Access to the Polar Oceans
Vessel Capabilities to Meet National Research Needs

- **Science Drivers**
- **Synergies**
- **Current Status**
- **Future Planning**

Polar Marine Science: Sample Science Drivers

Land Ice Loss

Hypothesis: The most rapid losses of land-ice occur in areas with marine-terminating glaciers and ice streams. Freshwater inputs from these areas will increasingly influence circulation and contribute to rising sea level.

Need for the PRV: Access to fjords and glacier fronts to collect seafloor bathymetry, grounding line characterization, and ocean circulation data using AUVs and gliders, moorings

Paleoclimates

Hypothesis: Polar regions have experienced significant changes in climate and abrupt transitions in ice-sheet behavior.

Need for the PRV: Collection of sediment cores in ice-covered waters and coastal areas proximal to outlet glaciers to complement collection of longer, but spatially limited, records through drilling, such as those recently demonstrated by IODP

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Polar Marine Science: Sample Science Drivers

Ocean Acidification

Hypothesis: Ocean acidification will have pronounced impacts in Polar latitudes because of the enhanced solubility of CO_2 in cold waters

Need for the PRV: Ocean observations and experiments in all types of ice cover, instrument and mooring deployments including AUV, gliders, and ROV.

Polar Ecosystems

Hypothesis: Polar organisms are dependent upon and adapted to cold regions. Dual pressures of increasing ocean temperatures and lowered pH will affect processes essential to life influencing how organisms and ecosystems function at a basic level.

Need for the PRV: Penetrate the ice to conduct experiments, deploy instruments, and service observatories that will inform the state of the ocean and its ecosystems.

Polar Vessels Available to U.S. Researchers

	LMG	Sikuliaq	NBP	Healy	ODEN	Sea/Star
Length (ft)	230	254	308	420	353	399
Icebreaking (ft @ 3 knts)	1.25	2.5	3	4.5	5	6
Science/Crew Berths	28/16	26/20	39/26	52/75	50/26	30/155
Vessel Age (yr)	12	N/A	18	11	12	33
Endurance (days)	42	45	52	53	100	86

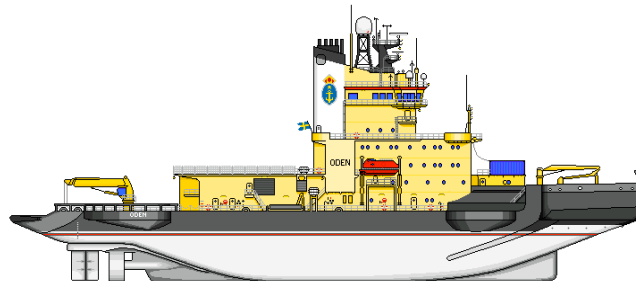**RV Laurence M. Gould**   **RV Sikuliaq**   **RVIB Nathaniel B. Palmer**

USCGC Healy   **IB Oden**   **USCGC Polar Sea/Star**

Light Ice

RV Laurence M. Gould

Seasonal Ice

RVIB Nathaniel B. Palmer

RV Sikuliaq

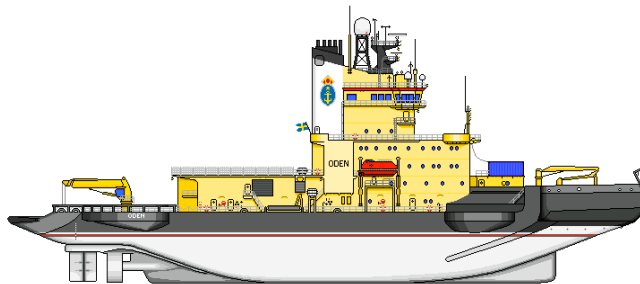**Multi Year Ice**

USCGC Healy

IB Oden

USCGC Polar Sea/Star

Southern Ocean Research: NSF Charters

Laurence M. Gould

- Recently renewed charter for 5 yr (2010-2015) with possible 5 yr (2015-2020) option
- Greater than 20 years old in 2020

Nathaniel B. Palmer

- Current charter expires March 2012
- Request for Proposal vessel with similar capabilities will be released
- 20 years old in 2012

Polar Research Vessel Requirements Study
(2002-2006)

- **Two Workshops – Requirements for Southern Ocean Science**

- **U.S. Maritime Administration and Science Technology Corporation contracted to explore vessel types**

