We are celebrating your support.

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We are grateful for your support.

On behalf of everyone at Imperial College London, thank you for your support. Your philanthropy enables us to excel in research and education for the benefit of society.

The stories in this report highlight some of the many ways that your donations make a difference in the quality of our research, the education and lives of our students, and our ability to make important advances in addressing society’s most pressing problems.

Our public health researchers are working to improve children’s health in one of London’s most deprived neighbourhoods, and in communities around the world (p16). Alumnus Marit Mohn’s transformative gift will create a state-of-the-art centre for children’s health and wellbeing at our White City Campus. Quinbrook Infrastructure Partners are the benefactors of Imperial’s Centre for Climate Finance and Investment, where specialists are working to steer the business community towards safer, cleaner investments (p18).

Our talented students benefit from generous scholarship donations and they, in turn, contribute to society. President’s Scholar Graham Peyton and Raising Scholar Hamid Soleimani are developing new, low-cost medical technologies that could revolutionise healthcare in remote, rural communities (p12). These are but a few examples of the inspirational achievements made possible by your generosity. In the following pages, you will see how your philanthropy is bringing people together, unleashing potential, and helping us surmount some of the biggest challenges we face. You will see how gifts large and small make a difference, from transforming the entire College to changing a student’s life in a deeply personal way. I hope you will see just how much your support is valued and appreciated.

In our College 2015–2020 strategy, we committed to building a supportive, diverse, considerate and highly motivated community, and to building and maintaining better ties with friends and alumni. We committed to enriching the student experience, strengthening ties with business, academia, and non-profit, healthcare and government institutions across the globe, and to sharing the wonder and importance of what we do. Your philanthropy is enabling us to achieve all of this and more, and we are sincerely grateful for your generosity and support.

Thank you, once again, for giving to Imperial College London.

Professor Alice P. Gast
President
We are bringing people together.

In 2017–18, 13,354 people together raised a phenomenal £59.1 million for research and education at Imperial College London. This is an incredible success, achieved through collaborative efforts between Imperial alumni, friends, students and staff. Here are just a few highlights from an extraordinary year.

Leading the way

A £25 million gift from Marit Mohn (MSc Chemical Engineering and Chemical Technology 1973) will create a Centre for Children’s Health and Wellbeing at the new home for Imperial’s School of Public Health in White City. Marit Mohn is a generous supporter of education and community development in West London and a longstanding friend and donor to the College. Her leadership gift was announced at the launch of Imperial’s £100 million philanthropic campaign for the School of Public Health, which will enable us to build an innovative and interconnected hub for research, education and community engagement focused on health and wellbeing. (See p16 for the full story).

Library love

The generosity of everyone who donated to the Library Fund over the past three years has enabled ongoing improvements to the Central Library. This year, levels four and five were fully refurbished with a new cooling and ventilation system and power access at all desks. A particularly meaningful contribution came from Mr Alan Patrick (Metallurgy 1952), who left a legacy gift of £40,000 when he passed away in March 2017. Mr Patrick’s family visited the library in 2018 for the unveiling of his commemorative name plate.
Paying it forward

Mr Yuangao Liu (Civil Engineering Research 2006) gave £100,000 to the Lee Family Scholarship Fund – the Fund that supported him throughout his engineering degree – so that future students would benefit as he had. On hearing the news that a past scholar wished to give back to the Fund he established, Dr Richard Lee (Chemical Engineering 1960, PhD 1964) decided to match the donation with a further £200,000 to create a new scholarship that will support students from Imperial who go on to pursue postgraduate studies at Imperial College Business School.

“I quite simply wouldn’t have been able to study at Imperial without the generosity of Dr Richard Lee. My scholarship has been truly life changing. I hope that my achievements and the outcomes of the other Lee Family Scholars will assure Dr Lee, and other alumni considering making a gift to the College, that such a donation is worthwhile.”

Yuangao Liu
(Civil Engineering Research 2006)

Next generation care

Now in its second year, the Jean Alero Thomas Scholarship Programme awarded four new scholarships to students in the Faculty of Medicine, doubling the number offered previously. The programme was established thanks to a legacy gift from Dr Jean Alero Thomas (Medicine 1970), a dedicated lecturer and researcher whose work focused on the application of immunopathological techniques to diseases caused by viruses. Thanks to her generosity, the Jean Alero Thomas scholars are being supported to pursue postgraduate study in cell and molecular biology, which underpins research into a wide range of diseases.
We are bringing people together.

An active community
A significant gift from the Sackler Trust will support research at Imperial’s world-leading Sackler MSk Lab, helping a team of surgeons, physiotherapists, scientists and engineers to develop new surgical tools and techniques to improve musculoskeletal health. Collaborating closely with patients, the Lab works to bring innovative treatments to as many people as possible, so they can pursue active, independent lives for longer.

