MAKING MOLECULES WITH LIGHT
HOW A START-UP COMPANY IS DOING GROUNDBREAKING WORK AT BRISTOL

PLUS:
BLUECRYSTAL 4: BRISTOL'S SUPERCOMPUTER
HERBILICIOUS: THE SCIENCE OF ROSEMARY
Welcome

Here at Bristol we’re looking forward to another exciting year in the School of Chemistry. In this issue we give you a taste of the latest stories and successes we’re building upon.

Continuing the School’s award-winning streak, staff and students have been recognised for their outstanding achievements, with some travelling all the way to Canada to celebrate with their peers, while others have shared their knowledge with schools closer to home during Bristol’s science festival season.

Our industry connections go from strength to strength, with a new start-up company that’s working with pharma, a multi-million pound extension to Bristol’s supercomputing facility, and insights from our long-term partnership with local company Edwards.

Last but by no means least, turn to the feature on our technical manager Simon Osborne, who makes sure that everything works in the building and a great deal more besides.

As ever, there’s so much more going on than we can manage to fit in here. Visit our website and Facebook pages to learn more: bris.ac.uk/chemistry/ and facebook.com/bristolchemistry

Professor Nick Norman
Head of the School of Chemistry

Your say

We want to hear from you! If you’ve anything you want to tell us about your experiences at Bristol University, or if you have any thoughts about Chemistry Explored, then please email us at chemistry-explored@bristol.ac.uk.
One of Chemistry’s most successful researchers has been elected a Fellow of the Royal Society in recognition for his outstanding contribution to science. Professor Andrew Orr-Ewing is now the sixth current member of Chemistry to become an FRS, joining history’s most celebrated scientists, engineers and technologists from across the UK and the Commonwealth.

This latest accolade comes in a long line of achievements for Professor Orr-Ewing who has previously won the Royal Society of Chemistry’s Harrison Memorial Prize, Marlow Medal and Prize, Tilden Prize and awards in Optical Spectroscopy and Chemical Dynamics; he is also a Royal Society Wolfson Research Merit Award recipient.

These awards, and now election as an FRS, testify to Professor Orr-Ewing’s contributions to the study of fundamental mechanisms of chemical reactions. He is especially renowned across the world for using different types of lasers to study chemical reactivity, atmospheric chemistry and optical properties of aerosol particles.

One of his core specialisms involves the use of ultrafast laser spectroscopy, which allows scientists to study the dynamics of chemical reactivity in liquids, solutions and gases on extremely short timescales.

Professor Orr-Ewing began his scientific life at the University of Oxford where he obtained his BA and MA degrees in Chemistry before embarking on his DPhil. After two years of postdoctoral study at Stanford University, he returned to the UK to join the University of Bristol in 1994 and has been here ever since.
UPDATE

The Festival of Nature took place in Bristol in June

Sometimes the old methods are the best, as Chemistry volunteers discovered when they turned to coloured pens, water and filter paper to demonstrate the principles of high-end scientific techniques at the Festival of Nature.

In turn, schoolchildren and other festival-goers discovered how analytical chemistry is used to understand the nature of ancient civilisations, past climates, prehistoric farming and Egyptian mummification.

Volunteers from Bristol’s Organic Geochemistry Unit joined fellow exhibitors from the University, Bristol Zoo Gardens, Natural England and the BBC, opening people’s eyes to the wonders of science.

Some of the ideas brought to life by the exhibitors included the use of chromatography, mass spectrometry and measuring isotope ratios, all of which are used by students and researchers in Bristol’s labs to help improve our understanding of everything from archaeology to forensics.

The Festival of Nature is the UK’s largest celebration of the natural world, organised by the Bristol Natural History Museum.

A splash of colour

Upfest is Europe’s largest street art festival

From 28–30 July, the city of Bristol was transformed into one giant canvas for Upfest, Europe’s largest street art festival. With over 300 artists performing live painting of subway cars, boards and buildings, Upfest was an excellent celebration of the diversity and talent of both local and international street artists. The event wasn’t just about showcasing art though, with a team of volunteers from the University of Bristol and the local Royal Society of Chemistry division, showing that where there’s paint, there’s chemistry.

