issue 16 | summer 2025

UNIVERSITY of York

# ChemYork

HIGHLIGHTS FROM A LEADING UK CHEMISTRY DEPARTMENT

## Award-winning Cheryl... and friend

## Technicians to the Fore

## New Head of Department

# Dr Derek Wann takes over the reins

IT IS WITH TREMENDOUS PLEASURE AND PRIDE THAT I WRITE FOR MY FIRST EDITION OF CHEMYORK AS HEAD OF DEPARTMENT, HAVING TAKEN OVER FROM CAROLINE DESSENT ON 1ST MARCH 2025.

As a Department, we owe Caroline a huge debt of gratitude for sacrificing her time over the past four years to give the level of service that is required to be an effective Head of Department. It hasn't been an easy period, and Caroline and her leadership team have overseen much change: continued recovery from the COVID years, a switch to semesterisation, the introduction of a new taught postgraduate course in Data Science, development of a new strategy for the Department and continuing to make progress on Departmental culture, equity and diversity.

Turning to myself – I've been an academic at York for twelve years now and have been a member of the Senior Management Team since 2019, first as Chair of the Board of Studies and then latterly as Deputy Head of Department for Teaching. You might say that I've had a good apprenticeship under Duncan Bruce and then Caroline, and now is my time to give something back to the Department.

> "It feels like a good time to take over as HoD – I've inherited a Department recently placed 6th in one national subject league table and 5th in another, and with healthy student numbers, and productive and collegiate staff."

Running a Department is very much a team effort and I am indebted to our three Deputy Heads of Department and all the other members of the Senior Management Team who have pulled together through the transition to a new HoD. It feels like a good time to take over – I've inherited a Department recently placed 6th in one national subject league table and 5th in another, and with healthy student numbers, and productive and collegiate staff. Although this is a time when the University's finances need to be kept in check, I'd like to think that this will be a positive in the longer term, as we look for better and more efficient ways of working.

The past few months have seen some comings and goings of personnel in the Department – we have welcomed Max Veit as a new lecturer with a focus on machine learning and computational modelling. We will also say goodbye to Paul McGonigal and Alyssa-Jennifer Avestro as they move on to pastures new in Oxford. And, since Christmas, we've seen Anne Routledge and James Clark retire – we wish them both health and happiness.

As I write this piece, our students have just received their assessment result. For many this means that they will now move on to graduate in July and on to the wider world of work and further study. They leave with our very best wishes and a hope that they will want to stay in touch with us. With our exam period behind us, we recently held our summer staff Thank You party – an opportunity for everyone from across the Department to come together, with families, to celebrate another successful year.

I hope you'll enjoy this edition of ChemYork. In it you'll find a celebration of the amazing work performed by the technical staff in the Department, a fascinating article explaining the key role that iodine has played in Lucy Carpenter's career, and an interview with alumna Cheryl Alexander on a recent schools leadership award. Plus Jamie Blaza reflects on the emerging strength in York around cryo-EM, a technique that allows us to directly image biologically relevant molecules.

Finally and importantly, 2025 marks the 60th anniversary of our Department opening at York. And what a 60 years it has been! We are lucky that there are still people around who remember the very early days of the Department. It is always great to hear from them how much things have changed (and what hasn't!). Many of these stories were written down for the 50th anniversary so that they will be remembered long into the future. We will have a series of academic seminars on the afternoon of Friday 12th September, an option for dining with us that evening, and a full day of events on Saturday 13th September centred around the Department and aimed at alumni, others with connections to the Department, and their guests. Please save the date and help to spread the word!

***Front cover image:*** *Cheryl Alexander and assistance dog Tyrian. Photo by Graham Penny*

***Compiled by*** *Duncan Bruce*

***Designed by*** *Cookie Graphic Design*





# Where do you like your Deuterium?

RESEARCHERS IN THE DEPARTMENT ARE EXPLORING THE MARKET FOR THEIR NEW, USER-FRIENDLY METHOD FOR DEUTERATING COMPLEX MOLECULES.

*Left to Right: Dr Chris Spicer, Dr Ksenia Stankevich, Dr Jessica Dobson*

Dr Ksenia Stankevich, a postdoctoral researcher with Dr Chris Spicer, has been awarded a place on the Innovate UK ICURe Discover programme to move their novel and patented isotopic labelling platform towards commercialisation. The new technology simplifies access to molecules containing deuterium, a heavy isotope of hydrogen. These molecules are vital tools for academic and industrial laboratories for a whole range of uses, but are often difficult and/or expensive to access, especially where complex molecules such as peptides and proteins are involved. In contrast, the new, user-friendly method achieves deuteration with high precision in minutes under very mild conditions, making isotopic labelling safer and giving faster workflows.

