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 (CCI) 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, and to give 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.

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.

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.”

Department of Chemistry maintains its place in the UK top 10
The Department has once again confirmed its place among the UK’s most highly regarded departments for the subject of Chemistry. The Department is ranked 8th in the UK in the Complete University Guide 2022. Published annually since 2007, the Complete University Guide ranks 130 UK universities, 14 Arts, Drama and Music colleges and conservatoires, and 74 subjects by quality measures important to students.
Drilling down into final year research opportunities

An overview of our final year projects – how they are organised and what they involved

MChem Year in Industry

Our recruitment process for year 4 placements starts in the Summer Term of year 2. A handbook is issued containing details of at least thirty regular placement companies. Students research these companies to find out the sort of chemistry they do and their location (companies are based throughout the UK and some in western Europe). At the end of the Summer Term students select their 8 favourite companies and register their interest in the scheme. After the summer exams we organise CV writing and interview sessions so that students can brush up on these skills. Over the vacation, students prepare CVs/ supporting letters for their chosen companies and submit these at the start of year 3. The Department attaches a reference from the College tutor, then forwards this information to the companies, who hopefully offer our students interviews, starting in October. New companies usually become available throughout the year. It is a competitive process and we cannot guarantee every student will secure a placement (students will always have the opportunity to complete their MChem degree at York if they change their mind or if they don’t secure a placement) – on saying this, we typically place around 50 students per year.

BSc Projects including Chemical Communication

Our BSc research projects give our students the opportunity to do an original piece of work, covering a wide spectrum of different types of research, from the synthesis of novel compounds, to designing new analytical methods, to completely non-lab-based projects. One option for our final year BSc chemistry students who are considering a career such as teaching, is to undertake a Chemical Communication project in place of a more traditional lab-based research project. There are two styles of project to choose from. One is school-based, in which a student spends a minimum of ten days across two terms in a local secondary school, observing and helping with (mainly) chemistry and other science lessons. The second style of project involves designing and running an outreach event for visiting school groups. The activities that the participants take part in are based on areas of chemistry research at the University of York. The chemical communication projects have been running for 16 years, and several of our former students are now teacher mentors for our current cohort. If a student is considering teaching, this is an excellent way for them to dip their toe in the water to see if this is the career for them.

MChem Year Abroad

We support students in various ways both prior to, and during, placements at a university abroad. Students in years 1 and 2 are invited to attend information sessions at the start of each academic year. These give an overview of the programme and what students need to do to prepare. Students interested in spending a year in a country where English is not the first language are encouraged to take part in language courses via the LFA (Languages for All) programme. The Department covers the fees for these courses for students enrolled on the MChem (Abroad) scheme. At the end of year 2, students submit their preferences for the different destinations/research topics. The MChem (Abroad) coordinator works with students during year 3 to organise nominations for placements. The focus is on finding placements and research projects that fit with students’ interests. Although some destinations can be oversubscribed, the Department uses a transparent/fair system to make decisions on nominations. It is usually possible to secure placements for most students interested in the programme at one of the destinations they are keen to visit. The coordinator offers support to students preparing to spend year 4 abroad, with assistance from our Centre for Global Programmes.

MChem Year in York

Our research projects are ‘real world’, open-ended and as tailor-made and individualised as possible. By the end of year 3, many students will have clear, informed ideas about their research interests/future plans, and we offer and support a wide range of projects supervised by academic staff. We start the process with an introduction session, early in Spring of year 3. Students then explore opportunities for projects by talking with academic staff. If students have suggestions of their own, we are usually able to accommodate these. At the end of the Spring Term, students submit four project choices, in order of preference. Typically, we assign at least 90% of projects according to first or second preferences. When oversubscription issues arise, the module coordinator brokers the best possible alternatives between students and academic staff, but we never assign projects that did not feature among a student’s project choices. Assignments are usually completed around the middle of the Summer Term, when the module coordinator shares all choices and final assignments to ensure maximum transparency. Students are asked to contact their project supervisor(s) to discuss the latest developments/plans, and collect reading for the summer, to prepare for a smooth start in the next academic year.
Researchers identify new enzyme that infects plants - paving the way for potential disease prevention

Scientists have identified an unusual enzyme that plays a major role in the infection of plants - and have shown that disabling this enzyme effectively stops plant disease in its tracks. By discovering previously unexplored ways in which crop pathogens break through plant cell walls, the scientists have opened up opportunities for developing effective disease control technologies.

