

# ASPIRE: Teachers and researchers working together to enhance student learning

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ASPIRE: The Amundsen Sea Polynya International Research Expedition : Elementa

https://home.elementascience.org/special-features/aspire-the-amundsen-sea-polynya-international-research-expedition/ Reader



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Science of the Anthropocene

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An Elementa Special Feature

# ASPIRE: The Amundsen Sea Polynya International Research Expedition

## Published Articles

*Additional articles under review*

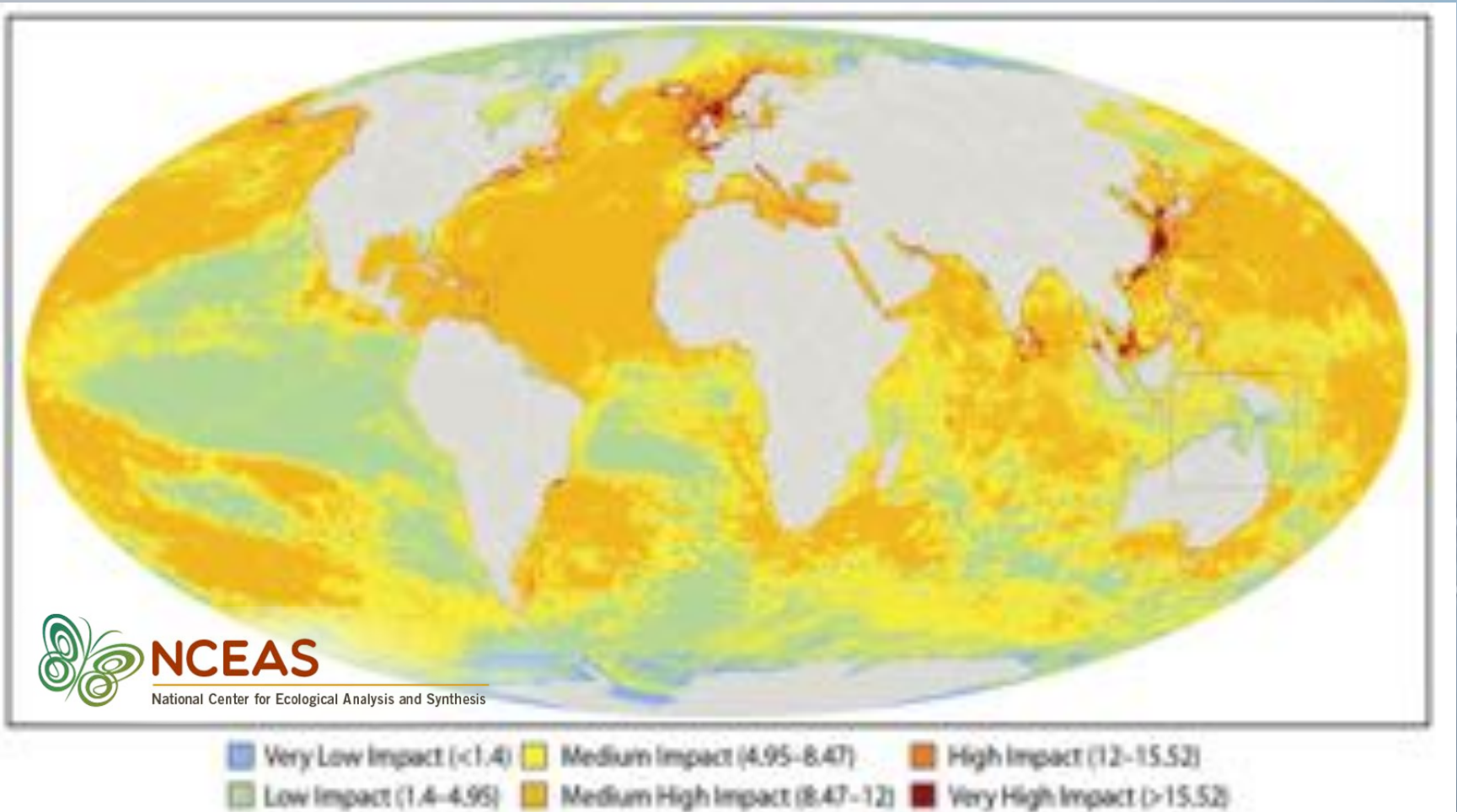
Sea ice algal biomass and physiology in the Amundsen Sea, Antarctica  
Kevin R. Arrigo • Zachary W. Brown • Matthew M. Mills  
Research Article • Ocean Science

