Curriculum Vitae

Ryan W. Paerl
Associate Professor – NC State University
Department of Marine, Earth, and Atmospheric Sciences (MEAS)
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Raleigh, NC, USA
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Professional preparation

UNC-Chapel Hill	BS Biology and minor in Chemistry	2004
University of California at Santa Cruz	PhD Ocean Sciences	2011
Scripps Institution of Oceanography, UCSD	Post-doc; Marine microbiology	2011-2014
University of Copenhagen, Helsingør	Post-doc; Marine microbiology	2014-2016

Appointments

Assistant Professor NC State, Department of Marine, Earth, and Atmospheric Sciences (2017 – 2023); Associate Professor (2023-present)

Publications (chronological order)

- Bittner M.J., Bannon CC, Rowland E, Sundh J, Bertrand EM, Andersson AF, **Paerl R.W.**, Riemann L. New chemical and microbial perspectives on vitamin B1 and vitamer dynamics of a coastal system. ISME Commun, In press.
- **Paerl R.W**., Curtis N.P., Bittner M.J., Cohn M.R., Gifford S.M., Bannon C.C., Rowland E. and Bertrand E.M. Use and detection of a vitamin B1 degradation product yields new views of the marine B1 cycle and plankton metabolite exchange. 2023. mBio: e00061-23. doi: https://doi.org/10.1128/mbio.00061-23
- Barnard M.A., Plaas H.E., **Paerl R.W.**, Karl C.M., Holland W.C., Hardison D.R., Hall N.S., Bartenfelder A.N., Rossignol K.L., Braddy J.S., Sloup R.S., and Paerl H.W., Macronutrient and B vitamin dynamics of Chowan River (North Carolina, U.S.A.) CyanoHABs, In: Band-Schmidt, C.J. and Rodríguez-Gómez, C.F. (Eds.). 2022. Proceedings of the 19th International Conference on Harmful Algae, La Paz, B.C.S., Mexico. International Society for the Study of Harmful Algal Blooms. 365 pp, https://doi.org/10.5281/zenodo.7034970.
- Plaas H.E., **Paerl R.W.**, Baumann K., Karl C., Popendorf K.J., Barnard M.A., Chang N.Y., Curtis N.P., Huang H., Mathieson O.L., Sanchez J., Maizel D.J., Bartenfelder A.N., Braddy J.S., Hall N.S., Rossignol K.L., Sloup R., Paerl H.W. (2022). Harmful cyanobacterial aerosolization dynamics in the airshed of a eutrophic estuary. Sci. Total Environ. 852: 158383. doi:https://doi.org/10.1016/j.scitotenv.2022.158383
- Yadav, S., Curtis, N.P, Venezia, R. E., Tandon, A., **Paerl, R.W.**, and Petters, M.D. (2022). Bioaerosol Diversity and Ice Nucleating Particles in the North-Western Himalayan Region. J. Geophys. Res. Atmos. **127**: e2021JD036299. doi:https://doi.org/10.1029/2021JD036299

