

ERIK R. ZINSER
Curriculum Vitae

University of Tennessee
Department of Microbiology
M409 Walters Life Science
Knoxville, TN 37996
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EDUCATION

- 9/94-3/01 Ph.D. Harvard University Microbiology and Molecular Genetics
- 8/90-5/94 A.B. Kenyon College Biology, *summa cum laude*
- Summer 02 Workshop on Molecular Evolution, Marine Biological Laboratory,
Woods Hole, MA
- Summer 98 Microbial Diversity course, Marine Biological Laboratory,
Woods Hole, MA

PROFESSIONAL EXPERIENCE

- 8/11- Present Associate Professor
- 2/05-7/11 Assistant Professor
Department of Microbiology
University of Tennessee
- 1/01-1/05 Postdoctoral Research Fellow
Advisor: Dr. Sallie W. Chisholm
Department of Civil and Environmental Engineering and
Department of Biology, Massachusetts Institute of Technology
- 9/94-10/00 Graduate Research Assistant
Advisor: Dr. Roberto G. Kolter
Department of Microbiology and Molecular Genetics
Harvard Medical School
- 6/92-5/94 Independent Undergraduate Research
Advisor: Dr. Joan L. Slonczewski
Department of Biology, Kenyon College

FELLOWSHIPS AND AWARDS

Professorial (University of Tennessee)

- 2016 College of Arts and Sciences Senior Faculty Excellence in Teaching Award
- 2015 Chancellor's Research and Creative Achievement-Professional Promise Award
- 2013, 2010 Undergraduate Faculty Award for Outstanding Undergraduate Teaching, Dept. of Microbiology
- 2011 UT Quest Scholar of the Week (June 6-10)

Postdoctoral (Massachusetts Institute of Technology)

- 7/01-6/04 NSF Postdoctoral Fellowship in Microbial Biology

Graduate (Harvard University)

- 11/01 Bernard N. Fields Prize in Microbiology
- 12/97-10/00 Albert J. Ryan Pre-Doctoral Fellowship

Undergraduate (Kenyon College)

- 5/94 Maxwell Elliott Power Prize
- 5/94 High Honors, undergraduate thesis (Biology)
- 9/93-present Member-at-large, Phi Beta Kappa
- 9/92-5/94 Lillian and Thomas Mastin Scholarship
- Summer 92 CURSOR undergraduate research fellowship
- 9/90-5/94 Tidewater Area Marine Officers' Wives Club Scholarship

PROFESSIONAL SOCIETIES

- 94-present American Society for Microbiology
- 01-present American Society of Limnology and Oceanography

PROFESSIONAL SERVICE (since at University of Tennessee)

- 2011-present Editorial board member, *Applied and Environmental Microbiology*
- 2009-2015 Editorial board member, *Environmental Microbiology* and *Environmental Microbiology Reports*
- 2005-present Manuscript referee: *Applied and Environmental Microbiology*, *BMC Genomics*, *BMC Research Notes*, *Environmental Microbiology*, *Environmental Science and Technology*, *FEMS Microbial Ecology*, *FEMS Micro Lett*, *Frontiers Microbiol.*, *ISME J*, *J. Bacteriology*, *Global Biogeochemical Cycles*, *J Great Lakes Research*, *J Phycology*, *J Phytoplankton Res*, *Limnology and Oceanography: Methods*, *Marine Genomics*, *Microbial Biotechnol*, *Microbiology*, *Microbiol. Molec. Biol. Rev.*, *mSystems*, *Nature Methods*, *Oecologia*, *PLoS ONE*, *Science*
- 2010,11,13, 15,16 NSF Panelist: Div. of Environmental Biology, Div. of Ocean Sciences
- 2018 NASA Panelist
- 2005-present Ad hoc reviewer for NSF proposals (OCE, OPP)

DEPARTMENTAL SERVICE

- 2018-present Departmental Retreat Chair
- 2017 Seminar to Microbiology Undergraduate Club: "Fermented Foods"
- 2014-2017 Manager, departmental newsletter "The Microscope"
- 2014-present Departmental Awards Committee
- 2012-18 Graduate Curriculum Committee (Chair)
- 2007-present Curriculum and Undergraduate Affairs Committee, Chair
- 2005-present Member of graduate student advisory committees: 14 Current, 35 Total
- 2006-present Examiner, PhD candidate qualifying exam: 8 as Chair, 31 Total
- 2012,13,16 Undergraduate teaching evaluation of peer faculty
- 2006-2015 Graduate Admissions Committee (Co-chair: 2007-2011)
- 2014 Strategic Planning Committee (Chair)
- 2013 Seminar to Microbiology Undergraduate Club: "CVs"

