



UNITED STATES COAST GUARD ACADEMY

Science Lecture Series

Leveraging the Sun for safe drinking water

Eric Ryberg, PhD

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Access to safe drinking water remains a major global challenge, with nearly 800 million people worldwide lacking access to safe drinking water. The lack of access to safe drinking water, sanitation, and hygiene (WASH) services remains one of the leading risk factors for diarrheal disease and mortality, disproportionately impacting those living in rural areas of low-income countries. Addressing this challenge requires innovative, accessible, and sustainable treatment technologies that can function at the point-of-use (POU) without relying on centralized water treatment infrastructure.

In this presentation, Dr. Ryberg will share his work leveraging light-enabled processes that produce reactive oxygen species (ROS) to create drinking water disinfection technologies. Aqueous photochemical processes produce numerous ROS – including hydroxyl radical ($\bullet\text{OH}$), singlet oxygen ($^1\text{O}_2$), and superoxide ($\bullet\text{O}_2^-$). Despite their transient nature, ROS play an outsized role in environmental and engineered systems through their reactions with organic and inorganic compounds, influencing microorganism viability, contaminant fate, and biogeochemical cycles. Dr. Ryberg will introduce several solar-enabled disinfection technologies and discuss how ROS generated by sunlight-driven processes can be harnessed to improve drinking water quality, followed by an in-depth look into his recent work on edible and natural photosensitizing dyes that produce $^1\text{O}_2$ upon excitation by visible light. The disinfection performance of these photosensitizers will be reviewed, as well as a novel mechanism that indicates to the user that the water has been sufficiently disinfected. Taken together, these approaches demonstrate how fundamental photochemistry can be translated into practical drinking water treatment technologies that may help expand access to safe drinking water in regions of the world where access remains limited.

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2000 - 2100

Dimick Auditorium, U.S. Coast Guard Academy

Dr. Eric Ryberg is an assistant professor in the Department of Allied Health Sciences at UConn. His primary research interests lie at the intersection of environmental science, health, and engineering, where he aims to improve our understanding of light-driven chemical reactions and how they can be harnessed to improve environmental quality and human health. With a strong belief in the value of interdisciplinary collaboration, Dr. Ryberg has worked with public health practitioners, architects, earth scientists, and industrial partners to address environmental problems through a holistic approach. Prior to joining UConn, Dr. Ryberg was a postdoctoral researcher in the Department of Marine Chemistry & Geochemistry at the Woods Hole Oceanographic Institution, and he earned his Ph.D. in Chemical & Environmental Engineering from Yale.

If you have any questions regarding the event, please contact Dr. Kanani K. M. Lee

(kanani.km.lee@uscga.edu) for more information.