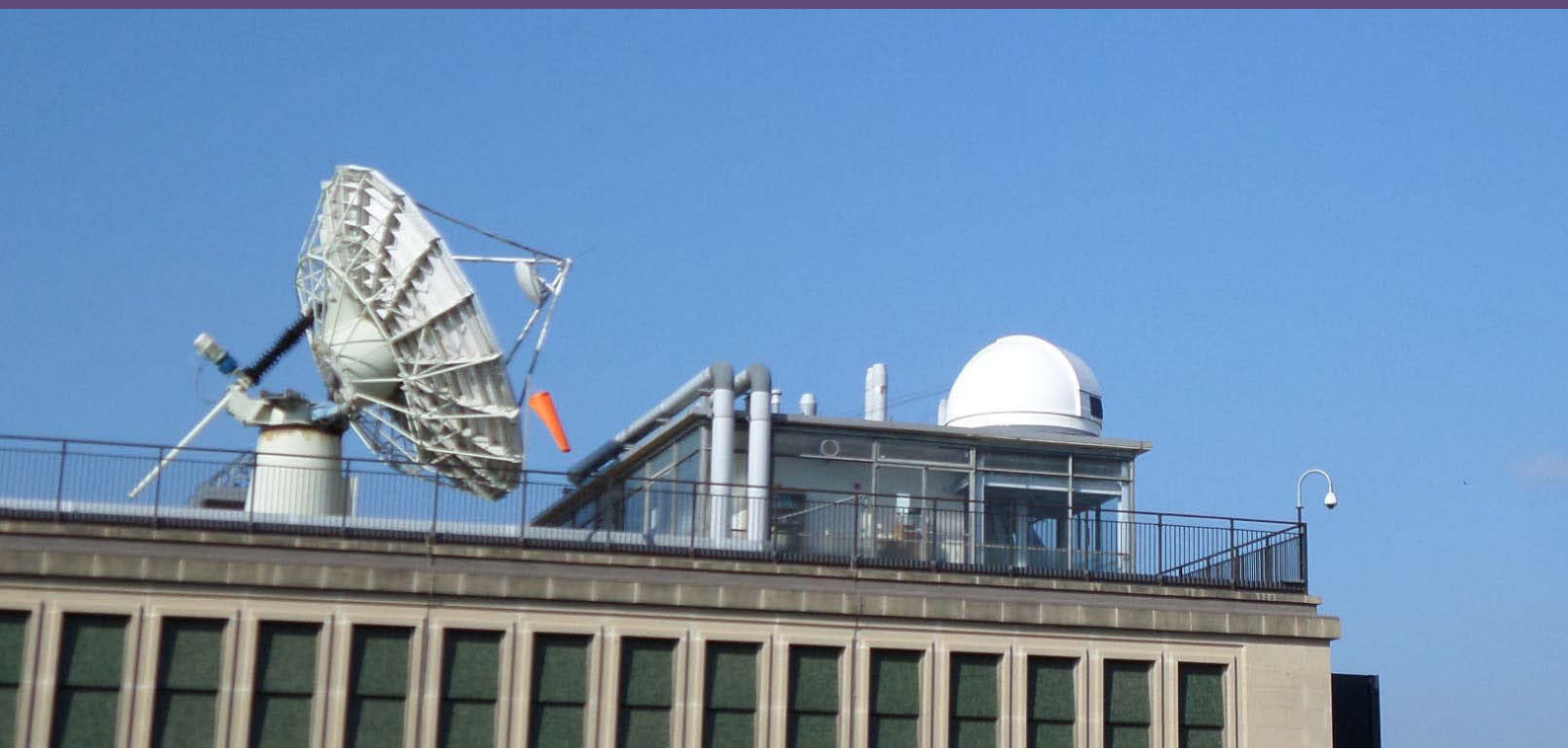
School of Physics

Newsletter
November 2015



A warm welcome

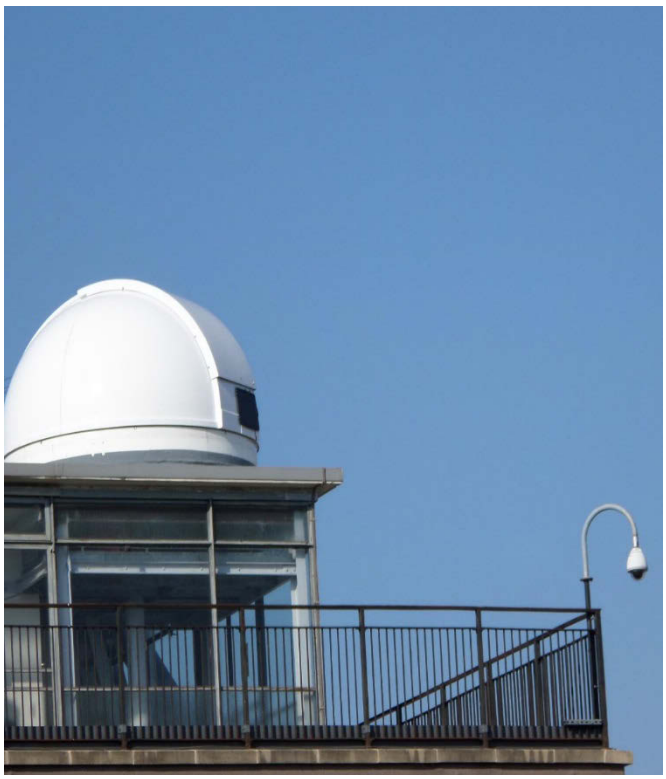
In this edition of the newsletter we feature recent investment in facilities for our undergraduate students which were supported by the generosity of our alumni, as well as news of our recent activities in public engagement, and our new strategic partnerships initiative.

We start this year with around 250 undergraduate first year students on a range of single and joint honours courses, including programmes with a year in Europe or industry, and the first intake on our degree in Theoretical physics. Over £20,000 has been invested in facilities for students including new computer labs for students in theory and astrophysics, and for upgrades to the optical telescope on the roof. In addition, more than £9,000 was raised by contributions from the Alumni of the Class of 1965, following their visit to the university in July.

At postgraduate degree level the School of Physics now has three Centres for Doctoral Training as well as the graduate school. Our postgraduate students have been involved alongside staff, in outreach, public engagement and summer schools over recent months.

Looking ahead, we plan to develop our partnerships with business and industry, providing new opportunities for our students. I hope you enjoy reading about these exciting developments.

Professor James Annett, Head of the School of Physics



Above: The new motorised dome on the roof of the HH Wills Physics Laboratory. The black patch is a solar panel which charges the battery to open and close the shutter.
Photos Dr Ben Maughan.

More students will benefit from our telescope thanks to the generosity of Physics alumni

Thanks to a generous contribution from the class of 1965, whom we welcomed for a reunion in July, the optical telescope on the roof of the Physics building was upgraded over the summer. A donation from the alumni covered half of the cost of the project, which included completely replacing the dome that houses the telescope as well as purchasing a new camera for the telescope.