UNIVERSITY SERVICE

- 2018-present College of Arts and Sciences Lecturer Promotion Committee
- 2018 Lab tour for Governor's School for the Sciences and Engineering
- 2017 College of Arts and Sciences Junior Teaching Award Committee
- 2014 Ad hoc reviewer, Akers Faculty Enrichment Fellowship Award (BCMB)
- 2012 Ad hoc reviewer, M-CERV proposals

2012	Undergraduate teaching evaluation (Ecol. Evol. Biol.)
2007-2011	Member of Provost's Junior Faculty Fellows advisory board
2006-present	Undergraduate Advisor (10-15 advisees / yr)
Spring 2008	Judge, Exhibition of Undergraduate Research and Creative Activity (EURECA)

TEACHING EXPERIENCE (University of Tennessee)

Undergraduate

Spring 17, 19	Co-Instructor, Micro 321: Advanced Microbiology
Spring 06-14, 16, 18	Instructor, Micro 410: Microbial Physiology
Spring 09, Fall 11	Co-Instructor, Micro 310: Introduction to Microbiology
Spring 07	Co-Instructor, Micro 320: Advanced Microbiology
Fall 05-present	Micro 401/402/493: Independent undergraduate research, 23 total

Graduate

Fall 17	Co-Instructor, Micro 609: Microbial Genomics Journal Club
Fall 16, 18	Co-Instructor, Micro 6(1/7)0: Advanced Topics in Microbiology
Fall 16, 18	Co-Instructor, Micro 595: General Seminar
Spring 14, 16, 18	Instructor, Micro 617: Synthetic Microbiology
Fall 09, 12, 15	Instructor, Micro 680: Foundations in Microbiology
Spring 08, 09, Fall 14,17	Instructor, Micro 601: Microbial Physiology Journal Club
Fall 07, 10	Instructor, Micro 606: Microbial Ecology Journal Club
Fall 09	Instructor, Micro 593: Graduate Student Colloquium
Fall 06-present	Ph.D. candidate mentor: Jeff Morris (2006-10), Jeremy Chandler (2007-14), Martin Szul (2008-15), Lanying Ma (2009-15), Megan Silbaugh (2013-17), Benjamin Calfee (2015-), Spiridon Papoulis (2015-), Elizabeth Glasgo (2018-)

OUTREACH

- Fall 12, 14 Research and career presentation at Lejeune High School, Camp Lejeune, NC (USMC)
- Summer 10 Microbiology advisor for webinar presentation, "Disinfection and Sanitization of Residual Water Treatment," by the Water Quality Association (a not-for-profit organization) www.wqa.org
- Fall 08-Spr 09 With site visits by PhD candidate Jeff Morris, participated in Lincoln Memorial High School's (Fayetteville, TN) Scientific Research class, a Junior-level laboratory course. The exercise, adapted from our Morris et al. 2008 publication, involves isolating heterotrophic bacteria from the environment and assaying for their ability to help *Prochlorococcus* grow in media.
- Spring 2007 Assisted in two 8th grade science fair projects, one involving isolation and characterization of aquatic algae, and the other testing the ability of *E. coli* to grow on various food products
- Spring 2007 Web-based outreach during 40-day Pacific Ocean research cruise (<http://www.soest.hawaii.edu/oceanography/zij/wp2/outreach.html>). Interactions included a daily journal and a question-of-the-day forum, where we answered questions from K-12 students and others. Total visits to the website during the cruise was approximately 10,000.

