

Application for Consent to Conduct Marine Scientific Research

1. General Information

1.1 Reference ID:

Application number: F2011-122
 Project name: Role of viral lipids on oceanic carbon and sulfur cycles

1.2 Sponsoring institution(s):

Institution	Contact Information	Director
Institute of Marine and Coastal Sciences, Rutgers University	Dr. Kay Bidle 71 Dudley Road New Brunswick, NJ 08901 848-932-3467	Dr. Rich Lutz
Woods Hole Oceanographic Institution	Benjamin Van Mooy Department of Marine Chemistry and Geochemistry Woods Hole Oceanographic Institution Woods Hole, MA 02543 Ph: (508) 289-2322	Dr. Susan A. Avery
Grice Marine Laboratory, College of Charleston	Jack DiTullio Siegling Professor of Biology 331 Fort Johnson Charleston SC 29412 843-953-9196	Louis Burnett

1.3 Scientist in charge of the project:

Name: Kay Bidle
 Affiliation: Rutgers University
 Address: Dept. of Marine Sciences
 Phone: 732-932-6555, Ext. 393
 Fax: 732-932-6557
 Email: bidle@marine.rutgers.edu

1.4 Scientists from coastal states involved in the planning of the project:

See Section 8 (*Participation*)

1.5 Submitting officer:

Name: Eric Benway
 Affiliation: Woods Hole Oceanographic Institution
 Address:
 Phone: 508-289-3770
 Fax: 508-457-2185
 Email: ebenway@whoi.edu

2. Description of Project

2.1 Nature and objectives of the project:

The focus of this proposal is to elucidate the molecular, ecological, and biogeochemical links between virally encoded glycosphingolipids (vGSLs) and other polar lipids with the global cycles of carbon and sulfur. We propose a multi-pronged approach combining a suite of lab-based, mechanistic studies using several haptophyte-virus model systems along with observational studies and manipulative field-based experiments the Northeast Atlantic. Using these diagnostic markers, we propose to document active viral infection of natural coccolithophore populations and couple it with a suite of oceanographic measurements in order to quantify how viral infection (via vGSLs) influences cell fate, the dissolved organic carbon (DOC)

pool, vertical export of particular organic (POC) and inorganic carbon (PIC; as calcium carbonate, CaCO₃) (along with associated alkenone lipid biomarkers and genetic signatures of viruses and their hosts) and the upper ocean sulfur cycle (via the cycling of dimethylsulfide [DMS] and other biogenic sulfur compounds). Furthermore, given they are unique to viruses, we propose that vGSLs can be used to trace the flow of virally-derived carbon and provide quantitative insights into a "viral shunt" that diverts fixed carbon from higher trophic levels and the deep sea. Our overarching hypothesis is that vGSLs are cornerstone molecules in the upper ocean, which facilitate viral infection on massive scales and thereby mechanistically 'lubricate' the biogeochemical fluxes of C and S in the ocean. Proposed fieldwork aims to test whether the cellular and molecular mechanisms of viral infection operate in natural haptophyte populations by conducting observational studies and manipulative experiments on the Northeast Atlantic (NEA) spring bloom. These blooms are likely infected and terminated by viruses, presenting an excellent venue to test our hypotheses on haptophyte-viral dynamics in surface ocean and linkages to C and S export. We propose a 30 day cruise in June 2011 aboard the R/V Knorr following a transect from Ponta Delgada, Azores (37.7° N, 25.7° W) to Reykjavik, Iceland (64.4° N, 21.6° W). Our goal for this cruise is to transect the region of the NEA spring bloom and to extensively sample the bloom when we encounter it. Our cruise track is modeled after a recent study in this area, which documented intense coccolithophore (and other haptophyte) blooms across Rockall Hatton Plateau to the Iceland Basin (55-63°N latitude) and coincided with elevated POC and TEP. For now, we envision sampling 12 water depths at 20 stations. We will also occupy three stations for several days to allow opportunities for extended experiments and sinking particulate carbon collection and flux determination.