**ASPIRE: Teachers and researchers working together to enhance student learning**  
Lollie Garay • Anna Marie Wotkins • Kate E. Lowry • Janet Warburton • Anne-Carlijn Alderkamp • Patricia L. Yager

## Understanding the climate-sensitive processes supporting the Antarctic's most productive marine ecosystem

**T**he Amundsen Sea is a place on Earth about as far as you can get from human civilization. Satellites reveal it to be the most productive region of coastal Antarctica. Nearby glaciers and ice sheets

**Elementa – Science of the Anthropocene** is a new on-line, open-access journal for earth and ocean science that is university-based and not-for-profit, with high-editorial standards. Please see: <http://www.elementascience.org>.

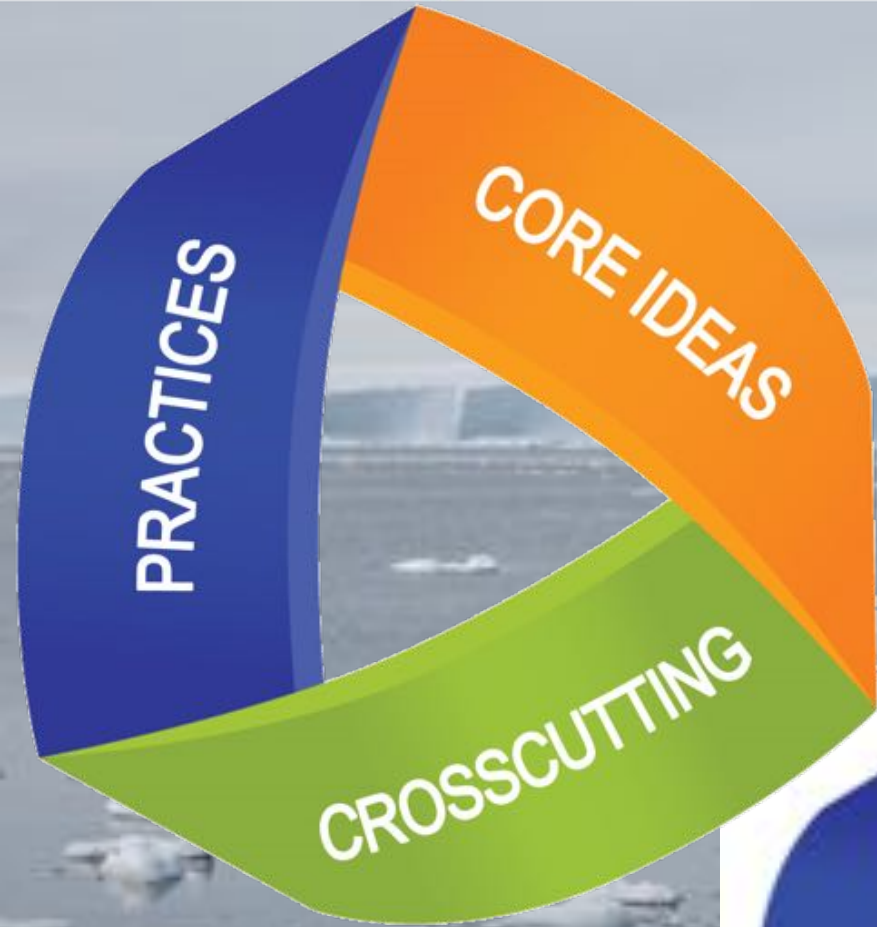


Given the **impact of human activities on the ocean**, involving teachers, students, and their families in scientific inquiry has never been more important.