INVITED SEMINARS

- Summer 2016 University of Georgia, Dept. of Microbiology; invited NSF REU speaker
- Spring 2016 Clemson University, Dept. of Biological Sciences
- Fall 2015 Miami University, Dept. of Microbiology
- Summer 2015 University of Freiburg, Germany; Biology
- Spring 2015 UC Irvine, Earth System Science School of Physical Sciences
- Spring 2015 Cal Poly San Luis Obispo, Dept. of Biology
- Fall 2013 Bowling Green State University, Dept. of Biology
- Fall 2012 Pronutria, Cambridge, MA
- Summer 2012 Oak Ridge National Laboratory, BioSciences Division
- March 2011 Kenyon College, Dept. of Biology
- Spring 2011 University of Tennessee, Dept. of Civil and Environmental Engineering
- Fall 2010 California Institute of Technology, Environmental Sci. & Engineering
- Fall 2010 University of Southern California, Molecular and Computational Biology
- Spring 2010 University of Minnesota, BioTechnology Institute
- Spring 2010 Dartmouth Medical School, Dept. of Microbiology and Immunology
- Spring 2010 University of Wisconsin, Dept. of Bacteriology
- Spring 2009 Monterey Bay Aquarium Research Institute
- Fall 2006 Vanderbilt University, Dept. of Biological Sciences
- Spring 2006 University of Georgia, Dept. of Marine Sciences
- Spring 2005 Dartmouth Medical School, Dept. of Microbiology and Immunology
- Fall 2004 Woods Hole Oceanographic Institution, Biology Department
- Fall 2000 Universidad Nacional Autonoma de Mexico (UNAM), Department of Molecular Biology and Biotechnology at the Biomedical Research Institute

NATIONAL AND INTERNATIONAL CONFERENCE INVITED ORAL PRESENTATIONS

- Summer 2017 Phycological Society of America Annual Meeting, Monterey, CA
Summer 2015 Maine in Spain 3, Canfranc, Spain
Spring 2015 Keynote speaker, 12th Annual Harold B. Amos Symposium of Ryan Fellows, North Conway, NH
July 2014 Microbial Stress Gordon Research Conference, South Hadley, MA
Nov 2013 China-US Annual Workshop. Joint Research Center for Ecosystems and Environmental Change, Gatlinburg, TN
Spring 2012 Astrobiology Science Conference, Atlanta, GA
June 2011 Canadian Society of Microbiologists Conference, St. Johns', NL, Canada
Sept 2010 China-US 2010 Joint Symposium, "Energy, Ecosystem, and Environmental Change." Beijing, China
July 2010 Microbial Stress Gordon Research Conference, South Hadley, MA
Winter 09 ASLO Aquatic Sciences, Nice, France
Spring 08 Prochlorococcusfest (20th Anniversary Symposium) MIT, Cambridge, MA
Summer 05 International symposium on the genomics of marine phytoplankton Station Biologique de Roscoff, France

INVITED PARTICIPATION IN NATIONAL AND INTERNATIONAL WORKSHOPS

- Summer 15 NSF ECOGEO EarthCube workshop, Honolulu, HI; member of steering cte.
Summer 13 NSF Ocean Omics EarthCube workshop, Catalina Island, CA

NATIONAL AND INTERNATIONAL CONFERENCE SESSION CONVENER

- Fall 10 China-US 2010 Joint Symposium, Beijing, China "Energy, Ecosystem, and Environmental Change."
Winter 09 Aquatic Sciences Meeting (ASLO), Nice, France, "Linking microbial communities to geochemical cycling"
Winter 06 Ocean Sciences Meeting (ASLO), Honolulu, HI, "Linking microbial diversity to ecosystem functioning"