The new research, published in *Science*, describes a family of enzymes found in a microorganism called *Phytophthora infestans*. The enzymes enable crop pathogens to degrade pectin - a key component of plant cell walls - thereby enabling the pathogens to break through the plant’s defences to infect the plant.

Self-propelling gel beads as highly-mobile waste collectors

Recent research from the Department has created gel beads that can spontaneously move when placed in water. By assembling a unique nanoscale network within the particles, the beads become turbo-charged and better able to remove a pollutant dye from the water. Working in the research lab of Professor David K. Smith, Dr Carmen Piras fabricated innovative hybrid gel beads by mixing the well-known polymer gelator agarose with a self-assembling small molecule gelator previously developed in their lab. Dr Piras said: “We hope that in the future, self-propelling gel beads such as these may be able to remove pollution from difficult to reach areas - essentially seeking it out and collecting it like a mobile waste collector. To achieve this we would need to achieve greater control over the movement of the gel beads, and optimize the self-assembled network to maximise pollutant uptake.”

Scientists build on AI modelling to understand more about protein-sugar structures

New research building on AI algorithms has enabled scientists to create more complete models of the protein structures in our bodies - paving the way for faster design of therapeutics and vaccines. The study - led by York - used artificial intelligence (AI) to help researchers understand more about the sugar that surrounds most proteins in our bodies. Up to 70 per cent of human proteins are surrounded by or scaffolded with sugar, which plays an important part in how they look and act. Moreover, some viruses like those behind AIDS, Flu, Ebola and COVID-19 are also shielded behind sugars (glycans).

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. 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. Dr Alyssa-Jennifer Avestro, a Dorothy Hodgkin Research Fellow at York and an author of the study said “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.”

York enzyologists part of team to win Horizon Prize

Researchers at York, in collaboration with colleagues at the University of Manchester, GSK and Prozomix Ltd, have been recognized with one of the inaugural Royal Society of Chemistry Horizon Prizes. The prize recognises the discovery, characterisation and application of enzymes – “RedAms” - that catalyze a reductive amination reaction, an important reaction in Chemical synthesis for the formation of amines. Using enzymes to catalyze amine synthesis enables more selective, green and sustainable synthesis of molecules such as rasagiline, used in the treatment of Parkinson’s disease.

One of the largest ever land mammals evolved into a dwarf elephant, study finds

An extinct species of dwarf elephant experienced a weight and height reduction of 8,000 kg and almost two metres after evolving from one of the largest land mammals that ever lived, a new study has confirmed. The research team, which included academics from York, found that the island-dwelling Sicilian dwarf elephant – thought to have become extinct about 19,000 years ago – was just 15% of its original body mass by the time its dwarfing process was complete.

The second winter lockdown did not have the same impact on UK air pollution levels as the first lockdown of 2020, new research from York shows. Researchers say the disparity was probably due to people using more heating as they were working from home during the winter months and also from people who were starting cars in colder conditions. During the spring 2020 UK lockdown, nitrogen dioxide (NO₂) decreased by 52% on average compared with only 28% on average in the lockdown which started in January 2021. NO₂ is a key pollutant caused by vehicles and other emissions. The research was led by undergraduate student Rhianna Evans and Dr Will Drysdale from the Department and used data from roadside monitoring stations across the UK.
Decolonising Chemistry

The Department is taking bold steps towards decolonisation and has recently published a key paper (in the Journal of Chemical Education) sharing its progress so far, with the goal of encouraging other departments to develop momentum towards a vibrant diversified and decolonised curriculum across the international chemistry community. Across UK Higher Education, it is well-evidenced that black and ethnic minority students have worse outcomes than their white peers with equivalent pre-university qualifications. Furthermore, the UK chemistry pipeline loses almost all of its black students after undergraduate studies. Clearly one way to address these issues is to ensure proper support and inclusion of such students in the university setting. In the broadest sense, decolonisation involves identifying colonial systems, structures, and relationships, and working to challenge them. Although discussions of decolonisation are increasingly common in Arts and Humanities departments, they remain rare in Chemistry. Decolonisation suggests the need to question the understanding of science as something that grew solely from the discoveries of a series of famous, western individuals. Instead, the colonial roots in science and imperialism should be recognised. As such, the aim of decolonising science is to develop a more complete scientific perspective that better includes global voices and represents global challenges and interests. The Department has embarked on an ambitious program, and taken a number of key steps, developing an understanding of what decolonisation really means in a chemistry setting. It is important to note that this project was started in response to the Department’s need to better include global perspectives that better includes global voices and represents global challenges and interests.

