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FIRST ISSUE FROM CDT IN CATALYSIS

Edited and reviewed by Ben Howchen, Chris Bryant and Jack Steward

In our first issue:

CATALYST DESIGN PROJECTS

All 1st year CDT students recently finished their projects designing a catalyst and tackling a particular catalytic problem.

OUTREACH AT THE MUSEUM

Two of our students were involved in an outreach program at the national Cardiff museum. They taught and entertained children and adults alike with science in this evening session.

CONFERENCE IN DUBLIN

One student was invited to attend a catalysis conference in Dublin earlier in this academic year for his work in his Masters project.



H2O(S) SKATING

by Sam Bates

The CDT in Catalysis isn't just about science. We often go for group days (and nights) out: Pub crawls, film nights and taking part in the welsh rugby culture. To the left, is a picture of most of our cohort embarking on an ice skating excursion which involved wobbly legs and a few bruised elbows. Our very own dancing on ice star, Sophie Thomas, was running circles around the rest of us, reminding us of just how terrible we were.

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EPSRC Centre for Doctoral Training in Catalysis

CATALYST DESIGN PROJECT

by Annie Cooper

Split into five groups we were given projects focusing on current issues in catalysis. With titles varying from 'Rehabilitating the diesel engine: Designing a single catalytic converter that will eliminate CO, hydrocarbons, NOx and carbon particulate from diesel exhaust' to 'How can catalysis be used to avoid the food versus fuel conflict in the production of fuel grade bioethanol and biobutanol?'. Our challenge, to come up with a feasible solution to our given problem and be able to present our findings in such a way to secure hypothetical research funding. Each group presented their solution to the CDT students, lecturers and visitors from industry. In addition, each group designed and presented a poster on the topic.

The day was a success with all groups pitching their case successfully and answering a multitude of questions and perhaps, most importantly, everyone got their report in before the deadline! The day was naturally concluded with celebratory drinks down the pub.



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*One, remember to look up at the stars and not down at your feet.
Two, never give up work. Work gives you meaning and purpose
and life is empty without it. Three, if you are lucky enough to find
love, remember it is there and don't throw it away*

- Stephen Hawking RIP

AFTER DARK IN THE MUSEUM

by Rebekah Taylor and Sophie Thomas

On Thursday 2nd November, Rebekah and Sophie volunteered in the “After Dark in the Museum” event. This event included different experiments such as: spicy painting, using turmeric as a pH indicator; Mission Starlight, which involved UV-active beads; and chromatography, using filter paper, black pen and water to separate out the different coloured inks. Busking inside and outside of the Museum included giving out free glow sticks to encourage the whole family to learn how they work. There weren't just chemistry experiments present, fake wounds and drones were also available to encourage children into science. The night was a huge success with 1750 visitors attending compared to the expected 500 visitors!

As well as volunteering for the museum night, Rebekah also visited Cardiff High School for the Primary Science Teaching Trust day on the 16th of February. This day was designed to promote the interest of primary school children in the sciences. Cardiff University's Chemistry and Physics departments were present with stalls to enthuse the children on a variety of topics. Experiments included “guess the smell”, teaching the children to understand that different molecules in our food are responsible for the different smells; “chromatography”, and testing the pH of different soft drinks to illustrate acidity. The reception was amazing, and hopefully inspired interests in STEM in the children.

DUBLIN CONFERENCE

by *Liam Bailey*

CDT student, Liam Bailey, was highly commended by the Undergraduate Awards with his submission in the Chemical and Pharmaceutical category placing in the top 10% of submissions. Liam was invited to attend the three day Undergraduate Awards Global Summit held in November in Dublin which allowed him to meet fellow winners who were students representing universities across the world.

The summit involved three days of social events, talks and workshops held in many prestigious venues around Dublin, where the attendees were encouraged to discuss their work and gain a greater understanding of other fields within academia. Keynote speakers included Chris Lubbe who discussed his role in ending apartheid in South Africa and robotics professor Noel Sharkey of Robot Wars fame.

