Certification Program for Oceanographic Professionals: A Needs Assessment Study

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Tom Murphree

Marine Advanced Technology Education Center
Monterey, CA

Presentation to the ORRAP
27 June 2007
Washington, D.C.
<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Development of a Certification Program for Oceanographic Professionals (CPOP)</th>
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<tr>
<td><strong>Lead Institution</strong></td>
<td>Marine Advanced Technology Education (MATE) Center Monterey Peninsula College</td>
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</tbody>
</table>
| **PIs**         | Deidre Sullivan, MATE Center (dsullivan@mpc.edu)  
|                 | Leslie Rosenfeld, Ph.D. (l.rosenfeld@sbcglobal.net)  
|                 | Tom Murphree, Ph.D. (tom_murphree@yahoo.com) |
| **Funding**     | NOAA’s National Ocean Service + Office of Oceanic and Atmospheric Research |
| **Period**      | October 2006-September 2007 (initial)  
|                 | October 2007-September 2008 (anticipated) |
| **Web sites**   | CPOP Project: [http://marinetech.org/cpop/](http://marinetech.org/cpop/)  
|                 | MATE Center: [http://marinetech.org/](http://marinetech.org/) |
Certification vs Certificates

Certification
“recognition by one’s colleagues and peers that an individual has demonstrated professional integrity and competence in their field” (American Society for Photogrammetry and Remote Sensing).

Accreditation
The process of evaluating the academic qualifications or standards of an institution or program of study in accordance with pre-established criteria (GISCI.org web page)

An individual is certified, an institution is accredited.

Certificate
A document attesting to completion of a course of study not leading to a degree.
Licensure vs Certification

From Navy Credentialing Opportunities Online (COOL) https://www.cool.navy.mil/index.htm

Licensure
Governmental agencies—federal, state, or local—grant licenses to individuals to practice a specific occupation, such as a medical license for doctors. State or federal laws or regulations define the standards that individuals must meet to become licensed. Licenses are typically mandatory.

Certification
Non-governmental agencies, associations, and even private sector companies may grant certificates to individuals who meet predetermined qualifications. These qualifications are generally set by professional associations or by industry and product-related organizations. Certification is typically an optional credential, although some state licensure boards and some employers may require certification. For many occupations, more than one organization may offer certifications.
Motivation
Assessing oceanographers’ qualifications has become more difficult and more important due to:

1. Increased complexity and multidisciplinary nature of oceanography
2. Increase in operational oceanography activities
3. Increased public attention to the ocean and ocean issues

Goals
Investigate professional certification for oceanographers as a means to:

1. Enhance professional development
2. Aid in development of ocean-related workforce
3. Improve ocean-related education
4. Assist users of oceanographic products & services

Objectives
1. Assess the need for a CPOP
2. Prepare report on need for, and pros and cons of, a CPOP
3. Develop overview plan for a CPOP, if warranted by assessment
4. Investigate with U.S. Department of Labor the possibility of establishing a specific occupational title for oceanographers
Potential Benefits of a CPOP

1. Definition of a professional body of knowledge
2. Accepted standards for determining qualifications
3. Aid in evaluation of job applicants, employees, and peers
4. Broadening of career opportunities
5. Increase in professionalism by encouraging professional development and advancement
6. Establishment and maintenance of standards of professional practice and ethical conduct
7. Increase in awareness, understanding, confidence, and reliance on oceanographic community by users of oceanographic products & services (e.g., regarding consulting, testimony, support for operations, policy, education)
8. Increased role for professional societies in promoting oceanography and oceanographic professionals
Questions to Be Answered and Potential Obstacles

1. Who will use certification and how (e.g. employers, customers, general public, peers)?

2. Certification in related professions driven by need for confidence in products & services that affect health, safety, budgets, property values, environmental quality, laws and regulations, national security, etc. Do these types of needs apply to oceanography?

3. Should focus be on traditional oceanography subdisciplines, or other areas such as ocean related data management, geospatial technology, resource management, policy, etc? How many types of certification are appropriate for the broad diversity of oceanographers?

