

Dr. William D. Orsi
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Positions

- 2013-present Assistant Research Scientist, Horn Point Laboratory, University of Maryland Center for Environmental Sciences (UMCES)
- 2013-present Guest Investigator, Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution (WHOI)
- 2011-2013 Postdoctoral Fellow, Department of Geology and Geophysics, Woods Hole Oceanographic Institution (WHOI)
- 2006-2011 Graduate Researcher, Biology Department, Northeastern University

Education

- 2013-present Postdoctoral research in marine microbial ecology, UMCES
Advisor: Dr. Alyson Santoro
- 2011-2013 Postdoctoral research in marine geomicrobiology, WHOI
Research Advisors: Dr. Virginia Edgcomb (WHOI)
Dr. Jennifer Biddle (U Delaware)
Academic Advisor: Dr. Maurice Tivey (WHOI)
- 2006-2011 Ph.D. in Biology, Northeastern University
Advisor: Dr. Slava Epstein
Dissertation: *Protistan Microbial Observatory in the Cariaco Basin: An Examination of Species Richness, Habitat Specialization, and Biogeography*
- 2002-2006 B.S. in Biology with honors, Temple University
Advisor: Dr. Ee Lin Lim

Fellowships and Research Awards

- 2012-2013 Ocean Life Institute (WHOI) research grant awarded
- 2012-2013 Center for Dark Energy Biosphere Investigations research grant awarded (OCE-0939564)
- 2011-2013 Center for Dark Energy Biosphere Investigations postdoctoral fellowship

Honors, Awards, Publicity

- 2013 Featured Interview on Nature Podcast, “What Lives Under the Seafloor” (June 13th)

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| 2013 | Spektrum.de Research Highlight, “Deep Biosphere, The Creatures from the Underworld” (July 12 th) |
| 2013 | LiveScience Research News Highlight, “Thriving Microbe Community Lives Beneath Seafloor” (June 12 th) |
| 2013 | WHOI Press Release, “Deep Biosphere Harbors Active, Growing Communities of Microorganisms” (June 12 th) |
| 2013 | OurAmazingPlanet Research News Highlight, “Ancient Fungus Discovered Deep Under Ocean Floor” (March 5 th) |
| 2013 | WHOI Press Release, “Fungi Flourish Below the Seafloor” (March 1 st) |
| 2013 | Electron microscopy photographs chosen as cover artwork for <i>Forschung</i> , the German Science Foundation (DFG) Magazine |
| 2012 | Electron microscopy photographs chosen as cover artwork for <i>The International Journal of Systematic and Evolutionary Microbiology</i> |
| 2011-2012 | Electron microscopy photographs chosen as cover artwork for <i>The ISME Journal</i> |
| 2006 | Charles Hodge IV Prize for excellence in undergraduate research |

Research Interests

- Subseafloor geomicrobiology and biogeochemistry
- Microbial ecology and biogeochemistry of marine oxygen minimum zones
- Evolutionary and ecological genomics
- Marine genomics and bioinformatics
- Microbial interactions
- Data mining in microbial ecology

Teaching and Mentoring Experience

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| 2013 | Invited lecturer for the EU-US theoretical and practical training course on marine bioinformatics, Delaware Biotechnology Institute, Delaware (June 17-30 th) |
| 2012 | Invited lecturer for the marine biology workshop for international high school students, WHOI |
| 2012 | Mentor for the Falmouth Academy High School Science Fair (Falmouth, MA) |
| 2006-2011 | Teaching Assistant, <i>Introduction to Microbiology</i> , Biology Department, Northeastern University |
| 2010 | Teaching Assistant, <i>Introduction to Biology</i> , Biology Department, Northeastern University |

Professional Activities and Service

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| 2013-present | Junior member of the Ethics Panel for the Center for Dark Energy Biosphere Investigations (C-DEBI) |
| 2013-present | Member of the Geochemical Society |

2013 Co-chair of session B015: “Carbon Transformations in Hydrothermal Systems”. American Geophysical Union (AGU) meeting, San Francisco