**STEM** Science, Technology,  
Engineering, Mathematics

**Science, Technology, Engineering, and Math** (STEM) disciplines have become key focus areas in the education community of the United States.



**Next Generation Science Standards** require that educators embrace innovative approaches to teaching.



#### Details



**Completion time:** Less than 1 period  
**Permission:** Download and Share

### Pumping Carbon

#### Overview

This activity allows students to participate in a physically interactive dramatization of the oceanic biological pump.

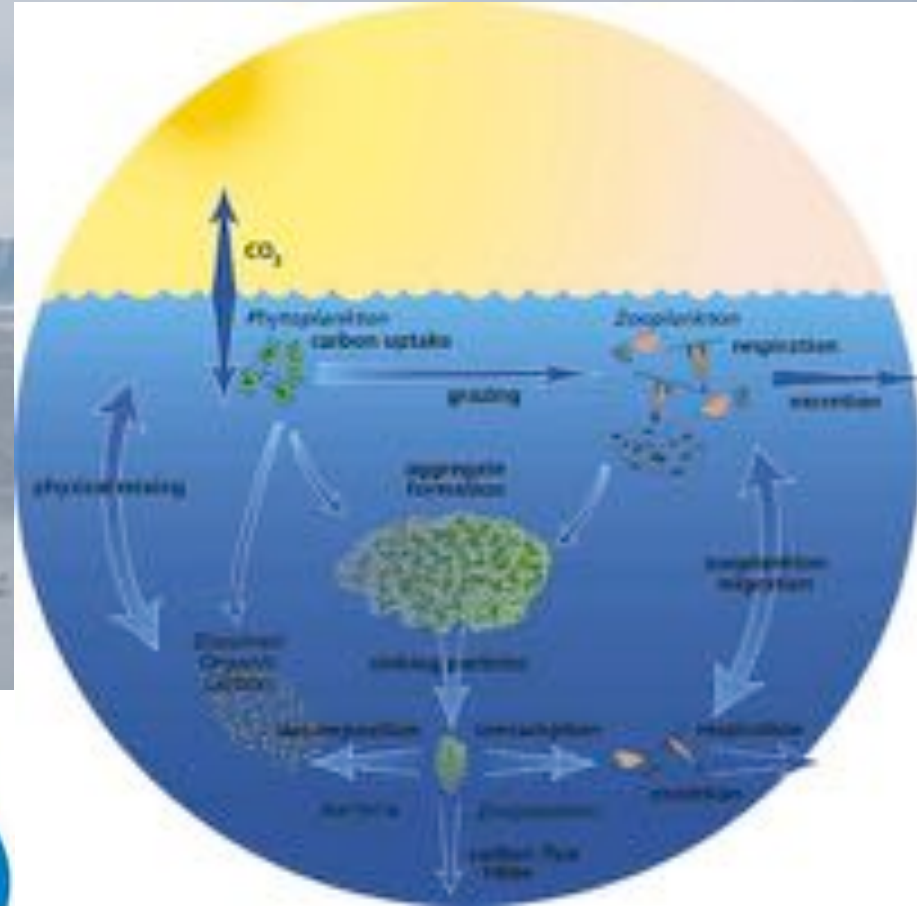
#### Objective

The purpose of this activity is to develop a conceptual understanding of how the biological pump moves carbon through the oceans.

#### Materials

- 2 cans or bottles of coke for demonstration
- Blue crepe paper or material to represent ocean (cheap bed sheets or blue shower liners work well)
- Props for the warmer equa-

Transforming classrooms to **actively engage students** through a combination of knowledge and practice develops conceptual understanding and application skills.



**Crosscutting concepts of research in polar marine science** can serve as intellectual tools to connect important ideas about ocean and climate science for the public good.

