Chemistry Update

Newsletter 339, 17 December 2021

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Calendar of Events

Organic Seminar
Speaker: Prof. Akane Kawamura, Newcastle University
Date: Wednesday 5 January 2022
Time: 1pm—2pm
Location: C/A/101

Physical Seminar
Speaker: TBC
Date: Wednesday 12 January 2022
Time: 1pm—2pm
Location: C/A/101

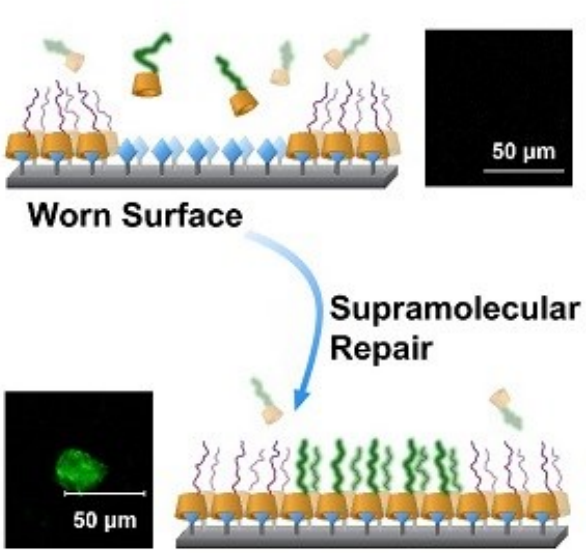
Early Career Seminar
Speakers: Dr Fabrizio Ortu, University of Leicester; Dr Rhianne Lord, University of East Anglia and Dominikus Heift, Kingston University
Date: Wednesday 19 January 2022
Time: 1pm—2.30pm
Location: C/A/101

UCAS Visit Days
Date: Friday 20 & 27 January 2022
Time: 12pm—4pm

Date of Next Issue:
28 January 2022

Slippery sugar-coated surfaces repair themselves

Using nature for inspiration, a team of scientists in the UK and China has developed low-friction surfaces that have been designed in such a way they can repair themselves if damaged. These smart materials might one day be used in medical implants, like hip replacements.



A graphical representation of the repairing surface coating and microscope images showing a repaired area in green. Sugar rings are shown in gold docking onto the adamantanes in blue. Image credit Dr Paul McGonigal & Chem.

The new sugar-coated surfaces mimic the way cartilage works to lubricate our joints. Cartilage uses water to make a slick surface that minimises wear and tear. In the same way, the new coatings coax a layer of water to the surface, making it slippery and protecting the surfaces as they are knocked or rubbed. If cartilage becomes damaged, it can usually be repaired by the body, but artificial surfaces are not normally repaired so easily. This is the problem the new materials aim to solve.

The artificial polymer coating has two major parts. Firstly, it has a long molecular chain with positive and negative charges to hold onto a water layer – using an effect similar to static electricity. A sugar ring is then attached to one end of the chain. This ring anchors itself to a surface by docking with specific molecules, called adamantanes in a 'molecular recognition' process. Treating titanium metal with these adamantane structures, allowed the polymer coating to adhere to the surface. The reversible interactions that form are key to the repair.

"This is dynamic yet selective chemistry, which looks like it could be an effective way to limit the negative effects of mechanical wear on joints and other surfaces," said Dr Alyssa-Jennifer Avestro, a Dorothy Hodgkin Research Fellow at the University of York and an author of the study. "If our protective coating layer is worn off, it is restored again without needing our intervention, as the interactions that hold the polymer to the titanium surface can re-establish themselves."

For now, an efficient repair process requires more polymer coating to be dissolved in the water surrounding the surface. But the researchers believe it won't be long until the coatings are improved to avoid the need for this extra material to be present. Ultimately, it is hoped these types of coatings will extend the lifetimes of joint replacements. The researchers also hope their design will inspire other chemists and engineers to develop new and improved low-friction surfaces based on molecular recognition strategies.

Creating artificial materials capable that are compatible with artificial joints and capable of self-repair has required the expertise of an international team of mechanical engineers and chemists. Yulong Sun, a researcher working with senior author Dr Paul McGonigal in Durham University, spent time investigating the low-friction surfaces with Yixin Wang and Hongyu Zhang in Tsinghua University's Department of Mechanical Engineering in China. He bridged the gap between the chemical expertise needed to make the coatings and the engineering techniques used to measure their function.

