School of Physics

Newsletter
June 2015

Welcome!

I am very pleased to introduce this newsletter. We are now nearing the end of the 2014-15 academic year, and exams are in full progress. It will be just a short time until our final year students have their graduation ceremonies, a time to recognise and publicly acknowledge all their hard work and the achievements represented by their degree awards.

Our excellent students are our best asset as a school. We hope that the few short years spent studying physics in Bristol provides not just a qualification, but also an experience which will be a benefit to our students for the rest of their careers, whatever future direction they take in life.

This has been an exciting and interesting year for the School and the University in general, with many new beginnings. This newsletter presents a selection of highlights of these, which I hope you will find interesting and informative.

Professor James Annett
Head of School of Physics

Above: Students enjoy the spring sunshine outside the School of Physics.
Photo: Dr Terry McMaster.

Quantum Engineering Technologies Laboratories: engineering quantum science into quantum reality

Our new Quantum Engineering Technology Laboratories (QET Labs) officially launched in April on board Bristol's SS Great Britain.

With significant new investment from the University of Bristol, the laboratories span research groups across the Faculties of Science and Engineering to deliver a radically new generation of machines that exploit quantum physics. Development is well under way and will be fully complete and open for business in September.

The laboratories will provide unique world-leading facilities, bringing together industrial and academic collaborators to build devices that span numerous areas of quantum technology development from the nano-fabrication of quantum devices to a city-scale Quantum Key Distribution network.

Potential applications could transform our lives. They include developing secure communication systems; precision sensors for environmental monitoring, biomedical applications and security; quantum simulators to design new materials, pharmaceuticals and clean energy devices; and quantum computers to tackle challenges in big data and machine learning.

Professor Jeremy O'Brien, Director of the Centre for Quantum Photonics, spoke at the launch event from the deck of the SS Great Britain: "It seems fitting that we are standing here on Brunel's SS Great Britain, in sight of the Clifton Suspension Bridge, launching a new venture that pays homage to such great historical figures as Dirac and Brunel. QET Labs brings their contributions to humanity together, binding quantum physics with engineering technology."

QET Labs aims to be a global centre for research, development and entrepreneurship in the emerging quantum technology industry with world leading facilities and core expertise in photonic quantum technologies and quantum systems engineering. The laboratories will house over 100 researchers working to deliver quantum technologies whilst supporting the training of future quantum engineers through the EPSRC Centre for Doctoral Training in Quantum Engineering.

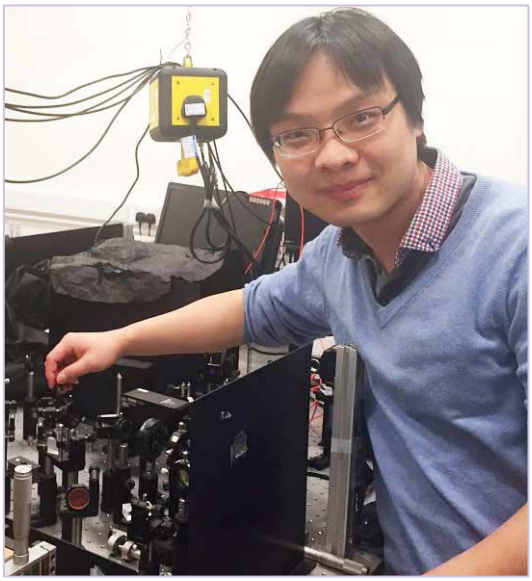
Also at the launch was Professor David Delpy, Chair of the UK Quantum Technology programme, a £270m investment in quantum technologies administered by the Engineering and Physical Sciences Research Council (EPSRC) and Innovate UK.

He said: "I'm impressed that Bristol's QET Labs spans the full innovation landscape from theory through to commercial success."

Focus on international students

The University of Bristol attracts excellent students with a strong work ethic from all over the world, and the School of Physics is no exception: students from every continent are studying at undergraduate and postgraduate level. We asked our international students about their experiences and their reasons for choosing Bristol. Here is a snapshot of their views.

Jianwei Wang (China), a PhD student in the Bristol Centre for Quantum Photonics



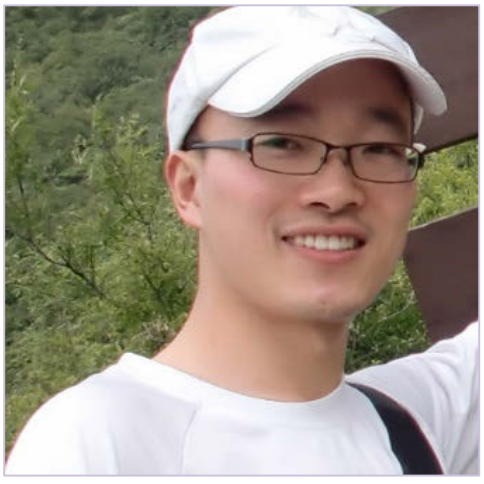
I am a PhD candidate at the Centre of Quantum Photonics in the School of Physics, working with Professor Jeremy O'Brien and Dr Mark Thompson.
I have been working on developing integrated photonic devices for applications of quantum communication, computation, simulation, and machine learning.

