2016 Ocean Sciences Educators' Retreat (OSER) Minutes
Louisiana State University, Baton Rouge, LA – 5-6 October 2016

Representatives from different sectors across the ocean science, technology, and operational communities were brought together to identify workforce development strengths, weaknesses, and opportunities for collaboration across the training pipeline. Recommendations on actions that can be taken to address training needs, gaps, and improvements to better serve the ocean related workforce were discussed over the two days of OSER 2016.

Keynote Address – Thomas Chance, CEO, ASV Global, LLC.
Thomas Chance kicked off the retreat with a Keynote Address on challenges that face the Ocean Science workforce. He discussed the skills needed in non-academic careers that are often lacking in academic training. While hard science and research are important skills such as program management, basic accounting, more applied research, field work, communication skills are necessary for non-academic careers but are not being taught effectively. Students frequently have to develop these skills on their own outside of the academic setting, if at all. As the landscape of opportunities and available jobs changes, there is a need for training for more diverse career development and opportunities for students, as many are interested in pursuing careers outside academia. Faculty needs to be educated on how to provide guidance for non-academic career paths.

Thomas' presentation can be found here.

Overview of OSER - Leigh Zimmermann, COL
Leigh provided participants with background and history on OSER and COL. Leigh's presentation can be found here.

Where are our graduates going and what does the data say?
Reports on data regarding graduate careers and educational preparation for those careers.

Carolyn Wilson (AGI): Carolyn's presentation can be found here.
Sue Cook (TOS): Sue's presentation can be found here.
Todd Christenson (NOAA): Todd's presentation can be found here.

2016 Survey on Professional Skills Training for Graduate Students – Amanda Holloway, COL
In addition to the annual graduate student and faculty data surveys, COL surveyed the ocean sciences community on graduate training skills. The survey had four sections to survey different audiences: current graduate students, graduate educators/faculty, employers and early-career individuals. While all audiences identified both project management and non-technical oral communication as important skills, employers and early-career individuals overall felt that these skills are either not taught or taught ineffectively. Suggestions for ways to improve training of these skills in the academic environment included: encouraging students to take communication trainings offered at national conferences, create a formal communication course that all students are required to take or provides professional workshops (not for credit) to strengthen skill sets. U. Delaware has one night event, where students give 90 second pitch clips, among colleges at the university, and the university videos the event to use for marketing. A challenge with adding items to the curriculum is the trend to get or keep course hours down to 120, so something gets sacrificed; how do you fit in skills based courses in a reduction environment?

Core curriculum could be restructured so students are getting some of these communication skills but maintaining a balance so that students don't overvalue the broader impacts pieces, but realize these are necessary skills. Other ideas included pairing of 4th and 5th year graduate students with a journalist to mentor non-technical writing skills. Amanda's presentation can be found here.

Panel – Industry Perspectives on the Emerging Workforce – Laurie Jugan (MSET/MIST), Roy Keller (LTTO), Liesl Hotaling (MTS).
Representatives from technology societies discussed current workforce landscape – how do we support the workforce that is transitioning to higher technologies (sensor development, new technologies), from the standard blue economy (O&G, shipping, ports, fisheries)? MTS enlists partnerships and coordination across many communities. Educational research supports that interdisciplinary is the best way to educate but there are disconnects between core (math, physics) sciences and ocean sciences. MSET hosted a Blue Economy Focus Group - IT/Engineering ranked first in employer needs, scientists ranked 2nd. The Louisiana Technology Transfer Office (LTTO) is a small business incubator (35 businesses currently); works with all universities in the state; 1/3 are Blue Economy, funded by NASA, SBA, State of Louisiana. Small Business Innovation Research (SBIR) is viable avenue to for universities to connect and bring in funding; win-win situation for company and university. NSF Innovation Corps Program (I-Corps) forces a researcher to think like a business person - great way to build entrepreneur skills; encourage students to utilize/intern with the incubators in the area. Student incubator model allows for students to learn business plan development and experience business plan competition, utilizing a review panel of business people. Some challenges include a fragmented Blue Economy, not just nationally but also globally. Ocean science community is grappling with reduced funding to even have graduate students, so the blue economy is attractive, but will need to adapt/alter the curricula. There are different needs in different region - reality of having to move locations for a job but also what is the benefit of a university to address non-regional workforce needs? Another ongoing challenge is the maritime alliance attitude that there is no need for more PhDs, but needs technicians, etc. Students should be encouraged to look for applicability to their research (ie: computer programming class, have them build the database instead of just use a database) and to solve problems of data analysis, or other creative ways to work skill development into their experience (hands on, problem-based). Other examples of bringing in softer skill-development: WHOI has paired research students with artists and dancers; U. Delaware has connected students from science, art, and early childhood development to develop children's educational products (creative thinking, communication, teamwork).

