

School of Physics Newsletter



May 2012

A warm welcome!

Welcome to the first edition of the School of Physics Newsletter. Our plan is to produce at least one issue a year.

I sincerely hope it will be of interest to all friends of the H H Wills Physics Laboratory.

Please email phys-newsletter@sympa.bristol.ac.uk with any comments or to be added to our email list. Best wishes

Professor Nick Brook
Head of School



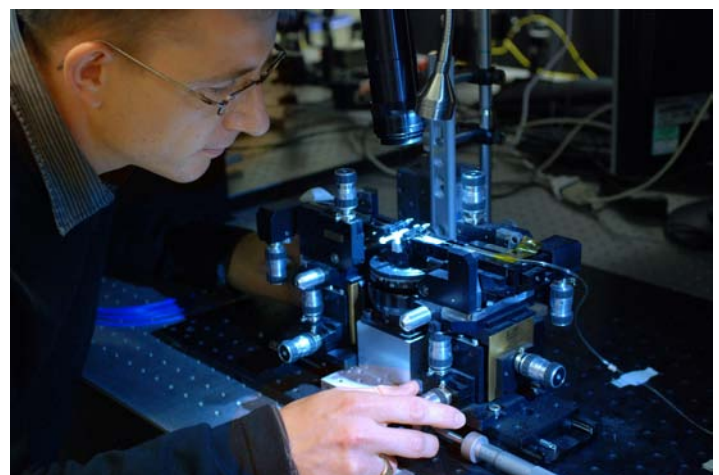
Focus on research

Dr Mark Thompson – Integrated quantum photonic technologies

Dr Mark Thompson's research interests lie at the interface between physics and engineering, and between fundamental science and technology development. He leads a team of researchers developing quantum photonic technologies that will revolutionize the way we communicate and process information.

Until recently, quantum photonic experiments - which harness the quantum mechanical properties of photons (such as superposition and entanglement) to encode, process and transmit information - have been realized using large elements mounted on optical tables, with severe limitations in miniaturization, scalability, stability and performance. Since joining Bristol, Mark has applied state-of-the-art photonic engineering techniques to fabricate integrated quantum photonic devices that control and manipulate quantum states of light on the micrometre-length scale. In future these will be

integrated with conventional computing and mobile technologies. Mark explains: "Integrated quantum photonic circuits are a crucial step for the development of practical real-world quantum technologies with potential applications encompassing quantum communications, encryption, sensing, simulation, computation and fundamental science."



Mark has a Masters degree in physics, a PhD in engineering, and varied experiences including development of silicon-based integrated

photonic components for a start-up telecommunications company, semiconductor optoelectronic devices for ultra-short pulse generation at the University of Cambridge, and photonic interconnect technologies for the next generation of microprocessors as a Toshiba research fellow in Japan.

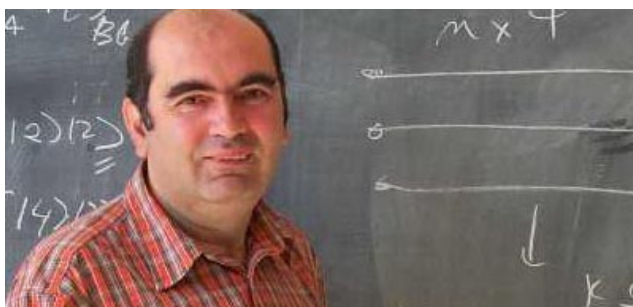
As coordinator of the European Union-funded FP7 project QuantIP and with industrial collaborators Nokia and Toshiba, the recent successes in Mark's research include realising the first ever multi-particle quantum walk [*Science* **329**, 5998, 2010], and a reconfigurable quantum circuit for the generation and manipulation of entanglement [*Nature Photonics* **6**, 45-49, 2012].

To find out more about the Centre for Quantum Photonics, please see www.bristol.ac.uk/physics/research/quantum/

Professor Popescu awarded ERC Advanced Research Grant

Last May Professor Sandu Popescu from the School of Physics was awarded the 2011 John Stewart Bell Prize. The University of Toronto selected Sandu to receive the prize in recognition of "his enormous contributions to the field of quantum mechanics."

Now Sandu's high profile is confirmed with his recent award of the prestigious - and competitive - European Research Council Advanced Research Grant. The €1.7 million grant will fund his research on the foundations of quantum mechanics.



Sandu's research is on quantum non-locality, arguably the most paradoxical, and with potentially most powerful applications, of all quantum effects.

Cosmic balloons

This year is the 100th anniversary of the discovery of cosmic rays by Victor Hess. To mark this anniversary the School of Physics will be appearing at the Bristol Balloon Fiesta (financed by STFC) highlighting the anniversary and the work of Nobel Prize winning Bristol Physicist Cecil Powell.

In cosmic ray work higher is generally better, to minimize the shielding effect of the earth's atmosphere, and early work on cosmic rays involved climbing mountains or balloon flights. Hess's landmark experiment showed that an electroscope discharged more quickly when flown at altitude in a balloon, indicating that the charged particles responsible for this discharging came from above rather than below as previously assumed.



Cecil Powell was instrumental in the development of photographic emulsions for the study of subatomic particles, improving the sensitivity of this technique. His Nobel Prize winning work used emulsions exposed on mountain observatories, but much of the later work involved balloon flights.