CONFERENCE PRESENTATIONS OF MENTORED STUDENTS

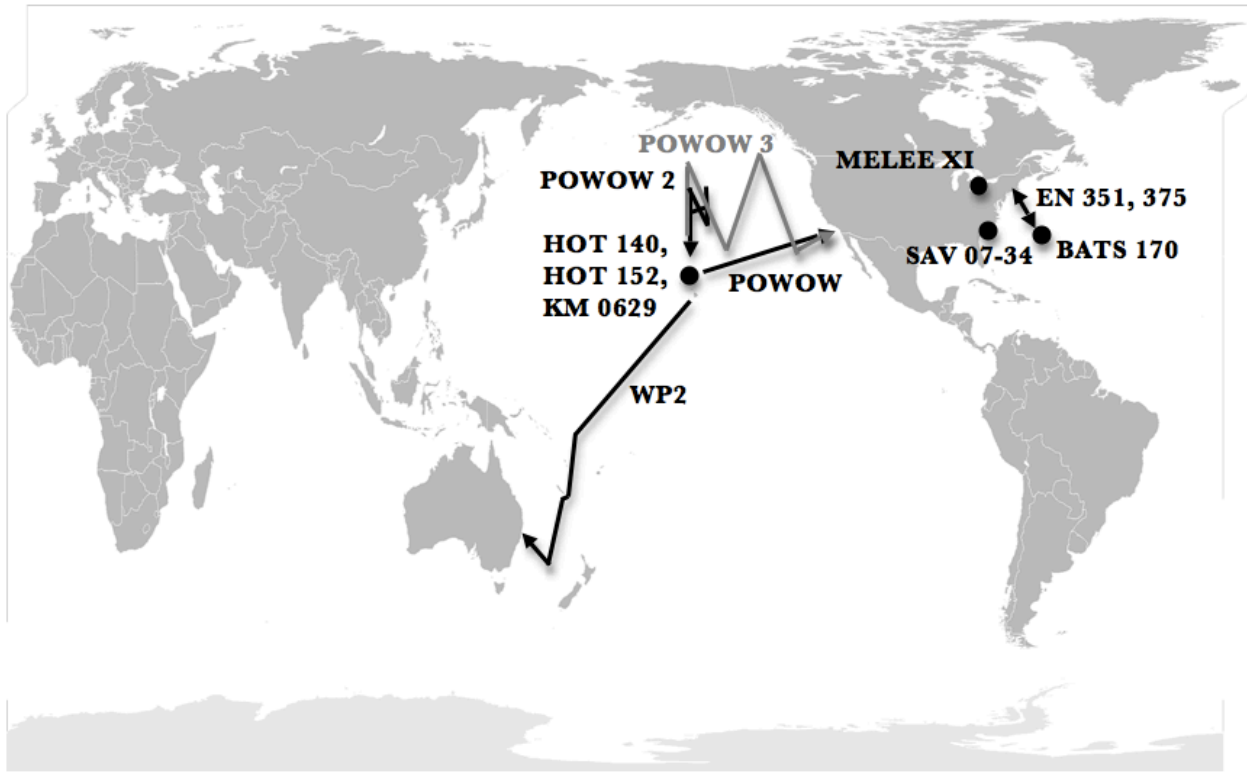
- Fall 17 ASM TN/KY Branch Meeting (*Ben Calfee, Spiro Papoulis*)
Spring 16 ASLO Ocean Sciences Meeting, New Orleans, LA (*Marty Szul, Megan Silbaugh, Ben Calfee*)
Spring 14 ASLO Ocean Sciences Meeting, Honolulu, HI (*Marty Szul, Megan Silbaugh*)
Spring 14 1st Annual Southeastern Biogeochemistry Symposium, GA Tech, Atlanta (*Jeremy Chandler, Marty Szul, Megan Silbaugh*)
Summer 07-11 Phycological Soc. America Annual Meeting (*Jeff Morris*)
Summer 08, 11 ASM General Meeting, (*Jeff Morris, Jeremy Chandler*)
Summer 10 13th Int. Symp. Microb. Ecol. (ISME-13), Seattle, WA (*Jeremy Chandler*)
Fall 09, 12 ASM TN/KY Branch Meeting (*Elizabeth Coultas, Jeremy Chandler, Marty Szul, Lanying Ma*)
Summer 08 Prochlorococcusfest, MIT, Cambridge, MA (*Jeff Morris, J. Chandler*)
Summer 07 Southeastern Phycological Colloquy, Dauphin Is., AL (*Jeff Morris*)

AWARDS TO MENTORED STUDENTS (University of Tennessee)

- Spring 18 Lisa Kahn Memorial Undergraduate Research Award (*Abigail Jarratt*)
Spring 18 UT EURECA Bronze Award for undergraduate poster presentation (*Abigail Jarratt*)
Summer 17 Undergraduate Summer Research Internship (*Chris Roberts, Lucas Buchanan*)
Summer 16 Microbiology Undergraduate Research Award (*Kathlyn Collins*)
Spring 16 David C. White Travel Award, ASLO Ocean Sciences (*Megan Silbaugh, Ben Calfee*)
Summer 14 Microbiology Undergraduate Research Award (*Ben Calfee*)
Spring 14 David C. White Travel Award, ASLO Ocean Sciences (*Marty Szul, M.Silbaugh*)
Summer 12 Undergraduate Summer Research Internship (*Chris Roberts, Lucas Buchanan*)
Fall 10 Ecological Dissertations in the Aquatic Sciences (Eco-DAS) Symposium, Honolulu, HI (*Jeff Morris*)
Summer 10 David C. White Travel Award, ISME-13 (*Jeremy Chandler*)
Summer 10 Harold C. Bold Award for top graduate student oral presentation at the Phycological Society of America Annual Meeting (*Jeff Morris*)
Summer 10 Hoshaw Travel Award, Phycological Society of America Annual Meeting, E. Lansing, MI (*Jeff Morris*)
Summer 10 UT Undergraduate Summer Research Internship, Microbiology Summer Undergraduate Award (*Mark Mowbray*)
Spring 10 Science Alliance Award for graduate research (*Jeff Morris*)
Spring 10 UT EURECA Award for undergraduate poster presentation (*Lydia Siebert*)
Summer 09 Undergraduate Summer Research Internship (*Lydia Siebert, Elizabeth Coultas*)
Summer 09 Phycological Society of America Grant-In-Aid (*Jeff Morris*)

