



Faculty of Engineering and Physical Sciences

The Photon Science Institute

School of Physics and Astronomy

Newsletter Spring 2007

MSc in Photon Science moves to new multi-million pound, bespoke residence

The Photon Science Institute, along with experimental equipment valued at more than £15 million, is set to move into its new £24 million bespoke laboratory, located on the South Campus at The University of Manchester.

The design for the new building, based on the interdisciplinary philosophy underpinning the Institute, will feature multi-functional high-tech, open plan laboratories and central meeting areas to promote interaction, openness and co-operation between the disciplines.

The MSc in Photon Science (Laser Photonics) will also be based in the new building, providing students with an opportunity to benefit from the expertise of leading researchers from different backgrounds, and access to a wide array of sophisticated tuneable light sources. The central laser hub will provide researchers with the most comprehensive range of wavelengths, laser fluences, powers and temporal characteristics available within a single facility.

Dr David Binks, Programme Director for the MSc said, "The new building illustrates The University of Manchester's commitment to build a campus that innovates and inspires. The Photon Science Institute is truly in a position to provide excellent facilities for postgraduate teaching and learning alongside world-class research."

MSc in Photon Science (Laser Photonics) Key Features:

- Multi-disciplinary syllabus
- Flexible core and optional modules
- Internationally leading/recognised researchers
- Collaborations with industry
- Dynamic research environment
- New multi-million pound, purpose built facility
- Links to national and international resources

School of Physics & Astronomy
The University of Manchester
tel +44(0)161 306 3673
physics@manchester.ac.uk
www.manchester.ac.uk/psi/postgraduate

A Message from the Director of the Photon Science Institute

Welcome to the Photon Science Institute. The Institute aims to place Manchester at the forefront of world-class photon science research, academic excellence and exemplary knowledge transfer. Our expertise, dedicated state-of-the-art building and sophisticated laser equipment will support our goals for pioneering influential, exciting research and exceptional postgraduate teaching and learning.



Prof. Klaus Müller-Dethlefs, PSI Director

Our research will focus on the development and application of new and existing laser technologies across a variety of fields including engineering, medical, pharmaceutical, life and physical sciences.

For example, in my own research I have the worldwide patent for non-invasive glucose testing using Raman spectroscopy with the aim of developing a device that will enable people to measure their blood sugar level without the need to obtain a blood sample.

In other research, we are developing micro tweezers, (tightly focused laser beams) opening up new possibilities for the capture and manipulation of micro particles (such as biological specimens) on the cellular level. In the medical discipline we hope to use a non-invasive imaging technology – optical coherence tomography – to aid in the detection of skin cancer, avoiding the need for the conventional method of biopsy.

“The Institute aims to foster a knowledge sharing, innovative environment that assists engineers and others to cross traditional disciplinary boundaries and collaborate with the life, medical, physical and material sciences.”

Using multi-parameter spectroscopy for imaging in live cells we aim to identify the function of several proteins in a single cell simultaneously, which will help us to understand how the living cell works – current techniques allow us to only identify a single protein at a time. This method is particularly relevant to applications of targeted drug delivery.

In materials science, we are looking to characterise new materials including nanomaterials by non-destructive techniques such as Raman and IR overtone spectroscopy and time-resolved measurements.

In a method comparable to ultrasound testing of materials we are also looking at the use of novel laser techniques for in situ testing of, for instance, composite materials to identify mechanical stress related failures. Such maintenance practices would have obvious benefits to the aerospace industry.

The Photon Science Institute addresses the need for cross and multi-disciplinary research to meet today and tomorrow's big scientific challenges. In turn by providing these scientific challenges to our postgraduate students and post-doctoral researchers, we aim to educate the best minds who will go on to work in academia or internationally leading organisations.

MSc in Photon Science (Laser Photonics)



Jennifer Sanders tells us why she chose to study the MSc and why Manchester is a great place to be.

What initially attracted you to Manchester and the MSc in Photon Science?

Having completed my undergraduate BSc in Physics here at The University of Manchester I knew the city and the University's high calibre teaching and learning facilities very well. The MSc in Photon Science presented me with an opportunity to study areas of physics that had always excited me.

How have you found Manchester and the University so far?

I love Manchester - the city and the University! Guidance and support from lecturers, supervisors and staff is especially helpful and they are readily approachable.

What special subjects and career directions interest you?

Photon science has always fascinated me, and I find holography extremely interesting and even fun! The MSc qualification will provide me with many career opportunities for applications of photon science in science and technology, such as telecommunications, security holographics, or laser technology within medical science.

How have you found the MSc so far?

I have really enjoyed the MSc because photon science is an area of physics I enjoy learning about and applying. The blend of challenging and stimulating laboratory experiments and the ability to choose from a wide range of interesting modules means that I could shape the course to suit me.

Although the core of the MSc focuses on lasers, their applications and related optics, the course still offers lots of variety, with a range of subjects from using lasers in



medicine to the business of technological enterprise. All of the modules I've taken have been interesting and given an up-to-date vision of the current photon science technology. Several modules allow you to concentrate on specialist topics within that field; selecting a topic you know almost nothing about to having built up enough knowledge to explain it to your peers is very rewarding.

For me – someone who loves holography and anything associated with it – one of the highlights of the MSc has been the trip to OpTIC Technology Centre where the other students and I saw some very impressive holograms and compared these to our self-designed attempts in the laboratory. A chance to meet and talk to scientists within the field was also very refreshing.

Tell us a little about your research project

My dissertation looks at a particular holographic technique known as Moiré interferometry. The technique involves interfering two laser beams to create a virtual diffraction grating, which is then superimposed onto a physical diffraction grating. The interference between the two creates what are known as Moiré fringes and as the physical diffraction grating shifts or is deformed, the subsequent movement of the Moiré fringes can be used to characterise the force causing the deformation. The technique can be applied to measuring thermal deformation or the shape changes in dental composites such as fillings.

“Selecting a topic you know almost nothing about to having built up enough knowledge to explain it to your peers is very rewarding.”

How is the MSc contributing to your future plans?

In terms of future career or further study plans, I would really like to stay within the field of photonics, optics or at least some form of physics or engineering. I have applied for positions that use lasers or optics within their company such as The Atomic Weapons Establishment, The Ministry of Defence and DSTL but I really would jump at the chance for a career using holography. I have also now submitted a PhD application for a project looking at manipulating small particles with lasers – another area I find extremely interesting.

If you enjoy Photon Science and are not afraid of challenging and hard work then I would definitely recommend this MSc course.