Laurie's presentation can be found here and Liesl's presentation can be found here.

Panel – Workforce Preparation: Are Our Ocean Science Graduates Adequately Prepared? – Monty Graham (USM), Ruth Perry (Shell) and Laurie Jugan (on behalf of Tina Tinney, Northshore Technical Community College)
Industry and academic representatives identified needs and gaps in current training available to graduate students and discussed opportunities for improvement. Hard truth that we face, as we talk about the great things we want to do to train students, is that we are facing declining investments in state funds (documentary: *Starving the Beast*). The value of a graduate education in science used to be of benefit to the community, but is now seen as an investment to the individual. If we want them to have leadership and communication and other skills, then that that requires not only a curriculum shift but possibly a shift in funding sources.

Northshore Technical Community College (NTTC) worked with industry and alumni to develop a curriculum to support the industries within their region. They teamed with a 4-year university to keep the education going; asked industry what were the biggest needs in the next 5 years: Marine engineering, Unmanned systems, and Vessel operations and maintenance. Curricula for each track is very tailored and industry-led - industry members teach some of the courses. Looking at next areas, marine GIS and marine geomatics.

USM had two traditional programs, marine bio based at gulf coastal science lab, and oceanography based at Stennis; brought everything under one academic roof. Partnerships are key to leverage opportunities for students, R/V *Point Sur* partnered with the LUMCON group that manage the R/V *Pelican*; leveraged into opportunities to partner with state and commercial opportunity. Location at Stennis affords for opportunities to partner with the Navy. The end game is not just training more ocean scientists but creating opportunities for students in other colleges (business, nursing, etc) to have some knowledge of marine science to create a smarter coastal society overall.

Students can create and should be encouraged to create interdisciplinary opportunities during their graduate studies. Ruth is an intermediary between Shell, regulations, policy, and research, which requires a wide breadth of knowledge. Companies like Shell are looking for highly educated people with expertise, but get the bigger picture and are able to communicate this to a variety of audiences - communicate the value of what they do, the expertise they know and have the confidence while doing both (confidence is also a soft skill). Faculty can expand upon their teaching by reaching out to industry, tap into the networks, have them present their business/industry challenge to your students. Use alumni to expose students to networking as a soft skill and to encourage students to get involved in societies that are maybe outside of their box.

Discussion – Actions and Recommendations for OSER Community – Bradley Moran, UAF
Recommendations and actions for the marine science and technology academic community, including COL, to improve and fill training gaps.:
- Define the blue economy.
    - At a time in ocean science education where we either eat or be eaten, so this blue economy may be a way
    - What is the blue economy? Who owns it? How big is it?
- Define the customers.
    - Who will hire our blue economy scientists?
    - Engage industry aggressively.
- Get the money/resources.
    - Can't just turn to industry
    - Public/private partnerships
- Define the strategies and partnerships
    - Figure out the way forward
- Help graduates influence the decision/policy makers
    - Opportunity to bring students to COL events (Industry Forum and Public Policy Forum)?
- Companies are interested in alternative opportunities to meet these bright/best students; could be an opportunity for corporate sponsorship