2013-present Reviewer for *Nature Scientific Reports*

2013-present Reviewer for *The Biological Bulletin*

2013-present Reviewer for *Limnology and Oceanography*

2013-present Reviewer for *FEMS Microbiology Letters*

2013-present Reviewer for *Protist*

2012-present Reviewer for *FEMS Microbial Ecology*

2012-present Reviewer for *Journal of Experimental Marine Biology and Ecology*

2012-present Reviewer for *The ISME Journal*

2010-present Reviewer for *Applied and Environmental Microbiology*

2010-present Review Editor for *Frontiers in Extreme Microbiology*

2008-present Member of the International Society of Microbial Ecology (ISME)

Field Experience

2013 Central California Current, North Pacific: Oceanographic research cruise (R/V *Western Flyer*), performed as a part of the Moore Microbiology Initiative (MMI) project: “Life on the dark side: Complex trophic interactions of marine microbial eukaryotes”, funded by the Gordon and Betty Moore Foundation. Responsibilities included implementation of coupled microbial utilization and the stable isotope (¹³C and ¹⁵N)/RNA bottle experiments to study of dissolved organic matter (specifically amino acids and peptides) resulting impact on C and N remineralization rates.

2009, 2011 Eastern Mediterranean Sea: Two oceanographic research cruises (August 2009 on R/V *Oceanus*, and December 2011 on R/V *Atlantis*) to deep-sea hypersaline anoxic brines in the Mediterranean Sea as a part of an international collaboration and NSF grant #OCE-0849578. Responsibilities included preparation, deployment, and collection of samples and sampling equipment (Niskin bottles and two *in situ* robotic water samplers).

2006-2009 Caribbean Sea, Venezuela: Four oceanographic research cruises (R/V *Hermano Ginés*) to the anoxic Cariaco Basin, Venezuela as a part of an international collaboration and NSF Microbial Observatory Grant # 532550-MCB-0348341. Responsibilities included preparation, deployment, and collection of samples and sampling equipment (Niskin bottles and an *in situ* robotic water sampler).

Technical Expertise

- **Molecular methods:** DNA extraction, rRNA extraction, mRNA extraction, protein extraction, PCR, RT-PCR, qPCR, RT-qPCR, single cell genome amplification (MDA), molecular cloning, FISH, CARD-FISH, metatranscriptome sample and library preparations.
- **Biogeochemical methods:** Stable isotope (¹³C and ¹⁵N) labeling of phytoplankton derived OM. Sampling for measurements of ¹³C and ¹⁵N DOC, DON, DIC, and DIN. Stable

isotope/RNA (RNA-SIP) coupled methodology for identification of microbial populations and biochemical pathways responsible for transformations of phytoplankton derived DOM.

- **Microscopy:** Light microscopy, fluorescence microscopy, and scanning and transmission electron microscopy.
- **Microbial cultivation:** Aseptic technique, aerobic and anaerobic cultivation of Bacteria, Protozoa, and Fungi.
- **Bioinformatics:** Proficient in bioinformatic analysis of high-throughput 454, Illumina, and Sanger sequence data from DNA and RNA datasets. Proficient in assembly, read mapping, taxonomic and functional assignment of metagenomic and metatranscriptomic data using PhymmBL, MEGAN, HMMer, CLC genomics workbench, and BLASTn/x/p. Extensive experience with analysis of rRNA data, including sequence-based phylogenetic inference and multivariate spatial ecology analyses using ARB, QIIME, and R. Extensive experience with Linux based systems.
- **Data visualization:** Proficient in comparative genomics and genome mapping of metaomics data using Circos. Also proficient in mapping of metaomics data to metabolic pathways using KEGG and iPATH.
- **Programming skills:** Proficient in programming with Perl and R for bioinformatics.
- **Statistics:** Proficient in using the R statistical language for data visualization and statistical analysis of high throughput DNA/RNA sequence data and metadata.
- **Foreign languages spoken:** Fluent in conversational German and basic language skills in Spanish.