Liam said "I am very proud to have been recognised for my work by the Undergraduate Awards and to have represented the CDT at the Global Summit. I had a fantastic few days in Dublin and met many interesting people from around the world. My favourite event at the summit was the UPresent day where I was able to talk about my research and hear about the work the other attendees had done. I would like to thank Prof. Stan Golunski and Luke Parker for their help and guidance while I was researching and writing my submission."



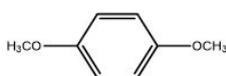
SCIENCE OF THE SEASONS

by *Alex Barnes*

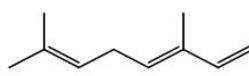
For the season of spring we are taking a closer look into the key chemicals responsible for the smell of daffodils.

1,4-dimethoxybenzene is an organic compound said to have an intensely floral aroma. It is a minor component of the daffodil flower but is also present in many other plants including willow and courgettes. It appears that the biological function of the compound is to attract bees as it has a powerful response to their antenna.

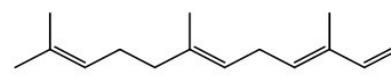
Two other compounds found in daffodils are part of a versatile class of highly aromatic chemicals called terpenes. Terpenes derived biosynthetically from individual units called isoprene. (*E*)- β -ocimene, a monoterpene, has a floral or woody smell, it is believed their role biologically is defence of the plant as they have anti-fungal properties. (*E,E*)- α -farnesene is a sesquiterpene. Where the prefix 'sesqui' means one and a half as it consists of three isoprene units or one and a half terpenes. It is responsible for the characteristic smell of green apples.



1,4-dimethoxybenzene



(*E*)- β -ocimene



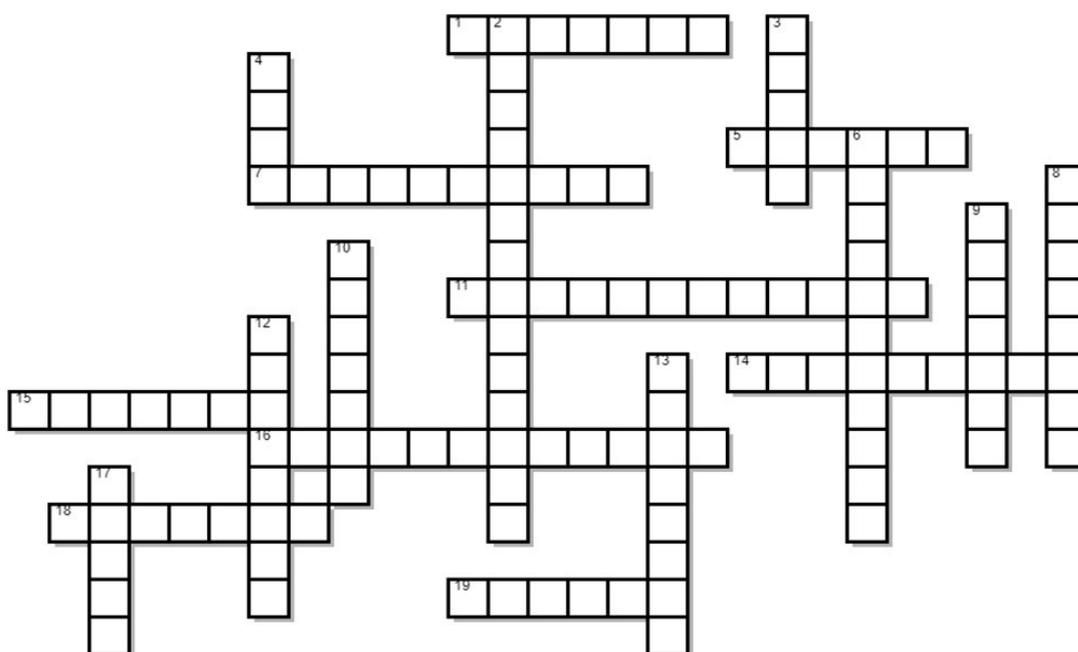
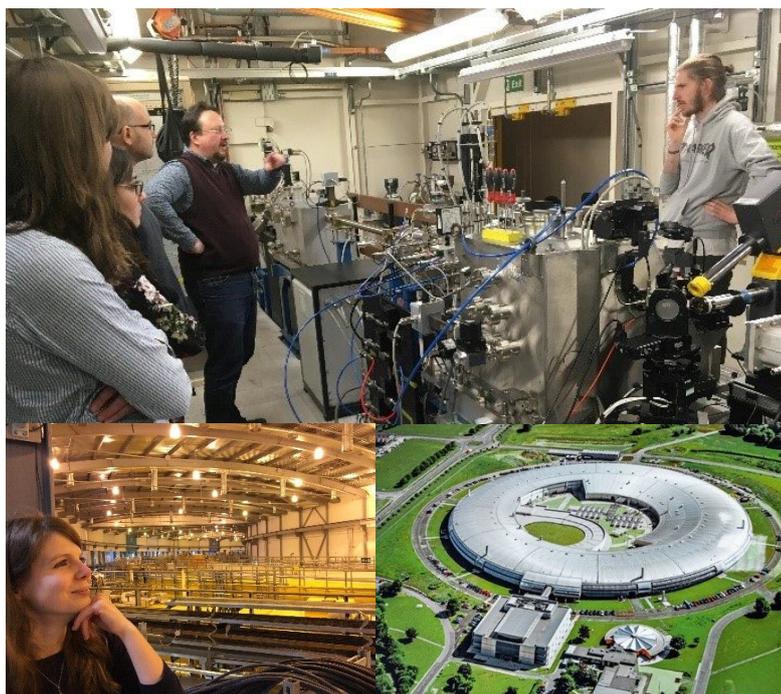
(*E,E*)- α -farnesene

