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Celebration of the Britton Chance Legacy

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This special section of the *Journal of Biomedical Optics* features 13 papers about metabolic imaging and spectroscopy and commemorates Professor Britton Chance (1913–2010). Britton Chance was a prolific scientist and trailblazer in the fields of biochemistry, biophysics, biology, bioengineering, electrical engineering, physics, and medicine. In addition, he was a founding father of both *in vivo* NMR and *in vivo* biomedical optics. His research activities spanned three quarters of a century, regularly connecting basic discoveries to clinical translation, with the ultimate goal to elucidate tissue biology and function for diagnosis and healing of disease and for improving health.

Britton Chance generated many important technological advancements that had impact on basic and clinical science.¹ In the 1930s and 1940s, he invented miniature stop-flow instruments and used them to make seminal contributions to our understanding of enzymatic kinetics; for example, he experimentally demonstrated formation of Michaelis-Menten enzyme-substrate complex. In the 1950s, he invented the dual-beam spectrophotometer and used it in pioneering investigations of bioenergetics and the redox state in mitochondria. In the 1960s, he and coworkers found evidence for and elucidated the electron tunneling phenomenon in a biological system. In the 1970s, he and coworkers identified hydrogen peroxide release by the respiratory chain in mitochondria. In the 1970–80s, he was a key player in the development of *in vivo* NMR spectroscopy. Finally, in the 1990s until his death, he was a founding father of and a leading figure in the field of biomedical optics, especially in regard to utilizing optics for biomedical research and translating these technologies to clinical practice. In addition to his research, Britton Chance always focused on mentoring and creating opportunities for the next generation of scientists, *e.g.*, from developing and implementing summer programs for high school students in Philadelphia, to promoting scientific cooperation and exchange between the Eastern and Western communities of the world.

In honor of his 105th birthday, The Second Britton Chance International Symposium on Metabolic Imaging and Spectroscopy (<http://www.med.upenn.edu/chance/index.html>) took place at the University of Pennsylvania, June 11–13, 2018. The event brought together over 200 physicists, engineers, biologists, and clinicians for discussion and presentation of cutting-edge research innovation and clinical translation in metabolic imaging and spectroscopy. After this symposium, the Organizing Committee solicited manuscripts from these research communities for two journal issues, in the *Journal of Biomedical Optics* (JBO) and *Molecular Imaging and Biology*, respectively.

The contributions to this special section of JBO Volume 24, Issue 5, cover a wide range of topics and applications. This research develops and/or uses optical tools to measure functional processes in healthy and diseased cells and tissues. We have classified these manuscripts into five categories: metabolism,^{2,3} perfusion,⁴ cancer imaging/monitoring,^{5,6,7,8} functional brain monitoring,^{9,10} and technology development.^{11,12,13,14} Britton Chance was deeply interested in all of these subfields of biomedical optics. To honor his contributions and to carry his scientific torch further, hereafter we will organize a Britton Chance Symposium every five years.

Finally, we appreciate the support and contributions of all symposium participants, and the journal issue authors, reviewers, editors, and staff.

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Lin Z. Li is an associate professor of radiology and directs the Britton Chance Laboratory of Redox Imaging at the University of Pennsylvania. Prior to 2004, he developed original NMR methods that contributed fundamentally to the development of quantitative susceptibility mapping. Since 2004, he has been employing and developing NMR and optical redox imaging methods to interrogate cellular redox state in diseases such as cancer and aging.

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Arjun G. Yodh is the James M. Skinner Professor of Science in the Department of Physics and Astronomy at the University of Pennsylvania. His biomedical research is oriented toward imaging and monitoring with diffusing light; this research explores fundamental aspects of light transport and aims to demonstrate the potential of these tools for functional imaging/monitoring in brain, breast, and muscle. He also directs the Laboratory for Research on the Structure of Matter, an interdisciplinary materials institute that hosts the Penn NSF-MRSEC.