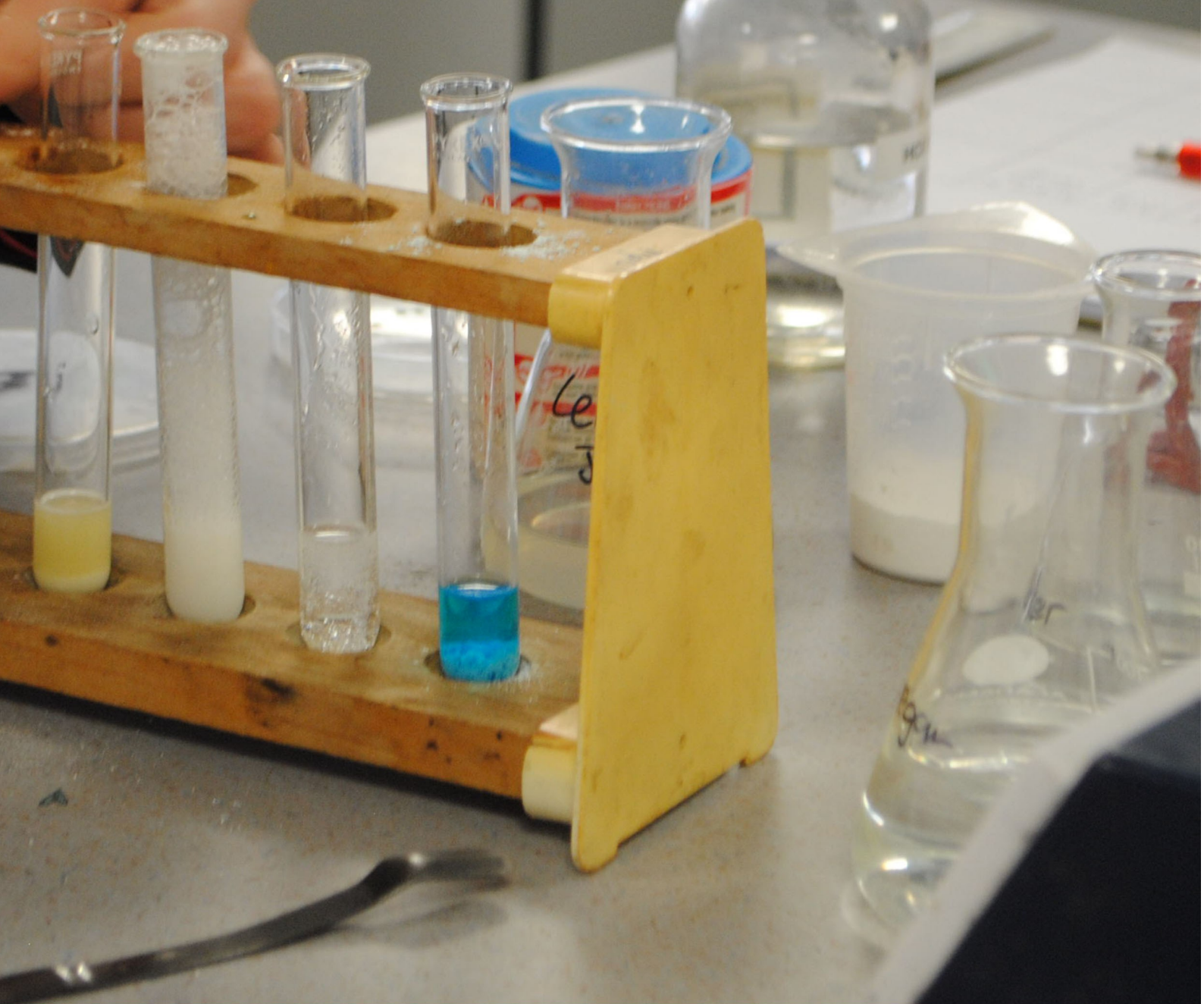


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All Hallows Catholic College Magazine

Science Special Edition 2017



| Honourable Purpose | Respect | Co-operation | Stewardship | Compassion |

A Welcome from the Science Faculty Leader

Although All Hallows has had the pleasure of publishing many different Departmental newsletters and brochures, we are proud to announce our second edition of *Aspire: Science*. Created by Mrs Buhac, the entire Science Faculty and our students, we have put together another magazine which contains lots of interesting facts and information about what is going on in our Department. We will take this opportunity to showcase the vast range of talents and activities our staff and students are involved in throughout the year.