Dr Paul McGonigal added “The components of our coatings are biocompatible, which makes them exciting prospects for use in medicine. However, we could also imagine developing a range of these materials that work in very different environments. Avoiding and repairing the damage caused by friction is equally important to ensure that cars and other machinery last for a long time.”

The research paper is published in *Chem*.

Dr Alyssa-Jennifer Avestro is partly of the recently-established ‘Molecular Materials’ research grouping in the Department of Chemistry at York. This group aims to explore a molecular approach to materials science, in which molecular recognition plays a key role in fabricating materials for a wide-range of high-tech applications.

Departmental prizewinners 2020-21

Congratulations to our Departmental prizewinners 2020-2021 who have recently received their awards.

Photo: Year 2 Astra Zeneca prizewinners Imogen Howard and Jack Harrison

The Year 2 AstraZeneca prizewinners (pictured left) were able to collect their certificates in person from Dr Nigel Lowe, and winners of all other prizes for the year - unable to attend a presentation by virtue of having left York - have received their certificates and medals through the post.

Congratulations to:

Jack Harrison - Year 2 AstraZeneca prize for best performance on written examinations including option papers

Imogen Howard - Year 2 AstraZeneca prize for best performance on Core Practical

Marcus Dennington - BSc Whinfield Medal for overall academic performance

Rachel Ellen Brown - MChem Whinfield Medal for overall academic performance

Hannah Scott - Margaret Bishop prize for best MChem in York project.

The full list of the 2020-21 undergraduate prizewinners has now been updated on the Chemistry Intranet.

York trio awarded prestigious Royal Society of Chemistry Prizes

The University of York has been recognised with three Royal Society of Chemistry Prizes.

The team behind the online course, '[Exploring Everyday Chemistry]' - which was developed at the University of York - has been recognised with a Royal Society of Chemistry 2021 Horizon Award, while Dr Julia Sarju has been named the winner of the Royal Society of Chemistry's Early Career Prize for Excellence in Higher Education.

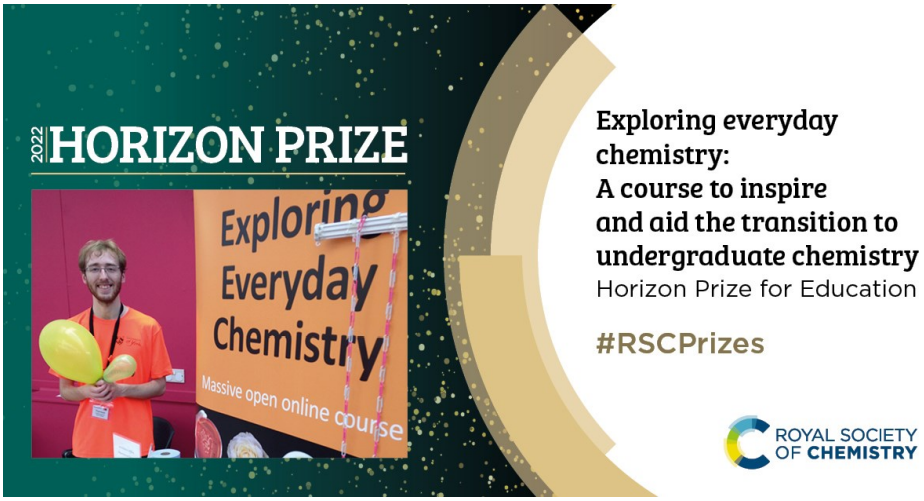
Meanwhile, Nicky Waller has been awarded the Excellence in Primary Education Prize for her contributions to the [Children Challenging Industry] programme.

Step change

The Horizon Prizes for Education celebrate ground-breaking innovations and initiatives that mark a step change in education.

Professor Andrew Parsons, from the Department of Chemistry, received the prize for developing the University's first-ever massive open online course (MOOC).

The course is designed to allow participants to gain an insightful look into everyday chemistry, and was developed to encourage students to study chemistry at university.



Everyday applications

Chemistry admissions tutor Professor Parsons said some students were not opting to study chemistry because its applications were unclear.

With the help of colleagues, he developed the course to explain everyday applications of Chemistry, with topics including the search for new antibiotics, how to make the most delicious coffee, the underlying chemistry behind perfumes and designing performance-enhancing sportswear.

