STEMSEAS
STUDENT EXPERIENCES ABOARD SHIPS


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UNOLS Council Meeting: November 29, 2017

LAMONT-DOHERTY EARTH OBSERVATORY
THE EARTH INSTITUTE AT COLUMBIA UNIVERSITY

IUP

UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM
UNOLS

# What is STEMSEAS?


- STEMSEAS takes advantage of under-used capacity on (UNOLS) vessels to provide undergraduate students with high-impact experiences.
- STEMSEAS sails both declared geoscience majors and non-majors with undergraduate faculty mentors for 5-10 day ship transits.
- STEMEAS aims to increase the number of meaningful shipboard experiences available to undergraduate students, introducing students to essential skills and competencies for geoscience careers, and exposing non-STEM students to STEM issues and careers.

Developed initially in response to the 2015 NSF solicitation:

## Improving Undergraduate STEM Education: Pathways into Geoscience (IUSE: GEOPATHS)

**PROGRAM SOLICITATION**
**NSF 15-526**

**National Science Foundation**

Directorate for Geosciences
Division of Atmospheric and Geospace Sciences
Division of Earth Sciences
Division of Ocean Sciences
Division of Polar Programs

Directorate for Education & Human Resources
Division of Undergraduate Education
Division of Human Resource Development

**Letter of Intent Due Date(s)** ***(required)*** (due by 5 p.m. proposer's local time)*:*

January 07, 2015

Letter of Intent (Required) Due Date

August 14, 2015

Letter of Intent (Required) Due Date

**Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

March 16, 2015

Full Proposal Submission Deadline

October 05, 2015

Full Proposal Submission Deadline

# IUSE: GEOPATHS Program Goals

- Increase the number and diversity of students
  - pursuing degrees and careers in the geosciences
- Prepare students for any geoscience career
  - considering ALL pathways available to them in the geosciences, including teaching
- Build on & contribute to the evidence base
  - for effective student engagement, learning, and retention in STEM

We saw great potential to contribute to NSF long-term goals…

## Three Pillars: Long-Term Goals

- **Improve STEM Learning & Learning Environments**
  - Improve the knowledge base for defining, identifying, and innovating effective undergraduate STEM education teaching and learning for all NSF-supported disciplines, and foster widespread use of evidence-based resources and pedagogies in undergraduate STEM education practice.
- **Broaden Participation & Institutional Capacity for STEM Learning**
  - Increase the number and diversity of undergraduate students recruited and retained in STEM education and career pathways through improving the evidence base for successful strategies to broaden participation and implementation of the results of this research.
- **Build the STEM Professional Workforce for Tomorrow**
  - Improve the preparation of undergraduate students so they can succeed as productive members of the future STEM workforce, regardless of career path, and be engaged as members of a STEM-literate society.

# Core Operating Principles

1. Target students …
   i. at key junctures as undergraduates
   ii. from communities poorly represented in geosciences
   iii. that are primarily STEM-interested
   iv. in non-STEM majors poised to be STEM advocates
2. Leverage ship capabilities whenever feasible
3. Establish synergistic relationships with UNOLS operators
4. Add value by doing science on transits whenever feasible
5. Seek diversity among mentors
6. Sail experienced mentors with new mentors
7. Deliver content related to ship track
8. Provide time for reflection while on transit
9. Facilitate research if opportunity arises
10. Provide avenues for career exploration
11. Measure impact and add to the evidence base