Creative engagement
A £500,000 gift from Mr Humphrey Battcock is enabling Imperial’s Public Engagement team to develop innovative ways to engage new audiences with science. A varied programme of creative debating experiences is exploring contemporary scientific issues that hold relevance to researchers and the public alike, many of which are developed in close collaboration with members of the community. This year’s series, designed to complement and enhance the Imperial Festival and Fringe programme, included a project with drama company Theatre of Debate, in which patients, clinicians, actors and script writers worked together to produce a thought-provoking performance about antimicrobial resistance. A post-event discussion enabled participants and audience members to share their thoughts, experiences and questions surrounding the topic.

All on board
Members of Imperial College Business School Advisory Board came together to create a new scholarship programme at the Business School. Thanks to their donations, the Advisory Board Scholarships Programme will offer two exceptional candidates per year the opportunity to enrol on the full-time MBA course, with all tuition fees covered.

3,941 of the gifts made this year were from College alumni.

Sharing a passion
Imperial’s much-lauded lunchtime concert series has been a hallmark of College life since the 1950s. One of the key figures in establishing the series was Imperial Emeritus Professor Malcolm Haines, who was a long-standing member of the Plasma Physics Group and an accomplished pianist and organist. After Professor Haines passed away in 2013, his wife Mrs Polly Haines decided to commemorate his life with a generous gift which will share his passion for music with the College community by supporting one lunchtime concert each year for the next decade.

“Before the Blyth Centre for Music and Arts was established, Malcolm was glad to help set up the lunchtime recitals at Imperial. Today, I am glad to contribute to the lunchtime concerts and know that Malcolm would be pleased that music is still a key part of life at Imperial.”

Polly Haines
We are bringing people together.

The Schistosomiasis Control Initiative

The Schistosomiasis Control Initiative (SCI) supports countries to deliver programmes against parasitic worm infections, which affect over 1 billion people in some of the world’s poorest communities. These infections can leave children unable to go to school, adults unable to work and increase the risk of HIV in women. Thanks to philanthropic support, the SCI is reaching more people than ever before and is working towards the elimination of these diseases. Dr Wendy Harrison, Executive Director of the SCI, explains.

“We’ve taken great pride in our achievements ever since our foundation in 2002. We have, for example, supported the delivery of over 150 million treatments against parasitic worm infections in 15 sub-Saharan countries. This would not have been possible without our supporters. The regular donations we receive enable us to support long-term programmes, making them sustainable, resilient to new challenges and able to reach more communities affected by these diseases.

“But there’s still a way to go. Currently, we focus primarily on providing treatments against parasitic worm infections, as this has been shown to reduce the disease burden in populations most quickly. However, to eliminate these diseases for good, we also need to address the underlying factors sustaining disease transmission, such as helping those affected to adopt behaviours that can lower their disease risk.

“We recognise that we will not be able to do this alone. Through the development of strong partnerships, greater investment into research and collaborative work to strengthen systems and processes, we aim to take on these additional challenges and make the greatest impact.

“It’s never far from our minds that everything we do is enabled by the people who support us. Thanks to the partnership and generosity of our donor community, we really are helping change people’s lives for the better and enabling them to achieve their full potential. And that’s an amazing thing to do.”
“I would like to sincerely thank all the donors who so generously support the President’s Scholarship Fund. They have allowed me the freedom to focus on my research without worrying about money. Thank you.”

Katia Hougaard
President’s Scholar (Life Sciences)
Gifts from friends and alumni help us offer life-changing opportunities to bright, ambitious young people. Whether you’re donating to scholarships, hardship support, extracurricular experiences or community outreach programmes, your gifts are helping to inspire and enable the next generation of thinkers, leaders and problem-solvers.

We are unleashing potential.

President’s PhD Scholar Katia Hougaard discusses her research with donor Dr Denis Gross (Physics 1973) at the RCS1 plant facility in the Sir Alexander Fleming Building. Katia is investigating the role of resistance genes in plants’ natural defences to aphids, in the hope that this will lead to the development of smarter, safer strategies for controlling aphid outbreaks in economically important crops.
Bursaries relieve hardship and provide enriching university experiences.

Thanks to your support of the Deans’ Funds, medical student Dan Mawhinney was able to relieve his financial anxiety and participate more fully in student life.

“I chose to study at Imperial because of its international reputation for excellence. I have seen this excellence reflected in my six years of study. I particularly valued my placement in A&E, where I felt well-equipped to be the first medic to see patients.