The course is designed to motivate students to learn, as well as giving an insight into what university-level chemistry can offer.

Experiments

Targeted at sixth formers, the four-week course, which is free, typically attracts over four times the number of under 18-year-olds than a typical FutureLearn course. It comprises four weeks of learning and has attracted over 24,000 learners from around 150 countries since its launch back in January 2017.

Learners contribute to real-world discussions (facilitated by undergraduate York chemists), participate in quizzes, learn about modern research and undertake kitchen experiments.

Pioneering

Professor Andrew Parsons said: "I have relished the opportunity to develop this pioneering free online course. The success of the course, as recognised by this prestigious Horizon Prize, is all down to teamwork.

"It has been a pleasure to work with Katrina Sayer and Iain Barr, two highly talented and very enthusiastic administrative colleagues at York, who have helped me to design, deliver and advertise the course to pre-university students.

"Ten undergraduate chemists also helped to develop and refresh the course content, as well as facilitate the course over the summer vacations. The course has achieved so much more than I could have anticipated, and the opportunity to enthuse learners across the globe about a subject that I am passionate about has been a real privilege."

High-quality teaching

Dr Julia Sarju, Lecturer in Chemistry Education, has become one of the first winners of the Royal Society of Chemistry's Excellence in Education Prizes.

The Excellence in Education Prizes celebrate inspirational, innovative, and dedicated people working in primary, secondary, further education and higher education – including teachers, technicians and more. These prizes recognise a wide range of skills – from curriculum design to effective teaching, and from personal development to working culture.

In her role, Julia strives to meet the diverse needs of all students and actively promotes equality, diversity, and inclusion. She provides high-quality teaching, evidenced by peer observation, student feedback, and performance review. She takes a scholarly approach to teaching innovation and works closely with students as partners in chemistry education projects.

Julia also leads prize-winning teaching and accessibility training, which received positive feedback and excellent engagement from students.

After receiving the prize, Dr Sarju said: "To have won an award for work that I care deeply about is extremely moving and a great privilege. Awarding prizes for efforts in Equality, Diversity, Inclusion, and Accessibility signifies the great importance the Royal Society of Chemistry places on progress in this area."

Inspiring

Dr Helen Pain, Chief Executive of the Royal Society of Chemistry, said: "Educators are some of the most important people in the sciences, nurturing and inspiring the next generation of talent who ultimately will help us further advance understanding of the world around us and solve some of the immense challenges facing the world today and tomorrow.

"Over the past two years, educators have had to deal with circumstances unlike anything we have seen in living memory; with remote teaching and lack of access to equipment due to COVID restrictions making the sciences a particularly tricky subject to teach. What we have seen is resilience and brilliance – and our winners stand high in a particularly inspiring field of nominees.

"Dr Sarju has demonstrated an outstanding commitment to chemistry education, and it is our honour to celebrate their considerable contribution."

Dedicated

Meanwhile, Nicky Waller has received the Royal Society of Chemistry's Excellence in Primary Education Prize. Nicky was chosen by the RSC's prestigious panel of judges as one of the most inspirational, innovative and dedicated people in education.

For 17 years, Nicky has been an advisory teacher in the North East for the Children Challenging Industry programme, based at the University of York's Centre for Industry Education Collaboration (CIEC). The pioneering teaching and learning programme is designed to bridge the gap between industry and education and has 25 years of experience in inspiring young children to become interested in science.

In her role, Nicky trains industry's scientists and engineers in effective communications with primary children, provides science CPD for primary teachers, and works directly with children in the classroom. She helps devise practical activities which make relevant links between real world applications of science and the primary science curriculum.

Nicky also leads teacher CPD at the National STEM Centre on the campus, and has authored many resources for CIEC as well as having her own book, 'A Creative Approach to Primary Science' published by Bloomsbury in 2017. She has previously been recognised by the Institute of Physics with their Primary Science Teacher of the Year for her excellent contribution to primary science teaching in 2016, and by the National STEM Learning Centre with a STEM Educators award at the level of national expert. You can see Nicky in action here on a video that she made to share with teachers (scrolling required!) as part of an online conference in 2020.

After receiving the prize, Nicky said: "I could not be more excited to win the Royal Society of Chemistry's 2021 Excellence in Primary Education Prize. I am extremely passionate about primary science education and I have worked hard to enthuse and support teachers and children over many years and help them to gain confidence and expertise within this subject area. To be recognised at such a high level for me is an absolute honour and a real highlight of my career."

