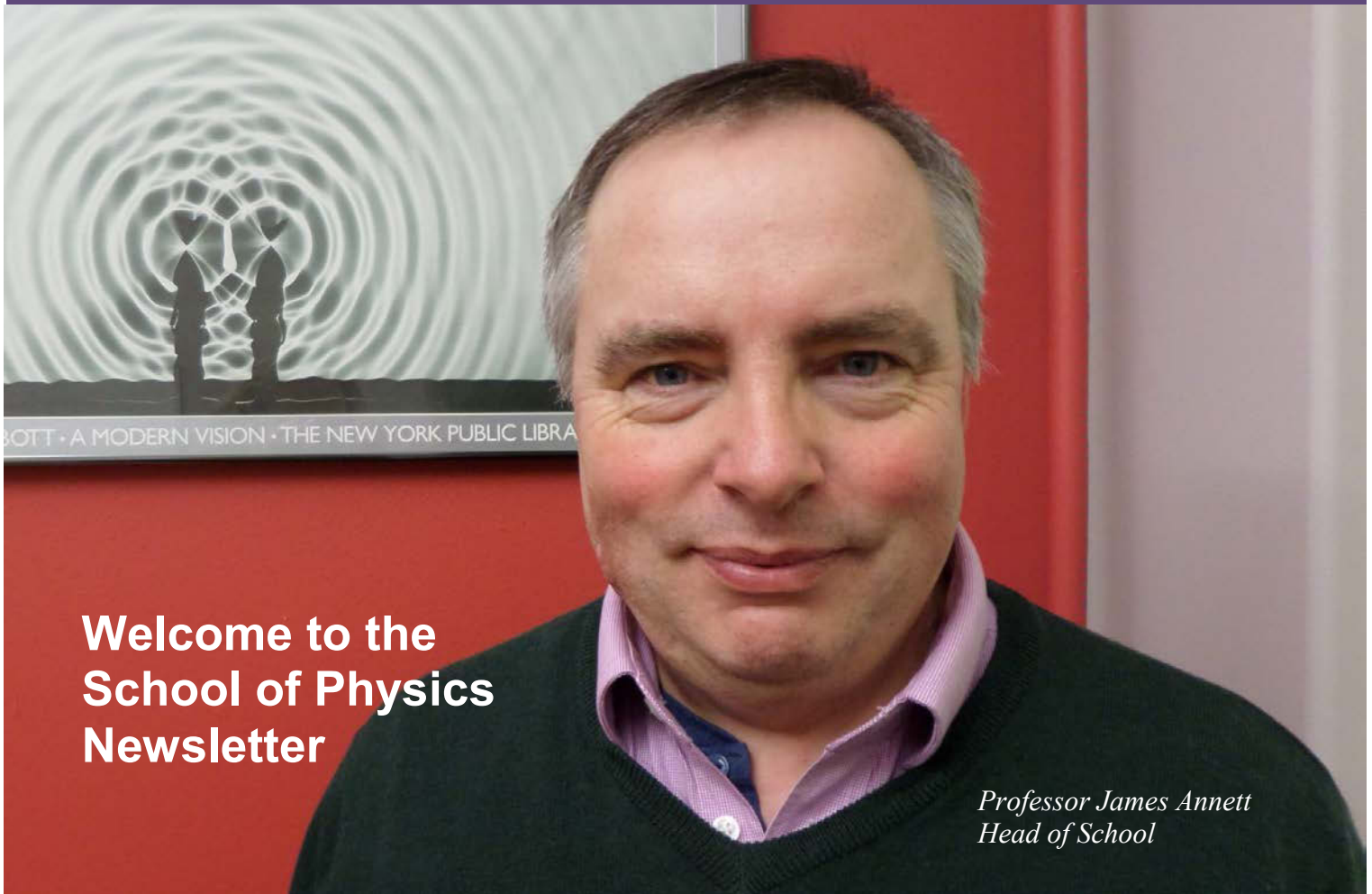


School of Physics

Newsletter

December 2014



**Welcome to the
School of Physics
Newsletter**

*Professor James Annett
Head of School*

This is an exciting but challenging year for the School of Physics.

Not only are we now host to two new national centres for doctoral training, we are also seeing major new research initiatives in Nuclear Materials and Quantum Technologies within the school.

Undergraduate student recruitment has been excellent in 2014, and the summer of 2015 will see the launch of both a new MSci degree programme in Theoretical Physics and a taught MSc in Nuclear Science and Engineering.

