

MatSoc Magazine

Winter 2020

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IMPERIAL MATERIALS



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The Materials Society (MatSoc) is a student run organisation which aims to enhance the experience of students studying in the Department of Materials at Imperial College London, and to promote Materials Science and Engineering both at university and in industry.

MatSoc achieves this goal through collaborative events, social functions, extra-curricular lecture series, and industrial visits to engage with Materials Science beyond an academic environment.

Our society currently has around 800 members, including undergraduate and postgraduate Materials Science students at Imperial, as well as other students studying other subjects and are interested in Materials Science and working in related areas upon graduation.

MatSoc Fleeces are out!!



IMPERIAL MATERIALS





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Welcome to the MatSoc Magazine

Editors Foreword & President's address

Welcome to the 2020 Winter edition of the MatSoc Magazine!

Producing the magazine whilst everyone was in a cloud of uncertainty was undoubtedly a challenge. Despite my fears of not getting many interested writers because of the surrounding uncertainty, I am pleased to say that I received an overwhelming response. This magazine includes a varied range of high quality articles about internal and external events and I am confident that this edition contains an article of interest to every individual.

To the freshers who will be reading this, welcome to Imperial, the Royal School of Mines and the Department of Materials. An article of particular interest to you would likely be "Four Years at Imperial" by Schan (MatSoc President 19-20). I hope you find some time to read these in your holidays after the exams. Additionally, I would like to direct the third and fourth years to "Sustainable Plastics" by Enora (3rd Year) and "High Performance Composites" by Anuja for some informative features. The highlight of this edition would be the 'Alumni Section' featuring articles from 3 Materials Alumni (Enrico (2019), Abigael (2020) and George Grant (2019)).

Finally, I would like to thank all those who contributed and I encourage anyone who wants to try their hand at journalism to contact me. Enjoy!

Aishwarya Varanasi
MatSoc Magazine Officer 20-21



Hello everyone,

I am very excited to introduce the winter edition of the MatSoc Magazine! I hope you find it an exciting read, and maybe it will even inspire you to write something for the next edition! Thank you to everyone who has contributed and to Aishwarya for her stellar work— without you guys there would be no magazine.

I think it goes without saying that this autumn term has been different, but I am proud to say that Materials as a community definitely came together to make the term as great as possible. The shift in moving events online was made smoothly, made possible by your guys ongoing attendance. Personally, I thoroughly enjoyed our first rollout of events with among us, a game that has made me lots more paranoid, as well as getting overly competitive in Charlie's Big Fat Quiz of the year.

With this eventful year coming to a close, there are a few things to be excited about for the next year. With the order all but sent off, we look forward to rolling out our MatSoc fleeces early into Spring term. Although our annual NY dinner is doubtful to make a return, alternative in-person events are being considered to celebrate the year as a cohort, alongside more competitions, events and lunchtime lectures. Alongside this, we are going to continue hosting social events every Friday through the winter break (with the exception of Christmas day), and Emily and the wellbeing team are continuing Materials Tea and Biscuits every Saturday as well.

It has definitely been a testing year, but we hope that you have been able to enjoy at least some of it. We are always open to your suggestions, so please don't hesitate to contact us at mtsoc@ic.ac.uk or through our website, matsoc.co.uk. From us at MatSoc, we hope you and your family stay safe and have a wonderful winter holiday and we look forward to seeing you all again in January!

Arinjay Jadeja
MatSoc President 20-21



A “Virtual” Freshers’ Week

Shantam, a first year, speaks about his “virtual” freshers’ week

Lectures as videos, lecture halls as bedrooms, and classmates as pictures on a screen: Covid-19 has certainly lived up to its promise of providing an array of never-before experiences. However, as the cliché goes- *“there is no such thing as a negative experience”* and also because my experiences have been fun, being a remote student has allowed me to savour a plethora of thoughts, perspectives, and ideas.

The welcome week started off with a click and we had our online induction. I remember the feeling of happiness that swelled in me. We met our future classmates for the first time and were introduced to the Material Department staff. From solving riddles in a group or playing various games in online servers, we then bonded by the activities department had planned for us.

“Events by the RSM also kept giving us the chance to socialise with classmates and other seniors. Events like the “Game Night” involved a set of online games that could be played with each other, while events like the “Virtual Dinner” allowed us to bond together with something we all love: food.”



RSM Escape room—a popular event amongst the freshers

Additionally, the Materials Challenge played a dual role— it served as the perfect introduction between the members of the Materials family and allowed us to explore the whole department with us being glued to our seats. The Material Department staff, being determined and perseverant to make our experience as memorable as possible, designed the Challenge to be very interesting and mentally invigorating; it involved a set of clues hidden in different parts of the virtual department, each leading to a unique solution found by fulfilling a task.