4. How many proficiency levels of certification are appropriate?

5. How should certification be administered and by what organization?

6. Skepticism about need for, and impacts of, a CPOP
   a. Subjective, qualitative assessments
   b. Unnecessary hurdle in career advancement
Education, Career Paths, and Certification

Graduate Schools

Research Scientists (mainly PhD)

Research Support, Operations, Resource Mgmt, Policy, Education

Internships

Navy

Undergraduate & Technical Schools

Marine Techs

More standardized path & assessment processes

Less standardized path & assessment processes ⇒ may benefit from certification

Adaptation of figure by Mel Briscoe
Examples of Possible Levels and Types of Certification

- Use of Forecast Models
  - Exams, education, documentation

- Use of Satellite Data
  - Exams, education, documentation

- Instrumentation
  - Exams, education, documentation

- Data Management
  - Exams, education, documentation

Basic Certification

Exams, education, documentation

Adaptation of figure by Mel Briscoe
Data and Methods

1. Collect and analyze data from:
   a. Meetings with ocean-oriented professional societies (AGU, AMS, ASLO, MTS, TOS, IEEE-Oceans)
   b. Certification programs in similar fields (meteorology, hydrography, environmental science and engineering, ecology, GIS, lake and wetlands science and management, geology, fisheries, remote sensing)
   c. Surveys of employees, employers, and users of ocean products & services (consulting, oil, and other companies; federal, state, and local government; NGOs; marine science education and research institutions; oceanography program alumni)
   d. Interviews
   e. Facilitated workshop
Data and Methods

2. Coordinate and collaborate with professional societies and other organizations, including government agencies, on related efforts in:
   a. Education
   b. Professional development
   c. Professional standards
   d. Certification

3. Investigate education programs created to meet emerging requirements for ocean workforce, including:
   a. MS program in Operational Oceanography at Rutgers
   b. Master of Geosciences Certificate in Ocean Observing Systems at Texas A&M

4. Research standards and organizations that accredit scientific certifications
   b. Council of Engineering and Scientific Specialty Boards
   c. ASTM International (formerly American Society for Testing and Materials)
Options for Managing a National Certification Program

Option 1
Professional society or societies

Option 2
Independent certifying body with participation by professional societies, employers, educators, and/or government agencies

Option 3
Employers and/or trade organizations

Option 4
Government agency

Related Ocean Workforce Project

Title: Understanding and Predicting Changes in the Workforce for Ocean Sciences, Technology, & Operations

PIs:
- Deidre Sullivan, MATE Center, lead PI
- Tom Murphree, Naval Postgraduate School
- Leslie Rosenfeld, Naval Postgraduate School
- Lisa Campbell, Texas A&M University
- Sharon Franks, Scripps Institution of Oceanography
- Bruce Gilman, Marine Technology Society
- Janice McDonnell, Rutgers University
- Drew Michel, ROV Technologies, Inc.
- Cheryl Peach, Scripps Institution of Oceanography

Sponsor and Funding Period: NOPP, October 2006 - September 2008

Goals:
- Produce a more complete description of the present state of the ocean science, technology, and operations (OSTO) workforce
- Anticipate future developments in this workforce
- Characterize the educational programs that will be needed to respond to those developments

Project Site: www.marinetech.org/OSTOworkforcestudy
Accomplishments to Date

• Completed investigation of 12 professional certification programs in similar fields using websites and online documents

• Met with AGU Ocean Sciences section officers, AMS Council and Commission on Professional Affairs, TOS Council, MTS Council, ORRAP Industry and Education Sub-panels

• Have investigated organizations that accredit certification programs for scientific professionals

• Compiled list of potential respondents for surveys
Accomplishments to Date

• Have had discussions with NOAA and Naval Meteorology and Oceanography Command to coordinate and collaborate on workforce studies and competency models / knowledge and skills guidelines (skill standards)

• Initial survey for OSTO project, including questions on certification, is ready for distribution

• ORION Newsletter article – included in information for this meeting. We’ve received several inquiries and responses as a result.

• April 27, hosted meeting in D.C. on ocean workforce and certification issues. Representatives from CORE, JOI, MMS, NASA, NOAA, NOPP, NSF, ONR, TOS, USGS. Met later with DOL representative.
# Summary of information on 10 certification, 1 licensing and 1 chartered accreditation program