- Summer 09 Hoshaw Travel Award, Phycological Society of America Annual Meeting, Honolulu, HI (*Jeff Morris*)
- Summer 08 David C. White Travel Award, ASM General Meeting (*Jeremy Chandler, Jeff Morris*)
- Summer 07 Best Student Presentation award to *Jeff Morris* at the 29th Annual Southeastern Phycological Colloquy (SEPC); first time award was given

OCEANOGRAPHIC CRUISES (personal participation)



BATS 170	Nov 02	R/V Weatherbird II, Sargasso Sea
EN 351	Mar-Apr 01	R/V Endeavor, Sargasso Sea
EN 375	Aug-Sep 02	R/V Endeavor, Sargasso Sea
HOT 140	Oct 02	R/V Ka'imikai-O-Kanaloa, North Pacific Subtropical Gyre
HOT 152	Oct 03	R/V Kilo Moana, North Pacific Subtropical Gyre
KM 0629	Nov 06	R/V Kilo Moana, N. Pacific Subtropical Gyre, Co-Chief Sci
MELEE XI	Aug 06	CCGS Limnos, Lake Erie and Ontario
WP2	Jan-Feb 07	R/V Kilo Moana, HI to Australia, Co-Chief Sci.
SAV 07-34	Nov 08	R/V Savannah, Georgia Shelf
POWOW 1	Mar 12	R/V Thomas G. Thompson, North Pacific
POWOW 2	Jan-Feb 13	R/V Kilo Moana, North Pacific
POWOW 3	July 13	R/V Kilo Moana, North Pacific

Total days at sea: 159

Total days at sea for PI + graduate students: 460

TEXTBOOK AUTHORSHIP

Slonczewski, J.L., Foster, J.W., and **E.R. ZINSER**. Microbiology: An Evolving Science. 5th edition (2020 projected release). W.W. Norton & Company, Inc., New York

RESEARCH PUBLICATIONS

Szul, M.J., Dearth, S.P., Campagna, S.R., and **E.R. ZINSER**. 2019. Carbon fate and flux in *Prochlorococcus* under nitrogen limitation. *mSystems*. **4**: e00254-18.

ZINSER, E.R. 2018. The microbial contribution to reactive oxygen species dynamics in marine ecosystems. *Environ. Microbiol. Rep.* **10**: 412-427

ZINSER, E.R. 2018. Cross-protection from hydrogen peroxide by helper microbes: the impacts on the cyanobacterium *Prochlorococcus* and other beneficiaries in marine communities. *Environ. Microbiol. Rep.* **10**: 399-411

Ma, L. Calfee, C.C., Morris, J.J., Johnson, Z.I., and **E.R. ZINSER**. 2018. Degradation of hydrogen peroxide at the ocean's surface: the influence of the microbial community on the realized thermal niche of *Prochlorococcus*. *ISME J.* **12**: 473-484

Hennon, G.M.M., Morris, J.J., Haley, S.T., **ZINSER, E.R.**, Durrant, A.R., Entwistle, E., Dokland, T., Dhyrman, S.T. 2018. The impact of elevated CO₂ on *Prochlorococcus* and microbial interactions with 'helper' bacterium *Alteromonas*. *ISME J.* **12**: 520-531.

Martin, R.M., Dearth, S.P., LeCleur, G.R., Campagna, S.R., Fozo, E.M., **ZINSER, E.R.**, and S.W. Wilhelm. 2017. Microcystin-LR does not induce alterations to transcriptomic of metabolomics profiles of a model heterotrophic bacterium. *PLoS ONE* **12**: e0189608.

