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Undergraduate Research Experience in Ocean/Marine Science (URE-OMS) with African Student Component

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http://nia.ecsu.edu/ureomps2010/index.html

LONG-TERM GOALS

The Undergraduate Research Experience in Ocean/Marine Science program supports active participation by underrepresented undergraduate students in remote sensing and Ocean/Marine Science research training activities. The program is based on a model for undergraduate research programs supported by the National Science Foundation. The URE project features mentors, research projects, and professional development opportunities. It is the long-term goal of the URE in Ocean/Marine Science to provide an active research experience as an effective way to attract talented undergraduates and retain them in careers in ocean and marine science. In addition, this program supports the involvement of students from the African Countries of Ghana, Senegal and Nigeria. Funds were leveraged with the NSF Research Experience for Undergraduates (REU) grant # ANT-0944255 [2].

OBJECTIVES

The program objectives are designed to promote the professional development of underrepresented undergraduate students through their participation in ongoing ocean, marine and polar science research [1].

APPROACH

Both a flier announcing the program and a webpage were developed to recruit students. Particular attention was paid to recruiting students from minority serving institutions with limited research capabilities and from the University of Ghana. Dr. George Wiafe, PI, Coastal and Continental Shelf Processes Research led the Ghana recruitment efforts. This structure of recruitment will be continued to ensure that while not being exclusive, the program reaches a large number of underrepresented students.

Producing data and providing technical support for the URE program are the Center of Excellence in Remote Sensing Education and Research (CERSER) and the ECSU POLARGRID labs. CERSER was developed under ONR grant #N0014-1-1070. Both labs contain state-of-the-art computers, servers and software. The labs aid in insuring that students engage in innovative remote sensing projects that increase knowledge and understanding of coastal, ocean, and polar science.

The Program timeline was as follows:

Spring: Development of the website and fliers to advertise the program and selection of participants.
Summer: Conduct training in Ocean and Marine Science, visiting lectures, enrichment activities; Final oral and written reports.
Following AY: On-line mentoring of students by faculty and advisement of students on applying for future ocean and marine science internships.

WORK COMPLETED

The URE program featured high quality interactions with faculty and/or other research mentors, structured research projects, and professional development opportunities.

- Professional development opportunities
- Sample Collection and Water Quality Analysis
- Boating Safety Certification by the U.S. Coast Guard
- GIS Training
- CPR and First Aid Training
- Canoeing in the Great Dismal Swamp
- Hands-on GPS training
- CPS and First Aid certification
- IEEE research paper formatting workshop
- Remote Sensing related research training

RESULTS

Abstracts from the 2010 research teams can be found on the team web pages available at http://nia.ecsu.edu/ureomps2010/teams.html. Since the beginning of the URE program teams have engaged in 46 research projects including:

2001
Validation of LITE Tropospheric and Stratospheric Temperature Measurements
ArcView/GIS Software as a Tool for Evaluating Coastal Population
http://nia.ecsu.edu/onr/ocean/teams.htm

2002
National Marine Fisheries Service Plankton Gear Comparison Research
http://nia.ecsu.edu/ureoms2002/teams/plankton/abstract.html

Correlation of AVHRR SST with the Presence of Loggerhead Turtles
http://nia.ecsu.edu/ureoms2002/teams/avhrr/abstract.html

2003
Correlation between Right Whale Distribution and Sea Surface Temperature
http://nia.ecsu.edu/ureoms2003/whale/abstract.htm

2004
Dolphin Presence/Absence Probabilities on the Virginia and North Carolina Coasts as Correlated with Sea Surface Temperature and Chlorophyll-a Levels
http://nia.ecsu.edu/ureoms2004/teams/rs1/abstract.htm

Historical Observations of Coastal Upwellings along the Northern Beaches of the North Carolina Outer Banks http://nia.ecsu.edu/ureoms2004/teams/rs2/abstract.html

The Spatial and Temporal Variability of the Northwest Gulf of Mexico
http://nia.ecsu.edu/ureoms2004/teams/ors/abstract.html

NOAA Fishery Stock Assessment Research and Stock Modeling
http://nia.ecsu.edu/ureoms2004/teams/fsa/index.html

Determining the Maximum Depth of Sea Grass Beds along the Southern Outer Banks with an Optical Model http://nia.ecsu.edu/ureoms2004/teams/noaa/np_abstract.html

The Relationship between Sea Height and Sea Surface Temperature on Strandings of Harbor Porpoise along the North Carolina Coast http://nia.ecsu.edu/ureoms2004/teams/noaa/kw_abstract.html

2005
Migratory Bottlenose Dolphin Movements and Numbers along the Mid-Atlantic Coast and Their Correlation with Remotely Sensed Chlorophyll-a and Sea Surface Temperatures
http://nia.ecsu.edu/ureoms2005/tms/dolphin/abstract.htm