“The last two years of my degree have been particularly tough financially. I found that I was slipping into more debt, despite also working a part-time job. I was on placement and studying during the week, and then heading to work at the weekends – it was exhausting. Receiving a bursary from the Dean’s Fund for Medicine was such a relief – I don’t have to worry as much about money, and it has freed up some time in which I can recharge. I could afford to go to a conference, which I wouldn’t have considered before, and I can participate more fully in clubs and societies. I also spent a month volunteering in a clinic in Roatán, Honduras, where I consulted with patients myself under the indirect supervision of the local doctors (see left). This was a great opportunity to develop my confidence in diagnosing and managing common ailments, and I welcomed the opportunity to practise my Spanish, which had been a key objective while organising my elective.

“I would like to thank all the donors – I am so grateful to them for their generosity, without which I would have struggled. It really has made an impact on my experience at Imperial, my academic performance, and my wellbeing.”

1,128 people gave to the Deans’ Funds in 2017–18, raising £403,415 across all of Imperial’s faculties.
Scholarships allow our students to push their academic boundaries.

“Imperial’s Business School was my top choice for my PhD because it is committed to innovation and entrepreneurship, and has a vibrant community evolving around student start-up networks.

“This community of students undertaking research in their chosen fields of expertise, alongside my attendance of entrepreneurship and innovation events, inspired my research focus. I have chosen to research the current technology commercialisation of start-ups in the photovoltaic industry. This involves gathering large datasets which reveal how successful start-ups have commercialised new technology, despite the difficulties they inevitably face. I believe start-ups will introduce the technologies that revolutionise our world and change how we live. Imperial is the perfect place to study the success of start-ups because of the entrepreneurial spirit of its students.

“My President’s Scholarship has allowed me to pursue my dream of a career in academia. This includes presenting my research at a conference where I built connections and received feedback from world-renowned academics. I would like to thank the donors for making it possible for so many young people, like myself, to carry out cutting-edge research, and for giving us the confidence to share our work and push boundaries within our chosen fields of expertise.”

Thanks to your support of the President’s Scholarship Fund, Imperial College Business School PhD student Mara Guerra was able to build a foundation for her career in academia.

1,183 people gave to the President’s Scholarship Fund in 2017–18, raising £224,018.
Innovative students use their Imperial education to make a difference.

Thanks to the generosity of our supporters, bioengineering students Graham Peyton and Hamid Soleimani were able to create a start-up with real-world impact that took them all the way to the USA.

Both Graham and Hamid are undertaking their PhDs in Bioengineering at Imperial. On choosing to study at the College, Graham said: “I love the calibre of research and collaborative atmosphere at Imperial. The Department of Bioengineering in particular emphasises interdisciplinary research and is a leader in the field worldwide.”

This collaborative atmosphere has been key to Graham and Hamid’s success. Together they have shrunk the components of ultrasound machines down to a microchip, co-founded their start-up Microsonix and won £10,000 for their low-cost, portable medical imaging device which can conduct and display ultrasounds on tablets or smartphones. Thanks to their work, the possibility of bringing life-saving medical imaging to isolated regions and developing nations is now within reach. Graham and Hamid are taking their journey a step further by working on the possibilities of wearable ultrasound devices in the US, after being approached by medical imaging specialists, Butterfly Network, Inc.

As well as being business partners and sharing a passion for bioengineering and entrepreneurship, Graham and Hamid are both scholarship recipients. Graham is a recipient of a President’s PhD Scholarship, while Hamid is a Hans Rausing PhD Scholar, supported by the Arcadia Charitable Trust. Their story acts as an outstanding example of the way in which financial support from friends and alumni of the College allows truly excellent students to translate their academic study into real-world application. Hamid says of his scholarship: “The generosity of donors has inspired me to do my best and make a significant contribution to my field.” Graham says: “Every morning, when I walked up the steps leading to my office, I would think of how great a privilege it is to be studying at Imperial. This was made possible through the generous contributions of those who help fund scholarships. Thank you. My life will never be the same!”

If you would like to make a gift to support students at Imperial, please contact Mariah Bush, Senior Regular Giving Manager on +44 (0)20 7594 6743 or at m.bush@imperial.ac.uk
Meet your makers.

White City teenagers bring ideas to life through Imperial’s Maker Challenge.

Thanks to philanthropic support, 291 young people have realised their creative vision through hands-on science at the Reach Out Makerspace in Imperial’s Invention Rooms. Say hello to Cindy and Madeena, winners of our very first Maker Challenge Programmes.

Name: Cindy Xhebro
Age: 15
Project: Sneaker Speaker

“My idea was to develop trainers with built-in speakers connected to a device (e.g. smartphone) via Bluetooth, powered by a lightweight LiPo battery. The inspiration came from a combination of my personal interests: basketball, music and trainers. I thought putting music and trainers together would make a basketball game more lively!”

