactions with other communities, e.g. coastal investigators
- Coordinated efforts toward open access sensor development
- Increased emphasis on societal engagement

The technological objectives that were identified are listed in the slides.

The DESCEND-2 report will be open for comment this week:

- The Executive summary, detailed report and appendices await community input
- Comments will be closed in early January
- The report will be made available on the UNOLS website
- Watch for more info from the UNOLS office.

Emerging technologies and Broader Activities:

Hawai'i Undersea Research Laboratory (HURL) *Pisces* operations in 2016 and future plans – John Smith (U. Hawaii) provided the report. His slides are included as *Appendix XIX*.

John explained that HURL is in Transition. NOAA defunded the program in 2013. As funding expired, HURL transitioned to an operational, contract for-hire entity with some institutional bridging support from UH/SOEST. The science program and external awards for dive time via RFPs ended and currently there is no remaining UH campus staff on payroll. They still operate both *Pisces* subs (2000 m). The 35-year data archive is being maintained and updated with limited support from SOEST. There is a commitment to keep subs active through 2017 to complete obligations.

There is much potential for work in the expanded Marine National Monuments and poly-metallic nodule/crust regions of the Pacific.

John highlighted the major accomplishments this year:

- 62 dives from March-November in four mobilizations, most dive days were 2-sub ops (400 hours underway)
- 2 months of dives in South China Sea canceled days before departure, rebounded with productive alternate dive season
- Took on 30-day NSF-funded ROV *Jason* mission to the NWHI on short notice due to *Kilo Moana* issues
- Cruise details are provided in the slides.

Other highlights included:

- Training of Navy SEALs in operating LRT submersible platform for delivery vehicle
- Two first descents on unexplored Geologists Seamounts, Cook and McCall
- 3 days of cold water intake pipe surveys for NELHA
- WWII era submarine I-400 bell recovery (permitted)
- Two more maritime wrecks located and identified

John reviewed HURL's plans for 2017 (see slides). For more information about the HURL program, Google "HURL".

U. Hawaii ROV – John Smith continued with a report on the status of the University of Hawai‘i/SOEST ROV *Lu`ukai*. His slides are included as *Appendix XX*.

Lu`ukai was purchased by SOEST, designed and manufactured by DOER Marine, and delivered in 2013. It is a larger, more powerful, and deeper diving version of the Scripps ROV. *Lu`ukai* will be operated and maintained by a diverse group, mostly HURL personnel, along with OTG ship techs and HMRG engineers.

A series of unfortunate experiential and engineering events ensued; however, success was achieved in Sept 2015 by bringing Aloha Cabled Observatory (ACO) back online.

Numerous scientific and applied research entities have expressed interest in *Lu`ukai*'s use, partially due to its mid-Pacific base of operations and accessibility.

To date, ROV *Lu`ukai* has completed 50+ dives with an average bottom time of under 3 hours at work and training sites. *Lu`ukai* plans for 2017 include:

- Extend the on-site endurance of the system
- Enable software controlled operations such as Auto X-Y-Z, station keeping, and ground fault monitoring
- Integrate 10km .681 UNOLS umbilical wire to streamline mob/demob operations
- Successfully complete two currently scheduled missions: ACO service and a 3-4 week deployment to CCZ poly-metallic nodule fields

DeSSC Subcommittee on Telepresence-Enabled Science Missions – Chris German provided a report on the newly formed DeSSC subcommittee on Telepresence-enabled science missions. His slides are included as *Appendix XXI*. Chris chairs the subcommittee and members are listed in his slides. Some of the suggested topics that will be included in the white paper include:

- Modes of operations
- Operational perspective – looking at reduced berths.
- Limitations
- Products
- Time management considerations
- Logistical considerations
- Recommendations on the usefulness of this technology

NDSF Coordination with the Polar Working Group – Pete Girguis reported that there is interest in coordinating polar scientists with users and operators of the NDSF vehicles. It would be useful to better understand the deep submergence research interests of the polar scientists. Phil McGillivray expressed his interest in working with the Polar group.

Autonomous Surface Vehicle tender for *Sentry*, *Neried Under Ice (NUI)* vehicle, and the *Nereid Hybrid Tether* – Andy Bowen provided updates on the development status of these vehicles and technologies. Individuals can contact Andy for additional information.

Ocean Observatories Initiative (OOI) – Brian Midson provided an update on OOI. OOI is operational and data is flowing. NSF accepted and commissioned OOI in the spring.

