Graphene membranes for microscopy

Project supervisors:

Dr Neil Wilson (neil.wilson@warwick.ac.uk)

Graphene is a fascinating material: although only a single atom thick, it is strong, stiff, highly electrically and thermally conductive, and impermeable even to helium. Its superlative physical properties have led to a wide range of proposed applications, from lightweight composites to batteries to next generation electronics. These applications have driven a worldwide research effort focussed on fabricating large-area high-quality graphene, so that the price of this material is falling rapidly. As our understanding of how to fabricate and handle graphene improves, this facilitates new applications. An interesting niche is in the application of single-atom thick graphene membranes for ultra-high resolution microscopy. These offer the ultimate possible resolution and stability.

The aim of this project will be to develop synthetic methods and protocols for the fabrication of large-area arrays of free-standing graphene membranes. These membranes are an enabling technology with potential applications in a variety of fields, from determining protein structure, to developing catalysts, to a new approach to filtration. In this project, we will concentrate on microscopy applications, although the techniques developed should be more generically applicable. The research will be in collaboration with Silson Ltd, a company that specialises in ultrathin silicon nitride membranes with long experience in fabrication of large-area arrays for microscopy and other custom application areas, and with EMResolutions, a company that sells microscopy consumables. The research will build on our long experience at Warwick in working with graphene oxide, growing graphene, and creating and using graphene membranes for research.

The postgraduate student will be trained in chemical vapour deposition for the growth of graphene, graphene transfer, lithography, and a variety of microscopies including scanning probe microscopy, scanning electron microscopy and transmission electron microscopy. The student will also work with graphene oxide, and a variety of nanoscience approaches to fabricating self-assembled nanostructures. You will have access to the state-of-the-art analytical science facilities at Warwick. As part of this project, there is potential for an internship with Silson Ltd, gaining experience in translating academic research into technical products, and opportunity for some paid work during the project. To make the most of these opportunities, we are looking for a hard-working student with a desire to develop practical skills in nanoscience, good communication skills to facilitate interactions between academic and industrial partners, and a strong background in the physical sciences as demonstrated by a good degree in Physics, Chemistry or Engineering.

For more information, please contact Dr Neil Wilson *(neil.wilson@warwick.ac.uk)*.

Department of Physics
University of Warwick
Neil.Wilson@warwick.ac.uk
www.warwick.ac.uk