



UCL Chemistry NEWSLETTER

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Many thanks go to Louise McSeveny, for organising this years newsletter and to Tracy Hankey at UCL Digital Media for her help.

We hope this newsletter gives a flavour of the exciting chemistry and family atmosphere achieved in the department.

It is not an exhaustive document but can provide a number of contact points to the wide variety of activity that occurs in the department.

Introduction by Head of Department



I am feeling very relaxed as I start writing this welcome having just returned from my honeymoon in Croatia after getting married in August! Being able to unwind after another busy year in the chemistry department, many highlights of which are included in this newsletter, was greatly appreciated. We were pleased to see that UCL Chemistry moved up 11 places to 30th in the QS world university rankings by subject (from 41st in 2018). This was one of the biggest uplifts of any subject at UCL and puts us 4th in UK.

This academic year Professor Xiao Guo moved to the Department of Chemistry, University of Hong Kong after 11 years here at UCL. Farzana Hassain (Departmental Administrative Assistant) moved to a new role in Professor Jawwad Darr's group. We welcomed Dr Yang Xu from the Technische Universitat Ilmenau as a Lecturer in Electrochemical Energy Storage, Dr Cally Haynes from University of Cambridge as a Lecturer in Organic Chemistry and Dr Anna Regoutz from Imperial College as a Lecturer in Materials Chemistry. In addition, Dr Adam Clancy and Dr Gi-Byoung Hwang will both be starting Ramsay Trust Fellowships in the department. We also welcomed Hannah Shalloe as our first Apprentice Technician, Helena Wong who has started as a Chemistry Teaching Laboratory Technician, Thom Dixon as our new Teaching and Learning (Student Lifecycle) administrator, Angelo Delbusso as our Workshop Technician and Malgorzata Puchnarewicz who has joined us as maternity cover for the mass spec facility. Louise McSeveny is now with us permanently as my Executive Assistant, while Nicola Philips on returning from maternity leave has moved to a new position as the departmental Senior HR Administrator.

There have been a number of awards within the department. Two members of the department received awards from the Royal Society of Chemistry. Dr Matt Powner has been awarded the Harrison-Meldola Memorial Prize and I received the Applied Inorganic Chemistry award. Four members of the department were elected to membership of the Academia Europea – Professor Ivan Parkin, Professor Sally Price, Professor Peter Coveney and Professor Paul McMillan. Martyn Towner (Natural Sciences Laboratory Technician based in the Chemistry Department) received a UCL Education Award (Individual) for his outstanding contribution to enhancing and supporting student learning in undergraduate laboratories in the Department of Chemistry. Dr Jadranka Butorac (Senior Teaching & Learning Postgraduate Administrator) received a BEAMS Professional Services Award for giving our students the best support, facilities and opportunities.

Yet again the department had an excellent intake with over 110 students taking one year MSc and MRes degrees in the department. Undergraduate and PhD admissions were also very strong with record numbers of UG students. We have been pleased to be able to invest in new equipment this year including a new High Resolution UPLC-Q-Exactive Orbitrap Mass Spectrometer System, an X-ray Fluorescence Spectrometer, a fluorimeter with NIR capability, a NanoDrop OneC Spectrophotometer and various battery testing facilities to support the Faraday Challenge. Upgrades to the 3rd floor synthetic laboratories continue and we are excited about a major investment by UCL to develop a Laser Science Centre in the basement of the Christopher Ingold Building.

I hope to see many of you at the Annual Lab Dinner in November.

Best wishes

Professor Claire Carmalt

New Appointments

Academic Appointments



Yang Xu

Lecturer in Electrochemical Energy Storage

Before joining UCL in April 2019, Yang was a Senior Scientist and Group Leader at the Technical University of Ilmenau in Germany (2013-2019) and a Postdoctoral Research Associate at the University of Alberta in Canada (2012-2013) and Boston College in USA (2011-2012). He received his PhD in Chemistry in 2011 from the University of Science and Technology of China, under the supervision of Professor Yi Xie.

Yang's research focus is electrochemical energy storage technologies with a special interest in rechargeable Sodium- and potassium-ion batteries. Current research within the group focuses on discovering new electrode materials, designing electrode architectures, and understanding the defect structure-battery performance relationship, particularly at local atomic and nanometric scales, as well as investigating solid-liquid/solid-solid interfaces towards local electrochemical reactivity in a battery material system. Furthermore, the group has an increasing interest in exploiting new cell chemistries and the underlying electrochemical mechanisms.



Cally J.E. Haynes

Lecturer in Organic Chemistry / Chemical Biology

Before joining UCL in June 2019, Cally was a Postdoctoral Research Associate at the University of Cambridge (2015-2019). She completed her PhD under the supervision of Professor Philip Gale at the University of Southampton (2009-2011), where she was also awarded an EPSRC Doctoral Prize Fellowship (2011-2012) and worked as a PDRA until 2013. She also worked as a Publishing Editor at the Royal Society of Chemistry, contributing to the production of journals including ChemComm, Chemical Science and ChemSocRev from 2013-2015.

Cally's research interests are in supramolecular chemistry, targeting the development of small molecule

probes to perform new functions inside lipid bilayers for biomedical applications. This will involve generating fundamental knowledge on predicting and controlling the membrane binding, partitioning and localisation of small molecules, which will in turn enable precise regulation of their delivery and function. The applications of this work will include producing simple synthetic mimics to replicate the action of natural occurring membrane-bound proteins and establishing the knock-on effects of introducing these mimics into cellular systems. Other goals will be the application of controlled membrane-crossing and partitioning events to mediate the selective delivery and localisation of diagnostic and imaging agents.



Anna Regoutz

Lecturer in Materials Chemistry

Anna joined the department in July 2019 as a Lecturer in Materials Chemistry. She is a CAMS-UK Fellow and holds a Visiting Scientist position at Diamond Light Source. Before joining UCL Anna was an Imperial College Research Fellow (2017-19) and Postdoctoral Research Associate (2015-17) at Imperial College London and a Research Fellow at the University of Southampton (2013-14). She received her PhD in Inorganic Chemistry from the University of Oxford in 2014, where she worked under the supervision of Professor Russell Egdell.

Anna's research focus lies on bulk, thin film, and nano materials for application in devices, including power and flexible electronics, photovoltaics, and biosensors. Her interests include novel growth methods for high quality thin films, nanostructured layers, and nanostructures of inorganic materials with a focus on metal oxides. She works on developing and advancing X-ray spectroscopy methods for bulk materials, surfaces, and interfaces in electronic devices. She concentrates on using and developing both laboratory- and synchrotron-based spectroscopic methods to study in particular the electronic structure in oxide heterostructures. Anna uses her combined expertise in deposition and characterisation of these materials to understand and tune the materials' electronic and optical characteristics to ultimately improve existing device concepts and develop novel device applications.

Promotions

We are very proud to announce the following senior promotions of the department, effective from 1st October:



Mike Porter

Promoted to Professor of Organic Chemistry



Matt Powner

Promoted to Professor of Organic Chemistry



Daren Caruana

Promoted to Professor of Physical Chemistry



Vijay Chudasama

Promoted to Professor of Organic Chemistry and Chemical Biology



Rob Palgrave

Promoted to Professor of Inorganic and Materials Chemistry



Tracey Clarke

Promoted to Associate Professor



Vicky Hilborne

Promoted to Senior Teaching Fellow

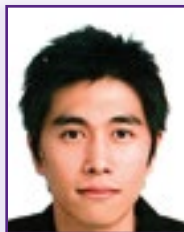
Ramsay Fellows



Adam Clancy

Ramsay Fellow

Adam completed his PhD at Imperial College London in 2016 in carbon nanotube composites under Professor Milo Shaffer, before being awarded an EPSRC Doctoral Prize Fellowship to continue his work into nanotube processing. He subsequently moved to UCL in 2017, originally joining the Institute for Materials Discovery, working on icephobic materials, before returning to nanocarbons when joining UCL's Chemistry Department under Professor Paul McMillan, developing graphene-based fuel cells. As a Ramsay Fellow, he is investigating the solution processing of 2D nanomaterials for optoelectronic and energy storage applications.



Gi Byoung Hwang

Ramsay Fellow

Gi obtained his Master's degree from Konkuk University (South Korea). After working at the Korea Institute of Science and Technology (KIST), he joined Professor Ivan P Parkin's group and graduated from UCL with a PhD in 2018 with his thesis on white light activated bactericidal surfaces. He is currently working as a Postdoctoral Research Associate under supervision of Ivan P Parkin on Manufacturing Advanced Functional Materials. In 2019, Gi obtained a Ramsay Memorial Fellowship which he will start at UCL at January 2020.

Royal Society of Chemistry Awards

Professor Claire Carmalt

was awarded the Royal Society of Chemistry Applied Inorganic Chemistry Award for 2019.

Claire was recognised for her outstanding contributions to the synthesis of inorganic CVD precursors and the development of superhydrophobic paint.



Claire's group works on developing robust water repellent materials that can be combined with different adhesives to create "self-cleaning" surfaces, such that water droplets are able to roll over the surface, picking up dirt, viruses and bacteria along the way. The material addresses one of the biggest challenges for the widespread application of self-cleaning surfaces by finding a way to make them tough enough to withstand everyday damage. Research in the group also investigates the synthesis of novel molecular precursors and deposition of films using chemical vapour or spray deposition.

Professor Carmalt said: "I was delighted to find out that I had been awarded the 2019 Applied Inorganic Chemistry Award. Research in my group over the years has focused on developing new materials and investigating how best to use them to improve our daily lives. This award for industrially focused research is a great recognition of the hard work not just from me but from my team and collaborators."

Congratulations to

Prof. Ivan Parkin, Prof. Sally Price, Prof. Peter Coveney and **Prof. Paul McMillan** who have all been elected to membership of the Academia Europea.

Prof. Claire Carmalt who has been elected as Fellow of the European Academy of Sciences.

Congratulations to Thibault Gendron

at UCL Radio-chemistry and UCL GMP Facility for winning the Royal Society of Chemistry Radiochemistry Group Young Researcher's Award for his work on dibenzothiophene sulfonium salts as leaving groups for 18F aromatic fluorination.



Dr Matthew Powner is the 2019 recipient of the Royal Society of Chemistry's Harrison-Meldola Memorial Prize, awarded for the most meritorious and promising original investigations in chemistry and published results of those investigations.

Matt is awarded for pioneering investigations into prebiotic synthesis, which illuminate key conceptual steps in the origin of life.

The origin of life is one of the great unsolved problems of science. Resolving this problem requires answers to a wide range of questions concerning the underlying prebiotic chemistry, the assembly of the first cells, the advent of Darwinian evolution, and the planetary context of the origins of life.