- **ARVOC Created a 15-member Committee to assist process**

- **ARVOC hosted Town Hall meetings**

- **ARVOC surveyed the community for input on science requirements**

Over 270 individuals were involved in this effort

**Requirements Study Documents
http://www.usap.gov/usapgov/vesselScienceAndOperations/PRVSection.cfm**

Conclusions of the PRV Requirements Study

- Year round access to ice covered seas

- Data and sample collection within seasonal and multi year ice

- Stable platform for work within and transit across the Southern Ocean

CAPABILITIES

- Geophysical Mapping (seismic, multibeam)

- Geological Sampling (coring, dredging)

- Biological Sampling (acoustically quiet, nets, trawls, etc)

- Remotely Operated and Autonomous Vehicle deployments

- Water Sampling and Water Column Measurements

- Long endurance vessel, large science party for multidisciplinary research

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Synergies within NSF

- **Complementary science priorities**

- **Common community of users**

- **Planning**

  - **PRV Study**

  - **UNOLS Study**

  - **Planning progressing with OCE input**

Progress Update:

- **NSB Subcommittee on Polar Issues briefed on the Polar Research Vessel August 2010**

- **OPP, working with GEO, engaged UNOLS to refresh Science Mission Requirements**
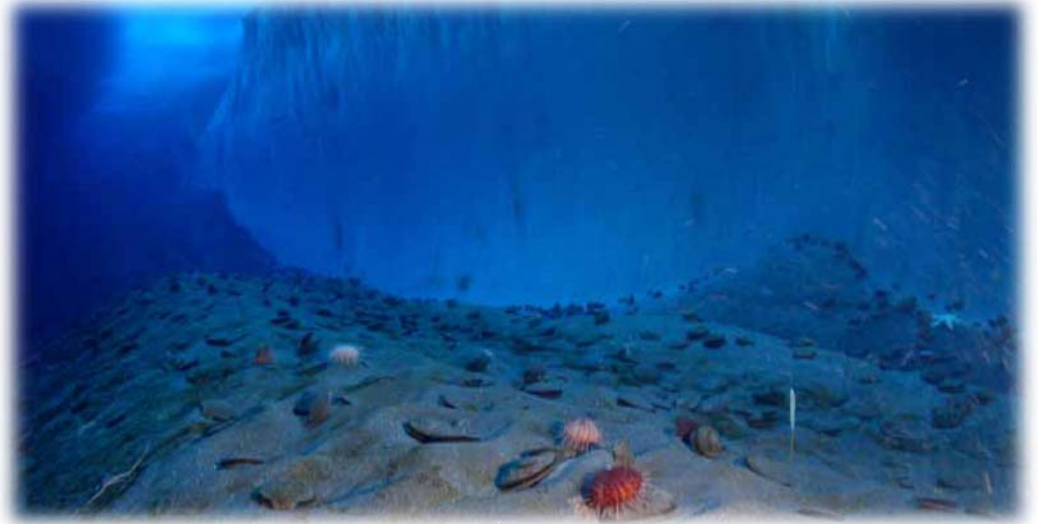
"[UNOLS] offer the experience base and the expertise of UNOLS and the academic fleet operators to assist OPP in further defining the new vessel…"

UNOLS Polar Research Vessel Committee
Science Mission Requirements Refresh

Membership

- Openly solicited nominations by November 3rd
- 8-9 members from the research community (international, disciplinary balance)
- 3-4 Technical Experts (naval architects, vessel operators, vessel technical support personnel)

Activities

- Three Meetings (December at AGU, February at NSF, April)
- Web Survey to collect science requirements
- Community Workshop (mission scenarios; community feedback)
- Internal OPP/NSF discussion of interim findings
- Interim input to NRC committee "Review of the US Antarctic Program: Future Science Opportunities in the Antarctic and Southern Ocean"
- Report to NSF in early June 2011

Next Steps

- **Establish Project Advisory Team (Spring 2011)**

- **NRC and UNOLS studies completed (Summer 2011)**

- **Brief MREFC Panel (Summer 2011)**

- **Director's Review Board (July 2011)**

- **NSB Information Item (August 2011)**

- **Solicit for Project Office contingent on satisfactory progress (Fall 2011)**

Questions?

Future Planning

	2010			2011				2012				2013				2014				2015				2016				2017				2018			
	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Current NBP charter																																			
Proposed NBP charter renewal																																			
Conceptual Design Phase																																			
Community planning/development of conceptual design																																			
Conceptual Design Review																																			
Readiness Stage																																			
Vessel design																																			
Integrated Baseline Review																																			
NSF Approves Submission to NSB																																			
Construction Phase																																			
Final Design Review																																			
Construction of Vessel																																			
Commissioning, Testing and Acceptance																																			