2.2 Relevant previous or future research projects:

This is the first application that has been filed for this type of work through the Marine Science Research Application Tracking System at the US State Department

2.3 Previously published research data relating to project:

not applicable

3. Methods and Means to be Used

3.1 Platform:

Name:	KNORR
Nationality (Flag State):	United States
Overall length:	281.00
Maximum draught (meters):	16.70
Displacement/gross tonnage:	2518.00
Propulsion:	Two Lips diesel-electric azimuthing stern thrusters, 1500 SHP each
Call sign:	KCEJ
Cruising speed:	11.00
Maximum speed:	13.00
Name of captain/master:	Captain Kent Sheasely
Number of crew:	22
Number of scientists on board:	34

3.2 Other craft used in the project:

none

3.3 Methods and scientific instruments:

Types of Samples and Data	Methods to be Used	Instruments to be Used

<p>Obtaining samples for identifying and quantifying vGSLs and linking their presence and distribution to the genetic composition of haptophytes and co-occurring viruses</p>	<p>Lipids will be analyzed by HPLC/MS as described. The presence and diversity of haptophytes and co-occurring viruses will be assessed by means of SYBR®Green-based quantitative PCR [qPCR] and amplicon pyrosequencing using genetic markers targeting (a) haptophytes [18S rRNA genes]; (b) closely related <i>E. huxleyi</i> strains [genes encoding a protein with calcium-binding motifs, GPA; and cytochrome oxidase subunit I, COI] along with associated (c) coccolithovirus strains [the virus major capsid protein genes, MCP] and (d) other algal dsDNA viruses of the Phycodnaviridae [DNA polymerase gene, DNA pol]. Quantitative, reverse transcriptase PCR [qRT-PCR] of viral SPT and MCP gene transcripts will be used as an additional measure of viral infection dynamics. Concomitantly, the aforementioned suite of diagnostic cellular markers will assess algal physiology and virus infection.</p>	<p>Water samples for this analysis will be collected using a CTD-Rosette equipped with 20 L Niskin Bottles. Samples will be filtered and stored frozen until analysis back at the respective research institutions in the United States.</p>
<p>Core physical, chemical, biological, and biogeochemical parameters will be measured at each station and linked to in situ community composition, physiological state, and viral infection dynamics. These parameters will include primary productivity (via ¹⁴C-HCO₃⁻ fixation), calcification rates (via ¹⁴C incorporation into CaCO₃), and DMSP turnover rates. Core parameters on water column characteristics will consist of: temperature, salinity, mixed layer and euphotic zone depth, dissolved nutrients (NH₄⁺, NO₃⁻ + NO₂⁻, TDN, PO₄³⁻, silicate), bioactive sulfur compounds, DOC, particulate matter (POC, PON, PIC, BSi), pigments (chlorophyll a, 19'Hexanoyloxyfucoxanthin, HPLC accessory pigments), Fv/Fm, phytoplankton composition and abundance (via flow cytometry and microscopy).</p>	<p>Samples for dissolved nutrients (NH₃, NO₃⁻ + NO₂⁻, PO₄³⁻, silicate) will be analyzed at the WHOI Nutrient Analytical Facility. Samples for TDN and DOC will be analyzed at IMCS Nutrient Analysis Center. Sampling protocols will follow established methods for each of these facilities. Chl a will be measured at sea using standard fluorometric methods. In addition, samples will be filtered for on-shore HPLC pigment analyses. All biogenic sulfur samples will be analyzed at sea using a cryogenic purge and trap system coupled to a Shimadzu 2014 gas chromatograph fitted with a flame photometric detector methodology.</p>	<p>Water samples for these analyses will be collected using a CTD-Rosette equipped with 20 L Niskin bottles. Samples will be filtered and stored frozen until analysis back at the respective research institutions in the United States</p>
<p>We will also deploy drifting PIT trap arrays to determine vertical fluxes of POC, PON, and PIC. While we recognize the quantitative limitations of PIT traps on short (~24 hour) deployment times, we feel they provide an important first-order estimate on vertical C & S flux.</p>	<p>We will deploy drifting PIT sediment and net traps for 24 h and 72 h, respectively, at both 150m and 500m depth. These net traps are useful for trapping large amounts of material, can be turned around rapidly on deck, and are amenable to placing two traps on a single line. PIT and net trap arrays will be tracked using standard ARGOS/GPS gear.</p>	<p>PIT trap arrays (floating traps - all will be recovered).</p>