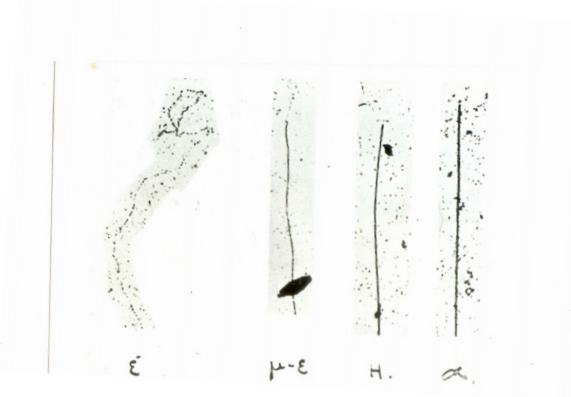
One disadvantage of balloons is the lack of control of where they come down. A film of one flight, in the physics archives, shows the apparatus crashed on what appears to be an immaculately manicured lawn. Hopefully the owners weren't too upset with the unannounced guests. It's not everyday a Nobel prize winner pops around.

Fragments of an autobiography of Powell can be found at www.bristol.ac.uk/physics/about/history.html.

The story of his attempt to produce hydrogen gas reveals an early enthusiasm for experimentation - although Powell's approach to Health and Safety is not recommended.

Dr Helen Heath

Powell developed emulsions in which electron tracks could be seen. Pictured from left to right: an electron track; a muon decaying to an electron; a proton and an alpha particle.



Two awards for Teaching and Learning

The quality of teaching and learning in the School of Physics has been recognized in the University of Bristol's 2011/12 University Teaching Awards.

Dr Mark Dennis of the Theoretical Physics group was awarded a Rising Star Award. Mark joined other recipients who were presented with their awards at the University's Learning and



Teaching Exhibition in March. Mark's award is for the development of new advanced theoretical physics courses - and his enthusiastic lectures.

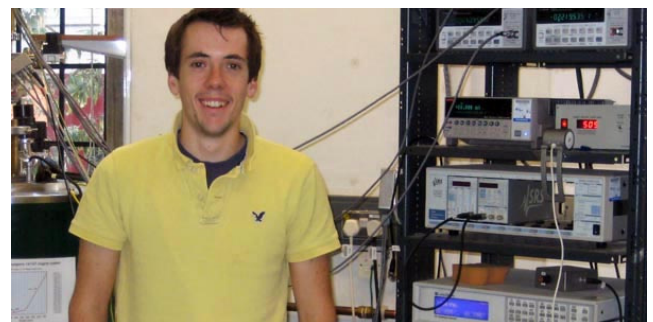
In addition, Student Administration Manager Barb Perks was delighted to receive an award in recognition of her support for teaching and learning in the School.



The University presents awards annually to celebrate and recognize excellent teachers as well as individuals who support teaching and learning. Awards are made in a number of categories and are judged by a panel of Education Directors, chaired by Professor Nick Lieven, the Pro Vice-Chancellor for Education.

Nick Wakeham wins Graduate School paper prize

Nick Wakeham of the Correlated Electron Systems research group won the inaugural Physics Graduate School research paper prize with his article "Gross violation of the Wiedemann–Franz law in a quasi-one-dimensional conductor". The law had held true for over 150 years.



Nick's paper was published recently in Nature Communications.

The Graduate School paper prize is an annual award for the best paper to which a student was the major contributor. The winner is selected by the School of Physics Research Strategy Group.



Mr Steve Hoselitz and Mrs Maggie Gravelle joined two PhD students, Daniel Souza Covacich and Haridas Kumarakuru, during a recent visit. See below.

The Kurt Hoselitz memorial fund

The School of Physics was delighted to welcome members of Professor Kurt Hoselitz's family in a recent visit to the University.

Professor Hoselitz was a physicist who made very important contributions in the area of applied magnetism and became Director of Research at Mullard Research Laboratories in Surrey.

He came to Bristol as a refugee following the Nazi takeover of Austria in 1938 and was offered a PhD studentship by Professor Tyndall.

His son and daughter, Mr Steve Hoselitz and Mrs Maggie Gravelle, have kindly made a donation to establish a fund in his memory that will be used to support PhD studentships in physics. Eligible students will be either refugees, or those who qualify for special support for reasons of hardship.

School of Physics

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Bristol teenagers and the ethics of nanotechnology

Teenagers in a Bristol school joined Dr Annela Seddon, Dr Terry McMaster and a group of Bristol PhD students in a Europe-wide debate about the ethical, social and legal questions associated with nanoscience.

The debate featured a group of PhD students from the Bristol Centre for Functional Nanomaterials (BCFN), in a bid to help form an ethical code for nanotechnology looking at privacy issues, acceptance, human health, access, liability, regulation and control. Pupils in Years 10 and 11 at St Mary Redcliffe and Temple School shared their thoughts after learning about nanotechnology as part of an on-going partnership with the University.

The Nanochannels project is funded by the European Commission and involves 20 teachers from eight countries across the continent, each engaging students through the use of social media such as Facebook, Twitter and live debates. The Guardian newspaper is a partner in the project – its Nanotechnology World microsite is at www.guardian.co.uk/nanotechnology-world



Annela also features in a short film on Women in Science, one of a series of new films which shine a spotlight on the many facets of the University of Bristol, exploring a wide-range of topics from the complexities of volcanoes to witchcraft in the modern world.

The collection of 52 short films, showcasing the wealth of talent and range of research being carried out at the University, was officially launched at Bristol's MShed recently. To view them all, see www.bristol.ac.uk/bristolchannel/