While artists were busy spray painting walls, volunteers were helping children make up different paints and learn how to mix pigments and chemicals to achieve various effects. Members of the public had a go at stencilling designs with some rather lively paint that went off with a ‘fizz’ when it got wet. The chance to try some chemical investigations of marker and felt pens with chromatography also proved popular. Overall, the event was a huge success with adults and children alike having the chance to better understand the importance of chemistry in art and get very messy in the process!

Lessons from the past

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Three of Chemistry’s PhD students found themselves in Toronto this summer, winning awards for their outstanding contributions whilst also learning about the work of their peers.

Sam Pearce, John Finnegan and Josh Turner were among chemists from all over the world who attended the 100th Annual Canadian Conference and Exhibition.

Sam was one of five to win C$100 and a certificate as part of the graduate oral presentation competition. His talk focused on ‘Two Dimensional Functional Nanostructures Through the Self-Assembly of Charge-Terminated Crystallizable Homopolymers’.

Josh was one of eight winners out of 150 contenders for the poster prize, earning himself a C$50 cash prize and textbook, for his display on ‘Dehydrocoupling of Amine-Boranes by Iron: The Role of Amine-Borane-Complexes’.

John won the Xerox prize for a graduate talk in the Macromolecular Science and Engineering Division.

“JOSH WAS ONE OF EIGHT WINNERS OUT OF 150 CONTENDERS FOR THE POSTER PRIZE”

OUTREACH 2016–17 AT A GLANCE

The Bristol ChemLabS programme seeks to engage with teachers, schools and students...

PRIMARY OUTREACH

17,266 Primary School pupils were engaged in Outreach Events

14,140 Primary School Pupils saw the Science Assembly ‘Gases in the Air’

At least 470 teachers were engaged

SECONDARY OUTREACH

1,469 students did practicals in the Undergraduate Teaching Laboratories

671 students extracted caffeine from tea leaves

3,871 students saw the lecture demonstration ‘A Pollutant’s Tale’

7,935 secondary students attended lectures, talks, tours or spectroscopy workshops
Harvey Dale has just completed his final year MSci research project with the Bristol Laser Spectroscopy and Dynamics Group. He reflects on what it’s like to work with the best of the best.

NEW FRONTIERS

Harvey Dale has just completed his final year MSci research project with the Bristol Laser Spectroscopy and Dynamics Group. He reflects on what it’s like to work with the best of the best.

It’s incredible to think that we can now watch chemical reactions in real time. Photoredox catalysis is one example where we’re able to do this. It’s the process by which the energy of light is used to accelerate a chemical reaction using sequences of single electron transfers. It’s a revolutionary method because it’s clean, operationally simple and complementary to a classic repertoire of thermal reactions.

For my final year MSci project I was fortunate enough to pursue a new avenue of research under the supervision of Professor Andrew Orr-Ewing and Dr Daisuke Koyama, applying ultrafast laser techniques to explore exactly how photoredox organocatalysis works.

Although synthetic chemists are capable of achieving a variety of weird and wonderful chemical transformations, in most cases the key molecular players in the catalytic cycle are too short-lived to be observed with conventional techniques.

We were able to overcome this challenge by using ultrafast absorption spectroscopy. This allowed us to track highly transient species on a timescale faster than a trillionth of a second.

I was given the opportunity to select my own project, use advanced kit, draft my own research paper, and work alongside exceptional PhD students and academics. I was offered a great deal of guidance and advice, but to a large extent left to devise my own experiments and conduct my own analysis.

My project represents only a very small fraction of what can be achieved with Bristol’s ultrafast laser techniques, but I believe this new line of research holds much promise for the future.

Harvey Dale is the recipient of the Physical and Theoretical Section Project Prize, the Richard N Dixon Prize and the WE Garner Prize.

Photoredox organocatalysis is a technique where the rate of a chemical reaction is increased by an organic catalyst in the presence of light, without the use of transition metals. Photoredox catalysed reactions are used in natural product and pharmaceutical synthesis, and in carbon dioxide reduction. They are popular because the chemistry can be driven by cheap, low-energy light sources such as blue and near-UV light emitting diodes (LEDs). The photochemistry is much more controlled and targeted than traditional photochemical and radical reactions.

