Sam Miller
University of Nottingham

I completed my undergraduate studies at the University of Nottingham, which included an industrial placement year which was spent at AstraZeneca R&D Mölndal. My research project for my master's degree was performed in the group of Dr Ross Denton, studying the vicinal dichlorination of alkenes using sulfonyl chloride.

I then remained at Nottingham for PhD under the supervision of Professors Martyn Poliakoff and Michael George. My PhD research has centred around the use of photochemically generated singlet oxygen as a tool for sustainable synthesis, originally studying the semi-synthesis of the antimalarial natural product Artemisinin in collaboration with Sanofi. My other research interests have included process chemistry, continuous flow chemistry and continuous reaction monitoring using NMR spectroscopy.

Presentation abstract: 'Antimalarial Drugs from Light and Air'

Reducing environmental impact and increasing sustainability is one of the greatest challenges that faces the chemical industries today. As a process chemist working on sustainable drug manufacture, I research the use of photo-oxygenation – activating oxygen gas with light – to replace more hazardous oxidation chemistry in synthesis. In particular, I have been studying the large-scale production of the important antimalarial medicine Artemisinin. Malaria kills more than 400000 people per year worldwide, with the vast majority of cases occurring in less economically developed parts of the world. Artemisinin and Artemisinin-based Combination Therapies (ACTs) are the frontline treatment recommended by the World Health Organisation (WHO). Producing ACTs in a large enough quantity to meet the worldwide need whilst keeping the product affordable is a major undertaking, and is now performed on a 600 ton scale by the pharmaceutical company Sanofi using photo-oxygenation chemistry.

My PhD has involved research into ways in which Sanofi might improve the environmental impact of their process, whilst increasing yields and decreasing cost. This has involved the use of alternative solvents and continuous flow chemistry, and the development of novel continuous nuclear magnetic resonance (NMR) monitoring techniques to discover how these things affect the photo-oxygenation chemistry itself, and in turn the production of Artemisinin.