



## An Overview of The Quillworts: Identification, Ecology, and Evolution

Quillworts were once described as the least studied group of vascular plants. This may no longer be true, but there is still much to learn about the roughly 300 species in the enigmatic, aquatic lycophyte genus *Isoetes*. Though physically these plants have changed little since the Jurassic, recent evidence suggests most current species have evolved recently, adapting to almost every possible freshwater niche – from wet prairies to rock outcrop pools to deep oligotrophic lakes. This course will provide an introduction to quillwort biology, ecology, systematics, and genomics – covering topics for the field botanist to molecular systematist. We'll cover the history of Isoetology (the study of quillworts), with a emphasis on anatomy and morphology that are crucial for using identification keys. Next, we'll focus on quillwort ecology, examining how different species grow in an incredible wide range of habitats. This will include a review of the recently published *Isoetes* genome and the role of CAM photosynthesis in aquatic environments. Much of the newest quillwort literature focuses on relationships between species, so we will concentrate on revelations from next generation sequencing and highthroughput cytometry that have drastically changed our understanding of how many quillwort species exist, where they occur, and the role of polyploidy in their evolution. Finally, we'll try to synthesize these aspects of quillworts to understand their present distribution, threats, and methods for conservation.

**September 8, 11,  
15, 18, and 22**

**7PM–9PM ET  
\$225**

*Participants need to have a Zoom account (<https://zoom.us> sign up for zoom is free). You will receive a secure link to join the instructor before each class. Classes will be recorded so participants can review them or make up missed ones.*

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**GENERAL INFO**

Peter Schafran ([ps997@cornell.edu](mailto:ps997@cornell.edu)) is a National Science Foundation Postdoctoral Fellow at the Boyce Thompson Institute in Ithaca, New York. His work focuses on generating new genomes from hornworts to understand different species' genes, genome evolution, and adaptations to their environments. He received his PhD from Old Dominion University in Norfolk, Virginia, and spent several years as a fellow and research associate at the Smithsonian National Museum of Natural History in Washington, D.C., where he studied the evolution and speciation of quillworts in the Southeast, which is a global biodiversity hotspot for these distant relatives of ferns. He has taught botany courses at Old Dominion University, the American University of Iraq—Sulaimani, and the Cranberry Lake Biological Station at the State University of New York College of Environmental Science and Forestry.