<p>We plan to deploy a glider and profiling floats with a suite of optical sensors to better characterize the in situ physical, chemical, and optical conditions of phytoplankton blooms when they are encountered.</p>	<p>The glider (pressure rated to 200 m water depth) and profiling floats will be deployed from the deck of the research vessel with it's position, course and data acquisition being controlled remotely via satellite. Two profiling floats will profile the water column measuring CTD, O2, spectral backscattering (3 wavelengths), chlorophyll 7 CDOM fluorescence 3 wavelengths of downwelling irradiance and downwelling PAR.</p>	<p>An autonomous underwater vehicle (AUV), or glider, which moves up and down in the ocean by changing buoyancy. Wings allow steerable gliding, thus horizontal propulsion. This vehicle maneuvers through the ocean at a forward speed of 30-40 cm/s in a sawtooth-shaped gliding trajectory, observing temperature, conductivity, etc. versus depth, and, at the surface, fix position via an on-board GPS receiver, and communicates via appropriate satellites. We will use Slocum Autonomous Underwater Vehicles (AUVs), built by Webb Research Corporation (Falmouth, MA).</p>
<p>Meteorological Sensors: Wind velocity, short- and long-wave radiation, relative humidity, barometric pressure, air and sea-surface temperature. Acoustic Doppler Current Profiler (shipboard): Measures water velocities. Uncontaminated seawater testing</p>	<p>Shipboard mounted sensors</p>	<p>Acoustic Doppler current Profiler, shipboard meteorological sensors and uncontaminated seawater flow through system.</p>

3.4 Will harmful substances be used?

yes

Some of our fieldwork will employ on-deck incubations with specific chemicals (some of which are designated as hazardous chemicals) and radioisotopes (3H, 14C, and 33P). In both cases, MSDS information sheets and approved protocols for collection and strict disposal methods will be followed.

3.5 Will drilling be carried out?

No

3.6 Will explosives be used?

No

3.7 Will protected species be studied?

No

4. Installations and Equipment

4.1 Will there be any installations?

yes

We plan to deploy a glider and profiling floats with a suite of optical sensors to better characterize the in situ physical, chemical, and optical conditions of phytoplankton blooms when they are encountered. We will also deploy drifting PIT trap arrays to determine vertical fluxes of POC, PON, and PIC.

5. Geographical Area(s)

5.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude):

The primary proposed research area for our cruise consists of a transect in the Northeast Atlantic (NEA) ocean between Ponta Delgada, Azores (37.7° N, 25.7° W) to Reykjavik, Iceland (64.4° N, 21.6° W) . Given the timing of the phytoplankton blooms is difficult to predict exactly, the precise cruise track will be determined by remote sensing data analyzed by the PIs a few days before and during the cruise.

5.2 Attach chart(s) showing the geographical areas of the intended work and, as far as practicable, the positions of intended stations, the tracks of survey lines, and the locations of installations and equipment:

See Section 10 (*Attachments*)

6. Dates

6.1 Expected dates:

Project Start Date: Jun 12, 2012

Project End Date: Jul 17, 2012

Coastal Area	Estimated Entry Date	Estimated Departure Date	Multiple Entries Expected?
Azores	Jun 15, 2012	Jun 25, 2012	No
Explanation of multiple entries: N/A			
Research will be performed: between 12-200 nm			
Extent to which Azores will be enabled to participate or to be represented in the research project: Berth will be reserved for observer if necessary.			
Coastal Area	Estimated Entry Date	Estimated Departure Date	Multiple Entries Expected?
Ireland	Jun 18, 2012	Jul 01, 2012	No
Explanation of multiple entries: N/A			
Research will be performed: between 12-200 nm			
Extent to which Ireland will be enabled to participate or to be represented in the research project: Berth will be reserved for observer if necessary.			
Coastal Area	Estimated Entry Date	Estimated Departure Date	Multiple Entries Expected?
United Kingdom	Jun 20, 2012	Jul 05, 2012	No
Explanation of multiple entries: N/A			
Research will be performed: between 12-200 nm			
Extent to which United Kingdom will be enabled to participate or to be represented in the research project: Berth will be reserved for observer if necessary.			
Coastal Area	Estimated Entry Date	Estimated Departure Date	Multiple Entries Expected?
Denmark	Jun 20, 2012	Jul 13, 2012	No
Explanation of multiple entries: N/A			
Research will be performed: between 12-200 nm			
Extent to which Denmark will be enabled to participate or to be represented in the research			