The upgrade has converted the optical observatory into a robotic facility enabling remote operation by observers. Previously, students using the telescope had to be physically present on the roof at night. Space and safety limitations meant that only a few students each year were able to use the telescope. Now, thanks to the generous gift of our alumni, dozens of students each year will be able to experience planning and making observations, and analysing their own data.

The new dome is motorised and can be opened, closed and rotated by computer control. The same computer controls the telescope and with the aid of the new camera will be able to accurately point the telescope at an observing target, follow it as the Earth rotates, and take images and spectra.

The new camera includes a guider, which uses bright stars in the image to lock the telescope into position so that it does not drift away from the target of the observation over time. This will allow students to image deep-sky objects by taking long exposures, safe in the knowledge that the telescope will not drift during the exposure (which would blur the image). The camera also has a filter wheel which enables the remote observer to take images through different colour filters to measure the colour of objects (to estimate, for example, the temperature of stars). The wheel also includes a new prism to disperse the light from bright sources into a spectrum, to look for the emission and absorption signatures of different chemical processes in the target objects. Finally, the camera has a much faster readout than the previous model, which will allow the students to attempt ‘lucky imaging’. This is when hundreds of very short images of the same target are taken. Every so often, there will be a chance alignment of the turbulent regions in the air above us, allowing a clean sharp view through the atmosphere. The students will computationally select these rare, lucky images and combine them to make a single image that is much sharper than any normal image that could be taken through Bristol's skies.

This year, four BSc students are testing out the new equipment in their final year projects, and in the near future we plan to make the robotic observatory available for second and third year students, so that many more gain this experience.

