

**TANJA BOSAK**  
**Department of Earth, Atmospheric and Planetary Sciences**  
**Massachusetts Institute of Technology**  
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### **Degrees**

University of Zagreb	Geophysics B.Sc.	1998
California Institute of Technology	Geobiology, Ph.D.	2004
Harvard University	Microbial Sciences Fellow	2005-2007

### **Employment**

Cecil and Ida Green Assistant Professor of Geobiology, Massachusetts Institute of Technology, Cambridge, MA		2007-
Microbial Sciences Initiative Fellow, Harvard University, Cambridge, MA		2005-2007
Graduate Research Assistant, California Institute of Technology, Pasadena, CA		1999-2004
Meteorologist, Zagreb International Airport		1999
Summer Undergraduate Research Fellow, Caltech, Pasadena, CA		1998

### **Honors**

AGU James B. Macelwane Medalist		2011
Cecil and Ida Green Career Development Chair Massachusetts Institute of Technology		2007
The Subaru Outstanding Woman in Science Award Geological Society of America		2007
Invited Participant in Chinese-American Frontiers of Sciences Symposium The United States National Academy of Sciences and the Chinese Academy of Sciences		2005-2006
Microbial Sciences Initiative fellow Harvard University		2005-2007
Everhart Distinguished Graduate Student Lecturer Award California Institute of Technology		2004
Student Travel Grant for Short Course in Biomineralization American Mineralogical Society		2003
Student Travel Award American Society of Microbiology		2003
Summer Undergraduate Research Fellowship California Institute of Technology		1998
The Award of the Dean of Studies Faculty of Natural Sciences, Zagreb, Croatia		1998

### **Publications**

- Bosak, T., Templer, S., Wu, T.-D., Liang, B., Guerquin Kern, J.-L., Mui, J., Vali, H., Evans, A., Sim M.-S., Friedman, J., Klepac-Ceraj, V., Cyanobacterial composition and activity in modern conical stromatolites, *submitted*.
- Petroff, A. P. P., Rothman, D. H., Beukes, N., Bosak, T., Biofilm growth and fossil form, *PNAS*, in revision.
- Bosak, T., Lahr D. J. G., Pruss, S. B., Macdonald, F. A., Gooday, A. J., Dalton, L., Matys, E. D., Possible early foraminiferans in post-Sturtian cap carbonates, in press.
- Bosak, T., Lahr, D., Macdonald, F. A., Matys, E. Putative Cryogenian ciliates from Mongolia, *Geology*, in press.
- Petroff, A. P. P., Wu, T.-D., Liang, B., Mui, J., Guerquin-Kern, J.-L., Vali, H., Rothman, D. H., Bosak, T. (2011) Reaction-diffusion model of nutrient uptake in a biofilm: theory and experiment, *Journal of Theoretical Biology*, **289**, 90-95.
- Sim, M. S., T. Bosak, and S. Ono (2011) Large sulfur isotope fractionation does not require disproportionation, *Science*, **333**, 74-77.
- Sim, M. S., Donovan, K. A., Ono, S., Templer, S. P., and T. Bosak (2011) Effect of electron donors on the fractionation of sulfur isotopes by a marine *Desulfovibrio* sp., *Geochimica and Cosmochimica Acta*, **75**, 4244-4259, dx.doi.org/10.1016/j.gca.2011.05.021.
- Bosak, T., Lahr, D., Pruss, S. B., Macdonald, F. A., Dalton, L. and Matys, E. (2011) Agglutinated tests in post-Sturtian cap carbonates from Namibia and Mongolia, *Earth and Planetary Science Letters*, **308**, 29-40, doi:10.1016/j.epsl.2011.05.030.
- Bosak, T., Microbial contribution to the precipitation of calcium carbonate minerals (2011) *Encyclopedia of Geobiology*, H.W. Fritz, J. Reitner, A. Kappler, V. Thiel, K. Konhauser, P. Reid, X. Zhang (editors), Springer Verlag, Germany.
- Pruss, S. B., Bosak, T., Macdonald, F. A., McLane, M., P. F. Hoffman (2010) Microbial facies in a Sturtian cap carbonate, the Rasthof Formation, Otavi Group, northern Namibia, *Precambrian Research*, **181**, 187-198.
- Petroff, A. P., Sim, M. S., Maslov, A., Krupenin, M, Rothman, D. H., and T. Bosak (2010) Biophysical basis for the geometry of conical stromatolites, *Proceedings of the National Academy of Sciences of the U.S.A*, **107**, 9956-9961.
- Bosak, T., Bush, J., Flynn, M., Liang, B., Ono, S., Petroff, A. P., and M. S. Sim (2010) Formation and stability of oxygen-rich bubbles that shape photosynthetic mats, *Geobiology*, **8**, 45-55.
- Brocks, J. J., Bosak, T., and A. Pearson (2009) Oligoprenyl-curcumanes and other new aromatic isoprenoids from the 1.64 billion years old Barney Creek Formation *Organic Geochemistry* **40**: 795-801.
- Bosak, T., Liang, B., Sim, M. S., and A. P. Petroff (2009) Morphological record of oxygenic photosynthesis in conical stromatolites, *Proceedings of the National Academy of Sciences of the U.S.A*, **106**, 10939-10943.
- Kontnik, R., Bosak, T., Butcher, R. A., Brocks, J. J., Losick, R., Clardy, J., and A. Pearson (2008) Sporulenes, Heptaprenyl Metabolites from *Bacillus subtilis* Spores, *Organic Letters*, **10**, 3551-3554.
- Bosak, T., Losick, R. and A. Pearson (2008) A polycyclic terpenoid that alleviates oxidative stress, *Proceedings of the National Academy of Sciences of the U.S.A.*, **105**, 6725-6729.

