UNIVERSITY OF WARWICK
DEPARTMENT OF CHEMISTRY

BUBBLING UP: SUSTAINABILITY

Termly collection of wellbeing stories shared by staff and students, because we care

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ABOUT US

ISSUE 8 TEAM

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If you'd like to supply feedback, or submit a piece for the upcoming issue, please get in touch via a form at warwick.ac.uk/bubblingup or by emailing chem.experience@warwick.ac.uk

FROM THE EDITOR

RORY KENRICK
FINAL YEAR MCHEM STUDENT

Hi there! My name is Rory and for those of you who do not yet know me from reading the previous issue (firstly, feel free to go back and give it a read; The topic surrounds dealing with change and there really are some fantastic pieces to catch up on!) I had the absolute pleasure of working alongside issue curators Bo and Adam for that and am really thrilled to have been invited back again. For this issue, we are looking at sustainability and the trials and tribulations that may arise from working towards a greener tomorrow. By doing this, our authors look just as much back to where their personal passion for helping to care for the planet arose as they do forward to the not-so-distant horizons of the future.

So, the first, and most obvious questions to address at this point are: what is sustainability and why is it important to contribute towards a sustainable society? According to Google, sustainability is 'avoidance of the depletion of natural resources' to 'maintain an ecological balance'. I feel the most important point to take from this definition is that even from a strictly environmental perspective, sustainability is not defined by any one resource or challenge – but rather being aware and considerate of everything that we do as humans and how it may negatively impact on our environment for generations to come. The unfortunate reality is that the natural resources we consume to fuel our day-to-day productivity (be it through our energy usage on the grid, the litter we produce or the cars we drive) will all inevitably leave a footprint on our planet which may last for centuries or more. This may not be something that you consider much on a daily basis. I mean, here I am sat on campus on a computer consuming electricity from the national grid having been driven in on a big diesel-hungry bus and until this point in the day had not really stopped to consider how this might contribute to the issues surrounding resource management and the climate.

To me, however, the most striking part of googling this single term in the interest of this foreword was looking at the frequency in which the word 'sustainability' is quoted in literature from 1800 to the present day (turns out this is called an 'Ngram' – the more you know!). It appears that sustainability really is a highly topical issue; With the graph showing a sharp increase in frequency from the early 1970s onwards up to where we are today in 2022 and is continuing to skyrocket. Even from when I was back in primary school throughout the 2000s, the issues of global warming and climate change seemed so far off and almost like something out of a dystopian novel back then. The longer the issues are discussed however, the more they are understood and the more you begin to realise that the threats faced by humanity are very real and not quite as far off as you might think. In fact, research suggests that not attaining net zero emissions by 2050 will cause global temperatures to consider to soar above 1.5˚C over pre-industrial levels (this United Nations article provides some more useful insights for anybody interested!). You may be wondering how this is relevant to sustainability. Well, one of the most important initiatives related to this is focused on renewable energy sources including solar cells, wind turbines and hydropower, to name a few. Use of non-renewable resources including fossil fuels present issues related to climate change and therefore opting for more sustainable energy sources can help to overcome this.

So, it's easy for me to sit here and lecture about why sustainability is important, but what can we do as everyday people in order to lessen the mark we leave on planet Earth? Allow me to preface this by saying I have certainly been guilty of the mentality of 'Well, what's the point of me changing my habits if I'm only one person?' – but that's exactly the point; It can't be. All of us have to band together to improve our understanding and perception of sustainability on and off campus. This might be a series of small changes including cutting meat consumption for one or two days a week or walking to and from the shops instead of driving. As an exercise, I encourage you to take a moment to consider your own daily rituals and what you might be able to tweak to save the resources you have – it may have more of a long-term impact than you think!

For anybody particularly interested in the involvement of chemistry in production of 'clean' energy, I highly recommend the 3rd/4th year 'Energy' module led by Professor Ross Hatton (who incidentally we are also lucky to have as an author within this issue!). This module taught me a lot about the impressive science behind modern energy production and storage methods as well as the bigger picture surrounding current challenges within this multidisciplinary field. There really is something for everybody to be excited by here.

With that said, thank you so much for taking the time to read this foreword and I really do hope you enjoy this issue of Bubbling Up. We are truly lucky to have some excellent pieces surrounding the issue of sustainability by some of the department's greatest minds.