<table>
<thead>
<tr>
<th>Sponsor</th>
<th>Govt. entity (2); professional society (8); independent agency (2)</th>
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<tbody>
<tr>
<td>Start year</td>
<td>1957-2004</td>
</tr>
<tr>
<td># people certified</td>
<td>51 - 1600; ~5000 professional geologists</td>
</tr>
<tr>
<td>Fees</td>
<td>1st time: $100 - $600; renewal: $35-$275</td>
</tr>
<tr>
<td><strong>Education requirements</strong></td>
<td>None; bachelor's, bachelor's with certain courses; B.S.; bachelor's in engineering; master's</td>
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<tr>
<td><strong>Experience Requirements</strong></td>
<td>2 – 16 yrs; 5 yrs is most common. For some, M.S. may be used to substitute for 1-2 yrs; Ph.D. for 2-3 yrs. For one, A.S., B.S., M.S. or Ph.D. each count for 0.5 yrs experience.</td>
</tr>
<tr>
<td><strong>Test requirements</strong></td>
<td>None (5); oral (1); written (3); written or oral (1); written and oral (2)</td>
</tr>
<tr>
<td><strong>Other requirements</strong></td>
<td>References; technical report; sign code of ethics; membership in a professional society; essay</td>
</tr>
<tr>
<td><strong>Continuing requirements</strong></td>
<td>Point system for professional development activities (7)</td>
</tr>
<tr>
<td><strong>Recertification interval</strong></td>
<td>5 yrs (7); 3 yrs (1); 1 yr (2), none (2)</td>
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Survey Certification Questions

We are assessing whether there is an unmet need for voluntary certification of some ocean professionals. Such programs already exist for a few ocean-related professions, such as meteorology, fisheries, and diving. One potential benefit of certification includes the development of accepted standards for determining qualifications to aid in evaluation of job applicants, employees and peers.

• As an employer/supervisor, for which types of positions might a new certification program for ocean professionals be of value?

• Would nationally standardized measures of employee competence, such as certification, be useful in marketing your products or services to clients and users?
  Yes  No  Maybe

• Are there other reasons for which you would find certification beneficial to you or your organization? If so, please list them below.

• What are your concerns about certification for oceanographic professionals?
Next Steps

1. Working in concert with OSTO project, analyze OOS employer surveys to get information on attitudes about certification, and a better characterization of the oceanographic workforce.

2. Make contact with sponsoring organizations for related certification programs to verify and augment information obtained from web sites.

3. Take advantage of MTS, TOS, ORRAP and its sub-panels, OSTO PIs and advisors, and others, in trying to identify users and industries which might benefit from and/or advocate for certification.

4. Work with ASLO to set up special session and workshop at Ocean Sciences meeting in Orlando in March 2008.
JSOST Inter-Agency Task Force on Anthropogenic Sound and the Marine Environment

27 June, 2007 briefing* of:
Ocean Research and Resources Advisory Panel (ORRAP)
CORE Headquarters, Washington, D.C.

* Given by Dr. B. Southall (NOAA Ocean Acoustics Program and Task Force Executive Secretary) on behalf of the task force
Anthropogenic Sound and Marine Life

Humans produce underwater sound either intentionally (sonar, seismic exploration, research, navigation) or incidentally (shipping, drilling, construction).

Similarly, marine animals produce sound and listen for environmental acoustic cues. Underwater sound is very important in life history.

WHAT ARE THE SCIENCE AND TECHNOLOGY NEEDS TO ADDRESS:

WHEN IS ANTHROPOGENIC SOUND A THREAT TO MARINE LIFE?

WHAT CAN BE DONE TO MITIGATE IMPACTS WHILE ALLOWING ACTIVITIES VITAL TO NATIONAL & ECONOMIC SECURITY?
Why does the USG care?

Protection of marine animals from excessive sound is a conservation issue regulated under:

- Endangered Species Act
- Marine Mammal Protection Act
- Magnuson-Stevens Fishery Conservation and Management Act
- National Environmental Policy Act
- CZMA (in California)
History of Interagency Acoustics Task Force (IATF)

• **21 September 2006**: Following inter-agency collaboration, Dr. Robert Gisiner (ONR) presents briefing to ICOSRMI entitled “Effects of Anthropogenic Sound on Marine Mammals: An Interagency Issue”
  – ICOSRMI concurs with the need for inter-agency collaboration and calls for formation of a task force with reporting structure and other details TBD.

• **13 December 2006**: Mr. Donald Schregardus (DASN, Environment) presents information paper developed by “core” agencies (Navy, NSF, NOAA, MMS) to ICOSRMI. Five key science and technology areas are highlighted.
  – ICOSRMI calls for the task force to “continue to develop a detailed strategy for moving ahead with necessary efforts to coordinate and enhance research into the impacts of sound on marine mammals”

• **December 06-April 2007**: Formation of IATF beyond the core agencies to include most of targeted membership with primary and alternate representatives. IATF executive secretary selected (NOAA primary); terms of reference (TOR) produced.