Ksenia will explore the market for the new technology and strategic collaborations with industry, with support from Dr Jessica Dobson from the University of York's Commercialisation Team and the SETsquared Partnership. Talking about the breakthrough technology, Ksenia said: "In the group, we believe that every researcher should be free to explore ideas without technical barriers. That's why we develop robust, easy-to-use chemical tools that give scientists in academia and industry fast access to the isotopically labelled compounds they need - so they can focus on what truly matters: discovery".

# Double Success for Sara

Sara Bonfante, currently a postdoctoral researcher with Jason Lynam and John Slattery, is celebrating a double success with the award of the Royal Society of Chemistry's Main Group PhD Lectureship Prize and the Thesis Prize of the Division de Chimie de Coordination of the Société Chimique de France.

Both awards recognise Sara's PhD work, which she carried out within a Marie Skłodowska-Curie European Joint Doctorate Network co-supervised by Jason and John in York and by Antoine Simonneau and Christian Lorber at the LCC in Toulouse. This follows her first degrees at Università degli studi di Padova, which included a placement at TU Munich. As suggested by the title of her thesis – 'Zirconium- and Phosphine-Assisted C–F Bond Activation and Functionalisation' – C–F bond activation was the key focus, which she demonstrated both with zirconium complexes (*Chem. Sci.*, 2025, **16**, 3552) and phosphines (*J. Am. Chem. Soc.*, 2024, **146**, 2005). As part of her prize, she gave an invited lecture at the Royal Society of Chemistry Dalton 2025. Congratulazioni Sara!

# In my element – Iodine

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IN THE LATEST IN THIS SERIES OF FEATURES, PROFESSOR LUCY CARPENTER DISCUSSES A WELL-KNOWN ELEMENT, IN PERHAPS AN UNEXPECTED GUISE, THAT HAS BEEN CENTRAL TO A GREAT DEAL OF HER RESEARCH.

It would be fair to say that iodine has been the making of my career, so I am very appreciative of this fascinating and adaptable element. My early forays into iodine began during my first postdoctoral research position when I discovered, through field work at the Mace Head Atmospheric Research Station, that the coast was a rich source of atmospheric iodine (*J. Geophys. Res.*, 1999, **104**, 1679). The strong tidal signature of a number of novel atmospheric reactive iodine species showed that seaweeds were the source. Those molecules turned out to give rise to new aerosol particles that could exert a regional effect on climate through their growth to cloud condensation nuclei (*Atmos. Chem. Phys.*, 2004, **4**, 701). So, we were on to something with the realisation that iodine, despite its very low atmospheric concentrations, could 'punch above its weight' in terms of its impact.

Atmospheric iodine shares many features with its fellow halogens bromine and chlorine. The X atom, where X = I, Br or Cl, rapidly forms halogen oxide radicals ($XO^{\cdot}$) in the presence of ozone ($O_3$) and enters catalytic ozone-destroying cycles with hydrogen oxides ($HO_x$) and nitrogen oxides ($NO_x$). These are the essential reactions which destroy $O_3$ in the stratosphere and, as we discovered from measurements at the Cabo Verde Atmospheric Observatory, also the troposphere (in the case of iodine and bromine) (*Nature*, 2008, **453**, 1232). The iodine atom is unique however in that, unlike Br and Cl, it does not react with hydrocarbons, leaving $O_3$ essentially its only candidate for reaction. This renders iodine incredibly efficient not only in destroying $O_3$ but also in forming new iodine oxide aerosol particles. The exact mechanism by which it does this has been in hot debate for several years and recent research using the CERN CLOUD chamber revealed that the mechanism channels through gas-phase iodic acid ($HIO_3$) (*Nat. Chem.*, 2023, **15**, 129). Gas-phase $HIO_3$ has now been detected in a number of environments, including the Arctic, and has been proposed to be a more effective nucleator of new aerosol particles than sulfuric acid in pristine regions (*Science*, 2021, **371**, 589), which is a remarkable finding.

A puzzle for some years was how abundant the $IO^{\cdot}$ radical was in the atmosphere, given the very low concentrations of organic precursors (*Geophys. Res. Lett,* 2010, **37**, L18804), but that puzzle was solved when we discovered that the ocean surface is a ubiquitous, and globally dominant, source of inorganic iodine ($I_2$ and HOI) through the heterogenous reaction of $O_3$ with oceanic iodide ($I^-$) (*Nat. Geosci.*, 2013, **6**, 108). This means that increasing $O_3$ levels lead to increasing atmospheric iodine and explains why iodine has increased markedly over the 20th century and beyond, as shown from ice core analyses (*PNAS*, 2018, **115**, 12136). Thus, natural iodine acts to buffer anthropogenic $O_3$ pollution (*Atmos. Chem. Phys.*, 2015, **15**, 2215).