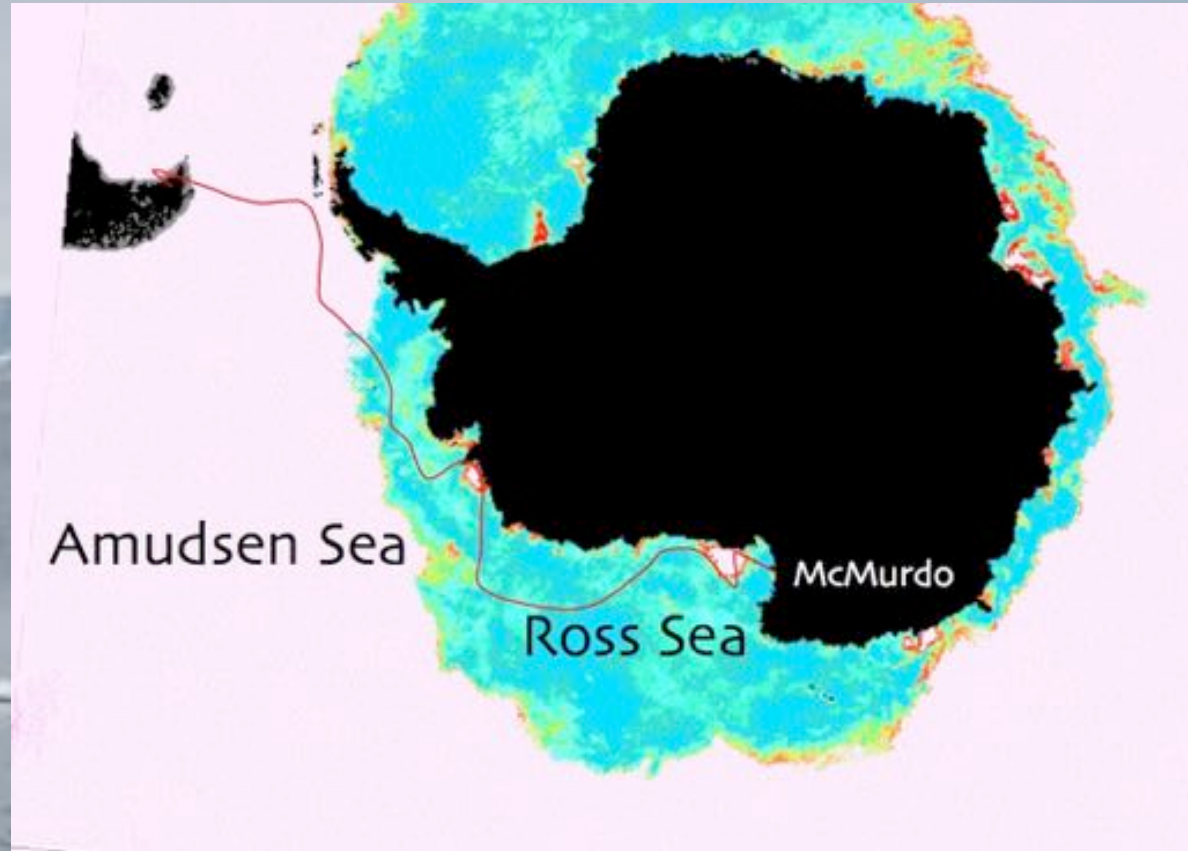


The **partnerships between researchers and educators** during the Amundsen Sea Polynya International Research Expedition (*ASPIRE*) offer an example of how academic research can enhance K-12 student learning.