## 2002-2007

- Maloof, A. C., Kopp, R. E., Grotzinger, J. P., Fike, D. A., Bosak, T., Vali, H., Poussart, P. M., Weiss, B. P. and J. L. Kirschvink (2007) Sedimentary iron cycling and the origin and preservation of

magnetization in platformal carbonate muds, Andros Island, Bahamas, *Earth and Planetary Science Letters*, **259**, 581-598.

Bosak, T., Greene, S., and D.K. Newman (2007) A likely role for anoxygenic photosynthetic microbes in the formation of ancient stromatolites, *Geobiology*, **5**, 119-126.

Bosak, T. and D. K. Newman (2005) Microbial kinetic controls on calcite morphology in supersaturated solutions, *Journal of Sedimentary Research*, **75**, 190-199.

Bosak, T., Souza-Egipsy, V., and D. K. Newman (2004) An abiotic model for peloid formation, *Geobiology*, **2**, 189-198.

Bosak, T., Souza-Egipsy, V., Corsetti, F.A., and D. K. Newman (2004) Micron-size porosity as a biosignature in carbonate crusts, *Geology*, **32**, 781-784.

Bosak, T. and D. K. Newman (2003) Microbial nucleation of calcium carbonate in the Precambrian, *Geology*, **31**, 577-580.

Bosak, T. and A. P. Ingersoll (2002) Shear instabilities as a probe of Jupiter's atmosphere, *Icarus*, **158**, 401-409.

### **Publications in Progress**

Bosak, T., Lahr, D., Macdonald, F. A., and Matys, E. D., Silicified tests of Cryogenian eukaryotes from the Tayshir Formation, Mongolia, *in preparation*.

Bosak, T., Knoll, A. H., and Petroff, A. P. P., Toward a theory of Precambrian stromatolites, *in prep for Annual Reviews of Earth and Planetary Sciences*.