The planned refurbishment of the whole HH Wills Physics laboratory building has now finally come to completion, and a totally new cleanroom research facility will open in the school in January 2015. The cleanroom will enable cutting edge research in a whole range of areas,

including semiconductor device physics and quantum photonics, and will also be a university-wide facility used by colleagues from the Faculty of Engineering and partners in industry.

In August, following Professor Nick Brook's departure to become Dean of Mathematical and Physical Sciences at University College London, I had the great privilege of being appointed Head of School. The HH Wills Physics Laboratory has been a scientific and cultural home to so many great students and staff and it is a great personal honour to be its Head. I had previously been Head of Theoretical Physics as well as having roles as chair of the Institute of Physics (IOP) South West region and as president of the University of Bristol branch of the University and College Union (UCU).

Having done the job of Head of School for only a short time now I can wholeheartedly say that Nick Brook's leadership of the school over the past few years has been tireless and has set a very clear direction of movement for the future. I intend to continue this good work and I believe that the School of Physics will continue to be a truly world-class centre for excellence in both teaching and research in physics.

Professor James Annett
Head of School

University of Bristol to host new Nuclear Energy hub

The University of Bristol will host a new hub for nuclear energy research and education in the south of the UK thanks to catalyst funding of £2.43 million from the Higher Education Funding Council for England (HEFCE), alongside the University's own investment of over £5.3 million.

Dr Tom Scott, pictured below, is Reader in Nuclear Materials and Director of the Nuclear Research Centre. He said: "Our objective is for the Hub to become an internationally recognised centre for nuclear research and education. It will bring academic and industrial expertise together in an exciting multidisciplinary environment to address some of the major engineering, scientific and societal challenges related to civil nuclear power generation.

"A new Masters programme is under development, aimed at delivering the skills needed for the next generation of UK nuclear plant operators, regulators and supply chain."

Strong support has been received from leading industrial stakeholders, government organisations and agencies.

The Hub, which will open in early 2016, signifies a development of the existing Nuclear Research Centre strategy by creating a dedicated physical presence at the University that will be accessible to both the UK and international nuclear energy community.

Find out more at [University of Bristol News](#).



Why choose a PhD in a Centre for Doctoral Training?

Drs Chris Bell and Annela Seddon train students in two School of Physics Centres for Doctoral Training (CDT). We asked what excites them about their work with research students.

Dr Annela Seddon (right) is Lecturer in Physics and Graduate Teaching and Research Fellow at the Bristol Centre for Functional Nanomaterials (BCFN).



What is special about your CDT?

I would say three key aspects make us special. The first is the tight-knit cohort experience; our students learn from day one how to work as a team and our programme is designed to foster a supportive and collaborative atmosphere. The second is choice through exploration – we don't assign students a PhD project when they start; instead they are

encouraged to explore new areas through short training projects, before finally deciding on the PhD that is right for them. I'd say the thing that sets us apart is the training that we offer our students – not just in their first year, but throughout their PhD. We place a huge emphasis on skills development, whether this be communication, understanding the social and economic aspects of science or being a more creative and productive scientist – all of these are explicitly addressed through training activities which we've developed with experts in their fields.

What area of research does your CDT cover?

We are interested in the area of functional nanomaterials, which is an incredibly wide remit! We focus on understanding advanced materials at the nanoscale, so that we may predict and control their functionality and applications at the macroscale, and we have projects with applications in engineering, biomedicine, plant science, new imaging techniques, electronic devices; the list is endless. All of our projects are inherently interdisciplinary and are supervised by at least two academics from different departments so the students have to take on the challenge of working to bring together different subject areas to create something that we hope is greater than the sum of the parts.

What are the benefits of a CDT for a young scientist?

Our emphasis on training and working as a part of a team, I think, equips young scientists more fully for their life beyond a PhD. Because we don't assign projects from day one, there's the opportunity to try your hand at some techniques that students may never have encountered before – this is a great way of getting a feel for what might be right for them as a PhD project. There's also the chance to work across disciplines on some cutting-edge problems and to have a real sense of ownership of their research. We also hope that we offer a wider perspective of science, and that students will leave more rounded and with a better understanding of their place in the scientific landscape.

What would be your advice to a PhD candidate who is interested in BCFN?

