

Dr. Gerard O'Connor – Senior Lecturer in Physics

1989 BSc University College Galway  
1994 PhD University College Galway



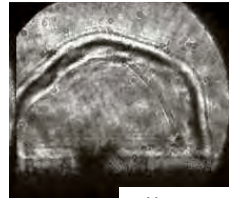
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**Research Clusters & Interests:** NCLA, LightHOUSE - Centre for Applied Photonics  
Integrated Nanoscience Platform for Ireland, INSPIRE.

### Research interests

My research interests are driven by LightFactory2020 -a vision for future adaptable factories based on using light & optics to make, monitor, and measure in manufacturing. LightFactory2020 is a personal vision, shared with the EU photonics community [www.Photonics21.org](http://www.Photonics21.org), that proposes a development programme for intelligent micro- and nano- scale manufacturing systems to develop adaptable, reconfigurable, knowledge intensive processes of the future.

Laser technology has the potential to compete with, disrupt, many other well-established micro- & nano-fabrication techniques. This activity addresses the challenge of using lasers to structure materials on scales which are below that determined by the diffraction limit associated with the wavelength of light. My research activities centres on hybrid, short pulse, laser processing of materials for nano-structuring. The terms are explained as follows: Hybrid: Enables new laser processes for nano-scale structuring using gases, liquids, sacrificial solids, electric fields etc. Short pulses: Pulse durations,  $\sim 10^{-12}$  seconds, comparable to electron thermalisation time in materials. Processes based on laser ablation, material removal processes, with subsequent spontaneous reassembly and deposition. Nanostructuring: applications in preparing functional surfaces, micro- and nano-scale structures from materials.



Nanoscale image of ablative laser material ambient interaction

Enquiries from research students with interests in laser–matter–ambient interactions, optics, real-time imaging, gas phase chemistry and materials science are welcomed.

### Selected Recent Publications

Expansion of a laser plume from a silicon wafer in a wide range of ambient gas pressures

A. N. Volkov, G. M. O'Connor, T.J. Glynn, G. A. Lukyanov, Applied Physics A, (2008) 92: 927–932

*Langmuir probe investigation of surface contamination effects on metals during femtosecond laser ablation*, G.O. Williams, G.M. O'Connor, P.T. Mannion, T.J. Glynn, Applied Surface Science, (2008) 5921–5926.

*The mechanism of nanobump formation in femtosecond pulse laser nanostructuring of thin metal films*, D. S. Ivanova, B. Rethfeld, G.M. O'Connor, T.J. Glynn, A.N. Volkov, L.V. Zhigilei, Appl Phys A (2008) 92:791-796

*Controlled process for polymer micromachining using designed pulse trains of a UV solid state laser*, D. Ilie, C. Mullan, G. M. O'Connor, T. Flaherty, T.J. Glynn, Applied Surface Science, (2007) 845–84

*Langmuir probe diagnosis of plasma expansion in femtosecond and picosecond laser ablation of selected metals*, P.T. Mannion, S. Favre, D. Ivanov, G. M. O'Connor, B. Doggett, J. Lunney, & T.J. Glynn, accepted for publication (2005) in Journal of Physics Conference Series, 59 (2007) 753.