

# Quantitative Imaging Cytometry for the Diagnostic Pathologist: What Does the Laser Scatter Imaging Component Add?

**Presenter:** William Geddie, Department of Laboratory Medicine and Pathobiology,  
Toronto General Hospital, University Health Network, University of Toronto

*William Geddie, MD practices as a staff cytopathologist clinician-teacher at University Health Network, an amalgamation of three University of Toronto teaching hospitals. A graduate of the University of Toronto Faculty of Medicine, he completed residency in anatomical pathology, further post-graduate training in respiratory, cardiovascular and hematopathology, and subsequently undertook further post-graduate training in cytopathology under Torsten Löwhagen at the Karolinska Hospital in Stockholm.*



*He is a passionate proponent of fine needle biopsy as a low-cost diagnostic tool in settings where resources are limited, and also in technologically advanced medical environments as a minimally invasive means of repetitively obtaining material for diagnosis, predictive testing and pharmacodynamic monitoring. He is the recipient of the Medical Staff Association Physician of the Year Award at Princess Margaret Hospital for his humanitarian activities and teaching in Africa.*

*Dr. Geddie has sat on the Examination Board in Anatomical Pathology of the Royal College of Physicians and Surgeons of Canada and has chaired the Cytology Committee of Ontario's Quality Management Program for Laboratory Medicine. He is the author of numerous publications, including peer-reviewed articles and reviews, chapters, and editorials.*

## **Abstract**

Digitized slides are increasingly being used for diagnostic purposes in pathology, but scanned slides containing both conventional morphologic information and multiparametric data of various kinds are still developmental. Multiplexed immunohistochemical stains on the same slide are technically challenging, and simultaneous use of chromogenic and fluorescent stains is hampered by the light absorption properties of the colored dyes. One possible solution is to evaluate cell and tissue morphology using a method of producing contrast that does not rely on histochemical staining. Shaded relief images produced in QIC by manipulation of laser light absorption fulfill this function well.

We have found laser light absorption ("shaded relief") morphology consistently informative in examination of unstained tissue sections and cytologic preparations. The images obtained share many features with differential interference contrast microscopy, although they are produced in an entirely different way. Patterns of cell dispersion in cytology samples and tissue architecture patterns in sections are easily identified, as are N/C ratio, character of cytoplasm, nuclear chromatin texture, presence of nucleoli and character of extracellular material, including infectious organisms. With experience, most cell types can be identified and specific pathologic diagnoses made. Since this morphologic data can be captured simultaneously with multichannel fluorescence, it can provide the morphology component of the high-content virtual slide in both histology and cytology.