The only thing we weren't able to obtain as part of the upgrade was a weather machine, so we are still at the mercy of Bristol's capricious climate. Wish us clear skies!

The impact of philanthropy: postgraduate scholarships and bursaries

As a research-intensive university, the University of Bristol recognises the significant contribution that postgraduates make to academic life: supporting the work of experienced researchers, developing new ideas, and inspiring younger students. We believe in nurturing talent and supporting the next generation of academic researchers. With the cost of living rising dramatically in the past few years, and research grants scarce, studying for a PhD is an unaffordable luxury for many students. Yet postgraduate education is increasingly important for career progression in some specialist industries. Philanthropy plays a key role in this: thanks to the generosity of alumni and friends of the University, a growing number of postgraduate students are fully or partially supported by donations.

In this article, some of our postgraduate Physics students who have benefited from scholarships and bursaries share their thoughts on the impact of philanthropy.

Farhad Syed
(H H Potter Fund and the Kurt Hoselitz Fund)

Farhad Syed is studying for a PhD in Micro- and Nanostructural Materials
Photo Bhagesh Sachania

Farhad Syed is in the fourth year of his PhD studies in Micro- and Nanostructural Materials, and has been supported by bursaries from two philanthropic funds. Farhad worked for several years as a scientific officer in electron microscopy in his home country, Bangladesh, and moved to the UK in October 2011 to study for a PhD at Bristol. A scholarship from the government of Bangladesh covers his tuition and bench fees, but provides very little for maintenance. Although Farhad is grateful for his government scholarship, he admits that without extra philanthropic support he would struggle to afford the city's high living costs.

"50,000 Bangladeshi Taka (about £400) per month isn't really enough to survive in Bristol, so I applied to the School of Physics for a bursary to help me," Farhad says. He receives a maintenance bursary from the H H Potter Fund, established in memory of the late Dr Harold Herbert Potter (BSc 1919), a Physics alumnus and subsequently also a highly esteemed member of staff. The Fund supports postgraduate study and research in Physics at Bristol. "The H H Potter bursary meant that I need not worry about having a part time job that would, I believe, significantly impede my research pace. Many of my achievements in my PhD work might not have been possible if I needed to worry about covering my living costs, so I am very grateful for the bursary."

In 2014, Farhad was awarded a bursary from the Kurt Hoselitz Fund, to enable him to attend the Spring Meeting and Exhibit of the Materials Research Society in San Francisco. Farhad's bursary was the first award made by the School of Physics from this newly-created endowment, established with a discretionary payment from the estate of Professor Kurt Hoselitz. Professor Hoselitz fled to Bristol from Vienna in 1938 to escape persecution by the Nazis. Despite having

not completed his undergraduate studies, he was offered a PhD studentship by Professor Tyndall, and went on to become a prominent physicist who made important contributions in the field of applied magnetism.

After Professor Hoselitz's death in 2010, his son and daughter made a donation from his estate to support PhD students in Physics who are themselves refugees, or who qualify for special support for reasons of hardship. This extraordinary gift was made in recognition of the benevolence Professor Hoselitz received from Professor Tyndall, and the University of Bristol, and demonstrates the significant impact of philanthropy on students.

Alex Neville
(Wilkinson Scholarship in Quantum Photonics)

Alex Neville was awarded the Wilkinson Scholarship in 2013, to fund his PhD studies. The Scholarship is funded by a donation from a retired electrical engineer, to support a talented student in engineering or science. During his working life, the donor founded a company that designed and manufactured safety devices for oil rigs and nuclear energy plants, and he is keen to see Alex develop those same innovation and entrepreneurial skills.

Alex is now entering the third year of his PhD in quantum photonics, having already graduated from the University of Bristol with First Class Honours in Mathematics and Physics in 2012. His research focuses on the calibration and optimisation of optical quantum devices. He's currently involved in the Quantum in the Cloud project, which gives members of the public remote access to a quantum processor for their own experiments. The aim is to give people interested in quantum photonics – especially budding quantum students – the opportunity to gain practical experience of using quantum computers.

