JAMES MARK FULTON

Postdoctoral Investigator
Department of Marine Chemistry and Geochemistry
Woods Hole Oceanographic Institution
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EDUCATION

PH.D., GEOSCIENCES AND BIOGEOCHEMISTRY

The Pennsylvania State University, University Park, PA, Dept. of Geosciences, May 2010

Dissertation: *Interpreting Nitrogen Isotope Excursions in the Sedimentary Record*
Advisors: Michael A. Arthur and Katherine H. Freeman

M.A., SECONDARY EDUCATION

Ball State University, Muncie, IN, Dept. of Educational Studies, 2000
Teaching certification in Earth Science and Chemistry

B.S., GEOLOGICAL SCIENCES

Wheaton College, Wheaton, IL, Geology Department, 1997

RESEARCH POSITIONS

POSTDOCTORAL INVESTIGATOR, Woods Hole Oceanographic Institution (2011-2012)
Supervisor: Benjamin Van Mooy
Projects:
- Membrane lipid dynamics in viral infection of *Emiliania huxleyi*
- Degradation of intact polar lipids by natural populations of heterotrophic bacteria

POSTDOCTORAL RESEARCHER, Biogeochemical Stable Isotopes Lab, Penn State, (2010-2011)
Supervisor: Kate Freeman
Projects:
- C and N stable isotope analysis of scytonemin, a cyanobacterial biomarker pigment
- C and N stable isotope analysis of coenzyme F430 from methanogens and methanotrophs
- Nitrogen isotope study of Permian-Triassic sediments from the Panthalassic Ocean

RESEARCH ASSISTANT, Department of Geosciences, Penn State University (2003-2009)
Responsibilities:
- Sample collection and preparation for multiple analytical techniques, including:
  - EA-IRMS (elemental analysis-isotope ratio mass spectrometry)
  - HPLC-MS^n (high performance liquid chromatography-multistage mass spectrometry)
- Operation and maintenance of a Costech Elemental Analyzer
- Operation of a ThermoFinnigan Delta-plus XP Mass Spectrometer
- Operation and maintenance of an Agilent HPLC-MS^n

Method development:
- EA analysis of nanomolar carbon and nitrogen samples, "nano-EA"
- HPLC purification of pigments for analysis of C and N stable isotopes

VISITING RESEARCHER, Department of Chemistry, University of York, UK (summer 2005)
Host: Brendan Keely
- Analyzed pigments in sediment and water-column samples from Fayetteville Green Lake

TEACHING APPOINTMENTS

TEACHING ASSISTANT, Penn State University (2002-2003, 2008)
National Parks Geology (online course) TA, spring 2008
Oceanography lab instructor, spring 2008
Physical Geology lab instructor, Head TA, spring 2003
Physical Geology lab instructor, fall 2002

TEACHER, Talawanda High School, Oxford, OH (2000-2002)
Interdisciplinary Earth Science, Physical Science, and Environmental Science

INSTRUCTOR, Department of Educational Studies, Ball State University (1999-2000)
I taught two semester-long secondary education classes: *Basic Concepts in Education* and *Principles of Secondary School Teaching*. I prepared lectures, developed exams and other assessments, and supervised university student interns in secondary schools.

HONORS AND GRANTS

2012	*Proposal pending, submitted to NSF Geobiology and Low Temperature Geochemistry* "Tracing Aridity: Sedimentary Preservation of Scytonemin from Microbiotic Desert Soil Crusts" Principle Investigator with Ben Van Mooy, co-PI.
2010-2011	Pennsylvania Space Grant postdoctoral research grant
2009	Krynine Fund Travel Grant—IMOG meeting PSU Biogeochemistry Dual Title Degree Program research fellowship 2nd place oral presentation award, PSU Geosciences Graduate Student Colloquium
2005-2009	NSF EAR-0525464 "Assessing Microbial N Fixation in Ancient Euxinic Basins" to PI M. Arthur and co-PI K. Freeman ($428,688). I participated in project development, grant writing, and research as a Ph.D. student.
2008	Shell Oil Graduate Fund Travel Grant—AGU Fall Meeting 1st place oral presentation award, PSU Geosciences Graduate Student Colloquium
2003-2006	NSF-IGERT "Biogeochemical Research Initiative for Education (BRIE)" fellowship
2005	Worldwide University Network Grant—Research at University of York, UK ($5000)
2004	BRIE travel grant—AGU Fall Meeting BRIE student research grant—Nitrogen stable isotope study of Green Lake ($4000)

PUBLICATIONS

Fulton, J.M., Arthur, M.A., and Freeman, K.H. (2012) Black Sea nitrogen cycling and the preservation of phytoplankton $\delta^{15}N$ signals during the Holocene. *Global Biogeochemical Cycles* **26**, GB2030, doi:10.1029/2011GB004196.