Next steps: “To develop the shoes into being more effectively powered. I would like to experiment and find a way for it to be powered using kinetic energy by the shoes charging as the consumer takes steps.”

Name: Madeena Hadafmand
Age: 15
Project: Lumi Lamp

“The idea behind my invention, the Lumi Lamp, was based on my lack of sleep and my curiosity to invent something that could bring me closer to having a full good night’s sleep. I struggle to sleep in complete darkness, but I know it’s not good to leave a light on all night. The Lumi Lamp monitors your breathing and movement during the night and turns off automatically, once it has detected that you have fallen asleep.”

Next steps: “I plan on studying and entering the field of engineering at university but, in the meantime, I’m also looking for more opportunities where I can continue to make inventions.”

Making ideas a reality
The first of its kind in the UK, The Invention Rooms is a new and unique space for community innovation in White City. Offering advanced prototyping equipment, design studios and hackspaces, The Invention Rooms brings members of the local community together with Imperial’s academics, students, alumni and partners, inviting them to get creative, build prototypes and share in the fun of making and discovery. Over the coming years, we hope to inspire generations of inventors, entrepreneurs and makers from the local area and beyond.

The Invention Rooms and Reach Out Makerspace programmes are supported by the Mohn Westlake Foundation, the Berkeley Foundation, JP Morgan Chase Foundation, Garfield Weston Foundation, the Elsevier Foundation, the Ben-Brahim Family Fund, the Higher Education Funding Council for England (HEFCE) and the Worshipful Company of Coachmakers and Harness Makers.

If you would like to support outreach at Imperial, please contact Clare Dodds, Head of Trusts and Foundations, on +44 (0)20 7594 1829 or at c.dodds@imperial.ac.uk
“The Kadoorie Charitable Foundation has given us an unprecedented opportunity to address one of the major public health issues in Lao PDR and reach thousands of people at risk of cholangiocarcinoma. We could not be more grateful.”

Simon Taylor-Robinson
Professor of Translational Medicine
Gifts to research and College priorities help us tackle some of society’s biggest challenges – from preventing disease and predicting natural disasters, to supporting safe AI and climate-friendly investments. Thanks to your generosity, our students and academics are making discoveries that will benefit communities around the world – both now, and in the future.

Since 2010, Imperial has brought its expertise in imaging and biomarker research to a programme in Thailand that works with communities at risk of cholangiocarcinoma (CCA), a cancer of the biliary ductal system. CCA is often preceded by a parasitic infection spread through the consumption of raw fish. By combining screening with awareness-raising initiatives, the Cholangiocarcinoma Screening and Care Program (CASCAP) is securing earlier diagnoses and better health outcomes for patients. Thanks to a £1 million gift from the Kadoorie Charitable Foundation, the programme is now expanding into the Lao People’s Democratic Republic.
The best start in life.

Enormous progress has been made in protecting children's health over the last 25 years. Better access to healthcare, sanitation and mass vaccination programmes have reduced under-five mortality by more than half since 1990. Yet significant health threats remain both locally and globally. In our own community in White City, many children are living with chronic health problems, such as obesity, diabetes, asthma and eczema. We are only beginning to understand the long-term impacts of childhood illness, which can affect health and wellbeing over a lifetime.

Now, thanks to a £25 million gift from alumnus Marit Mohn, Imperial is establishing the Mohn Centre for Children’s Health and Wellbeing, which will unite researchers and clinicians working to improve the health of children and young people in White City and communities around the world.

Imperial is home to many research initiatives with a focus on children and young people, and has world-leading expertise that spans issues such as infectious disease, childhood obesity, diabetes, neonatal health, and many common diseases of childhood, such as asthma and allergies. With the creation of the Mohn Centre, Imperial will, for the first time, have a dedicated space for multidisciplinary children’s health, where researchers focusing on allied themes will work together, sharing ideas and expertise. The gift also allows the appointment of an

“... My generation has been lucky. We grew up with advantages and opportunities in life that aren't available today. The challenges facing children and young people these days are much greater – particularly when it comes to health. That is why I am pleased to be able to support the Centre for Children’s Health and Wellbeing. Its research will help to shape interventions to give children the very best start in life, both here in the UK and around the world. For me, that’s rewarding. I know that my support is making a difference that will last a lifetime.

Like everyone, I want to know that my donations will be used wisely. Finding a good project that’s run by good people can be difficult. But with Imperial, I have that confidence. I am inspired by the expertise and ambition that the College is bringing to White City – an area that I know well from mytime on the Board of a local housing association. Walking the streets, you get a sense of people's lives and the challenges faced locally. It is exciting that my support can help to do something positive for the future of the community.”

Marit Mohn (MSc Chemical Engineering and Chemical Technology 1973)
academic director to develop and lead an ambitious programme of research that aims to tackle some of the greatest health threats facing children and young people.