Think about why you want to do a PhD. It has to be because you simply can't think of anything you would rather do – research has to be the thing that gets you out of bed in the morning. Talk

to BCFN students (they're very friendly!) or to one of the BCFN management team about the type of opportunities that will be available to you. Read the scientific literature and think about what motivates you and what you imagine yourself doing. Then apply! You should read the [information about applications](#) and funding, and perhaps come to an open day.

Dr Chris Bell is a Senior Lecturer in the School of Physics, and trains students in the [Condensed Matter Physics Centre for Doctoral Training](#).



What is special about your CDT?

This CDT is a joint venture between the Universities of Bristol and Bath. Each university has a different focus, research interests and specialities - this provides an exciting opportunity to get the best of both places!

I like this mixture of techniques and styles - it gives lots of new interesting possibilities for both students and academics.

What area of research does your CDT cover?

We are interested in condensed matter physics - basically all the stuff in the world around you - but with a focus on 'hard' materials: meaning things like ceramics, metals, and so on. They can be magnets, semiconductors, superconductors or have mysterious combinations of all of those properties that we don't yet fully understand! There's a whole host of exotic materials that we study; some might one day replace the silicon devices in your computer, others become efficient solar cells, and high temperature superconductors which could create high magnetic fields for body scanners. But before we can get to applications, right now we're trying to understand their fundamental properties.

What are the benefits of a CDT for a young scientist?

In the first year you have lectures and training, as well as short and long projects in various aspects of condensed matter physics, both theoretical and experimental, and even training at the [ISIS facility](#) near Oxford. You also have transferable skills training. You get a perspective of what it's all about: what's possible with various techniques and what's interesting at the cutting-edge of a whole range of different research topics.

This will help you make a good decision about the topic you will focus on for the following three years for your PhD, but the broad knowledge you have gained will also stay with you. Whether you stay in academia, or move into industry, you have a wider picture of all of the directions you can go in.

What would be your advice to a PhD candidate who is interested in condensed matter?

Apply! If you're generally interested in condensed matter physics, but not sure of the topic you finally want to go after, then a CDT is ideal. Even if you do think you have a preferred topic, you can still join and get to try a variety of completely different things for the first year. Who knows, you might find a new passion, or a new idea that you wouldn't have otherwise.

Practically, what is needed for an application to your CDT?

Enthusiasm, and a willingness to get involved! There is much more of a team-feeling in CDTs than for a normal PhD: this can be a big plus for everyone involved. More practically: competition for places is high, so you need to have a solid degree too, but we have a very broad range of research topics, so we're looking for all types of people to join our team.

For more on the University's Bristol Doctoral College and other Centres for Doctoral Training, see <http://www.bris.ac.uk/doctoral-college/centres/>

What Bristol means to me!

We asked undergraduate students about life in Bristol, and how they would advise anyone thinking of studying physics here.

Kris Chamberlain, third year MSci Physics

How do you feel about living in Bristol?

I have always lived in Bristol and when making the decision of where to study I really couldn't see myself going anywhere else.

This is my third year living independently and I couldn't be happier with what the city has to offer. I love the fact that Bristol is fairly small but packed full of everything you could need and it has such a strong student presence. I never see myself leaving.

In three words what does Bristol mean to you?

Friendly, diverse, home.

What would you say to a student thinking of studying a Physics degree in Bristol?

Short answer - Do it!

If you enjoy physics then there is a massive choice of institutions to study at and the large majority will give you the same education. The thing that sets Bristol apart from the rest is the people. I have never heard anyone say they regret coming to Bristol, no matter how they ended up here. There is a lot of support available for new students not only from the academics but also from other students, so we have 'physics families' (which I happened to organise this year). It's a really good scheme that allows students to socialise with other years as well as giving new students someone to talk to that has been through it all before, which in my opinion makes the adjustment a lot less scary.

Xing Chen Chen, first year BSc Physics

How do you feel about living in Bristol?