### **Undergraduate Students Supervised**

Diana LaScala-Grunewald, UROP	Fall 2007 to Spring 2009
Kristen Whaley, UROP	Spring 2008
Anastasia Maheras, UROP	Summer 2008
Jose L. O. Lugo, University of Puerto Rico	Summer 2008
Joan Chen, UROP	Fall 2008, Spring 2009
Barry D. Bannon, UROP	Spring 2009- Spring 2010
Kevin Gildea, UROP	Spring 2010
Matthew Archer, UROP	Spring- Summer 2010
John Bardeen, UROP	Spring 2010
Lilly Dalton, Smith College	Summer 2010
Eileen Molzberger, University of Wisconsin	Summer 2010, Summer 2011
Emily Chen, UROP	Summer 2010
Rachel Harris, Wellesley College	Summer 2011

### **Ph.D. Students Supervised**

Alexander Petroff (secondary advisor), currently a postdoctoral fellow at Rockefeller 2007-2011

University	
Min Sub Sim, 5th year student	2007-present
Alexander Evans (secondary advisor), 5th year graduate student	2008-present
Yulia Agramakova, terminal M.Sc.	2009-2010
Jonathan Grabenstatter, 3rd year graduate student	2009-present
Jessica Wiedemeyer-Thompson (rotation, Microbiology program)	2009
Alison Takemura (rotation, Microbiology program)	2009

### M.Sc. Students Supervised

Katherine Harris	2008-2009
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### Postdoctoral Researchers Supervised

Dr. Biqing Liang (now at Academia Sinica, Taiwan)	2008- 2010
Dr. Stefanie Templer (now at Emmi, Switzerland)	2009- 2010

### Service

#### Internal to MIT:

Foreign Scholarships Committee	2008-2009
EAPS Undergraduate Committee	2007-present
Thesis advisory committee, three WHOI students, two EAPS students	2007-present
Generals examination committee, eight MIT and WHOI students	2007-present

#### External to MIT:

Member of the review editorial board for <i>Frontiers in Microbiological Chemistry</i>	2011-
Session Convener, "Taphonomy and Organic Geochemistry" V. M. Goldschmidt	August 2011
Conference 2011, Prague, Czech Republic	
Session Convener and Chairwoman, "Geomicrobiology and Fossil Biosignatures"	June 2009
V. M. Goldschmidt Conference 2009, Davos, Switzerland	
Speaker, Girls' Angle, a math club for girls (8-13 years old)	February 2009
Referee: <i>Geology, Geobiology, Journal of Bacteriology, Chemical Geology,</i> <i>Journal of Sedimentary Research, Science, EPSL, Journal of the Royal Society</i> <i>Interface, Palaios, Sedimentology</i>	
Science Review Panel, NASA Exobiology Program	
External Reviewer: NSF Geobiology and Low-Temperature Geochemistry, NASA Exobiology	
Lecturer, Program in Astrophysics at the Department of Physics, Split, Croatia	2008
Member of the editorial board of <i>Geobiology</i>	2008-present
Speaker at the Geological Society of America mentoring program for women in geology	2007
Member of the Organizing Committee of Chinese-American Frontiers of Sciences Symposium	2006-2007

### Collaborators and Other Affiliations

D. Rothman, MIT, J. Bush, MIT, R. Summons, MIT, S. Ono, MIT, A. C. Maloof (Princeton U.), A. Pearson (Harvard U.), A. Husinec (St. Lawrence University), G. Geesey (MSU), H. Vali (McGill U. Canada), R. Kontnik (Harvard U.), R. M. Losick (Harvard U.), J. Clardy (Harvard U.), J. Brocks

(ANU), M. Flynn (University of Alberta), L. Casillas (University of Puerto Rico), C. Reddy (WHOI), R. Nelson (WHOI), S. Pruss (Smith College), J.-L. Guerquin-Kern (Institute Curie), T.-D. Wu (Institute Curie), A. Meibom (LMCM, Museum of Natural History, Paris)