The Powner group develops new reactions [1-4] and physicochemical methods [5] that can shed light on the process that led to the origin of life on Earth. The group and their collaborators have developed a new *modus operandi* to investigate the origins of life through the application of 'Systems chemistry'. Rather than attributing functional importance to any one class of metabolite or to one specific environmental niche, concomitant analyses of the chemical constituents of life, their biochemical activation towards macromolecular assembly and the planetary history of the Earth are being undertaken to elucidate the origins of life.

1. Canavelli, P., Islam, S. & Powner, M.W. Peptide ligation by chemoselective aminonitrile coupling in water. *Nature*, (2019).
2. Roberts, S.J. et al. *Nat. Commun.* 2018, 9, 4073.
3. Fernandez Garcia, C.A., Grefenstette, N.M. & Powner, M.W. *Chem. Commun.* 2018, 54, 4850–4853.
4. Coggins, A.J. & Powner, M.W. *Nat. Chem.* 2017, 9, 310–317.
5. Islam, S., Bucar, D.K. & Powner, M.W. *Nat. Chem.* 2017, 9, 584–589.

Congratulations to Jadranka Butorac

Senior Teaching and Learning Postgraduate Administrator who received the BEAMS Professional Services Award for giving our students the best support.

Congratulations to Alex Ganose and Guanjie He

who were jointly awarded the MAPS 2018 Faculty Postgraduate Research Prize for the exceptional quality of their PhD theses and publications in Chemistry.

RSC-BMCS Hall of Fame and Medal 2018

Professor C. R. Ganellin

Professor Robin Ganellin received his medal and framed certificate on becoming the inaugural inductee into the BMCS-RSC Hall of Fame (Biological and Medicinal Chemistry Sector of the Royal Society of Chemistry) on March 13 at the Mastering Medicinal Chemistry meeting held at Lilly, Erl Manor, Windlesham, and he lectured on "Discovery of Pitolisant, the first histamine H3-receptor inverse agonist/antagonist for treating narcolepsy".

A new medicine for treating narcolepsy, WakixTM is the result of a collaboration between medicinal chemists, Prof. Robin Ganellin (UCL) and Prof. Walter Schunack (Free University of Berlin), with Prof. Jean-Charles Schwartz (a neurobiologist at an INSERM laboratory in Paris) and Dr. Jeanne-Marie Lecomte who headed a small pharmaceutical company, Bioprojet-Biotech in Rennes and Paris.

The collaboration has produced the compound known by the International Nonproprietary Name, **pitolisant**, 1-{3-[3-(4-chlorophenyl)propoxy]propyl}piperidine hydrochloride (**Wakix**).



The histamine H3 receptor has a marked constitutive activity and pitolisant is a potent inverse agonist/antagonist. Since pitolisant reverses the constitutive activity, it means that pitolisant can put a brake on histamine release at the level where histamine would otherwise inhibit transmission in histaminergic neurons.

Wakix is the first histamine H3-receptor inverse agonist to be taken through all of the preclinical and clinical phases and it has been demonstrated to be effective in treating all major symptoms of narcolepsy. It is a first-in-class medicine that acts on histamine H3 auto-receptors in the brain.

This leads to increased histamine transmission in the brain thereby enhancing wakefulness and alertness and decreases cataplexies and hallucinations in patients with narcolepsy.

It has received marketing authorisation from the European Medicines Agency for treating narcolepsy, with or without cataplexy, in 2016. Wakix was accepted by NICE for the UK in 2017 and received fast track examination from the FDA in the USA in 2018. It has also become on the REF impact case studies for our chemistry department.



Image: Prof. Robin Ganellin receiving his award

Provost Education Awards 2019



Martyn Towner, a member of the Natural Science teaching lab, team is this year's recipient of the UCL Provost Education Award. These awards recognise staff making outstanding contributions to the learning experience and success of our students.

Martyn is one of the Teaching Lab Technicians based in the chemistry department, managing both the third-year chemistry undergraduate lab course and the MSc in Applied Analytical Chemistry. He has played an essential part in enhancing the student experience and is a source of outstanding support for the department.

Alexa Marroquin, Chemistry's undergraduate student representative has received the **Faculty Academic Rep of the Year** award for the MAPS Faculty. Alexa has collected vast amounts of student feedback and has endeavoured to talk to staff about issues that affect the students in her department.

The Student Academic Representatives scheme is managed by Students' Union UCL and during this academic year, 1,600 Academic Reps worked across UCL, sitting on committees at programme, faculty and university level, where they act as the voice of students.

EDI Committee Newsletter



Who are we?

We are the Equalities, Diversity and Inclusion Committee. We meet monthly and work proactively within the department to embed equality and diversity practices.



How to get involved

If you would like to become a member of the working committee, please visit our website and complete an expression of interest form.

Link: <https://www.ucl.ac.uk/chemistry/edi-team>

Letter from the Chair



It has been a pleasure to work with the EDI team this year. It's been a busy year with the introduction of the coffee mornings, our first thesis writing workshop, a new checklist to provide greater clarity in terms of health/safety when pregnant, the new website and twitter account, various talks/events (e.g. Mental Health & Wellbeing in the Workplace, Carers talk), appointment of our new PDRA tutor, overseeing how our Department's case study model for promotion awareness is being implemented at Faculty level, use of positive action to encourage equal opportunity, etc. We also have new screens to be put up in the department in the coming months, a careers event in early September and a new mentoring scheme to look forward to. I would like to take the opportunity to thank the team for all their hard work - all members have contributed and deserve a lot of credit with the appointment of Nicola Phillips as Deputy Chair & EDI Officer being a great addition.

*Professor Vijay Chudasama
Chair of EDI Committee 2018/19*

LGBTQ+

Hey there! My name's **Jamie Riley** and my role in the Department is mixed between doing super cool research with ultrafast lasers (alas, I work near 300 K) and teaching undergraduate physical chemistry courses. But one of the most exciting aspects of my job is being a member of the departmental Equality, Diversity and Inclusion (EDI) committee – specifically, championing LGBTQ+ issues both in the workplace and with your university experience as a student. Why I love this so much? Well, we're really at the forefront of pushing boundaries and coming up with innovative ideas to challenge and change the status quo. Why's this important? Simple. Representation matters! As much as some people might not like to admit it, or might save the reservation for the humanities, science is creative. Only your unique experiences, personality and ambitions are what can drive the process for new concepts and creative thought. We as a Department then must ask, how do we create an environment and safe-space that allows for this? The answer really is simple, people, regardless of who they are, must feel comfortable to truly express themselves without any reservations, fear of discrimination or onset of inappropriate behaviour. Unapologetically and unashamedly themselves. One of our most recent feats has been the introduction of **Friends of Out@UCL** and Out@UCL stickers being provided to all members of staff within the Department. A simple item, such as a sticker, allows for greater visibility to LGBTQ+ people that can be valuably reassuring. We're pleased to see this has already been taken up by many members of the Department, and I must say, the building is looking ever the prettier for it. Also, coming this academic term will be the creation of a new LGBTQ+ network within the Department. This will be open to absolutely anyone, regardless of how you identify, and aims to be a relaxed and friendly setting where people can chat, meet new people, get their concerns and ideas out, and we'll even be arranging fun activities! Details to come, so make sure you keep up to date with all our exciting news and ideas by following us on twitter [@EDIUCL](#) – see you around!



Thesis Writing Workshop

We are pleased to announce that our department's first thesis workshop was a great success, with overwhelmingly positive feedback. The aim of the workshop was to improve and increase support for PhD students when entering and considering the writing up stage of their doctorate. Based on our follow-up survey results, we achieved this aim, and attendees reported a highly positive experience at the workshop. However, the good work should not stop there, and the EDI committee would love to hear any more thoughts and ideas that members of our community might have to create an even more supportive environment for our department and improve on the steps that we have already made. The thesis writing workshop will be making an annual appearance, so watch this space for those improvements.

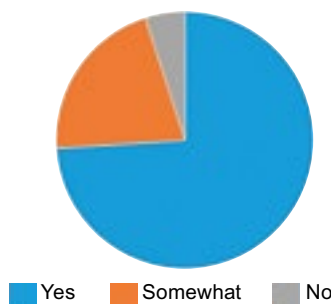
Image: Thesis Writing Workshop 2019



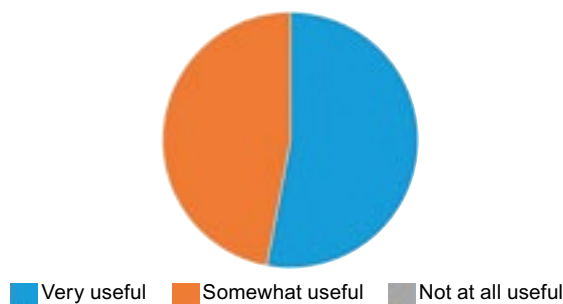
Attendance by Gender



Did the workshop help with your worries



Usefulness of the Event?



EDI Events

Coffee Mornings

We hold weekly coffee mornings on **Wednesdays** from **10.30am – 11.30am** in the Nyholm Room. This is an informal coffee open to all staff to socialise and network. Please feel free to pop along, we only ask you bring your own mug!

19th November 2019

International Men's Day: Join us in celebrating the positive value the men in Chemistry bring to the world, their families and communities.

4th December 2019

International Day of People with Disabilities (3rd December): To mark IDPWD, the department is inviting the Chair of the Enable Network to the coffee morning to explore relevant topics for disabled staff.

March 2020

The EDI Team are currently putting together a schedule of events to celebrate **International Women's Day**. We will be looking at the superstar women in Chemistry, what kick started their careers and what advice they give to others wishing to pursue an academic career.

If you have any topics you would like the committee to explore, please do get in touch with us.