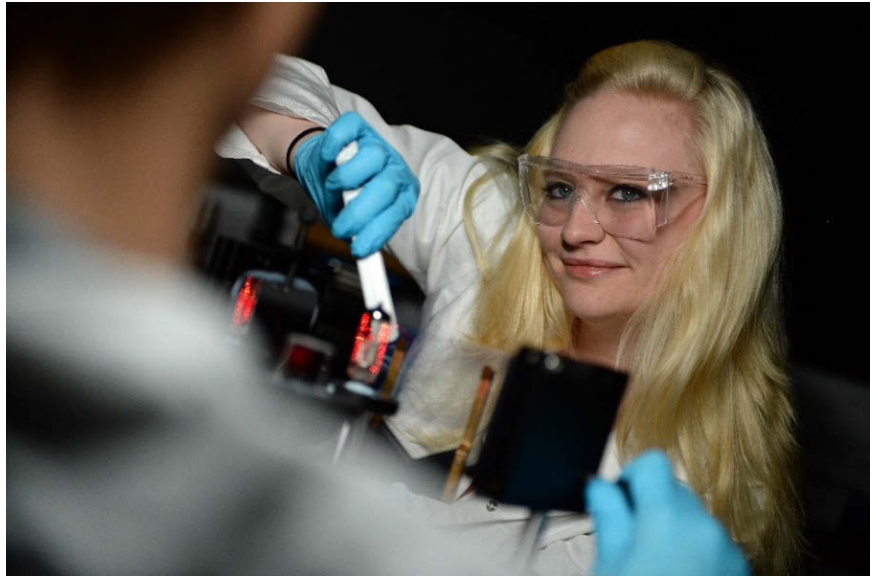
Living in Bristol is great. The city can be as quiet as you want and on the other hand there are tons of activities and events going on. Shopping is convenient and you can find every kind of food here. Bath is only 15 minutes' train journey away and you can fly to basically wherever you want through Bristol Airport. I enjoy every minute here.

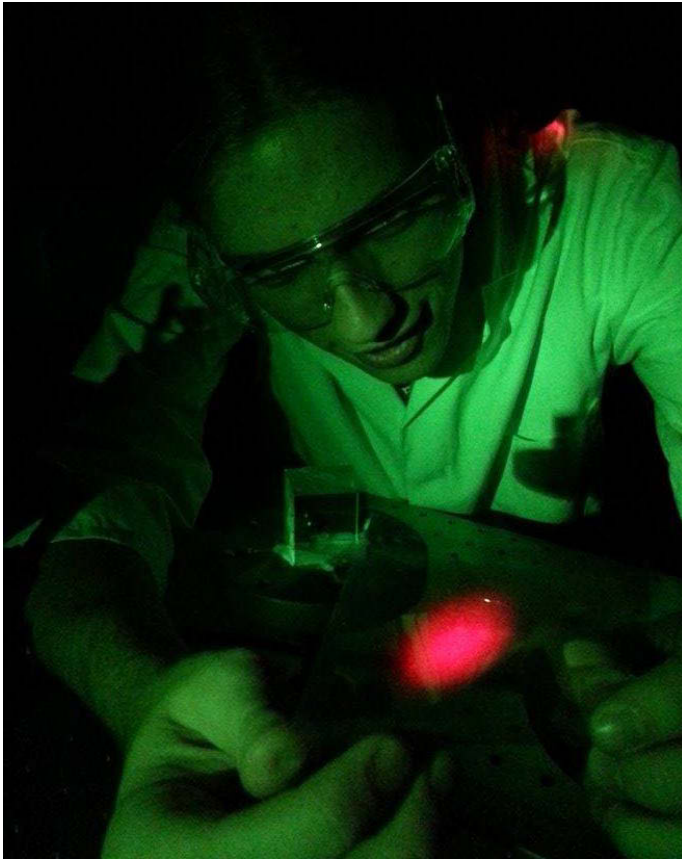
In three words, what does Bristol mean to you?

Living, working, fun.

What would you say to a student thinking of studying a Physics degree in Bristol?

I totally love it here, the study environment is brilliant as well as the social environment. It would be a fantastic experience. However, Bristol does have a high level standard, so work hard!





Christy Howarth Nunns, first year MSci Physics

How do you feel about living in Bristol?

I love it! The best thing about Bristol, for me, is the mixture of its lively and exciting parts, and the almost hidden peaceful parts interspersed between. Basically, it's big enough that one can find anything to do, and small enough to walk everywhere.

In three words, what does Bristol mean to you?

