2014 was another excellent year for the PAB Group. Our membership has grown to 377; the total is impressive, given that the Group only started up just over 5 years ago. We were delighted that 120 people (including some non-Group-members!) attended our annual conference, hosted at Imperial College last April. We believe that this is a reflection of the community interest in our activities, which are designed to reflect and promote the thriving accelerator profession in the UK.

In 2014 we directly organised workshops and conferences on topics including plasma wakefield accelerators, accelerator engineering, and novel materials for accelerators. Of particular note was a hugely successful ‘open day’ (hosted at STFC/RAL) which attracted 95 undergraduates from 16 UK universities who are interested in a career in particle accelerators; this bodes well for attracting talented young people into our field. We were delighted to award the 2014 Group Prize for Outstanding Professional Contributions to Chris Prior. Reports on these activities are included in this newsletter.

We look forward to another year of stimulating Group events. For 2015 we are already planning workshops on medical accelerators (joint with STFC, February 17th), accelerator engineering, and another open day for undergraduate students (at Daresbury in November or December). We are also sponsoring workshops on space-charge effects and medical isotope production. Our annual conference will be held on April 14th, kindly hosted in Glasgow by Strathclyde University. Further details of planned events are in this newsletter: We are also seeking suitable nominations for the 2015 PAB Group Prize, and would want to encourage you to nominate suitable candidates.

The Group Committee works hard to organise activities of broad community interest, and we welcome suggestions for these. We are looking to elect four Committee members at our April AGM – please nominate people to join and help us, and encourage colleagues to join the Group and join the fun!

Phil Burrows

Group Chair
News from the Laboratories — Daresbury

Beyond the X-ray – a new frontier in structural biology
signals big gains for UK industry

2 December 2014: A UK lab has successfully taken images of the atomic structure of materials - at a shutter speed close to one ten-thousandth of a billionth of a second. This new imaging capability is great news for UK industry, drug discovery companies and researchers, as it takes biological and materials research beyond the limits of what is currently possible in the UK. It is also a step towards the 'holy grail' of being able to make molecular movies.

Known as ‘ultra-fast electron diffraction’ the technique is a UK first, and a remarkable milestone for researchers at the Science and Technology Facilities Council’s (STFC) Daresbury Laboratory in Cheshire. This makes Daresbury Laboratory one of only a handful of sites globally that can perform ultra-fast electron diffraction, and STFC intends to ensure that UK industry and researchers can benefit from this exciting new research tool. STFC’s newest particle accelerator, VELA (Versatile Electron Linear Accelerator), has been purpose built to assist UK industry to bridge the gap between prototypes and market ready products by making this ultrafast imaging technique available at a fraction of the cost and physical size of facilities using other methods.
Minister for Universities, Science and Cities Greg Clark said: “This visionary breakthrough at Daresbury Laboratory is a further demonstration of how British expertise is pushing the boundaries of science. Not only will this development mean that the scientific community can work more efficiently, but it could help pave the way for new treatments to use in the fight against viruses and diseases”.

Professor Susan Smith, Head of STFC’s Daresbury Laboratory, said: “Achieving ultra-fast electron diffraction is a major milestone for STFC. This capability can be used to develop new and better products more cheaply, and we are really keen to work with industry and academia at this early development stage to ensure that the potential of this technique is fully realised to the benefit of the UK economy and society.”

Diffraction imaging itself is not new and has already led to the development of new drugs and understanding of viruses such as HIV and Foot and Mouth. However, these discoveries have relied on high intensity X-rays that can change or destroy the tiny and fragile samples of materials that are being studied before valuable information is gained. Ultra-fast electron diffraction imaging, which uses very short, fast pulses of electrons, causes very little damage to these samples and can therefore take biological research beyond what is possible with X-rays on third generation light sources.
This is exciting news, particularly for the drug discovery sector because it means that UK researchers will now be able to look at protein membranes in a way that they have not been able to before. There are thousands of protein molecules within the protein membrane of one single human cell. These proteins control the movement of substances into and out of the cell, and send signals from the outside of the cell to the interior. These proteins are the key targets of drugs, and over half of the drugs on the market today work by interacting with proteins in the cell membrane. The fragility of these minute proteins limits what we can find out about them by X-ray, but ultra-fast electron diffraction takes us beyond these limits.