- Paerl, H.W., Justić, D., Lovejoy, C., **Paerl. R.W.** (2022). "Estuarine phytoplankton" in Estuarine Ecology 3rd ed. Editor: Crump, B. *In press*.
- Wienhausen, G., Bittner, M., and **Paerl, R.W.** (2022). Key knowledge gaps to fill at the cell-to-ecosystem level in marine B-vitamin cycling. Frontiers in Marine Science – Aquatic Microbiology. Front. Mar. Sci. **9**.
- Sathe R.R.M., **Paerl, R.W.**, Hazra A.B. (2022). Exchange of Vitamin B1 and Its Biosynthesis Intermediates Shapes the Composition of Synthetic Microbial Cocultures and Reveals Complexities of Nutrient Sharing. J Bacteriol. Apr 19;204(4):e0050321. doi: 10.1128/jb.00503-21.
- Asmala, E., Osburn, C. L., **Paerl, R. W**., and Paerl, H. W. (2021). Elevated organic carbon pulses persist in estuarine environment after major storm events. Limnol. Oceanogr. Lett. 6, 43–50. doi:https://doi.org/10.1002/lol2.10169.
- **Paerl, R. W.**, Venezia, R. E., Sanchez, J. J., and Paerl H. W. (2020). Picophytoplankton dynamics in a large temperate estuary and impacts of extreme storm events. Sci. Rep. **10**: 22026. doi:10.1038/s41598-020-79157-6
- **Paerl, R. W.**, Claudio, I. M., Shields, M. R., Bianchi, T. S., and Osburn, C. L. (2020). Dityrosine formation via reactive oxygen consumption yields increasingly recalcitrant humic-like fluorescent organic matter in the ocean. Limnology and Oceanography Letters. 5: 337–345. doi:10.1002/lol2.10154
- Yadav, S., Venezia, R. E., **Paerl, R. W.**, and Petters, M. D. (2019). Characterization of Ice-Nucleating Particles Over Northern India. Journal of Geophysical Research: Atmospheres, 124(19), 10467-10482.
- **Paerl, R.W.**, Sundh, J., Tan, D., Svenningsen, S.L., Hylander, S., Pinhassi, J., Andersson, A.F., and Riemann, L. (2018). Prevalent reliance of bacterioplankton on exogenous vitamin B1 and precursor availability. Proc. Natl. Acad. Sci. U. S. A. 115, E10447–E10456.
- Pedersen, J. N., D. Bombar, **R. W. Paerl**, and L. Riemann. (2018). Diazotrophs and N2-Fixation associated with particles in coastal estuarine waters. Front. Microbiol. **9**. doi:10.3389/fmicb.2018.02759
- **Paerl R.W.**, Bertrand, E., Schatt P., Mehiri M., Niehaus T.D., Hanson A.D., Riemann, L., and Yves-Bouget, F. (2018). Carboxythiazole is a key microbial nutrient currency and critical component of thiamin biosynthesis. Scientific Reports. 8:5940 | DOI:10.1038/s41598-018-24321-2
- **Paerl R.W**., Hansen T.N.G., Henriksen N.N.S.E., Olesen A.K., and Riemann L. (2018). N-fixation and related O2 constraints on model marine diazotroph Pseudomonas stutzeri BAL361. AME 81:125-136 | DOI: https://doi.org/10.3354/ame01867
- Bombar, D., **Paerl, R. W.**, Anderson, R., and Riemann, L. (2018). Filtration via conventional glass fiber filters in 15N2 tracer assays fails to capture all nitrogen-fixing prokaryotes. Frontiers in Marine Science, 5, 6.
- **Paerl, R.W.**, Bouget, F.Y., Lozano, J.C., Vergé, V., Schatt, P., Allen, E.E., Palenik, B., and Azam, F. (2017). Use of plankton-derived vitamin B1 precursors, especially thiazole-related precursor, by key marine picoeukaryotic phytoplankton. The ISME journal, 11(3), 753.

- Bombar, D., **Paerl, R. W.**, and Riemann, L. (2016). Marine Non-Cyanobacterial Diazotrophs: Moving beyond Molecular Detection. Trends in microbiology, *24*(11), 916-927.
- **Paerl, R. W.,** Bertrand E. M., Allen A. E., Palenik B. and Azam F. (2015). Vitamin B1 ecophysiology of marine picoeukaryotic algae: Strain-specific differences and a new role for bacteria in vitamin cycling. Limnology and Oceanography, 60: 215–228. doi: 10.1002/lno.10009.
- Moisander PH, Serros T, **Paerl RW**, Beinart RA, and Zehr JP. (2014). Gammaproteobacterial diazotrophs and nifH gene expression in surface waters of the South Pacific Ocean. The ISME journal 8 (10), 1962-1973
- Shilova I.N., Robidart J.C., Tripp H.J., Turk-Kubo K., Wawrik B., Post A.F., Thompson A.W., Ward B., Hollibaugh J.T., Millard A., Ostrowski M., Scanlan D., **Paerl R.W.**, Stuart R. and Zehr J.P. (2013). A microarray for assessing transcription from pelagic marine microbial taxa. The ISME journal 8 (7), 1476-1491.
- **Paerl, R.W.**, Tozzi, S., Kolber, Z. and Zehr, J.P. (2012). Variation in *Synechococcus* sp. CC9311 *narB* mRNA abundance relative to changes in light, nitrogen growth conditions and nitrate assimilation. J Phycology. 48: 1028-1039.
- Robidart J.C., Preston C.M., **Paerl R.W.**, Turk K.A., Mosier A.C., Francis C.A., Scholin C.A., and Zehr J.P. (2012). Seasonal Synechococcus and Thaumarchaeal population dynamics examined with high resolution with remote in situ instrumentation. The ISME journal. 2012 Mar 1;6(3):513-23.
- **Paerl, R.W.**, Turk, K.A., Beinart, R., Chavez, F.P., and Zehr, J.P. (2012). Seasonal change in the abundance of *Synechococcus* and multiple distinct phylotypes in Monterey Bay determined by *rbcL* and *narB* quantitative PCR. Environ. Microbiol. 14: 580-593.
- **Paerl, R.W.**, Johnson, K.S., Welsh, R.M., Worden, A.Z., Chavez, F.P., and Zehr, J.P. (2011). Distinct distributions of select nitrate assimilating *Synechococcus* across the California Current System. *Frontiers in Aquatic Microbiology* 2. Available online: http://www.frontiersin.org/Journal/Abstract.aspx?s=53&name=aquatic_microbiology&ART_DOI=10.3389/fmicb.2011.00059
- Foster, R.A., Kuypers, M. M. M., Vagner, T., **Paerl**, **R.W.,** Musat, N. and Zehr, J.P. (2011). Nitrogen fixation and transfer in open ocean diatom-cyanobacterial symbioses. ISME J 5: 1484–1493.
- Boyd, T.J., Barham, B.P., Hall, G.J., Schumann B.S., **Paerl, R.W.**, and Osburn, C.L. (2010). G00F14 Variation in ultrafiltered and LMW organic matter fluorescence properties under simulated estuarine mixing transects: 2. Mixing with photoexposure. Journal of Geophysical Research-Part G-BioGeo. 4. doi 10.1029/2009JG000994.
- Goebel, N.L., Turk, K. A., Achilles, K.M., **Paerl, R.W.**, Hewson, I., Morrison, A.E., Montoya, J.P., Edwards, C. A. and Zehr, J. P. (2010). Abundance and distribution of major groups of diazotrophic cyanobacteria and their potential contribution to N2 fixation in the tropical Atlantic Ocean. Environmental Microbiology 12: 1462-2920.