Oral Presentations: National and International Meetings, Invited Talks*

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| 2014 | Keynote speaker for the Geobiology Session 18f: “Life and Death: Molecular biomarkers to study current and past ecosystems”, to be presented at the 2014 Goldschmidt conference, Sacramento, CA. * |
| 2014 | “Microbial ecology from a molecular perspective, potential implications for biogeochemistry”, presented at Stony Brook University, Stony Brook, NY. * |
| 2014 | “Interactions between marine Euryarchaeota and picoeukaryotes in the Central California Current”, presented in the Marine Microbial Ecology session (069) at the 2014 Ocean Sciences conference, Honolulu, HI. * |
| 2014 | “Gene expression in the deep biosphere”, presented at the Center for Dark Energy Biosphere Investigations NSF site visit, University of Southern California, CA.* |
| 2013 | “Shedding light on the ocean’s deep, dark biosphere: investigations of microbial activity, distributions, and evolution in sub-seafloor sediments”, presented at the University of Bremen (MARUM), Bremen, Germany.* |
| 2013 | “Marine microbial interactions: new insights and potential implications for biogeochemical cycling”, presented at the Leibniz Institute for Baltic Sea Research (IOW), Warnemünde, Germany* |

- 2013 “Microbial ecology from a molecular perspective, potential implications for biogeochemistry”, presented at the University of Maryland Center for Environmental Science (Horn Point Laboratory) seminar series, Cambridge, MD. *
- 2013 “Gene expression in the deep biosphere”, presented at the 2013 Goldschmidt conference, Florence, Italy. *
- 2013 “A molecular perspective on microbial ecology: new insights and potential implications for marine biogeochemistry”, presented at the WHOI Marine Chemistry and Geochemistry Department seminar series, Woods Hole, MA. *
- 2013 “Metatranscriptomics: snapshots of microbial activity”, presented at the international EU-US marine bioinformatics workshop, University of Delaware, Newark, DE. *
- 2013 “Molecular insights into the ecology of marine protists”, presented at the University of British Columbia, Vancouver, Canada.*
- 2012 “Active Fungi amidst a marine subsurface RNA paleome”, presented at the 2012 American Geophysical Union (AGU) Fall Meeting, San Francisco, CA. *
- 2012 “Microbial ecology from a molecular perspective”, presented at the international high-school marine biology workshop, Woods Hole, MA. *
- 2011 “Protistan microbial observatory in the Cariaco Basin”, presented at the WHOI Biology Department Seminar Series, Woods Hole, MA.
- 2011 “Protists in anoxic and extreme Environments”, presented at the WHOI Geology and Geophysics Departmental Seminar Series, Woods Hole, MA.
- 2011 “Protistan microbial observatory in the Cariaco Basin: insights into species richness and habitat specialization”, presented at the MIT Microbial Systems (& Beyond) seminar series, Cambridge, MA. *
- 2011 “Protistan microbial observatory in the Cariaco Basin”, presented at the American Society for Limnology and Oceanography (ASLO) meeting, Puerto Rico. *

Publications

- Orcutt BN, LaRowe D, Lloyd K, Mills H, **Orsi W**, Reese BK, Sauvage J, Huber JA, Amend J. (2014) IODP deep biosphere research workshop report – a synthesis of recent investigations, and discussion of new research questions and drilling targets. *Scientific Drilling* 2:1-6.
- Orsi W**, Edgcomb V, Christman G, Biddle J. (2013). Gene expression in the deep biosphere. *Nature* 499: 205-208.
- Orsi W**, Biddle J, Edgcomb, V. (2013). Deep sequencing of subseafloor eukaryotic rRNA reveals active Fungi across multiple subseafloor provinces. *PLoS ONE* 8(2): e56335.
- Coolen, M, **Orsi W**, Balkema C, Quince C, Harris K, Sylva S, Filipova-Marinova M, Giosan L. (2013). Evolution of the plankton paleome in the Black Sea from the Deglacial to Anthropocene. *PNAS* 110(21): 8609-14.
- Burgaud G, Woehlke S, Redou V, **Orsi W**, Beaudoin D, Barbier G, Biddle J, Edgcomb V. (2013). Deciphering presence and activity of fungal communities in marine sediments using a model estuarine system. *Aquatic Microbial Ecology* 70: 45-62.
- Stock A, Edgcomb V, **Orsi W**, Filker S, Breiner HW, Yakimov M, Stoeck T. (2013). Evidence for isolated evolution of deep-sea ciliate communities through geological separation and environmental selection. *BMC Microbiology* 13:150.
- Edgcomb V, Bernhard J, Summons R, **Orsi W**, Beaudoin D, Visscher P. (2013). Active eukaryotes in microbialites from Highborne Cay, Bahamas, and Hamelin Pool (Shark Bay), Australia. *The ISME Journal*. DOI:10.1038/ismej.2013.130.
- Edgcomb V, **Orsi W**, Biddle J. (2013) Fungi in the marine subsurface; In: Kallmeyer, J. and Wagner, D. (eds.), *Microbial life of the Deep Biosphere*. (in press) De Gruyter, Berlin.
- Orsi W**, Song Y, Hallam S, Edgcomb V. (2012). Effect of oxygen minimum zone formation on communities of marine protists. *The ISME Journal* 6: 1586-1601.
- Orsi W**, Edgcomb V, Faria J, Foissner W, Fowle W, Hohmann T, Suarez S, Taylor C, Taylor GT, Vdacny P, Epstein S. (2012). Class Cariatotrichea, a novel ciliate taxon from the anoxic Cariaco Basin, Venezuela; *International Journal of Systematic and Evolutionary Microbiology* 62: 1425-1433.
- Orsi W**, Charvet S, Vd'áčný P, Bernhard JM, Edgcomb V. (2012). Prevalence of partnerships between bacteria and ciliates in oxygen-depleted marine water columns. *Frontiers in Extreme Microbiology* 3: 341.
- Vdacny P, Bourland W, **Orsi W**, Epstein S, Foissner W. (2012). Genealogical analyses of multiple loci of litostomatean ciliates (Protista, Ciliophora, Litostomatea). *Molecular Phylogenetics and Evolution* 65(2): 397-411.