project: Berth will be reserved for observer if necessary.			
Coastal Area	Estimated Entry Date	Estimated Departure Date	Multiple Entries Expected?
Iceland	Jun 20, 2012	Jul 14, 2012	No
Explanation of multiple entries: N/A			
Research will be performed: between 12-200 nm			
Extent to which Iceland will be enabled to participate or to be represented in the research project: Berth will be reserved for observer if necessary.			

7. Port Call(s)

Port	Arrival Date	End Date	Special Logistical Requirements	Shipping Agent
Ponta Delgada	6/12/2012	6/15/2012	no special requirements	Allships-Agencia de Navegação, Lda. Avenida Infante D. Henrique, 33-5 9500-150 Ponta Delgada AZORES ISLANDS Contact: Eduardo Cordeiro Phone. 351 296 284 620 Fax: 351 296 284 501 Mobile: 351 962700054 Mobile: 351 917861923 Email: azores.shipping@mail.telepac.pt; allships@azores-shipping.com http://www.allships-agency-azores.com
Reykjavik	7/14/2012	7/17/2012	no special requirements	TVG-Zimsen ehf Korngardar 2 104 Reykjavik Iceland Phone: 011 354 5600 700 Fax: 011 354 5600 780 Email: eca@tvig.is 24 Hour Mobile Service: 011 354 856 0701 Primary Contact: Johann Bogason Direct line: 011 354 856 0701 Email: johann@tvig.is Contact: Helgi Bjarnason Direct liine: 011 354 856 0740 Email: helgi@tvig.is

8. Participation

8.1 Extent to which coastal state(s) will be able to participate or to be represented in the research project:

See Section 6 (*Dates*)

8.2 Proposal dates and ports for embarkation/disembarkation:

See Section 7 (*Port Call(s)*)

9. Access to Data, Samples and Research Results

9.1 Expected dates of submission to coastal State of preliminary reports, which should include the expected dates of submission of the final results:

No more than 30 days from the end date of the research.

9.2 Propose means for access by coastal state to data and samples:

Data will be provided through official channels at no cost to the coastal State(s). Samples will be provided upon request.

9.3 Propose means to provide coastal State with assessment of data, samples and research results or provide assistance in their assessment or interpretation:

Assessment of data, samples, and research results will be provided at no cost to the coastal State(s). Assistance in further assessment or interpretation will be provided upon request.