Eyes on the prize

For final year students, this is the goal…

A major project is the main focus for all final year undergraduates, who have a vast research profile to explore when making their choice. Prizes are awarded for the best projects in Inorganic & Materials Chemistry, Organic & Biological Chemistry, Physical and Theoretical Chemistry. Prizes are also awarded for the best performance across all areas of each of Bristol’s Chemistry programmes, including the Richard N Dixon Prize for the best student on the Chemistry MSci programme, and the WE Garner prize for the best student across all Chemistry programmes.
Bristol students are taking their skills and some new kit out onto the streets to track the city’s air quality.

The scheme has been designed by Dr Chris Adams, who received a teaching innovation grant to buy 250 diffusion tubes, one for every first-year Chemistry student.

The tubes offer a simple approach to monitoring air pollution, specifically nitrogen dioxide (NO₂), a toxic gas that is mainly emitted through energy production and distribution, factory emissions, road transport and car engines, particularly diesel.

The tubes will be attached to permanent supports, such as lamp posts, and left in place to absorb NO₂. After four weeks, the tubes will removed and the contents analysed to provide a measure of the NO₂ concentration in a particular area. This will help to map how air quality varies across the city.

“I thought this would be an excellent way of engaging our first years,” says Chris. “Not only can we show them how the laboratory techniques they learn in their first few weeks at university are applicable to real-life situations, we can introduce them to scientific research right at the start of their studies rather than waiting until their final-year project.”

THE AIR WE BREATHE

- Nitrogen dioxide (NO₂) is part of a group of gaseous components produced from combustion processes.
- It’s a major contributor to the formation of photochemical smog and acid rain, which can have significant impacts on human health, vegetation, buildings and water bodies.
- About 50,000 people die prematurely each year in the UK from respiratory, cardiovascular and other illnesses associated with pollutants such as NO₂.
- A 2016 study by the World Health Organisation (WHO) cited Bristol among 39 urban areas that were in breach of safe levels of air pollutants.

Bristol and the environment

- The city is home to a number of major players in the socially conscious and engaged arena, including the Soil Association, The Wildlife Trust and Sustrans, the sustainable transport charity behind the development of the National Cycle Network.
- It was one of the UK’s first Cycling Cities and is a proud champion as a Fairtrade City, which sees it trading fairly with nearly five million workers in 58 developing countries.
- Nature is a core part of the city’s ethos and image, with Avon Wildlife Trust managing 3,000 acres (over 1,100 hectares) of Nature Reserve sites in Bristol and the surrounding area, taking in salt marshes and wetland to wildflower grasslands, ancient woodlands and Iron Age forts.
- Bristol’s green credentials were officially recognised when it was elected European Green Capital in 2015.
- It’s also a member of the Bristol Green Capital Partnership, aiming to make Bristol “a sustainable city with a high quality of life for all”.
- The University’s very own Cabot Institute is further evidence of the city’s eco-conscious ways, focusing on the major issues at the centre of the human-planetary relationship.
We’re proud to be able to say that our students are among the brightest and the best, both when they start their journey here, and when they leave to pursue their ambitions beyond university life. Here we take a look at what some of our graduates have gone on to achieve after their time at Bristol…

Becky Boston
After completing my PhD, I went to Sheffield for a two-year postdoctoral position in Materials Science and Engineering. That led to a five-year Lloyd’s Register Foundation and Royal Academy of Engineering Research Fellowship which I started last December. Currently I’m investigating the development of sustainable and low energy synthesis of functional oxides including thermoelectrics and Li-ion batteries. My work builds directly on the techniques I learned while at Bristol. I’m excited to be applying them to new areas of materials science.

Piotr Wolanin
Straight after I finished my PhD in Functional Nanomaterials, I joined Nu Nano Ltd, a company founded by former and current academics from the University of Bristol.

My role as a process engineer is to carry out research and development into the production of micrometer-sized probes for atomic force microscopes. These allow us to look at nanoparticles, DNA and other materials that are too small to be seen with traditional optical microscopes.