### Invited Presentations

“Towards a theory of stromatolites”, “Unique opportunities in Geobiology” symposium of the International GeoBiology Summer Course, Golden, CO	June 2011
“Modern eukaryotes between the two Snowballs”, annual meeting of the NASA Astrobiology Institute team, MIT, Cambridge, MA	May 2011
“Towards a theory of stromatolites”, Department of Geology and Geophysics, Yale University	March 2011
“Towards a theory of stromatolites”, a series of 3 lectures at Petrobras, Rio de Janeiro, Brazil	February 2011
“What they eat is how they fractionate: controls on sulfur isotope fractionations during microbial sulfate reduction in culture and nature”, <i>invited</i> , AGU Fall Meeting, San Francisco, CA	December 2010
“Evolution of modern eukaryotes and the Cryogenian global changes”, <i>invited talk</i> , AGU Fall Meeting, San Francisco, CA	December 2010
“Life between the Snowballs”, Department of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA	November 2010
“Life between the Snowballs”, Program in Organismic and Evolutionary Biology, UMass Amherst Amherst, MA	October 2010
“Evolution of photosynthesis”, Science for the Public televised seminar series	September 2010
“Life between the Snowballs”, Microbial Science Initiative Seminar Series, Harvard University, Cambridge, MA	September 2010
“Growth geometry of modern conical stromatolites”, <i>invited talk</i> , Goldschmidt Conference, Knoxville, TN	June 2010
“Life between the two Snowballs”, annual geobiology symposium “Advent of Complex Life and the Neoproterozoic-Cambrian transition”, Harvard University, Cambridge MA	2010
“Growth geometry of modern and ancient photosynthetic biofilms”, Earth System Initiative Young Faculty Talk Series, MIT	2010
“Surviving the Snowball”, MIT alumni breakfast	2009
“Growth geometry of modern sedimentary structures”, OEB and EPS, Harvard U.	2009
“The evolution of photosynthesis”, MIT Darwin Bicentennial Symposium	2009
“Conical stromatolites as records of microbial processes”, Department of Environmental Sciences and Engineering, MIT	2008
“Zivot na mladom planetu”, popular science lecture open to general public Split, Croatia	2008
“What do geostable lipids do in modern bacteria?”, Faculty of Physics University of Split, Croatia	2008
“What do geostable lipids do in modern bacteria?”, Chemical Oceanography Seminar Series, Woods Hole Oceanographic Institute, Woods Hole, MA	2008
“Conical stromatolites as records of microbial processes”, Department of Earth Sciences, University of California, Santa Cruz, CA	2008

“Conical stromatolites as records of microbial processes”, Department of Geosciences, Princeton University, Princeton, NJ	2008
“Morphology of microbial aggregates as a biomarker”, Plenary Session NASA Astrobiology Science Conference, San Jose, CA	2008
“What do geostable lipids do in modern bacteria?”, Faculty of Geosciences, University of Tuebingen, Tuebingen, Germany	2007
“Stromatolites as records of early life on Earth”, Department of Earth Sciences University of Washington, Seattle, WA	2006
“What do polycyclic terpenoids do in modern bacteria?”, Department of Earth Sciences, University of Washington, Seattle, WA	2006
“Stromatolites as records of early life on Earth”, Department of Earth, Atmospheric and Planetary Sciences, MIT	2006
“What do polycyclic terpenoids do in modern bacteria?”, Department of Earth Atmospheric and Planetary Sciences, MIT	2006
“Stromatolites as records of early life on Earth”, Department of Geosciences Dartmouth College, Hanover, NH	2006
“What do polycyclic terpenoids do in modern bacteria?”, Department of Geosciences, Dartmouth College, Hanover, NH	2006
“Laboratory models of ancient stromatolites”, Everhart Lecture, California Institute of Technology, Pasadena, CA	2005
“Laboratory models of ancient stromatolites”, Department of Geology and Geophysics, Yale University, New Haven, CT	2005
“Finding microbial imprints in the Precambrian stromatolites”, mini-symposium, Geobiology Summer Course, Agouron Institute and USC, Bozeman, MT	2003

### **Teaching**

Undergraduate: 12.007 (Geobiology), 12.092 (Seminar in Geobiology and Astrobiology), 12.420 (TA for Physics and Chemistry of the Solar System), 12.080 (EAPS Undergraduate Seminar)  
 Graduate: 12.601 (TA for Essentials: Planetary Science), 12.490 (Seminar in Geobiology and Astrobiology), 12.490 Microbial Sediments