Determining the Correlation between Sea Surface Temperature, Chlorophyll Concentrations, QuikSCAT Wind Data and the Presence of Caretta caretta and Chelonia Mydas in the Mid-Atlantic
http://nia.ecsu.edu/ureoms2005/tms/avhrr/Abstract.htm

Mapping Sea Grass Resources in North Carolina's Core and Back Sounds
http://nia.ecsu.edu/ureoms2005/tms/bft_seagrass/abstract.htm

2006
Holistic Ice Sheet Modeling: A First-Order Approach and Study
http://nia.ecsu.edu/ureoms2006/teams/hism/teamabstract.htm

Automating the TeraScan Image Process for Creation of NOAA AVHRR Data Products
http://nia.ecsu.edu/ureoms2006/teams/ts/abstract.html

2007
A Multiple Linear Regression of pCO2 against Sea-Surface Temperature, Salinity, and Chlorophyll a at Station ALOHA and its Potential for Estimate pCO2 from Satellite Data
http://nia.ecsu.edu/ureoms2007/teams/ocean/teamabstract.html

Antarctic Firn Annual Emissivity Trends at the Ski Hi Automatic Weather Station from in-situ and SSM/I Brightness Temperatures
http://nia.ecsu.edu/ureoms2007/teams/firn/abstract.html

2008
Temporal and Spatial Variations of Sea Surface Temperature and Chlorophyll a in Coastal Waters of North Carolina
http://nia.ecsu.edu/ureomps2008/team-ocean/abstract.html

The Modeling of Beach Erosion and Shoreline Changes Supported by Prior Research Based on Video Image Processing in Duck, North Carolina
http://nia.ecsu.edu/ureomps2008/team-remote/teamabstract.html

2009
A Comparative Analysis of Localized Command Line Execution, Remote Execution through Command Line, and Torque Submissions of Matlab(R) Scripts for the Charting of CReSIS Flight Path Data
http://nia.ecsu.edu/ureomps2009/teampolar/abstract.html

Visualization of the 1993-2007 CReSIS Greenland Data Sets for the Polar Grid High Performance Computing System
http://nia.ecsu.edu/ureomps2009/teamgreenland/abstract.html

Estimating the Distribution of CO2 Parameters in Surface Water of the Indian Ocean from Temperature and Salinity
http://nia.ecsu.edu/ureomps2009/teamocean/abstract.html

2010
Particulate Properties of the Dead Sea Retrieved by the Physical Optics Method
http://nia.ecsu.edu/ureomps2010/teams/optics/abstract.html

Generation of Titanic Prime Numbers Through High Performance Computing Infrastructure
http://nia.ecsu.edu/ureomps2010/teams/polargrid/abstract.html

Establishing a Baseline of Water Quality along the Coast of Northeastern North Carolina in Response to the Deepwater Horizon Oil Spill
http://nia.ecsu.edu/ureomps2010/teams/dwhorizon/abstract.html

Design of an Autonomous Global Positioning System (GPS) Guided Watercraft
http://nia.ecsu.edu/ureomps2010/ku_ghana_teams.html

IMPACT/APPLICATION

Since the first cohort in 2001, a total of 145 students have participated in the URE programs representing 27 institutions and 12 majors. Among the majors included were Physics, Computer Science, Biology, Geology, Chemistry, Math Education, Marine Biology, Computer Engineering, Mechanical Engineering, Geography, Geology, and Mathematics. Minority serving institutions comprised 79% of the participating institutions, 11% were from African institutions and 10% were

other. Four Hispanic, two Native American Indian, seven African and three non-minorities have participated in the program. The largest percentages of participants were African-American.

In addition to increasing the participation of underrepresented groups in ocean/marine science, another impact of the program was involving students in research who might not otherwise have the opportunity. The URE Program had an impact on students from institutions where research programs and opportunities are limited. A significant number of student participants came from outside Elizabeth City State University.

Included among the institutions were:

URE MSIs Impacted

		MSI	African	# Students	# Faculty
1	Alcorn State University	Yes		1	2
2	Dillard University	Yes		1	0
3	East Carolina University	No		1	1
4	Elizabeth City State University	Yes		61	46
5	Fayetteville State University	Yes		8	1
6	Hampton University	Yes		2	1
7	Jackson State University	Yes		1	0
8	Jarvis Christian College	Yes		3	0
9	Mississippi Valley State University	Yes		13	1
10	Norfolk State University	Yes		5	2
11	North Carolina A&M State University	Yes		5	1
12	North Carolina Central University	Yes		1	0
13	North Carolina State University	No		2	0
14	NOVA University	No		1	0
15	South Carolina State University	Yes		4	0
16	Spelman College	Yes		1	1
17	St. Augustine's College	Yes		5	1
18	Tennessee State University	Yes		1	0
19	University of Arkansas at Pine Bluff	Yes		1	0
20	University of Ghana	No	Yes	5	1
21	University of Hawaii	No		1	0
22	University of Lagos, Nigeria	No	Yes	4	2
23	University of Maryland	No		2	0
24	University of North Carolina at Pembroke	Yes		2	1
25	University of Texas at Brownsville	Yes		1	0
26	Virginia State University	Yes		11	1
27	Winston Salem State University	Yes		2	1
	MSI University Participation	20	74.1%	145	62
	African Nation University Participation	2	7.4%		
	Non-MSI Participation	5	18.5%		