- Filker S, Stock A, Breiner H W, Edgcomb V, **Orsi W**, Yakimov M, Stoeck T. (2012). Environmental selection of protistan plankton communities in hypersaline anoxic deep-sea basins, Eastern Mediterranean Sea. *MicrobiologyOpen* 2(1): 54-63.
- Orsi W** and Edgcomb V. (2012). Microbial Eukaryotes in Oxygen Minimum Zones; In: Seckbach, J., Oren, A., and Stan-Lotter, H. (eds.), Polyextremophiles – Organisms living under multiple stress; Springer, Dordrecht.
- Edgcomb V and **Orsi W**. (2012). Microbial Eukaryotes in Hypersaline Anoxic Deep Sea Basins; In: Seckbach, J., Oren, A., and Stan-Lotter, H. (eds.), Polyextremophiles – Organisms living under multiple stress; Springer, Dordrecht.
- Orsi W**, Edgcomb V, Jeon S O, Leslin C, Bunge J, Taylor G T, Varela R, Epstein S. (2011). Protistan microbial observatory in the Cariaco Basin, Caribbean. Part II. Habitat specialization. *The ISME Journal* 5:1344-1356.
- Edgcomb V, **Orsi W**, Bunge J, Jeon S O, Leslin C, Christen R, Holder M, Taylor G T, Suarez P, Varela R, Epstein S. (2011). Protistan microbial observatory in the Cariaco Basin, Caribbean. Part I. Pyrosequencing vs. Sanger insights into species richness. *The ISME Journal* 5: 1357-1373.
- Edgcomb V, **Orsi W**, Taylor G T, Vd'ačný P, Taylor C, Suarez P, Epstein S. (2011). Commentary: Accessing marine protists from the anoxic Cariaco Basin. *The ISME Journal* 5: 1237-1241.
- Edgcomb V, **Orsi W**, Breiner HW, Stock A, Filkner S, Yakimov M, Stoeck T. (2011). Eastern Mediterranean deep hypersaline anoxic lakes: novel active kinetoplastids associated with halocline habitats. *Deep-Sea Research I* 58 (10): 1040-1048.
- Vd'ačný P, Bourland W, **Orsi W**, Epstein S, Foissner W. (2011). Phylogeny and classification of the Litostomatea (Protista, Ciliophora), with an emphasis on free-living taxa and the 18S rRNA gene. *Molecular Phylogenetics and Evolution* 59 (2): 510-522.
- Vd'ačný P, **Orsi W**, Bourland W, Satoshi S, Epstein S, Foissner W. (2011). Morphological and molecular phylogeny of Dileptids: resolution at the base of the class Litostomatea (Ciliophora, Intramacronucleata). *European Journal of Protistology* 47 (4): 295-313.
- Vd'ačný P, **Orsi W**, Foissner W. (2010). Molecular and morphological evidence for a sister group relationship of the classes Armophorea and Litostomatea (Ciliophora, Intramacronucleata, Lamellicorticata infraphyl. nov.), with an account on basal haptorid litostomateans. *European Journal of Protistology* 46 (4): 298-309.
- Edgcomb V, **Orsi W**, Leslin C, Epstein SS, Bunge J, Jeon S, Yakimov MM, Behnke A, Stoeck T. (2009). Protistan community patterns within the brine and halocline of deep hypersaline anoxic basins in the eastern Mediterranean Sea. *Extremophiles* 13 (1): 151-167.

