

SPECIAL SECTION GUEST EDITORIAL

Tools for Biomolecular and Cellular Analysis

Over the last two decades, the use of photonics technology in the study of biology and medicine and its application to biotechnology and medicine have grown overwhelmingly. Indeed, the founding of the *Journal of Biomedical Optics* was in part a response to that evolution. This special section focuses on new techniques for addressing research questions in biology and medicine, as well as more practical problems. Several of the papers are expanded from presentations delivered at the SPIE Photonics West Conference in San Jose, California, in 2002.

The first article, by Xiaohu Gao and colleagues in Shuming Nie's lab, describes recent achievements in the development of quantum dots as fluorescent labels, and their advantages in comparison to more classical labels. Nicolas DiCesare and Joseph Lakowicz review a series of fluorescent indicators based on charge transfer fluorophores and boronic acid which are sensitive to saccharides including glucose. The ratiometric character and appropriate sensitivity of the new probes offer new hope for *in situ* glucose sensors, especially for controlling insulin levels in diabetics. Paul Gourley and his colleagues detail some of the vital issues involved in making integrated optical devices incorporating semiconductor light emitters and other devices compatible with the biological fluids with which they are likely to be in contact. Richard Thompson and his colleagues describe a new fluorescence excitation ratiometric approach to the measurement of free zinc ion, at concentrations as low as picomolar. Sara Hamilton and col-

leagues in Robert Lodder's lab describe a sophisticated hyperspectral infrared analytical technique usable on complex samples, even remotely; they demonstrate the method by analyzing the stability of gelatin capsules at a distance of half a kilometer. John Sowell and colleagues from Gabor Patonay's lab summarize some recent work in the application of infrared fluorescent probes to capillary electrophoresis. Finally, Sophia Kyriacou and colleagues in X. Nancy Xu's laboratory describe their fluorescence microscopy studies of drug efflux from single bacterial cells.

These articles indicate not only the power and sophistication of the new techniques, but also their broad applicability to many different problems. While most of these techniques are currently research tools, it is not difficult to imagine their use on other, more practical questions. We look forward to the evolution of photonic technology in the service of human needs.

Richard B. Thompson, University of Maryland at
Baltimore

Fran Ligler, Naval Research Laboratory

Special Section Guest Editors