**Materials Family bonding in an RSM Scavenger Hunt
Oscar (Year 4), Shreya (Year 1), Marco (Year 1), Jake (Year 4) & Luke (Year 3)**



Our welcome week was over, we had our first week of classes. The classes were delivered in a multi-mode format- recorded lectures, live sessions, and workshops.

As a student fresh out of high school, many aspects of remote learning did seem slightly different. For example, though the welcome week was based on “Microsoft Teams” and I had been taught the basic functions, the prospect of watching lectures almost the way I would use Netflix Party or asking questions by “raising my hand” or discussing with my classmates just the way I would use WhatsApp seemed a bit daunting to me at first. However, I got used to it and soon began to appreciate the professors’ choices for a mode of delivery for his/her module; it seemed as if the module was designed for the particular mode of delivery.

Another thing which seemed slightly different for me was the concept of modules as I had been learning specific subjects like Mathematics, Physics, etcetera in high school before learning modules like Material Structure and Material Performance which seemingly integrated several subjects at once. However, realising of the modules’ relevance to Materials and the sheer amount of connections between several modules, it soon seemed obvious that specific subjects could not do justice to this course. “Remote learning does seem to be the perfect trailer for the fantastic years to come.”

Shantam Gilra — *Student Writer*
First Year Materials Undergraduate



A Summer in Lockdown

Yash, a second year, writes about what he did over Summer 2020

Summer (*n.*): a time when holidays are booked, internships are planned, and chill-time is much anticipated.

Spoiler alert. We all know things didn't go as planned.

Personally, my family was planning to embark on a journey to the motherland: India, but instead, I was 'treated' to 3 months of home time. So, as the mindful, young student I aspire to be, I set out on a journey to discover how to use my time effectively.

Slowly, the holiday began. The initial days were spent recovering from remote university life. One of the methods was by finally having my first few lie-ins. Shortly after, our very own DJ star, Adam Wu, decided to have me on his EP: 'Y1: Will you be my quarantine???' So, we recorded 'Indigo Skyline': a love song. Go listen on Spotify.

"After eventually deciding to use my time a bit more productively, I came across a website called InsideSherpa."

It hosts multiple virtual experience programs that span a wide range of sectors. I decided to complete the Software Engineering Experience with JPMorgan Chase & Co. as I believe programming is a skill critical for success in many organisations, particularly in technical engineering roles, and it was intriguing to face a real-world application. After completing this, I gained valuable experience by analysing and writing code used to find the optimum time to buy or sell a stock in the stock market. Although finance is not the field I am interested in, to see the type of work is done by a programmer in a large company was still engaging.



Like many others, I fell into the quarantine cliché of cooking and baking to hone my culinary expertise. Finally, after years of watching my mother take control of the kitchen, wielding pans and spatulas as if they were an extension of her arms, I was allowed to take the helm and prepare dishes by myself. The standout meals included popular Indian dishes, noodle dishes and various breakfast dishes.

“I also attempted baking millionaire’s shortbread and different cakes - the successful ones dissolved right in your mouth and disappeared without a crumb in the span of 2 days...”



Yash's Cooking

In July, once more restrictions were lifted, I travelled (whilst maintaining social distancing) to meet up with course mates on the 18th and we enjoyed a sunny, cheerful Saturday in Brighton filled with questionable diet choices and a dip in the English Channel.



The slogan “Brighten your day in Brighton” was very much a successful one.



Materials Year 2 in Brighton

“In the same month, I also discovered the Wonsulting Project, which seemed like quite the interesting initiative to get involved with.”



Essentially, the Wonsulting Project was a 10-week long program in which teams get in contact with local organisations and help them solve a problem. Capulus, our team, decided to focus our idea on spurring positive change to help the vulnerable community. Therefore, we designed a door handle to help the visually impaired, which would limit the spread of coronavirus in the community. I worked on materials selection using Ashby plots and it was pleasing to see how applicable the skills learnt at university are.

Whilst all such activities progressed through the months, the remainder of August was spent meeting with school friends, smashing golf balls in a driving range and waiting in long queues to take advantage of the 50% off scheme.

However, I'd argue that we were just paying them with time rather than money, and as the old saying goes "Time is money..."

While the pessimist in me occasionally wonders whether 2020 could get any worse, I look back to find the many positive experiences that have been peppered throughout this "unprecedented time". I'm grateful to have had so much time to develop, not just academic/technical skills but as a person as well. 2020 isn't over, and a lot of the troubles that came with it are still present. Although the future is still uncertain, time spent at home, away from a London city dweller's bustling life has been precious and I feel a bit more prepared and ready to tackle any more challenges that life throws my way.