Alex Neville (right) and Chris Harrold, PhD students
Photo Gerardo Villareal

Aside from his research, Alex is also involved in public outreach activities and in teaching mathematics to first year undergraduate Physics students. “The most rewarding and enjoyable aspect of my time so far as a postgraduate researcher has been my interaction with younger students” says Alex, “and my aim after completing my PhD is to train as a secondary school teacher. I hope to use my experience in academia to inspire and guide students from a young age, and especially help any keen young scientist or mathematician to realise their full potential. The Wilkinson Scholarship has given me a fantastic opportunity to learn about cutting-edge quantum technology, and I want to share what I have learned as widely as possible.”

Peter Martin
(D J Noble PhD Scholarship)

In 2013, Peter Martin graduated from the University of Bristol with First Class Honours in Geology – one of only three first class degrees amongst his cohort. After graduation, a technical internship in the School of Physics’ Interface Analysis Centre (IAC) introduced Peter to scientific research in materials analysis. He aspired to continue his studies with a PhD, but his financial circumstances meant that he could not possibly afford to pursue this without funding. Having been impressed by Peter’s outstanding performance in his undergraduate studies, and his extraordinary potential, the School of Physics was also keen for Peter to continue his studies. In summer 2014, Peter’s goal became a reality, when he was awarded a PhD Scholarship thanks to a generous gift from Perry Noble (LLM 1983) and his wife Elaine (LLB 1988).

Peter’s PhD focuses on analysing the fallout material from the explosions at Japan’s Fukushima Daiichi nuclear power plant in early 2011. In the years following the incident, billions of dollars have been spent on a clean-up operation, with much more set to be spent, but it’s still not clear that it is safe for residents to return to some of the affected areas. A major problem is that little is known about the nature of the materials that were ejected from the plant.

Above: Peter Martin and the drone, which will be used to locate areas of heightened nuclear activity in the Fukushima exclusion zone

While for the most part, the radioactivity levels have dropped considerably, high levels of long-lived nuclides in certain areas could still pose a serious toxicological health risk to nearby communities. Indeed, during a research expedition to Fukushima in 2014, a team led by Dr Tom Scott from the IAC discovered evidence to suggest that some of the fallout contained uranium from the nuclear fuel, as opposed to the more volatile elements on which the clean-up is currently focused. If these nuclides are indeed present, they could still pose a very serious health risk.

Peter plans to use a drone developed at Bristol to locate areas of heightened nuclear activity in the Fukushima exclusion zone, and to take samples for detailed analysis in the IAC labs. Peter hopes that the data he obtains from this analysis will help inform the clean-up operation. “Without this scholarship,” Peter says, “I would not be able to undertake this PhD, conducting research that has the potential to benefit thousands of people displaced by the disaster, but who will hopefully one day return home.”

Peter’s research is already impressing the wider academic community. Indeed, his paper on using drones to map radiation is currently the most downloaded article for 2015 in the Journal of Environmental Radioactivity – a great coup for a scientist so early on in his studies.
We are immensely grateful to all our donors who have made it possible for exceptional students like Peter to continue their studies at Bristol.

Strategic partnerships

The academic world is changing, and so are we. With challenges including the increase in student numbers, changes to student fees and research funding, and a desire to generate impact from our research, the School of Physics is increasingly engaged with the real world applications of our work. We continue to do not only a lot of very good, fundamental research, but also work with industry on more practical research questions.

We are also constantly reviewing the training we provide and are asking the world around us whether our students get the right training to get the best jobs. To enhance this process we have developed a new Physics at Bristol Roadshow that will enable us to visit companies and show what we can do together. Examples of partnerships might include short student projects, access to our excellent facilities, contract and collaborative research, student mentoring, consultancy, sponsored PhD positions, recruitment events and many more.

If your company is interested in discussing a possible link up with the School of Physics, please find out more at our Industry solutions web pages – and get in touch.

Focus on outreach and public engagement

Our staff and students love to share their knowledge and there is no shortage of opportunities to do so, from school visits and summer schools to Ada Lovelace Day, via Bristol Bright Night and Pint of Science. Read about a few examples below.