Melanie Busby
After graduating with my MSci from Bristol in 2016 I began working as an auditor for KPMG, training for my ACA qualification. My background in Chemistry helped me a lot more than I ever thought it would – I can use the skills gained to help me do something completely different.

I’m now entering the second year of my three-year qualification and have worked with a wide range of clients. None of this would have been possible without the skills and experience gained at Bristol.

“MY BACKGROUND IN CHEMISTRY HELPED ME MORE THAN I EVER THOUGHT IT WOULD”
Claudia Hallam
After completing an MSci in Chemistry with Industrial Experience in 2016, I began work as a trainee patent attorney at Carpmaels & Ransford LLP. During my industrial placement, I worked as part of a late-stage drug optimisation team and gained an appreciation of the value of intellectual property in both promoting and safeguarding this research. The skills I learnt at Bristol are now put into use on a daily basis.

I love working at the forefront of technology, being able to work with inventors from across the globe and putting my Chemistry Master’s into practice!

Michael Clegg
Since finishing my MSci at the University of Bristol in 2016, I have embarked upon an industrial PhD at GlaxoSmithKline in collaboration with the University of Strathclyde.

Utilising the skills I developed at Bristol, I now work alongside experts from industry and academia to push back the frontiers of medicinal science. My research is now primarily focused on the development of chemical probes for use in target validation, a far cry from my MSci project developing diamond-coated nanostructures! Fortunately, my broad and thorough teachings from Bristol have helped make this transition from physical to medicinal chemistry as smooth as possible.

Ikenna Ndukwe
Having completed my PhD in 2016, I was pleased to be offered a postdoctoral position at Merck in their Nuclear Magnetic Resonance (NMR) research laboratory in New Jersey, USA. The role involves the development of new NMR methods as well as expanding or improving the capabilities of existing methods through the incorporation, where feasible, of ‘pure shift’ NMR methodology to improve resolution and experimental sensitivity (continuing from work done during my PhD at Bristol).

Sarah Lowe
After graduating with a BSc in Chemistry from Bristol in 2016, I spent six months working at Deloitte as a data analyst. The skills I learnt in this role helped me to gain a place on the Risk Advisory graduate scheme at Deloitte, London specialising in technology consulting.

I will also be studying to become a chartered accountant (ACA) whilst at Deloitte. Studying Chemistry developed many transferable skills including analytical and numerical skills, problem-solving and my capacity for hard work, all of which helped me to secure a great opportunity in the professional services industry.
Molecules made with light

New start-up company Photodiversity Ltd is doing groundbreaking work in the production of photochemically derived molecules

Experts in drug discovery and synthetic photochemistry have teamed up to create a new company that has the capacity to accelerate industry efforts to come up with new products.

Photodiversity Ltd is a joint venture between the Universities of Bristol and Sussex. It has already had significant successes working with a number of pharmaceutical clients and intends to reach out to a wider client base including those in the agrochemical sector.

The company’s distinct capabilities lie in designing and synthesising complex small-molecule scaffolds using bespoke photochemical techniques and technologies. This work is led by Bristol’s Professor Kevin Booker-Milburn, a pioneer of photochemical flow chemistry with 25 years’ experience in the field.

These scaffolds will then be transformed into large 200–500 member diversity libraries for drug screening at Sussex, led by Professor Brian Cox, who has over 30 years’ experience in the pharmaceutical industry, working with Novartis and GSK.

The company is built on a solid basis of previous successes. Research at Bristol recently resulted in the first practical flow reactor for synthetic photochemistry called the 'Firefly', the first laboratory scale reactor with photochemical productivities of over one kilogram per day.

Start-up success

Photodiversity Ltd is the latest start-up company to emerge from the School of Chemistry. Other start-ups which continue to exploit science that has been carried out in Chemistry include Revolymer (now called Itaconix, the creators of the world’s first degradable chewing gum), Zylo and Interactive Scientific, all of which provide many employment opportunities for students and researchers as well as internships for current undergraduates.
FROM TOXIC WASTE TO GREEN MATTER

Somerset manufacturing firm Edwards has been leading the way in eco-friendly processes

One of the main challenges faced by the electronics industry is how to make their processes eco-friendly and cost-effective. Somerset firm Edwards enables manufacturers of semiconductor chips to create components used in devices including smartphones, laptops, flat-panel displays, LEDs and solar cells.

