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## **Image-Guided Therapies: Advances in Imaging, Modeling, and New Applications**

J. Siewerdsen,<sup>1,2</sup> D. Hawkes,<sup>3</sup> P. Keall<sup>4</sup>

1. Ontario Cancer Institute, Princess Margaret Hospital, Toronto ON, Canada
2. Department of Medical Biophysics, University of Toronto, Toronto ON, Canada
3. University College, London, UK.
4. Department of Radiation Oncology, Stanford University, Palo Alto CA, USA

Recent advances in imaging technology, image modeling and registration, and advanced therapeutics offer the potential for precise, image-guided therapies that will transform existing approaches to planning, intervention, adaptation, and monitoring of therapeutic response. Such therapies are marked by a dramatic increase in the application of image information from multiple modalities and demand accurate coregistration of morphological and functional information across a broad range of spatial and temporal scales. The scope of advanced therapeutic modalities enabled by such advances is broad, ranging from high-precision image-guided radiation therapy and surgery to minimally invasive target ablation, cell-based therapies, and other forms of novel therapeutics. Moreover, the information acquired during the course of intervention will drive patterns of therapy delivery that are increasingly adaptive and patient-specific. This symposium focuses on the scientific principles and recent advances in imaging, guidance, image modeling, registration, adaptation, and advanced therapy delivery techniques. Three speakers will present on topics central to such advancement: Dr. Siewerdsen will discuss principles of imaging performance, guidance, and the development and integration of new technologies for therapy guidance; Dr. Hawkes will address principles of rigid and deformable image registration, fusion, visualization, and augmented reality; finally, Dr. Keall will discuss the latest advances in imaging, adaptation, and novel treatment delivery techniques in image-guided radiation therapy.

### Learning Objectives:

- 1.) Gain exposure to new developments in imaging technologies for image-guided interventions.
- 2.) Understand challenges in rigid and deformable image registration, fusion, and visualization.
- 3.) Learn the latest advances in imaging, adaptation, and therapy delivery techniques in IGRT.