So, why have we decided to publish another *Science Aspire*? Well, aside from continuing to help ambitious young scientists, we also want to share our celebrations of British Science Week, as well as our work with local Primary Schools and with each other. We are so very proud of our students' achievements and we hope you enjoy reading about our very busy students and staff.

Science is fully alive and in action at All Hallows Catholic College!

Mrs C Buhac—Science Faculty Leader



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FANTASTIC PHYSICS EVENT





As part of British Science Week celebrations at All Hallows Catholic College, a number of Year 9 students took part in the Institute of Physics 'Fabulous Physics' event hosted by Loreto College on Wednesday 22 March. The evening began with some welcoming refreshments in the canteen on arrival, followed by a lecture on the Physics of Liquid Crystals by Professor Helen Gleeson from University of Leeds. This was an informative lecture which began by highlighting different aspects of Physics research, from nano-physics of making new materials atom by atom, through to astrophysics research including stellar winds, galactic super winds, planet and star formation, pushing forwards the frontiers of knowledge. Professor Gleeson discussed in more detail her own area of research on Liquid Crystal Displays and possible medical applications such as switchable contact lenses which change focus. This led to some thought-provoking questions to the speaker by students from All Hallows Catholic College.

Next followed a hands-on activity called Medical Mavericks which introduced students to the applications of Physics within Medicine and Sports Science. Highlights included racing a virtual Usain Bolt, testing reactions on a BATAK wall, testing strength and record ball throwing speed. The students were very keen to compete with each other on these activities! Students were also able to take blood, record and print an ECG, try keyhole surgery, see inside their body with an ultrasound machine and take a picture of the inside of their eyes. A lot of fun was had experiencing the Pathology Goggles and trying to walk in a straight line wearing the tunnel vision goggles and beer goggles! With so many hands-on activities, the only disappointment was not enough time to explore each one!

The second lecture covered surface and interfacial Chemistry/Physics research at University of Manchester. Students were shown the technological applications of this specialist area of Physics including materials being used for dental implants, hip replacements, stents, heart valves and targeted pharmaceuticals using polymer Titaniumoxide nanoparticles.

The evening ended with an all you can eat buffet where the students' hearty appetites were fulfilled! This event was a great opportunity for our students to explore how fantastic Physics really is and it certainly gave them the opportunity to reflect on how they can explore the subject even further.

BRITISH SCIENCE WEEK



British Science Week (BSW) ran from 10 -19 March and the theme was “Change”. It encouraged young people to think about, and investigate the changes happening in the world all around us; from seasons and climate, to materials and energy. It was also a chance for our students to consider the changes they make day to day to have a positive impact on the future.

The Thursday in BSW is always “Demo day” and is an opportunity for teachers and technicians to show off experiments they may not have the chance to do in normal lessons (something they love doing!). This year we looked at chemical and physical changes and gave our science club members an opportunity to demo to their peers.

Demo day started with Ms Beck and Mr Jones plating a copper coin in zinc to turn it a very shiny silver! Students were then shown that heating the silver coin could turn it a brilliant gold! Unfortunately the coin hadn’t actually turned into gold, but the zinc and copper had reacted to form brass, an alloy.

Next it was over to our young scientists to demo making “Elephants Toothpaste”. They needed to heat yeast in water to get it producing oxygen (through respiration) and then add to a mixture of washing up liquid and hydrogen peroxide resulting in an eruption of foam from the conical flask, hence the name elephants toothpaste.

To finish off demo day all students were able to make and try a (tasty) physical change, using salty ice to draw heat quickly out of milkshake so that it froze. Meaning the students could make their own ice cream in just 5 minutes.

Demo day was great fun for all involved (us included!) and the students loved showing off some of the skills they had developed over the past year or two in lessons and Science Club.

Science Club runs every Thursday (second break) in B3 and is a fantastic opportunity for students to get hands on with science experiments. So far this year we have made some amazing things such as bottle rockets, slime and fire extinguishers, some of which students can take with them or make at home. As well as this we have regularly run competitions for prizes such as a soap boat race, testing fireworks and a classic egg drop competition which was our big project before Christmas.