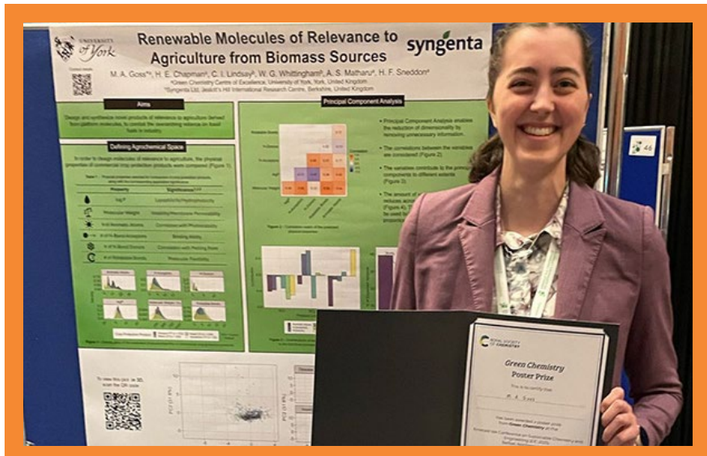
Currently, we have a battle on our hands in the form of hypoiodous acid (HOI). This molecule is, we believe, the single largest form of iodine emitted from the oceans, and yet so far there is only one direct atmospheric measurement (*PNAS*, 2021, **118**, e2009951118). It is incredibly challenging to calibrate and measure, but we have made a lot of progress and are now able to quantify very low levels, utilising bromide-ion chemical ionisation mass spectrometry (CIMS). Our next step is to attempt to unravel the complex coupling of chemical and physical processes which control the emissions of HOI from the sea surface microlayer. In turn, this will help us to better quantify the impacts of atmosphere iodine, which extend from the lower atmosphere right through to the stratosphere (*Sci. Adv.*, 2021, **7**, 6544).

## Honorary FRSC for John Holman

Professor Emeritus Sir John Holman has been elected an Honorary Fellow of the Royal Society of Chemistry. Each year, a very small number of Honorary Fellowships are bestowed to individuals who 'have made an extraordinary impact on scientific advancement' and/or have 'contributed to the benefit and welfare of the chemical sciences through public service, outreach, policy development, and change'. John's contributions to our subject are manifold and legendary, and in this issue, it is pertinent to recognise the substantial effort he devoted to developing and promoting the Technician Commitment. John - we are delighted for you and offer our heartfelt congratulations.







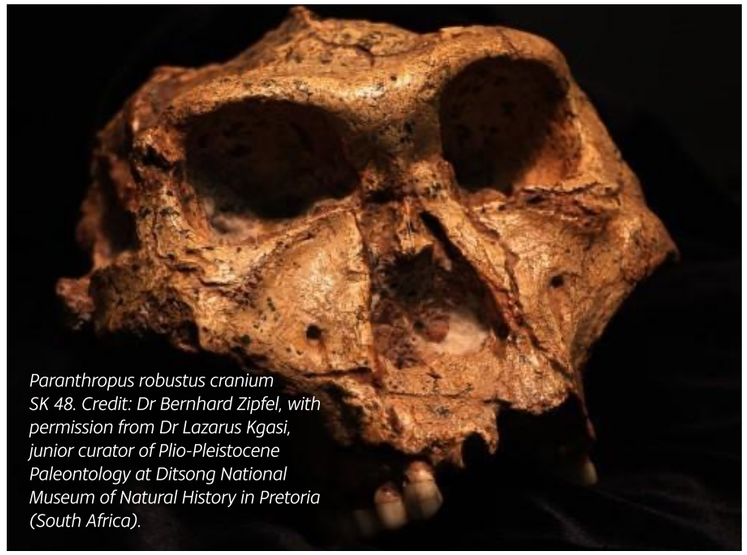

## GCCE student wins poster prize at Emerald Isle conference

Megan Goss, a second year PhD student, has won one of three poster prizes at the Emerald Isle Conference on Sustainable Chemistry and Engineering with her poster on Renewable Molecules of Relevance to Agriculture from Biomass Sources. Well done, Megan!