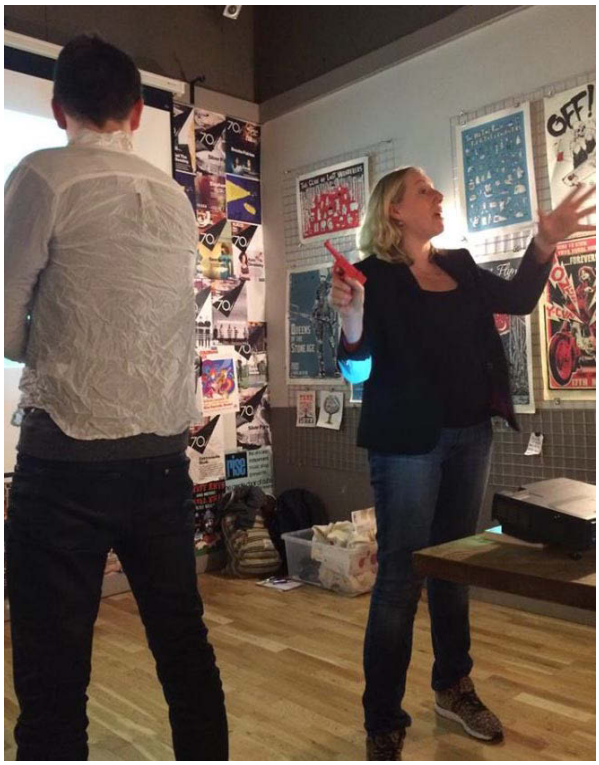
Bristol Bright Night 2015

On September 25, Bristol Bright Night had a second successful run at @Bristol. Researchers from the Particle Physics and Quantum Photonics research groups took part.

Particle Physics PhD student Sophie Richards writes: 'A particular highlight was the spark chamber (a particle detector which detects cosmic rays) which we brought with us. A team of researchers told visitors all about the spark chamber, and the physics in which our team is involved at the Large Hadron Collider. We also had a crystal from the Compact Muon Solenoid (CMS) experiment at CERN.'

A very successful night in which the researchers enjoyed meeting the public and passing on their enthusiasm.

PhD student Lana Beck explains the CMS crystal to visitors at Bristol Bright Night 2015.



Dr Annela Seddon – opportunities offered by nanoscience.

Pint of Science

Back in May, Bristol University physicists took part in the city's sold-out Pint of Science festival, sharing scientific ideas with the public in local pubs and cafes.

Pint of Science is a global science festival that celebrates the research of local universities through interactive talks and discussions, all over a pint. The festival aims bring research to the general public, allowing them to learn more about the cutting edge science going on in their city. The festival found itself in Bristol for a second year, with eighteen events spread across the city over three days. The festival reached all corners of science, featuring academics from Bristol University and UWE, as well as some local technology companies. PhD students Abi Coveney and Tom Millichamp from the School of Physics helped to organise events covering research from across Chemistry and Physics.

Academics from the School of Physics were on hand to share ideas too. 'To infinity, and beyond' talks by Drs Tony Short and Furqaan Yusaf discussed the big questions surrounding both quantum mechanics and cosmology - an evening that spanned the greatest of scales! Later in the week Dr Annela Seddon (Director of the Bristol Centre for Functional Nanomaterials) presented 'Small world, big future', an evening devoted to nanoscience. With the help of some inventive demonstrations Dr Seddon explained how we can

see things at the nanoscale and the opportunities nanoscience offers to solve some of the biggest challenges facing us today.

The sessions were designed to encourage everyone to interact and engage with the topics, challenging the speakers with no shortage of interesting questions and opinions. Feedback from all events was extremely positive, showing just how interested the public are in the research that goes on in their city.

The festival is in May next year - so look out for even more exciting events in Bristol and around the world!

Work experience week

Twelve school students, pictured right, enjoyed their week of work experience in Bristol's School of Physics. The students, aged between 14 and 17, worked in the laboratory, attended talks, and learned about the application of physics and mathematics in different situations. You can read their report at Physics work experience week.

Centre for Quantum Photonics summer school

In August the Centre for Quantum Photonics (CQP) organised its first summer school, in partnership with the Institute of Physics (IOP), to celebrate the International Year of Light. The summer school was attended by fourteen students aged 16 – 22, from as far away as Rome. Light has been at the heart of the many important breakthroughs in physics, from Maxwell's theory of electromagnetism to Einstein's theory of relativity. Light is at the origin of quantum mechanics, and is currently playing a large part in the quantum information technology revolution.

CQP summer school will continue to run as an annual event and will be even bigger in 2016, bringing in other research groups from within the School of Physics, the University of Bristol and around the UK

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Athena SWAN Bronze Award

IOP Institute of Physics Juno Practitioner

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