

Andrew R. Babbin

MIT Building 54–1420
T +1 617 253 2181 babbin@mit.edu
<http://babbin.mit.edu>

APPOINTMENTS

Massachusetts Institute of Technology, Cambridge, MA — Nov 2016 – present

Assistant Professor (Jan 2017 – present)

Visiting Research Scientist (Nov 2016 – Dec 2016)

Department of Earth, Atmospheric, and Planetary Sciences

Massachusetts Institute of Technology, Cambridge, MA — Nov 2014 – Oct 2016

NSF Postdoctoral Research Fellow

Department of Civil and Environmental Engineering

- *Project*: Marine microbial response to organic matter and chemical gradients characteristic of oxygen minimum zones
- *Advisors*: Roman Stocker & Otto X. Cordero

EDUCATION

Columbia University, New York, NY— Bachelor of Science, *Summa Cum Laude*, 2008

Earth and Environmental Engineering with a minor in Applied Mathematics

- Concentration in Water Resources and Climate Risks

Princeton University, Princeton, NJ — Master of Arts, 2010

Geosciences Department

- Concentrations in Chemical Oceanography and Environmental Microbiology

Princeton University, Princeton, NJ — Doctor of Philosophy, 2014

Geosciences Department

- *Dissertation*: **Biogeochemical controls on fixed nitrogen loss processes in the marine environment**
- *Advisor*: Bess B. Ward
- *Committee*: François M.M. Morel; Jorge L. Sarmiento; Daniel M. Sigman

RESEARCH GRANTS & AWARDS

MIT Environmental Solutions Initiative Seed Grant (\$200,000)

MIT Research Support, James H. Ferry, Jr. Fund for Innovation in Research (\$75,000)

MIT ESI Curriculum Development Grant, Biogeochemistry of natural environments (\$60,000)

Bruce Heflinger Award (\$36,000)

MIT Ally of Nature Award (\$20,000)

NSF Postdoctoral Fellowship in Biology, Intersections of Biology and Math (\$138,000)

National Defense Science and Engineering Graduate Fellowship (\$200,000)

PUBLICATIONS

Babbin, A.R., B.D. Peters, C.W. Mordy, B. Widner, K.L. Casciotti, and B.B. Ward. Novel metabolisms support the anaerobic nitrite budget in the Eastern Tropical South Pacific. *Global Biogeochemical Cycles*, **31**: 258-271 (2017).

Peters, B.D, **A.R. Babbin**, B.B. Ward, K. Lettman, C.W. Mordy, O. Ulloa, and K.L. Casciotti. Vertical modeling of the nitrogen cycle in the eastern tropical south Pacific ODZ using high resolution concentration and isotope measurements. *Global Biogeochemical Cycles*, **30**: 1661-1681 (2016).

Babbin, A.R., A. Jayakumar, and B.B. Ward. Organic matter loading modifies the microbial community responsible for nitrogen loss in estuarine sediments. *Microbial Ecology*, **71**: 555 (2016).

Babbin, A.R., D. Bianchi, A. Jayakumar, and B.B. Ward. Rapid nitrous oxide cycling in the suboxic ocean. *Science*, **348**: 1127-1129 (2015).

Ji, Q., **A.R. Babbin**, A. Jayakumar, S. Oleynik, and B.B. Ward. Nitrous oxide production by nitrification and denitrification in the Eastern Tropical South Pacific oxygen minimum zone. *Geophysical Research Letters*, **42**: 10755-10764 (2015).

Ji, Q., **A.R. Babbin**, X. Peng, J.L. Bowen, and B.B. Ward. Nitrogen sources of nitrous oxide in salt marsh sediments. *Journal of Marine Research*, **73**: 71-92 (2015).

Babbin, A.R., R.G. Keil, A.H. Devol, and B.B. Ward. Organic matter stoichiometry, flux, and oxygen control nitrogen loss in the ocean. *Science*, **344**: 406-408 (2014).

Bianchi, D., **A.R. Babbin**, and E.D. Galbraith. Enhancement of anammox by the excretion of diel vertical migrators. *Proceedings of the National Academy of Sciences*, **111**: 15653-15658 (2014).

Bowen, J.L., **A.R. Babbin**, P.J. Kearns, and B.B. Ward. Connecting the dots: Linking nitrogen cycle gene expression to nitrogen fluxes in marine sediment mesocosms. *Frontiers in Microbiology*, **5**: 429 (2014).