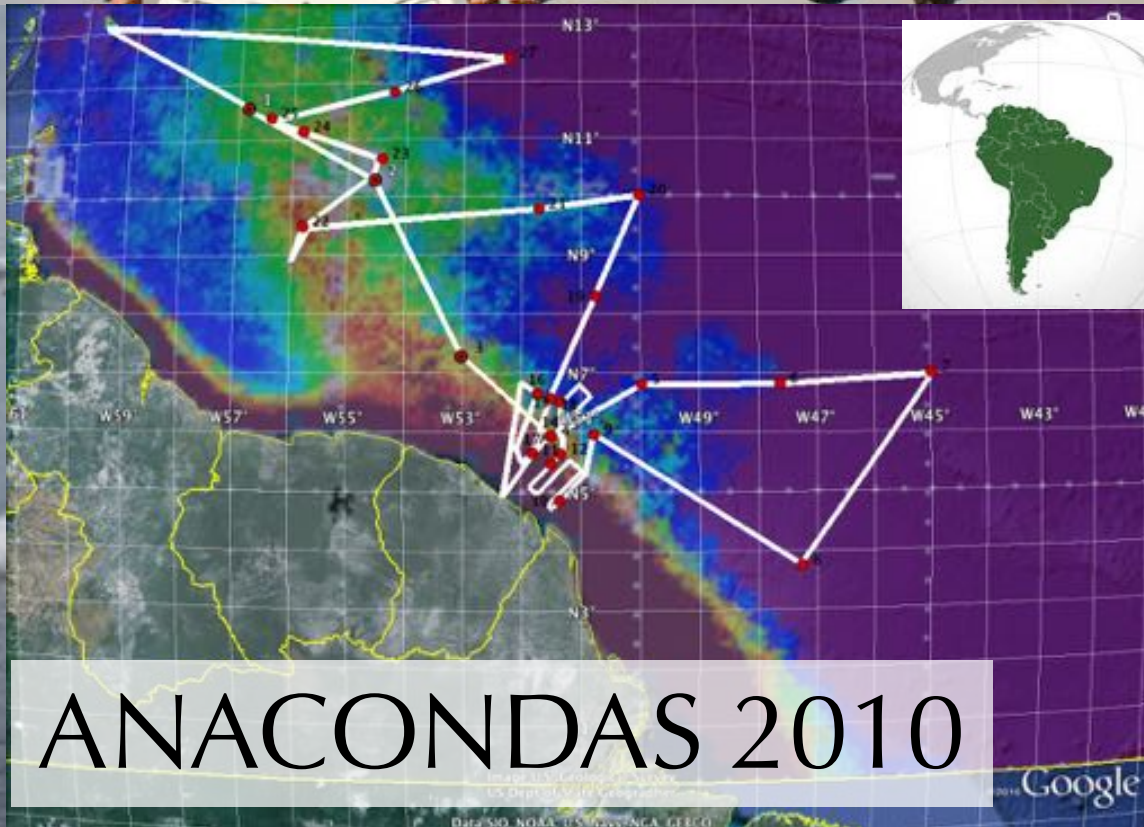


Janet Warburton first introduced Tish and Lollie in 2007 during the planning stages of the Oden Southern Ocean 2007-2008 expedition. They spent nearly two months at sea together and have been fast friends and colleagues ever since.





Tish had another project going on in the tropics studying the Amazon River Plume. She wrote an RET supplement to her existing NSF grant to support Lollie to participate.