Yash Dwivedi — *Student Writer*
Second Year Materials Undergraduate



Sustainable Plastics

Enora, a third year, reports on the first MatSoc Lunchtime Lecture

Now more than ever, the challenge of addressing plastic waste recycling is an un-escapable reality. This time, it made its way right into my dining room in what was a very odd Freshers' week, and I was not expecting casual lunch with my family to turn into a passionate discussion in front of Microsoft Teams.

“Questions arose...Should we stop using plastics entirely? How can we recycle all the plastics we use? How effective are alternative polymers? How do we assure their production does not impinge on worldwide food crops?”

Professor Edward Kosior is the managing director of Nextek Ltd, a consultancy focused on implementing recycling plants, developing innovative recycling techniques and helping businesses increase their sustainability performance. As an expert in the field of polymer material science, in this lecture he had clarified the above problems and given us some answers.

“Through this insightful lunchtime lecture, I had learnt that the main problem with polymer recycling is keeping the value of these specifically engineered materials in a loop, aiming towards infinite reuse of the polymer molecules.”

As Prof Kosior reminded us, polymers are a very versatile material, and possess many useful material properties which serve us in our daily lives. These include their lightness, transparency, strength to mass ratio, thermoplasticity in some cases, low reactivity with aggressive species (think of cleaning detergents), thermal and electric insulating properties, as well as easy and cheap processing.





(Left) Difficult to recycle plastic bottles (Right) Landfills
Images taken from Nextek Presentation

Many of these properties serve two purposes : either they make plastics impossible to degrade, or they have a positive impact on the environment. For example, transporting drinks in plastic containers emits less CO₂ than in glass containers, due to savings in space and weight, therefore placing less lorries on the roads. If these amazing properties just end up going to landfill, much hard work would have been lost in polymer processing and manufacture .

A clear example Prof Kosior gave of this is regarding bioplastics. These carefully crafted polymers, once synthesized and used, are left to biodegrade, or, in most cases, incinerated for energy recovery.

However, Kosior insisted on the fact that keeping the value of the polymer chains throughout many recycling processes is a major challenge, for these some of these properties degrade after many cycles. For example, PET progressively changes to a yellow-green colour due to oxidation, and this phenomenon increases if excessively high temperatures are used during decontamination and extrusion. To counteract this, additives are employed to regain polymer transparency.

Kosior insisted that the way forward would be to value science over marketing, using it to enable product eco conception/design with less materials and easy sorting, recyclability of chosen materials and sustainability of fabrication lines. However, marketing's full strength should be taken advantage of to induce consumers into buying these more sustainable products. Customers should also be educated to place less value on the packaging design in itself, being more tolerant of colour imperfections, as mentioned above.

“Drawing to a conclusion, Kosior delivered a general action agenda, as well as giving, under Manjula’s prompt, manners in which students could get involved. He encouraged us to choose and be successful in polymer related modules, or to join the student SPE chapter.”

His general action agenda consisted of working to generate 100% recyclable packaging, prevent ocean plastics, build up large scale recycling operations for the four main resins (>100 00 tonnes/yr for LDPE, HDPE, PP and PET), encourage resin companies and brand owners to close the circle on their products by holding stakes in recycling operations etc.

This insight into the plastics recycling industry was particularly striking in the context of the UG lab sessions. It showed how the machines we learn about in lectures and techniques we use in labs are regularly used in real research. Overall, this was a very fun and interesting lecture.

“Here’s to a whole new academic year of virtual lunch lectures!!”

**Enora Saule — *Student Writer*
Third Year Materials Undergraduate**



High performance Composites

Anuja, a fourth year, reports on a MatSoc Lunchtime Lecture given by one of MatSoc newest sponsors Solvay

I'm sure that everyone would agree with me when I say that now, more than ever, is the time where large companies (where possible) need to start investing seriously and sustainably for the future given the worrying rate at which several global crises are unravelling as we speak.

For this reason, it was a pleasure to hear that Solvay, a Belgian chemicals company, has pushed towards sustainability over the last decade and has recently partnered with the Ellen MacArthur Foundation as a step towards transforming their business into a circular economy. Sustainability isn't just talk for them; it's become a key priority in the future progression of the company, so much so that they value their sustainability goals in equal standing with their financial goals.