Babbin, A.R. and B.B. Ward. Controls on nitrogen loss in Chesapeake Bay sediments. *Environmental Science & Technology*, **47**: 4189-4196 (2013).

[Selected as Editors' Choice, "Lost N Found" in *Science*, **340**: 408]

Newell, S.E., **A.R. Babbin**, A. Jayakumar, and B.B. Ward. Ammonia oxidation rates and nitrification in the Arabian Sea. *Global Biogeochemical Cycles*, **25** (2011).

Babbin, A.R., C. Buchwald, F.M.M. Morel, S.D. Wankel, and B.B. Ward. Nitrite oxidation exceeds reduction and fixed nitrogen loss in anoxic Pacific waters (submitted).

Babbin, A.R. and B.B. Ward. Survey of nitrogen loss from the Pacific oxygen minimum zones (in preparation).

PRESENTATIONS

Babbin, A.R., C. Buchwald, and S.D. Wankel, 2016. Anaerobic nitrogen cycling: Tales from the Eastern Tropical Pacific. *Ocean Sciences Meeting, New Orleans, Louisiana*.

Babbin, A.R., B.B. Ward, and R. Stocker, 2015. Incomplete denitrification causes rapid nitrous oxide cycling in the oceanic oxygen minimum zones. *American Geophysical Union Fall Meeting, San Francisco, California. (invited)*

Babbin, A.R., 2015. Anaerobic cycling of marine nitrogen. *Biogeochemistry and Pollutant Dynamics Seminar, ETH Zürich. (invited)*

Babbin, A.R., R. Stocker, and B.B. Ward, 2015. Incomplete denitrification under suboxia. *Gordon Research Conference in Chemical Oceanography, Holderness, New Hampshire*.

Babbin, A.R., 2015. Anaerobic cycling of marine nitrogen. *EAPS Sack Lunch Seminar, Massachusetts Institute of Technology. (invited)*

Babbin, A.R., B.D. Peters, C.W. Mordy, K.L. Casciotti, and B.B. Ward, 2015. High resolution nitrite-centric nitrogen cycling in the Eastern Tropical South Pacific. *Aquatic Sciences Meeting, Granada, Spain*.

Babbin, A.R., B.B. Ward, R.G. Keil, and A.H. Devol, 2014. Biogeochemical controls on nitrogen loss processes in the marine environment. *Dissertations in Chemical Oceanography, Lihue, Hawaii. (invited)*

Babbin, A.R., B.B. Ward, R.G. Keil, A.H. Devol, and D. Bianchi, 2014. Fixed nitrogen loss: Controversy and resolution. *Earth Systems Special Seminar, Stanford University. (invited)*

Babbin, A.R., B.B. Ward, R.G. Keil, A.H. Devol, and D. Bianchi, 2014. Resolving the controversy over anammox and denitrification. *Environmental Geology & Geochemistry Seminar, Princeton University. (invited)*

Babbin, A.R., A. Jayakumar, and B.B. Ward, 2014. Rapid nitrous oxide consumption in the Eastern Tropical North Pacific. *Ocean Sciences Meeting, Honolulu*.

Babbin, A.R. and B.B. Ward, 2013. Heterotrophy-coupled anaerobic ammonium oxidation in the Eastern Tropical North Pacific oxygen minimum zone. *International Conference on Nitrification, Tokyo, Japan*.

Babbin, A.R., A. Jayakumar, and B.B. Ward, 2013. Rapid cycling of N₂O in the Eastern Tropical North Pacific oxygen deficient zone. *SOLAS Summer School, Xiamen, China. (invited)*

Babbin, A.R. and B.B. Ward, 2013. Organic matter controls pelagic nitrogen loss. *GeoGraduate Research Symposium, Lamont-Doherty Earth Observatory, Palisades, NY. (invited)*

Babbin, A.R. and B.B. Ward, 2013. Controls on nitrogen loss in the Eastern Tropical North Pacific oxygen deficient zone. *Aquatic Sciences Meeting, New Orleans.*

Babbin, A.R. and B. B. Ward, 2012. Sediment nitrogen cycling following a simulated discharge event. *Ocean Sciences Meeting, Salt Lake City.*