VELA’s unique electron beam generates very short pulses of electrons that take images at a shutter speed of within about one ten-thousandth of a billionth of a second, otherwise known as 100 femtoseconds. To put this into context, one femtosecond is to a second, as a second is to approximately 31.7 million years. Development of VELA will allow even shorter shutter speeds in future.

This ultra-fast shutter speed also puts the UK well on track to being one of the only places in the world capable of making ‘molecular movies’ of chemical and biological processes as they happen, meaning that VELA could be the first small-scale accelerator in the world to be able to provide this facility, at a fraction of the cost; a goal that could be reached as soon as 2015.

STFC’s Dr Mark Surman led the experiment which achieved the ultra-fast images on samples of platinum, aluminium and gold. Dr Surman said: “The capability that we have achieved here provides a much lower cost alternative that can be used on smaller accelerators, which might only be a few meters in length. This is a major milestone for VELA and we are really looking forward to taking this capability to the next level, which is to make molecular movies that can be used by industry to develop new products.”

Dr Jonathan Underwood, of the University College London, and academic collaborator in the development of this capability at VELA said: “This development should not be understated; with the capability for relativistic electron diffraction at VELA coupled with the synchronised femtosecond laser systems, this instrument will have the ability to take ultra-fast snapshots during physical and chemical change of matter at the atomic scale. This exact capability is being directly targeted internationally by the construction of a number of large scale research facilities, but now that this has been achieved at VELA the UK has the potential to leap-frog those international developments.”
VELA is the result of £2.5m government investment into STFC’s Daresbury Laboratory for accelerator technology developments, as part of a series of investments across the Sci-Tech Daresbury science and innovation campus, one of the Government’s flagship Enterprise Zones.

Contact:

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About VELA

The Versatile Electron Linear Accelerator (VELA) is a high performance, modular injector facility capable of delivering a highly stable, highly customisable, short pulse, high quality electron beam to a series of test enclosures. The new facility will deliver a capability for the cutting edge development and qualification of advanced accelerator systems, enabling industry to expedite their technology development from prototypes to market ready products. In doing so it has the potential to help revolutionise the use of accelerators in priority areas such as:

- healthcare (imaging, radiotherapy development and sterilization)
- security (cargo scanning)
- energy (development of components for accelerator driven sub critical reactors)
- industrial processing (development of machines for polymer crosslinking and rheological modification)
- environment (water treatment and environmental clean-up)
- and science as well as opening up further high technology commercial markets.

VELA accelerates electrons to high energies, which can then be used to test samples of material, produce images, or test the operation of novel accelerator components. Electron beams can also be used to modify or improve the properties of a material by causing changes to its molecular structure.

VELA produces an electron beam of exceptionally high quality, exceeding that of any commercially available facility. This feature is aiding the development of new and compact accelerator technologies, opening up opportunities in the UK for high-value manufacturing of commercially-ready accelerator systems.

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Novel Low Secondary Electron Yield Engineered Surface for Mitigation of Electron Cloud

The ASTeC Vacuum Science Group has been awarded Proof of Concept Funding (PoC) to investigate a novel e-Cloud mitigation process. The award of £80k will support a recently drafted patent and investigation of the potential commercialisation of this novel surface modification technique.

The ASTeC Vacuum Science Group at STFC Daresbury Laboratory, in a collaboration with the School of Engineering at the University of Dundee (Professors Allan Gillespie and Amin Abdolvand), have recently engineered metal surfaces which have SEY < 0.8 as compared with traditional metal surfaces, which have typical SEY around 1.9. The technique involves rapid surface micro- and nano-structuring in an argon and/or reactive atmosphere at room temperature using high power nanosecond pulsed laser systems at wavelengths 1064 nm and 532 nm for processing of aluminium, stainless steel and copper foils, respectively. The average laser energy fluence is close to the ablation threshold of the metals. The proposed technology looks very promising for solving the long-standing problem of electron multipacting in both the accelerator and space communities.