Solvay was founded by an influential figure in the late 19th century called Ernest Solvay who developed a process for making soda ash 160 years ago. Since then the company has developed several more materials such as PSU and PEEK, and they are well-known for their contribution to the successful Solar Impulse project

Although they offer their services to the agrochemicals, electronics, consumer and healthcare markets, their primary focus has been in the automotive and aerospace industries and so naturally the presentation was centred around engineering polymers and high-performance composites – specifically carbon fibre polymer composites.



“Not taken MSE 309 yet? – no problem.”

A thermoset that most people are familiar with is epoxy; epoxies have been used in the aerospace industry for the last 30 years, prized for their great versatility which can be attributed to their simple reaction chemistry and design flexibility. However, there are drawbacks. Due to the ring-strain of the epoxide groups, a lot of energy is released during the ring-opening reaction with amines; therefore, this highly exothermic reaction requires stringent safety measures. And despite being quite stiff for a polymer (3.5GPa), it's unfortunately quite brittle which is why thermoset-thermoplastic blends are used instead, to improve the toughness of the epoxy. Epoxies can also have quite low glass transition temperatures which is not desirable for use in high-temperature environments like an engine.

A different class of thermoset chemistry that has shown much potential is benzoxazines.

They use a phenol catalysed ring opening polymerisation reaction to produce highly linear structures which can then be transformed to cross-linked structures (using some clever chemistry) that possess remarkably high stiffnesses close to 5.5GPa. This chemistry makes it possible to reach glass transition temperatures as high as 280°C, which puts them in competition with other promising polymers such as BMI and polyimides. But a potential weakness with benzoxazine is that it demonstrates dramatic strain-softening behaviour, which at first glance seems alarming for an aerospace material, however they've realised that by reinforcing the polymer using some nanotechnology, they would need the polymer matrix to strain-soften any-



“A famous reinforcement material for composites that has always been of great interest is PAN carbon fibre.”

To transform white PAN fibre into the black carbon fibre we're familiar with, the fibre must go through oxidation and carbonisation steps, followed by surface treatment and sizing. These carbon fibres can then be embedded in a resin matrix in two different ways to produce fibre composites. One method is to layer prepregs in several orientations to achieve the desired mechanical properties; this would then be cured under vacuum conditions to produce a laminate composite. Alternatively, a woven carbon fibre fabric could be used, which is shaped and then injected with the resin matrix. Therefore, it's vital the resin matrix is adaptable for different processing methods.

“Speaking of the current and future role of composites.”

It's commonly known that aluminium has been the long-held favourite in the aerospace industry; however, is not as lightweight of a material as we'd like to make planes out of. The lighter the materials, the better the fuel efficiency, and the smaller the industry's carbon footprint; hence why there's been a great effort from the likes of Airbus and Boeing to increase the total amount of carbon fibre composites used in their aircraft in place of more traditional, weightier materials. To get an idea of where we currently are, the proportion of composites used in Boeing's 787 aircraft is an astonishing 50%!

As for the automotive industry, the use of carbon fibre composites has been limited to Formula 1 and hyper-cars.



The extensive use of composites elsewhere in this industry has been restricted due to the lack of industrialisation of the processes required to get composites onto cars. Although the progress has been slow, there has been progress, nonetheless. The BMW i3 is one of the first few examples of a serial production car which has a carbon fibre composite shell, and it's likely that many other car manufacturers will follow suit.



Example of carbon fibre composite use

High-performance and sustainable

An important message was highlighted at the end which emphasised that, beyond the issues of process simplification and improving material performance, the future wide-spread use of high-performance composites also poses a sustainability challenge. Unfortunately, due to the nature of thermosets it's not possible to re-shape and reuse scrap carbon fibre composites, and so addressing this key concern of recyclability will be important for the future of carbon fibre composites.

For so long, companies have only focused on developing materials solely for performance during service; and now with sustainability being more important than ever before, materials must be developed with a circular economy in mind - and this will require rigorous lifecycle analysis.

Anuja Sharma — *Student Writer*
Fourth Year Materials Undergraduate



A 'Virtual' Careers Fair

George Morgan, MatSoc VP, writes about the MatSoc 2020 Careers fair

The fourth MatSoc Careers Fair was held this year during the second week of term. With companies and institutions having a strong connection with MatSoc and our activities, it was great to be able to continue this partnership and hear all about the attending companies.

This year and like a lot of things nowadays, The MatSoc Careers Fair had to take a big step into the online world. Typically, the fair was held during one afternoon of autumn term and each company had a stand within G01 where students could go and speak to the attending companies — a 'normal' Careers Fair. Despite the new challenge of moving the event online, we were fortunate to welcome 11 companies over the course of the week. The attending companies included four of our sponsors, and other exciting companies with interests ranging from photovoltaics to consumer health goods.

