Chemistry Update

Newsletter 341, 28 February 2022

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Calendar of Events

UCAS Visit Days
Dates: 1, 3, 7 & 10 March
Time: 12pm—4pm

BioInorganic Seminar
Speaker: Prof. Julea Butt, University of East Anglia
Date: Wednesday 9 March
Time: 1pm—2pm
Location: C/A/101

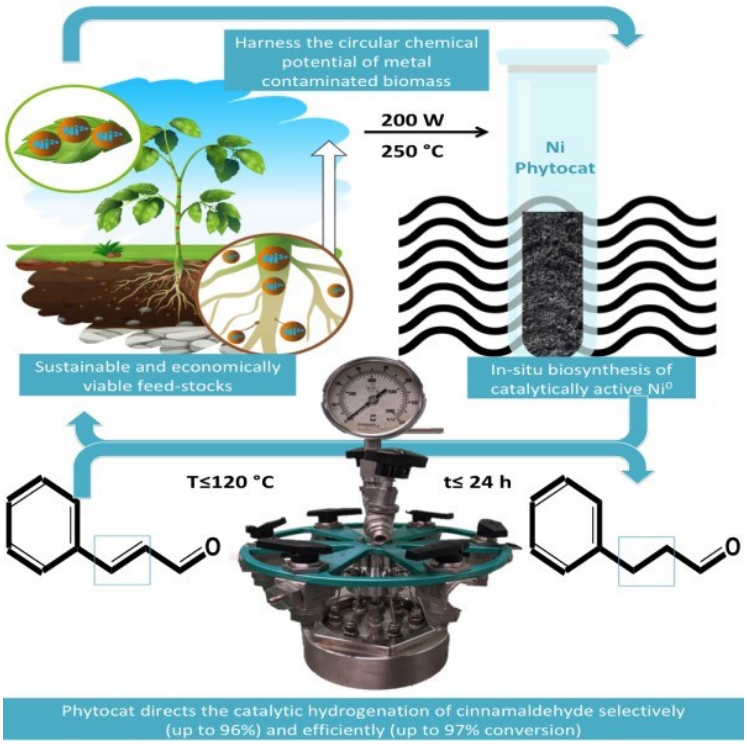
Organic Seminar
Speaker: Dr Jordi Bures, University of Manchester
Date: Wednesday 16 March
Time: 1pm—2pm
Location: C/A/101

SCI Day of Science and Careers
Speakers: Various
Date: Wednesday 23 March
Time: 10am—5.30pm
Location: STEM Centre
More information and registration

Date of Next Issue:
25 March 2022

Biologically bound nickel in the plant matrix directs the selective hydrogenation transformation

Research collaboration between Green Chemistry Centre of Excellence (GCCE) and Centre for Novel Agricultural Products (CNAP) opens door to utilize strategies beyond waste-to-energy to harness the circular chemical potential of metal contaminated biomass.



Phytocat directs the catalytic hydrogenation of cinnamaldehyde selectively (up to 96%) and efficiently (up to 97% conversion)

Nickel is a useful metal in areas such as chemical catalysis and batteries. However, it is also a problematic contaminant in many regions, including 5% of European agricultural land. Through a "double green" strategy, we have successfully used nickel captured by plants from contaminated soils as a catalyst for industrially important hydrogenation processes. Thus, toxic soils can be remediated, and at the same time, we can reduce the need for the wasteful and energy-demanding mining of virgin metal. We believe that by utilizing this green approach, we can develop more "phytocats" and involve different metals, especially where they can be used instead of scarce, difficult to refine and increasingly expensive noble metals.

There are several synthetic procedures for fabricating metal-based bio-catalysts. However, these protocols focus on the artificial incorporation of metallic species into bio-derived carbon materials. There are also several types of nickel catalysts that are active in reactions such as hydrogenations, but these present problems in addition to their need for virgin metals. Raney nickel, for example, is very active and inexpensive, but it is pyrophoric and difficult to handle. Conventional catalysts can also lack the desired selectivity in application. As an added bonus in the use of our phytocat in the hydrogenation of cinnamaldehyde, the natural encapsulation of nickel inhibits the undesired reduction of the carbonyl group.