The manufacturing process involves repeated cycles of deposition using thin layers of silicon or its oxide. It also involves photolithography, which is a bit like using masking tape to define an area of a wall to be painted, while etching involves the selective removal of material through the open areas of the mask to define the active areas of the device, typically an individual transistor or memory cell.

All of these processes require vacuum and typically exhaust process gas that needs treatment before being released into the atmosphere.

Twenty-three years ago, Edwards called in Dr Peter Timms from the School of Chemistry to help devise an environmentally friendly way to dispose of the exhaust gases, resulting in the Gas Reactor Column.

This works by reacting chlorinated exhaust gases with silicon in the first stage and using a metal oxide in the second stage of a heated column. The initial stage forms silicon tetrachloride which then reacts with the metal oxide in the second, locking the by-product within the cartridge itself. Not only does this mitigate against harmful by-products, the cartridges can be recycled into the steel-making process.

Even potentially harmful photolithography chemicals (usually complex cyclic hydrocarbon-based molecules) are decomposed into benign by-products like carbon within the GRC cartridge.

Industrial processes generate significant quantities of perfluorocompounds (PFCs), but there is a ‘gap’ between emissions that are currently accounted for and those that are observed by atmospheric measurement.

PFCs, and particularly CF₄, are used as convenient gaseous sources of fluorine for the semiconductor industry because fluorine itself is so corrosive and toxic, making it difficult and expensive to transport and use. CF₄ is also a by-product of the manufacture of rare-earth metals and aluminium, formed by the reaction between the fluoride flux (‘cryolite’) and the carbon electrodes crucial to the electrolysis process used to extract the metals from their ores.

The concern regarding the climatic impact comes from their high global warming potential and chemical stability.

Working with Professor Simon O’Doherty and Dr Matt Rigby from the School of Chemistry, and PhD student Eleni Michalopoulou, Edwards is now one step closer to a solution.

Dr Mike Czerniak, Environmental Solutions Business Development Manager at Edwards and Visiting Industrial Professor in the School of Chemistry, says: “We now have knowledge of nearly all major industrial sources of PFCs. This is the first time anybody has even come close to building the whole picture, it’s so exciting.”

Mike Czerniak was interviewed by Maev Moran

Putting the Science into the Environment

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Imagine being able to perform so many millions of calculations that the results could unlock the potential of new pharmaceuticals, create revolutionary software and design previously unheard of materials. Now, thanks to the latest multi-million pound investment in a supercomputer, it’s precisely the kind of activity that Bristol’s students and researchers will be doing more of.

BlueCrystal 4 is the latest incarnation of Bristol’s High Performance Computing (HPC) capacity, which, in the last ten years, has already transformed how scientists use computers to investigate everything from climate change to the rotary blade design of helicopters, the mutation of genes, and the spread of disease. It is three times faster than its predecessor, putting it among the fastest supercomputers in the world, and it can now perform up to 600 trillion calculations – or 600 Teraflops – per second.

After a recent upgrade, the University of Bristol now boasts one of the fastest and most advanced computers in the UK. Christopher Woods, Research Software Engineer, examines the mighty BlueCrystal 4…

**COMPUTATIONAL TOOLS**

WaterSwap is a computational tool to help drug designers simulate how molecules bind to proteins. For a new drug to be effective, it needs to interact with the body - at the molecular level this arises from binding to proteins. The strength of such interactions is difficult to predict accurately, but can be determined by comparing a drug molecule with an equivalent volume of water in a simulation. Developed at Bristol, the WaterSwap tool is now used internationally for the design of new pharmaceuticals. Each WaterSwap prediction needs over 10 million million calculations to be performed. BlueCrystal Phase 3 was instrumental in developing WaterSwap, and the new and more capable successor method ProteinSwap was the very first application that was developed using the increased power that is now available with BlueCrystal Phase 4.
SUPER SPEED, SUPER SCIENCE