Fulton, J.M., Arthur, M.A., and Freeman, K.H. (2012) Subboreal aridity and scytonemin in the Holocene Black Sea. *Organic Geochemistry* **49**, 47-55, doi:10.1016/j.orggeochem.2012.05.008.

O'Neil, G.W., Carmichael, C.A., Fulton, J.M., Goepfert, T.J., Knothe, G., Lau, C.P.L, Lindell, S., Mohammady, N.G-E., Van Mooy, B.A.S., and Reddy, C.M. (2012) Beyond fatty acid methyl esters: Expanding the renewable carbon profile with alkenones from *Isochrysis* sp. *Energy & Fuels* **26**, 2434-2441.

Algeo, T., Henderson, C.M., Ellwood, B., Rowe, H., Elswick, E., Bates, S., Lyons, T., Hower, J.C., Smith, C., Maynard, B., Hayes, L.E., Summons, R.E., Fulton, J., and Freeman, K.H. (2012) Evidence for a diachronous Late Permian marine crisis from the Canadian Arctic region. *GSA Bulletin* **124**, 1424-1448, doi:10.1130/B30505.1.

Meyer, K.M., Macalady, J.L., Fulton, J.M., Kump, L.R., Schaperdoth, I., and Freeman, K.H. (2011) Carotenoid biomarkers as an imperfect reflection of the anoxygenic phototrophic community in meromictic Fayetteville Green Lake. *Geobiology* **9**, 321-329.

Polissar, P.J., Fulton, J.M., Junium, C.K., Turich, C.T., and Freeman, K.H. (2009) Measurement of ^{13}C and ^{15}N isotopic composition on nanomolar quantities of C and N. *Analytical Chemistry* **81**, 755-763.

MANUSCRIPTS

Fulton, J.M., Fredricks, H., DiTullio, G., Popendorf, K., Vardi, A., Bidle, K. and Van Mooy, B.A.S. Environmental occurrence of lipids associated with viral infection of *Emiliania huxleyi*. (In Prep., to be submitted to Environmental Microbiology)

Fulton, J.M., Freeman, K.H., Keely, B.J., and Arthur, M.A. C and N isotopes of bacterial pigments in redox-stratified basins. (In Prep., to be submitted to Geobiology)

Fulton, J.M., Bird, L., Patel, N., and Freeman, K.H.. Investigating methanotrophy using C and N isotopes of coenzyme F430. (In Prep., to be submitted to Organic Geochemistry)

INVITED TALKS

Fulton, J.M., Phytoplankton productivity in anoxic oceans. Kansas State University, Department on Geology (Feb. 2012)

Fulton, J.M., Biomarker pigments of cyanobacteria on land and in the oceans. Pacific Northwest National Lab, Chemical and Biological Signatures Group (Nov. 2010).

Fulton, J.M., Detecting cyanobacteria in modern and ancient environments. NASA Goddard Space Flight Center, Planetary Environments Laboratory (Oct. 2010).

Fulton, J.M., Organic geochemistry of pigments in the Black Sea and beyond. Baylor University, Geology Department (Feb. 2010).

Fulton, J.M., Evaluating pigment-specific carbon and nitrogen stable isotopes as indicators of past N-fixation. MIT, Department of Earth, Atmospheric and Planetary Sciences. (Feb. 2009).

MEETING ABSTRACTS

Fulton, J.M., Longnecker, K., Fredricks, H.F, Van Mooy, B.A.S. Intact polar lipid degradation in the Sargasso Sea. Gordon Research Conference on Organic Geochemistry. Holderness, NH. (Aug. 2012)

Fulton, J.M., Fredricks, H.F., Bidle, K.D., DiTullio, G.R., Vardi, A. and Van Mooy, B.A.S., Lipid-based mechanisms of viral infection and defense in *Emiliania huxleyi*. Aquatic Virus Workshop 6. Texel, The Netherlands. (Nov. 2011)

Giri, S., Fulton, J.M., and Baums, I., Assessing the effect of thermal stress on larval lipid reserves of the elkhorn coral *Acropora palmata.* GSA Annual Meeting. Minneapolis, MN. (Oct. 2011)

Fulton, J.M., Bird, L.R., and Freeman, K.H., Coenzyme F430: A new approach to understanding methanotrophy in methane rich environments. Goldschmidt. Prague, Czech Republic. (Aug. 2011)

Macalady, J.L., Albrecht, H.L., Welander, P.V., Fulton, J.M., Schaperdoth, I., White, T.S., Freeman, K.H., Newman, D.K., and Summons, R.E. Proterozoic analog ecosystems and organic biomarkers in a Florida sinkhole. Goldschmidt. Prague, Czech Republic. (Aug. 2011)

Fulton, J.M., Freeman, K.H., Arthur, M.A., Kump, L.R., Keely, B.J., Chemocline and sedimentary pigment isotopes. Anaerobic Phototrophic Ecosystems workshop. Fayetteville, NY. (Oct. 2010)

