

ocean pH dynamics. We hope that this training will lead to high-quality pH observations and advance knowledge on ocean acidification across different marine ecosystems.

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IMPACTS OF A CHANGING CRYOSPHERE ON LAKES AND STREAMS IN MOUNTAIN REGIONS

A China-United States Cooperation Workshop

Benjamin Burpee and Juliana D’Andrilli

Accelerated climate warming is drastically diminishing glaciers, permafrost, and perennial

snow cover in mountain regions across the world. With increased radiative forcing and decreased snowfall, alpine climates are becoming warmer and wetter, elongating ice- and snow-free growing seasons. Receding glaciers and permafrost thaw are likely to deliver increasing amounts of meltwater containing solutes, sediments, contaminants, and nutrients to connected lake and stream ecosystems. Connectivity of lakes and streams will reorganize as a function of meltwater export from continued glacier decline. Downstream aquatic ecosystems may experience high turbidity, shifting nutrient limitation patterns, and changes in thermal regimes. Ecological impacts will be variable among systems, but can include changes in ecological communities and biodiversity, invasive species intrusion and altered species distributions, changes in trophic structure, and increased primary productivity rates. Understanding these complex drivers and changes requires broad and interdisciplinary knowledge that spans across climate, cryosphere, and aquatic habitats.

To meet this challenge, 20 Chinese and 19 American scientists met for a cooperation workshop from August 21–26, 2017, at Qinghai Lake (青海湖), Qinghai Province, China. Qinghai Lake, located within the glaciated landscape of the Tibetan Plateau, is the largest inland lake in China, well-known for its saline waters and bar-headed goose nesting colonies. This location was an ideal setting to combine climatic, cryospheric, and ecological expertise. Attending scientists from diverse disciplines



US-China Cooperation Workshop attendees gather on Bird Island boardwalk to learn about Qinghai Lake. Photo credit Juliana D’Andrilli.

showcased ongoing research projects that defined the various questions and knowledge gaps associated with their fields. The introductory talks served to catalyze collaborative relationships between American and Chinese researchers by identifying common questions between North American and Asian systems. Junping Wang and Zhang Jiawei, representatives from the US National Science Foundation and National Science Foundation of China, were present to facilitate discussions and answer questions regarding international research proposals.

In addition to building collaborative relationships, an objective of the workshop was to produce a synthetic publication that assesses cryospheric and ecological change in periglacial landscapes, tracing linkages between climatic drivers, changing ice, permafrost and snow, and finally the impacts on aquatic ecosystems. Synthetic publications that target these types of environmental changes and ecological responses are needed now, more than ever, because of rapidly diminishing ice stores and the complex nature of the biological processes involved. Two days of the workshop were allocated for specialized group discussion sessions surrounding these topics. From these sessions, group discussion teams developed a publication outline and will continue to work on the manuscript over the next six months. We aim to generate knowledge and interest in the current and future states of North American and Asian cryosphere ecosystems as they change irreversibly.

This cooperative workshop was organized by Drs. Yan Baoping and Luo Ze (Computer Network Information Center, Chinese Academy of Sciences, China) and Drs. James Elser (Flathead Lake Biological Station, University of Montana, U.S.) and Jasmine Saros (Climate Change Institute, University of Maine, U.S.). This meeting was jointly funded by the US National Science Foundation and the National Science Foundation of China. Please visit <https://renzedyk.wixsite.com/us-china-workshop> for more information.

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PHYCOLOGICAL RESEARCH CONSORTIUM SUPPORTS ALGAL RESEARCH AND TRAINING

Sylvia Lee and Mindy Morales-Williams

Established in 2014, the Phycological Research Consortium (PRC) is a network of phycologists that meet annually at Iowa Lakeside Laboratory to provide opportunities for networking, training, and collaborative phycological research. Understanding the response of algal communities to environmental stressors is critical to the assessment of anthropogenic climate change impacts on water resources, particularly global increases in primary productivity and harmful algal blooms. The PRC brings together skillsets in algal physiology, ecology, taxonomy, and assessment methods necessary to address these questions. Phycological research and taxonomy continue to develop rapidly. The goal of the PRC is to bring together a diverse group of phycological researchers specializing in multiple disciplines to stay on the cutting edge of this dynamic field.

The primary focus of our fall PRC meeting was training for graduate students, who made up over half of the participants. As such, working groups were geared toward the specific needs

of student attendees, focusing on diatoms and cyanobacteria. The diatom working group, led by Sylvia Lee (US EPA) and Kerry Howard (University of Nevada-Reno), addressed challenges and research interests including diatom identification in the *Nitzschia*, *Aulacoseira*, and araphid groups; characterizing the diversity of South American diatoms; and online resources for identification of diatoms found outside of the U.S. The cyanobacteria working group, led by Mindy Morales-Williams (University of Vermont), addressed recent taxonomic developments, methods of quantifying and distinguishing morphologically similar groups of cyanobacteria and heterotrophic bacteria, accuracy in biovolume estimates, and sample preservation methods. Additional discussion topics included culturing techniques, drivers of blooms and toxin production, and the accepted level of effort in contemporary taxonomy in ecology papers.

Training and discussions were balanced with time for personal and collaborative research. Betsy Swanner and Tania Leung (Iowa State University) provided a demonstration of Phyto-PAM II, a multi-wavelength fluorometer that will be used to assess the photosynthetic efficiency of phytoplankton under variable environmental conditions. Some participants used the time away from daily distractions as a writing retreat which resulted in the completion of manuscripts; co-authors discussed revisions and next steps for ongoing research on



Phycological Research Consortium participants enjoying a sunny and crisp fall day at Iowa Lakeside Laboratory. Image credit: Betsy Swanner.