**PROJECT TITLE:** Rapid Detection of Algal Toxins in Minnesota Lakes

Dr. Andrew Bramburger is a Research Associate at the Natural Resources Research Institute (NRRI) at the University of Minnesota Duluth (UMD). His research interests and expertise lie within the field of phycology (the study of algae), and he has been conducting research on freshwater algae for over 15 years. Bramburger has published 20 peer-reviewed articles on algal communities and presented over 50 conference presentations. Since 2010, Bramburger has served as PI or Co-PI on research programs totaling over $3.5 million in total funding, including ongoing EPA Great Lakes phytoplankton monitoring programs and several projects related to harmful algae blooms in both Canada and the U.S.

The NRRI is a U.S.-based research institute established by the Minnesota state legislature within UMD. NRRI is a non-profit applied research organization that works to develop and deliver the understanding and tools needed to utilize our mineral, forest, energy and water resources in a balanced and environmentally responsible manner. The NRRI facility in Duluth MN is a 110,000-square-foot facility dedicated to providing research-based solutions for empowering sustainable development. NRRI is equipped with the facilities for GIS, water quality, and algal analyses, including a wide variety of sampling equipment, boats and field vehicles, as well as sample processing, inverted microscopy and image analysis capabilities. NRRI is a well-established laboratory and research facility and can provide ~$500,000 in analytical equipment, computers, and microscope facilities at no cost to the project. NRRI works in close collaboration with other departments at UMD including the Large Lakes Observatory (LLO) and Minnesota Sea Grant.

The Phycology / Paleolimnology Lab (Bramburger) at NRRI is fully equipped for microscopic analysis of phytoplankton. The laboratory has several microscopes, including Olympus BH-2 and BX-60 compound microscopes equipped with DIC, RIC, and phase contrast optics, as well as Olympus CX-40 inverted microscopes equipped with phase contrast optics and epifluorescence accessories. Auxiliary equipment includes a freeze-dryer, centrifuges, hot-plates, and slide warmers, as well as a dedicated radioisotope preparation facility featuring a Hitachi Aloka Accu-Flex 8000 liquid scintillation counter. Shared facilities within NRRI also consist of a LaChat multi-channel flow-injection nutrient autoanalyzer and a Hitachi TM3030 Plus scanning electron microscope.

The Sheik Geomicrobiology lab housed at the Large Lakes Observatory (LLO) and associated with the Biology Department is equipped as a modern microbiology laboratory with emphasis on culturing and processing samples from the environment. The lab is outfitted with common area bench space with power and gas outlets, a laminar flow hood, fume hood, centrifuges, PCR machine, Qubit DNA quantification platform, agarose gel electrophoresis systems, transilluminator with gel capture camera system, diH2O, Milli-Q water system, incubator, lighted and refrigerated growth chambers, an autoclave, and -20 and -80 °C storage.

The Organic Geochemistry Laboratory (Schreiner) has two Agilent 6890 GCs, one interfaced to an Agilent 5973 quadropole MS and one interfaced to a flame ionization detector. Additionally, this laboratory contains various extraction and other equipment, including Soxhlet extractors, an Accelerated Solvent Extractor, and glassware, hoods, and other equipment necessary for organic geochemical analyses.

The Central Analytical Lab (Filstrup) houses an HPLC, Total Organic Carbon analyzer, and FTIR spectrometer, in addition to multiple ovens and furnaces, hoods, microscopes, and chemical glassware and other equipment. The LLO also houses a dedicated LC-MS laboratory, which contains an Agilent LC triple quadrupole MS, along with a variety of peripherals including fraction collectors.