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The biomedical optics and ultrasound imaging communities remain actively engaged in the development of photoacoustic (PA) imaging methods and exploration of their biomedical applications. PA imaging is a hybrid technique that combines the high tissue contrast of optical imaging methods with the good spatial resolution of ultrasound imaging methods. In PA imaging, an ultrashort pulsed laser is employed to induce ultrasound sources within tissue via the PA effect. The magnitudes of the induced ultrasound sources are proportional to the absorbed optical energy density. The ultrasound fields produced by the induced ultrasound sources propagate out of the tissue and are subsequently recorded by use of ultrasound transducers. By use of the recorded signals, an estimate of the absorbed optical energy distribution within the tissue can be reconstructed. The spatial resolution of PA images is determined by the acoustic detection system. Because optical absorption provides the contrast for PA imaging, both endogenous and exogenous absorbers can be imaged. As hemoglobin is the dominant absorber in biological bodies, multiple-wavelength PA imaging can reveal functional parameters related to blood oxygenation.

There are two broad classes of PA imaging methods: PA computed tomography (PACT) and PA microscopy (PAM). The special section contains papers that address both implementations. In PACT, the image is computed by use of a reconstruction algorithm. On the other hand, image formation in PAM generally takes advantage of A-scan-type depth visualization at different lateral locations to generate B-mode and C-scan mode volumetric views. However, the distinction between PACT and PAM systems is not strict, as it is possible that a PAM system can employ a reconstruction algorithm for image formation.

The development of improved image reconstruction algorithms for PACT remains an important topic of investigation. Image reconstruction methods for PACT must compensate for physical factors that are distinct from those encountered in established computed imaging technologies such as x-ray computed tomography or magnetic resonance imaging. The special section contains papers that address the PACT image reconstruction problem. In the work by J. Poudel et al., a method for mitigating image artifacts that are caused by acoustic heterogeneities present in tissue is proposed. Alternatively, A. Da Silva et al. propose a method that exploits acoustic heterogeneities to improve the localization and the quantification of the optical parameters in PACT.

The special section also contains several papers that address innovative system designs for PACT and PAM. The paper by L. Lin et al. describes a compact handheld PAM probe for fast photoacoustic imaging. Different from benchtop PAM systems, the handheld probe provides flexibility in imaging various anatomical sites. R. Ellwood et al. describe a PACT system that employs an L-shaped detection geometry that allows improved image reconstruction when Fabry–Pérot sensors are employed. Light delivery optimization for photoacoustic-guided minimally invasive surgeries is addressed in the paper by B. Eddins and M. Bell . A number of other interesting works that address topics related to system development are present in the special section.

Novel applications of PA imaging continue to be intensively studied and are described in the special section. P. Hai et al. applied a linear-array-based photoacoustic tomography (LA-PAT) system for label-free high-throughput detection and quantification of circulating tumor cell clusters *in vivo.* Such technologies are important for understanding the tumor metastatic process and improving cancer therapy. M. Arabul et al. described the use of PA imaging in combination with plane wave ultrasound imaging to obtain three-dimensional images of endarterectomy samples ex vivo and compared the results with histology to investigate the potential of PA imaging-based identification of intraplaque hemorrhage. K. Furdella et al. demonstrated real-time PA imaging and spectroscopy using a wavelength-tunable visible laser and clinical ultrasound scanner to track cardiac drug delivery. A review article contributed by P. Kumar and M. Pramanik summarizes the recent developments of PA imaging systems and their applications in preclinical and clinical practices.

We are grateful to the contributors of this special section and all the reviewers who ensured the high quality of the accepted papers. Additionally, we are indebted to the JBO staff for their assistance. We hope that this special section will contribute to the growth of the PA research community, which can lead to further advancements of this exciting technology.

Mark A. Anastasio is a professor of biomedical engineering at Washington University in St. Louis. He is an internationally recognized expert on tomographic image reconstruction, imaging physics, and the development of novel computed biomedical imaging systems. He has conducted pioneering research in the fields of photoacoustic computed tomography, diffraction tomography, and s-ray phase-contrast imaging. He received an NSF CAREER award in 2006 for research related to image reconstruction topics and is a Fellow of AIMBE. He is on the editorial boards of the *Journal of Biomedical Optics, Photoacoustics*, and *Medical Physics*, and is on the organizing committee for the SPIE Photonics West Photon Plus Ultrasound Conference.

Paul C. Beard is professor of biomedical photoacoustics at University College London. His research interests include photoacoustic detection and excitation instrumentation, quantitative spectroscopic methods, and the preclinical and clinical application of photoacoustic imaging.

Quing Zhu is a professor in the Biomedical Engineering and Radiology Department at Washington University in St. Louis since 2016. Prior to joining Washington University, she was a professor in the Electrical and Computer Engineering and Biomedical Engineering Departments at University of Connecticut. She has been named fellow of OSA and SPIE, and is an associate editor of *IEEE Photonics* and an editorial board member of *Photoacoustics* and the *Journal of Biomedical Optics*. Her research is focused on ultrasound-guided diffuse optical tomography for breast cancer diagnosis and treatment monitoring, co-registered ultrasound and photoacoustic tomography for ovarian cancer diagnosis, optical coherent tomography, photoacoustic microscopy, and structured light for ovarian cancer detection.