“What this gift challenges us to do, is to think about how we can bring together Imperial’s incredibly rich expertise in child health in new and complementary ways,” says Professor Deborah Ashby, Director of the School of Public Health. “We already have some good examples of paediatricians and epidemiologists working together – for example, in researching risk factors for developing childhood asthma. The new Centre will be a place to deepen and expand these collaborations.”

The Mohn Centre will also be the base for the landmark White City Cohort Study, which will follow a group of children from birth into adulthood and old age. By monitoring the health of participants over an extended period of time, researchers will deepen the understanding of childhood illness and its impact over the years.

“Establishing the Mohn Centre will see us primed to take on this kind of long-term study, which is crucial to finding out how disease in old age is connected to early life experiences,” says Professor Ashby. “This cohort study will last a lifetime and the findings that come from it will have impact for generations to come.”

The cohort study will also provide a unique insight into the health of children and young people in White City, which will help to shape practical interventions to improve health and wellbeing locally. White City is one of the UK’s most disadvantaged areas, with high levels of child poverty (four in ten children grow up in poverty) and overcrowding (17.8% of households) both factors that have been shown to have a negative impact on health.

“The effects of disease, lifestyle and social disadvantage in infancy are felt throughout life, often only becoming apparent in old age,” says Professor Ashby. “At the Mohn Centre we will develop effective early interventions that ensure future generations have every opportunity to thrive and succeed.”

Transforming health and wellbeing

Imperial’s £100 million campaign for the School of Public Health will enable us to deliver a state-of-the-art building at White City, and amplify our work in four key areas: world health, food and nutrition, community health and policy, and children’s health and wellbeing.

imperial.ac.uk/giving/transforming-health/

To support the campaign, please contact Angela Bowen, Director of Development, Faculty of Medicine on +44 (0)20 7594 1277 or at angela.bowen@imperial.ac.uk
Unlocking climate investment.

With interest in renewables and clean technology at a high, why isn’t more investment flowing into these emerging sectors? Imperial’s Dr Charles Donovan explains how a new research fellowship supported by a £525,000 donation from Quinbrook Infrastructure Partners could help to provide the clarity that investors need.
The 2015 Paris Agreement on climate change could unlock opportunities for investment worth trillions of dollars, as countries around the world begin to drive a shift towards a low-carbon economy. But while investor interest in renewables and clean tech is increasing, we aren’t yet seeing the level of investment that would be required to affect the kind of transformation that’s needed if we are to avoid catastrophic climate change. What’s holding investors back?

The problem, according to Dr Charles Donovan, Director of the Centre for Climate Finance and Investment at Imperial College London, is that big institutional investors don’t have the data they need to make informed decisions about where to invest. “The investment community has really woken up to climate change over the last couple of years,” says Dr Donovan, “but until they have a better sense of the risks and rewards involved, we’re not going to see the kind of investment that’s needed to accomplish the transition to a low-carbon economy.”

It was to help investors and policymakers overcome this lack of clarity about risk and return in emerging clean technology sectors that the Centre for Climate Finance and Investment was established in 2016. Based in Imperial College Business School, the Centre brings together Imperial’s expertise in finance, data science and climate research to analyse investments in clean energy, energy efficiency and low-carbon infrastructure globally. Dr Donovan believes that the Centre’s data-driven approach can help to cut through investor uncertainty. “Investors want to invest in clean technology and are asking how they can do that in a way that’s responsible to their shareholders or pension fund holders. We’re trying to break through this hesitancy, this round-and-round discussion, with really targeted numerical analysis.”

The work of the Centre received a substantial boost in 2018 thanks to a donation of £525,000 from Quinbrook Infrastructure Partners, a low-carbon and renewable energy infrastructure investment specialist. The gift establishes the Quinbrook Fellowship — a new academic post that will bring fresh expertise and additional capacity to the Centre. The successful Fellow’s research will look at the business models, financial instruments and investment strategies that can help the global economy adapt to climate change. “We’re hoping to bring in a world-class scholar who can complement research across the Business School and become a leading voice in this area,” says Dr Donovan.

One priority for the Fellow will be to remain responsive to the questions that the investment community is asking. “Investors can’t wait years for answers,” Dr Donovan says. “We need to think in terms of the weeks and months ahead. That’s where philanthropic support is particularly helpful. This gift enables research on a shorter timescale than would be possible through other sources of funding. It allows us to have immediate real-world impact.”

The fact that the post is philanthropically funded will also make it easier for Dr Donovan to recruit someone who can bridge the academic and business worlds. “Usually, when an academic appointment is made, the focus is on recruiting someone who is fully in the academic world – someone who can build the research profile of the institution. This gift frees us from that. It gives us the flexibility to recruit someone who has that academic background, but whose research is also going to have relevance to, and impact in, the business world.”