Thanks for reading!

MANPREET KAUR

DOCTORAL RESEARCHER

I like to think I'm quite a nature girl. Romanticising nature, writing poems about it, and caring for it. Plants rarely survive under my care but over the years I've spent at Warwick, learning about how nature works and how we can use nature as a guide to solve many of the world's problems has left me in awe of this wonderful companion that we have.

It started off with making small switches in my personal life, to joining charities and signing petitions. Then attention turned to labs and now I find myself actively engaged with the Chemistry Green team (if you aren't, join us! It's super fun). But nature to me is not just about the efficiencies, redesigning economies, and the future generations. It is personal. It is a lot about the here and the now. I truly believe that we are nature. A part of it, an essence of it rather than spectator (ions).

Eco anxiety is something I can say that I experience quite a bit. Sometimes overwhelmed by news headlines, sometimes completely lose my ability to feel in the face of sheer disregard and man-made natural disasters. In my personal life, struggling with my mental health has not been uncommon, and nature has helped me with not losing sight of things. I won't lie; therapy helped. But just standing amongst trees, closing my eyes and knowing that the trees and the waters will always be there, and there will always be another morn and that I am just one person in this beautiful world calms me down. Nature provides a constant in life when sometimes nothing else feels genuine enough to last. I always find my peace in knowing that my day-to-day struggles are actually not that big a deal, life will go on just like the sunrises (or rain, since we're in Britain). Being a small part of something big and beautiful brings its own relief (at least to me).

I have read countless articles on how nature is beneficial for people's wellbeing. It provides the space to reflect and connect with the self. We've seen over the past few years how many people found ways to connect with the natural world during the lockdowns; from the Jane Austen-y walks many of us would have gone for, to Taylor Swift releasing two albums so hugely inspired by the natural world. I mean, just look at songs like Ivy and The Lakes.

But the natural world is being destroyed by those who have benefitted from it, i.e. us. Climate change, biodiversity loss, and plastic and chemical pollution are some of the biggest challenges we face today. It's a lonely business sitting in one's room reading the headlines about yet another oil spill. But I find refuge in the community of people who care. Be it the people on social media who share their work, the charities tackling the issues head-on, or the next green team meeting where we discuss the little and big things we can do to improve. Nature provides company but I guess it also taught me to seek company. For me, the best things about climate action, and caring about the natural world, is meeting other people who too care about nature. And I think with that reassurance comes hope and motivation to keep going.

Learn more about the Chemistry Green Team here.

ALISTAIR POXON

FINAL YEAR MCHEM STUDENT

Last year, as yet another unusually hot summer began, the time came for me to decide upon a research area to undertake in my fourth and final year at Warwick. Having spent my third year in industry at Rothamsted Research (a sustainable agriculture lab in Hertfordshire). The work I was involved with was fascinating, and more importantly, helped to create and nurture real-world change that would lead towards a more sustainable future, and I fondly look back on what I achieved during my time there. Ultimately though, I found that lab work wasn't for me, my passion for chemistry in its myriad forms had waned, and I was ready to explore something new. This realisation led me to investigate the 'Chemical Education' option for my fourth year research project, as it presented something that broke away from the traditional chemistry route.

This year, working with Dr Bo Kelestyn, I decided to explore how chemistry students' views and actions, regarding environmental sustainability, are affected through their university education. Choosing a topic related to environmental sustainability was a very attractive route for me, as it's an area that I've cared deeply about for years and one which has now become a defining issue of our time. I felt that chemistry students were in a unique position within the university, as their actions have the potential to affect great positive change, through the continued development of such technologies as solar cells, batteries, fuel cells, recycling, and so much more, all of which contribute greatly towards giving future societies a better chance to thrive in a more sustainable way. However, a chemist should also be aware that with their unique position, comes a heightened responsibility; the use of energy intensive equipment, environmentally hazardous chemicals, and precious materials, amongst other factors, comes at a cost. For these reasons, and also the simple fact that I'm a chemistry student, I chose my home department as the basis of this study. Originally, my plan for the project was to start an initiative or scheme which would help chemistry students improve their day-to-day sustainability.

