Upcoming Events Include:

5-7 March 2017 **Experimental Condensed** Matter School, Old Thorns, Liphook

30-31 March **Student Led Conferences**, **University of Southampton**

24-26 April 2017 **Quantum Technologies** School, Old Thorns, Liphook

28-29 June 2017 **Training for Enterprising Ideas Competition**, Guildford

3-6 July 2017 **GRADnet Summer School**, NPL, Teddington

18 October 2017 Welcome Back Day for 2nd Year PGRs. London

25 October 2017 **GRADnet Induction Day** for Year 1 PGRs, London

A full list is available on the GRADnet VRE:

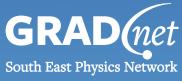
www.sepnet.ac.uk/vre

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New initiatives in Data Intensive Science

Data intensive science has a huge, and rapidly growing, importance in much of our research and also the potential to influence the economic and societal health and wealth of the UK and the wider world. With our expertise in handling large volumes, complexities and rates of data to address real questions,

we physicists have a huge amount to offer. Several SEPnet partners are thus building the Data Intensive Science Centre within SEPnet, to be called DISCnet.

They plan this to be a sustainable centre of innovative education, training and research in data intensive science for postgraduate students. They aim to enable fantastic, worldleading science with the latest big-data sets and also prepare individuals for exciting careers in data science outside academia. DISCnet plans to provide intensive, residential training in many areas of data science and challenging placements to exploit those skills in non-

academic environments much of which will be in collaboration with GRADnet.



DISCnet will be working with a wide range of companies and third sector organizations. The organisers are hoping to get funding from STFC, which will provide large cohorts of new students from September 2017. In the meantime, a DISCnet pilot has been launched. Current PhD students and postdoctoral researchers have been asked to register heir interest and DISCnet organisers have been very encouraged with the huge response so far: 56 SEPnet researchers across SEPnet have registered



interest. Anyone else who is interested can sign-up at https://goo.gl/forms/ xQ1sLvNezqLzYRgt1

> Prof Seb Oliver, University of Sussex Prof Mark Sullivan, University of Southampton

GRADnet Enterprising Ideas Competition

Which SEPnet partner institution has the greatest entrepreneurial spirit? The 2017 Enterprising Ideas Competition is about to launch and this year it is open to teams of both post graduate and undergraduate students across the SEPnet partnership. Also, for the first time this year the competition is being deliberately structured into two parts. Part one focusses on initial training and ideas generation. Part two is for those wishing to go the whole way and work their idea up into a commercial pitch to a business audience. Think Dragon's Den.

To find out more, sign on to the VRE and look on http://www.open.ac.uk/students/ research/sepnet/gradnet-enterprising-ideas-competition

Accessing GRADnet

Further details of all GRADnet activities can be found on the GRADnet Virtual Research Environment. All Physics PhD students in the SEPnet region can attend events free of any charge to themselves or their project funding. To learn more and obtain a login visit

www.sepnet.ac.uk/vre and www.sepnet.ac.uk/vrefaqs



























NEWS FROM THE SOUTH EAST ENGLAND PHYSICS GRADUATE SCHOOL

Issue 6: Spring 2017

IMPACT: Why Bother?

If you are planning a future in research, impact will feature strongly in your world. Without impact your work could be under-valued and go unseen, however interesting the physics behind it.

Impact comes in many guises, but engaging the public in your research is an important part of it. Engaging the public not only strengthens public support for science and helps widen the potential uptake base for research but also develops your essential transferable skills to boost your career in business or academia.

In order to promote impact thinking, SEPnet held a competition to identify good impact creation ideas and develop good practice. The winning academics and their associated post-docs and PhD students received seed corn funding totalling £54k to undertake impact feasibility studies. This edition of GRADnews tells their stories.



Prof Averil MacDonald OBE.

SEPnet Impact Lead

Hadrons in Schools

An app for schools to use LHC data in the classroom

Dr John Hays, Prof. D Berman, Dr Martin Archer Queen Mary University of London

Our LHC app has attracted attention from as far afield as a Brazilian educational organisation. The LHC app enables schools / teachers to use genuine LHC data to tie teaching into real research. The key challenge is to scale the app so that it can be used by unlimited numbers of schools. We have engaged with partner teachers to feed into the process and to trial a beta version that is expected to be launched as this newsletter goes to press. Alongside SEPnet, Queen Mary is funding this work further out of its own impact fund and if all goes well, then there the possibility to apply to STFC for more substantial funding.