Day 1 Recap – Bradley Moran, UAF
Key take-aways and themes from day 1 revisited with additional ideas and recommendations:
- Suggestion to further define "industry" by region and present this information in a regional context
- Reaching out to alumni and career development offices at universities
- AGI exit survey, if department participates then get back aggregate data, asks the question about whether students are willing to be contacted
- Pathways to science, the societies (AGU, ASLO) do a lot of these things, aggregate resources/job/etc; continually push students in those directions
- Special issue of Oceanography focuses on societies and what they offer to students
- ESWN (Earth Science Women's Network) listservs
- MTS has links to industry
- Similar to NOSB, could do some sort of technology competition to be judged by industry (Ocean Innovation Bowl); MTS does an ROV competition; idea-visualization tools
- Industry support of graduate research? Very common in engineering/business schools

Review of OSER 2014 Actions – Leigh Zimmermann, COL
The actions resulting from OSER 2014 were:
- Fill in the gaps in the present survey
- Provide clearing house for resources that are useful to graduate-level educators and administrators, including examples of non-traditional career paths for their students
- Work as a community to create better messaging about what ocean science is and derive an outreach tool for potential students. Some examples of areas where improvements could be made include:
  - In terms of attracting underrepresented groups, there is a perception that ocean science is a "soft science."
  - In terms of attracting a broader range of students in general, people do not necessarily understand that ocean science encompasses so many disciplines (e.g., someone interested in microbiology may not realize that this can be done as part of ocean science)
  - Some terminology can be confusing for outsiders. For example, those not familiar with the field might wonder about the difference between ocean and marine science.
- Create a match-making message board (or other mechanism) for institutions to collaborate on student- and course-sharing
  - For course-sharing, institutions would have to give credit (for it to work); can do MOUs to avoid tuition exchange, or do something creative like take a class at another institution, but call it an independent study

Additional resources and recommendations:
- AGI website: career resources, infographic on non-traditional careers
- Alumni career panels to show students real-life examples
- General get the message out about the scope of ocean science and its importance, incredible diversity of opportunities
- REU programs are extremely valuable for this type of pulling from the "hard" sciences into
- Should we change the language to Ocean STEM, rather than Ocean Science?
- Could COL help design a marketing campaign (include social media) that institutions can use to recruit students from STEM? To post on a job board? Could also be used at high schools? 2-year colleges?
- Learning exercise on a critical concept that uses oceanography examples (law of solubility → use ocean surface exchange example)
- CERC website and COSEE network, science kits from C-MORE.

- Individual institutions bring in K-12 teachers to train on oceanography concepts
- Sea Grant programs have a lot of these types of activities, tend to be regional/local in nature
- Environmental Science AP exam- does it have any ocean/marine science? NSF GEO tried hard to include Earth Science in the course/exam; recent AP exam questions dance around the ocean
- Opposite ends of the same pipe; reason that people want to go into medicine and law is because they know they can get a good paying job; need to help tell the story that people with oceanography/ocean science degrees can make a good living
- Diversity issues include pipeline issues, mentoring, break points, (Duke University recently posted a job announcement asking for a redacted CV – no names)
- 2012 Jim Yoder workshop at WHOI, increasing diversity in Ocean Science, oceanopportunities.org site has not been updated
- COL to push federal governments to create/support diversity fellowships, focus at NSF is on transformative stuff; could this be a recommendation from this group to push
- The real breakdown is in the connections between people; these resources and information need to be shared with students; is social media (twitter and snapchat, youtube) a way to improve these connections? Videos and photos help drive traffic (and algorithms). Short communications are best. #15secondscience

Leigh's presentation can be found here.