However, after sifting through the literature and searching through Warwick's own initiatives, I found that there was already a great deal of effort being put into environmental sustainability education, and that all of my ideas for a new project had already been implemented in some way within the university. This shifted the course of my study to a more analytical approach of existing schemes and their effectiveness when it came to positively changing student behaviour.

In carrying out this background research, I was delighted to find that the chemistry department really is taking serious action to combat its negative effects on the planet, and to promote sustainable practices to both its staff and students. From the UniGreenScheme, which prevents high value items, such as fume hoods, bespoke glassware, and gas chromatography systems, from being wasted by recycling, selling, or reusing them, to the STEM Grand Challenge, which aims to redesign the science precinct at Warwick with sustainability at its core, there's plenty going on in the background to help Warwick reach a more sustainable future. Additionally, there's also a good number of ways students can engage with the department. If they are interested in getting involved with improving sustainability, students, staff, and even societies can sign up to Warwick's Green Champion Scheme, which encourages its members to consider sustainability in their every-day actions, and provides them with some useful tools to help them do this effectively.

A little closer to home is the Chemistry Green (Action) Team, who host meetings, events, and talks on a regular basis. These events have a wide subject range, so they're perfect for anyone looking to join in or help out with improving Warwick's future. One particular programme that the Chemistry Green Team encourage is UCL's 'LEAF' (Lab Efficiency Assessment Framework) initiative, which is a framework that allows laboratories to assess and improve their sustainable practices; some labs at Warwick are already taking part in this scheme, but there's room for many more to join. It is crucial that labs make an effort to reduce their effect on the planet as they typically consume 3-10 times more energy per metre squared than typical academic spaces, and they are in the top four carbon emitters on campus (which, together, account for 84% of the uni's total emissions).

If however, you find that you simply don't have the time to take part in these great extra-curricular opportunities, there's even on-course modules that you can take which have a keen focus on sustainability; CH3F7/CH416 (for third or fourth years) is the 'Energy' module offered by the chemistry department. This excellent module thoroughly examines the energy issues that our society is currently facing, and how we can use chemistry to overcome these seemingly monumental challenges, be it through improved photovoltaic devices (solar cells), hydrogen fuel, or many other emerging and promising technologies. I've found studying this module provided a much needed and more optimistic contrast to the doom and gloom that tends to surround the future of our fragile planet. Hopefully, as time goes by, more and more modules at Warwick will begin to integrate a layer of sustainability in their teaching.

Overall, the future of sustainability at Warwick is looking good.

Finally, the world is switching back on to the idea that our actions have significant environmental consequences and that we are in no way removed or separate from nature's great balancing act. A great global change is needed, and like all great change, it must start small. At a university scale, this cannot happen without the creation and development of initiatives dedicated to sustainability, which, encouragingly, we are seeing appear more and more frequently. It is up to us to join this positive action, and piece by piece, mend the damage that we, as a race, have caused.

I'll be sending out a survey called "Environmental Sustainability in Undergraduate Chemistry Education" later this term as part of this research. I would really appreciate participation from any undergraduate students at Warwick whether you're interested in sustainability or not, so if you see it, please consider submitting a response.

ROSS HATTON

PROFESSOR OF PHYSICAL CHEMISTRY

My 'I fix it' journey

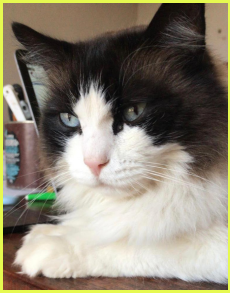
A few weeks ago, I finally conceded that I would either need to upgrade my mobile phone, or replace the battery. Given that electronic waste (e-waste) is now a major source of environmental pollution and our rate of consumption of rare metals for electronic devices is wholly unsustainable, I decided to look into where I could get the battery changed. I soon discovered that my phone was designed to make it extremely difficult to change the battery, by using tiny screws (less than one millimetre in length) with several different obscure screw head designs. Additionally the manufacturer would not supply a replacement battery. Annoyed by this I set myself the task of finding a company who would sell me a battery so I could fit it myself, thereby saving me a great deal of money and avoiding contributing to the e-waste mountain. I announced my plan at the breakfast table to my wife, who diplomatically said, 'Is it wise to add this job to your very long to-do list'?'