The novel laser-engineered surface treatment does not introduce new material; it modifies the microstructure of the existing surface, therefore it is expected that the impact on wall impedance and wake fields should be less than from any other e-cloud mitigation techniques. Furthermore, this technique can easily be applied to existing vacuum surfaces where the improvement has to be done in-situ with minimum disturbance to the beam line. The treatment process is carried out in an inert gas environment at atmospheric pressure and therefore the actual cost of the process is considerably lower than other existing mitigation processes. The surface is reproducible and offers a very stable surface chemistry which can be influenced during the process. The surface is robust and is immune to any surface delamination, which can be a detrimental problem for thin film coatings. The treated surface remains the same material, therefore it is unlikely to cause a serious effect on the surface impedance - and this has recently been verified.
Early stage results for SEY of Cu as a function of incident electron energy for as-received and conditioned samples: Cu – untreated surface, Black Cu – treated surface.

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**US Patent Granted to ASTeC for Innovative Magnet Design**

ASTeC have been granted a US Patent for a permanent magnet-based variable strength multipole magnet (patent number 8,829,462) which has been developed for the CLIC Linear Collider project at CERN. ASTeC has already built two prototypes which have been successfully tested both at Daresbury and at CERN. The team are now developing new ideas for permanent magnet dipoles with variable field strength, again funded by the CLIC project.
News from the Laboratories — RAL

National Particle Accelerator Careers Open Day, RAL, Nov. 2014

On the 26th of November 2014, the Rutherford Appleton Laboratory hosted the National Particle Accelerator Careers Open Day, sponsored by the Institute of Physics, the Science and Technology Facilities Council (STFC), the John Adams Institute for Accelerator Science (JAI) and the Cockcroft Institute of Accelerator Science and Technology (CI). The day was organised to show university undergraduates what a rich variety of post-graduate careers and training options are available in the world of particle accelerators. Building on the success of last year’s event at Daresbury Laboratory, the event attract a total of 95 students from 16 universities from as far afield as Edinburgh, Sheffield, Cardiff and Brighton, with particularly strong attendance from Portsmouth and Birmingham. Spreading the word to universities not usually associated with accelerators is a key PR and recruitment goal for the accelerator community, so getting a good mix on the day was excellent. Also well received was the strong attendance of female students at 30% of the total.

Starting with a networking session over a buffet lunch, the day moved on to a series of talks. STFC CEO John Womersley welcomed the group and described the valuable work that STFC undertakes for UK science. Phil Burrows from the JAI performed admirably, listing in just 15 minutes the mind-boggling array of possible paths students could take, emphasising the importance of collaborations between the three main sectors of academia, national laboratories and industry. Suzie Sheehy from STFC’s Accelerator Science and Technology Centre (ASTeC) described the exciting opportunities afforded by PhD studies of accelerators. Hayley Smith from ISIS gave a very interesting account of operating the ISIS synchrotron as part of the STFC graduate scheme. Finally Per Bergfjord and Stephen Towe from Elekta discussed the fast-paced life of a commercial medical accelerator company manufacturing two linacs every day.
After the talks were two further activities. The group had the opportunity to discuss career options in person with 15 exhibitors from national labs, universities and industry; the exhibition was a lively event with hands-on activities, demonstrations, video displays and even lollipops given away by the Culham Centre for Fusion Energy (CCFE)! Next, the group enjoyed tours of the many accelerator facilities on site at the Rutherford Appleton Laboratory, including the ISIS and Diamond synchrotrons, the Front End Test Stand (FETS) and the Muon Ionisation Cooling Experiment (MICE). The students found it exciting to see real working equipment, particularly appreciating seeing inside the ISIS synchrotron during a rare shutdown period.

Overall, the Careers Open Day was a great success and very smoothly kept to time. Feedback was excellent, with both the students and exhibitors appreciating the chance to network and find out more about the many career opportunities available in the accelerator sector.

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The VESPA Shines Bright at ISIS

The Vessel for Extraction and Source Plasma Analyses (VESPA) is a new ion source test area now operating at ISIS. It will be used to demonstrate the production of negative hydrogen ($H^-$) ions in a much more efficient manner than is currently done on the operational machine. $H^-$ ion beams are notoriously difficult to produce in both large quantities and in a consistent manner needed for an operational facility. A group of ten ion sources are in rotation at ISIS, each routinely producing 50 mA of pulsed beam current for about a month before needing to be replaced. To do this requires three 19" racks worth of equipment – much of which is operating near its maximum rating – and a lot of experience. The VESPA aims to remove some pieces of kit that are no longer strictly necessary, and to run those that remain in a much calmer regime. These changes should bring greater operational reliability to the ion source section, thus enhancing the overall up-time of ISIS.

