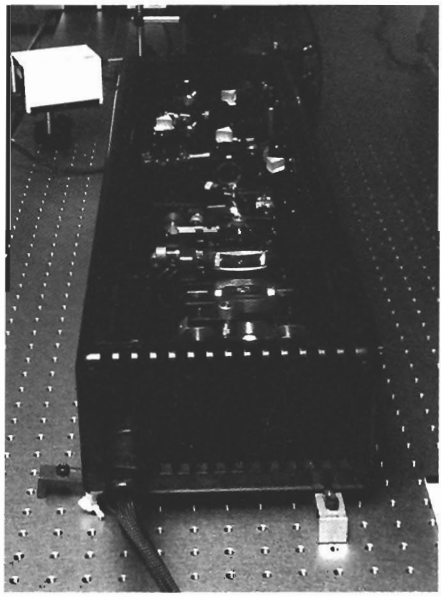
Biophotonics – a marriage of sciences

By Dr John Girkin of the Institute of Photonics

AS BIOPHOTONICS begins to bring real hope of earlier and less invasive methods of disease diagnosis and faster and more accurate drug testing to the medical world, it has never been more important that scientific disciplines are brought together to focus creatively on real-world requirements.

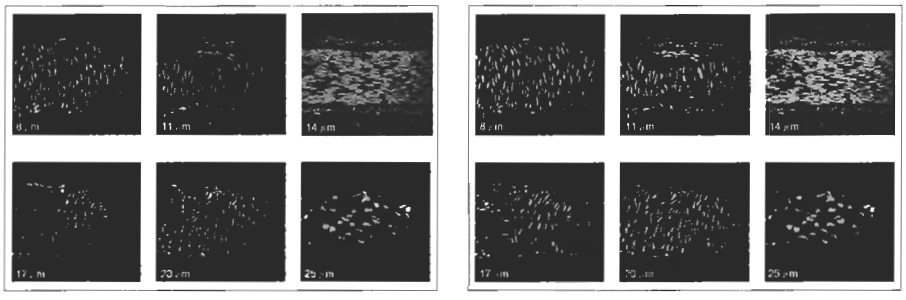
For years optical physicists have applied their skills to biomedical challenges and come up with ground-breaking devices such as the ophthalmic instruments now used around the world. The advent of the laser in the 1960s propelled this interaction to a new level but the last few years have seen an unprecedented surge of interest in collaboration between the different branches of science as biophotonics, the marriage of photonics and biology, has emerged as a major force for good and for profit.

Biophotonics is enabling biologists to move towards the study of live cells with minimum disturbance thanks to imaging tools such as miniature optical fibre-based probes and multiphoton microscopy, which uses lasers capable of pulsing at a rate in which light only just has time to cross a human hair. Already being applied to the early detection of cancer and dental disease, such techniques give biologists and physiologists a better understanding of the processes taking place within the body and the effect that drugs may have in disease prevention and cure. Optical detection techniques can also be used by pharmaceutical companies to facilitate the high throughput screening of their vast libraries of chemicals, opening up yet another significant market. But if any of the techniques outlined here are going to reach the marketplace the marriage of biologist, physicist – and sometimes chemist – must be characterised by good communication and pragmatism.



A laser diode pumped Cr:LiSAF laser producing 100fs pulses at 850nm using a saturable Bragg mirror, suitable for multiphoton imaging.

Photonics researchers need to develop a greater understanding of the problems that biology poses. Product designers need to develop instrumentation that's easy to use, reliable and, for the mass market, cost-efficient to produce. And there needs to be creative thinking about how, for example, methods pioneered in nanotechnology and techniques developed for the telecommunications market could be applied to the biological field. Only with a concerted effort to pull the different scientific and sectoral strands together through new partnerships will biophotonics continue to grow as a source of interest to researchers and to industrialists.



Photon imaging of intact arterioles stained with the nuclear dye, DAPI. Sample prepared by Dr Karen McCloskey

The Institute of Photonics, Glasgow

Biophotonics is high on the research agenda of the Institute of Photonics, established in 1995 at the University of Strathclyde in Glasgow to bridge the gap between academic research and industrial application and development. Promoting commercially-relevant research and its exploitation, the Institute's work is underpinned by a belief that effective technology transfer is enabled by providing the environment, facilities and expertise in which a wide range of activities, from strategic research to support for spin-outs, can flourish.

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