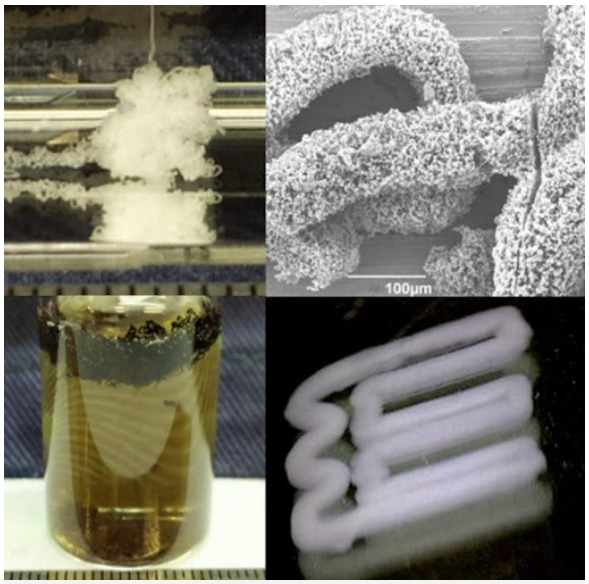
This research paper is published in *Applied Catalysis B: Environmental*.

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.

3D-printed gels with the Midas Touch for stem cell growth

A method has been developed in York to 3D-print self-assembled gel scaffolds and load them with gold nanoparticles in situ – the presence of gold has been shown to significantly enhance stem cell growth.



Wet spinning gel filaments (top left), nanostructuring of filaments (top right), gold-loaded filaments (bottom left), 3D-printed object with well-defined shape (bottom right).

Gels are fascinating materials with potential applications in tissue engineering, where they can be used to support the growth of human stem cells. This approach lies at the heart of future medical technologies, for example offering the potential to engineer replacement organs for implantation from a patient's own stem cells.

In order to maximise the potential of self-assembling gels in regenerative medicine, it is important that they can be shaped, patterned and structured such that they can direct cell growth. Furthermore, they should encourage effective stem cell proliferation. A new research paper outlines innovative approaches to these important goals.

Professor David Smith and Dr Carmen Piras, working in collaboration with Dr Juliette Fitremann from CNRS, IMRCP, Toulouse in France, demonstrated that a simple self-assembling gelator developed in York could be easily shaped into tubes and filaments. Furthermore, by 3D-printing multiple layers of gel, they were able to shape gel objects on demand. Importantly, these 3D-printed gel shapes had remarkably high stability on standing for extended periods of time in water.

The self-assembling gelator chosen by Professor Smith and Dr Piras has the capability to enable the formation of embedded gold nanoparticles within the gel when exposed to gold salt solutions. They demonstrated that this property was retained within their printed filaments, hence proving that the carefully-designed chemistry of their gelator endowed the resulting shaped gels with its own unique behaviour.

In collaboration with Professor Paul Genever from the Department of Biology, the researchers then tested stem cell growth on these gels. Crucially, the new gels showed high stability and biocompatibility, and when the gold nanoparticles were present, stem cell growth was significantly enhanced.

Dr Piras explains: "Being able to print a gelator that can create and organise gold nanoparticles, enhancing stem cell growth is a significant step forwards in applying such materials to tissue engineering. Other researchers have shown that gold nanoparticles can particularly assist in bone growth, so in the future, we would hope to print our 'Midas Touch' gels into shapes designed to assist with bone tissue engineering."

This research has been published open access in *Chemical Science*, the flagship journal of the Royal Society of Chemistry.

This research was funded by the Royal Society of Chemistry through a Researcher Mobility Grant.