Bristol is a very nice city and it has topped the list of the most liveable cities in UK. The University of Bristol (UoB) is a world-class university with a high reputation, and it has been well known in many fields, including research at the frontier of science and engineering. I love Bristol and the UoB!

Mrs Rebecca Emmanuel Mfon (Nigeria), a first year PhD student in the Micro and Nanostructures research group

I am a PhD research student in physics, in the Micro and Nanostructures research group supervised by Dr Andrei Sarua. I am involved in the synthesis of metallic nanoparticles using leaf extracts and their characterisation, for possible applications for the benefit of mankind.

Bristol is a city bubbling with life especially at weekends, and the University of Bristol is a friendly, world class university.
Being an international student feels like being grafted into a family that leaves no stone unturned to ensure that you 'become your dream'. If you want to earn an enviable degree from the University of Bristol, you must be focused and hardworking, and avoid distractions.

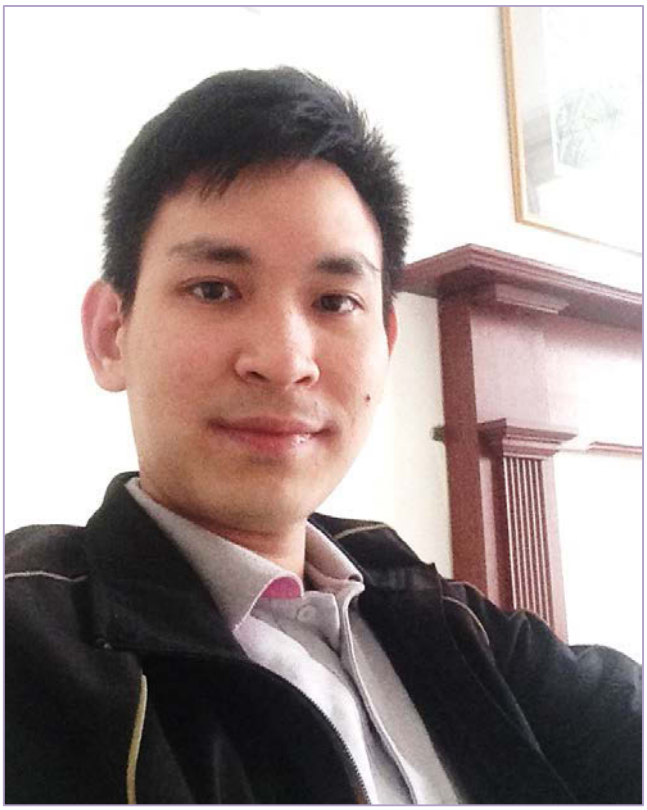


Yan Zhou (China), a first year PhD student working on microstructures

I am a PhD student working on Gallium Nitride at the Centre for Device Thermography and Reliability, supervised by Professor Martin Kuball. I discovered Bristol through a friend's recommendation and QS world university rankings, an academic ranking.

Bristol is a good place to fulfil your scientist's dream, just come and play with the interesting science!

Poemwai Chainakun (Thailand), a second year PhD student in the Astrophysics research group



I'm doing PhD research about modelling the X-rays that can be detected from around a supermassive black hole using the reverberation technique. This technique allows me to probe the innermost region very close to the event horizon. I've been conducting this research with Dr Andrew Young since I was a Master's student in 2011.

The University of Bristol captured my interest because of its effective research teams and its high-ranking profiles, especially in physics. Bristol, with its beautiful scenery and peaceful environment, is very attractive for living.

Being an international student here is a very good opportunity. The University of Bristol can provide not only strong academic support but also a good environment in which to live, learn and share experiences with people from across the world. Bristol is uniquely peaceful and hospitable for overseas students. If asked to summarise the city of Bristol, the university, and my studies – I'd say they are extraordinary!

If I were to give advice to a student thinking of carrying out research in Bristol, I'd say that being a research student here, you'll be surrounded by experts who will kindly encourage you from the beginning of your research until you choose your career path after graduation. You're missing out if you don't choose the University of Bristol!

Photo: Dr Putzke in his University of Bristol gown and PhD hood at the graduation ceremony.

Dr Carsten Putzke (Germany)

I have just received my PhD in Physics. My research has been concerned with the electron and magnetic properties of high temperature superconductors with Professor Tony Carrington.

My Diploma thesis in Germany was in the field of strong correlated electron systems, mainly high temperature superconductors. I became more and more interested in the unsolved problem of high temperature superconductors. The Bristol group is deeply involved in this field, with many high profile publications.

My time as PhD student in Bristol has been a great experience. Bristol is vibrant and multicultural, and all the university staff and colleagues were very welcoming, although British culture, especially among first year undergraduate students, is very different to Germany.