York chemist wins Royal Society professorship renewal

Professor Gideon Davies has been awarded a further five-year term for his prestigious Royal Society Ken Murray Research Professorship. The Ken Murray Research Professorship, first awarded to Professor Davies in 2016, provides long-term support for internationally recognised work in areas such as biochemistry, genetics, chemistry, developmental biology and physics. The renewal of the appointment will extend the term of the post to ten years, granting £1M in funding to the Department of Chemistry. It will allow Professor Davies to continue to lead research into the chemistry of living systems, with impacts for clinical diagnostics, antiviral agents and neurodegeneration drugs as well as biofuels and the degradation of recalcitrant materials.

Commenting on the renewal of the Royal Society professorship, Professor Davies said: “It’s a great honour to receive the renewal. It reflects the ongoing research from my amazing group, they are a talented and dedicated team. The renewal of the professorship, alongside funding from the European Research Council and the BBSRC, will enable us to build on our work.”
Meet a tutor

Professor Kirsty Penkman teaches core and option modules to our undergraduate students. Her research involves developing methods to chemically analyse complex samples. She focuses particularly on the analysis of biomolecules found in fossils - and what they can reveal about an organism’s life and death.

Chemistry can take you anywhere. I’ve always loved the sciences, but I’m also fascinated by archaeology and geology. At A level I had been thinking about taking history, but the timetable was awkward, so I ended up doing sciences and maths. I really fell in love with chemistry at that point - I think because it sits as the central science, reaching out to answer all sorts of other questions in other fields.

It wasn’t until the final year of my degree that all of my interests suddenly clicked into place, when I was lucky enough to work on a project in an archaeological research lab. A couple of months in I knew that I’d found the perfect job for me - using chemistry to help understand the past.

Finding solutions

Working with fossil material is analytically very challenging. The molecules that you are interested in are incredibly low in concentration. They are often badly degraded, and there is a whole load of other stuff in there - both organic and inorganic, original and contamination - that will complicate your analysis. The trick is being able to isolate the part you want to look at without altering it in the process. The challenge makes it so interesting from my point of view as an analytical chemist, and so supremely satisfying when you do eventually get your data!

Science as a reflection of society

I have a young daughter so I’ve been working part-time for a few years now. It’s still unusual for an academic scientist to work part-time, but my colleagues have offered loads of encouragement and support. Having to think harder about what I do and when I do it has actually resulted in some really creative approaches to my work, so I am really pleased to have had the opportunity. There have been huge advances in awareness of equality and diversity issues in science. I feel incredibly lucky to be working in a department where these issues are taken seriously. Science advances through new ideas, and the greater the diversity of backgrounds and perspectives we can encourage into the field, the better chemistry we will do.

Through data, we can see our assumptions confirmed or overturned - either way the science and our understanding is moving forward. Sometimes it’s not until your whole dataset is processed that you start to see the beauty of the overall pattern. Other times you get a chromatogram straight off the printer and you can immediately see its importance. I have been found hopping around the lab in excitement at just the first glimpse!

Through the looking-glass

My colleagues and I use liquid chromatography and mass spectrometry to understand the chemistry of biomolecular degradation. We’ve gained insights not only into the past, but also into degenerative diseases. We’ve developed a technique for dating samples by tracking the breakdown reactions of fossil protein trapped in crystal time-capsules. One set of key reactions is the change in chirality of amino acids, which shift to their mirror images over time. This method covers the last 3 million years. It’s a period that is particularly challenging to date, but it’s critical for understanding both climate change and human evolution.

Sharing knowledge through teaching

I love teaching at York - from the great discussions in tutorials, to the buzz of a workshop, to the excitement of seeing the first data from an undergraduate project. I’m motivated by the enormous practical applications of chemistry, which are woven through the core lectures, helping you to see the authentic applications of what you are learning. It’s exciting to be able to design a course focusing on the latest and most important science, and to see my students fired up by it. I’m also a big fan of using peer-supported learning: the engagement, professionalism and collegiality that the students show in their constructive feedback to each other is inspiring.