Such a major philanthropic investment in the Centre’s research will have a multiplier effect, opening up new sources of funding and signalling the interest that the business world takes in this nascent field. “The gift from Quinbrook Infrastructure Partners is a massive enabler,” says Dr Donovan, “and we are most grateful for their support. Having this philanthropic commitment allows us to bring in additional funding in the form of research grants and research contracts. And since ours is an emerging area of research, this donation will be seen as a vote of confidence. We’re building on their gift to create something that we hope will be here for the next hundred years.”

Dr Charles Donovan, Director of the Centre for Climate Finance and Investment.
Computing pioneer remembered with endowed fund for blue-skies research.

A visionary gift from Diana Scarrott (MBA Management School 1998) is creating an endowed fund that will allow Imperial's computer scientists to explore the frontiers of their field. Ms Scarrott has also pledged a generous legacy gift towards the fund, which honours the memory of her late father and renowned computer engineer, Gordon Scarrott.
Professor Daniel Rueckert, Head of the Department of Computing and Professor Alessio Lomuscio, Royal Academy of Engineering Chair in Emerging Technologies (right), discuss what kind of research the new fund could support.

Professor Rueckert, could you give us some examples of blue-skies computing research?

DR: When we say ‘blue skies’, we are often referring to work that may not have any direct application to real life today, but stands to have significant impact in the future.

One example is quantum computing. At the moment, there isn’t a single quantum computer existing in the world that can handle more than a very few qubits. However, once we have the ability to build one, it could break virtually any type of encryption we currently use; so there is a lot of interest in developing new ways for encrypting data. Now, this is unlikely to become a challenge in the next five years, but in 20, it might be a significant challenge.

Another example is my colleague Alessio Lomuscio’s work in the verification of artificial intelligence systems, where he is developing techniques to assess whether a system based on machine learning will always provide the right outcome.

Professor Lomuscio, could you expand on this?

AL: Think about the situations where we want to deploy AI in society – self-driving cars, or controlling groups of autonomous planes, or making diagnoses. We want to guarantee that its behaviour will be safe and reliable. We want to be able to verify that the correct outcome will be achieved in all possible situations.

My work in verification of autonomous systems started around 2001, and it progressed relatively well; there are a number of complex autonomous systems that we successfully verified, including autonomous submarines measuring the salinity of the water. But the big revolution of the past five years is machine learning. Machine learning is driving AI applications in the realm of vision, image and video detection and beyond. However, one of the problems with machine learning is that verifying behaviours is intrinsically very challenging.

How has machine learning changed things?

DR: Computer science up until now has often been very algorithmically driven. So, for example, we can make an if-else statement: ‘if the traffic light is red, stop the car. If the traffic light is green, go.’ These are fairly unambiguous statements and we have mathematical tools to prove that a car will stop at a red traffic light.

However, in a situation where we use machine learning, the challenge might be the following: is the traffic light actually red, or not? You have a camera on a car, looking at the street ahead, and it has to first detect that there’s a traffic light somewhere, and then has to recognise whether the traffic light is red or green. And it needs to work when there’s no lighting, or there’s fog, or it’s raining. We are no longer using systems which you programme with rules like ‘if this pixel on an image is red, then stop’. Instead we have a machine learning algorithm, for example a neural network, which we train – like a human – to look at hundreds of images and identify whether a traffic light is red or green. And we don’t yet have the tools to prove what has actually been learned. That is what Alessio is working on.

AL: Ultimately, the big challenge is that neural networks are so complex that they are very hard to analyse. Traditionally, their behaviour was
studied only statistically – which is fine in some applications, but where safety is paramount, you want something to be correct all of the time. When you step onto a plane, the probability of fault that a regulator will accept is $10^{-9}$ for some of the components. This is not where we are with systems driven by machine learning. So our challenge is: how do we give guarantees about systems that are not programmed by humans, but are synthesised by data through algorithms in machine learning? That’s work we’ve started to do here at Imperial.

**Does philanthropy play a particularly important role in supporting ‘blue-skies’ research?**

**DR:** Yes. It really allows us to be more adventurous. Philanthropy can plug the funding gap for long-term projects and enable us to take on quite ambitious challenges. If you have only a short-term vision, you’re always playing catch-up with what other researchers, or other countries, are doing. Therefore, supporting longer-term work might also have significant economic benefits in the future.

**AL:** What long-term funding gives us, from any avenue, is the ambition to think more deeply about challenges that may be coming. It is absolutely fundamental to the health of a university.