Columbia's Final Mission

Held in the historic Cumberland Lodge in Windsor Great Park, the SEPnet Winter School on leadership and teamwork was a 3 day residential event focussed on the final mission of the Columbia space shuttle.



The aim of the school was to enable a better understanding of your own strengths and weaknesses in regard to how you work within a team. This was explored first through Belbin team role assessments: a combination of self-assessment and the evaluation of others. Being self-aware of your own working style was very helpful and was taken as the starting point for study of the Columbia mission.

The mission workshops had us split into groups, with each group assuming the persona of one of four key management team members at NASA during the launch and subsequent spaceflight. By going through the information available to each player, day by day, you got an unfolding sense of the mind-set of your specific management team member, which influenced the actions taken in response to the unfolding disaster. This information consisted of actual emails, documentary video interview clips and voiced transcripts of the mission management team (MMT) meetings. After having a clear mind of our group's role, we then met up with the entire class to discuss the different viewpoints and try to identify the problems at hand. The more people got into character, the more fun and heated the discussion became. On the final day, when preparing for the final MMT meeting, it became clear to all that it was in fact the organisational structure of NASA that was at fault, standing as a warning of what a lack of adequate communication can cause.

Over the three days, we experienced key aspects of what a healthy team should have in order to work efficiently. What we learnt will be useful when working in any environment in the future.

James Kneller & Ying Liu Queen Mary University of London GRADnet student delegates at the Winter School.



More exciting than meeting Tim Peake!

The Tactile Universe

Dr Nicolas Bonne, Dr Karen Masters, Dr Jen Gupta, Dr Coleman Krawczyk,

Institute of Cosmology and Gravitation, University of Portsmouth

Put simply, we engage the blind and vision impaired (BVI) community with astrophysics and cosmology. We take a black and white galaxy image, and scale each pixel vertically based on its brightness and now have 3D printed two sets of 13 galaxy images in 3 photometric bands (78 prints).

We have worked with Guide Dog Association for the Blind Southampton, the University of Portsmouth Equality and Diversity Unit, and Action for Blind People Salisbury, at a project information session.



In October, project lead Nicolas Bonne attended the 3rd Symposium for Universal Design in Astronomy Education in Tokyo, Japan. He presented the project to an international audience of inclusive education professionals, and began the process of international dissemination and networking for the project. He has also been made a member of the International Astronomical Union Equality and Inclusion working group.

We trialled our tactile models with a totally blind primary school student. The rest of her class created their own galaxy classification scheme using galaxy images, and she was able to work alongside them using our models. She was able to understand what galaxies looked like, and she was quoted as saying 'this is the first time I felt like I was doing the same thing as the rest of my class' and 'getting to feel the shapes of galaxies was even more exciting than meeting Tim Peake'!

RHUL - the coldest place in the universe?

More efficient heat exchangers for cryogenics

Harriet Van der Vliet, Dr. Andrew Casey

Royal Holloway

We aim to make the cryogenics industry less vulnerable to the worldwide helium-3 crisis. We are identifying candidate materials for a new generation of more efficient heat exchangers for cryogenic applications which will reduce the required volume of helium-3 in a dilution refrigerator.

Talks with Oxford Instruments Nanoscience developed into an Innovate UK proposal, however OI has just pulled out of all of their Innovate projects. We are currently in discussion with companies and others about how we can exploit these ideas, perhaps through a bid for Innovate UK funding .

To win or not to win – a quantum question?

Quantum Information board game

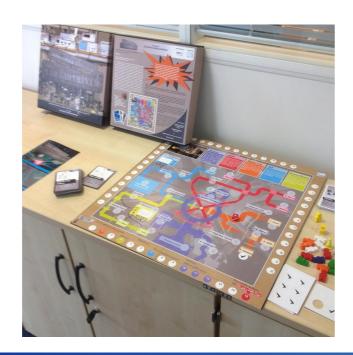
Katarzyna Krzyzanowska, Prof Silvia Bergamini, Prof Andrew Norton

The Open University

Is it possible to familiarize and engage the public with research in quantum technologies, especially quantum computing?