Reminiscences of Clive Brookes (1934-2022)

Assembled by Robin Perutz

Clive Brookes was recruited as a technician in the mechanical workshop aged 30 in 1965 before the Department of Chemistry had even begun and played a critical role with his creativity, supreme skills and welcoming ways. He stayed until his retirement in the 1990s apart from short spells in a small company and in Physics.

Clive with the milling machine

Clive portrait

I arrived in October 1983. It was transformative to work with Clive – he was so welcoming and always listened patiently to me and the research students, designing, machining and installing successful instruments. That we obtained great results was a direct consequence of his contribution. I think he enjoyed working in the Department partly because he could both design and build, but also because he relished working with the students and could see what a difference he made.

I have asked some other colleagues to contribute their memories. Five of them were founding members of the Department. The other two knew Clive as research students and are now academics:

David Waddington: I can tell you the time and date of Clive's interview: 12pm on Tuesday 25 March 1965. It was in Micklegate House, on the top floor with rotten joists so you needed to walk along a pathway to avoid certain very broad 18th century floorboards. Many years later, Clive recalled that he was expecting a formal interview with a panel and instead got me, whom he described as scruffy. He was amazed to be sitting with me in armchairs with no-one else present. He came from the University of Leeds: we upset them by recruiting several of their technicians. His widow, Lois, told me that while I interviewed Clive, she waited for him in the street, heavily pregnant. When he was appointed, all we had to show was an attic with woodworm, a hole in the ground and a few girders at Heslington. Perhaps that was one of the glues. The Department gave him our confidence to get on with the work and he repaid us handsomely. I think all the new recruits took a risk. For me, Clive was the epitome of that skilful generation. They would take my drawings, suppress their mirth at my ineptitude and produce something that was far, far better.

David Goodall: In the late 1960s, I had the idea for a new instrument for fast reaction kinetics, but could it be made? Clive was the only one in the workshop who thought it was feasible and he took on the project as an engineering challenge. Relishing working at the absolute limit of precision, he built a stopped-flow unit which worked flawlessly. Clive's achievement of perfection enabled successful research for many graduate students and a fruitful long-lasting collaboration with Unilever. As an academic whose career has been built around instrumentation development and partnerships, I couldn't have wished for a better colleague than Clive.

Bruce Gilbert: I think that my most distinct and memorable recollection is the way in which Clive had set up the newly arrived and very large ESR spectrometer, so that we could start recording spectra immediately on arrival in October 1965 - we could even demonstrate its use to the Duke of Edinburgh on 22 October 1965 when he came to open the buildings! He referred to the magnet as a piece of torpedo tube. Happy days indeed - and a tribute to a superb workshop team.

Tom Halstead: Clive was a fine craftsman who made several variable-temperature NMR probes for my group. Often, academics are not welcome in workshops either for safety reasons or for their assumed incompetence, but in the 1970s this wasn't always the case, and the head of the workshop allowed me to use the lathes and other equipment. It was Clive who had the patience to teach me how to use them properly. Clive loved working on intricate pieces of equipment, and I can picture him now at his desk in the side office, examining an item with a binocular microscope.

Dave Haddleton (now Professor in University of Warwick): In 1983, Robin moved the matrix isolation equipment from Oxford to York and it turned up like an unassembled giant Meccano set with no instructions in multiple boxes and Robin just told me to "put it back together and get started". Without Clive Brookes it would have been mission impossible, good humour and willingness to help a new PhD student who really had no clue helped me on my way.

Simon Duckett: Clive was someone who would go the extra mile to help. From a research student perspective, you felt no intimidation even though he was the boss, open and willing to listen and help to solve your problems. It made a real difference to have that friendly backing that your work was important and workshops were there to help in any way that you needed.

Alwyn Taylor: Clive was of course a supreme engineer - but he was also a dab hand at constructing pedal cars. After the Brookes boys had had their fill of such a great machine it was passed on to my gang. My daughter took it for a test ride; we watched as she started to rise and fall as if riding a horse, those boys of Clive had obviously given the tyres a hard time. We looked on in horror as the inner tube leaked out of a hole in the tyre; my daughter's puzzled look turned to screams at the inevitable rupture. Thank you Clive, it took me quite some time to find replacements.