Gainer, P.J., Pound, H.L., Larkin, A.A., LeCleur, G.R., DeBruyn, J.M., **ZINSER, E.R.**, Johnson, Z.I., and S.W. Wilhelm. 2017. Contrasting seasonal drivers of virus abundance and production in the North Pacific Ocean. *PLoS ONE* **12**: e0184371

Hellweger, F.L., van Sebille, E., Calfee, B.C., Chandler, J.W., **ZINSER, E.R.**, Swan, B.K., and N.D. Fredrick. 2016. The role of ocean currents in the temperature selection of plankton: Insights from an individual-based model. *PLoS ONE* **11**: e0167010.

Martiny, A.C., Ma, L., Mouginot, C., Chandler, J.W., and **E.R. ZINSER**. 2016. Interactions between thermal acclimation, growth rate, and phylogeny influence *Prochlorococcus* elemental stoichiometry. *PLoS ONE* **11**: e0168291.

- Morris, J.J., Johnson, Z.I., Wilhelm, S.W., and **E.R. ZINSER**. 2016. Diel regulation of hydrogen peroxide defenses by open ocean microbial communities. *J. Plankton Res.* **38**: 1103-1114.
- Chandler, J.W., Lin, Y., Gainer, P.J., Post, A.F., Johnson, Z.I., and **E.R. ZINSER**. 2016. Variable but persistent coexistence of *Prochlorococcus* ecotypes along temperature gradients in the ocean's surface mixed layer. *Environ. Microbiol. Reports* **8**: 272-284.
- Larkin, A.A., Blinebry, S.K., Howes, C., Lin, Y., Loftus, S.E., Schmaus, C.A., **ZINSER, E.R.**, and Z.I. Johnson. 2016. Niche partitioning and biogeography of high light adapted *Prochlorococcus* across taxonomic ranks in the North Pacific. *ISME J.* **10**: 1555-1567.
- Fernández-Pinos, M.C., Casado, M., Caballero, G., **ZINSER, E.R.**, Dachs, J., and B. Piña. 2015. Clade-specific quantitative analysis of photosynthetic gene expression in *Prochlorococcus*. *PLoS ONE* **10**: e0133207.
- Morris, J.J., and **E.R. ZINSER**. 2013. Continuous hydrogen peroxide production by organic buffers in phytoplankton culture media. *J. Phycol.* **49**: 1223-1228.
- Lin, Y., Gazsi, K., Lance, V.P., Larkin, A., Chandler, J., **ZINSER, E.R.**, and Z.I. Johnson. 2013. *In situ* activity of a dominant *Prochlorococcus* ecotype (eHL-II) from rRNA content and cell size. *Environ. Microbiol.* **15**: 2736-2747.
- Morris, J.J., Lenski, R.E., and **E.R. ZINSER**. 2012. The Black Queen Hypothesis: Evolution of dependencies through adaptive gene loss. *mBio* **3**: e00036-12
- Rowe, J.M., DeBruyn, J.M., Poorvin, L., LeCleur, G.R., Johnson, Z.I., **ZINSER, E.R.**, and S.W. Wilhelm. 2012. Viral and bacterial abundance and production in the Western Pacific Ocean and the relation to other oceanic realms. *FEMS Microbiol. Ecol.* **79**: 359-370.
- Morris, J.J., Johnson, Z.I., Szul, M.J., Keller, M., and **E.R. ZINSER**. 2011. Dependence of the cyanobacterium *Prochlorococcus* on hydrogen peroxide-scavenging microbes for growth at the ocean's surface. *PLoS ONE* **6**: e16805
- Johnson, Z.I., Shyam, R., Ritchie, A.E., Mioni, C., Lance, V.P., Murray, J.W., and **E.R. ZINSER**. 2010. The effects of iron- and light-limitation on phytoplankton communities of deep chlorophyll maxima of the Western Pacific Ocean. *J. Mar. Res.* **68**: 283-308

Malmstrom, R.R., Coe, A., Kettler, G.C., Martiny, A.C., Frias-Lopez, J., **ZINSER, E.R.**, and S.W. Chisholm. 2010. Temporal dynamics of *Prochlorococcus* ecotypes in the Atlantic and Pacific Oceans. *ISME J.* **4**:1252-1264.