Can time go backwards? Professor Popescu describes the quantum pigeonhole principle to Morgan Freeman

Can time go backwards? It seems the stuff of science-fiction, but various aspects of present-day physics, from intricate distortions of space-time due to gravity to strange quantum effects, suggest that at least some form of backward-in-time influences are possible.

This question is discussed in the latest episode of Through the Wormhole with Morgan Freeman, the television science documentary series produced for the Discovery Channel. One of the scientists at the forefront of this research is Professor Sandu Popescu at Bristol's School of Physics. Together with Morgan Freeman he describes one of the quantum paradoxes that he and his collaborators discovered, namely the Quantum Pigeonhole Principle in which three microscopic particles, such as atoms or molecules, can be put in two boxes but no two particles are in the same box!

To find out how this is possible and what this has to say about going back in time, watch the documentary - the link below takes you to YouTube.

Through the Wormhole, season 6 episode 2: Can Time Go Backwards?

Bristol undergraduate to row across the Atlantic

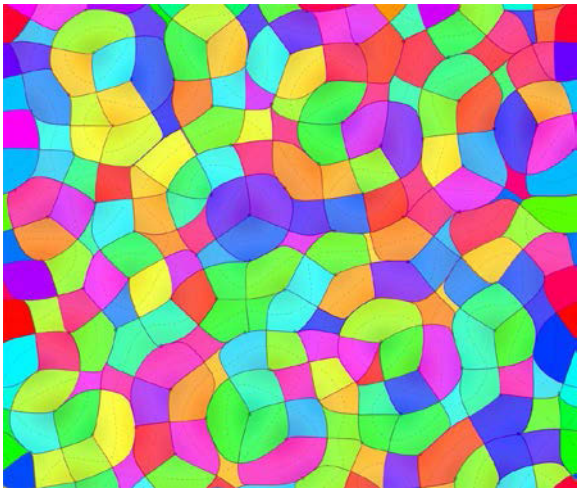
More people have been sent into space or climbed Everest than those who have rowed across the Atlantic Ocean. A test of such physical endurance teamed with a wide range of dangerous obstacles unique to the vast ocean environment is not for the faint-hearted. Yet second year Bristol Physics and Astrophysics student Jay Olenicz is preparing for this year's Talisker Whisky Atlantic Challenge, which at just under 3,500 miles is one of the world's most arduous and intense races.

Jay (pictured with close friend Ross Macleod) said: "I started rowing at school aged twelve. So few people have rowed across the Atlantic that I really want to do it; and if I do it this year, I'll be the youngest person ever to do so. The youngest pair to ever have done it before had a combined age of 42, whereas ours will be 40."

Jay will row as a pair with Ross; they will spend 5 - 12 weeks on a 7.5m long, 1.8m wide boat, with one cabin, and no room to walk around. The race is from the Canary Islands off the north west coast of Africa, to Antigua in the Caribbean. Read the full report by undergraduate student, Aimee Nevill, to find out more about the challenges they face and which charities will benefit from the duo's work.

Follow the School of Physics on social media

Don't miss news from the School of Physics! For regular brief news updates, why not follow us on twitter - and facebook?



Above: Quantum Watersheds. A depiction of the areas connected by a common gradient direction in a random quantum eigenfunction. Such patterns characterise the crossover between order and disorder manifest in quantum chaos.
Figure by Dr Alexander Taylor, who recently completed his PhD in the Theory Group.

MSci Theoretical physics – a new degree programme for 2015

Theoretical Physics has always been a key branch of our research and teaching in Bristol. Bristol theoretical discoveries such as the Mott insulator, the Aharonov-Bohm effect and the Berry phase are part of undergraduate physics courses worldwide, and our graduates will well remember lectures and homework problems from the likes of John Alcock, Mike Allen, Michael Berry, Bob Evans, Balazs Gyorffy, John Hannay, Brian Pollard and Sandu Popescu.

In the newest chapter of our theoretical physics teaching in Bristol, we are about to welcome the first cohort of undergraduates on the new MSci Theoretical Physics Degree. Introduced to emphasize our distinctiveness in Theoretical Physics to future Bristol students, the new programme complements our other honours physics programmes including Physics with astrophysics, Chemical physics, Physics and philosophy and Mathematics and physics.

Students on the new programme will be taught extra mathematical units, and take a dedicated theoretical physics project in their fourth year, with options not only from the traditional theoretical research areas of condensed matter, wave geometry and quantum information, but also other areas including theoretical astrophysics, particle physics and even biophysics. Since part of the Bristol theory tradition is to work closely with experiment, our new degree programme will incorporate some laboratory work, since even theorists need to know some electronics!

Right: The School of Physics in the spring sunshine: the classic 1920's physics tower is on the left, with the modern physics building in the centre; to the mid-right is the Centre for Nanoscience and Quantum Information (attached to the School of Physics) while on the far right is the new £56m Life sciences building.
Photo: Dr Terry McMaster, School of Physics.

Athena SWAN Bronze Award

IOP Institute of Physics Juno Practitioner

School of Physics
University of Bristol
Bristol BS8 1TL

@UniBrisPhysics

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