Moving to the online world enabled for the event to be reconstructed in a way which could be more beneficial for the students. During the lunchtime of each day of the Virtual Careers Fair week, companies delivered a short talk to MatSoc and outlined their company focuses, as well as how materials undergraduates are able to get involved within their company. In the afternoon following the lunchtime talks, students were able to book 1-to-1 meetings with each company to ask their more specific and burning questions.

Solvay BP MONDAY Catch Up	Careers Service ICorr Rolls-Royce TUESDAY Catch Up	Zotefoams OxfordPV P&G THURSDAY Catch Up	Shell Prof. Eduardo Saiz Richard Simons FRIDAY Catch Up
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1-1 booking system on MatSoc website



“On the first day, we welcomed Solvay and BP.”

New sponsors for MatSoc, Solvay, are based in Europe yet have a large presence across the rest of the world. With a large proportion of their net sales owing to the automotive and aerospace field, Solvay are working towards lighter and cleaner aircrafts and automotive vehicles. They are able to do this by creating novel composite materials and technologies that are applicable throughout aircrafts and cars. A particular focus is developing more energy-efficient cars by reducing fuel consumption and carbon emissions. This overlaps with their contribution to the global efforts of reducing the global carbon footprint, which outlines new techniques to produce and store renewable energies.



An insightful overview of BP followed. We learnt the current interests of BP and how they intend to lower their carbon footprint. Whilst BP are prominent in the petroleum industry, they are preparing for the production of much cleaner energy solutions and adapting their business model accordingly. The wide scope of roles available at BP became apparent straight away, and the depth of skills that are both required and that you can gain whilst at BP provided for great insight.



“The second installment of the Careers Fair week provided for another interesting lunchtime.”

On Tuesday, the Careers Service here at Imperial outlined the facilities they have available to help students with their applications. This ranged from where to look for jobs and how to find roles that may be of interest to us, all the way to how to book and arrange CV consultation sessions. The Careers Service provides an extremely valuable service to students and something that should be thought about when applying for career roles.





Some of the attendees on the second day of careers fair

The Institute of Corrosion, ICorr, gave a taste as to what membership of the institute could provide to undergraduate students. Being the largest community of corrosion academics and professionals within the UK, ICorr provide a range of courses and training to members. Additionally, they run both a mentor programme and allow members access to speak and interact with industry experts. The goal of ICorr is to educate future generations, whilst reducing cost and improving technologies. Importantly, student membership to ICorr is free!

Finally, we were fortunate to hear from recent alum Alice from Rolls Royce. Alice presented to us what a career at Rolls Royce looks like. Outlining the wide array of things that Rolls Royce are involved with, and what a speciality role within those sectors is like. Alice reminisced and was able to relate the skills she had acquired during her time spent at Imperial in the department to her day-to-day tasks. We heard the fields that Rolls Royce currently operate in, and those that they wish to expand into moving forwards - such as electrification of aircrafts. We learnt the path of Alice's career once she was employed at the company and how her role evolved. Lastly, Alice gave a great insight into how students can become an employee at Rolls Royce, and some valuable tips to help students when applying.

“The penultimate day of the Careers Fair involved three exciting companies.”



The first, and current sponsor, Zotefoams displayed their fascinating foam technology. We heard how the foams were produced, to how these foams were implemented and applied in the real world. Currently, Zotefoams have an exclusive partnership with Nike - involving the use of the foams in the sole of Nike trainers. It was great to see Zotefoams contributing to the current world issue of PPE, where they provide their foams within the headband of medical face shields. Zotefoams have great opportunities spread across the world, and we were informed of their student opportunities.



New to the Careers Fair, we were fortunate to hear from OxfordPV - who followed on from Zotefoams. OxfordPV is a spin-out from Oxford University, and are interested in photovoltaics and in particular, the development of perovskite solar cells. Laura from OxfordPV touched on the history of OxfordPV and their involvement with the development of the perovskite solar cell. The solar energy from the sun is an extremely large energy source that is not yet being used to its full potential for us on Earth, something which increasingly efficient perovskite solar cells would be able to take advantage of. Laura delved into the science of perovskites and how they are applied to the field of photovoltaics, whilst also discussing the current difficulties of advancing this innovative research field.

We also heard from Proctor and Gamble, P&G, and their extremely large involvement within consumer goods. Having just recently opened their R&D facility in reading, we were given an insight into the work that goes on behind the scenes to advance and innovate current products out in the world today. As P&G invests the most, ~\$2 billion, into R&D within their industry, an extremely exciting career path is available at P&G - of which was explained to us. P&G have a wealth of opportunities available to students, namely R&D opportunities at their site in Reading, of which

“Friday quickly approached and the final day of the first Virtual Careers Fair was upon us.”