OSER 2016 Data – Amanda Holloway, COL

Amanda presented update on OSER graduate and faculty surveys, including a look at the variation in IPEDS reporting across institutions. Key thoughts:
- Some institutions are changing their departments to address interdisciplinary nature/thematic, so that may explain the increase in the "other" category.
- Lack of support of grants in marine bio may be the explanation for the decrease in marine bio applications/employment
- While over 50% of completions are women, not seeing this reflected in faculty
- Both things need to happen at once, increase in students' awareness of other career paths and support of diverse workforce in academia
- How do IPEDs codes get changed? SIP codes are managed by the Dept. of Ed.

Amanda's presentation can be found here.

Current Graduate Training Landscape
Steve Skrabal, University of North Carolina Wilmington (UNCW):
- new joint PhD between UNCW and ECU; 70-80 professors at UNCW but scattered throughout the departments, but looking for inter-institutional collaboration, integrated coastal marine science is the name of the new program, intention is to be accessible to students with more traditional marine science research and be inviting to policy/health/etc.
- Three themes, students have to pick primary and secondary: Scientific, Social sciences, Other
- Students take courses in both primary and secondary to stress the interdisciplinary, team work across the themes
- 120 potential faculty mentors
- Include a chapter in the dissertation to include the interdisciplinary nature
- If students are coming in without STEM background, there are two new courses (4 credits each) and the goal is that they can teach an Oceanography 101 course

Rob Wheatcroft, Oregon State University (OSU):
- ~200 students between geography, geology, marine resource management, ocean earth science,
- Have professional advisors (4 FTE) for undergraduates
- Experiential learning coordinator, publishes weekly list of internship opportunities
- In some undergrad degrees, require an internship
- 2-person student development office, for grad students
- Board of advisors, alumni, mostly from geoscience side, come 2x/year to expose both undergrads and grad students to life outside of academia, don't have very many ocean science type advisors (gap to improve)
- Several 1-credit student to professional classes, mostly for undergrads
- Mentoring Program, pairs grad students with undergraduates, gives grad students training in mentoring
- IDP, AAAS, myidpsciencecareers.org, scientific skills assessment (science knowledge, communication, writing and editing, presenting, teaching, etc) where students self-assess, encourage students to use this to structure their interactions with their mentors/advisors, set goals on a quarterly basis and re-assess on recurring timeframe
- Feel that "hard" science faculty should be teaching these "soft" skills, instead point students to various resources and put the onus on the students

Peter McCarthy, Harbor Branch Oceanographic Institute (HBOI):
- Historically a private research institution, had many internships, etc, collaboration with FAU to do semester by the sea
- In 2007, became a part of FAU
- Currently have 25 graduate students, fairly steady for 3 years
- Currently registered in programs in Boca Raton or Davy, so students had to drive to those locations to take their classes, but using technology to overcome this program
- Trying to develop new programs in marine science, new masters in marine science and oceanography in fall '17, based at HBOI and Boca Raton
- One of main goals is that all of the students feel like they're part of the program, first semester will take place at HBOI
- All PhD students are part of Integrative Biology run out of Boca Raton, adding a track in marine science and oceanography
- Building up the # of students
- Tackling the communication skills for the students, lecture series by faculty get 300-400 attendees
- Started Lunchtime Lecture Series that is given by graduate students
- 3-minute thesis; can you describe what you do in 3 minutes without using jargon?
- HBOI is being used as a recruiting tool for FAU

Other discussion and models for graduate training:
- University of Washington (UW) surveyed alumni and identified career training as a gap, so now use remaining time in a 1-credit seminar course to assess through AAAS tool and started 6-month committee meetings to re-assess through graduate career
  - Important concept is to get faculty to buy-in that it's ok for some students to not follow academic faculty path. Need leadership from Director/Dean
- UW got rid of 5 core courses (atmospheric science included), made 3 co-taught courses, Solid Earth, Fluid Earth, Earth Surface; have formal assessment this year
- MIT Teaching/Learning lab, write a teaching statement, and MIT Writing Center, geared towards good writing but not technical writing