Valuable insights

The research project in your final year lets you really focus on an area you’re interested in. You’ll work with one of our research labs, helping them to ask broader questions. Our students’ work provides valuable insights and has even led to published papers.

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Dr Glenn Hurst Awarded National Teaching Fellowship

Glenn Hurst has been recognised with a prestigious Advance HE 2021 National Teaching Fellowship in recognition of his remarkable contributions to higher education teaching and pedagogy. Dr Hurst is an Associate Professor in the Department of Chemistry and Green Chemistry Centre of Excellence at York, and in receiving the Fellowship becomes one of the youngest academics in the UK to be recognised in this way. He uses holistic, systems-thinking approaches to equip the scientists, engineers and policymakers of tomorrow with the knowledge and skills to address complex and interdisciplinary global problems. Head of Department, Professor Duncan Bruce said: “I am delighted with the news of Glenn’s richly deserved National Teaching Fellowship. Three members of staff in the Department of Chemistry now hold these awards, reflecting the outstanding educators in the Department and the passion we have for providing high quality, innovative education to our students.”

Two Vice-Chancellor’s Teaching Awards for Chemistry

Chemistry lecturers Dr Julia Sarju and Dr Lizzie Wheeldon have received the Vice-Chancellor’s Teaching Award 2021 in recognition of ‘excellent contributions’ to learning and teaching activities in the Department. The Vice-Chancellor’s Teaching Award celebrates significant achievements in teaching and learning support. Vice Chancellor Charlie Jeffrey wrote to the winners: “The Panel was impressed with the excellent contributions you have made across a wide range of learning and teaching activities in the Department. The panel was also impressed with the outstanding feedback you receive from staff and students. You are clearly committed to the delivery of high quality, innovative teaching, engaging with and responding to your students, as well as carefully reflecting on your practices.”

Inclusive Training of the Next Generation of Professional Chemists

Two recent papers published in the *Journal of Chemical Education* highlight the innovative ways the Department is approaching the training of undergraduate students and graduate teaching assistants. The work aims to foster an inclusive culture within the Department, influence others beyond the Department, and develop the next generation of professional chemists to act as agents for change. It is perhaps surprising that although undergraduates receive extensive training and teaching across their degree, very rarely does any of this address equality, diversity and inclusion (EDI). The recent introduction of an online EDI training workshop in the Department aims to revolutionise the Skills training provided to first year undergraduate students at the beginning of their degree and set them up to succeed both in their university studies, and their future lives as professional chemists. The training incorporates short authentic videos from a diverse range of departmental voices. This provides students with insights into how they can access support, act as allies, and respect diverse peers. This prepares students for study within the Department, particularly activities such as group practical work and tutorial group teaching. Beyond that, it helps prepare them for their professional life in chemistry, where many of them will take on leadership positions. Specifically, the training explores issues faced by black and ethnic minority scientists, women in STEM, LGBT+ individuals, and disabled scientists. Students also carry out an exercise in unconscious bias and learn about the ethos of the Department and its diversity work.

USEFUL LINKS

Student Finance
www.york.ac.uk/students/finance
The University’s Student Financial Support Unit will be able to help with any student financial queries that you may have.

Student Societies
www.yusu.org/student-life/clubs-and-socs
York University Students’ Union (YUSU) offers an array of societies covering a huge range of activities ranging from the Murder Mystery Society to award-winning media societies.

Student Sports Clubs
www.yusu.org/student-life/clubs-and-socs
Enjoy more than 60 different sports clubs.

University Library
www.york.ac.uk/library/
Our Academic Liaison Librarian can help you identify resources and discuss tools and techniques for working effectively.

Chemistry Review
www.york.ac.uk/chemistry/schools/chemrev/
Chemistry Review, a magazine for post-16 chemists, is commissioned and edited at York.

Departmental video links
www.york.ac.uk/chemistry/undergraduate/studentprofiles/student-talking-heads/
See our undergraduate students explain why they decided to study their Chemistry degree at York.

www.youtube.com/watch?v=3bQmh45rVhU
Our Life of a Chemistry Student video highlights the journey from preparing to study, to progression through the four years of our MChem degree.

Find out about the latest news in the department using twitter or instagram
www.twitter.com/chemistryatyork
www.instagram.com/chemistryatyork/

Admissions enquiries
Please contact:
Telephone: +44 (0) 1904 322545
Email: chem-ugrad@york.ac.uk
Website: www.york.ac.uk/chemistry