

Spring 2014



## Welcome to our latest Chemistry Newsletter

I hope you find these short articles interesting. If you have any questions about Chemistry at Birmingham, please do not hesitate to contact us.

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## Emily Doyle

**Chemistry  
with Industrial  
Experience MSci**

### Secures a placement at Roche, Basel

As a second-year Chemistry with Industrial Experience student, I had a very busy first term, exploring placement opportunities, submitting job applications and attending interviews. But all the hard work paid off when in a matter of days I received offers from both GSK and Roche. With the added bonus of living in Switzerland for a year, I chose Roche and will now be spending next year working in their Medicinal Chemistry department in Basel. This exciting opportunity will help me to develop in many ways; alongside the obvious academic benefits, I am looking forward to living and working in a foreign country, which will certainly test my language and communication skills! I can't wait to move out to Switzerland and start my placement. Although I will be sad to say goodbye to Birmingham, I'm sure the year will fly by and before I know it, I'll be back in the UK to complete my final year!



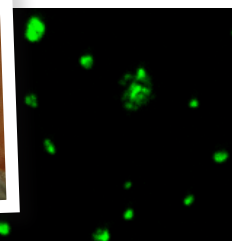
## Damian Robertson

**Chemistry with Industrial Experience  
MSci, Nestlé, York**

I am currently in the fourth month of my industrial placement working in the Science Department at Nestlé Product Technology Centre (PTC) in York where I am specialising in flavour and aroma development.

In my first few months at Nestlé PTC I was trained on and carried out several GC-MS analyses, and set up a new GC-O/MS splitter system. In addition to improving my analytical techniques, I have spent some time carrying out in-depth maintenance, looking for leaks, which has given me hands-on experience with the instrumentation I am now using. I have enjoyed learning about how chocolate is manufactured on an industrial scale and have conducted my own trials in the kitchen before testing the recipes with the GC-MS! This work placement has not only given me the opportunity to improve my laboratory skills but also to gain valuable experience in a working environment. I have learnt how to manage my time effectively, organising my own calendar for setting up meetings with internal colleagues and external clients and most of all, balancing my university work with my placement project.

These past few months have been a challenge, but a challenge that I have thoroughly enjoyed. I would strongly recommend going on an industrial placement. I can already see that the experience is helping me to develop skills both inside and outside of chemistry, which I am confident will benefit my final year at Birmingham and most importantly my future scientific career.



## Biomedical Applications of Nanotechnology

**Dr Francisco Fernandez-Trillo  
Birmingham Fellow**

I recently joined the School of Chemistry as a Birmingham Fellow working on Biomedical Applications of Nanotechnology. After graduating from the University of Santiago de Compostela in Spain, where I did my PhD on natural product synthesis, my research has moved to the chemistry-biology interface and the development of novel polymeric materials for nanomedicine. The multidisciplinary nature of my research has been promoted through different post-doctoral positions, both in the UK (Durham and Nottingham) and Spain (Santiago de Compostela) where I had the chance to develop polymeric materials for biocatalysis, cell recognition and adhesion, MRI, synthetic biology and the development of novel antibiotics.

Polymeric materials, because of their intrinsic multivalent nature and ability to assemble at the nanoscale, are extremely suitable to interfere with biological systems. Because of this, the main goal of my research is to design, synthesise and characterise novel polymeric materials that can interface with natural systems. At present, a strong focus is placed on the development of novel antimicrobials. We employ a combination of organic, polymer and analytical chemistry, together with imaging and microbiology to understand how our materials interact with bacteria and the consequences for bacterial behaviour and metabolism. This is of great importance for the development of new and efficient antibiotics.

## Scholarships and Prizes

**Congratulations to this year's winners of School Scholarships and Prizes:**

Aisha Syed, Jack Lownes, Emily Doyle, Poppy Robertson, Ben Cross, Chuheng Li, Georgina Leck, Fatima Pirzada, Yawei Tang, Edward Wilkinson, Perminder Hayer, Johnathon Deobald, Nathan Sutmire, Tobias Smith, Ben Rowsell, Alex Fawcett, Elspeth McGregor, Chung Sham, Owen Evans, Simon Goldich, Joseph Benford-Ward, Joseph Williams, Chloe Lee, Kimberley Dunne, Iqra Jabeen, Rachel Porter, Gajandran Srikanthan, Dipesh Mangabhai, Iqra Bibi, Alan Chung and Charles Barton.