TRIP TO HARWELL SCIENCE AND INNOVATION CAMPUS

by Dan Latham

All members of the 2017/18 CDT cohort were fortunate enough to be given a fascinating tour of Diamond Light Source, the UK's national synchrotron facility. Along the 561.2 metre circular walk, we discovered the vast importance this amenity has for many areas of scientific research, and this left many pondering over how the synchrotron could fulfil their own dreams to achieve ground-breaking catalytic research.

We were directed to an ISIS target station, where we were shown how neutron and muon scattering can be useful for probing structures. We were also grateful to lay eyes on a high resolution transition electron microscope (TEM) at The Electron Bio-Imaging Centre (eBIC) - capable of magnifications up to 15,000,000x. It's fair to say we thoroughly enjoyed the day, as much as the coveted buffet lunch.



Across

1. Microporous, aluminosilicate minerals used as adsorbants/catalysts (7)
5. The simplest carboxylic acid (6)
7. cyclic reaction requiring a diene and dieneophile (5,5)
11. Process by which sugar is converted to ethanol and carbon dioxide (12)
14. Alkaline earth metal located in period 3 (9)
15. Beams of these are produced by nuclear fission or a spallation source (6)
16. Process by which syngas is obtained from coal (12)
18. Common ore of aluminium (7)
19. Polymer found in walls of many plants, making them rigid and woody (6)

Down

2. Chemical ingredient found in both Dr Pepper and most antifreezes (8,6)
3. 3rd most abundant gas in the Earth's atmosphere (5)
4. Graham Hutchings' favourite element (4)
6. The term for an addition reaction which favours a group adding at the more substituted position (11)
8. The relation of an enol to a ketone (8)
9. Halogen that is a liquid at room temperature (7)
10. A phase of titania (7)
12. Element with the highest known boiling point at 5660 °C (8)
13. Infamous colourless gas used as a weapon in WW1 (8)
17. Non-technical name for di-hydrogen monoxide (6)