- Texas A&M University undergraduates must take 2 "writing intensive" certified courses
- LSU, techniques in presentations and journal and proposal preparation/collaboration are two courses; has three pathways for undergraduates, rigorous science, policy/management, environmental health 5-year program (3 years at LSU and 2 years at LSU School of Public Health), program is only 7-years old and grew from 5 students to 140 current students

OSER community is split between programs that still use 4 core courses and the more interdisciplinary model (some anecdotal evidence is that it is not working). According to Oceanography special issue, 33% still have 4 core courses.
- How do we teach the breadth courses, so that there is the integration between the material?
  - As a group of core instructions, have them develop the syllabi together
- Suggestion is to make the integrative courses at the higher level, so that all students have the same basis
- Redundancy among the 4 cores is not a bad thing, in fact students may retain better if they can see a concept 2+ times
- Some institutions have even done away with the qualifying exams

Miscellaneous Discussion
- Recap of OSER 2016
- Engagement of industry in a meaningful way, through some sort of innovation bowl
- Is it possible to tease out a few institutions that have reported every year? And aggregate that data? Or pull out an individual institution's data?
  - Potential internship to digitize and fill in gaps in the data
  - Question about making the data public; having this data set to be able to do peer comparisons for accreditation
- Ocean Opportunities website not updated in 4 years, but facebook page has been updated within last day (Meg will talk to Jim Yoder), suggestion to link Facebook page to other social media platforms, such as Instagram, twitter
- COL create website to post internship opportunities (work with industry), PhD opportunities, project management/communication workshops and seminars
- Ideas for topics at next meeting - what's happening, curriculum, expansion of nodes/networks (especially in context of diversity), REUs are a recruitment tool.
- PEP program (partnership education program), targets HBCU, bring 2-4 former PEP students into summer fellowship program, NOAA/MBL/WHOI funded, WHOI contribution is to pay some post-docs to teach a few introductory courses.
- Undergraduate honors/capstone project/thesis can be a good hook, as well
- Follow up activities from OSER 2016, including the following actions:
  - Send data back to individual institutions and ask them to backfill the data
  - Get the information (in a database?) the Russ McDuff has to COL
  - COL advocate for bridging gap between academia and industry
  - Pursue NSF sustained funding for diversity in ocean science education, addresses concern about 3-5 year projects
  - Create a content/resource page on the COL website
  - Identify host and planning committee for OSER 2018

Meeting Attendees

Amanda Holloway	Consortium for Ocean Leadership
Bradley Moran	University of Alaska Fairbanks
Brian Shedd	Louisiana State University
Carolyn Wilson	American Geosciences Institute
Chunyan Li	Louisiana State University
David Black	Stony Brook University
David Naar	University of South Florida
David Smith	University of Rhode Island
Dianne Lindstedt	Louisiana Sea Grant
Frank Sansone	University of Hawaii-Manoa
Jen Biddle	University of Delaware
Kam-Biu Liu	Louisiana State University
Karen Jones	Louisiana State University
Kenneth Rose	Louisiana State University
Larry Sanford	University of Maryland Center for Environmental Science
Laurie Jugan	Marine Industries Science & Technology Cluster
Leigh Zimmermann	Consortium for Ocean Leadership
Liesl Hotaling	Marine Technology Society
Mark Warner	University of Washington
Meg Tivey	Woods Hole Oceanographic Institution
Monty Graham	University of Southern Mississippi
Nancy Rabalais	Louisiana State University
Peter McCarthy	Harbor Branch Oceanographic Institute
Rick Shaw	Louisiana State University
Rob Wheatcroft	Oregon State University
Roy Keller	Louisiana Technology Transfer Office
Ruth Perry	Shell
Shari Yvon-Lewis	Texas A&M University
Stephanie Sharuga	U.S. Fish and Wildlife Service
Stephen Skrabal	University of North Carolina Wilmington
Sue Cook	The Oceanography Society
Thomas Chance	ASV Global, LLC.
Todd Christenson	National Oceanic and Atmospheric Administration