Babbin, A.R. and B.B. Ward, 2011. Stoichiometric constraints on environmental nitrogen loss processes. *GeoGraduate Research Symposium, Princeton University. (invited)*

Babbin, A.R., G. Truong, R. Newton, and P. Schlosser, 2008. Oxygen isotope ratios in the Arctic Ocean: Implication for the freshwater balance. *Ocean Sciences Meeting, Orlando.*

EDUCATIONAL ACTIVITIES

Research advisor to Princeton University undergraduates and local high school students#:

- Nora Xu (junior paper): Spring 2010 (current grad student at MIT)
- Owen Coyle (senior thesis): 2010 – 2012 (current grad student at U. Washington)
- Kacie Farrell (internship): Summer 2012 (current undergrad at Princeton)
- Naveen Setlur# (internship): Fall 2013 (current undergrad at Carnegie Mellon)
- Derek Qiu# (internship): Fall 2013 (current undergrad at NYU)

Assistant in Instruction, *Global Change and Human Impact* (PU: FRS 124): Spring 2013
This Freshman seminar uses the Everglades as a lens for human impacts on the environment. It is laboratory-based and includes an intensive field sampling trip to south Florida where the students design research projects related to the effects of anthropogenic nutrients.

additionally assisted on the field component as an A.I. in Spring 2014

Assistant in Instruction, *Water Pollution Technology* (PU: CEE/GEO 471): Fall 2011
This course introduces the fundamentals of how contaminants are removed via biological, chemical, and physical processes from water and applies these principles to both engineered and natural systems. Comprised of 50% graduate students, 50% upper level undergraduates.

Assistant in Instruction, *Observing the Marine Environment* (PU: GEO 318): Summer 2008
This course is an intensive field class based in Bermuda for one month and teaches how biology and chemistry interact in the ocean. The students participate in a number of research cruises to collect and analyze seawater around Bermuda.

Teaching Assistant, *The Climate System* (CU: EESC V2100): Spring 2008

This course is laboratory-based for students to learn how the atmosphere and ocean interact to generate “climate.” The subject is approached through laboratory experiments and numerical analyses of global climatology data sets.

SCIENTISTS ADVISED

Sarah Schwartz PhD Student, MIT Microbiology Program

Tyler Tamasi PhD Student, MIT/WHOI Chemical Oceanography Joint Program

Einat Segev Postdoctoral Researcher, now Assistant Professor at Weizmann Institute

RESEARCH CRUISES

Bermuda (part of Princeton GEO318 course) St. George’s, Bermuda. Jul 2008 (3 days)

Eastern Tropical North Pacific, Manzanillo, Mexico to San Diego, CA. Mar–Apr 2012 (26 days)

Subtropical Atlantic, St. George’s, Bermuda. Aug 2012 (4 days)

Eastern Tropical South Pacific, Valparaíso, Chile. Jun–Jul 2013 (33 days)

Subpolar North Atlantic, Narragansett, RI to Reykjavik, Iceland. Apr–May 2014 (24 days)

Subtropical Pacific (UNOLS Chief Scientist Training cruise), San Diego, CA. Feb 2016 (8 days)

Pacific P18 Transect, San Diego, CA to Punta Arenas, Chile. Nov 2016–Feb 2017 (75 days)

East Pacific Rise, Manzanillo, Mexico to Puntarenas, Costa Rica. Apr–May 2017 (21 days)

SYNERGISTIC ACTIVITIES

Session Chair, Nitrogen at the interface, Ocean Sciences Meeting: 2016

Evaluation Panelist, National Defense Science & Engineering Graduate Fellowship: 2015

Session Chair, The many faces of the marine nitrogen cycle, Ocean Sciences Meeting: 2014

ACTIVE COLLABORATIONS

Bess Ward (Princeton University), **Scott Wankel** (WHOI), **Otto Cordero** (MIT), **Roman Stocker** (ETH Zürich), **Daniele Bianchi** (UCLA), **Allan Devol** (University of Washington), **Jennifer Bowen** (Northeastern University), **Amal Jayakumar** (Princeton University), **Karen Casciotti** (Stanford University), **Carolyn Buchwald** (Dalhousie University), **Stefan Sievert** (WHOI), **Jeremy Rich** (Darling Marine Center), **Amy Apprill** (WHOI), **Mick Follows** (MIT)