Clive at his retirement (with his wife Lois, Simon Duckett and James Clark).

Thanks to Clive's son, Ian, for the photos. For a few years, Ian was a member of the Department too, working in the Electronics workshop.

Green plastics? Sustainable plastics?
A Rhinoceros in a lifeboat?

Professor Vânia Zuin Zeidler, Visiting Professor at the Green Chemistry Centre of Excellence (GCCE), Guest Professor at Leuphana University, Germany and Professor at UFSCar, Brazil, together with Professor Klaus Kümmerer (Leuphana University), published a provocative paper in the latest special issue on polymers of *Nature Reviews Materials* (Volume 7 Issue 2, February 2022), titled '[Chemistry and materials science for a sustainable circular polymeric economy]'.

To build a more honest and sustainable future, taking into account that more than 12 billion tons of plastic waste is currently expected to be generated by 2050, the authors presented some suggestions on how to work in the field of chemistry. One of the main points highlighted in the paper is that problems cannot be postponed into the future by increasing the complexity of the materials and processes. For instance, using polyethylene terephthalate (PET) from plastic bottles in textile fibres can be understood as an example of procrastination.

Important keystones for a plastic circular economy go beyond reduction, reuse and recycling, as there is a starting point, responsibility, which is to take "the ownership of your product throughout the whole life cycle beyond the value chain and required function".

We invite you to read the paper from the cover, also authored by Professor Zuin Zeidler and Professor Kümmerer; it's a Fellini moment in a plastic ocean, where *La Nave va*.

New starters

Dr Martina Conti, 'Seachange' PDRA in Penkman group
Room: C/D024 & C/D 016/026; Ext: 4472; Email: martina.conti@york.ac.uk

Dr Barbara Procacci, PDRA in laser-initiated time-resolved methods for studying solvation dynamics
Room: C/A057; Ext: 4525; Email: barbara.procacci@york.ac.uk

Benjamin Trowse, PDRA in Synthetic and Supramolecular Chemistry
Room: C/D126; Ext: 4184; Email: ben.trowse@york.ac.uk

Dr Matthew Simmons, PDRA in High Throughput 2D-Infrared Screening
Room: C/A057 & C/A051; Ext: 4525 & 4541; Email: matthew.simmons@york.ac.uk

Laetitia Raynal finalist in PhD Spotlight Competition 2022

Laetitia Raynal, third-year Chemistry PhD student in Dr Chris Spicer's group, was a finalist in the York 2022 PhD Spotlight Competition. Part of the YorkTalks day held on 12 January, the PhD Spotlight competition was an opportunity for postgraduate researchers from all disciplines to demonstrate the value of their research to non-specialist audiences.

Laetitia said of the competition, "I wanted to participate as I think that science should not only be run in labs or behind computers, but should be accessible to everyone who wants to generate ideas and pursue new goals in research by working together".

"Working on a research poster by making it clear and readable for everybody was a very interesting task in itself, and I was glad to learn that my poster got selected in the final ten PhD representatives.

"I learned about very diverse subjects over the day of talks, and it made me realise how broad research is and how much we can do even as PhD students to have an impact."

Laetitia Raynal studied Chemistry at the Ecole Nationale Supérieure de Chimie de Montpellier. During her Master's, she did an internship at DSM in the Netherlands and a one-year research placement at the University of Geelong in Australia, graduating with a Diplôme d'ingénieur Chimiste in 2019. The same year, she was awarded a Rosetrees Trust PhD Scholarship with Dr Chris Spicer at the University of York, developing new approaches to enhance protein signalling. She wants to continue working between the interface of chemistry, biomaterials and biology to impact the medical world beneficially.

Laetitia's poster "Increasing the potency of biomaterials for tissue growth" can be viewed online.

