

**American Geophysical Union (AGU), American Society of Limnology and
Oceanography (ASLO), and The Oceanographic Society (TOS)– February 21-
26, 2016**

<http://osm.agu.org/2016/>

CellScope Aquatic: A lab quality, portable cellphone-based microscope for on-site collection of algae images

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Abstract

Collecting algae samples from the field presents issues of specimen damage or degradation caused by preservation methods, handling and transport to laboratory facilities for identification. Traditionally, in-field collection of high quality microscopic images has not been possible due to the size, weight and fragility of high quality instruments and training of field staff in species identification. Scientists at the Southern California Coastal Water Research Project (SCCWRP) in collaboration with the Fletcher Lab, University of California Berkeley, Department of Bioengineering, tested and translated Fletcher's original medical CellScope for use in environmental monitoring applications. Field tests conducted by SCCWRP in 2014 led to modifications of the clinical CellScope to one better suited to in-field microscopic imaging for aquatic organisms. SCCWRP subsequently developed a custom cell-phone application to acquire microscopic imagery using the "CellScope Aquatic" in combination with other cell-phone derived field data (e.g. GPS location, date, time and other field observations). Data and imagery collected in-field may be transmitted in real-time to a web-based data system for *tele-taxonomy* evaluation and assessment by experts in the office. These hardware and software tools was tested in field in a variety of conditions and settings by multiple algae experts during the spring and summer of 2015 to further test and refine the CellScope Aquatic platform. The CellScope Aquatic provides an easy-to-use, affordable, lightweight, professional quality, data collection platform for environmental monitoring. Our ongoing efforts will focus on development of real-time expert systems for data analysis and image processing, to provide onsite feedback to field scientists.