

July 8, 2010 - Boulder Nonlinear Systems, Inc., announced today that it has received a Small Business Innovation Research (SBIR) grant from the National Center for Research Resources through the National Institute of Health to develop new methods for automation of quantitative DIC microscopy for 3D live-cell imaging using programmable active wavefront modulation. The grant provides approximately \$350,000 in research and development funds.

Boulder Nonlinear Systems (BNS) was founded in 1988 by Steve Serati. With a background in electrical engineering and liquid crystal optics, he began by building optical processors and phased array beamsteerers for LIDAR applications. The company gained a reputation for innovative research and development in optical systems. Over the years, the projects have grown in optical processing and leading edge optical components. The BNS signature product is its family of analog liquid crystal on silicon (LCOS) spatial light modulators. These devices are used to modulate a beam of incident light in order to add information to it, or to shape, correct, or steer it.

"Our decades of experience with liquid crystal technology allow us to resolve problems without vibration or noise from mechanical components," explains Mark Tanner, CFO. "Boulder Nonlinear Systems is able to leverage its expertise in this area into advanced microscopy applications."

Incorporating the SLM into the microscope in such a way that does not limit its multimode functionality, the SLM technology to automate DIC will achieve independent phase bias, shear distance and shear direction control. This unique design will be simpler and easier to adapt to commercial microscopes at less cost than other current alternatives.

Principle investigator Dr. Sharon V. King explains, "Differential interference contrast (DIC) images can be designed to create phase maps representing optical-path-length through a layer of partially absorptive material. These images can be interpreted for quantitative study of weakly absorbing objects, such as, density changes within a cell during its life cycle or for study of embedded structures such as waveguides in glass or polymer. ."

DIC is a mode of the microscope originally developed in 1955 to introduce contrast into images of weakly absorbing objects. Today, DIC is a common alternative mode in commercial fluorescence research microscopes. It is useful to biologists to see where the fluorescence signal is coming from within the context of the whole cell structure.

Quantitative phase imaging methods exist in different stages of development. For example, OCT is well developed, while QSIP is brand new. This grant supports further development of quantitative phase imaging from DIC. Current approaches to DIC based phase imaging include: phase-shifting to extract the phase gradient information for subsequent integration or estimation of the phase reached through some form of iterative model-based algorithm.

For more information, visit www.bnonlinear.com.