- Hewson, I. Poretsky, R.S., Beinart, R.A., White, A.E., Shi, T., Bench, S.R., Moisander, P.H., **Paerl, R.W.**, Tripp. H.J., Montoya, J.P., Moran, M.A., Zehr, J.P. (2009). *In situ* transcriptomic analysis of the globally important keystone N2-fixing taxon *Crocophaera watsonii*. ISME J. 3: 618–631.
- Hewson, I. **Paerl, R.W.**, Tripp, J.H., Zehr, J.P. and D. M. Karl. (2009). Metagenomic potential of microbial assemblages in the surface waters of the central Pacific Ocean tracks variability in oceanic habitat Limnol. Oceanogr. 54: 1981-1994.
- **Paerl, R.W.**, Foster, R.A., Jenkins, B.D., Montoya, J.P., and Zehr, J.P. (2008). Phylogenetic diversity of cyanobacterial *narB* genes from various marine habitats. Environ. Microbiol. 10: 3377-3387.

Professional activities

NC State university instructor

- Aquatic Microbiology (MEA468/568)
- Molecular Ecology of Aquatic Microbes (MEA493/591)
- Introduction to Coastal Environments Laboratory (MEA251); guest instructor, 2021-present
- Marine Biology (MEA220)
- Field Investigation of Coastal Processes (MEA459); Summer 2018 – present; co-instructor
- First year graduate seminar (MEA611); Guest instructor, 2021

Reviewer for >15 scientific journals, including:

- Aquatic Microbial Ecology
- Estuaries and Coasts
- Environmental Microbiology
- Environmental Science & Technology
- EOS American Geophysical Union
- Federation of European Microbiological Systems
- Frontiers in Aquatic Microbiology
- Frontiers in Marine Science
- Journal of Phycology
- Limnology and Oceanography
- Nature Scientific Reports
- Nature Communications
- PNAS
- The ISME Journal

Reviewer/panelist for the following agencies/organizations

- University of Southern California Sea Grant
- South Carolina Sea Grant
- The National Science Foundation
- Agence nationale de la recherché (France National Research Agency)

- Hong Kong Research Grants Council
- Gulf Research Program

Associate editor
- Associate Editor for Frontiers in Marine Science, 2020-present

Society memberships
- Association for the Study of Limnology and Oceanography, 2007 - present
- American Society for Microbiology, 2018 - present
- North Carolina Water Resources Association, 2019 – present
- International Society for Microbial Ecology – 2014-2017, 2022-present

Postdoctoral mentor
- Garrett Sharpe (2023 - current)

