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Optical Diagnostic and Biophotonic Methods from Bench to Bedside

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The eighth Inter-Institute Workshop on Optical Imaging from Bench to Bedside was held at the National Institutes of Health (NIH) in Bethesda, Maryland, on September 24–25, 2015, with generous support from diverse institutes and centers within the NIH. These included the National Institute of Neurological Disorders and Stroke (NINDS), National Institute of Biomedical Imaging and Bioengineering (NIBIB), Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), and National Heart, Lung, and Blood Institute (NHLBI).

The workshop was held during the International Year of Light 2015, a resolution that was passed by UNESCO to promote the central role of light in science and culture. More than ever before, optics is surrounding our daily lives, with health care applications becoming more and more dominant. In the spirit of bench to bedside research, the workshop featured presentations focused on translational biophotonics research.

Recognizing a lifetime of achievements, the 2015 NIH Workshop Bench-to-Bedside Pioneer Award was presented to Katarina Svanberg, MD, PhD. Prof. Svanberg is a consulting physician in oncology at the Lund University Hospital. She holds a professorship in oncology at Lund University as well as at the South China Normal University in Guanzhou, China. Her contributions to the fields of photodynamic therapy and spectroscopic imaging methods have been numerous. Her clinical activities paired with research work have allowed her to successfully translate photodynamic therapy and spectroscopic imaging into a clinical setting at the Lund University Hospital, demonstrating true bench-to-bedside efforts. Not only has she fostered many collaborations between research and clinical settings within Sweden, but she has also successfully translated this clinical research work to several other countries including many countries in Europe, Africa, and the United States. She also served as the president of SPIE in 2011, another testimony to her achievements.

The workshop further featured two keynote speakers, who both have been SPIE Britton Chance Biomedical Optics Award Recipients. This award is presented through SPIE annually in recognition of outstanding lifetime contributions to the field of biomedical optics through the development of innovative, high-impact technologies. The two keynote speakers were Lihong Wang (2015 recipient) and Robert Alfano (2012 recipient).

In addition, several hundred people attended the workshop, including university researchers, students, government scientists, industrial entrepreneurs, and scientists from the United States and abroad. The two-day program included 8 sessions with 26 oral presentations by outstanding leaders in the community, ~90 poster presentations, and 2 panel discussions. The session topics included imaging approaches to neuroscience, advances in optical coherence tomography, multidisciplinary approaches to global health innovation, cancer metabolism and genomics, image-guided therapy and surgery, theranostics, as well as advances in microscopy. Leaders in their respective fields were invited as speakers in each session. In the spirit of bench to bedside, a discussion with panelists from industry and academia emphasized the hurdles and burden of translational research. Funding opportunities and the future of the funding landscape of NIH was held with Houston Baker from the NCI and Behrouz Shabestari from NIBIB.

Most of the papers in this special section were based on the presentations. However, there are additional papers by groups that did not attend the meeting, but the main theme of bench to bedside is evident in them. The field of optics plays a major role in the development of point of care, near-patient, and precision-medicine applications. Translation of research achievement into real clinical application will continue to grow for the sake of better human healthcare within the United States and the whole wide world.

Jana Kainerstorfer is an assistant professor of biomedical engineering at Carnegie Mellon University. Her research includes noninvasive optical imaging of tissue for disease detection and/or treatment monitoring, with a particular emphasis on diffuse optical spectroscopic imaging (with applications to the brain, breast, skin, and muscle). Her research spans from instrument development, to novel data analysis tools, all the way to clinical applications, with results published in more than 20 peer reviewed scientific articles.

Fatima Chowdhry is a research fellow in the Section on Analytical and Functional Biophotonics in the National Institutes of Child Health and Human Development (NICHD) at the National Institutes of Health in Bethesda, Maryland. She is a graduate of Fatima Jinnah Medical College in Lahore, Pakistan. One of her research interests includes functional near-infrared spectroscopy for functional neuroimaging.

Amir Gandjbakhche is the senior investigator and chief of the Section on Analytical and Functional Biophotonics at the National Institutes of Health (NIH). One of his research interests is focused on near-infrared spectroscopic imaging for tissue characterization and function, such as functional brain imaging. He has devised quantitative methodologies and associated instrumentations to bring technology from the bench to bedside, and he has authored more than 180 peer-reviewed journal articles and numerous book chapters.

Bruce J. Tromberg is the director of the Beckman Laser Institute (BLI) and Medical Clinic at UCI and principal investigator of the Laser Microbeam and Medical Program (LAMMP), an NIH P41 National Biomedical Technology Center in the BLI. He is a professor with joint appointments in the Departments of Biomedical Engineering and Surgery and has been a member of UCI faculty since 1990.

Israel Gannot is a professor of biomedical engineering at Tel-Aviv University and a research professor in the Department of Electronic and Computer Engineering at Johns Hopkins University. His research interests are multimodal approaches, nanoparticles-based image treatment and monitoring of diseases, optical fibers for surgical and sensing applications, and translational research. Israel has also founded Optical Diagnostics, an in-vitro diagnostics company that is developing an instant bacteria detection instrument in a clinical setting.