Contact Us

Website: <https://www.ucl.ac.uk/chemistry/equality-diversity-inclusion-edi>

Email: chem.edi@ucl.ac.uk

Twitter: [@UCLChemEDI](https://twitter.com/UCLChemEDI)



Chemistry Department staff at this year's graduation ceremony, Royal Festival Hall, 4 September Left to right: Mr Mike Kelly, Dr Krešo Bučar, Dr Dewi Lewis, Prof. Ivan Parkin, Prof. Claire Carmalt, Dr Martijn Zwijnenburg, Dr Stephen Potts, Prof. Katherine Holt, Prof. Chris Blackman, Prof Tom Sheppard, Prof. David Scanlon, Dr Gemma-Louise Davies, Prof. Daren Caruana

2018 – 2019 PRIZE WINNERS

We would like to congratulate the following prize winners:

Undergraduate Prize Winners

TERESA INSINNA

CK Ingold Prize

For Excellence in Undergraduate Performance

ISOBEL DUDLEY

CK Ingold Prize

For Excellence in Undergraduate Performance

SADIA BEGUM

CK Ingold Prize

For Excellence in Undergraduate Performance

CONNIE YANG

CK Ingold Prize

For Excellence in Undergraduate Performance

HARRY LI

CK Ingold Prize

For Excellence in Undergraduate Performance

KRISTINA KOSTADINOVA

CK Ingold Prize

For Excellence in Undergraduate Performance

KATARINA BRLEC

Neil Sharp Prize

For Excellence in Theoretical (including Computational) Chemistry

SORINA IACOBAN

Parke Davis Prize

For Excellence in Medicinal Chemistry

JORIS SIMAITIS

Harry Poole Prize

For Excellence in Physical Chemistry

ASHLEIGH KIRS

Ronald Nyholm Prize

For Excellence in Inorganic Chemistry

ROSALIND STRANG

Charles Vernon Prize

For Excellence in Biological Chemistry

YASSIN HJIEJ ANDALOUSSI

Franz Sondheimer Prize

For Excellence in Organic Chemistry

PhD Prize Winners

KATARINA BRLEC

Supervisor: David Scanlon

Ronald Gillespie Prize

- For the best graduate starting a PhD in Inorganic/ Materials Chemistry

NEHAAL AHMED

Supervisor: Vijay Chudasama

Tuffnell scholarship

- For the best graduate progressing to the research school

Second Year PhD Poster prizes

We are pleased prizes were awarded for the best 2nd Year PhD poster to the following students:

Computational Chemistry: **Alexander Gheorghiu**

Supervisor: Peter Coveney

Organic Chemistry: **William Whitehouse**

Supervisor: Stefan Howorka

Inorganic Chemistry: **Kristian Mears**

Supervisor: Claire Carmalt

Physical Chemistry: **Roshni Malde**

Supervisor: Jamie Baker

Rothwell Prize for best poster in synthetic inorganic chemistry: **Helena Philpott**

Supervisor: Helen Hailes

Chemistry Prizes

On the 26 June 2019 Professor Claire Carmalt (Head of Department) congratulated the following final year PhD students who were awarded prizes for the best presentation in each of the major research areas of Organic/Medicinal, Inorganic/Materials, Computational and Physical Chemistry, as assessed by a committee.



Sebastian receives his Catlow Prize from Prof. Claire Carmalt

SEBASTIAN DIXON

Catlow Prize

Supervisors: Ivan Parkin and Claire Carmalt

Best PhD presentation in Inorganic Chemistry for his presentation entitled: Understanding mobility trends in transition metal doped $\text{In}_2\text{O}_3\text{:M}$ (M = Mo, Hf, Zr, Sn)



Robert receives his Catlow Prize from Prof. Claire Carmalt

ROBERT SINCLAIR

Catlow Prize

Supervisor: Peter Coveney

Best PhD presentation in Computational Chemistry for his presentation entitled: Multiscale Modelling of Graphene's Mechanical Properties



Catherine receives her Ewing Prize from Prof. Claire Carmalt

CATHERINE HIGGINS

Ewing Prize

Supervisor: Steve Price

Best PhD presentation in Physical Chemistry for her presentation entitled: The Interactions and Reactions of Small Molecules on Astrochemically Relevant Surfaces



Peter receives his Davies Prize from Prof. Claire Carmalt

PETER SEAVILL

Davies Prize

Supervisors: Jon Wilden and Katherine Holt

Best PhD presentation in Organic Chemistry for his presentation entitled: Utilising Copper for Methodological Advancements in Electro-Organic Synthesis

Honourable mention to runners up:

Inorganic chemistry: Jian Guo

Physical Chemistry - Gabriele Marchello

Organic Chemistry - Jianxiong Zhao & Andre Shamsabadi

Graduating Students

MIREN AGOTE ARAN

PhD Chemistry

Supervisor: Andrew Beale

ABDULLAH ALOTAIBI

PhD Chemistry

Supervisor: Ivan Parkin

KATHRYN ASHE

PhD Chemistry

Supervisor: Matthew Powner

DUSTIN BAUER

PhD Chemistry

Supervisor: Jawwad Darr

GAVIN BELL

PhD Chemistry

Supervisor: Ivan Parkin

GIULIA BOUCHER

ENGD

Supervisor: Dario Alfe

JACOB CHAPMAN

ENGD

Supervisor: Dorothy Duffy

ADAM CLARK

ENGD

Supervisor: Gopinathan Sankar

MERINA CORPINOT

PhD Chemistry

Supervisor: Dejan-Kresimir Bucar

ELEANOR DANN

PhD Chemistry

Supervisor: Richard Catlow

DONATO DECAROLIS

PhD Chemistry

Supervisor: Andrew Beale

RACHEL FLETCHER

PhD Chemistry

Supervisor: Ben Slater

CALLUM FODEN

PhD Chemistry

Supervisor: Thomas Sheppard

ALEX GANOSE

ENGD

Supervisor: David Scanlon

FELICITY GOSSAN

PhD Chemistry

Supervisor: Stephen Price

THEODORE HAYES

PhD Chemistry

Supervisor: Jonathan Wilden

LUCA IUZZOLINO

ENGD

Supervisor: Sarah Price

GALVIN KHARA

ENGD

Supervisor: Dorothy Duffy

LEONA LEIPOLD

PhD Chemistry

Supervisor: Helen Hailes

YAOMIN LI

PhD Chemistry

Supervisor: Christopher Blackman

EVA LIATSI DOUVITSA

PhD Chemistry

Supervisor: Giuseppe Battaglia

KIT MCCOLL

PhD Chemistry

Supervisor: Furio Cora

IMMAD NADEEM

ENGD

Supervisor: Geoff Thornton

JOSEPH NEWCOMBE

PhD Chemistry

Supervisor: Thomas Sheppard/Alethea Tabor

HA NGUYEN

PhD Chemistry

Supervisor: Stefan Howorka

STEVEN PACMAN

PhD Chemistry

Supervisor: James Anderson

ROSSELLA PROMONTORIO

PhD Chemistry

Supervisor: Charles Marson

ENCARNA PUCHETA MARTINEZ

PhD Chemistry

Supervisor: Francesco Gervasio

GENEVIEVE PUGH

PhD Chemistry

Supervisor: Stefan Howorka

MIGUEL QUESADA GONZALEZ

PhD Chemistry

Supervisors: Ivan Parkin and Claire Carmalt

LISA RICHARDS

PhD Chemistry

Supervisor: Richard Catlow

SAMUEL ROBERTS

PhD Chemistry

Supervisor: Matthew Powner

CHRISTOPHER SAVORY

PhD Chemistry

Supervisor: David Scanlon

HARRIET STORY

PhD Chemistry

Supervisor: Alethea Tabor

AISHA SYED

PhD Chemistry

Supervisor: James Anderson

FELICITY TAYLOR

PhD Chemistry

Supervisor: Richard Catlow

DIANA TEIXEIRA GOMEZ

PhD Chemistry

Supervisor: Robert Palgrave

OLIVER WARE

PhD Chemistry

Supervisor: James Anderson

TINGTING ZHAO

PhD Chemistry

Supervisor: Xiao Guo

UCL Chemistry Outreach



Deeqa & Desmond

In addition to welcoming 1000s of students and teachers to the department for outreach days, our undergrad students have been involved in two very exciting projects.

Deeqa and Desmond are both about to start their third year in Chemistry and were enlisted by Prof. Andrea Sella to help run some exciting projects over summer with two local schools. The idea started as an opportunity to provide important outreach to schools on what chemistry has to offer and to break down stereotypes of what a scientist may look like.

The first project was to highlight air pollution working with two local schools. The first was Highbury Grove, a secondary school Academy in the City of London. The second was a referral centre for excluded students in south London, which we believe sends a positive message to those pupils who are on the margins of mainstream education that they have not been abandoned. Deeqa and Desmond took their knowledge from first year labs to collect NO_x - nitrogen oxides that contributes to the formation of smog and acid rain, but also plays a role in affecting tropospheric ozone - an important region protecting us from harmful UV radiation.



Lego Spectrometer

Deeqa and Desmond brought kit from our labs, helped the students assemble it, and got them to make a cool looking lego spectrometer. The students were asked to select locations around London to test for NO_x, and work began on analysing concentrations from these different locations.



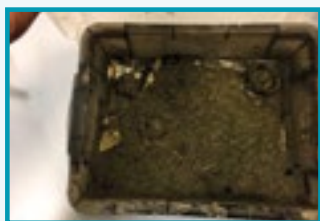
Bright pink NO_x

By using a known stock solution, the NO_x formed a bright pink colour when in high concentrations - bringing the science to life with a colour scale of how bad air pollution is in certain areas.

The second project saw Deeqa and Desmond team up with Thames 21 (who clean the Thames) and Helen Czerski, an oceans physicist, to start work on the Thames Plastic project: understanding all the different types (and there are many) of plastic that come into our river.



Collecting



Cleaning

One hundred randomly selected samples were chosen from the Thames, cleaned and subjected to IR spectroscopy, which reveals key signatures allowing for the identification of the plastic, to then begin work on creating a database on all the different plastic types. They even noted any labels left on the plastics to get an idea of where the plastic might have come from. The department is now providing Raman spectroscopy training, to help gain a greater insight into the exact composition of these plastics from structural fingerprints.

Both Deeqa and Desmond both said they have really appreciated the opportunity to get this experience and enjoyed working with pupils to bring chemistry to life.

Congratulations to students in Prof. Helen Fielding's group **Anand Patel & Alice Henley.**

Anand won the presentation prize for his talk on the synthesis and anion photoelectron spectroscopy of oxyluciferins at the 1st UK(RSC)-IT Joint Meeting on Photochemistry in Lipari, Italy, 24 – 26 June 2019.

Alice won the RSC Poster Prize at the Faraday Discussion Meeting on Advances in Ion Spectroscopy for her poster titled 'New twists on the relaxation dynamics of the photoactive yellow protein chromophore'.

Chemical & Physical Society Annual Report 2018-19

By Dr Stephen Potts, President

The Chemical & Physical Society (CPS) was founded in 1876, which makes it UCL's oldest student-run society! The cornerstone of the CPS is its committee, comprising dedicated and enthusiastic undergraduate students and postgraduate researchers, who organise and run the events. Academic staff sit on the committee as President and Vice-President in mentoring and advisory roles, but it was safe to say that, this year, the mentoring was not necessary! The main draws of the CPS are its weekly talks, held on Tuesday evenings during term-time, in addition to social events and, of course, the coveted colour-changing CPS mug.