**How does it feel to have Diana Scarrott’s support?**

**DR:** We’re very thankful to Diana; she has really trusted us with a lot of autonomy. We have the freedom to support the areas of work we believe are the most interesting, the most promising and, perhaps, the most challenging. Diana’s father, Gordon Scarrott, was exploring some of the more pioneering, early ways of solving problems in computer science, and that’s an incredible legacy he left. I think he has really shaped the field with his contributions. With her gift, Diana has also shown a great vision for how computer science can shape the future. The fact that she has endowed her gift means it too will have a very long-lasting legacy. Not only will it help the current generation of computer scientists, but future generations as well.

The Artificial Intelligence Research Network unites experts from across disciplines to respond to global challenges in AI research. For more information, visit imperial.ac.uk/artificial-intelligence

If you would like to make a gift in someone’s memory, or pledge a legacy gift in your will, please contact Anna Wall, Head of Legacy Giving on +44 (0)20 7594 3801 or at a.wall@imperial.ac.uk
Taking chemistry further.

In March 2018, Imperial announced a partnership with Agilent Technologies to boost molecular research and innovation. Following an additional gift of chemical analysis equipment, work on new medicines and crop protection can flourish, as Professor Tony Cass explains.

“Agilent’s instrumentation is very much best-in-field and it’s very broad in terms of its capability. So this donation is creating opportunities to intensify our existing research programmes in chemistry, and enabling us to explore new areas. These machines will help a lot of different research groups and support our aim to create an agile and flexible Molecular Sciences Research Hub.

“Professor Ed Tate, for example, works on discovering new drug targets in cancer and in drug-resistant infections. He is also working on tackling agricultural pests – the fungi and viruses that attack plants – to ensure food security for our growing population.

“To do this, we need to be able to tell which molecules are important and which drugs or pesticides might be effective against them. This ultimately comes down to identifying and measuring those molecules.

“Agilent’s liquid chromatography mass spectrometers will boost this research, allowing us to measure very small amounts of molecules and to distinguish between even very similar molecules. The performance of these machines is such that we will be able to do work we couldn’t do previously.

“This is a synergistic relationship – Agilent want to remain involved with Imperial to understand what their technology is being used for and how they can help develop the next generation of equipment to meet new scientific challenges.

“These days, research funders expect you to have much of the equipment you need to carry out a study and typically expect an institutional contribution towards instrumentation. Having this high-performance lab equipment makes it that bit easier to attract funding, meaning scientists have more time and resources to spend on cutting-edge research.”

The Molecular Sciences Research Hub will officially open in 2019. For more information, visit imperial.ac.uk/white-city-campus/research/molecular-sciences-hub
‘Man-made’ earthquakes could be key to predicting the next big event.

Thanks to a generous donation from Dr Neil McMahon, Imperial researchers have a rare opportunity to hunt for earthquake warning signs. Dr Saskia Goes, a geophysicist in the Department of Earth Science and Engineering, explains how she hopes to approach this long-standing challenge.
Dr Saskia Goes, Reader in Geophysics, Department of Earth Science and Engineering.

“I’m really excited to be part of this work because I’ve been interested in earthquakes for a long time. I spent my PhD at the University of California, Santa Cruz, studying the San Andreas Fault. Scientists there have spent 30 years monitoring and waiting for an earthquake but, even when it did come, they didn’t find the warning signs they were looking for.

“The holy grail for earthquake science is forecasting the next big event, so that a life-saving early warning can be issued. But, so far, research hasn’t met our expectations.

“The problem is that earthquakes don’t happen often and there haven’t been many since we began measuring possible warning signs. We don’t have enough data to find a clear pattern or a reliable precursor.

“Interestingly, some human activities can increase the likelihood of an earthquake. For example, artificial lakes created when we build large dams have triggered small earthquakes and occasionally larger ones. There’s also evidence that fracking – extracting natural gas from underground and, in particular, injecting waste water from the process deep into the ground – can trigger earthquake activity.

“The energy industry is monitoring these gas extraction sites and that creates a unique opportunity for earthquake scientists like me because we suddenly have a lot more data. Dr McMahon’s links with industry are helping us to tap into this supply of data and the funding he is providing will allow us to capitalise on this new opportunity.

“At Imperial we have created the Centre for Geohazards and have gathered a diverse team of researchers to bring a new perspective to this long-standing problem. Dr Peter Stafford is a civil engineer, Dr Alex Whittaker is a geologist, my research is in geophysics and we’ll work with data scientists to manage all this new data.

“The donation will fund a three-year project, including a new postdoctoral researcher who will hunt for correlations between the size and location of earthquakes, and changes that can be measured above ground, such as seismic activity, alterations in rock properties and surface deformation. Ultimately, we want to understand the process that leads to an earthquake and thereby increase our ability to forecast them. We might come up with some new ideas of what parameters to test next and, if we’re lucky, we might find some undiscovered earthquake signal.