Shell, a continuing sponsor, kicked things off. With a hand in all stages of production, from exploration to the transport of product, Shell are a world leader within the petroleum industry. Mabel from Shell gave us an overview of what being a Materials and Corrosion engineer at Shell would involve. It was interesting to discover the broad scope of what an engineer would be involved with, and which operational tasks would follow. From well engineering, to pipeline engineering - and of course thinking about maintenance and reliability of the sites Shell operates at.



Next, we heard from Professor Eduardo Saiz, Director of Postgraduate Studies in the department, who discussed the postgraduate opportunities available on home turf. The research themes of the department are prominent throughout our time spent as undergraduates, but nonetheless pointing these out gave a glimpse into postgraduate study and the topics available. From funding to finding your supervisor, Prof. Saiz made the process and mountain, that is a PhD, feel completely approachable. The final session of the lunchtime session rounded the careers based week off nicely.

Recent graduate from the department, Dr. Richard Simons, returned to present some advice that some materials students needed to hear. Richard looks at UV-C LED technology and its application to disinfection systems, and returned to not only speak about his current work - and excitingly his communication with NASA - but more general advice for a materials student seeking a non-conventional career path. Richard's words put minds at rest and reassured students that it is fine sometimes to go off-piste, and with a materials science degree - we are able to do that!

I would like to extend my thanks to our sponsors and guests who generously gave their time to speak to us throughout the Careers Fair week. The move to the virtual world was a first, and no doubt something that may happen again! I hope all students had a great week and gained at least one thing during the week, and feel some sense of direction with their future career path! Please get in touch if you would like to follow up any of the Careers Fair events and arrange a chat with any of our speakers.

**George Morgan—VP MatSoc
Third Year Materials Undergraduate**



PhD Demystified

Aishwarya (Magazine Officer 20-21) interviews a materials alumni doing a PhD

The purpose of this interview transcript is to give aspiring PhD students a glimpse into what a PhD is what and how to effectively prepare for one. This is by no means the 'go to guide' for a career in research.

Mr. Enrico Manfredi—Haylock is a PhD student in the Solid-State Electronic Structure in the Department of Materials that is run by Dr. David Payne. He started his career as a materials undergraduate in this department. He is currently working on a safer and cheaper alternative to the current recycling of lead-acid batteries. Aishwarya Varanasi (MatSoc Magazine Officer) spends an afternoon with him to understand more about the career path he had embarked on and the nature of research he was undertaking. Following are some of the key questions from the interview.

What lead you to a career in research?

To this Enrico had said "I cared deeply about the subject area. Even the smallest carbon footprint made a difference to me. I was always interested in tackling problems like 'global lead poisoning' and how that slowed children's growth development." In fact he had started his career as a UROP student in Dr. David Payne's lab in the summer of this third year. In his words, the PhD was an extended coursework project with one exam (the defense) in the end of 3/4 years. He also said that he loved the

What do you like and don't like about research?

To this Enrico had said that "independence is a double-edged sword".



The freedom to research on whatever he liked in his area was what excited him but it sometimes did make him go off-piste. He also joked about how he could be very “stubborn and hard-headed” at times and about the time he managed to burn a furnace once!

Something he found difficult but also strangely enjoyable was that his supervisor asks him more questions than give him answers. His advice to fourth years considering this career path is “If you don’t like your MEng project, don’t embark on a PhD”. He also loved the cutting-edge equipment and amazing people he got to work with on a daily basis.

When asked about how things have changed for him during the pandemic,

He spoke about the interesting ways his research group (like many others at Imperial and around the world) adapted to the pandemic. He is using Raspberry Pi cameras to monitor his chemical reactions as he can’t be at the lab like he used to in the pre-pandemic times. He also spoke about how all the lab books had become cloud-based now. He personally felt that he used the pandemic to reflect on the work that he was doing in the labs and its relevance to the world outside. He believed that this reflection would allow him to undertake more meaningful research in the future.

When asked about what advice he would give to undergraduates,

He said that “make the most of your time at Imperial” but definitely do spend at least a year in industry (either as a sandwich year or for a year after your degree before coming back to do a PhD at Imperial or elsewhere”. He spoke about how he had spent an year at Cambridge Consultants before starting at Imperial and how that helped him do better on degree programme. He felt that his time in industry helped he see the broader picture of the science that we studied and eventually made realise what he was truly passionate about.

Mr. Enrico Manfredi-Haylock
PhD Student



A letter to my juniors

2016 was an interesting year. We'd just voted to leave the EU and Trump was well on his way to the Oval office. But global, political uncertainty was the least of my worries, I had bigger concerns such as whether I'd packed the correct size bed sheets for my halls room..

