Research project in **Photonics**

**Photonics of NV centres in Diamond**

**Research supervisor:** Professor John Donegan  
Photonics Group in collaboration with Professor Graham Cross

**Scientific Background / Current Research**

Nanophotonics deals with the interaction of light with nanoscale materials and devices, and it will be a major new technology within ten years. Nanoscale light sources such as the Nitrogen-vacancy (NV) centres in diamond can emit light in the form of single photons. This light has unique photon statistics and is essential for the realisation of new technologies such as quantum computing, spintronics and quantum cryptography.

**Project**

Our **aim** is to develop a fully integrated platform for single photon sources based on site-controlled stable NV centres in diamond coupled with photonic/plasmonic structures.  
**Objectives:** (i) To optimise an innovative technique to produce site-controlled single photon sources in diamond using He-ion irradiation. (ii) To design and fabricate plasmonic/photonic antennae for both pumping and collecting light from these single photon sources using deposition, lithography and etching tools. (iii) To engineer device integration based on these new sources of light that will impact secure optical communications. We have shown in a proof of concept experiment, in collaboration with Graham Cross from TCD, that we have the ability to create and control the density of NV centres in diamond using localised exposure by ions in a He-ion microscope. Both experimental and computational work will be carried out in this project.

**Funding** Applicants should discuss funding with the Research Supervisor. They should apply for funding from the following sources: Irish Research Council (deadline 11 February, 2015), TCD PG Scholarship and School of Physics Studentship schemes.

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