How BlueCrystal 4 is helping smokers give up the habit

Smoking related diseases are now the second most prevalent cause of death in the world. Every year, diseases such as lung cancer claim the lives of more than five million people. Varenicline is currently the main anti-smoking compound approved by the Food and Drugs Administration (FDA), the US agency responsible for regulating the manufacturing, marketing, and distribution of tobacco products. But it is only moderately effective in reducing the symptoms of nicotine withdrawal and may cause undesirable side effects, which means there is a growing need to develop new, more effective smoking cessation agents.

Enter BlueCrystal 4, which Bristol’s chemists will be able to use to investigate how nicotine, the major addictive agent in tobacco, binds to the nicotinic acetylcholine receptors. Structural changes at the interface between two subunits of the receptor activate the addictive agent in tobacco. This happens when nicotine binding opens the ion channels that stimulate the flow of cations across the cell membrane. The results from simulations carried out using BlueCrystal 4 will be used to identify the molecular determinants that modulate binding for novel candidates for smoking cessation drugs.

PROCESSING POWER

For Computational Chemists and Research Software Engineers, BlueCrystal 4 provides unprecedented opportunities thanks to the latest processors, network interconnects and Graphics Processing Unit (GPU) accelerators. Researchers will be harnessing its power to develop new molecular simulation methods and software, building on earlier successes from interactions with the Collaborative Computational Project Networks, such as CCPBiosim for Biomolecular Simulations and CCP5 for Computational Simulation of the Condensed Phase. Recent investment, in partnership with these networks, will use the software development environment of BlueCrystal Phase 4 to create the next generation of programs in this field.

FROM QUANTUM MECHANICS TO BIODESIGN

Chemical Bioengineers will use the supercomputer to engineer and design new biomaterials based on self-assembling organic peptides, using simulations to select the most promising candidates. Organic and inorganic synthetic chemists will be able study reaction pathways and catalysis and predict molecular properties from a detailed analysis of their electronic structure. Spectroscopists will be able to use advanced quantum mechanics calculations to deduce the molecular structure of new compounds by matching chemical spectra against simulation, helping to understand reactions in the atmosphere.

second. That’s the equivalent of the combined efforts of every single person on the planet working for over a week to achieve the same result.

Supercomputers are regarded as the ‘third pillar’ of modern research due to their important role in speeding up calculations and analyses which would previously have taken many years to complete.

Over 1,000 researchers and PhD students across the university will benefit from this system, and BlueCrystal is used in teaching as well, with students on several courses learning how to use HPC for research projects and real-life applications.

In chemistry, computational simulation has become an indispensable research tool and, thanks to BlueCrystal 4, Bristol chemists can now use it to investigate the properties, interactions and behaviours of molecular systems that are bigger and more complicated than ever before. Whether using simulation as a computational microscope to watch molecules interacting in catalytic reactions or in the atmosphere, complementing molecular imaging of the amorphous phases of complex matter, exploring the interactions between pharmaceuticals and enzymes, or using advanced quantum mechanical calculations to analyse experimental data through calculations, this powerful local resource will ensure that chemistry in Bristol stays at the forefront of modern research.
Most of us will be familiar with the smell and taste of rosemary, but did you know...
- Rosemary shares the same principal essential oil as eucalyptus called eucalyptol/cineole?
- While native to the coastal Mediterranean, it can manage cooler climates, surviving winter temperatures down to -10°C?

Rosemary gets its distinctive aroma from a molecule called pinene, an example of a terpene molecule (C_{10}H_{16}), common in nature and with a distinctive number of carbon atoms that is always a multiple of five. This is because they are biosynthetically derived from the isoprene molecule, which is a five-carbon molecule.

Pinene contains a double bond and so belongs to the family of alkene molecules. It also contains both a six-carbon and a four-carbon ring in its structure.

This means that terpenes are reactive, and their reactions usually involve breaking open this ring so as to create a more stable structure. The α isomer has a carbon–carbon double bond inside the six-atom carbon ring, while in the β-isomer, the double bond is outside the ring, where previously there was a methyl functional group. For both the α- and the β-form, two enantiomers (mirror images) exist.