• **27 April 2007**: Task Force Exec Secretary (Dr. Brandon Southall, NOAA) briefs ICOSRMI
  – ICOSRMI concurs with TOR proposal for IATF to report to JSOST, but inform ICOSRMI, SIMOR, and ORRAP. ICOSRMI makes several suggestions regarding TOR but instructs IATF to begin formally interacting with JSOST, beginning with revision/acceptance of TOR.

• **17 May 2007**: IATF briefs JSOST regarding TOR and other details regarding task force.
IATF Terms of Reference

~ Goals ~

(1) *Identify* scientific and technical requirements in assessing the extent and significance of effects from manmade sound on the marine environment;

(2) *Strengthen* coordination among federal agencies to *address scientific and technological aspects of this issue relating to various needs of the U.S. government*;

(3) *Develop* an inter-agency science and technology course of action for the purpose of minimizing adverse effects of human sound-producing activities.
IATF Terms of Reference

~ Scope ~

(1) *Compare* and integrate existing individual agency plans for addressing this issue;

(2) *Identify* remaining knowledge and capability gaps that limit the ability of the federal government to make informed decisions and take effective action on this issue;

(3) *Develop* strategic directions for federally-funded research on this issue, with cognizance of ongoing and needed research domestically and internationally.

(4) *Recommend* coordinated agency actions, identify agency leads for those actions, identify potential interactions with other bodies, and estimate fiscal requirements.

(5) *Integrate* IATF recommendations with other relevant ongoing national ocean policies and practices being developed by ICOSRMI, JSOST, and SIMOR.

(6) *Transfer* information and recommendations contained in the task force report to appropriate federal, state, and private entities, as directed/approved by JSOST.
IATF Terms of Reference

~ Membership ~

(1) Department of Commerce (National Oceanic and Atmospheric Administration);
(2) Department of Defense (U.S. Navy, U.S. Air Force, U.S. Army Corps of Engineers; Joint Chiefs of Staff);
(4) National Science Foundation;
(5) U.S. Marine Mammal Commission;
(6) Department of Homeland Security (U.S. Coast Guard);
(7) Department of State;
(8) Department of Energy;
(9) Department of Transportation;
(10) Department of Justice;
(11) U.S. Environmental Protection Agency;
(12) Smithsonian Institution;
(13) Subcommittee on Integrated Management of Ocean Resources (SIMOR);
(14) Office of Management and Budget;
(15) Office of Science and Technology Policy, Executive Office of the President
(1) By 15 September 2007 (revised from 31 July), the IATF will provide to JSOST an initial draft review with recommendations bearing on each of the three (3) stated goals.

(2) By 1 April, 2008, based on interactions and feedback from the member agencies, JSOST, and ICOSRMI, as appropriate, the Interagency Task Force will submit its final report and recommended action plan, with approximate cost estimates, to JSOST. The final report, which will be reviewed and cleared by JSOST, will include recommendations for tracking implementation and progress on the suggested course of action. The report will also identify education and outreach opportunities with the public and non-governmental organizations related to the proposed plan.
Current Status of IATF

• Primary and alternate members identified for most agencies;
• Introductory meeting (18 April) to develop draft terms of reference (TOR);
• Reporting/communication structures determined (JSOST);
• Detailed timeline for task force deliverables developed;
• TOR finalized and approved by JSOST;
• Second meeting held 21 June (Goal 1 – identify existing S/T efforts and coordinating mechanisms);
• Next steps: Identify and prioritize areas of needed research and development, including logical agency leads in key areas and approximate cost estimates; Produce draft report to JSOST by 15 Sept.
QUESTIONS/COMMENTS???
The U.S. Extended Continental Shelf

David A. Balton
Deputy Assistant Secretary for Oceans and Fisheries

Margaret F. Hayes
Director, Office of Oceans Affairs

Brian Van Pay
Geographer, Office of Oceans Affairs

U.S. Department of State

Ocean Research and Resources Advisory Panel (ORRAP)
Thursday June 27, 2007
What is the Extended Continental Shelf?

Every coastal State gets a 200-mile shelf automatically.

Some coastal States can claim an extended continental shelf beyond 200 miles.

UNCLOS Article 76.
How Do We Establish the Outer Limits?

If we accede to the LOS Convention:
- Ramp up data collection and analysis now!
- Submission to Commission on the Limits of the Continental Shelf (CLCS)

Otherwise:
- Ramp up data collection and analysis now!
- Develop and implement means to establish the limits of our ECS as a non-party
Why is this Important?

