

Multi-Spectral Opto-Acoustic Tomography for Next Generation Biomedical Imaging

Vasilis Ntziachristos

*Chair for Biological and Medical Imaging, Technische Universität München
Helmholtz Center München, Germany*

Optical imaging is unequivocally the most versatile and widely used visualization modality in clinical practice and life sciences research. In recent years, advances in photonic technologies and image formation methods have received particular attention in biological research and the drug discovery process for non-invasively revealing information on the molecular basis of disease and treatment. An increasing availability of endogenous reporters such as fluorescent proteins and probes with physiological and molecular specificity enable insights to cellular and sub-cellular processes through entire small animals, embryos, fish and insects and have revolutionized the role of imaging on the laboratory bench, well beyond the capability of conventional microscopy. This talk describes current progress with instruments and methods for in-vivo photonic tomography of whole intact animals and model biological organisms. We show how new tomographic concepts are necessary for accurate and quantitative molecular investigations in tissues and why it could be potentially a valuable tool for accelerated investigations of therapeutic efficacy and outcome. We further demonstrate that cellular function and bio-chemical changes can be detected in-vivo, through intact tissues at high sensitivity and molecular specificity. Examples of imaging enzyme up-regulation, carcinogenesis and gene-expression are given. The potential for clinical translation is further outlined. Limitations of the method and future directions are also discussed.

Biography

Vasilis Ntziachristos Ph.D. is a Professor and Chair for Biological Imaging at the Technische Universität München and the director of the Institute for Biological and Medical Imaging at Helmholtz Zentrum München. Prior to this appointment he has been faculty at Harvard University and the Massachusetts General Hospital. He has received his masters and doctorate degrees from the Bioengineering Department of the University of Pennsylvania and the Diploma on Electrical Engineering from the Aristotle University of Thessaloniki, Greece. Professor Ntziachristos serves as chair in international meetings and in the editorial boards of scientific journals and was named one of the world's top innovators by the Massachusetts Institute of Technology (MIT) Technology Review in 2004. His main research interests involve the development of optical methodologies for probing physiological and molecular events in tissues using non-invasive methods.