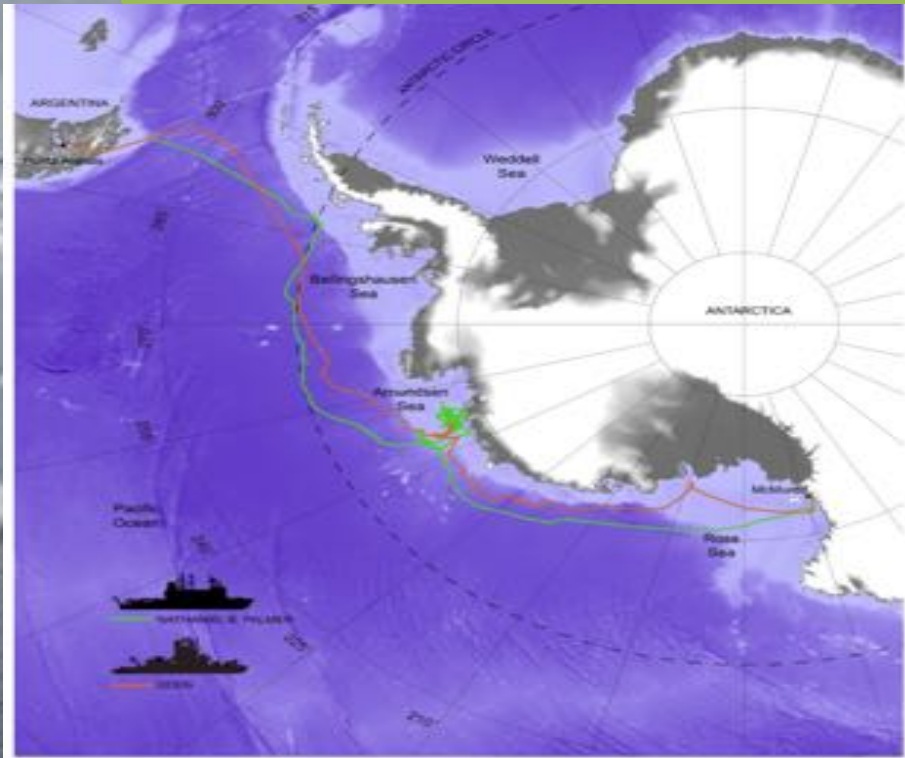


# ARCTIC NITRO 2010-12





# ASPIRE 2010-11



Lollie stayed home during ASPIRE 2010-11, but she helped us blog and then put together the outreach paper in Elementa



Who benefits from these types of teacher-researcher partnerships?

## Teachers benefit!

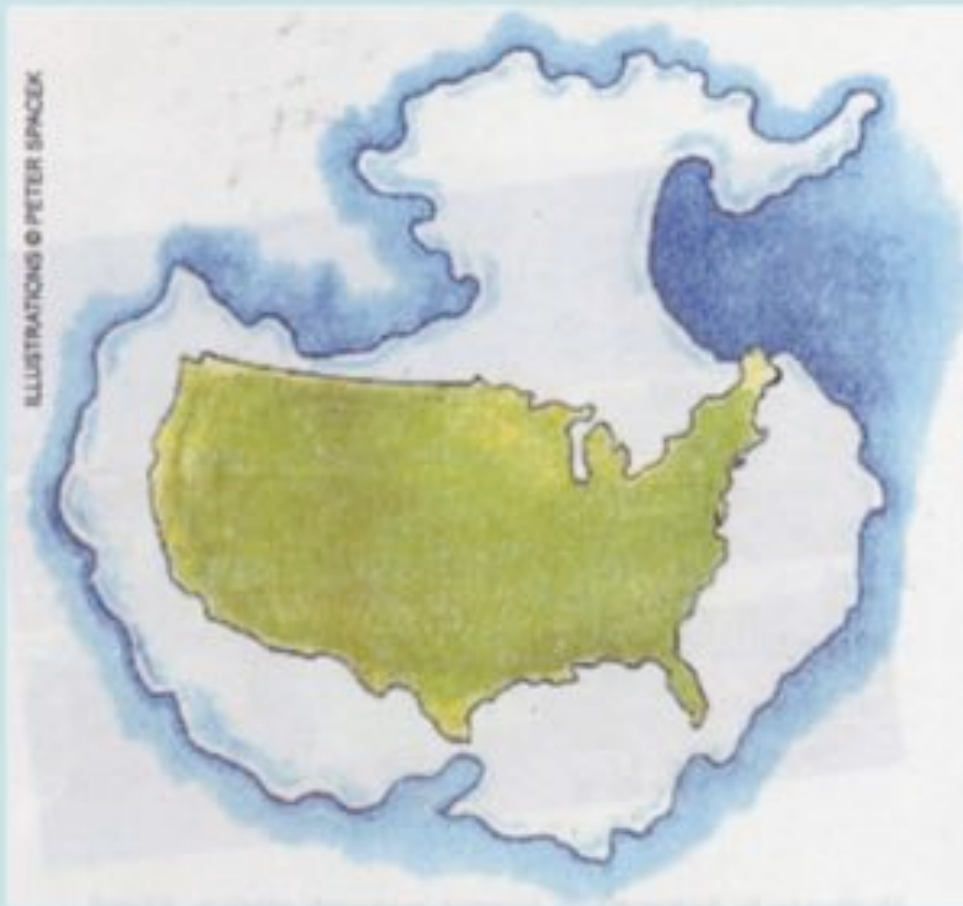
- Field experience provides hands on science knowledge and the **adventure** of a lifetime.
- Increased **science content** knowledge (ARCUS, 2013).
- **Instructional methods strengthened** by a better understanding of science processes and application
- More **confidence** in using open-ended inquiry for teaching science
- Observed inquiry in action shipboard helped take **risks** in providing realistic and relevant science content to her students
- Classroom **lessons** illustrate science concepts
- **Publications** that generate interest by other educators