Chemistry of the Whole Environment Research

Message via Sebastian Diez: Following successful #EnvChem events held online in 2019, 2020 and 2021, we are announcing our plans for #EnvChem2022, which will be held in York on Thursday 14 and Friday 15 July 2022 with a hybrid online component. #EnvChem2022 provides a forum for early career and established researchers working in environmental chemistry and ecotoxicology to share their latest research findings. This meeting, organised by RSC Environmental Chemistry Group and the Society for Environmental Toxicology and Chemistry, will comprise a programme of presentations from delegates who submit abstracts in:

- Environmental Processes in Soil
- Water and Air
- Emerging Contaminants
- Novel Techniques
- Atmospheric Chemistry
- Ecotoxicology

Evolving advice on pronouns...

Kevin Cowtan (they/them), co-chair of Equality and Diversity Group

I have never been particularly comfortable with pronoun circles - you know, those things at the start of meetings where everyone gives their name and pronouns[1].

At first I was uncomfortable because it was new and the social rules were unfamiliar. Then I was uncomfortable because they forced me to claim an identity which didn't fit. Now I am uncomfortable because rather than normalising gender diversity, they place it under a spotlight.

How people address us fundamentally influences how we feel. Whether we address people respectfully or dismissively can have significant impacts on their wellbeing. This is especially true for trans and non-binary young people, who see their identities questioned and ridiculed in online and public discourse[2,3]. Using a person's name and pronouns correctly is the simplest and most basic way of showing that you respect them.

Pronouns in a work context

Translating this into best practice guidelines in the workplace is often but not always simple. For example, it has often been recommended that meetings should begin with everyone sharing their name and pronouns, rather than letting people jump to conclusions. However, this can create a very uncomfortable situation for a transgender or nonbinary person who is not out in all contexts, forcing them either to out themselves or misgender themselves. The current cultural context adds more complexity, with transgender identities being weaponised by political factions - in this context we may sometimes benefit from less rather than more attention.

How can we navigate this? It may be helpful to start from three basic principles:

1. Do not "out" people.
2. Treat people with respect.
3. Act to normalise gender diversity, rather than stigmatising or politicising it.

Meetings

For online meetings, Zoom has (since version 5.7) allowed you to add your pronouns to your profile, making them obvious without being obtrusive. Sign in to your Zoom client and select 'settings/profile/ edit my profile' or use this link. You can toggle them on and off in meetings from the participant list. This is very easy, however even in Chemistry not many people seem to be aware of the feature. Ideally, half of the Department would be doing this[4]. Including your pronouns in your email signature or the first slide of a lecture course are similarly unobtrusive.