9.4 Propose means of making results internationally available:

Data Management Plan for OCE1061883, "Collaborative Research: Lipid lubrication of oceanic carbon and sulfur biogeochemistry via a host-virus chemical arms race" Our core sampling regime will focus on obtaining samples for identifying and quantifying vGSLs and linking their presence and distribution to the genetic composition of haptophytes and co-occurring viruses. vGSL samples will be analyzed by HPLC/MS as described. The presence and diversity of haptophytes and co-occurring viruses will be assessed by means of SYBR®Green-based quantitative PCR and amplicon pyrosequencing using genetic markers. Genomic sequence data that is acquired from our research efforts will be promptly deposited in NCBI databases (<http://www.ncbi.nlm.nih.gov/>). Where appropriate, we will also upload our genomic data into the Community Cyberinfrastructure for Advanced Microbial Ecology Research and Analysis (CAMERA) database (<http://camera.calit2.net/>). The aim of CAMERA is to serve the needs of the microbial ecology research community by creating a rich, distinctive data repository and a bioinformatics tools resource that will address many of the unique challenges of metagenomic analysis. Bidle and Coolen's group routinely perform such data uploads for their ongoing work. We will also measure core physical, chemical, biological, and biogeochemical parameters at each station and link them to in situ community composition, physiological state, and viral infection dynamics. These parameters will include primary productivity (via ^{14}C - HCO_3^- fixation), calcification rates (via ^{14}C incorporation into CaCO_3), and DMSP turnover rates. Core parameters on water column characteristics will consist of: temperature, salinity, mixed layer and euphotic zone depth, dissolved nutrients (NH_4^+ , $\text{NO}_3^- + \text{NO}_2^-$, TDN, PO_4^{3-} , silicate), bioactive sulfur compounds, DOC, particulate matter (POC, PON, PIC, BSi), pigments (chlorophyll a, 19'-HEX, HPLC accessory pigments), Fv/Fm, phytoplankton composition and abundance (via flow cytometry and microscopy). Given CaCO_3 acts as a ballast mineral and biological pump efficiency is influenced by the packaging of sinking material (e.g. in fecal pellets or as aggregates), we will also deploy drifting PIT trap arrays to determine vertical fluxes of POC, PON, and PIC. Hydrographic and oceanographic data from CTD hydrographic casts on cruises, as well as from surface samples collected by the ships underway system, will be submitted and disseminated through the Biological and Chemical Oceanography Data Management Office (BCO-DMO). Some of this data will also be posted on the PI's project website, as developed by IT personnel at the Institute of Marine and Coastal Sciences, Rutgers University. We will also submit the DMS data directly to the Global Surface Seawater Dimethylsulfide (DMS) Database hosted by NOAA's Pacific Marine Environmental Laboratory (PMEL; <http://saga.pmel.noaa.gov/dms/>).

10. Attachment(s)

Additional Attachments			
Attachment Type	Description	Attachment	Submission Date
	The primary proposed research area for our cruise consists of a transect in the Northeast Atlantic (NEA) ocean between Ponta Delgada,		

<p>Proposed Cruise Track</p>	<p>Azores (37.7° N, 25.7° W) to Reykjavik, Iceland (64.4° N, 21.6° W) . Given the timing of the phytoplankton blooms is difficult to predict exactly, the precise cruise track will be determined by remote sensing data analyzed by the PIs a few days before and during the cruise. The attached document shows a proposed cruise track, along with a short curriculum vitae and photo of Dr. Kay Daniel Bidle (the lead-PI and Chief Scientist)</p>	<p>1581406250_2012NorthAtlanticCruise_SuppDoc.pdf</p>	
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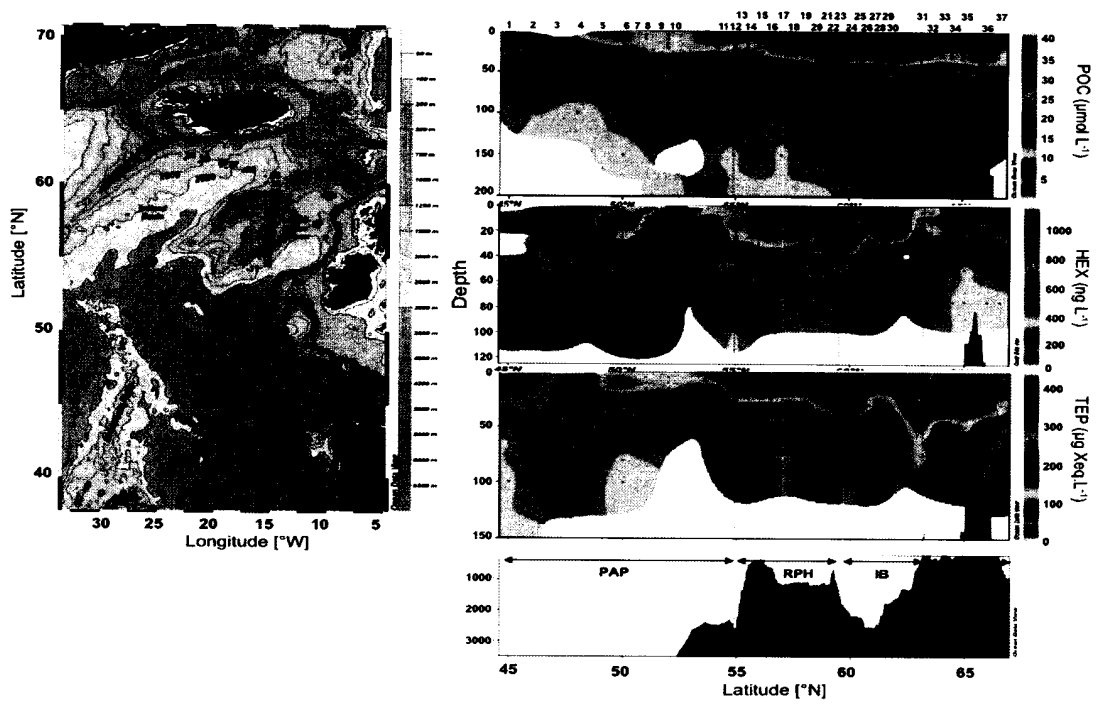


