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BLI PROFILES

Michael W. Berns

Co-Founder, Beckman Laser Institute

The Arnold and Mabel Professor, Chairman and CEO, Beckman Laser Institute non-profit corporation

Professor of Surgery

Professor of Developmental & Cell Biology

Professor , Biomedical Engineering
Samueli School of Engineering

Adjunct. Professor, Bioengineering
UC San Diego

B.S., Biology, Cornell University, 1964
M.S., Biology, Cornell University, 1966
Ph.D., Biology, Cornell University, 1968

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1002 Health Sciences Rd. East
Irvine, CA 92612
Research Program: Cellular Biophotonics Lab

Research Interests

The application of lasers and associated optical technologies in biology, medicine, and biomedical engineering: laser tissue interactions, laser microbeam studies on cell structure and function, development of photonics-based biomedical instrumentation, and clinical research in oncology, fertility, and ophthalmology.

Research Abstract

The focus of my research is the study of precisely how the body's cells and tissues respond to light. This includes basic research into the interaction of light and tissue at the subcellular, cellular, and tissue levels, and the application of this information in clinical research. We take an interdisciplinary approach to research questions, combining the expertise of cell biologists, chemists, physicists, engineers and physicians. In addition to studying biomedical systems, we also design and engineer basic and applied photonics-based instrumentation.

In our investigation of cell structure and function, we employ the laser microbeam to perform subcellular surgery (optical scissors) and trapping (optical tweezers). In the National Institutes of Health biotechnology resource, the Laser Microbeam and Medical Program (LAMMP), which is located at the Beckman Laser Institute, we develop sophisticated techniques and instrumentation, such as lasers, computers, light microscopy, scanning and transmission electron microscopy to study numerous problems in cell structure and function, such as cell motility and fertility. This includes investigations on the mechanisms of chromosome movement and spindle organization; cell movement; and the structure and organization of chromosomes, nucleoli, and mitochondria.

We are developing new clinical applications in which laser medicine makes a significant improvement over conventional medicine. An example of this is our work in the photodynamic therapy (PDT) of cancer, in which we apply our understanding of cellular carcinogenesis, the effects of photosensitizing chemicals, and the interaction of light with tissues to diagnose and destroy tumors. Other clinical areas of interest are ophthalmology, surgery, gynecology, dermatology, dentistry, and veterinary medicine.

A major emphasis of the program is to facilitate the application of basic laser research to biomedical problems. This is

accomplished through applied research which leads to new medical applications and therapies, and through basic research which defines the optimal parameters for the desired laser-tissue interaction. We work closely with 30 corporate affiliates who translate the results of our research into viable technology for the health and biotechnology fields.

My Links

cellular biophotonics lab