# The benefits of (slow) tooth decay

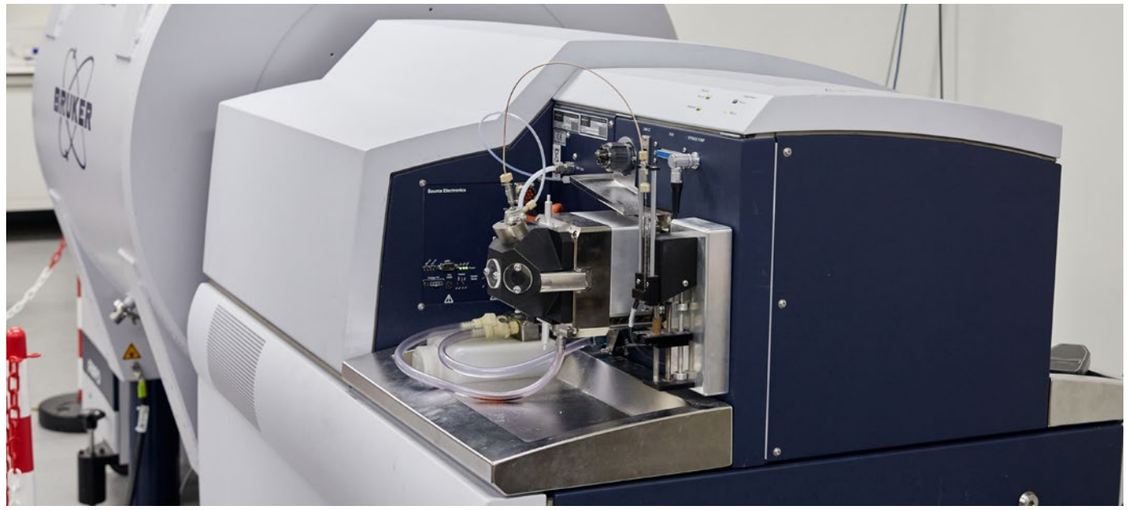
POSTDOCTORAL RESEARCHER DR MARC DICKINSON, WORKING WITH PROFESSOR KIRSTY PENKMAN AND A HOST OF OTHER INTERNATIONAL COLLABORATORS FROM EUROPE, AFRICA AND THE USA, HAVE SUCCESSFULLY EXTRACTED ANCIENT PROTEINS FROM TWO-MILLION-YEAR-OLD HOMININ TEETH. THIS BREAKTHROUGH PROVIDES PREVIOUSLY UNOBTAINABLE DETAILS ON THE BIOLOGICAL SEX AND GENETIC MAKEUP OF AN EXTINCT HUMAN RELATIVE. THE TEETH, WHICH WERE UNCOVERED IN SWARTKRANS CAVE IN SOUTH AFRICA, BELONGED TO AN EARLY HUMAN CALLED *PARANTHROPUS ROBUSTUS*.

Techniques developed in Kirsty's lab over many years make it possible to provide accurate dating of fossil samples by examining the extent of racemisation in amino acids trapped within biomineral crystals. The power of these techniques is that they are able to provide dating information for periods of the past that are not readily accessible by other methods. The York team's data were crucial in confirming that the teeth did indeed contain original amino acids and that they did not originate as the result of extraneous contamination. Then, by looking at specific peptide sequence patterns, the team was able to tell that two of the teeth belonged to male individuals and infer that the other two specimens were from females. This ability to determine the biological sex of such old fossil remains accurately is a critical advance, because it finally allows study of any impacts due to biological sex as humans evolved. For example, fossils from this taxa have large variability in size, and it had long been assumed that this was due to sexual dimorphism (physical differences between the biological sexes of a species), such as seen in great apes such as gorillas. These new molecular data shows that one of the males falls into the smaller size category. Being able to estimate biological sex in fossil individuals will provide new clues about how these early human relatives might have lived, moved and interacted within their groups.



*Paranthropus robustus cranium SK 48. Credit: Dr Bernhard Zipfel, with permission from Dr Lazarus Kgasi, junior curator of Plio-Pleistocene Paleontology at Ditsong National Museum of Natural History in Pretoria (South Africa).*

The work is published in the international leading journal *Science*.




# Technicians to the Fore

OUR PROFESSIONAL SUPPORT STAFF ARE CRUCIAL TO THE SMOOTH FUNCTIONING OF ALL THE ACTIVITIES THAT OCCUR WITHIN THE DEPARTMENT, YET SO MUCH OF WHAT THEY DO CAN BE UNSEEN. IN THE NEXT EDITION WE WILL CONCENTRATE ON OUR ADMINISTRATIVE STAFF, BUT HERE WE FOCUS ON THE TECHNICAL SUPPORT STAFF AND CONSIDER SOME OF THE WAYS THEY HELP MAKE THE WHOLE PLACE TICK.

Imagine these two scenarios:

- our students arrive into the teaching lab for the week's experiment, all the glassware, chemicals and other equipment are always in place. More than that, experience reveals how well the experiment works, which experiments cause a little more difficulty and the most likely reasons are that someone might seek help from the serving hatch.
- the Department wins funds for some new equipment (see for example the piece on the Cryo-EM, p. 11) and, after installation and commissioning, it is seamlessly integrated into the functioning of the particular research facility as if it had been there forever.

Just two simple examples of ways in which the functioning of the department relies on teams of people who simply get on with it to ensure that all of our lives are easier, that our teaching is facilitated and that our research is supported to the highest standards. Yet it is a complex, interwoven tapestry of skills, experience and knowledge that ensures that it all works – from the moment, for example, that chemicals arrive into stores, are made into compounds that are analysed and characterised or used in a range of experiments (perhaps using equipment built or modified by a member of the technical staff) and then disposed of safely – and works very well indeed.

In addition, the Department has recently launched the Chemistry Analytical Facility. Technical lead, Dr Hannah Briers explains, 'The Facility is supported by a team of highly experienced staff and offers a unified approach to accessing the Department's wide range of excellent analytical facilities, both for our own researchers and for external organisations.'