Stoeck T, Behnke A, Christen R, Amaral-Zettler L, Rodriguez-Mora MJ, Chistoserdov A, Orsi W, Edgcomb VP. (2009). Massively parallel tag sequencing reveals the complexity of anaerobic marine protistan communities. *BMC Biology* 7:72.

Published Abstracts

Orsi W, Worden AZ, Santoro A *Interactions between marine euryarchaeota and picoeukaryotes in the central California Current System*. Presented at the 2014 Ocean Sciences Meeting in Honolulu, Hawaii.

Orsi W, Edgcomb V, Christman G, Biddle J *Gene expression in the deep biosphere*. Presented at the 2013 Goldschmidt Gordon Conference, Florence, Italy.

Orsi W, Edgcomb V, Christman G, Biddle J *Gene expression in the deep biosphere*. Presented at the 2013 Geobiology Gordon Conference, Ventura, CA.

Orsi W, Edgcomb V, Christman G, Biddle J. *Active Fungi amidst a marine subsurface RNA paleome*. Presented at the American Geophysical Union (AGU), San Francisco, CA, 2012.

Orsi W, Biddle J, Edgcomb V. *Active microbial eukaryotes amidst a marine subsurface paleome*. Presented at the International Symposium for Microbial Ecologists (ISME). Copenhagen, 2012.

Orsi W, Biddle J, Edgcomb V. *Active microbial eukaryotes amidst a marine subsurface paleome*. Presented at the EU-US theoretical and practical training course in marine bioinformatics. Bremen, Germany, 2012.

Orsi W, Young S, Hallam S, Edgcomb V. *Effect of oxygen minimum zones on communities of marine protists*. Presented at the International Symposium for Microbial Ecologists (ISME). Copenhagen, Denmark, 2012.

Orsi W, Edgcomb V, Jeon S O, Leslin C, Bunge J, Taylor G T, Varela R, Epstein S. *Protists in anoxic and extreme environments*. Presented at the WHOI postdoctoral symposium. Woods Hole, MA, 2011.

Orsi W, Edgcomb V, Jeon S O, Leslin C, Bunge J, Taylor G T, Varela R, Epstein S. *Protistan microbial observatory in the Cariaco Basin*. Presented at the American Society for Limnology and Oceanography (ASLO) meeting in Puerto Rico, 2011.

Edgcomb V, **Orsi W**, Bunge J, Jeon S O, Leslin C, Christen R, Holder M, Taylor G T, Suarez P, Varela R, Epstein S. *Protistan Microbial Observatory in the anoxic Cariaco Basin, Part I; Diversity and endemism of microbial eukaryotes and their distribution across geochemical gradients*. Presented at the International Symposium for Microbial Ecologists (ISME). Seattle, 2010.

Orsi W, Edgcomb V, Jeon S O, Leslin C, Bunge J, Taylor G T, Varela R, Epstein S. *Protistan Microbial Observatory in the anoxic Cariaco Basin, Part 2; Estimating richness across geochemical gradients and identifying metabolically active lineages of novel deep-sea anaerobic protists*. Presented at the International Symposium for Microbial Ecologists (ISME). Seattle, 2010.

Orsi W, Edgcomb V, Faria J, Foissner W, Fowle W, Hohmann T, Taylor C, Taylor G T, Vdácny P, Epstein, S. *Class Cariacotrichea, a novel ciliate taxon from the anoxic Cariaco Basin, Venezuela*. Presented at the International Symposium for Microbial Ecologists (ISME). Cairns, Australia, 2008.