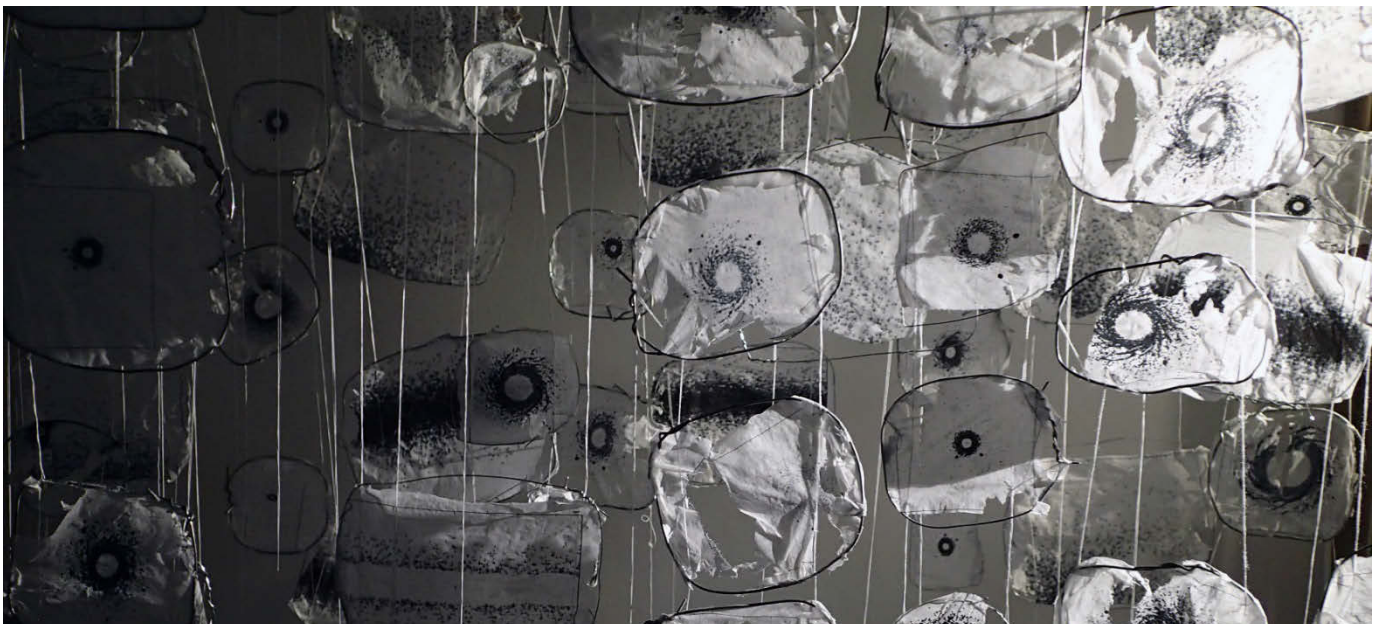
Physics, food, home.

What would you say to a student thinking of studying a Physics degree in Bristol?

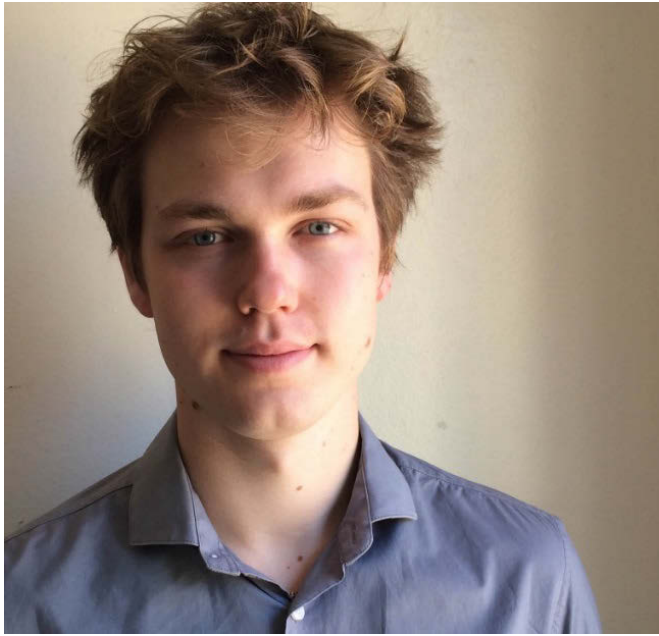
Do it! Bristol has definitely always been at the top of my list (yes, above other big names), not just because of the city, but for things like the university's widening participation work (funding for low income households) and the department's research links.

As for the course, I'm really enjoying it - particularly due to aspects like Bristol's - somewhat uncommon - tutorial system, through which we get to discuss problems and concepts, in small groups, with academic researchers. Labs are fun too! You develop your practical techniques really quickly, and get to dip into a very wide variety of physics (my highlight is definitely playing with lasers to make holograms!).

I also think it's great that Bristol take a really active role in listening to students and working to improve the course; for example, as a first year physics course rep, I speak about my peers' issues at student staff forum meetings.