> "The technical staff in the Department are the foundation of its operations, seamlessly integrating contributions across research, teaching and analytical facilities."

Head of Technical Operations, Dr Graeme McAllister, reflects on the team, 'The technical staff in the Department are the foundation of its operations, seamlessly integrating contributions across research, teaching and analytical facilities. Their multifaceted expertise ensures that cutting-edge research can flourish through the maintenance of sophisticated instrumentation and the provision of essential resources. Likewise, they help equip our students with practical skills by preparing and overseeing laboratory sessions, often acting as direct mentors and trainers.'

In the cameos opposite, some of our technical staff give an insight into what they do and what motivates them in their work.





## Roksana Osińska

After graduating in Biology in Poland in 2003, I moved to the UK with my young family and gained experience in a wide variety of laboratory-based jobs, with ten years in York Hospital in biochemistry and haematology before joining the Department. Since January 2022, I have worked in YSBL as a Research Technician and the last three-and-a-half years have been a fantastic time full of learning and gaining knowledge. I love the amazing academic atmosphere here and I look after the high-end equipment that is the apple of my eye. I support work with Aktas and the Mosquito for protein purification, as well as aspects of crystal and other sample preparation for crystallography and Cryo-EM.

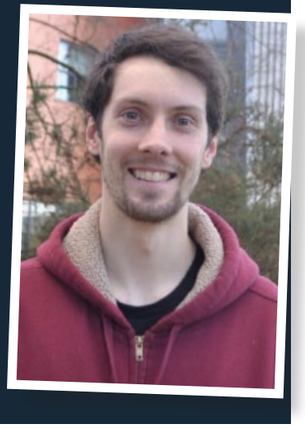
## Lee Duff

I am the Research Technician in the synthetic chemistry laboratories, where I support groups with the day-to-day running of the laboratories, maintain and repair equipment and carry out syntheses to support projects. After my degree in Chemistry in 2010, I returned in 2019 to undertake an MSc by Research and it was at this time I considered a career as a technician. In 2021, the chance arose to join the team in York. I enjoy the flexibility of my role and the ability to manage my own time, as well as the variety of work. I also help run the Elemental Analysis Service and enjoy the opportunity to learn new skills with the ambition of becoming a technical specialist.

## Chris Horbaczewskyj

My current role as Technical Specialist in Automation Technologies for Chemistry allows me to design, build, and test bespoke systems for specific chemistries in addition to using commercial systems for a variety of projects. Each project comes from PhD students and postdoctoral researchers in different research groups in the Department. I came to this role directly from my PhD, from the University of Leeds, where I was developing a flow system with online mass spectrometry and using optimisation algorithms to improve and learn more about a variety of chemical reactions.

I enjoy the full workflow from system design to developing the chemistry to work optimally with the system, particularly the scripting challenges as this is how I learnt Python.



## Sam Greeves

I am the technical specialist for the NEaar Lab which specialises in geochronology through amino acid racemisation (see also the story on page 5). I support the other lab members, keep our HPLCs working and analyse any commercial samples that come through.

Prior to my PhD I worked as a College technician and had really enjoyed the role, so I knew the technician career path was something I wanted to explore and, fortunately, as I was finishing my PhD, my current role became advertised. I love being able to contribute to many different projects and supporting the lab group with whatever they need. No two days are ever the same!

# To the village that made me

CHERYL ALEXANDER, A GRADUATE OF THE DEPARTMENT, TEACHES CHEMISTRY AT YORK HIGH SCHOOL. NOTHING TOO REMARKABLE ABOUT THAT UNTIL YOU CONSIDER SHE HAS PHYSICAL AND SENSORY DISABILITIES THAT MEAN SHE NEEDS TO USE A WHEELCHAIR AND THAT HER TEACHING AND DAY-TO-DAY LIFE ARE SUPPORTED BY HER ASSISTANCE DOG, TYRIAN. IN RECOGNITION BOTH OF HER OUTSTANDING TEACHING AND HER ADVOCACY WORK FOR STUDENTS FACING ANY KIND OF DISABILITY, CHERYL RECENTLY RECEIVED THE MASTER EDUCATOR'S AWARD FOR OUTSTANDING SCHOOL LEADERSHIP AT THIS YEAR'S EDUCATORS' TRUST AWARDS. HERE CHERYL REFLECTS ON HER JOURNEY FROM STUDENT TO AWARD WINNER.

**You were a wheelchair user when you came to York. What were the main challenges you encountered during your course?**

Finding ways around obstacles! The steep ramps, getting from a to b, double doors across campus taking lumps out of my knuckles! The department was extremely supportive and always helped me find a way, especially my supervisor, Paul Walton. I had lots of medical challenges and took a year out after I broke both arms in a fall. I was a medical disaster area, but they got me through.