Figure (Left Panel) Map of the proposed study area with proposed transect and stations **(Right Panels)** Vertical sections of particulate organic carbon (POC), 19'Hexanoyloxyfucoxanthin (HEX), and transparent exopolymer particles (TEP; in Gum Xanthan equivalent per liter; $\mu\text{g Xeq L}^{-1}$) vs. latitude and bottom topography. Figure is adapted from Leblanc et al. 2009 (59).

KAY DANIEL BIDLE

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RESEARCH INTERESTS

Microbial ecology, phytoplankton physiology and mortality, virology, molecular evolution and ecology, biogeochemistry, ecosystem processes, the structure and function of microbial food webs

PROFESSIONAL PREPARATION

Scripps Institution of Oceanography, University of California San Diego, CA, Ph.D. in Marine Biology, 2001; with Professor Farooq Azam
University of Maryland Baltimore County, Cum Laude, B.S. in Biological Sciences, 1991; undergraduate research with Professor Tom Cronin, Dept. of Biological Sciences
Shannon Point Marine Center, Western Washington University, REU Undergraduate Research Fellow, 1990; with Professor Patsy McGlaughlin

APPOINTMENTS

2011- present Associate Professor, Dept. Marine and Coastal Sciences, Rutgers Univ.
2005- 2011 Assistant Professor, Dept. Marine and Coastal Sciences, Rutgers Univ.
2004 –2005 Assistant Research Professor, Inst. Marine and Coastal Sciences, Rutgers Univ.
2001- 2004 Postdoctoral Fellow, Inst. Marine and Coastal Sciences, Rutgers Univ.
1996- 2001 Graduate Research Assistant, Scripps Inst. Oceanography, Univ. of California San Diego
1991- 1996 Faculty Research Assistant, Ctr Marine Biotechnology, Univ. of Maryland

PUBLICATIONS

i) Five publications most closely related to the project

- Bidle, K.D. and A. Vardi. A chemical arms race at sea mediates algal host–virus interactions. 2011. *Curr. Opin. Microbiol.* 14(4): 1-9.
- Vardi, A, B. Van Mooy, H.F. Fredricks, K.J. Popendorf, J.E. Ossolinski L. Haramaty, and K.D. Bidle. 2009. Viral glycosphingolipids induce lytic infection and cell death in marine phytoplankton. *Science* 326 (5954): 861-865
- Vardi, A., K. Bidle, C. Kwityn, D.J. Hirsch, S.M. Thompson, J.A. Callow, P. Falkowski and C. Bowler. 2008. A diatom gene regulating nitric oxide signaling and susceptibility to diatom-derived aldehydes. *Current Biology* 18:1-5.
- Thamatrakoln, K*, O. Korenovska*, A.K. Niheu, and K.D. Bidle. 2011. Whole-genome expression analysis reveals a role for death-related genes in stress acclimation of the diatom *Thalassiosira pseudonana*. *Environ. Microbiol.* doi:10.1111/j.1462-2920.2011.02468.x
- Bidle, K.D., L. Haramaty, J. Barcelos-Ramos and P.G. Falkowski. 2007. Viral activation and recruitment of metacaspases in the unicellular coccolithophorid, *Emiliania huxleyi*. *Proc. Natl. Acad. Sci. USA* 104: 6049-6054.