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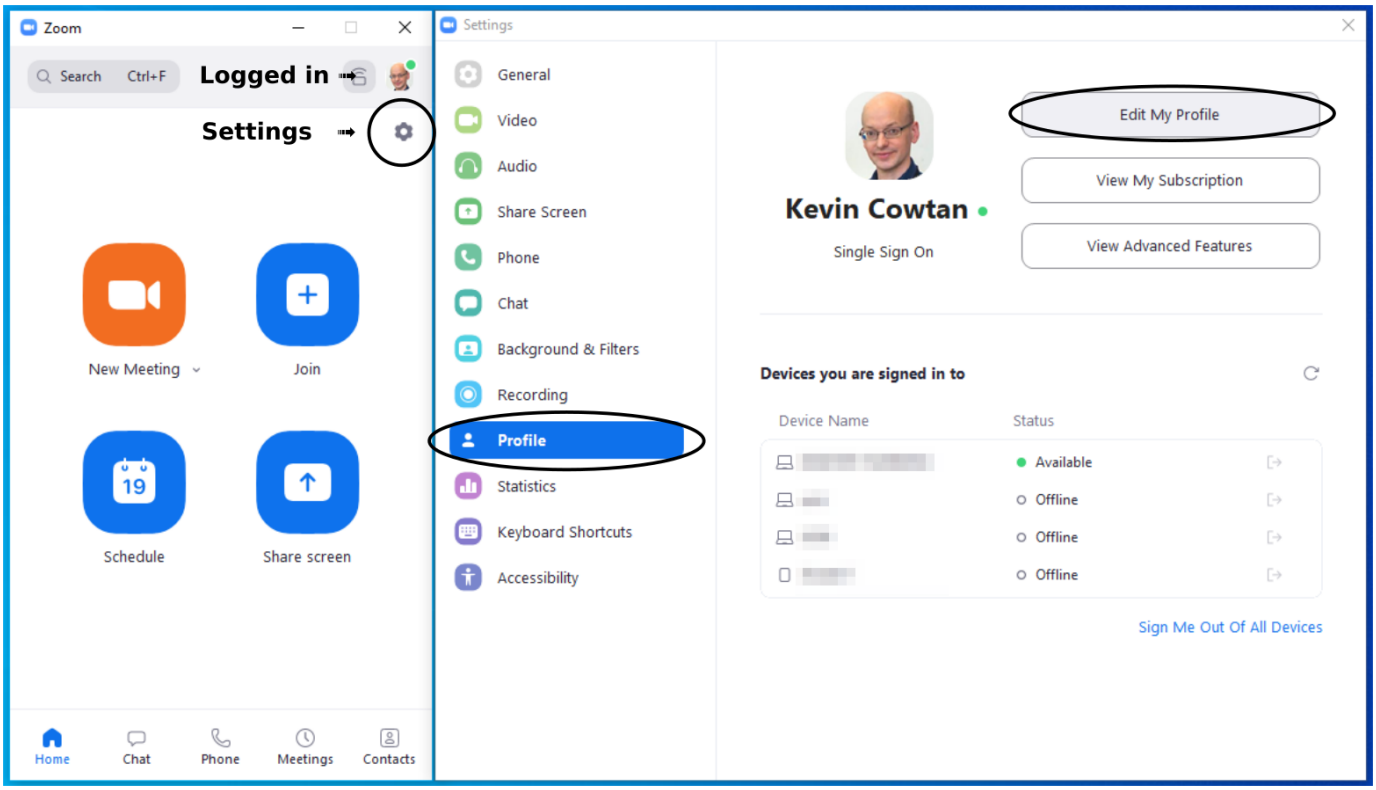
[1] The terms 'personal pronouns' and 'preferred pronouns' are deprecated. 'Pronouns' is sufficient.
[2] Gridley, S. J., Crouch, J. M., Evans, Y., Eng, W., Antoon, E., Lyapustina, M., ... & Breland, D. J. (2016). Youth and caregiver perspectives on barriers to gender-affirming health care for transgender youth. *Journal of Adolescent Health*, 59(3), 254-261.
[3] Russell, S. T., Pollitt, A. M., Li, G., & Grossman, A. H. (2018). Chosen name use is linked to reduced depressive symptoms, suicidal ideation, and suicidal behavior among transgender youth. *Journal of Adolescent Health*, 63(4), 503-505.
[4] To minimise the information which is disclosed by choosing whether or not to do so.



When it comes to face-to-face meetings, I am taking a contextual approach. If people are introducing themselves, I mention my pronouns with my name so that anyone else wanting to do so is not alone. If we are to normalise rather than stigmatise gender diversity, it would be better if this task is not left exclusively to gender minority participants. If introductions would not normally be appropriate in a meeting, then I tend not to introduce them for the sole purpose of sharing pronouns, although I vary this according to the meeting and the people present.

Getting it wrong

If I misgender a person to someone who does not know their gender history and I am outing them - I may have harmed them or placed them in danger, and that requires an apology and support. However, if I misgender someone whose gender history is known to everyone present, then I aim to correct myself as quickly as possible (to show awareness and respect) without drawing more attention to the issue.

We are in a time of rapid cultural change and norms are evolving continually in response to new pressures. I am trying to interpret the above principles in this place and time, but my interpretation is subjective and the context is changing, so please do not be surprised if things are different next year!