Note
NASA Langley, CReSIS, NOAA-Coastal Ocean Lab and NASA-GSFC also provided mentors.

RELATED PROJECTS

URE in Ocean and Marine Science ONR Grant #N0014-11-0529 preceded the current Undergraduate Research Experience in Ocean/Marine Science (URE-OMS) with African Student Component Award Number N00008-1-0832.

CReSIS - NSF FY 2005-108CM1
The Elizabeth City State University (ECSU) Center for Remote Sensing Education and Research (CERSER) is partnering with several other institutions sponsored by the National Science Foundation (NSF) as part of a Science and Technology Center (STC) with the University of Kansas. This partnership is intended to develop models and technology to arrive at a better understanding of the mass balance of polar ice sheets. The Center for Remote Sensing of Ice Sheets (CReSIS) studies how this mass balance affects the rising sea level that glaciologists have observed. http://www.cresis.ku.edu

Research Experience for Undergraduates NSF REU ANT-0944255
For the past 10 years the Office of Naval Research has funded summer research training for undergraduates at ECSU. The ONR grand supports 10 students from MSIs and students from the University of Ghana. This past year NSF Polar Programs funded a grant to expand the program to include 20 additional students with placement at ECSU and at other CReSIS partner sites. The objective of the Undergraduate Research Experience in Ocean, Marine and Polar Science (URE-OMP) program is to promote the professional development of minority undergraduate students through their participation in ocean, marine and polar science research. The program consists of undergraduates from over 15 MSIs. Each student is assigned to a specific research team, where they work closely with the faculty. As with this URE program, the REU project is conducted for eight weeks during summer, with on-line mentoring and follow-up during academic year. CERSER faculty and staff work together with students on research projects of importance to the northeastern North Carolina region. http://nia.ecsu.edu/ureomps2010/index.html

REFERENCES

[1] Hayden, L. Undergraduate Research Experience in Ocean and Marine Science, IGARSS 2003 Conference Proceedings.

[2] Hayden, L., Braaten, D., "Development of Educational Partnerships Dedicated to Remote Sensing of Ice Sheets Cyberinfrastructure", IEEE – IGARSS Conference, 2007, Barcelona, Spain.

PUBLICATIONS

Maybin, B., Yuan, J, Hayden, L., "Temporal and Spatial Variations of Sea Surface Temperature and Chlorophyll a in Coastal Waters of North Carolina: Undergraduate Research Experience in Ocean, Marine, and Polar Science", IGARSS 2009 Conference Proceedings

Hayden, L, Omar, A., "Collaborations Focused on Enhancing Undergraduate Involvement in Remote Sensing Applications to Atmospheric and Earth Science Research", IGARSS Conference, Denver, CO, July 2006.

Hayden, L., Broadening Participation in Science and Engineering, 2005, National Science Foundation HRD/Joint Annual Meeting, April 25- 26, 2005 Washington, DC

LeCompte, M., Hayden, L. Smith, E., Forde, J., "Historical Observations of Coastal Upwellings along the Northern Beaches of the North Carolina Outer Banks" 8th International Conference on Remote Sensing of Coastal and Marine Environments, Nova Scotia Canada May 2005

Hayden, L., Walter, D., Porter, W., "Identifying an Important Source of Talented Students from Underrepresented Communities through Effective Partnerships with Minority Serving Institutions", American Geophysical Union's (AGU) Fall Meeting, December 13–17, 2004 San Francisco

Hayden, L., Harrison-Wilkins, K., "Mentoring Minority Undergraduates through Remote Sensing and Geo-Information Science Research", African Association of Remote Sensing of the Environment (AARSE) 2004 bi-annual conferences, Oct. 18-21, 2004 Nairobi Kenya.

Hayden, L., "Undergraduate Research Experience in Ocean and Marine Science", IGARSS 2003 Conference Proceedings

HONORS/AWARDS/ PRIZES

National Association for Equal Opportunity in Higher Education (NAFEO) NOBLE Laureate 2009 distinguished Faculty Research Award.

NSF President's Award for Excellence in Science, Mathematics, Engineering Mentoring 2003
Emerald Award for Educational Leadership by U.S. Black Engineer Magazine 2003