ii) Five other significant publications

- Oliver M.J., O. Schofield and K. Bidle. Density dependent expression of a diatom retrotransposon. *Marine Genomics* (doi:10.1016/j.margen.2010.08.006)
- Bidle, K.D. and S.J. Bender. 2008. Iron starvation and culture age activate metacaspases and programmed cell death in the marine diatom, *Thalassiosira pseudonana*. *Eukaryotic Cell* 7(2): 223-236

- Bidle, K.D., S.H. Lee, S.H., D. Marchant and P.G. Falkowski. 2007. Fossil genes and microbes in the oldest ice on Earth. *Proc. Natl. Acad. Sci. USA* 104: 13455-13460.
- Bidle, K.D., M. Manganelli and F. Azam. 2002. Regulation of oceanic silicon and carbon preservation by temperature control on bacterial activity. *Science* 298: 1980-1984
- Bidle, K.D. and F. Azam. 1999. Accelerated dissolution of diatom silica by marine bacterial assemblages. *Nature*. 397:508-512.

HONORS and RECOGNITION

- 2011-present Kavli Fellow, US National Academy of Sciences
- 2011 Board of Trustees Research Fellow for Scholarly Excellence, Rutgers University
- 2005 Raymond A. Lindeman Award, American Society of Limnology and Oceanography
- 2001- 2004 Postdoctoral Fellow, Institute of Marine and Coastal Sciences, Rutgers University
- 1999- 2001 Achievement Rewards for College Students Scholar, ARCS Foundation (Los Angeles, CA)
- 2000 Edward A. Frieman Award, Scripps Institution of Oceanography
- 1996 Regents Fellow, University of California San Diego
- 1990 REU Fellow, National Science Foundation

SYNERGISTIC ACTIVITIES

- Organizing Committee, 24th Kavli Frontiers of Science Symposium, US National Academy of Sciences Scientific (November 2011- present)
- Planning Committee, 2012 Ocean Sciences Meeting (20-24 February 2012; Salt Lake City, Utah)
- NASA Panel Service; Astrobiology Science and Technology for Exploring Planets (ASTEP) (27-29 October 2010)
- NSF Panel Service; Integrated Organismal Systems, Organism-Environment Interactions (13-15 October 2010)
- External evaluator, Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution (June 2010)
- NSF Science and Technology Center, Site-Visit Panel: Center for Dark Energy Biosphere Investigations (C-DEBI), University of Southern California (Los Angeles, CA; 7-9 October 2009)
- NSF Panel Service: Office of Polar Programs, Antarctic Integrated System Science (July 2009)
- Program Committee, Chapman Conference on Submerged Aquatic Environments, American Geophysical Union (Baltimore, Maryland; March 2010)
- NSF Science and Technology Center, Site-Visit Panel: Center for Dark Energy Biosphere Investigations (C-DEBI), University of Southern California (Los Angeles, CA; 7-9 October 2009)
- Member, Scholastic Review Committee, Graduate Program in Oceanography (May 2010-present)
- Author, Web-based lecture series for American Society of Limnology and Oceanography; run by the Undergraduate Lectures for Teaching & Research Advancement (ULTRA) subcommittee which reports directly to the ASLO Board of Directors (June 2007- Present)
- Member, *Emiliana huxleyi* Genome Annotation Steering Committee (March 2007-Present)
- Thesis Committee: Dave Gruber, Matt Oliver, Carrie Frasier, Rachel Sipler, Mike Garzio, Chuck O'Brien (IMCS, Rutgers Univ.); Jillian Lynch (Medical Univ. South Carolina).
- Faculty Chair, Virology Session, George H. Cook Honors Program, Rutgers University (2007,2008)
- Faculty Research Mentor for Henry Rutgers Honors & George H. Cook Honors Programs and S-STEM Program, Rutgers University. Mentored Ms. Sara Bender (2004-2005), Mr. Ben Tully (2006-2007), Mr. Cliff Kwyityn (2007-2008) and Ms. Jennifer Rusciani (2010).
- Research Internships in Ocean Sciences (RIOS) program at IMCS, Rutgers University, an NSF-funded REU program. Mentored Cyndi Corwonski (Richard Stockton College of New Jersey, 2004), Olga Korenovska (Rutgers University, 2008), Sarah Brown (Rutgers University, 2009), Amelia Min-Venditti (Rice University, 2010).
- Ad Hoc Reviewer and Panelist for National Science Foundation (Office of Polar Programs, Antarctic Biology and Medicine; Antarctic Integrated System Science; Ocean Sciences; Earth Sciences; Integrative Organismal Systems, Ecological and Evolutionary Physiology; Microbial Observatories/Microbial