# Electrochemistry in your pocket

**Dr Paramaconi Rodriguez**  
Birmingham Fellow

Nowadays, more and more people have daily contact with electrochemistry, even though they may not know it; electrochemistry is all around us and is gaining increasing attention from industry. Electrochemistry is used in a broad range of technologies including energy conversion and storage – new battery systems, fuel cells, super capacitors and solar cells. It is also employed in environmental remediation (electrochemical treatment of waste water), hydrometallurgy, corrosion, industrial synthesis, surface finishing, electroplating and sensors, medical applications and bio-electrochemistry (eg, drug delivery and gene transfer to cells and tissues, ion electrophoresis, and skin electroporation, injury and repair).

With the growing concern about climate change and CO<sub>2</sub> emissions, industry is shifting its focus to alternative 'green' energy sources like solar energy, lithium-air batteries and fuel cells. In order for these alternative technologies to see large-scale commercial uptake, their energy efficiency and cost effectiveness need to be improved. New developments in electrochemical technologies are therefore required.

One approach is to make fuel cells and Li-air batteries cost-competitive devices for automotive as well as stationary applications by efficiently using the precious metals in the catalyst so that the same catalytic activity can be achieved with a lower amount of the precious metal. Another approach to making these devices cheaper is to improve their durability. For example, the long-term durability of a fuel cell can be enhanced by replacing



the commonly used carbon support materials with a more durable support.

Together with my team I am looking to contribute significant improvements to the development of electrochemical technologies based on sustainable energy resources. My research focuses on seeking solutions to some of the current limitations of fuel cells and Lithium-air batteries. In particular, I focus on the design of new, highly-functional, efficient oxygen reduction reaction (ORR) nanomaterials for use in Polymer Electrolyte Fuel Cells (PEFCs) and Lithium-air batteries. I am looking to achieve this by developing a molecular-level understanding of the electrochemical reactions on well-defined surfaces.

My other research interests include the application of electrochemical methods for waste-water treatment, CO<sub>2</sub> reduction and chemical analysis.

A fundamental understanding of reaction mechanisms and a deep understanding of physicochemical properties of electrodes are necessary to solve the limitations of Lithium-air batteries and fuel cells and will be vital if we are to advance the alternative energy revolution.

## Chris Wilson

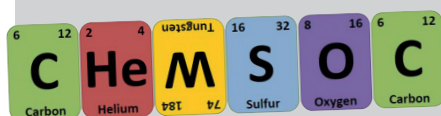
Chemistry with Study Abroad  
MSci – Australia

I'd always wanted to go to Australia and when it became an option to do so as a part of my degree, I knew I had to go for it. Moving 10,000 miles from everything you know is a daunting prospect but there isn't a day that goes by that I regret my decision. Sydney is a magnificent city and Australia is the most inviting and friendly place you could wish for.

Chemistry at the University of New South Wales is different to that of Birmingham with a stronger focus on industry. With a mixture of lectures, small-group learning sessions and lab projects that take anywhere up to 10 weeks, I've had a great spread of teaching from some of the best researchers around. Also having a different curriculum means I know I will return to the UK with experience in fields that none of my peers do. My favourite module so far has been on synthetic design, devising pathways to build some of the most complex molecules known to man.

As much as this year is part of my degree, it's been impossible to not have fun and make the most of my time here. Being an exchange student, I've made friends with people from all over the world and learnt something from each and every one of them. I've also been fortunate enough to experience the best that Australia has to offer, from snorkelling the Great Barrier Reef and hiking around Uluru, to kayaking with dolphins and skydiving over the beach.

A year abroad is the most difficult thing I have ever done, but by far the most rewarding, and I fully intend to use what I've learnt about myself and my field of study when I return home. To anyone considering it, I would advocate the study abroad programme wholeheartedly!



It has been an exciting, action-packed and ultimately very successful year for ChemSoc. Our charity days raised in excess of £1100 from cake sales and quiz evenings, and our

support for an Anthony Nolan Trust event saw 94 students signing on to the bone marrow register. We also had our biggest ever turnout at the ChemSoc Welcome Event, with 150 new and continuing students filling The Bristol Pear pub. New additions to our regular events included trips to the Cadbury factory and Modelez to discuss graduate opportunities, but keeping with tradition, ChemSoc activities culminated with our annual ChemBall, which this year took place at the Hilton Garden Inn in the city centre. Three lucky students and one lucky staff member each won a ChemSoc Annual Award for their contributions to the School of Chemistry. We're already thinking about how to make next year's ChemBall bigger and even better!