The key to achieving these goals is to understand fully the fine details of the plasma from which $H^-$ ions are extracted. The plasma is only the size of a fingertip, so is far too small for conventional diagnostics to probe. Instead, the VESPA uses a high resolution optical monochromator to study the beautiful pink light emission from the plasma. This gives vital information about the processes happening inside the ion source and helps refine plasma and beam simulations.

Another aspect which will be studied is the extracted beam itself. On ISIS, the first beam measurement device is positioned after a small magnet which is believed to collimate the beam heavily. In fact, it has been proposed that up to 100 mA of beam is extracted from the plasma but is subsequently lost on its way through the magnet, leaving only 50 mA to be measured downstream. The VESPA has the magnet removed and for the first time the full extracted beam has indeed been recorded to be over 100 mA – a great result! Once this beam has been fully characterised, new focusing optics will be installed which will prepare the beam for loss-less injection into the ISIS Radio Frequency Quadrupole (RFQ).
As well as these main spectroscopy and beam measurements, many other experiments will be performed on the VESPA; including a compact electrostatic chopper, a larger plasma chamber and a caesium detector. The VESPA is fully compatible with the ISIS mechanical fixtures, and therefore if all measurements go as planned, the hope is to install a higher power, more efficient, more reliable VESPA ion source on ISIS in the next long shut-down, currently scheduled for 2018.

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ISIS

Notice is hereby given that the

Annual General Meeting of the Particle Accelerators and Beams Group will be held at 12:30 on 14th April 2015 at John Anderson Building, University of Strathclyde, Glasgow.

AGENDA

1) Apologies for absence
2) Minutes of previous AGM
3) Chair’s report
4) Treasurer’s report
5) Honorary Secretary’s report
6) Election of committee/group officers
7) Any other business (please notify the Honorary Secretary in advance)

The group is always looking for enthusiastic members to join the group committee. The committee normally meets about 5 times a year. Its work includes organising topical workshops in the field of particle accelerators and beams, producing a group newsletter, awarding prizes for distinguished achievement in the field and providing expert advice on consultations.

Nomination for committee members/group officers are invited and should be made to the honorary secretary, Peter Williams (peter.williams@stfc.ac.uk) before 1st April. An election will be held to fill the following vacancies:

Honorary Secretary
Ordinary Member x 4

If you cannot attend the AGM but have any issues you would like to be raised at the meeting, please contact the honorary secretary.

No fee is charged to attend the Annual General Meeting.

Peter Williams
Hon. Secretary IOP PAB Group
From discovering Higgs Bosons at the LHC or providing ultralow temperature environment for the experiments with ISIS neutrons, one of the key technologies that must be employed reliably is CRYOGENICS. A major fraction of the construction and operational budget, particularly for the large scientific experiments is allocated to Cryogenics. Several new large projects like XFEL in Germany, ESS in Sweden, ITER in France, LCLS-II in the US and also the mid-range test facilities like ALICE at Daresbury Laboratory, all of which employ Superconducting technology (SRF cavities and magnets) rely heavily on the reliable operations of the cryogenic systems. Considering the size and complexity of Cryogenics technology such a goal can only be achieved through worldwide co-operation.

Recognising such a need a workshop series called ‘Cryo-Ops’ was introduced in 2004 at J-Lab in the US to provide a forum for engineers, technicians and operators responsible for Cryogenic operations to share their knowledge and experiences and also to discuss future challenges. Held every alternate year Cryo-Ops has now become a successful series and STFC Daresbury Laboratory was honoured to host Cryo-Ops 2014, the 6th International Workshop on Cryogenic Operations. More than 100 delegates from Scientific Laboratories and Industries from 14 countries participated at the event organised by ASTeC at the Cockcroft Institute from November 10-12, 2014. A variety of issues ranging from maintenance, reliability and economics to safety and staff training including some of the future challenges were discussed. It was also for the first time the cryogenics community form RAL, DLS and DL came together at DL and identified a range of areas for collaborations in the field.
Professor Susan Smith addressing the delegates at the Liverpool Football Club