Although their structures are very similar, pinene isomers smell distinctively different. The β-isomer has been described as having a woody-green pine-like smell, while the α-isomer smells like turpentine. Even a small difference in structure can give a completely different smell, related to where in the olfactory bulb the molecules bind.

Within rosemary, pinene molecules are formed by the cyclisation reaction of geranyl pyrophosphate, catalysed by the enzyme pinene synthase.

This piece is an edited version of a longer article researched and written by students from the Theory and Modelling in Chemical Sciences (TMCS) Centre for Doctoral Training; Hannah Bruce Macdonald from Southampton, Timothy Wiles from Bristol and Jonathan Mannouch, Daniel Tracey, Domagoj Fijan and Domen Presern from Oxford.

“There’s rosemary, that’s for remembrance.”
(i v. 5.) Hamlet, Shakespeare

The link between rosemary and memory is somewhat mythical although some research would seem to suggest that long-term memory can, in fact, be improved by exposure to rosemary oil. This may be due to a chemical in rosemary called ursolic acid, which prevents the breakdown of a neurotransmitter, a process which has been blamed for memory loss.
Talking tech

We talk to Technical Manager Simon Osborne about how life has changed at the School of Chemistry since he arrived 24 years ago...

Can you tell us about your job?
I have a team of over 30 technicians who work in various areas ranging from teaching, research, instrumentation, stores, electronics, mechanical workshops etc, and I, with them, deliver the technical needs for the School of Chemistry.

When did you first arrive at Bristol University?
1993. I came to the university into the electronics workshop as a technician. I was there for over 10 years and then I came into this role, I guess, about 15 years ago.

Are you one of the longest-serving people at the School of Chemistry?
There’s a few of us, amongst the technical body especially. There are people around from when I first got here. But we’re getting fewer and fewer in number now. We’ve just had one of our team retire and he’d been here for 44 years!

What have been the biggest changes since you first arrived?
Health and safety is the one that’s changed the most profoundly. I can remember going back 15–20 years ago having members of the academic staff with a desk in the same room as a fume cupboard with a reaction running in it!

What’s been among the most memorable things to happen at the School in your time here?
We built the Teaching Labs in 2007 which was a change in the kind of style of lab we had. The chemistry labs back then were designed and built in the early 1960s with ceramic tiles on the inside — it was all rather prosaic. We went from that to a purpose-built, very modern chemistry environment.

What do you like most about the job?
I love the people and I love the technical team. They’re a great bunch of very skilled people. I really enjoy new projects where we’re taking about something that we’ve never done before, figuring out how we’re going to do it, and delivering that.

My favourite Bristol hang-out
My favourite place in Bristol is the Highbury Vaults pub. I’ve been going there since I came to Bristol in 1983! It’s much the same now as it was then. Although there’s one thing that’s different — now they have a little model train running between the two bars! It’s a proper old-school beer pub. It was almost a rite of passage to go to the Highbury on a Friday after work and have a few pints and some of their chilli!
Chem@rt is a University of Bristol initiative that brings chemistry into the classroom and stimulates literacy and creativity. Here are a small selection of the stunning images created by our scientists...

Freeze-Dried Air by Steven Street
This is a photograph inside a freeze-dryer after the lid was accidentally left off overnight. It condensed the water vapour out of the atmosphere, creating a network of intricate ice crystals in the process.

Frosty Reception by Ben Mills
This photograph shows liquid nitrogen being delivered to the School of Chemistry on a cold night in November.

Surprising Sunflower by Emma Kastrisianaki Guyton, Jenny Slaughter & Natalie Fey
This photograph shows a sunflower, Helianthus Annuus ‘Velvet Queen’. The molecule ‘inside’ is a short strand of the polymer cis-polyisoprene, one of the main components of natural latex rubber.

Deep Blue by Alex Bell
A microscope picture taken under polarised light showing the nematic (thread-like) texture of a surfactant. Its molecules can conduct electricity, and they will spontaneously ‘self-assemble’ into a liquid crystal.