We have had a fantastic turn out from our year 7s and 8s and also from some year 9 students who have been brilliant at helping out in the experiments, but we are always happy to welcome new members.

If you are interested in joining science club just come along to a session and you can sign up and take part.

Mr R Jones



A HEART-WARMING VISIT

On the 15 March, I was fortunate enough to visit St Ann's Catholic Primary School in Buxton and perform a heart dissection for Year 5 and 6 pupils. Armed with scalpel, scissors and gloves from the All Hallows Science Faculty, the classes and I explored the outside and inside of sheep hearts. The hearts we used were kindly provided by Mycock Butchers.

The students were given the opportunity to feel the heart, observing the difference in thickness of the two sides. They even put their fingers through the aorta and vena cava, ending up in the ventricles!

After the students had explored the heart intact, I made two incisions with the scalpel and opened up the heart. The students could see which chambers their fingers ended up in and observed how the left side of the heart is much larger and more muscular due to its need to pump blood to the whole body.

The students were at the beginning of their study of this topic and eager to see a real heart being dissected. They were very enthusiastic and were ready with intelligent and curious questions, such as:

- a. "Does something control the rhythm of the heart?"
- b. "Could you survive with half a heart?"
- c. "Would the heart appear less red if it hadn't contained blood?"
- d. "What's the fat around the heart for?"

(answers to the questions printed below)

I would like to extend a big thank you to Mrs Wiggins, Mrs Healey, Mrs Mentzoni and Mrs Healey along with the students of St Ann's for their enthusiasm and inquisitive questions and like to invite them to visit All Hallows in the near future.





- a. Yes. The Atrioventricular Node controls the rhythm of the heart by stimulating it with electrical impulses from the brain.
- b. Sadly no. All four chambers of the heart are essential for us to live.
- c. The heart is a deep red when blood flows through - if it is a heart from an autopsy it is a very pale pink, but never white, as you can never squeeze all the blood out of it.



THE LIFE OF A CHEMIST



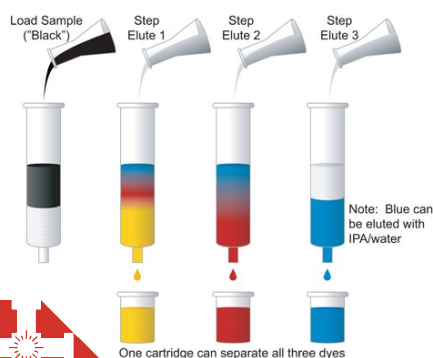
My name is Dave Perkins and I have been working in the Science Department at All Hallows Catholic College as a Science Technician for 6 months. Prior to becoming a science technician at All Hallows I worked for 29 years as a Research Scientist for AstraZeneca, a company that makes pharmaceuticals (medical drugs). My role was as an Organic Chemist and I was responsible for making target compounds for the discovery of new drugs to treat cancer. Chemistry can be broken down into numerous areas

and the making of pharmaceutical drugs involves mainly Organic Chemistry (a branch of chemistry based on the element carbon) as its main discipline.

Making potential drugs involves joining together small molecules to make larger molecules in the hope that these large molecules could provide new treatments (in effect it is similar to constructing a large Lego structure from many small Lego pieces).

All my work was carried out in a vented fume cupboard and required me to be dressed in a white laboratory coat, safety glasses and gloves for protection from the chemicals being used.

In practice making drugs is similar to cooking. I added different chemical ingredients and followed chemical recipes which showed the quantity of each ingredient required and the length of heating time etc. The equipment for a 'chemical reaction' is similar to the picture below. I used stirrer hotplates and three necked flasks fitted with a condenser, dropping funnels and a thermometer.



When the reaction was complete the impure reaction needed purifying, by use of a technique called chromatography, to give the clean desired compound. The diagram below demonstrates how the impure black compound can be separated into its pure compounds.

I then used another branch of chemistry, called Analytical Chemistry, to prove the structure of the compound I had made. For this I used techniques called Nuclear Magnetic Resonance (NMR) and Mass Spectrometry (MS). These are techniques are covered in the GCSE and A - level Chemistry courses.