Fulton, J.M., Freeman, K.H. and Arthur, M.A., Compound-specific C and N isotope analysis of scytonemin, a cyanobacterial biomarker. Gordon Research Conference on Organic Geochemistry. Holderness, NH. (Aug. 2010)

Fulton, J.M., Arthur, M.A., and Freeman, K.H., Scytonemin in Black Sea sediments. International Meeting on Organic Geochemistry (plenary talk). Bremen, Germany. (Sept. 2009)

Fulton, J.M., Holocene Black Sea cyanobacterial ecology elucidated by pigments and nitrogen isotopes. PSU Dept. of Geosciences Graduate Student Colloquium. (April 2009) **2nd Place Award**

Fulton, J.M., Arthur, M.A., and Freeman,K.H., Hydrologic control on bacterial nitrogen fixation in the Holocene Black Sea. American Geophysical Union (AGU) Fall Meeting. San Francisco, CA. (Dec. 2008)

Fulton, J.M., Productivity shifts revealed by pigment C and N stable isotope values. PSU Dept. of Geosciences Graduate Student Colloquium. (April 2008) **1st Place Award**

Fulton, J.M. and Arthur, M.A., Lacustrine surface and deep water responses to historical deforestation. Geological Society of America, Northeast Section Annual Meeting. (March 2008)

Fulton, J.M., Freeman, K.H., Keely, B.J., and Arthur, M.A., Sedimentary pigments and temporal changes in chemocline depth and N cycling in a meromictic lake (poster). International Meeting on Organic Geochemistry. Torquay, England. (Sept. 2007)

Fulton, J.M., Polissar, P.J., Turich, C.T., and Freeman, K.H., Rapid nanomole-scale stable isotope measurements of N and C by *nano*EA (poster). International Meeting on Organic Geochemistry. Torquay, England. (Sept. 2007)

Fulton, J.M. and Arthur, M.A., Nitrogen isotopes and chemocline depth in stratified basins (poster). AGU Fall Meeting. San Francisco, CA. (Dec. 2006)

Fulton, J.M. and Arthur, M.A., Nitrogen dynamics in the euxinic Holocene Black Sea. Biennial Meeting of the NASA Astrobiology Institute (poster). Boulder, CO. (April 2005)

Fulton, J.M. and Arthur, M.A., Sedimentary N stable isotopes and variations in nutrient cycling in the Holocene Black Sea (poster). AGU Fall Meeting. San Francisco, CA. (Dec. 2004)

RESEARCH CRUISE PARTICIPATION

Massachusetts to Bermuda, North Atlantic, April-May 2012. R/V *Knorr*.
Sargasso Sea, North Atlantic, March 2011. R/V *Atlantic Explorer.*

MENTORING EXPERIENCE (undergraduate students)

Sharmila Giri (2010) biology department summer intern (Lipid analysis of coral larvae)
Nisha Patel (2009) astrobiology summer REU (Isotopic analysis of methanogenic coenzyme F430)
Genevieve Ellsworth (2008-2010) sedimentary geology lab assistant (Several projects)
Peter Linde (2007) astrobiology summer REU (Scytonemin detection and isotopic analysis)
Tricia Nardiello (2005) biogeochemistry summer REU (Nitrogen cycling in a redox-stratified lake)

COLLABORATORS

Jack Oviatt (Kansas State University); Kay Bidle (Rutgers University); Jack DiTullio (College of Charleston); Assaf Vardi (Weitzmann Institute, Israel); Helen Fredricks (Woods Hole Oceanographic Institution); Kate Freeman (Penn State); Mike Arthur (Penn State); Diane Newman, (Caltech); Thomas Algeo (University of Cincinnati); Brendan Keely (University of York, UK), Lee Kump (Penn State); Jenn Macalady (Penn State), Chris Junium (Syracuse University), Katja Meyer (Stanford University); Burt Thomas (USGS)

ACADEMIC SERVICE

Proposal Reviewer—NASA Mars Fundamental Research Program Panel (2012)
Graduate student representative to Dept. of Geosciences faculty meetings (2007, 2008)
Penn State Environmental Chemistry Student Symposium planning committee (2005, 2006)
Penn State Geosciences Graduate Student Colloquium planning committee (2004, 2005)

MEMBERSHIPS

American Geophysical Union
Geological Society of America
Association for the Sciences of Limnology and Oceanography

REFERENCES FOR LETTERS OF SUPPORT

Benjamin Van Mooy, Associate Scientist, Dept. of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, 266 Woods Hole Rd., MS #04, Woods Hole, MA, 02543 bvanmooy@whoi.edu; (508) 289-2322

Kate Freeman, Professor, Dept. of Geosciences, Penn State University, University Park, PA 16802 khf4@psu.edu; (814) 863-8177

Michael Arthur, Professor, Dept. of Geosciences, Penn State University, University Park, PA 16802 maa6@psu.edu; (814) 863-6054