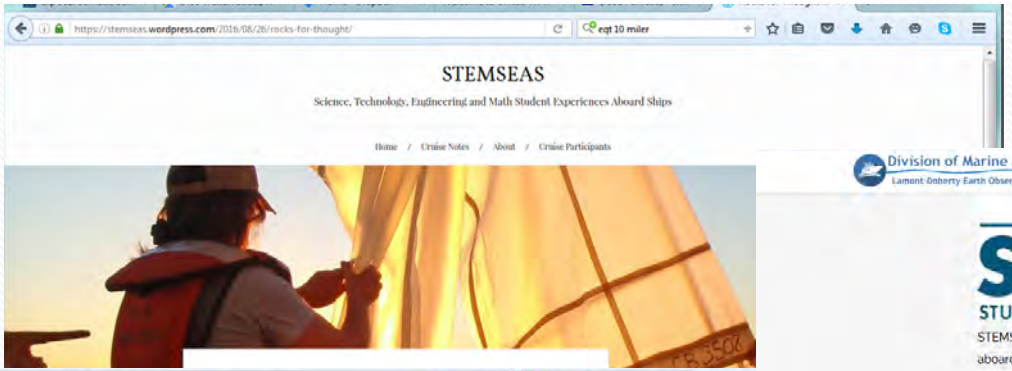
# What STEMSEAS did in its first 2 years

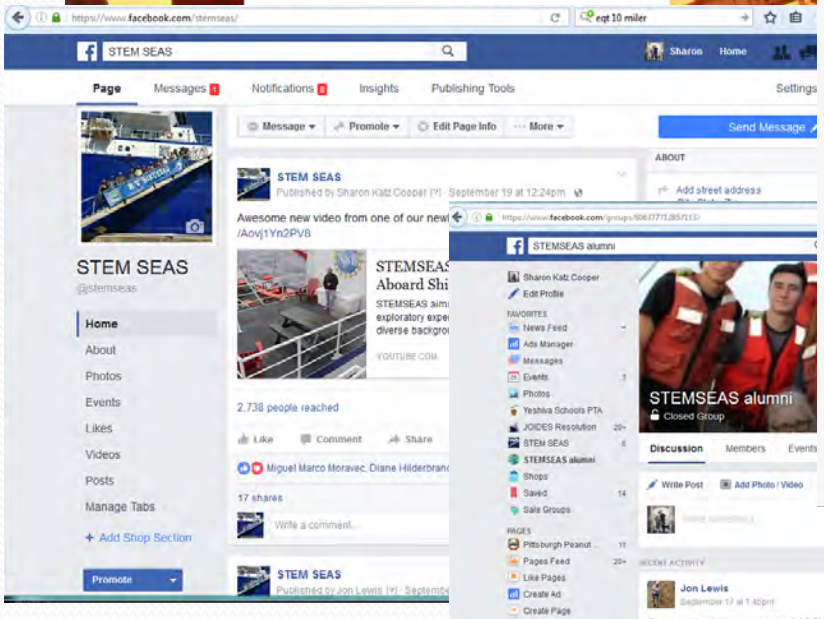
We opened applications for 30 slots in 2016 and received nearly **900 applications**.

| Dates | Vessel | Operator | Starting Port | Ending Port | No. students |
|---|---|---|---|---|---|
| **May 10-18 2016** | R/V Oceanus | OR State U. | San Diego, CA | Honolulu, HI | 9 |
| **July 15-20 2016** | R/V Endeavor | U. of RI | Morehead City, NC | Gulfport, MS | 11 |
| **August 17-23 2016** | R/V Sikuliaq | U. AK Fairbanks | Seattle, WA | Seward, AK | 10 |
| **July 25-Aug. 2 2017** | R/V Hugh Sharp | U. of Delaware | Gulfport, FL | Lewes, DE | 6 |