## Scientists benefit!

- **Funding for scientific research** depends on **effective communication** between scientists and the public.
- “**Broader impacts**” needed to justify federal funding,
- Having **research explained** in ways that the broader public can understand:
- Classroom lessons **generate interest** in the scientists’ research specifically and in marine science in general.
- Researchers can also learn from their education partners about **more effective teaching** strategies that can be transferred to the college level.
- **Perspectives** gained on constraints that teachers and students face in the pre-college classroom.
- **Motivated** to conduct additional educational outreach





"like driving  
across the US at  
12 miles per hour"  
-Dave H.



## Students benefit!

- Increased **science interest** by students whose teachers participated in teacher research experiences (ARCUS, 2013)
- Grade-appropriate pre- and post-**assessment** as well as ongoing formative assessment measure student success, identify misconceptions, and make adjustments to the instructional plan as needed
- Reflective journaling, coupled with explicit teaching, records **progress in thinking** and provided a safe way for students to express themselves through words, diagrams, and pictures
- Written tests **demonstrated increased content knowledge** both in polar and ocean.
- **Engage students** with actual and virtual authentic scientific investigations.





How do we sustain this relationship?

- Financial support
- Moral support  
(*aka Janet!*)
- Technical support  
(PolarTREC)
- Opportunity
- Dedication
- Patience
- Respect
- **Love**



This effort has been funded by **US NSF Office of Polar Programs, Antarctic Organisms and Ecosystems** (ANT-0741409 and ANT-0839069 to PY) and by **PolarTREC** (NSF 0956825), administered by the Arctic Research Consortium of the United States.

Garay's participation in the Amazon plume project was funded by a RET Supplement to an NSF Ocean Sciences grant (OCE-0934095 to PY).

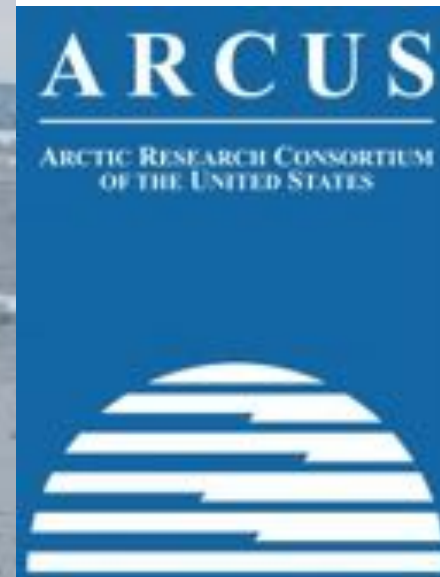
Lollie's participation in the Arctic fieldwork was supported by **Polar Trec** and by a grant from **NSF Arctic Natural Sciences** (ARC-0910252 to PY).

SMORE was supported by **Toyota Tapestry** grant to LG.



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Thank you!