It can be very difficult to discover new treatments for cancer with multiple thousands of potential compounds to be tested to give just one that finally treats patients. A new treatment can take 10-20 years to get from the initial idea to becoming a drug which doctors can prescribe and the whole process can cost over five hundred million pounds.

The life of a chemist is never boring and the possibilities are endless!

Why not consider a career in Chemistry where you could be:

- Inventing and developing new medicines and products
- Investigating environmental issues
- Diagnosing and treating illness and disease
- Analysing forensic evidence

Teaching, lecturing and carrying out academic research?

It's a wonderful world of opportunity out there!

“The right dose is what makes a chemical a remedy rather than a poison”

“The right dose is what makes a chemical a remedy rather than a poison” - a lecture by Professor Glen Clack, Honorary Professor of Translational Medicine at Sheffield University

Year 11s packed into the Hall for an eagerly awaited talk. The topic: “How do we make new Medicines?” We were not disappointed – drug development proved to be fascinating as Professor Clack’s logically talked us through each stage, helping us to both contextualise our GCSE Biology learning and think beyond GCSE level.

Drug development starts off with the building of molecules, where scientists work with their knowledge of the target illness and bond atoms together; animal testing is then carried out to determine whether the molecule is soluble and whether it triggers the curative activity in the body. 9 out of 10 molecules don’t make it past this stage. Working in Translational Medicine, Professor Clack is involved in the next step and designs human trials based on animal testing results. It’s crucial that human trials can be relied on to produce accurate results so that only safe and effective drugs are marketed.

But even when drugs survive the testing process, issues still arise: if overused, Ibuprofen can cause kidney failure. And who would have thought that Botox’s main active ingredient, Botulinum toxin, puts users in serious risk of Botulism, an infection which causes paralysis that can spread to the muscles that control breathing and prove fatal?

When it comes to drug dosage, the “optimum” is often a compromise: if the dosage is too high, the drug’s side effects will override its curative effect but if the dosage is too low, the drug will have little curative effect. Another dilemma is that because animals are not genetically identical to us, no amount of testing on them will prove that a drug is safe for humans: TGN1412 (a potential cure for Alzheimer’s disease) had been tested on rabbits and monkeys, during which no significant side effects were observed. But in the volunteer trial, the participants had to be rushed to intensive care in agony, their head and limbs swelling grotesquely as their immune systems collapsed and drove their hearts lungs and kidneys into failure.

But Professor Clack’s stance on animal testing remains one of tolerance. In hindsight, more comprehensive animal testing of Thalidomide (administering it to pregnant mammals and examining the effect of the drug on the fetuses from point of administration to a considerable amount of time after birth) could have prevented it being prescribed as a pill for morning sickness. Also, the welfare of live test objects is now taken into serious consideration - in line with Russel and Burch’s 3 Rs, animal testing now:

Is REFINED to decrease pain and stress
REPLACES animals with non-living materials whenever possible
REDUCE the number of animals sacrificed.



In addition, in the UK the Animals (Scientific Procedures) Act, 1986, demands that animal testing laboratories have Home Office licences and operate under 24 hour veterinary cover. State Animal Welfare officers also carry out (often unannounced inspections) to check for unnecessary cruelty to the test objects. And according to Professor Clack, 98% of animals used for testing are rats, fish and birds (which humans deem – with the exception in some cultures of birds – to either be pests or rodents).

But at All Hallows, the debate has continued. Can something like the Draize test (rabbits having their eyes clamped open for days so that they can't blink away the shampoo that's dripped into their eyes) ever be justified? Whilst animal testing helps create life-saving treatments for humans, the morality of it still seems questionable.

But could we be the generation that finds a realistic alternative to testing on living animals? And could we be the generation to shorten the testing period for new drugs from 15 years to 8 years or even 5 years? The faster our progress in drug development (provided that safety and ethical integrity are still prioritised), the closer we come to beating those ever-mutating pathogens. Thank you, Professor Clack, for a talk that was both challenging and inspiring.

Chen Ji, Y11



My Higher Project Qualification Learning Experience

Last July, I was offered the opportunity to complete a Higher Project Qualification (HPQ) over the next term and wanting to balance revision with learning that would perhaps be more personalised and enjoyable, I accepted the challenge.