*Tyrian*

**It's as though your first degree inspired you as you went on to complete an MRes in Clean Chemical Technology in York before completing a PGCE and then an MA. What motivated you first to research and then to teaching?**

I still love research, data and unanswered questions, and I'm still involved, but in education rather than chemistry. I figured I would try out teaching as teachers had given me so much. I was raised by a village of adults that didn't let me fall through the cracks when I so easily could have. I wanted to give something back, and thought I might be good at it.

**It's very clear that you are quite an inspirational teacher. What are your secrets for enthusing your pupils about the wonder of Chemistry as a subject?**

I'm determined to find the science that speaks to them. They don't all love chemistry, but once they know how central it is to all of their lives, they usually take an interest. 'Oh, you don't like chemistry? Do you eat... erm...food?' It's not only chemistry. Science in general. These children are growing up with all the information in the world at their fingertips, but they need to be able to question, analyse and decide what is true. Chemistry provides a framework for that, which can be applied to everything. It never hurts to kick off a lesson with an explosion, make your own fireworks, or make the lesson a murder mystery.

**Tyrian is clearly an integral partner in all that you do and is, I believe, your second assistance dog. Can you give us a sense of the various roles the dogs have played in your life?**

I got my first dog, Orca, in the year out from my first degree. He'd been with me for just five weeks when I crashed my electric wheelchair and he did his Lassie thing and got help. This made him famous, and I knew then how powerful a relationship we had and he helped me go out into the world without having to rely on people. He and I studied together, got a job together and there was a little dog on my wedding cake. He visited my daughter in the hospital when she was two hours old. He was so integrated into my life; into who I was, that I could have conversations with him in my head – he had the voice of Eeyore. He died in 2014 and I was devastated as for twelve years I had never been alone. At the time I was pregnant with my second daughter so I couldn't get another dog right away, but in 2016, Tyrian arrived. He is very different. Like Orca he is in my head, but he has the voice of Samuel L. Jackson in Snakes on a Plane. Whereas Orca was very serious, Tyrian is fun, hyper, silly, so smart and fits into my life in a way Orca wouldn't. Orca would not have enjoyed running around with screaming children, whereas Tyrian just joins in. He loves school, especially dropped pizza, and follows me around, knowing my needs before I do. I'm in his head, too.

**You were once quoted as saying that the biggest challenge you have faced is not your disability but your background. Could you enlarge on that for us, please?**

I can't remember a time when my childhood wasn't difficult for one reason or another. I grew up often in poverty, education wasn't seen as important, and my academic interests were viewed with a sort of suspicion. I was 14 or 15 before I knew what university was. I don't blame my family, but I just didn't know so many things. How do you dress for an interview? How do you get a passport? How do you rent somewhere with no references? What is a student loan? Where do you go in the university vacations if you've no home to go to? How do you study? I was the first in my family to do post-16 education. I made sure I wouldn't be the last. Two of my brothers also went to university (indeed one lived with me when I was an undergraduate), – one is now an academic chemist. If you change one life, you change so many.

Having said that, my background is also my strength. I've been looking after kids all my life. I can fix anything, because I never had anyone to do it for me and can face disaster with a five point action plan. I know adversity well; we get along. However, whilst I wouldn't advocate the school of hard knocks as an educational establishment, there are elements that are really important. In the pandemic I was a 'scrubber' making scrubs and theatre gowns for hospitals. My daughter also did – Britain's youngest scrubber, aged seven – she's been machine sewing since she was three and not because she has an amazing gift, rather that when she wanted to have a go, I let her. My children are all competent cooks, carpenters, mechanics and decorators, because I let them.

**Your recent award recognises both your teaching and your advocacy. Now that you've had a little time to reflect, what does the award mean for you, the pupils you teach and your colleagues and the school where you work?**

I feel like I'm collecting this award on behalf of so many people. My parents, who tried; my teachers who pushed and prodded and pulled. My brothers, who saw my life and wanted to come, too. My mentors who showed me how to be a functional adult. My foster parents, who showed me how to have a family. My first headteacher, who took a gamble on this wheelchair teacher with a dog. All my colleagues, that I can lean on for support whenever I need it, and they can lean on me.

So I collect on behalf of the village that made me, and the village I'm building for my students.


*Cheryl with husband Andrew at the recent awards ceremony*

**You've achieved a very great deal in your life and career so far, what's next?**

I'm often asked that. I have no ambitions for management – seniority would take me out of the classroom, where I belong and where I learn so much from my students. I've seen some absolute triumphs and unbelievable tragedies, really heart-breaking stuff. Inasmuch as I inspire my students, they inspire me. I tell them to keep going – it gets better. And they tell me that I made them realise they could be someone they wanted to be.

