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Introduction to the novel techniques in microscopy feature issue

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Abstract: The editors introduce the feature issue on “Novel Techniques in Microscopy,” which was the topic of a symposium held on April 12–15, 2015, in Vancouver, BC. This symposium was part of the Optics in the Life Sciences Congress.

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OCIS codes: (000.0000) General; (000.1200) Announcements, awards, news, and organizational activities.

References and links

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Optical microscopes emerged as extensions to the limited resolving power of the human eye. While the earliest instruments were mere magnifiers of minute details of the visible world, the tremendous developments in optical imaging technology have transformed the microscope into a device that brings multiple facets of the microcosm into clear view. Smart use of the physical properties of light and its interaction with matter have introduced novel ways to visualize the microscopic realm, as beautifully illustrated by the phase contrast microscope in the 1930s, the application of fluorescence as a contrast mechanism and the invention of the confocal microscope in the late 1950s. Each of these technologies enabled radically new views of biological cells and tissues.

The synergy between technical developments in optical microscopy and biological discoveries continues to this day. With each seminal advance, new opportunities arise for uncovering previously hidden aspects of biological samples. Examples include nanoscopic details revealed by super-resolution techniques, fast cellular dynamics captured by high-speed cameras and tissue architecture visualized by label-free nonlinear optical imaging methods.

The Novel Techniques in Microscopy (NTM) symposium, held on April 12–15, 2015, in Vancouver, BC, illuminated the enabling role that new optical techniques and approaches continue to play in biological imaging. The symposium presented a broad range of innovations in optical microscopy, from advances in optical tomography, to developments in nonlinear optical imaging, to new methods in super resolution fluorescence microscopy.

In this feature issue of *Biomedical Optics Express*, we have collected several papers that represent some of the technologies discussed at the NTM symposium. These papers highlight advances in photoacoustic flow cytography [1], 3D phase microscopy [2], 3D reconstruction algorithms [3], second-harmonic generation microscopy [4], and ultrahigh-speed imaging [5].

Together, they paint a current portrait of the exciting new developments in optical microscopy.