

EMBO Practical Course on Advanced Optical Microscopy for Cell Biology

The Marine Biological Association, Plymouth, U.K.
3 - 14 April 2018

The 15th EMBO Practical Course on Advanced Optical Microscopy for Cell Biology was once more held in the historic Marine Biological Association (MBA) on Citadel Hill, Plymouth, overlooking the sea. This immersive 10-day practical course attracted early career researchers, facility managers and industry-based microscopists from across Europe from a variety of fields spanning biologists, physicists, chemists and mathematicians. Year-after-year the course hosts invited speakers from across the globe who are leaders in their field to lecture on all things microscopy.

With lectures covering the fundamentals of optics, light sources, photophysics and detectors to recent advances super resolution and single molecule localisation techniques, there was really something for everyone. The aim of the course was to not only attempt to cover the vast and diverse theoretical aspects of optical microscopy, but to also provide the attendees with first-hand experience of using various advanced techniques with a variety of samples. The quality of teaching and practical demonstrations

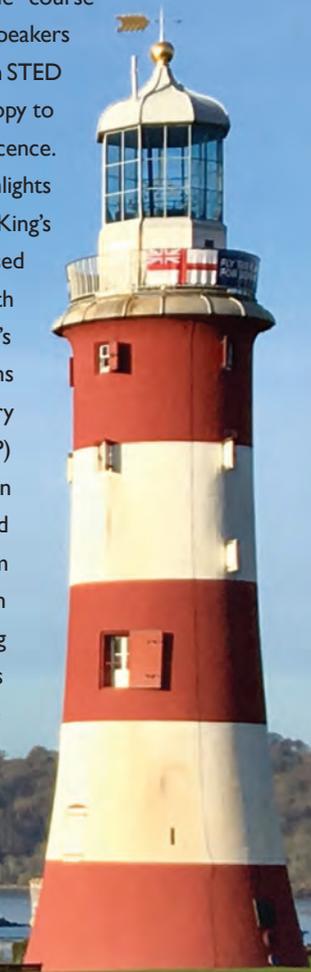
provided on the course is sure to prepare the next generation of budding optical microscopists to push on the frontiers of microscopy and widen our knowledge of the hidden world that surrounds us.

The course began with an introduction to this year's cohort from the co-organiser, Brad Amos. Brad briefly summarised the history of Plymouth's maritime past and its connections to science and microscopy, with particular emphasis on the MBA's

contributions since its inception in 1884. This was then followed by an easy-flowing mixer to allow the attendees to socialise with one another and learn about their research and motivations for attending the course. The following three days seen three comprehensive lectures from Brad which introduced a base understanding of optics before going onto describe how polarisation and interference phenomena can be used in various techniques and applications. Brad's lectures were complemented with a series of practical sessions which covered setting up microscopes for Köhler illumination, correcting optical aberrations, optimising and testing Differential Interference Contrast optics and setting up for phase contrast microscopy. There were also accompanying demonstrations of Abbe's historical diffraction experiments and the Jamin-Lebedeff image-shearing interference microscope. Following from Brad's introductory lectures we heard from Martin Thomas (CEO of Cairn Research) about light sources and their uses in optical microscopy; Gail McConnell (University of Strathclyde) discussed lasers and non-linear optics as well as the development of the Mesolens and its benefits for biomedical imaging; and Klaus Suhling (King's College London) spoke about the

variety of detectors available for a wide range of microscopy techniques. These talks provided a base understanding which was built upon over the remainder of the course as the talks became more focused on applications.

The next week-or-so of the course was packed full of excellent speakers covering a range of topics from STED and super-resolution microscopy to the chemistry of bioluminescence. My personal speaker highlights were from Maddy Parsons (King's College London) as she discussed the challenges of imaging with live cells and gave an expert's insight into live-cell applications such as Fluorescence Recovery After Photobleaching (FRAP) and Fluorescence Loss in Photobleaching (FLIP); Gerard Marriott travelled from UC Berkeley to deliver an informative and interesting look into the photophysics of fluorescence and the





properties of fluorescent photoproteins; and the keynote lecture delivered by Christian Eggeling (University of Oxford) on STED microscopy and nano-immunology. The quality of talks and enthusiasm from all the speakers cannot be stressed enough, which in my opinion made the course a resounding success.

The second week of the course also offered attendees the unique opportunity to gain hands on experience of a variety of advanced optical microscopes with experts on hand to provide demonstrations and troubleshooting advice. Representatives from Nikon, Olympus, Abbelight, Leica, Scientifica, Aurox, Hamamatsu, Oxford Nanoimaging and many others were present for the duration of the course and each had their latest product to showcase. One added benefit for many of those on the course was the option to go on a field trip to collect marine plankton from the Plymouth marina. Accompanied by Tony Campbell (University of Cardiff) and Brad Amos, the trip let us get our hands dirty by pulling up crustaceans, anemones and plankton from the sediment. Tony and Brad's expertise in identifying these sea-beasties was key to selecting the correct species to bring back to the lab for preparation and imaging. The practical aspects of this course taught

us how to better handle/prepare our samples and allowed us to gain a larger oversight of the up-and-coming microscopy techniques in the field – all of which complemented the theory covered by the course.

The course concluded with an informal dinner, prize-giving and thank you to the organisers. Over the 10 days those attending the course had the opportunity to present their research in a poster session and to complete a series of written problems, and whoever received the highest mark would win the much-coveted 'Jellyfish Trophy'. Being selected to attend this course was without doubt beneficial to my career development and understanding of the field. I return from Plymouth motivated, more confident in my abilities and eager to put what I've learned into practice. I would recommend attending to any early career research who actively uses microscopy in their research. There was a wide variety of optical physics, cell biology, image processing and statistical analysis covered by the course which provides learning points for those across the fields of biology, chemistry, physics and mathematics.

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