We plan to make the target audience truly understand the term 'quantum computer', feel comfortable while discussing modern quantum technologies and make this knowledge boost their curiosity about the field through a new commercial strategic board game on the theme of quantum computing / quantum technologies.

(The starting date of the project was postponed from November 2016 to January 2017)



Seeing the Wood for the trees: Detecting cyber-threats in smart cities

James Etherington, Prof. Bob Nichol

University of Portsmouth

We were fortunate to be given access to a large data set of around 2.5 billion domestic smart meter readings. James Etherington's analysis demonstrated that we could identify unusual meter usage, for example changes in periodicity from the normal day to night pattern, or changes in the level of usage of an individual meter which are not reflected by other similar users.

The ICG's expertise in analysing data from sky surveys such as the Dark Energy Survey and the strong similarities between astronomical data and smart meter data in terms of volume and noise meant that the algorithms used in astronomy can readily be applied.

Representatives of the electricity supply sector quickly recognised the relevance of this to their industry. Our next steps are to seek further funding to develop the work on smart meters in collaboration with a utility company and also to identify further applications for example addressing issues arising from the internet of things and smart cities.

Phone Home ET

Integrated Antenna and Battery System

Dr Michael Woods and Dr Maria Alfredsson

University of Kent

We have discovered a gap in the market: while combined antenna/battery systems exist, e.g. those in mobile phones, none of these solutions is completely integrated.

We have successfully 2D printed a complete organic Liion battery. This achievement - a single ultra-thin and light weight component - is an important advancement towards the EPSRC's strategy in making electronics of organic materials, flexible designs and new printable manufacturing. We estimate the current Technology Readiness Level (TRL) on the project to 2, building the prototype should raise the TRL to 3.

The next step is to print the battery materials directly on the antenna substrate, and seal the system into our lab-prototype. We will present the lab prototype to QINETIC who will assist in producing and testing a full-scale prototype at their battery line. The product will also be presented to other interested partners, including the DSTL.

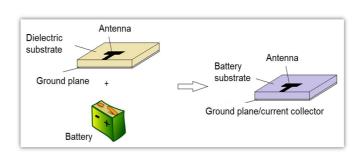


Figure Schematic design demonstrating the integration of a non-metallic Li-ion battery with a slot antenna.

Your IPS Fellows

We are fortunate in SEPnet to have two Industrial Partnership Fellows whose role is to facilitate commercialisation of Research, speeding up its Impact.

A flash in the pan?

Colin Hayhurst, SEPnet IPS Fellow, Sussex, is supporting James Sinclair in the University of Sussex to commercialise the Nanopulser. The advantage of the Nanopulser is its compact nature and therefore James made a first prototype for a general purpose light



source, rather than one designed for the Sudbury N e u t r i n o O b s e r v a t o r y. Initial market research showed that the fast light source could be u s e f u l i n n u m e r o u s

applications, particularly the life sciences where they can be used to characterise molecules using measurements of fluorescence lifetime.

In parallel enquires have been made by a Japanese consortium who are considering buying the Nanopulser light system for a new particle physics experiment in 2018.

The team at Sussex are now seeking to create a spin-out company to serve these.

Getting together



Gill Prosser IPS Fellow, Portsmouth, is supporting SEPnet departments to identify ways to work together to develop impact in the future. This led to pilot a Collaborative PhD Scheme in the area of detector development. The scheme was

designed to give small and medium sized enterprises (SMEs) access to PhD research with 3 or 4 SMEs joining together to support pre-competitive research, thus making the cost more affordable.

The scheme launched in autumn 2015 with initial contacts to SMEs across the region, the contacts were gleaned from academics, SEPnet's Employer Engagement team and extensive searching of LinkedIn and business directories. After an initial email campaign, follow up phone calls from academics and the IPS Fellows, a workshop was held where businesses and academics identified areas of common interest.

Further discussions have shown that there is potential for at least three projects, involving about ten students. In the short term these projects will generate research income for the four departments involved and in the medium and longer term impact as the businesses commercialise the projects.