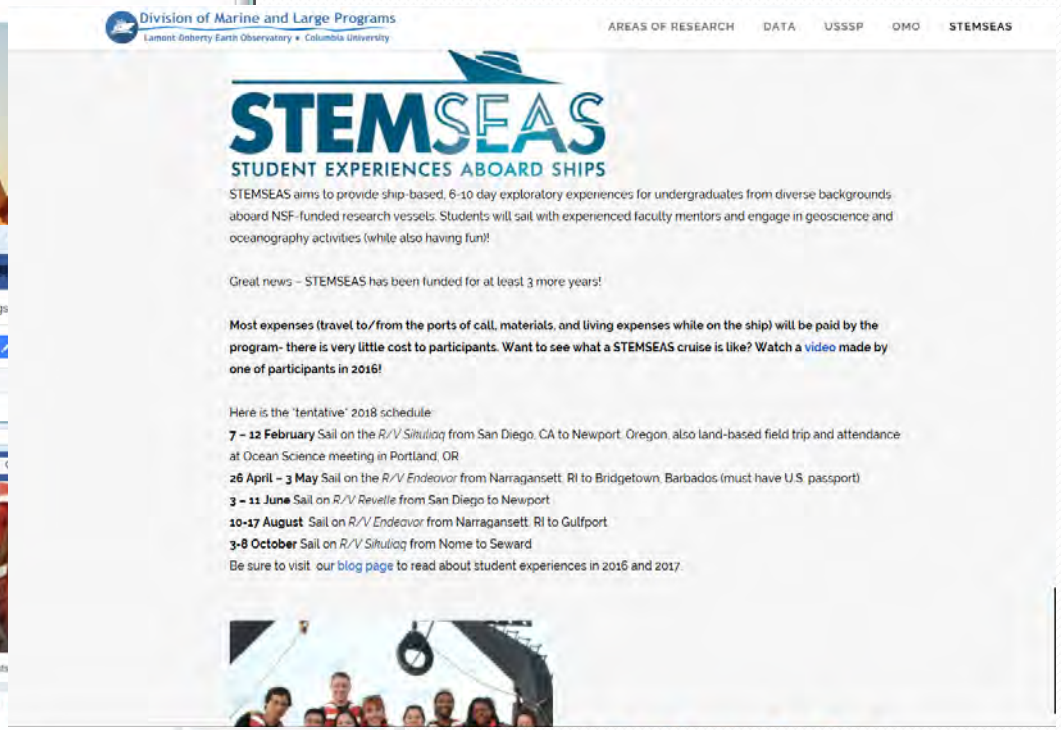

# Established web presence

# New: stemseas.org







# Goal: Target students from communities poorly represented in geosciences

**Which of the following best describes your ethnicity? (check all that apply)** (N=30)

| | |
|---|---|
| 23% | (1) African-American/Black |
| 3% | (2) Asian-American/Asian |
| 40% | (3) Hispanic or Latino |
| 10% | (4) Native American or Alaska Native |
| | (5) Pacific Islander |
| 30% | (6) White/Caucasian |
| | (7) Other (please specify) |

Also:
60% female, 40% male, several U.S. military vets, 1 student with identified disability that required accommodation

# Goal: establish synergistic relationships with UNOLS operators and have a diversity of mentor/ instructors

| Vessel | Senior Mentors (expertise) | Trainee Mentors, expertise | Other Mentors, expertise |
|---|---|---|---|
| **R/V Oceanus**<br>**Operator: OSU** | Kristen St. John, Ph.D., James Madison U. (paleoclimatology, paleoceanography)<br><br>Mark Leckie, Ph.D., UMass (micropaleontology, biostratigraphy) | Raquel Bryant, UMass grad student (advisor Mark Leckie) | |
| **R/V Endeavor**<br>**Operator: URI** | Kaatje Kraft, Ed.D., Watcom CC. (science education)<br><br>Steve Pekar, Ph.D., Queens College (stratigraphy, micropaleontology) | | Joe Montoya, Ph.D., GA Tech (biological oceanography, biogeochemistry)<br><br>Ryan Sibert, U. of GA Ph.D. student;advisor: Samantha Joye, (biogeochemical cycling) |
| **R/V Sikuliaq**<br>**Operator: UAF** | Jon Lewis, Ph.D., IUP (structural geology, active tectonics)<br><br>Kris Ludwig, Ph.D., USGS (oceanography, marine geology, public policy) | Raquel Bryant, UMass grad student (advisor: Mark Leckie) | Karen Thomson, Ed.D., Independent Consultant (science education) |
| **R/V Hugh Sharp** | Christopher Hintz, PhD (chemical and biogeochemical oceanography) and Carol Pride (chemical and paleo oceanography), Savannah State University | Emily Weigel, Savannah State | Partnership with Savannah State University (HBCU) |