Mia Mace, a Bristol MSci Physics with Astrophysics graduate, made this art installation inspired by the formation of the moon as part of Bristol Bright Night 2014 – find out more on the back page.



Oscar Williams, fourth year MSci with a Year in Industry

Tell us about the Year in Industry degree

The Year in Industry programme incorporates a year of full-time work within an industrial environment. This year is sandwiched between the second and third years of study, and if (like me) you are enrolled on the MSci version of the course, this third year will also involve distance learning and exams in the core modules of the third year. Who you work for is completely your own choice, as long as it is related to your subject in some way, and you typically apply to the companies in the same way as you would if you were applying for a job at that company.

Where did you work and what did you do?

I worked near Reading for a company called De La Rue, the world's largest commercial banknote printer, which also manufactures other security documents such as passports, identification cards, and tax stamps. This may seem like an industry with very little physics involved, but surprisingly there are a lot of physicists when you get to the Research and Development department. The main aim of the R&D sector of De La Rue is to produce and refine novel security features that will protect banknotes and other secure documents from being counterfeited – such as the watermark of the Queen's head that you can see on English banknotes when transmitting light through the note, or holographic foils stuck onto commercial products as authentication. I was assigned to the Research team within R&D, and the majority of my work consisted of early stage optimisation of two new potential security features.

What skills did you learn in your year in industry?

Aside from the technical skills specific to De La Rue, such as printing techniques and how to characterise various materials to produce an optical analysis. A huge amount of transferable skills and professional knowledge may be gained from a Year in Industry. Personally, time management was a quality that I was able to improve markedly; juggling a full-time job during an examination period successfully meant that I had to be very strict with my time allocation. Further, I found it incredibly useful for future job applications, as I was able to gain an insight into how a company operates and the qualities that they look for in applicants.

What would you say to a student thinking about doing a year in industry degree?

Working from my own experiences, I would say go for it! You should weigh up your personal situation and make sure that you do what is right for yourself at the time. For me, the year in industry has provided me with a toolbox of skills and experience, which I feel confident I'll take full advantage of to make informed decisions and successful applications in the future. Intuitively, I would say that you would be hard pressed to find a potential employer or future university that would not value highly an individual coming out of their degree with a full year's worth of industrial experience.

And finally ... in three words, what does Bristol mean to you?

Vibrant, innovative and fun.

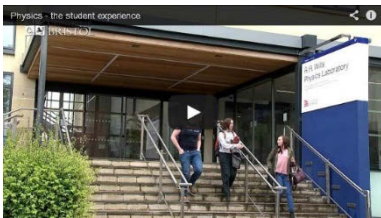
School of Physics awarded Athena SWAN bronze award

On 6 November Dr Furqaan Yusaf, Teaching Fellow, went to Cambridge where he received the Equality Challenge Unit's Athena SWAN bronze award on behalf of the School of Physics. The University of Bristol is a founder member of the Royal Society Athena SWAN (Scientific Women's Academic Network) Charter which recognises excellence in science, technology, engineering, maths and medicine (STEMM) employment in higher education, with particular regard to gender equality.



So it is great news that the School of Physics has now received the bronze award, which alongside its Institute of Physics Juno Practitioner status reflects our [commitment to a supportive working environment](#) for all. Dr Andy Young, Dr Annela Seddon and Ms Mahi Hardalupas (a fourth year MSci Physics and Philosophy student) are leading the implementation of these policies.

School of Physics on video



Short films showing the School of Physics are now [live on video](#) on the website. Three films give you a great chance to find out a little more about the experience of our students, and a glimpse of what Bristol physics is all about.

Daniel Finkelstein OBE, Executive Editor of The Times and RISE Companion to Professor Jeremy O'Brien visited Bristol in August to have a look at our laboratories and to film a short video for EPSRC about Professor O'Brien, Peter Shadbolt and the work undertaken at the Centre for Quantum Photonics. For links to the film see [The Man Leading the March of Machines](#).

Art and science

Mia Mace, MSci Physics with Astrophysics graduate, made an art installation inspired by the formation of the moon as part of Bristol Bright Night 2014 (see page 6).

European Researchers' Night takes place every year simultaneously in cities all over Europe and beyond. The aim is to showcase what researchers do and why research matters. The University of Bristol's contribution, [Bristol Bright Night 2014](#), included researchers from the Particle Physics and Quantum Photonics groups. Researchers' Night is funded by the EU's Marie Skłodowska-Curie actions programme.



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