My first year at Imperial was a blur of meeting new people, settling in to the new environment and getting a first taste of practical science in the form of weekly labs. I remember there being so much going on every single day that it often felt a bit overwhelming...

I would definitely say that one of the most important and perhaps most difficult things about starting university is establishing a working balance between the social and academic parts of your life. Everyone has different needs and the first year of university is a great time to figure them out! Rightly or wrongly, a lot of my time was spent engaging in the social aspects of college life.



MatSoc Christmas Curry in First Year

Getting involved with the RSM and MatSoc definitely helped facilitate some of the highlights of my first year, building networks and making lifelong friends. The best advice I can give for anyone who's worried about the social side of things, especially for this year's batch of freshers who have it particularly rough, is that it's never too late to put yourself out there. Don't feel that because you didn't get involved from the beginning that it's too late to start. Four years is actually quite a long time, so don't worry if your time-line doesn't line up with everyone else's!



I suppose the most defining decision I made towards the end of first year was to become involved in the organisational side of university social life by running for committee positions. There are a bunch different incentives for applying for positions in CSPs and the rep network, firstly it's incredibly rewarding and without volunteers, there would be a massive gap in the university experience for everyone. It can be hard work but at the end of the day it's a relatively safe environment to make mistakes and learn in. I'd highly encourage everyone to at least consider running for a role in the Union (CSPs and year reps). I can't speak for everyone but in my case, most of the career opportunities I came across at university were through my involvement in extracurricular activities, so don't think that it's wasted time!

My university experience was to some extent shaped by my decision to run for MatSoc publicity officer in my second year. Ultimately it was this first step that led me to stick with the society for a subsequent two years with the roles of Secretary and President. When I joined as a fresher, MatSoc was very much on the rise in terms of student engagement and social-vibes, so it was a great time to get on board!



RSM Lacrosse 2017/18

I was lucky enough to be a part of some incredibly ambitious committees which saw MatSoc become an even bigger part of the student experience in the department. Over my four years as a member / committee member of MatSoc I got involved with the very first summer tour, the very first careers fair, the very first printed edition of the MatSoc magazine and the very first New Year's dinner. A lot of firsts!



It's one thing to have ambition but a lot of these ideas became a reality through an immense effort of some very dedicated sponsorship officers. In particular Dylan Hall, who I believe gave a career talk earlier this year, really changed the game and set the committee up in a strong financial position for years to come.



First ever careers fair

In my opinion, one of the best things MatSoc does is the annual summer tour. I've been on every single one so I think I have some authority to say they're always fantastic. A material science degree can take you all over the world, and sometimes that prospect can be a bit terrifying. Travelling with MatSoc to see some of Europe's leading scientific institutions in an informal setting is the best way I can think of for getting over any apprehension you may have about travelling abroad for your career.



MatSoc Summer Tour 2017—Amsterdam

Past destinations have included Amsterdam, Stuttgart and Luxembourg and they have all been unique trips in their own right. It's a real shame that the tour couldn't go forward this year, but I hope that future committees still see how valuable these trips can be.



On that note I just want to say how impressed I am with the student response to the unfortunate position we all find ourselves in. Starting university isn't easy, and I can only imagine what additional challenges are faced by those starting in a pandemic. In particular, I take my hat off to this year's MatSoc and RSM committees, for making the most of a situation that no one could have imagined!

Whether you're a committee member or not I'm sure you can all empathise with the difficult task of creating a sense of community via purely remote means. Now more than ever I think it's important for everyone, whether you're on a committee position or not, to help contribute to this feeling of community. I know it's not easy but if everyone puts in that little extra effort to keep an open mind and reach out, I'm confident that we'll all come out of this situation stronger than ever!



MatSoc Summer Tour 2018—Stuttgart



**MatSoc Summer Tour 2019—
Luxembourg**

Best of luck to everyone, old and new, you're in a great place surrounded by great people so try not to let the global situation get you down.

Materials love,
Schan



Abi's Advice

Abigael (MatSoc President 18-19) gives some advice to materials students undertaking the MIT exchange programme

“**W**hen deciding on a MEng project, definitely think about what you like. But, if you are undertaking the Imperial-MIT exchange programme you will have to think about whether your MEng project can be supported by both the MIT & Imperial research groups. My top tips to 3rd and 4th years choosing an MEng project/placement would be starting your research early (esp. those going to MIT) and “literally” stalk professors and postdocs in your area of interest.”