Exclusive sovereign rights over the natural resources of the shelf.
  • Oil, gas, and other mineral resources
  • Sedentary species
    (clams, crabs, scallops, sponges, and mollusks)

Exclusive control over marine scientific research.

Significantly greater certainty.
Where Is Our ECS?
What data do we need?

- Bathymetric Data
- Seismic Data
- Gravity & Magnetic Data
Discoveries in the Arctic

This will be the single largest and most detailed research effort of the ocean bottom in U.S. history.

Bathymetric "pockmarks" on the Chukchi Cap are likely gas seeps and potentially the location of chemosynthetic communities.

The newly discovered Healy Seamount in the Arctic
Cost to Support a U.S. Claim?

At least $50 million over several years still needed
  • Seismic data collection is the largest missing piece
  • Additional bathymetric collection is needed

Additional staff
  • Combination of government and contractor
  • Requires sophisticated science and technical skills

Other cost-related issues:
  • Continued use of the Healy in the Arctic
About 60 countries have a potential ECS.

Most have begun work to support a claim.

9 of those countries have made a submission in whole or in part.

- Russia
- Brazil
- Australia
- Ireland
- New Zealand
- Joint Submission (France, Ireland, Spain, and U.K.)
- Norway
- France (New Caledonia and French Guiana)
Efforts Thus Far

NOAA
• Funded UNH to conduct a study in 2002 for $750,000.
• Provided $11 million to collect bathymetric data off the East Coast, Gulf of Mexico, Mariana Islands, the Gulf of Alaska, the Gulf of Mexico, and the Arctic Ocean.

Navy
• Provided ships for the collection of bathymetric data off the East Coast and in the Marianna Islands.

Coast Guard and NSF
• Provided use of the USCG Healy over three summers.

USGS
• 2002 – 2007: $250,000 – $300,000 annually.

U.S. Department of State
• Coordinating ECS interagency working group, providing legal and diplomatic guidance, and examining submissions by other nations.
Interagency Efforts

Department of State (DOS)
Executive Office of the President

Department of the Interior (DOI)
Minerals Management Service (MMS)
U.S. Geological Survey (USGS)

Department of Commerce (DOC)
National Oceanographic and Atmospheric Administration (NOAA)

Department of Energy (DOE)
National Science Foundation (NSF)

U.S. Navy (USN)
Arctic Research Commission (ARC)

Joint Chiefs of Staff (JCS)
Environmental Protection Agency (EPA)
Future Directions of ECS Task Force

Data Management Conference – Late October, 2007

Regional Workshops with Experts – Throughout FY08
  • Arctic Ocean
  • Pacific Islands
  • Bering Sea and Gulf of Alaska
  • Pacific West Coast
  • East Coast and Gulf of Mexico

Desktop study – June 1, 2009
  • Analyze existing bathymetry and seismic data
  • Determine likely ECS limit based on current data
  • Establish priorities for data collection
  • Determine cost estimates
  • Establish priorities

Analyze CLCS Recommendations and ECS Submissions – on going
Questions?
Outline

• Why the Academies?
• Origin of the Ocean Studies Board
• OSB Activities
• Reports and project planning
• Funding
• Dissemination
Why the Academies?

- Independence (non-profit, non-government)
- Balance (range of perspectives represented; report is based on consensus)
- Objectivity (conflict of interest procedures)
- Quality (NRC oversight, external peer review)

Each activity is conducted by a group of volunteer experts, selected for that specific task, and overseen by the National Research Council.

180 scientific and technical professionals donated their time and energy to OSB studies from 2005-2006
NAS Early History

1863
NAS Founded
Alexander Dallas Bache,
President

1916
NRC formed to improve cooperation among research organizations

1917
Committee on Physics Submarine Investigations Subcom.
Robert Millikan, Chair
Navigation Specifications for the Emergency Fleet
Lewis Baer, Chair

1919
NAS creates 1st Committee on Oceanography (NASCO)
Henry Bryant Bigelow, Chair

1919
Navy requests study on protecting iron ships from salt water
Compass Committee investigates magnetic deviations in iron ships
**Major Milestones in Ocean Science and Policy (1919 - 1985)**

- **1927** NASCO reformed
  - Frank Lillie, Chair

- **1929** NASCO publishes *Oceanography: Its Scope, Problems, and Economic Importance*

- **1948** NASO convenes NASCO at Navy’s request
  - Detlev Bronk, Chair

- **1956** NASCO reconvened at request of ONR, FWS and AEC

- **1959** NASCO publishes *Oceanography 1960-1970*

- **1966** Marine Resources and Engineering Act – established Stratton Commission