I chose Traditional Chinese Medicine (TCM) as my HPQ focus because has always fascinated me: I've been exposed to it from infancy because my father used to practise it and as I became old enough to understand a few aspects of it, I was drawn by its theories' enigmatic links to Chinese philosophy. I set my HPQ investigation title as "To what extent has political change in Mainland China impacted TCM since the 1950s?" (I'm also very interested in political history) and spent a highly energised summer visiting



TCM museums in my home city of Hangzhou. Back at school in September, however, my passion for science took over and I decided to focus on a purely scientific aspect of TCM; in December, I settled on the investigation question “What is the best method for carrying out Evidence Based Investigation into Traditional Chinese Medicine?”

A really fun part of my HPQ journey was the visit to Manchester University. Just to walk through the corridors of the University and gaze into the lecture rooms was wonderful enough because those glimpses reminded me that University was definitely where I want to be in 2 years. And now I’ve sat and ate in the Manchester University cafeteria, I realise that life at University doesn’t have to be daunting - it was clear from the atmosphere in the cafeteria that as long as you be yourself, University is a warm and accepting place. The workshop we attended was delivered by a PhD student, who in the space of 2 hours taught us so much about evaluating the reliability of research resources and citing them correctly - I was inspired by her

experience and knowledge to keep on working hard at my academic pursuits. The research session that followed was also incredibly useful as I was able to download scientific articles that then became that backbone of my research database.

Something I really came to appreciate was the support I received when learning to research and reference. My thanks to Mr Howells, our centre co-ordinator, for organising meet up sessions throughout our HPQ process as referring back to the advice I noted down during those sessions really strengthened my Project. Also invaluable was Mrs. Lewis’ support as my Project Supervisor – by critiquing my work, she helped me understand why it’s so important, as a researcher drafting your research, to put yourself in your readers’ shoes. I also want to thank Mrs. Lewis and my friend and fellow HPQ student Jordan Simpson for advice on time management, which is definitely my weakest skill when doing any project!

Through completing my HPQ, I’ve learnt that academic research involves much more than learning facts – having an overall understanding of the broad topic you’re researching is just the initial step. Rigorous academic research requires you to understand complex concepts and their relationships with each other and then formulate your own conclusion – it’s time consuming hard work but you get the best feeling in the world once you’ve completed your research.

Chen Ji, Y11
Wednesday 5th April 2017





The sheep shearing day was aimed at teaching students the importance of shearing sheep, why we do it and also what happens to the wool after it has been taken from the sheep.

We visited the farm and I taught students how we shear. They all had the opportunity to use the shears and sheared their own bit of wool from the sheep. Whilst we were doing this I informed the group about why we shear the wool and how it can affect the health of the sheep if it isn't carried out annually.



Sheep Shearing AHLC



When we had sheared the sheep the students took the wool back to our Wonder of Woollies tutorial. Judith from Wonder of Woollies showed the students how the wool is spun and also the process that it goes through before you can turn it into anything. useful

The highlights of the day for the students were:

- * Learning how to shear the sheep.
- * Watching Judith use the spinning wheel.
- * Getting to know the animals.
- Making new friends.

The students enjoyed every part of the day. They learned so much in such a short space of time.

Miss S Caffery

New Arrivals - Farm Update

So far this year we have taken on 10 new arrivals on the farm. We have 6 new sheep, 2 of these are lambs and we have also acquired 4 new chickens that have been donated by some of our students here at All Hallows.

The sheep are Grey face Dartmoors and they are a lovely breed of sheep. They have smiley faces and thick curly wool. They have been a big hit with both the students and the staff as they are all so friendly.

The chickens have come to live out the rest of their lives here on the farm with our resident chickens. They have settled in really well and they are loving being able to roam in the large paddock.

As well as donations to the farm we also had a nice little surprise from one of our guinea pigs. She gave birth to two lovely little baby guinea pigs. They are both healthy and getting on very well. The students love visiting all our new additions and they give them lots of attention and care.

Miss S Caffery





**All Are Welcome at
All Hallows Catholic College
Come in and visit our
wonderful Church College**



**All
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