NSTFC Air Quality Network launches online networking sessions

The STFC Air Quality Network (SAQN) is offering informal networking opportunities to the air quality community, allowing them to make connections with each other and with scientists from the Science and Technology Facilities Council (STFC). Interdisciplinary working takes time, and these sessions offer a space for the random interactions that used to only happen at in person events.

The sessions begin with a series of lightning pitches from a few people, followed by informal networking on the Wonder online platform. Anyone with an interest in air quality is welcome, including industry, policy and researchers from all disciplines.

The next online session takes place on Monday 24 January 2022, and you can register to attend on the SAQN website.

New starters

Dr Katie Jameson, PDRA in Structural Biology: Drug Discover in Leishmaniasis
Room: B/K266; Ext: 8276; Email: katie.jameson@york.ac.uk

Dr Alexandra Males, Associate Lecturer T&A (3 months secondment)
Room: C/B012; Ext: 2717; Email: alexandra.males@york.ac.uk

Dr Ashish Kumar, PDRA in Experimental Atmospheric Science
Room: C/G119; Ext: 1223; Email: ashish.kumar@york.ac.uk

Dr Saeed Akkad, PDRA in Fascione group
Room: C/E014; Email: saeed.akkad@york.ac.uk

Dr João Paulo Lourenço Franco Cairo, Research Fellow in the Biochemistry of LPMOs Chemistry
Room: C/E014; Email: joao.lourencofrancocairo@york.ac.uk

Katya Moncrieff, PDRA in Physical/Analytical Chemistry
Email: kem574@york.ac.uk

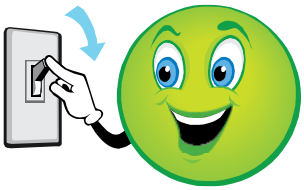
Online Department suggestion box

The online Equality and Diversity suggestion box has been extended to be a suggestion box for the whole Department. You can submit your thoughts/suggestions/ideas for general Departmental matters as well as matters relating to Equality and Diversity. You can find the Google form at this link.

Green Impact

Please switch-off over Christmas

Over the Christmas break, please can you ensure the following is turned off (preferably turn off at the wall):



- Computers
- Printers
- Monitors
- Lights
- Photocopiers
- Any equipment that does not need to be kept running over this period

Please turn down the heating to the minimum settings where possible (radiators, thermostat controls and thermostatic radiator controls). Please also turn off any air conditioning as well.

Think carefully about whether you need to leave your desktop switched on for the whole of the break and the environmental impact of this. You should only leave your PC on if you think you definitely will need to access your PC remotely via the Virtual Desktop Service (VDS) i.e. to access specific software on your PC. Remember you can still have remote access to the Virtual Private Network (VPN) which includes filestore access and web based apps without your PC being left switched on. Further information on remote access can be found on the IT Services - Work off campus pages.

Save your Christmas stamps!

Used stamps are collected and given to the Royal National Institute of Blind People (RNIB). The charity sells the stamps to generate revenue for their work.

Any and all stamps welcome!

Find a collection envelope located at **Chemistry reception**.

Green tips for Christmas

- ◊ **Heating** - try not to turn the heating up too much - wrap up in a jumper/blanket instead and wear layers.
- ◊ **Recycling** - recycle as much as you can - you might even be able to recycle wrapping paper (check on your Council's website - may need to remove sellotape) or use up old Christmas cards for scrap paper.
- ◊ **Food waste** - try not to cook more than you need or try to use up left over food the next day or store in the fridge or freezer.
- ◊ **Water** - use a dishwasher for full loads - otherwise try to wash up (and turn the tap off between each use). Only boil as much water as you need in the kettle.
- ◊ **Oven** - don't open the oven door if possible as this wastes energy. Cook more things at the same time by using smaller oven trays, for instance.
- ◊ **Fridge** - don't open the fridge too often (leave the door open for a longer period of time while you take out the items you need is more efficient than opening and closing the door several times).
- ◊ **Driving** – try to reduce the number of trips you have to make, for example try to combine outings, go shopping fewer times. Also, in the cold weather, try not to keep your car running when you start it up in the morning (it is more efficient to go straight away – de-ice your car before you turn the engine on).