Undergraduate advising
- Bailey Pelt (Independent study advisor; present)
- Maddy Arena (Independent study advisor; present)
- Research advisor for 14 prior undergraduate students

Graduate committee memberships
- **PhDs in progress as chair or co-chair (Total = 2)**
    - Hwa Huang
    - Nathaniel Curtis
- **PhDs in progress as committee member (Total = 4)**
    - Miranda Irby
    - Emily Pierce
    - Melanie Cohn (UNC-CH)
    - Acacia Zhao (UNC-CH)
- **PhDs completed as chair (n=1)**
    - Joel Sanchez
- **PhDs completed as committee member (Total = 4)**
    - Meriel Bittner
    - Haley Plaas
    - Gabrielle Corradino
    - Alexey Katin
- **Master's completed as chair or co-chair (Total = 2)**
    - Rebecca Venezia
    - Nathaniel Curtis
- **Master's in progress as committee member (Total = 2)**
    - Stephen Richardson
- **Master's completed as committee member (Total = 3)**
    - Nicole Koerth
    - Michael Walter
    - Marlene Jensen

University service

- MEAS Department hiring committee member for four searches (Geoscience Lecturer, Tectonic & Crustal Dynamics Geologist, Chemical Oceanographer, CMAST-BioSci Coastal Env Toxicology-Ecophysiology positions), 2018-2022
- Department Social Committee, 2017 – 2021
- Department Web Committee Chair, 2018 – present
- NCSU TRIO McNair Scholars Program Mentor, 2019
- NCSU Microbiology Graduate Program Faculty Member, 2018 – present

Outreach activities

- SACNAS - Celebremos Ciencas! Volunteer, Museum of Life and Science; Durham, NC. Spring 2022
- NCSU BIT Club Presenter – MicroFACS Overview and Research Applications. Spring 2022
- DELTA program virtual tour for teaching contributor; MicroFACS facility. Spring 2022
- NCSU Biology Club Presenter. Perspectives on marine microbiology research and the revitalized interest in B-vitamins in the sea. Fall 2021
- NC Central University Summer Mentor for Kemoni Hughes. Summer 2021
- Mentor for NC School of Science and Mathematics – Virtual summer research program (Audrey Zhou); Summer 2020
- Mobile Aquatic Microbial Laboratory (MAML) – 'pop-up' aquatic microbial lab events held at lake parks in the Research Triangle, NC; 2018-present
- ScienceSaturday public talks, NC Museum of Natural Sciences; 2018-present
- NC Science & Technology Fair Judge; 2017-present
- MEAS Student Research Symposium Judge; 2018
- Teacher & assistant for 3 ECTS course: Molecular analyses of bacterioplankton composition and function; Helsingør, Denmark; 2017

Recent presentations

- *Use & Detection of a Vitamin B1 Degradation Product Yields New Views of the Marine B1 Cycle & Plankton Metabolite Exchange*. ASLO Aquatic Sciences Summer Meeting. Palma de Mallorca, Spain. 6/9/2023.
- *Back to the future: Revitalized interest in B-vitamins in the sea.* University of South Carolina, School of the Earth, Ocean and Environment Seminar Series. 4/15/2022.
- *Impacts of Moderate to Extreme Storm Events on Picophytoplankton in a Large Temperate Estuary*. ASLO 2021 Aquatic Sciences Meeting. 6/22/2021.
- *Dimerization - A simple and under-explored explanation for recalcitrant organic matter in the ocean.* University of Florida Geology Seminar Series. 12/3/2020.
- *Back to the future - B-vitamins and their revitalized interest in the ocean.* University of Stockholm. Marine Microbiology Course. 12/1/2020.
- *Marine Microbes 101: A primer.* NCSU Microbiomes engineering course. 8/25/2020

- *Why so salty, why so blue?* River Bend Middle School. 5/7/2020.
- *Marine microbes take their vitamins too!* Plant Molecular Biology Seminar Series. Thomas Hall NCSU. Raleigh, NC; 8/25/18.
- *Revising vitamin B1 use and needs in phytoplankton*. Duke Marine Lab Seminar, Duke Marine Lab – Beaufort, NC, 2/23/18.

Graduate and post-doctoral advisors

- Lasse Riemann, University of Copenhagen, Denmark – postdoctoral advisor
- Farooq Azam, Scripps Institution of Oceanography – postdoctoral advisor
- Jonathan Zehr, University of California at Santa Cruz – PhD thesis advisor