In 2021 as a complication from Covid, I was on a ventilator for nine days. I woke up with 80% hearing loss, reduced sight in one eye, and I had lost over half my bodyweight. I don't think anyone expected I would return to teaching, but I did. It took a lot of research and a lot of assistive technology. It was a battle, but the solutions were there. What I want to do now is to encourage the world to see people with disabilities not as objects of inspiration or pity, but as people with something to contribute. You want to attract talented disabled people and if you don't build in access, you're cutting off a talent pool. While it might be blowing my own trumpet, I'm a good teacher. I bring a lot to the table.

When the first Ukrainian refugees arrived in school, a colleague was showing a student around and passed me in a corridor, knowing my language ability, asked me, "How's your Ukrainian?" I replied, in Russian, that I didn't speak Ukrainian but I did speak terrible Russian, so we'd probably be able to manage. Who else is bringing that to the table?

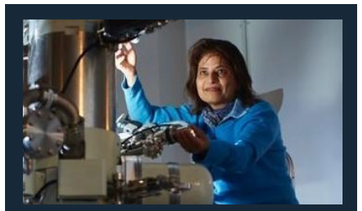
STOP PRESS STOP PRESS STOP PRESS STOP

## Welcome, Max

The Department is delighted to welcome Dr Max Veit as a Lecturer in Digital Chemistry. Max comes to us after spells working in Finland, Germany and Switzerland following his PhD in Cambridge. More about him in our next issue.

## More Changes at the Top

With Derek becoming Head of Department, Professor Alison Parkin has filled the vacancy created as Deputy HoD for Teaching, while Professor Ian Fairlamb has now assumed the role of Deputy HoD for Research.



## Pratibha Gai on the Life Scientific

Professor Emerita Pratibha Gai was featured in an edition of BBC Radio 4's The Life Scientific at the beginning of June. Pratibha, her husband Ed Boyes and their collaborators pioneered the development of analytical, *in situ* atomic-resolution, environmental transmission electron microscope and analytical *in situ* environmental scanning TEM with single-atom resolution to visualise and analyse dynamic gas-catalyst reactions at their operating temperature. The programme charts Pratibha's career from school and university studies in India, through her PhD in Cambridge, work in Oxford and then at Du Pont in the USA, before she came to York in the early 2000s. You can find the programme here if you want to have a listen yourself.

## Stockholm Declaration

Professor Helen Sneddon is seen signing the Stockholm Declaration on Chemistry for the Future on behalf of the Department's Green Chemistry Centre of Excellence. The declaration emphasises the role of chemistry in advancing the quality of human life, as well as acting as an aspirational, and at times provocative, challenge; outlining measures needed to transform scientific breakthroughs into positive impact for people and the planet. Helen was also one of five speakers at the launch in May, which followed the 198th Nobel Symposium on the topic of Chemistry for Sustainability: Fundamental Advances.

## Sixty Years and Counting

September will see the sixtieth anniversary of the opening of the Department and there will be events to mark this auspicious date on the 12th and 13th September. Please keep an eye on the Department's webpages for more information.

## RSC Prize for Green Chemistry

James Clark and a team from Green Chemistry have been awarded the 2025 Innovation Through Partnership Prize from the RSC for their work demonstrating a diverse range of applications of the bio-derived, non-toxic solvent Cyrene.



ChemYork

# York Cryo-EM Facility goes from Strength to Strength

SINCE ITS INSTALLATION IN THE ELEANOR AND GUY DODSON BUILDING IN 2021, CRYO-EM HAS MADE A DISRUPTIVE CHANGE TO THE WAY RESEARCHERS IN CHEMICAL AND STRUCTURAL BIOLOGY CAN TACKLE PROBLEMS OF INTEREST. CRYO-EM LEAD PROFESSOR JAMIE BLAZA REFLECTS ON ASPECTS OF THE NEW FACILITY.

*Sam Hart, Pavol Bardy, Johan Turkenburg, and Hamza Sheikh following acceptance of the energy filter*

Cryogenic electron microscopy (cryo-EM) allows the imaging with an intense beam of electrons of biological matter frozen into the 'vitreous' ice state. By-passing the physical limits that prevent light microscopes imaging molecules, cryo-EM has revolutionised biological research. The technique was given a huge boost about ten years ago when a new generation of highly sensitive 'direct electron detectors' was invented, driven by Richard Henderson of the MRC Laboratory of Molecular Biology, paving the way for a 'resolution revolution'. Given York's long-standing strength in structural biology it was clear that introducing cryo-EM would be transformational here and usher in a new era. Therefore, the University, Wellcome Trust, Wolfson Foundation, and Dr Tony Wild (alumnus and long-term benefactor of the department) came together to fund a new instrument and building to house it in perfect conditions (see Issue #14). Commissioning was completed in 2021.

Since installation, we have been busy and some ten different research groups are using the instrument regularly and already some 15 papers have been published. Projects include the structural basis of an inherited disorder, the structure of the most abundant phage in the human gut, and how Rubisco molecules come together to form supercharged carbon fixation hubs. Unsurprisingly, having an exceptional facility to hand has also attracted major research investment with close to £15M of grants won that will use cryo-EM, in many cases supporting several early career researchers in both Biology and Chemistry. One of these, Chris Hill in Biology, recently won the Lister Prize for his work using the instrument.