Interactions and Processes; Emerging Frontiers, EF/ Biocomplexity in the Environment); The Austrian Science Fund; The British Council; Netherlands Council for Earth and Life Sciences; *Nature*, *PLoS One*, *PNAS*, *Plant Cell*, *Environmental Microbiology*, *Limnology and Oceanography*, *Geochimica et Cosmochimica Acta*, *Biochimica et Biophysica Acta*, *Aquatic Microbial Ecology*, *Journal of Phycology*, *Marine Chemistry*, *Protein Science* (1999- present)
Adjunct Faculty, Rider University (Lawrenceville, NJ). Departments of Biology; Geological and Marine Science. Taught courses in *Oceanography*, *Environmental Microbiology* (2002-2004)

COLLABORATORS

Mike Allen (Plymouth Marine Lab, UK), Ilana Berman-Frank (Bar Ilan University, Israel), Kelly Bidle (Rider University), Chris Bowler (CNRS, Département de Biologie, France), Colomban DeVargas (Station Biologique de Roscoff, France), Paul Falkowski (Rutgers), Adam Kustka (Rutgers), Sang Hoon Lee (Korea Ocean Research & Development Institute, South Korea), Allen Milligan (Oregon State University), John Reinfelder (Rutgers), Jessica Ray (U. of Bergen, Norway), Ruth-Anne Sandaa (U. of Bergen, Norway), Maria Segovia (Univ. Malaga, Spain), Peter Van Dassow (Station Biologique de Roscoff, France), Ben Van Mooy (Woods Hole Oceanographic Institution), Assaf Vardi (Weizmann Institute of Science, Israel), Willie Wilson (Bigelow Laboratory for Ocean Sciences).

GRADUATE ADVISORS AND POSTDOCTORAL SPONSORS

Graduate: Dr. Farooq Azam, Scripps Inst. of Oceanography, University of California San Diego
Postdoctoral: Dr. Paul Falkowski, Inst. Marine & Coastal Sciences, Rutgers University

THESIS ADVISOR AND POSTGRADUATE-SCHOLAR SPONSOR

Graduate:

Jorge Montalvo, Microbial Biology Graduate program, Rutgers University
Christian Laber, Graduate Program in Oceanography, Rutgers University (Ph.D.) (2011-present)
Brittany Schieler, Graduate Program in Oceanography, Rutgers University (M.Sc) (2011-present)
Mansha Seth-Pasricha, Microbiology & Molecular Genetics Program, Rutgers Univ. (Ph.D.) (2011-present)
Suzanne Rose, Ecology and Evolution Graduate Program Rutgers University (Ph.D.) (2009-present)
Maria Teresa Mata Contreras, Department of Ecology, University of Málaga (hosted for Ph.D.; 2009, 2010)
Gad Rosenberg, Ecological and Biological Oceanography, Bar Ilan University (hosted for M.Sc.; 2008, 2009)
Lauren Seyler, Graduate Program in Oceanography, Rutgers University (Ph.D.) (2009, rotation)
Lauren Seyler (PhD), Graduate Program in Oceanography, Rutgers University

Postdoctoral:

Adam Kustka (*Dept. of Earth & Environmental Sciences, Rutgers- Newark*)
Assaf Vardi (*Dept. of Plant Sciences, Weizmann Institute of Science, Israel*)
Kim Thamatrakoln (*Institute of Marine and Coastal Sciences, Rutgers*)
Chris Brown (*Institute of Marine and Coastal Sciences, Rutgers*)



Kay Daniel Bidle

Date of Birth: 7 February 1969

Place of Birth: Baltimore, Maryland

Passport #: 485963716

Lead PI and Chief Scientist