# Goal: Add value by doing science on transits whenever feasible

- Coring on *Oceanus* with assistance from OSU team
- Calibration of equipment for ECOGIG cruise on *Endeavor*
- Collection of bathymetry data for USGS and Geological Survey of Canada on *Sikuliaq*
- Release of surface current drifters and use of multi-core instrument on *Sharp* (UDel marine ops borrowed afterwards)

# Overall, what was the main benefit of your participation in the STEMSEAS program? What did you get out of it?

- ***I felt like it opened my eyes to new possibilities I was not aware of. I rekindled my certainty of science and field work. I feel like I have a new set of support in my future endeavors.*** **– May student**
- *STEMSEAS allowed me to experience what it is like to be onboard a research vessel and get a hands-on practical approach as to how scientists go about gathering data from research expeditions. STEMSEAS helped me to be more focused on career path involving the geosciences while at the same time shows an array of other possibilities.* – July student
- ***The main benefit of this program was coming out with a new appreciation of the geoscience field. I did not realize how interrelated all the science fields were within this one field. I also loved all the new friends I made through the program.*** **– August student**
- *I met amazing individuals, made great connections, learned a ton, and am really considering graduate school as a result. Overall, I heavily advocate for this program and see so much potential.* – August student

# After 8 months post-cruise:

- **Having the opportunity to go on this trip with STEMSEAS has been the single greatest thing I have ever done. I am so thankful for the opportunity that it has given me. I will never forget it.**
- *I learned a lot about myself, mostly that I loved pretty much everything about doing science at sea. I learned that if I want to do academic research I probably need a Ph.D, and that people who get Ph.D's are not all crazy.*
- **I think this program opened the door to a field, and way of life that I didn't think was for me, so for that reason STEMSEAS will always affect me. Plus I use the loupe a lot.**
- *I was surprised by how my outlook of my future changed in the short two weeks. It made me realize I wanted to change my major and move towards a degree in a physical science, specifically geoscience. Prior to the experience I was not aware a geology department existed on my campus and I remember dropping by the first day I returned to campus.*

- **I felt like they chose a lot of community college students which I thought was amazing because we never really get opportunities like this.**
- *I was originally planning to do Marine Biology but now I'm leaning towards oceanography or geology.*
- **The most surprising thing was how diverse the students and crew were. There were people that looked like me doing the job I wanted to do.**
- *What surprised me about the STEMSEAS program was the diversity of students aboard the vessel. I felt comfortable knowing that several students aboard came from different ethnic backgrounds. In a way, it inspired me to further continue to pursue my dream of becoming a professional scientist.*

# The Future! 2018 and beyond

- We were awarded 3 more years of funding!
- The 2018 schedule is below, with many exciting collaborations.
- We want to get to know and work with YOU, to identify synergies and get feedback and ideas to make this work well long-term.
- Do you have any older equipment you want to find a new home for? We'll take it!

| Ship | # of days | Port and Depart Date | Port and Arrival Date |
|---|---|---|---|
| **Sikuliaq** | 4 | San Diego 7 Feb | Newport 10 Feb, field trip & Ocean Sci. Mtg Feb 10-12 |
| **Endeavor** | 8 | Narragansett 26 April | Bridgetown, Barbados 3 May with Joe Montoya |
| **Revelle** | 5 | San Diego 3 June | Newport 11 June with UCSD graduate students |
| **Endeavor** | 8 | Narragansett 10 Aug. | Gulfport 17 Aug. |
| **Sikuliaq** | 6 | Nome 3 Oct | Seward 8 Oct, AK Native Focus |

Questions? scooper@ldeo.columbia.edu or jclewis@iup.edu