ZINSER, E.R., Lindell, D., Johnson, Z.I., Futschik, M.E., Steglich, C., Coleman, M.L., Wright, M.A., Rector, T., Steen, R., McNulty, N., Thompson, L.R., and S.W. Chisholm. 2009. Choreography of the transcriptome, photophysiology, and cell cycle of a minimal photoautotroph, *Prochlorococcus*. *PLoS ONE* **4**: e5135

Morris, J.J., R. Kirkegaard, M.J. Szul, Z.I. Johnson, and **E.R. ZINSER**. 2008. Robust growth of *Prochlorococcus* colonies and dilute liquid cultures: facilitation by "helper" heterotrophic bacteria. *Appl. Environ. Microbiol.* **74**: 4530-4534.

ZINSER, E.R., Z.I. Johnson, A. Coe, E. Karaca, D. Veneziano, and S.W. Chisholm. 2007. Influence of light and temperature on *Prochlorococcus* ecotype distributions in the Atlantic Ocean. *Limnol. Oceanogr.* **52**: 2205-2220.

Moore, L.R., A. Coe, **E.R. ZINSER**, M.A. Saito, M.B. Sullivan, D. Lindell, K. Frois-Moniz, J. Waterbury, and S.W. Chisholm. 2007. Culturing the marine cyanobacterium *Prochlorococcus*. *Limnol. Oceanogr.: Methods* **5**: 353-362.

Johnson, Z.I.* , **E.R. ZINSER***, A. Coe, N.P. McNulty, E.M.S. Woodward, and S.W. Chisholm. 2006. Niche partitioning among *Prochlorococcus* ecotypes along ocean-scale environmental gradients. *Science* **311**: 1737-1740. * co-first authors

ZINSER, E.R., A. Coe, Z.I. Johnson, A. Martiny, N.J. Fuller, D.J. Scanlan, and S.W. Chisholm. 2006. *Prochlorococcus* ecotype abundances in the North Atlantic Oceans as revealed by an improved quantitative PCR method. *Appl. Environ. Microbiol.* **72**: 723-732.

ZINSER, E.R., and R. Kolter. 2004. *Escherichia coli* Evolution During Stationary Phase. *Res. Microbiol.* **155**: 328-336.

Rocap, G., F.W. Larimer, J. Lamerdin, S. Malfatti, P. Chain, N.A. Ahlgren, A. Arellano, M. Coleman, L. Hauser, W.R. Hess, Z.I. Johnson, M. Land, D. Lindell, A.F. Post, W. Regala, M. Shah, S.L. Shaw, C. Steglich, M. Sullivan, C.S. Ting, A. Tolonen, E.A. Webb, **E.R. ZINSER** and S.W. Chisholm. 2003. Genome divergence in two *Prochlorococcus* ecotypes reflects oceanic niche differentiation. *Nature* **424**: 1042-1047.

ZINSER, E.R., D. Schneider, M. Blot, and R. Kolter. 2003. Bacterial evolution through the selective loss of beneficial genes: Trade-offs in expression involving two loci. *Genetics* **164**: 1271-1277.

ZINSER, E.R. and R. Kolter. 2000. Prolonged stationary phase incubation selects for *Irp* mutations in *Escherichia coli* K-12. *J. Bacteriol.* **182**:4361-4365.

Finkel, S.E., **E.R. ZINSER**, and R. Kolter. 2000. Long-term survival and evolution in stationary phase. p. 231-238. *In* G. Storz and R. Hengge-Aronis (eds.) *Microbial Stress Responses*. ASM Press, Washington, D.C.

ZINSER, E.R., and R. Kolter. 1999. Mutations enhancing amino acid catabolism confer a growth advantage in stationary phase. *J. Bacteriol.* **181**: 5800-5807.

Finkel, S.E., **E.R. ZINSER**, S. Gupta, and R. Kolter. 1998. Life and death in stationary phase. p. 3-16. *In* S.J.W. Busby, C.M. Thomas, and N. L. Brown (eds.) *Molecular Microbiology* vol. 103. Springer-Verlag, Berlin.

Small, P., D. Blankenhorn, D. Welty, **E. ZINSER**, and J.L. Slonczewski. 1994. Acid and base resistance in *Escherichia coli* and *Shigella flexneri*: role of *rpoS* and growth pH. *J. Bacteriol.* **176**: 1729-37.