This year marked the 143rd academic year of the CPS and there certainly seemed to be no sign of it slowing down, with the Ramsay Lecture Theatre being packed out almost every week. This year's programme kicked off with a talk by Prof. Duncan Wass (University of Bristol) on **"Directions for Catalysts: Biofuels to Self-Healing Planes"**, describing how catalysis is employed to create materials from advanced biofuels, such as methanol, to self-healing planes – particularly important when carbon-fibre is replacing aluminium in airframes.

We then moved on to **"Molecules of Murder"** by Dr John Emsley (science writer). The talk, based on his book of the same name, contained lots of useful advice on how to dispatch unwanted people (provided you wanted to get caught). This was John's fourth visit to the CPS; having spoken to us in 1996, 2006 and last year. We'd gladly have him back again, but he'd have to write a new book! The following week's talk took us to the opposite end of the health spectrum; i.e. assessment of public health. In her talk **"Urban Water Fingerprinting to Inform of the Environment & Health"**, Prof. Barbara Kasprzyk-Hordern (University of Bath) introduced us to a cutting-edge approach of waste-water analysis, which gave insight in the general health of the local population and allowed for prediction of health risk.

Continuing on the topic of health, Dr John Marsden (King's College London) gave a fascinating presentation on **"Mental Images & Memory Processes as Targets for Cocaine Use"**, in which he described how observation of cocaine users has led to new insights into how psychological therapies can be adapted to treat addiction. There were some rather uncomfortable videos shown that really hammered home how important effective addiction therapy is.

The following week, we hosted our annual careers event, where speakers with chemistry degrees explained how they got to where they are today. This event was very well attended and promises to be bigger next year! The next talk followed on nicely, as UCL graduate Dr Anna Ploszajski (science communicator) gave an enthusiastic overview of **"Smart Materials"** and the challenges associated with them, which is why their widespread adoption has been somewhat limited, despite their promising applications.

"Mind Reading and Interpersonal Attraction" was the topic of our next talk by Dr Peter Mitchell (University of Nottingham). Peter demonstrated that people are more skilled at mind reading than they might realise and talked about the subtle cues we don't realise we respond to. It was certainly mind-expanding and something I'll be using on colleagues in the future. Sticking with matters of the brain, the following week Prof. Stephen Brickley (Imperial College London) discussed **"Age-Related Changes in Synaptic Transmission in Cognitive Design"**. He described that, rather depressingly, synaptic decline starts in humans in their 20s. However, a greater understanding of this decline has led to improvements in treatment for people suffering from lapses in cognition.



The committee signing up new members in September



Dr John Emsley giving his talk on "Molecules of Murder".



Prof. Barbara Kasprzyk-Hordern giving her talk on water fingerprinting

For our last talk of 2018, we left Earth to hear about **“Molecules in Space: Our Astronomical Origins”** by Dr Catherine Walsh (University of Leeds). The complex organic molecules that make up life originated from simple molecules, such as H_2 and CO, nucleating on interstellar ice and asteroids. It was fascinating, eye-opening stuff. Later that week, we said goodbye to the year with our infamous Christmas Quiz. Apparently, the theme tune to **“Arthur”** is very popular with chemists.

The new year kicked off with Prof. David Nutt (Imperial College London), who is famous for his former governmental role. His talk, **“Why We Must Change the Drug Laws to Liberate Research and Treatment”**, covered how many of the UK’s drug laws are based on moral issues rather than scientific evidence. There was a lot of data to back up his claims and it certainly marked an exciting start to 2019!

Dr Lizzy Ostler (University of Brighton) followed on with **“Will Red Wine and Chocolate Really Keep You Young and Healthy?”**, which looked at myths like a glass of red wine a day being good for you (isn’t it?). From food to scents, Ruth Mastenbroek (perfumer) gave one of the few talks with an equation as the title: **“Perfume = Chemistry + Artistry: An Interactive Talk”**. She covered the history of perfume and the associated molecules before explaining why the ingredients of perfume are never revealed on products, all while handing round samples. The Ramsay Lecture Theatre has never smelt sweeter!

By far the most popular talk of the term (indeed the year) was **“The Science of Climate Change – and What We Can Do About It”**. Prof. Joanna Haigh (Imperial College London) gave a sobering overview of the current state of the Earth’s climate, with clear scientific evidence demonstrating the rise in global temperature and carbon dioxide levels. However, she gave some sound advice on possible solutions to slow down these increases.

From the global environment to a more personal one, Dr Linda Thomas (consultant) gave a fascinating overview of how probiotic supplements fell foul of regulation in terms of what their manufacturers could claim in advertising in **“The Rise and Fall (and Rise Again?) of Probiotics”**. However, she showed evidence that taking care of your gut biome really can benefit your general wellbeing, anticipating a resurgence in their use. This talk was followed by Dr Rebekah Higgitt (University of Kent), whose talk, **“The First Prize Medal for Science: The Origin of the Royal Society’s Copley Medal”**, was a fascinating history of the esteemed prize.

From the historical to the modern. Dr Stephen Hilton (University College London) showed that a lot of money could be saved by printing lab equipment and consumables in **“3D Printing and its Applications Across Pharmacy and Chemical Synthesis”**. He went on to show how printing cases for magnetic stirrer bars can beneficially alter catalytic routes in certain chemical reactions. This was followed by a PhD speaker, Cerys Bradley (University College London), whose talk **“Measuring the Dark Web”** explained how the internet can be exploited for drug use and what is being done to combat it.

The last two weeks of the term turned to alcohol. Prof. Andrew Whiting (Durham University), who also runs the company pHure Gin, talked about **“Gin: the People’s Tonic”**. He presented a history of gin before explaining that pHure distills the gin at low pressure so that the lighter volatiles are retained, giving it a distinct flavour profile. We all had a chance to try it and it was delicious (from what I remember).

Lastly, Dr Stephen Potts (University College London) changed his usual wine-tasting into a talk: **“In Vino Veritas (et Moliculis)”**. He presented 13 molecules that are key aroma and flavour components in wine and described their origins. Although everyone’s nostrils were saturated by the end of the presentation, and the department smelled of old cork for the next week, it went down well with everyone (the post-talk wine helped too).

To round off the academic year, the CPS hosted its third **Boat Party**. Students from all year groups donned their best outfits to party the night away on the Thames and forget about impending exam results.

For more information about the CPS and the talk schedule for the next academic year, please visit www.cpsucl.com. Don’t forget to follow us on Facebook, Twitter (@CPSUCL) and Instagram (@cps_ucl), too!



The CPS committee at the annual Chemistry Lab Dinner



Committee members listening to Prof. David Nutt after his talk

Spectroscopy and Dynamics Seminars

We have hosted a series of weekly seminars that began in January 2019 and have hosted a diverse group of speakers from the Chemistry department and beyond in the broad field of spectroscopy and dynamics.

In January several research groups within the Department of Chemistry banded together to run the 'SDG seminars' – the spectroscopy and dynamics group seminars – based on shared research interest. This includes the groups of Helen Fielding, Stephen Price, Tracey Clarke, Graham Worth and Geoff Thornton, and the organising committee is formed from PhD students and Postdocs from each group.

We organise seminars on a weekly basis during term-time, from within our own groups and from further afield. External speakers have included Dr Artem Bakulin from Imperial College London, Dr Rachel Crespo-Otero from Queen Mary University of London, Prof. Gaetana Laricchia from University College London Physics and Prof. Katherine Holt from University College London as well. Each of these external speakers delivered a talk on their research for the relatively general audience of the SDG and anyone else who saw us advertising in the chemistry weekly newsletter!

Being a spectroscopy and dynamics focussed group does not restrict us in the choice of invited speakers, and we aim to find external speakers who work on the edge of something new – such as Professor Laricchia who gave a delightful and informative talk on positronium scattering from gas-phase molecules. To this effect, we are open to speakers from other aspects of physical chemistry as well. We often head to a local pub after the meeting to talk shop, so the group is a social one as well.

As a student and postdoc led meeting, we encourage everyone to present and chair, particularly the Masters and PhD students. This gives everyone a chance to practise this skill in front of a friendly audience. The environment also functions for getting feedback on new results, to pool our collective experience and understanding.

If anyone is interested in being added to the mailing list, or presenting their own work during the next year, please contact me. It is a welcoming environment designed for perfecting presentations for conferences and provides an opportunity to interest others in your work.

Dr Lily Ellis-Gibblings



ISOBEL WILSON is doing her PhD with Katherine Holt and Mike Porter, won the '**Three Minute Thesis**' competition at the MAPS faculty heat in June.

Isobel's talk was about the benefits of using electrochemistry in organic synthesis, such as reducing waste and toxicity. However, the uptake of this method of synthesis is slow in the organic community. Her research focuses on trying to develop a useful and adaptable electrosynthetic reaction to highlight the benefits of this type of process.



ELEANOR DANN is the recipient of the **2018 Ramsay Medal**. After graduating from University of Bristol in 2015, Ellie started her PhD with UCL under the supervision of Professor Richard Catlow and Dr Peter Wells (University of Southampton) in the

field of heterogeneous catalysis. Throughout the duration of her PhD, Ellie has been part of the UK Catalysis Hub located at the Research Complex in Harwell. As an industrially funded iCASE student, Ellie has worked closely with Johnson Matthey Technology Centre to provide greater understanding of the heterogeneous catalyst materials for emissions control technology. This has involved designing a new reactor for time-resolved X-ray absorption spectroscopy (XAFS) and diffuse reflectance infrared spectroscopy (DRIFTS) of supported palladium nanoparticle materials during catalytic operation for specific reactions; CO oxidation, selective NH₃ oxidation and CH₄ oxidation. Over the last three years Ellie has collaborated with beamline scientists at Diamond Light Source, the European Synchrotron Radiation Facility and the Swiss Light Source to make significant advances to the characterisation of supported nanoparticle catalysts, with work published in ACS Chemistry of Materials and Nature Catalysis. Ellie is now writing her thesis titled 'Improving Synchrotron Methods for Advanced Characterisation of Heterogeneous Catalysts', and has ambitions to train as a patent attorney.