“**W**hilst doing the MEng project remember it is okay if you don't know where you are going in the first few months of research. This is perfectly normal as you are never given a project with an answer. Just keep critically looking at papers and understanding what hasn't been taken into account.”

“**I** would definitely recommend applying to the MIT exchange programme. The course at MIT is intense academically with 8 HASS (Humanities and Social Sciences) courses, 36 credit classes, 16 week terms and midterms. But, I believe that the environment at MIT was very inclusive. I lived in halls with seniors, juniors and sophomores. There are four types of halls at MIT –multi-year, all four years, fraternities and independent living groups. The dining halls made the community vibe closer.”

Abigael Bamgboye
Materials 2020 Graduate



George's material Story

George Grant (Imperial Material Alumni) writes about his 'materials' story

Every young Materials Science student knows that they landed in this subject by some degree of chance. Flitting from interest to interest characterised a lot of my early childhood. My path went a little bit like this. It started with an obsession with dinosaurs (age 2-5), fossils & crystals (age 5-7). An emerging interest in crystallography perhaps? Oh, and anything from the sea. Around this point I also started getting into sports. Gymnastics and Rugby were my forte, and I dabbled with Athletics too (age 7-12). Meanwhile, I became seduced by literature, poetry, singing and drama (7-16). Okay you guessed it, I stopped singing when my voice broke around age 13! But the rest, the rest I loved more than anything. Up next, I stumbled across a very strange sport of pole vault (fiberglass & carbon fibre poles) and became rather good at it, peaking at National level aged 17. Alongside this, as my interest in the sciences evolved, and I decided first that I had an exciting career as a marine biologist ahead of me (after an inspiring day at the London Aquarium), but later I decided I would quite like to become a doctor. I was not squeamish, I liked helping people, and I found medicine incredibly interesting. Oh, and the technology! It was phenomenal and there was so much still left to be discovered. But who discovers it? Ah yes, this was when I found out about Materials Science.

Everyone's path to discovering the subject is totally different and the opportunities after studying Materials Science took me quite some distance from my starting point (Velociraptors and the humble Stegosaurus). Once I found myself at Imperial, it was certainly a challenge, but I really felt like I had met so many likeminded people! For the most part everyone was incredibly clued in and motivated. There was so much inspiration to be found, but it certainly was a shock to the system. Slowly, asking for support from others and bringing positivity day-to-day, I started to adjust.



I developed a passion for Biomaterials, working on team projects and unexpectedly loved the modules at the business school. I explored different industries ranging from an healthtech start-up to a manufacturing company in London to a tech internship in China. I even got involved in running the Materials Society working with some great friends. This helped me learn more about my interests and meet awesome people from across the department. There were many ups and downs along the way, but I am so thankful for my time at Imperial.

At some stage I realised that my interests diverged a little from many of my friends. For one, I had to admit to myself that I didn't enjoy practical work as much as I liked solving lots of people-oriented problems. I thought of becoming a Management Consultant since I enjoyed talking about different companies during the business school modules, working in team projects and got involved in an interesting project with the consulting society. I decided to study Management for my Masters to learn more about new subjects that took my interest, including Marketing, Strategy, Data Science and Psychology. I took a different turn to many of my friends and bid them farewell as I joined London Business School over in Baker Street (I kept in touch for regular pizza nights hosted by former MatSoc President now Biomaterials PhD student Schan Perrera!).

While I was at London Business School, I got job as a Life Sciences Strategy Consultant which landed me in the sweet spot between Science and Business. It was really the rigorous learning, communication skills and support system that I built at Imperial that helped me succeed during my Masters. I am sharing my story to encourage all students in the department to take the path that works for you and to embrace being different from others. Following their graduation, people in my year group people pursued anything from Scientific Research, to travelling the world, working for Engineering companies large or small, becoming Patent Lawyers, Consultants, Cyber Security experts, Project Managers, Bankers, Start-up founders and even Masters in new fields (*cough* me *cough*).



Wherever you go after your time in the department, the challenges and memories made during a degree at Imperial prepare you for success in the world. In the future I dream of learning about the healthcare industry and starting a successful business that helps improve quality of care for patients around the world, making doctors lives easier in the process. But who knows, maybe I'll become a paleontologist instead! My top tips for success at Imperial are to bring a positive attitude to your daily interactions and ask for help when you are struggling (everyone needs a little helping hand here and there). Embrace working in a highly multicultural environment with ambitious and engaged people. Always seek to understand each other and stay connected to the friends you make, who will fill your life with boundless opportunities, inspiration and fun!

George Grant
Materials 2019 Graduate



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**Cover Background Images by Mr. Tom McAuliffe:
EBSD (IPFZ map) of a Co/ Ni base superalloy**

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