“This is a rare and amazing opportunity to try something new. It’s not easy to find funding for this type of research – it’s considered too risky because we simply don’t know what we will find. But, like us, Dr McMahon thinks it’s possible to discover something that could forecast and ultimately predict earthquakes. By bringing industry together with a variety of researchers, we might find something new; something no one has seen before.”

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“I have been interested in earthquakes for a long time and have been frustrated that there has been very limited advance in our ability to predict when they will strike, especially in densely populated areas. Hopefully, by analysing data from the energy industry and using Imperial’s multi-departmental approach to research, this project can move us a little closer to understanding what we should monitor to improve earthquake prediction.”

Dr Neil McMahon

If you would like to support the Faculty of Engineering, please contact Jamal Iqbal, Head of Development, Faculty of Engineering on +44 (0)20 7594 3823 or at jamal.iqbal@imperial.ac.uk
We are recognising your generosity.

Thank you to everyone who gave so generously to Imperial in 2017–2018. To see so many alumni and friends donating year after year, and to have so many new friends joining them is truly humbling. We are so grateful for your support.

I hope you enjoyed reading about some of the ways your donations are having an impact, both at the College and in our wider community. Whether you’re helping us provide world-class educational opportunities, create new spaces for collaboration and innovation, or develop thoughtful and practical solutions to societal challenges, your support is truly making a difference.

One of the wonderful things about our donor community is that it unites people from across disciplines, across generations and across the world; people who are connected by their passion for science and education, and their commitment to the College. On behalf of everyone at Imperial, let me offer my deepest gratitude for your friendship and support.

Sarah Porter Waterbury
Vice-President (Advancement)
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The Imperial 1907 Circle recognises donors who give £5,000 or more during the College’s financial year and whose philanthropic support plays a leading role in advancing research and education at Imperial. Named after the year in which the College was established by royal charter, the Circle offers its members a commemorative lapel pin and special invitations to College events.

£59.1 million raised for research, education and College priorities in 2017–18.
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“Collectively, we can tip the scales between students experiencing or missing out on the exceptional Imperial environment.”

Dr Alistair Miller (PhD Chemical Engineering 1966) has donated generously to initiatives aimed at improving the student experience.

13,354 alumni and friends donated to the College this year.
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“I would not be here without the President’s PhD Scholarship. I am very grateful to the donors for their support and I will do my best to exceed Imperial's high expectations, as well as my own.”

Mathilde Fajardy
President’s Scholar studying for her PhD at the Centre for Environmental Policy and the Centre for Process Systems Engineering.
Imperial this year marked the topping out of the Michael Uren Biomedical Engineering Research Hub, one of the flagship White City Campus buildings. The building, which was made possible by a £40 million gift from Sir Michael Uren and his Foundation, will house life-changing research into new and affordable medical technology. Sir Michael Uren’s sons and representatives from the Foundation joined Imperial staff for an event to celebrate this milestone in the building’s construction.

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The Imperial 1851 Circle honours those donors who make a contribution of between £1,000 and £4,999 during the financial year. By giving at this level, Circle members play a crucial role in shaping the future of Imperial. The Circle is named after Prince Albert’s 1851 vision for a new scientific and cultural quarter in South Kensington, with Imperial College London at its heart. Members receive special recognition in donor listings, invitations to College events and a commemorative lapel pin.

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“One of the most rewarding parts of my job is meeting Imperial alumni and supporters and hearing about their connection to the College. It’s a great privilege to hear about people’s memories of their time here, and what inspires them to make a gift. Events like the Imperial College Symphony Orchestra concert are a great opportunity to be involved in Imperial community life.”

Andrew MacKinnon
Development Officer
In July 2018 Imperial announced the launch of ‘Transforming Health and Wellbeing’, a £100 million fundraising campaign for a new home for the School of Public Health at the White City Campus. Amongst those speaking at the launch event was Professor Neil Alford, Associate Provost (Academic Planning), who presented a computer animated fly through of the interior of the planned School of Public Health building.
Donors giving in 2017–18

Our 10 collective giving funds touch every aspect of life at Imperial – from enabling research, to enriching the student experience. We are grateful to the 4,719 people who donated more than £1.1 million to these funds.
Donors giving in 2017–18

“I made a donation to the Student Hardship Fund because I want to support future students and help them on the way to their own graduation day.”

Ahnaf Bin Anesee
(Biotechnology 2017) made his first donation to Imperial on the day of his graduation in summer 2017.
New scholars have the chance to meet and learn more about their scholarships and supporters at the College’s annual briefing event.
Donors giving in 2017–18

150 student callers took part in this year’s telephone campaigns, raising £154,717.

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