Eleanor Dann received her Ramsay Medal from Prof. Claire Carmalt at the 2018 Chemistry Lab Dinner

2019 CHEMISTRY LAB DINNER

We are pleased to announce that this year's Chemistry Lab Dinner will be taking place on

Friday 22nd November 2019

at the Ambassadors Bloomsbury Hotel

For further details please visit our website: <http://www.ucl.ac.uk/chemistry/about-us/chemistry-lab-dinner>



This year we are thrilled to announce the Thomas Graham Lecture will be given by Dr Matthew Powner. Matt was born in Wensleydale, North Yorkshire in 1981. He obtained a

first class master's degree in chemistry at the University of Manchester (2005), where he was awarded the Royal Society of Chemistry prize, the Degussa award, the Sigma-Aldrich prize, the Glaxo prize, the Eric Braithwaite prize, the Swan prize and the Merck Sharp & Dohme award. He then completed a medicinal chemistry internship at AstraZeneca, Alderley Park, before returning to Manchester to complete his PhD (2009) and a short EPSRC Doctoral Prize post-doctoral fellowship with Prof. John Sutherland FRS. In 2009 he was awarded a

Harvard Research Fellowship to work with Nobel Laureate Prof. Jack Szostak FRS at Massachusetts General Hospital and Harvard Medical School. He returned to the UK in 2011, joining UCL as a Lecturer in the Chemistry Department, where he is currently a Professor of Organic Chemistry and an Investigator of the Simons Foundation Collaboration on the Origins of Life. His research interests centre around chemistry associated with the origin of life and, along with his research group, has made contributions in the areas of nucleic acid and amino acid chemistry, protometabolic networks, ribozymes, lipids, crystal engineering, green chemistry, catalysis and photochemistry. Dr Powner has been awarded various prizes and fellowships in recognition of his research, including the ISSOL Stanley Miller Award (2011), the SET for Britain Roscoe Medal (2012), 1st prize in the Origins of Life Challenge (2012; jointly with Prof. John Sutherland FRS), an EPSRC Early Career Fellowship (2013), a Bürgenstock JPS Fellowship (2015), the Thieme Chemistry Journal Award (2015), a Center for Advanced Studies Fellowship (2016) and the RSC Harrison-Meldola Memorial Prize (2019).



Our after-dinner speech will be given by Ebony-Jewel Rainford-Brent who graduated with a MSci in Chemistry in 2006 and went on to play with the England team that won the 9th ICC Women's Cricket World Cup, the World T20 and Women's Ashes in 2009. Ebony-Jewel was awarded UCL Sportswoman of the Year in March 2007 and was the first Director of Women's Cricket at Surrey County Cricket Club.

Since retiring from sport, Ebony has gone on to a career in the media including becoming a broadcaster and commentator for the flagship BBC programme 'Test Match Special', as well as following her passion for personal development as a Motivational Speaker and Performance Coach.



We have also invited the President of the Chemical and Physical Society, Dr Anna Roffey to give a short speech on the current status of the CPS and how you can get involved. Anna joined the department as Teaching Fellow in 2017.

How to secure your place

We operate on a first come, first served basis and have 80 places available.

The full cost of the evening is £45. For current postgraduate students, a limited number of tickets will be charged at £25. To book your place at this year's event, please complete a booking form (found on the link above) for payment information. All cheques should be made payable to "**University College London**".

Tickets are non-refundable.

Obituary



Robin Clark 1935 – 2018

Robin Clark, who had been a member of the Department for 60 years, died on December 6, 2018 after a short illness. He was a distinguished physical/inorganic chemist who made major discoveries in the chemistry of the early transition metals, especially of titanium

and vanadium compounds with high coordination numbers, and of mixed valence, linear chain and metal-metal bonded complexes. He was also known for developing techniques of far infrared, Raman and resonance Raman spectroscopy applied to inorganic compounds, including pigments used in artworks and historical artefacts, thereby establishing a basis for verifying their provenance and identifying forgeries.

Robin was born in Rangiora in New Zealand, in 1935, and took a BSc and MSc degree in chemistry at Canterbury University College from 1953 -1958. He started a PhD at Otago University, but his supervisor, W.S. Fyfe moved to Berkeley. Robin then applied to work with Professor Ron Nyholm at UCL: on the toss of a sixpence he decided to accept the offer and after a long journey by boat and train he arrived in the UK on 29 July 1958. He spent all of his subsequent career in the Department, but always remained proud of his New Zealand heritage and kept strong contact with his homeland.

Ron Nyholm was widely seen as being responsible for the renaissance of inorganic chemistry, and the Department was a very lively place with a large contingent of Australian research students and staff who played in the departmental "Australia versus The Rest" cricket game. As a New Zealander, Robin was co-opted on the Australia team. Ron was interested in the chemistry of the transition metal elements and their complexes. Although highly (7- and 8-fold) coordinated complexes were known with Zr and Hf, it was widely believed that these would not form with early transition metals due to steric congestion. However, in his Ph.D. work Robin prepared the 8-coordinate complex

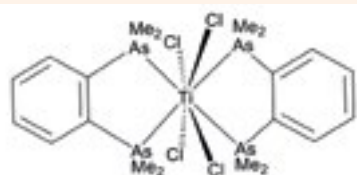


Figure 1

$[\text{TiCl}_4(\text{Diars})_2]$ between titanium tetrachloride and the diarsine ligand 1,2- $\text{C}_6\text{H}_4(\text{AsMe}_2)_2$ (Fig. 1), leading to a *Nature* paper.

He was appointed as a lecturer in 1962 and rapidly built up his own research group, using reflectance UV-visible and far-IR spectroscopy to

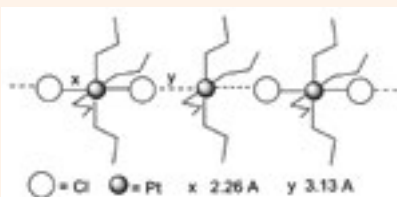


Figure 2

study inorganic compounds and solids. He later developed and applied Raman and resonance Raman techniques in complementary research.

In 1968 Robin published what is still regarded as the definitive monograph on the chemistry of *Titanium and Vanadium*, followed by volumes on *Titanium, Zirconium and Hafnium*, and on *Vanadium, Niobium and Tantalum*. He worked on the chemistry of complexes of Ni(II), Pd(II), Pt(II), V(III), and Cr(III). These compounds are highly air- and moisture-sensitive, and at the time UCL had no capability to handle them. Robin took a Linguaphone refresher course in German and translated a Ph.D. thesis from Jena that contained the necessary information. He then worked with departmental glass blowers to produce equipment that he used to establish the structures by diffraction and spectroscopic methods. Many types of compounds were studied, including metal-metal bonded compounds such as $[\text{Mo}_2\text{Cl}_8]^{4-}$ and $[\text{Re}_2\text{F}_8]^{2-}$, and the mixed-valence chlorine-bridged Pt(II)-Pt(IV) Wolfram's salt (Fig. 2). His work on Ni, Pd and Pt compounds began when he spent time with Harry B. Gray at Columbia University in New York, where the two friends appeared to improve their tennis skills while advancing science. When Harry moved to CalTech in 1965, Robin spent several months replacing him as visiting Associate Professor.

Robin's use of far-IR spectroscopy to study metal-ligand vibrations in halide and other complexes attracted considerable attention and it established use of the technique for structural characterisation. He later played a leading role in developing laser Raman spectroscopy as part of the University of London Intercollegiate Research Service (ULIRS) that he directed from 1970-73. The first instrument installed at Imperial College had the spectrometer in one room and the laser arrived through a hole in the wall from next door. Later Robin acquired funding for two state of the art Spex spectrometers that he installed at UCL, along with capabilities for multi-wavelength laser excitation. That permitted him to obtain the first Raman spectra of many highly coloured compounds, including pigments that later led to his work on artworks and ancient manuscripts. He soon began to investigate and then develop the technique of resonance Raman spectroscopy, where the interaction between electronic and vibrational transitions as a function of the laser excitation wavelength cause remarkable enhancement of certain Raman-active modes, including observation of extended progressions of overtones leading to analysis of anharmonicity parameters and opto-electronic coupling coefficients. His influential review of the field in *Angewandte Chemie* in 1986 as well as his editorship of "*Advances in Infrared and Raman Spectroscopy*" and "*Advances in Spectroscopy*", and co-authorship

of **"Raman Spectroscopy"** established Robin as one of the international leaders in the field, and his UCL Raman laboratory based in Chemistry as one of the main centres of activity.

Robin then complemented the Raman instrumentation by acquiring a micro-beam Raman instrument. The microscope could focus the incident laser beam and collect spectra from individual grains and regions within a sample as small as 2-5µm in diameter. Steve Best had joined Robin's group in 1984 to investigate electronic transitions and reaction mechanisms in transition metal complexes, and also developed a spectro-electrochemical cell for *in situ* studies and control of redox-active species. He received a phone call from UCL History of Art following a newspaper report describing the use of Raman microscopy to identify lapis lazuli, an important pigment. Robin had already worked on ultramarine blue to identify the chromophoric species S2- and S3- responsible for the characteristic intense colour. Although initially sceptical because of the possibility that electronic fluorescence could swamp the weak Raman signal, they showed that spectra could be successfully obtained using the microbeam technique. This led to a long and successful collaboration between Robin and library, museum and gallery curators to study and evaluate artworks and historical documents using Raman micro-spectroscopy. Initially, manuscript fragments for examination were assembled by Mrs Cheryl A. Porter of the History of Art department, and her input became critical for establishing contacts with curators or conservators who would permit laser illumination of their illuminated manuscripts. Later, Robin acquired a more portable Renishaw Raman spectrometer that included a fibre-optic attachment to enable scanning valuable documents *in situ* at their location. That led to important studies carried out in collaboration with many institutions, particularly the British Library. Robin and his team studied paintings and illuminated letters on over 100 manuscripts from some 25 countries ranging from

Korea, Thailand, India, Persia, Turkey, England, Iceland, and Colorado, and they varied in date from the 13th century BC to the 18th century AD. This included the Lindisfarne gospels ca. 715 AD, three of Gutenberg's printed bibles (1455), and the Vinland map which purported to show a pre-Columbus outline of the North East coast of North America, that their work showed to be a forgery. They also showed that the purported painting by Mark Chagall, dated 1910, of a *Nude Woman Reclining*, contained pigments which were not available until the 1930s. This work was dramatised on the BBC's programme *Fake or Fortune* in January 2014.

As Head of the Chemistry Department from 1989-1999. Robin took office at a difficult time when undergraduate numbers were low, and the Department ran at a large annual deficit according to a financial model that measured space required for teaching and research that were large for an experimentally-based discipline, against student numbers. Robin immediately set up a recruitment committee with clear goals to attract new students and the intake numbers improved. Ten staff vacancies occurred during his headship (1989-1999) and each time Robin won a battle with the Provost to be allowed to fill those positions, and excellent appointments were made. He also fostered cooperation with other departments in the science faculties and, with Peter Day, persuaded the Provost to agree that the Royal Institution and the Department should join forces: RI students could now register for joint PhD projects with access to EPSRC grants, and their numbers could be included in the RAE grading of Chemistry Departments. The RAE score rose to 4 in 1989 and later achieved 5* in 2001.

Robin was elected a Fellow of the Royal Society in 1990 and was made a Companion of the New Zealand Order of Merit (CNZM) in 2004 and won a large number of other awards including the Royal Society's Bakerian Lectureship and the Royal Society of Chemistry's Liversidge Lectureship.