I was not going to be deterred by this common sense advice, and managed to find a company called 'iFixit' who would sell me a battery for my phone, a specialist tool kit and provide online detailed instructions (with lots of videos) describing how to fit it for less than 3% of the cost of a new phone. Three days later, it arrived and I set to work. Step one and step two were a piece of cake. At step three the instructions stated that 'competent persons' can skip steps 4-7 and go straight to step 8, so I went straight to step 8 - wouldn't you? Unfortunately, my competence level didn't quite hit the mark; the extremely thin wire connecting the display to the rest of the phone snapped when I was removing the display. Steps 4-7 (which I had skipped) explained how to avoid this. I had learnt an important lesson – don't assume that if you are proven to be competent in one area that your competence extends to areas outside of your area of proven competence. I call this the 'knowing-a-great-deal-about-very-little confidence fallacy' which academics are particularly prone to.

Fortunately iFixit were able to supply a new display for my phone together with a specialist tool kit for 8% of the cost of a new phone, so I placed my order (behavioural economists amongst you may recognise this as the 'Sunk Cost Fallacy'). Three days later my new phone display and tool kit arrived. This time I had read all the instructions in advance and so the stage was set for success. Before fitting the new display I decided to install the new battery I had put aside three days earlier when I managed to break the very thin wire connecting the display to the rest of the phone. I carefully connected the new display, and then carefully dropped the new battery into place. However, just before screwing the phone back together I noticed that the battery, whilst in the right place and connected properly (so perfectly functional) was slightly misaligned with the edge of the case. A little voice inside me said 'come on, you can do better than that. Take it out and put it back in so that the edge of the battery is aligned with the side of the case'. I foolishly listened to that little voice (the voice of Doctor Perfectionism – you may know him?) and proceeded to try to lift the new battery back out of the small space, which required the use of a pair of tweezers.

In doing so I managed to puncture the thin plastic coating protecting the soft lithium ion battery beneath. It would have to be replaced on safety grounds! At this point I had learnt another important lesson: don't be a perfectionist – it rarely pays. Nobody would ever have known (or cared) that the battery in my mobile phone wasn't perfectly aligned with the inside of the case, and I could probably have lived with knowing this annoying fact. I placed an order for another battery and three days later, a new one arrived. I didn't need to buy the tool kit this time, nor did I need to look at the instructions, since by now (surely) I was a 'competent person'. Little did I know that fate would test me yet again.

As I carefully assembled the phone, one of my cats jumped onto the table (I say one of 'my' cats but anyone who has a cat will know, you don't own a cat, the cat owns you). Purring loudly, the cat (Henry) scattered the 16 tiny screws I had carefully lined up in the order they needed to be attached to the phone, onto the parquet floor below.



For those not familiar with parquet floors they are made up of an array of wooden blocks with small gaps between each block just wide enough to accommodate said tiny screws from a mobile phone. A few moments later my wife came into the room to find me on my hands and knees peering between one of the gaps between the wooden blocks of the parquet floor and the phone in two pieces on the table above. 'Ah, I can see you are busy, so I won't disturb you' she said, and left chuckling to herself. After some time I managed to find 15 out of the 16 tiny screws and took two key decisions:

1. To call off the search for the sixteenth missing screw due to the fading light.;

2. To test the hypothesis that, for my phone the missing screw wasn't really needed.

I reassembled the phone (minus one tiny screw) and gingerly turned it on. To my relief, the display burst into life - success! I had learnt another important lesson: don't worry about the small stuff, it's rarely as important as you think. I had also learnt that it is possible to survive without a mobile phone for six whole days! (It may even be possible to survive longer….). In fact, I slept better during those six days because I wasn't tempted to look at my phone in bed, and wasn't distracted by a continuous stream of e-mails. I don't regret my 'iFixit' journey one bit, because I learnt several important lessons and fixed my phone for 14% of the cost of a new one, whilst also saving one more electronic device from landfill. Finally, you may have noticed that I have mentioned the company iFixit many times in this blog, but haven't mentioned the mobile phone manufacturer once. This is because I believe we should support those companies who are genuinely seeking to make positive change as well as a profit, and should shun those companies who seek to trap us into a cycle of rampant consumerism.

NEXT ISSUE: CO-CREATION

COMING IN TERM 3 2021/22

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If you have been affected by this issue, please find out more about the support available on warwick.ac.uk/bubblingup or by speaking to your Personal or Senior Tutor in the department.