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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 14–18, 2013, in Waikoloa Beach, HI. This symposium was part of the Optics in the Life Sciences Congress.

OCIS codes: (000.1200) Announcements, awards, news, and organizational activities; (180.0180) Microscopy.

References and links

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The optical microscope has matured into a device that readily generates visuals of specimens with sub-micrometer resolution in just a fraction of a second; length and time scales that are

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of direct relevance to cell and tissue biology. Combined with the rich palette of optically addressable labels, these capabilities have consolidated a central role for the optical microscope in biological research. Indeed, the impact of the conventional optical microscope in the biological sciences cannot be underestimated. Yet, as biological questions become more refined, the need for improving the imaging capabilities of the microscope grows accordingly. Among these needs are faster image acquisition, a broader portfolio of contrast mechanisms, methods for quantitative probing, understanding and reducing the deleterious effect of light scattering in tissues, and means to achieve higher spatial resolution. Activities in these areas are impressive, which have produced many breakthrough advances in the last few years alone, exemplifying the continued dynamism in the field of optical microscopy.

The Novel Techniques in Microscopy (NTM) symposium, one of four symposia of the Optics in the Life Sciences Congress that was held on April 14–18, 2013, in Waikoloa Beach, HI, aimed to capture some of the most exciting technical advances in the field of biological optical microscopy [1]. Among other topics, the symposium touched on new approaches to achieve super-resolution, novel forms of nonlinear imaging contrast, advances in interferometric and phase sensitive microscopy, the latest methods in tomographic imaging, and techniques to mitigate or leverage light scattering in turbid media.

This feature issue is a compilation of papers by selected authors who presented their work at the NTM symposium and others active in the area of technique development. In this feature, new methods in nonlinear optical imaging are discussed [2–5], including approaches for deeper imaging [2] and interferometric nonlinear optical techniques to retrieve information about molecular orientation [4]. Exciting new developments in linear interferometric techniques are also highlighted [6–9], among which clever implementations of spatial light modulators for achieving better contrast [8,9]. In addition, this issue illuminates light scattering in turbid media [10] and the use of scattering to generate high quality images from cells [11]. Novel devices that enable efficient imaging in scattering tissues are discussed as well [12–15], including new implementations of optical coherence tomography systems [14,15]. Together, these papers paint a vivid picture of emerging technologies and promising developments in optical microscopy.

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