Donations

A big thank you to all the kind people who have supported the department directly to help us to build on our international reputation for teaching, research, and to make a range of exciting activities possible. Your kind contributions have a direct impact upon our students and staff, and we are very grateful for it.

We continue to provide an excellent education and training environment for undergraduate and postgraduate students in Chemistry and all staff are developing innovative methods to inspire and instruct. It is great to know that we have your support and assistance as we work to do this.

From Kerala to London: using UCL's records to rediscover a father's story

When Gopal Krishnan contacted UCL Alumni to help retrace his father's path to UCL, he had the chance to see his father's old student records and visit with staff and tour the Chemistry Department.

Many look to their family history for insights into their own identity. UCL was thrilled to help one man do just that during a visit to the UK from his home in India.

Gopal Krishnan is a mentor and advisor for Ayurveda Wellness Centres and Hospitals in Kerala. He recently came to the UK with his wife, Latika, to visit their daughter. While here, he wanted to find out more about his father, and role model, Krishnan Gopalan Unnithan (BSc Chemistry, 1934).

Ahead of his visit, Gopal contacted the Alumni Relations team at UCL and asked if we could help him find out more about his father's time at the university. We delved into our Special Collections and Student Records to dig out Krishnan's personal files.

Born in 1910, Krishnan studied at UCL during the 1930s. Sadly, Krishnan passed away in 1991 but left a rich legacy for his son to discover. Gopal says: "I remember my father as a kind man, he would always treat people with respect. He was totally dedicated to his profession. He was a spirited man who would not just sit idle. It's always been a mission in my life to see where he studied."

After completing a degree in India, Krishnan studied a Science BSc at UCL from 1931 to 1934 taking on subjects in chemistry and mathematics. Under the direction of His Highness the Maharajah of Travancore (now Kerala), he went on to specialise in rubber technology, becoming an Associate of Rubber Industry, London. He returned to India and was appointed as Rubber Expert in the Travancore Government Rubber Factory, later becoming General Manager before retiring.

While Gopal was visiting, UCL's Special Collections team showed him Krishnan's records, along with some other images and documents from the time he was studying, including the student magazine and photos of the campus. But there was one very special document, Krishnan's student records containing his handwriting and signature. For Gopal, seeing his father's signature after all this time was an incredibly moving moment – and later back in India, Gopal's sisters shed a tear on seeing the photos of it that Gopal had taken.

To give Gopal more perspective on his father's time at UCL, we also took him and Latika behind the scenes of the Chemistry Department, where he met with Professor Andrea Sella and Dr Dewi Lewis.

Gopal and Latika were given a tour of the Chemistry research facilities at the Christopher Ingold Building before being shown the refurbished facilities at the Kathleen Lonsdale Building where his father would have studied. Gopal shared many photos belonging to his father that showed that not much had changed.

For Gopal, the trip was invaluable. He says: "Those few hours were some of the most memorable moments of my life! I want to express my sincere thanks for all of the wonderful arrangements UCL made, for retaining those records and giving me a chance to see them."

Event photography with thanks from John Moloney Photography
Historic images with thanks from Gopal Krishnan.
Text from UCL Alumni Relations



Dewi Lewi, Andrea Sella, Gopal and Latika

Photos from last year's Lab dinner



1940 Chemistry Alumni, Leonard Lovelock



After Dinner Speaker Dr Rob Jackson, University of Keele



Prof. Helen Fielding, delivering the 2018 RSC Thomas Graham Lecture

The Kathleen Lonsdale Schools Lecture

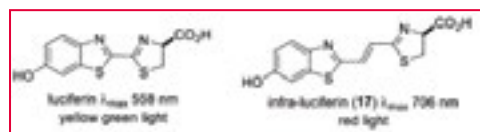
This year we celebrate the 70th anniversary of the appointment of UCL's first female Professor, Dame Kathleen Lonsdale FRS, who was made Professor of Chemistry in 1949. Prof Lonsdale was an eminent crystallographer and social campaigner. She discovered the structures of many important molecules and materials, including the first proof that benzene is a planar molecule. With support from the Royal Society of Chemistry, in June we held the first Kathleen Lonsdale Schools Lecture, which was delivered by Prof Judith Howard FRS. This will be an annual event hosted each summer and aimed at encouraging school children into science. We had over 150 students from many local and not-so-local schools attend.

This year's lecture was titled *The Endless Fascination of Crystals- Kathleen Lonsdale's legacy* and Prof Howard gave a great account of Kathleen Lonsdale's life and works. We were also lucky enough to have a talk from Dr. Claire Murray, who is a crystallographer at Diamond Light Source, and also works on the representation of women scientists in school textbooks. Dame Kathleen's son and grandson were also able to attend, as was her last PhD student, Prof. Mike Glazer.

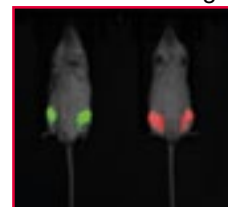
As a department we are glad to have our own 'named lecture' seeing as Imperial and Kings have long established lectures named after their famous alumni. Keep your eyes peeled for the announcement of the 2020 Kathleen Lonsdale Lecture.

Anderson research lab dual bioluminescence imaging using infraluciferin

The yellow-green light given by firefly's and other insects, known as bioluminescence, is one of nature's most spectacular phenomenon. The light is generated from the combination of a small molecule luciferin with an enzyme, luciferase. The light is spectacularly bright and is regularly used for the imaging of disease in living systems, so that we can see what is going on in real time, without invasion of the system being observed. The gene required to make the enzyme can be introduced into the genome of cells, such as cancer cells. When the cancer grows, the attached DNA machinery of the cell will make the luciferase enzyme. In the presence of luciferin, bioluminescence occurs and the detectable glow shows the extent and progression of the cancer cells. Unfortunately the yellow-green light naturally emitted by fireflies is absorbed by blood and tissue. We synthesised a modified luciferin, infraluciferin, that emits red light, which is transmitted through blood and tissue. Infraluciferin can also emit different shades of red light with modified enzymes. The multicolour red light emission of infraluciferin opens the possibility that we can track multiple biological events in the same sample if they produced different bioluminescence enzymes that emitted different shades of red light. We could then follow different diseases in a living animal or the elimination of a disease by a therapy. This will allow the easier observation of these events which will help develop better cures for diseases, such as cancer, and importantly reduce the number of animals required for the necessary research.



We have been able to show two cancer tumours in a single mouse, by infraluciferin emitting two different wavelengths of red light. The image below shows two cancer models differentiated by different bioluminescence light emissions with infraluciferin from different enzymes FLuc_green ~700nm (left mouse) and FLuc_red ~720nm (right mouse).



We have also used infraluciferin to track the effectiveness of CAR T cell therapy to eliminate a lymphoma tumour in a living mouse.

Infraluciferin will be used by scientists to study disease in living animals more quickly, cheaply and efficiently. The study of these diseases will enable therapies to be developed to combat them. The effectiveness of the therapies could also be tracked by this technique to help in the faster development of cures.

The Plastic Waste Innovation Hub

The Plastic Waste Innovation Hub was recently launched as a cross-disciplinary project across a number of UCL departments, including the Department of Chemistry (<https://www.instituteofmaking.org.uk/blog/2019/04/launch-of-ucl-plastic-waste-innovation-hub>). The Hub was set up as part of a 'Designing-out Plastic Waste' project funded by the Engineering and Physical Sciences Research Council (EPSRC) and UK Research and Innovation (UKRI) to investigate new interventions to tackle plastic waste (<https://www.plasticwastehub.org.uk/>). Research within the Department in the Hailes group focuses on the use of newly discovered PETases to break down polyethylene terephthalate (PET), whilst simultaneously exploring the use of enzymes for the breakdown of other plastics such as polypropylene and polyethylene. Building on previous work [e.g. F. Subrizi *et al*, *Angew. Chem. Int. Ed.*, **2019**, 58, 3854] upgrading of plastic monomers and the synthesis of novel monomers using enzymes is also ongoing. As part of the project, the team recently gave a talk at Cheltenham Science Festival, discussing possible solutions to the plastic waste problem and presenting our approach to the wider public. The talk aimed to engage the audience in a discussion about the sheer volume of plastic waste we are sending to landfill in the UK and what this means for the future, whilst going on to discuss the possibility of going 'plastic-free' together with misinformation about compostable and biodegradable packaging. Whilst acknowledging that there are many areas in our lives where we can significantly cut down on unnecessary single use plastic, it is important to realise that plastics usage can still be the most efficient option available to us due to its low mass. This is important when considering the wider effects of for example goods transport on climate change and global warming. Equally, the use of compostable and biodegradable plastics is largely misleading, as most countries do not have the industrial composters required for their degradation and they are contaminating current recycling streams or accumulating in the environment. Therefore, we believe that one of the options is to move away from the current linear economy and close the loop by breaking down plastics to their initial monomers to feed back into the system to create recycled virgin plastics.



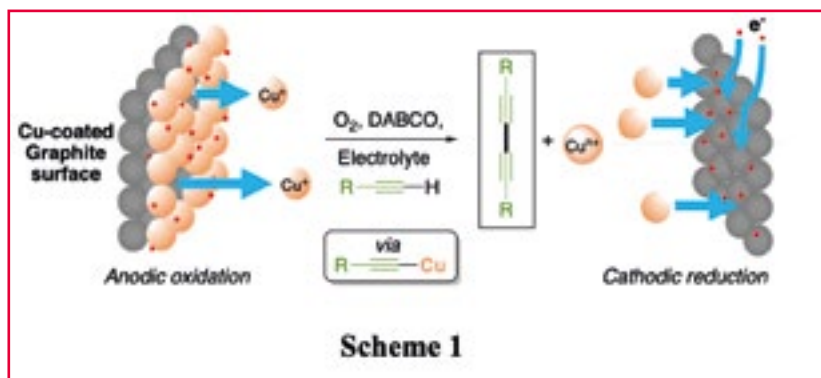
Caption: From left to right: Charnett Chau, Leona Leipold, Zoe Laughlin and Mark Miodownik

Applying electricity to classic organic reactions for a green and sustainable future

Jon Wilden

Electricity is a natural force that mankind has successfully harnessed to tremendous benefit. Until recently however, this powerful source of energy has received little attention from organic chemists as a way of controlling their reactions. There are many reasons for this: The apparatus is perceived as being cumbersome and expensive and many see the electrochemical technique as complex and loaded with unfamiliar jargon. The advantages of applying electricity to organic reactions however are considerable. Specific addition or removal of an electron from a substrate can give rise to reactive species that are not accessible by conventional routes. In addition, the sequential nature of the electron transfer reactions offers opportunities for control of reactivity of species participating in reactions.