Remembering that in science if you are standing still you are falling behind, we have been keen to keep upgrading. Currently, the cryo-EM workflow involves extracting biological molecules from living milieu, often working with host organisms that have been genetically engineered to make the target. But why not look at living objects themselves? This is the field of electron tomography (cryo-ET), but because the samples are very much thicker, the imaging electrons interact much more with the object of interest leading to degradation. Image quality can however be improved by the use of an energy filter and we recently mounted a successful £700k bid to the BBSRC that secured one, which has now been installed and is in routine operation. Current projects that use it include understanding how mycobacteriophages attack pathogens such as tuberculosis and the structure of the bacterial cell envelope.

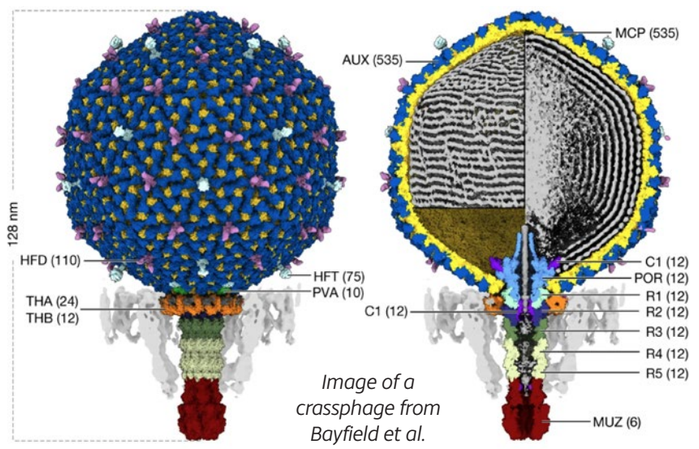



*Image of a crassphage from Bayfield et al.*

*The newly installed energy filter sitting below the microscope*

# From sticky-toffee pudding to polymers - a journey in sugars

WITH INCREASING CONCERNS ABOUT THE INTENSIVE USE, LACK OF RECYCLABILITY, ENVIRONMENTAL PERSISTENCE AND DEPENDENCE ON FOSSIL FUELS FOR MOST COMMERCIAL POLYMERS, THERE IS A PRESSING NEED FOR MORE SUSTAINABLE MATERIALS. OUR NEW COLLEAGUE, PROFESSOR ANTOINE BUCHARD, TACKLES THESE CHALLENGES WITH HIS TEAM, DEVELOPING POLYMERS FROM RENEWABLE FEEDSTOCKS AND DESIGNING NEW CATALYTIC STRATEGIES TO IMPROVE MATERIAL CIRCULARITY.

Antoine grew up in a small village in the West of France, the eldest and least irritating of three siblings, spending long summer days playing tennis and looking for an escape. At the age of 11, a family trip to London sparked a lifelong ambition to one day live across the Channel.

En route to the UK, Antoine first moved to Paris at age 18, joining the Lycée Louis-le-Grand to prepare for the entrance exams of the French 'Grandes Écoles'. This was successful and in due course he graduated from the Ecole Polytechnique, spending his final year at the University of Tokyo. He stayed at the Ecole Polytechnique for his PhD, working with Pascal Le Floch on new iminophosphorane ligands and their metal complexes for catalysis. One requirement of his PhD scholarship required a placement abroad and so Antoine finally crossed the channel again, spending three months at Imperial College in Charlotte Williams' group. This sparked an interest in polymerisation catalysis and bioderived polymers, and marked the start of what was to become a fulfilling, creative and productive scientific relationship that has lasted more than 15 years. After his PhD, Antoine returned to Williams' group as postdoctoral researcher, investigating the utilisation of $CO_2$ as monomer in polycarbonate synthesis.

Having tasted his first sticky-toffee pudding, met his future wife and been to Wimbledon, there was no turning back and in 2013, he was awarded a Whorrod Research Fellowship at the University of Bath. This enabled him to begin his independent research career, later winning a Royal Society University Research Fellowship in 2017, before being promoted to Reader (2019) and afterwards Professor (2023).

Then, in April 2024 to the delight of his wife's Yorkshire family (and the despair of his own), Antoine and his team moved further north to York. The main thrust of Antoine's research involves development of bio-derived polymers with targeted properties, be that as commodity plastics or speciality functional materials. Catalysis and catalyst development are also at the heart of the team's activities, for both the effective and selective polymerisation of new monomers, and the chemical recycling of polymers back into their monomers (including sugars).

When not working, Antoine enjoys reading mangas, listening to history podcasts, playing tennis, vacuuming, ironing and facetiming with family and friends (sometimes at the same time). Most of all, he loves spending time with his wife and son, whether for a run together, a movie night or a game of Mario Kart but, as a traitor to the country of his birth, Antoine hates cooking.