- **1969** Stratton Commission Report

- **1970** NASCO becomes Ocean Sciences Board
  - Ocean Policy Committee
  - Ocean Affairs Board
Recent History of Ocean Studies Board


- Ocean Sciences Board renamed Ocean Studies Board
- Walter Munk, Chair
- NOPP legislation
- OSB creates E&T Subcommittee
- USCOP Report 18 OSB reports cited
- Shirley Pomponi, Ocean Studies Board Chair
- NRC review of draft ORPP

1985
- Ocean Sciences Board renamed Ocean Studies Board
- Walter Munk, Chair
- NOPP legislation

1992
- OSB publishes Oceanography in the Next Decade

1997
- OSB creates Fisheries Subcommittee
- Oceans Act establishes US Commission on Ocean Policy

1998
- OSB creates E&T Subcommittee
- U.S. Ocean Action Plan JSOST

1999
- USCOP Report 18 OSB reports cited

2000
- Oceans Act establishes US Commission on Ocean Policy
- U.S. Ocean Action Plan JSOST

2004
- US Commission on Ocean Policy
- OSB starts 100th activity

2005
- Draft ORPP

2006
- Final ORPPIS

2007?
- Shirley Pomponi, Ocean Studies Board Chair
- NRC review of draft ORPP

Legend:
- OSB: Ocean Studies Board
- NOPP: National Ocean Policy Process
- USCOP: US Commission on Ocean Policy
MAIN OSB ACTIVITIES

• Board meetings
• Oversight of studies
  ➢ Study design, committee nominations, reviewers
• Proposal preparation
• Planning meetings
• Dissemination*

Current Studies
➢ Review of the Ocean Research Priorities Plan
➢ International Capacity Building for Sustainable Use of Oceans and Coasts
OSB “Extra” Services

• Briefings – Congress, agencies
• Meeting facilities, assistance, advice
  ➢ ORPPIS launch
  ➢ JGOFS, CORE,
  ➢ Coastal America (and others)
• Communications
  ➢ Revelle lecture
  ➢ Report briefs
  ➢ Ocean science series booklets
• Education and training
  ➢ NAS graduate fellows
  ➢ High school and undergraduate interns
  ➢ Mentoring minority graduate students
• International activities – SCOR, IOC
OSB Studies

702 reports to date in 2007
16,000 reports since 2003
PENDING PROPOSALS

• Environmental Information for Expeditionary Riverine Warfare
• Developing a Coastal Impact Factor to Assess Hurricane Intensity
• Review of NOAA’s Tsunami Warning and Detection System *(congressional request)*
• Review of NASA’s Ocean Biology and Biogeochemistry Plan
• Reducing and Preventing Marine Debris *(congressional request)*
• Review of Sea Turtle Population Assessment Methods *(congressional request)*
Recent ideas from the OSB meeting
• Ocean Acidification (also a congressional request)
• Support for Marine Science in the U.S. Territories
• Progress and Prospects for NOPP
• International Partnerships for Sharing Ocean Data
• Industry and Government Partnerships for Sharing Ocean Data
• Ocean Infrastructure Requirements for ORPP
• Status of Florida Manatee Populations
• Iron Fertilization of the Ocean for Carbon Sequestration
• Sea Level Rise
OSB proposals 2000-2007

• 51 proposals prepared, 29 funded
• 6 proposals initiated by the OSB
• 38 proposals requested by agencies
• 7 congressional requests

Most recently funded proposal: Nov. 2005
Ocean Studies Board Funding
2006
FUNDING FOR OSB STUDIES

Project Support By Sponsor (2002 - 2005)
New Dissemination Activities

• Report Briefs
• President’s Circle Communication Initiative
• Free pdf of Executive Summaries and Selected Reports

Subscribe and receive e-mail updates on the latest reports, projects, events, and other news from Earth & Life Studies at the National Academies dels.nas.edu
The Ocean Studies Board cordially invites you to the

6th Annual Roger Revelle Commemorative Lecture

Featuring
Richard B. Alley
Evan Pugh Professor of Geosciences
The Pennsylvania State University

Abrupt Climate Change, Oceans and Us

This lecture series was created by the Ocean Studies Board in honor of the late Roger Revelle, a giant in the field of oceanography for over 50 years. This event is sponsored by the National Science Foundation, the Office of Naval Research, the Scripps Institution of Oceanography, and the U.S. Geological Survey.