

The Photonics in Biophotonics

This short course will look at the influence that optics expertise and photonics technology has had in the fields of both life science research and clinical medicine in the last thirty years. It will provide the attendees with a background in some of the technologies used and an overall approach to the application of Biophotonics. Specific research examples will be provided by expert researchers working in the field and the attendees will then have an opportunity to explore a specific challenge to produce solutions of their own.

Photonics has always been at the forefront of all medical diagnosis as the first instrument any doctor uses in diagnosing a patient are their eyes as they observe the patient entering the clinic looking for signs of poor movement, colour difference on the skin and the like. Clearly with the advent of more advanced technology in the last thirty years the application of optics and photonics in this field has grown and underpins a great deal of both modern life science research and clinical medicine. Until very recently all DNA analysis, for example, was photonics based and optical microscopy has always been at the cornerstone of all core cellular based analysis and detection.

This course will start by looking how light in general is used in Biophotonics linking the scientific and clinical requirements with the photonics technology. It will start by consideration of how light can be shaped and directed to the target, how the target's optical properties then change the light and how the resulting light or light pattern is detected. The workshop will then look at the specific technologies involved here covering light sources (lasers and LEDs), optical components including active devices such as spatial light modulators and deformable mirrors as well as conventional lenses, and also temporal encoding of information as well as spatial changes. After consideration of how the sample may change the light the course will look at the different sensor types and how different forms can be used for specific applications.

Having provided some background on the basic photonics tools of the biophotonics the workshop will then look at the best approaches to then apply the methods to a range of life science challenges. There will then be a workshop challenge where the attendees either working alone, or in small groups, can develop their own potential solutions to specific life science challenges.

Workshop Tutors

Prof John Girkin, Durham University, UK, Professor of Biophysics. Weblink (<https://www.durham.ac.uk/staff/j-m-girkin/>) Professor Girkin has been researching and developing photonic based instruments both in academia and in industry for over 30 years. His early work led to the development of the world's first commercial laser diode ophthalmic photocoagulator for the treatment of diabetic retinopathy and the air puff tonometer for measuring the pressure in the eye. More recently his research has moved toward imaging covering both optical microscopy and micro-endoscopy within the living human lung. He has also built high speed, high sensitivity DNA analysis instruments based upon the use of advanced photonics technology correctly selected to solve the specific

challenges presented. He has received international awards for his instrumentation and is recognised as being an engaging and enthusiastic presenter and teacher.