Ocean Observing Initiative Cabled Array – Deb Kelley provided the report. The Cabled Array provides power and bandwidth, and two-way communication to scientific sensor arrays on the seafloor and throughout the water column. A shore station in Pacific City, Oregon includes two cable landings

serving key sites on the Cabled Array: 1) Slope Base, Southern Hydrate Ridge, and the Endurance Array Oregon Line; and 2) Axial Seamount, and Axial Base.

The OOI Cabled Array provides a constant stream of near-real time data from the seafloor and through the water column across the Juan de Fuca plate. The network of three instrumented cabled mooring sites (Axial Base, Slope Base, and Oregon Offshore) with complementary sensors on the Cabled Array and shared Endurance Array enable interdisciplinary observations of water-column processes.

ROV Development and Operation Updates:

Scripps Institution of Oceanography (SIO) ROV – Bruce Appelgate provided the report on SIO’s ROV *Trident*. His slides are included as *Appendix XXV*.

SIO has hired a full-time ROV engineer, Doug Penny. The vehicle has been disassembled and refurbished. There was a site visit by the manufacturer, DOER. It was identified that the topside control system needed replacement. Greensea Inc. was engaged to provide the integrated control system replacement.

In early January 2017, the topside control system will be installed with dock-side tests to follow. Sea trials are planned for mid February on R/V *Sally Ride*.

The ROV has a 2000-meter capability and is a flyaway system. It requires a minimum of three technicians and one 20-foot control van. It can be operated on any ship larger than 120 feet.

Schmidt Ocean Institute (SOI) – Victor Zykov provided the update on SOI’s 4500m ROV. His slides are included as *Appendix XXVI*. A list of the core instruments and sensors is provided in the slides.

Victor reviewed the ROV delivery plan and key project dates. The first planned research cruise is currently underway (11/30/16 to 12/21/16), “Searching for Life in Hydrothermal Mariana.”

Sea Trials for the ROV were carried out during the summer 2016 with external technical observers. There were 73 observations. Key observations included:

- Issues with the main video/still science camera
- Need for a streamline dive annotation system
- Need for an automated video management system
- Be prepared to deal with large volumes of data
- Be prepared to support seafloor photo-mosaicing.
- Finalize the development of an ROV Operational Team

A non-SVC cruise was carried out in November 2016 with science advisors as observers. This cruise was used for crew training. They made 72 observations and some key observations included:

- Accurate and consistent time-stamping of screen grabs
- Efficient compression of continuous video recording
- Highlights recording and automatic video file naming
- Camera auto-iris not working, halos still present
- Accurate logging and time-stamping of ROV nav data
- Instant screen grabbing

Looking forward, there are 97 days of ROV cruises planned in 2017 and 132 days of ROV cruises in 2018 (pending SOI Board approval).

Pete Girguis introduced, Lily Simenson. Lily is an artist at Berkeley and UCLA. She received a congressional medal for her work and has sailed with many deep-sea scientists. Lily offers a great way to bring the beauty of deep submergence science to a broader audience. Lily's work was on display at the meeting.

Open Discussion:

- Nick Hayman – He liked the discussion and summary of the DESCEND-2 workshop. There are good recommendations. What now?
- Pete Girguis – He enjoyed being a part of the workshop. There is a lot to do in terms of the recommendations. If we all get involved, we can get things done.
- Interagency efforts are very important and can be effective. Rick Murray wants to work with other agencies.
- Phil McGillivray – The international community is worried about the future of the *Pisces* vehicles in terms of seabed mining, etc. Can DeSSC get involved? Observer status is needed. Chris German – InterRIDGE could be involved.
- Question - When will the next *Atlantis/Alvin* cruise be? Pete Girguis - This same question came up yesterday. It takes a lot of planning. However there is value of doing another *Alvin* basic training on shore-side program.
 - Anne Dekas – The shore-side training was very helpful. It was very different, but both are worthwhile. If the at-sea program isn't going to happen, she suggests taking the shore-side course.
 - For those who have NDSF cruises with open berths, please let Annette know. Students are always looking for opportunities to get to sea.
 - Brian Midson – There won't be an *Alvin* 2017 training cruise. There are other facilities that might be options for training, such as the HURL facility. However, it takes a champion to submit a proposal and organize the program.
- Anna-Louise Reysenbach thanked everyone for participating in the meeting with a special thanks to Pete Girguis for his leadership. She was really sorry not to be at the meeting in person. Participation by the early career scientists is very exciting. She would like to continue Pete's legacy. Send Anna-Louise your ideas for other initiatives.

Closing Remarks - Pete Girguis thanked everyone for attending the meeting.

The meeting adjourned at 5:10pm