In 2016, Jon Wilden's group took the decision to refocus their research and focus their efforts on using electricity to effect organic reactions in a 'green' and sustainable way. Initially, copper(I) acetylides were prepared electrochemically which were then subsequently employed in organic C–C bond forming reactions. The group has also demonstrated that application of Faraday's laws allows the charge to be calculated so that only the required amount of metal is used. In addition, the application of copper-coated graphite electrodes allows the maximum atom efficiency for this process and even offers a recovery strategy to extract the metal following completion of the reaction (**Scheme 1**, see Seavill, P. W.; Holt, K. B.; Wilden, J. D. *Green Chem.* **2018**, 20, 5474-5478).



Recent work within the group has focused on the activation of molecular oxygen via single-electron reduction at a carbon electrode to generate reactive oxygen species capable of selectively activating organic molecules at specific sites in their structure. A key consideration of this approach are the use of benign and non-toxic reagents and additives that are sustainable both environmentally and in terms of energy efficiency. This is particularly important as the functionalisation and manipulation of organic molecules is a critical part of many industries, most notably

pharmaceuticals, agrochemicals and polymer industries. These enterprises are constantly seeking new, sustainable, economical and non-toxic processes to effect construction of organic frameworks. This work has recently secured a grant from the Leverhulme Trust for the group to continue its exploration of this exciting area.



Dr Bob Schroeder awarded UKRI Future Leaders Fellowships

The UK Government have announced funding for 78 scientists and researchers through their Future Leaders Fellowships scheme.

The Government announced a £98 million investment, allowing both UK researchers and small businesses to seize the vast opportunities in science and innovation and industries of the future. Of this, £78 million will be invested in 78 scientists and researchers, supporting many of those working at the cutting edge of the next scientific discoveries – including solutions to climate change and birth defects.

Dr Schroeder's project will drive advances in self-healing materials, creating a wearable sensor that can be directly applied to human skin to allow for continuous patient monitoring and ultimately improve treatments.

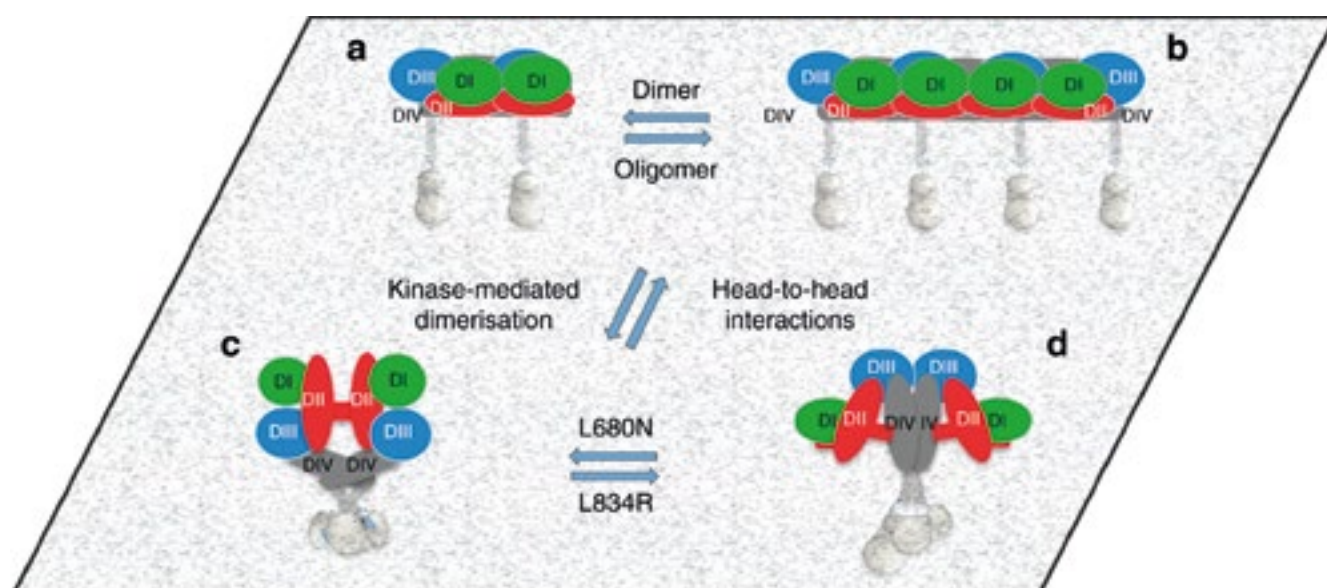
Understanding the activation mechanisms of a crucial drug target for lung cancer

Prof. Francesco L. Gervasio

The simulations performed by Prof. Francesco L. Gervasio's group contributed to clarify the complex activation and autoinhibition mechanisms of Epidermal Growth Factor Receptor through dimers and oligomers.

Epidermal growth factor receptor (EGFR) is a receptor tyrosine kinase whose activation through genetic mutations has been associated with a range of diseases, most notably non-small cell lung cancer. The majority of information regarding EGFR's activation mechanism thus far came from X-ray structures of monomer and dimer receptor fragments which were insufficient to adequately explain the receptor's (mis)behaviour in cells. So far it was thought that the activation of EGFR proceeded through the formation of an asymmetric dimer. Through a variety of high-resolution imaging techniques performed by Dr. Marisa Martin-Fernandez (Oxford and Harwell) combined with the state-of-the-art simulation and modelling approaches provided by Prof. Gervasio's group, it was possible to shed light on a much more complex mechanism, where an intricate balance exists between a multitude of EGFR's ligand-free dimeric and even oligomeric forms. This balance is disrupted when the somatic mutations occur in the absence of ligands and the scales are tipped towards active dysregulated forms leading to cell proliferation. These findings, published recently in **Nature Communications**, have great implications in the anti-cancer drug discovery process as they provide novel outlooks on the EGFR's activation in cells and might lead to the design of novel drugs.

Zanetti-Domingues LC, et al. (2018). The architecture of EGFR's basal complexes reveals autoinhibition mechanisms in dimers and oligomers. **Nat Commun** 9, 4325.



Peptide synthesis at the origins of life: energy-rich aminonitriles by-pass deactivated amino acids completely

Saidul Islam & Matthew Powner

Peptides are an essential element of all life on Earth. They are so highly enmeshed in physiology that it is difficult to imagine life without them. Peptide biosynthesis is now orchestrated by a complex host of genetically encoded enzymes, but it is inconceivable that these sophisticated and coordinated macromolecules suddenly emerged at the origin of life. A simpler scenario must lie at the root of peptide biosynthesis, but can the innate reactivity of prebiotic molecules initially replace enzymes? Can chemical reactivity control selective peptide ligation in water?

Peptides are widely assumed to be products of amino acid polymerization reactions. Whilst conceptually simple, in practice there are good reasons why these reactions are ineffective in water. For example, amino acids ($pK_{\text{aH}} = 9.4$) are zwitterionic at physiological pH, which quenches their nucleophilicity by protonation, and electrophilic condensation agents that activate amino acid monomers can irrevocably block peptide synthesis as well as derivatise amino acid side chain residues.

As reported in *Nature*, our group has reported a method to overcome several long-standing problems of peptide synthesis in water, which avoids uncontrolled polymerization reactions and by-passes amino acids altogether [1].

We took our initial cues from biology. Whereas **chemical peptide syntheses** generally proceed from the C-to-N terminus with ligation occurring at the activated monomer, both **ribosomal** (RNA-mediated) and **non-ribosomal** (thioester-mediated) peptide biosynthesis proceeds from the N-to-C terminus with ligation occurring at the activated C-terminus of the peptide chain (Fig. 1).

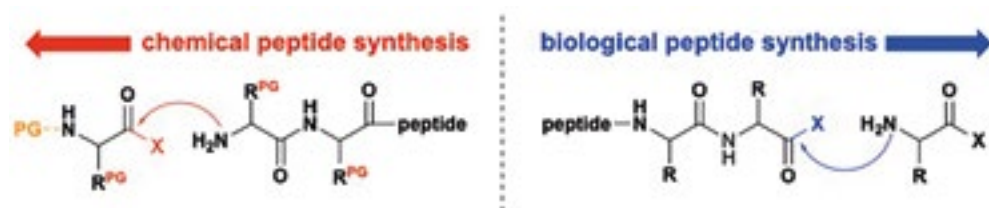


Figure 1 | Peptide synthesis.

Chemical peptide synthesis generally proceeds from the C-to-N terminus and requires a two-stage protecting-group strategy with orthogonal protecting groups for the activated monomers alpha-

amine (orange) and the amino acid residues (red). Conversely, biological peptide synthesis proceeds from the N-to-C terminus without protecting groups. PG = protecting group, R = amino acid side chain, X = leaving group.

As life has twice alighted on the same solution, it suggested to us that N-to-C-ligation may be privileged, and we suspected it would also be key to achieving prebiotic peptide synthesis in water. Furthermore, prokaryotic and mitochondrial protein syntheses are both initiated by N-formylation, and over 80% of eukaryote proteins are N-acetylated. Peptide N-acylation appears essential to prevent DKP-induced peptide degradation, so it seemed to us that peptide synthesis should proceed from the N-to-C terminus and be initiated by N-acylation.

But what substrates should be ligated and how should the peptide C-terminus be activated? We suspected that aminonitriles were the missing piece of this puzzle.

Aminonitriles have been widely explored as precursors of amino acids [2][3], but their potential in peptide ligation has been largely overlooked. alpha-Aminonitriles have a remarkably low basicity ($pK_{\text{aH}} = 5.3$) and they are only protonated in acidic solution (Fig. 2), which makes them ideally suited to ligation at physiological pH.

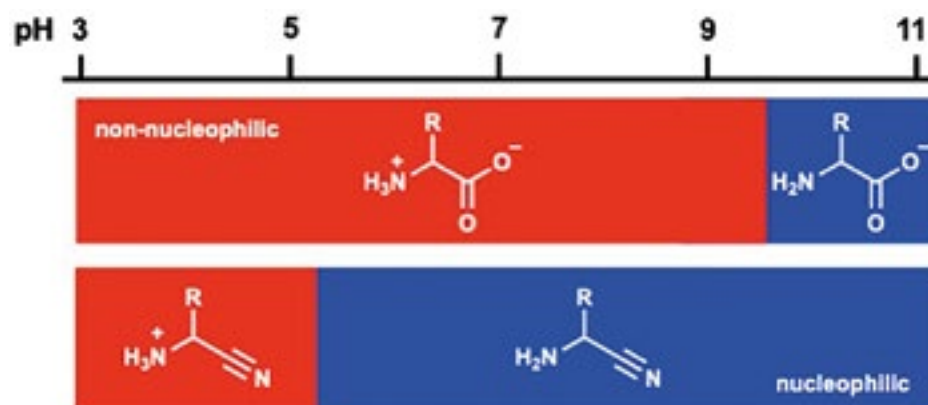


Figure 2 | Nucleophilicity in water.

Amino acids are zwitterionic and their nucleophilicity is quenched by protonation at near neutral pH (red), whereas alpha-aminonitriles are only protonated in acidic solution. alpha-Aminonitriles are nucleophilic over a broad pH range (blue), making them ideally suited to peptide ligation at neutral pH.

Additionally, aminonitriles have built-in energy (in their triple bond) that can be harnessed during peptide synthesis, unlike amino acids, which are their deactivated hydrolysis products. Drawing on our previous experience using thioacid activation to direct chemoselective 3'-5'-RNA ligation [4] and nitriles in prebiotic nucleotide synthesis [5][6], as well as recognising the potential commonality between peptide and nucleic acid chemistry, we began to investigate the irresistible opportunity that thioacid chemistry could also ligate alpha-aminonitriles to yield peptides in water.

Upon considering thioacids for peptide synthesis, we were immediately struck by the orthogonal reactivity of phosphates and sulfides, and the opportunities that sulfides opened for selective peptide ligation in a chemical network that needs to simultaneously build peptides and nucleic acids. Lipmann [7] and de Duve [8] had both previously proposed thioester-dependent peptide synthesis preceded RNA-dependent protein synthesis during the evolution of life. This "thioester world hypothesis" is a popular theory in origins of life research, but there had been very little progress in finding a robust prebiotic mechanism to synthesise the thioesters that are required to underpin this whole concept. We suspected this may have been due to a misplaced focus on amino acids and thioesters, rather than on aminonitriles and thioacids.

We found that thioacetate not only quantitatively acetylated alpha-aminonitriles in water, but that acylation electronically activated the nitrile group of the newly formed alpha-amidonitrile just enough to favour nucleophilic attack by H_2S , but not by water. The resulting alpha-amidothioamide was then readily hydrolysed to afford a C-terminal amidothioacid which can be ligated with another alpha-aminonitrile, and so the process can be cycled to yield an iterative peptide ligation in water (Fig. 3) [1].

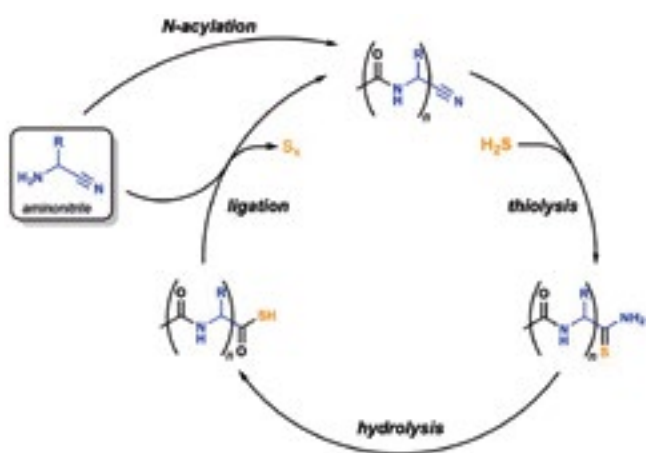


Figure 3 | Peptide ligation cycle. Sulfide-mediated peptide synthesis by N-to-C terminal ligation of aminonitriles in water.

All 20 proteinogenic side chain residues were tolerated (and gave high yields) in amidothioacid ligation, including histidine, aspartate, cysteine, serine, threonine, and tyrosine, which are essential to enzyme catalysis but are notoriously difficult to couple by previously reported (prebiotic) peptide bond forming reactions. The low basicity of alpha-aminonitriles even permits selective ligation of lysine residues to give natural alpha-peptide bonds. This lysine selectivity derives from the ~5 orders of magnitude difference in basicity of the two amine moieties of lysine nitrile. And finally, because our strategy operates via C-terminal peptide activation, rather than monomer activation, peptide **fragment ligation** is just as

effective as monomer ligation by our strategy, which provides a mechanism to rapidly build larger peptides [1].

Our results provide yet another clue that implicates cyanosulfidic chemistry at the origin of life [1][2][4][5][6][9][10], and we are currently developing other variants of our aminonitrile ligation. We are also exploring the emergence of function in these systems to further validate the prebiotic credentials of our chemistry.

Nevertheless, our results already have broad implications for understanding the origins of life. The highly predisposed nature of these reactions, under simple mild aqueous conditions, suggests that the chemistry of cyanide and sulfide foreshadowed enzyme-controlled peptide biosynthesis pathways.

This research has been published in Nature.

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Grants and Awards

Studies of radical-surface chemistry of relevance to the interstellar medium

£177961.00

Leverhulme Trust

PI: Professor Stephen Price

1 October 2018

Understanding how the microenvironment of a protein can dictate the course of bioconjugation

£154274.00

Leverhulme Trust

PI: Dr Vijay Chudasama

1 August 2018

Probing novel doping mechanisms for high mobility transparent conducting oxides

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Diamond Light Source Ltd

PI: Professor David Scanlon

1 October 2018

Neuro-oncological precision nanomedicines

£780882.44

EPSRC

PI: Professor Giuseppe Battaglia

2 September 2018

High end computing materials chemistry consortium

£489,315.64

EPSRC

PI: Professor Scott Woodley

1 November 2019

A combined activation/tethering strategy to lariat peptides

£185,286

Leverhulme Trust

PI: Dr Derek Macmillan

3 September 2018

Developing inkjet printable electronics inks and coatings

£100,000

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PI: Professor Jawwad Darr

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Understanding structure evolution in supported metal nanoparticles used in emission control; translating observations made on model catalysts to real world applications

£20,000

Diamond Light Source Ltd

PI: Professor Andrew Beale

1 October 2019

Understanding Structure Evolution in Supported metal nanoparticles used in emission control; translating observations made on model catalysts to real world applications

£16,000

Johnson Matthey

PI: Professor Andrew Beale

1 October 2018

Depollution of air using polymer-based coatings

£213,033

Innovate UK

PI: Professor Andrew Beale

1 September 2019

Sustainable Manufacturing of Transparent Conducting Oxide (TCO) Thin Films

£99,784

EPSRC

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Royal Society

PI: Professor Helen Fielding

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Coordinated Swarm Behaviour with Minimal Communication in Complex Topographies

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Volkswagen Stiftung

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PI: Professor Jawwad Darr

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PI: Professor Jawwad Darr

1 October 2018

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EPSRC

PI: Professor Andrew Beale

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Development of a polymersome treatment for brain cancer

£96,204

EPSRC - IMPACT ACCELERATION ACCOUNT

PI: Professor Giuseppe Battaglia

1 November 2018

The Development of In Situ Soft XAS Capabilities in the UK; exemplification Via Understanding The Dynamic Nature Of Fischer-Tropsch Synthesis Catalysts (Diamond)

£40,000

Johnson Matthey

PI: Professor Andrew Beale

1 November 2018

The development of in situ soft XAS capabilities in the UK; exemplification via understanding the dynamic nature of Fischer-Tropsch synthesis catalysts (JM)

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7 May 2019

Workshop: Complex Nanophotonics at the Interface

£10,822

EPSRC

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15 July 2019

Accelerating Tau PET Imaging through Head to Head Comparison of Novel Radiotracers

£99,042.90

Fidelity Biosciences

PI: Dr Kerstin Sander

1 March 2019

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Association for Frontotemporal Degeneration (AFTD)

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Oxford Nanopore Technologies Ltd

PI: Professor Stefan Howorka

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£20,000

Royal Society

PI: Dr Bob Schroeder

27 March 2019

Development of Raman spectroscopy technologies for in vivo and ex vivo assessment of tissue samples.

£29,112.16

MRC

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1 April 2019

Rational design of photoactive molecules using “black box” quantum dynamics simulations

£392,509.0

EPSRC

PI: Professor Graham Worth

1 May 2019

Systems Chemistry: Unified Metabolite Syntheses at the Origin of Life

£109,7175.86

Simons Foundation

PI: Dr Matthew Powner

1 June 2019

Global warming amelioration by oxidation of methane

£10,000

UK British Council

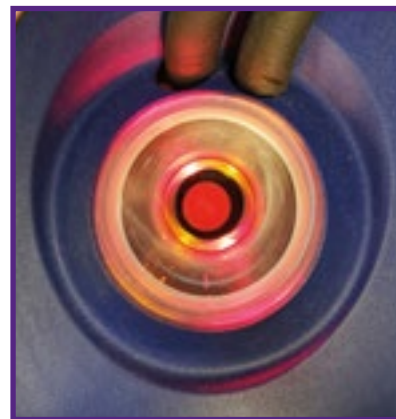
PI: Professor Chris Blackman

1 April 2019

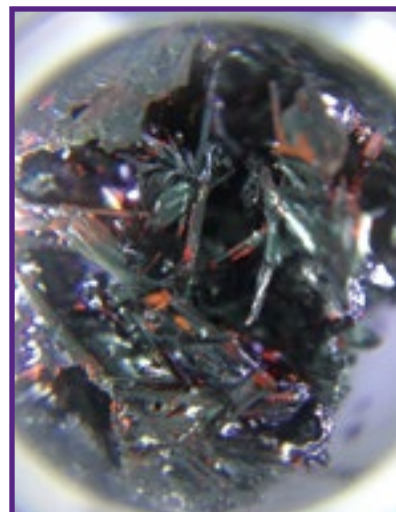
The department ran a summer **‘Photography as art competition’** for all PHD and post docs. **There were two categories: In the Lab and Chemistry Up Close.**

The winners of £25 Amazon vouchers were:

Viliyana Tsanova with her photo titled: Frankie says relax’ a photo taken of the labs relaxometer from above.



Clara Sanchez-Perez with her photo of a new single-source precursor developed in the Carmalt group for the deposition of novel bismuth-based perovskite materials for solar cells with improved stability.



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Departmental Structure

Head of Department:

C.J. Carmalt

Departmental Undergraduate Tutor/Deputy Head of Department (Teaching)

D.W. Lewis

Deputy Head of Department (Operations):

S.D. Price

Head of Physical Chemistry:

G.A. Worth

Head of Materials and Inorganic Chemistry Section:

F. Cora

Head of Organic Chemistry & Chemical Biology Section:

A.B. Tabor

Computational Chemistry

Professors:

C.R.A. Catlow
P.V. Coveney
S.L. Price
B. Slater
D. Scanlon
S. Woodley
G. Worth

Associate Professors:

R.G. Bell
D.W. Lewis
M. Zwijnenburg

Principal Research Associate:

A. Sokol

Research Associates:

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