While addressing the delegates at the banquet organised to celebrate the 10th anniversary of the Cryo-Ops series at the Liverpool Football Club Susan Smith, the head of Daresbury Laboratory and Director of ASTeC, stressed the importance of team work and coordination for successful delivery and execution of scientific projects. Earlier Dana Arenius (from J-Lab), the inaugural chair of the Cryo-Ops series was honoured to cut the 10th anniversary cake at the welcome reception hosted by Peter Ratoff, Director of the Cockcroft Institute.
The participants also took an opportunity to visit various cryogenics related projects at the lab. To conclude the workshop after three days of serious technical discussions the delegates visited Lewis Carroll Centre, the beautiful church that celebrates Daresbury’s famous villager, the creator of Alice in Wonderland an 1865 novel written by Charles Lutwidge Dogson under the pseudonym ‘Lewis Carroll’.

Rachael Buckley explaining the cryogenics system for ALICE, during the site tours

The concluding sessions at the Lewis Carroll Centre
The first meeting of the Accelerator Engineering Network was held at the IMechE headquarters in London in October. The network, run in partnership with the IoP PAB group, IET and IMechE, was set up to provide a networking forum specifically for engineers and technicians working on accelerators.

Over 100 engineers from industry, national labs and universities heard interesting talks from a wide range of speakers:

Per Bergfjord from Elekta the oncology company gave a very interesting talk about how they manufacture more than one linac every day for cancer treatment. Amos Dexter from Lancaster University gave a very informative talk about phase synchronisation systems for RF. Jim Kay, head of engineering at Diamond light source described the extreme engineering challenges that had to be overcome to achieve very brilliant beams in the electron storage ring. Neil Bliss, Group Leader at the Engineering and Technology Centre Daresbury Laboratory, talked about how they have been contracted to use their engineering expertise to deliver key technologies for the ELI-NP project in Romania. Stephen Jago, Accelerator Design Engineering Group Leader at ISIS described how to make radiation hard concrete magnets. Tom Jones from the Engineering and Technology Centre Daresbury showed some wonderfully detailed multiphysics simulations of RF Structures.

After a very fruitful networking lunch the talks continued with Mark Iskander from e2v giving a very educational talk about modulators for magnetrons. Imran Tahir from Rapiscan the scanning company gave a talk about applications of commercial linacs including an amazing system that can scan an entire train travelling at 60 mph. Yifeng Yang from Southampton University gave a very interesting and informative talk about how to get high current feeds from room temperature to cryogenic superconducting magnet windings.
The highlight of the day was Frédérick Bordry, CERN’s Director for Accelerators and Technology. An engineer himself, Frédérick gave a fascinating talk about the vast scale and scope of the engineering required to build the most amazing machine on earth: The LHC.

*The keynote speaker: CERN’s Director for Accelerators and Technology Frédérick Bordry.*

At the end of the day there was an open discussion about the future of the Accelerator Engineering Network. There was general agreement that we should hold another event in 2015.

*Dr Amos Dexter delivering his presentation*
The IET Communities Development Manager Fiona Dew (left) presents a certificate and £100 Amazon voucher to Emmy Sharples (right) the winner of the IET Young Engineer poster prize.

Emmy Sharples from Lancaster University won the Young Engineer poster prize for her work on metamaterial loaded accelerator components. Dan Faircloth, the network chairman said, “It was a very close competition between excellent candidates, the future of accelerator engineering in the UK looks very bright.”

The next accelerator engineering network meeting will be held in the autumn. If you have any ideas or suggestions for future events or would like to get involved with the network please contact the organising committee on the emails below.

All the talks are available online within the meeting agenda at:

https://eventbooking.stfc.ac.uk/news-events/particle-accelerator-engineering-network-219

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The International Institute for Accelerator Applications (IIAA) at Huddersfield has expanded rapidly since its inception nearly four years ago. Huddersfield has, up till now, been known as a typical Yorkshire industrial town with a fine musical and choral tradition, though it is also responsible for Rugby League and the Luddite riots. So we have a strong historical background to draw on.

The university's strategy was to boost its research standing by targeted investment in key areas that were going to blossom in future. It identified accelerators as just such an area — a choice with which all readers of this newsletter would hopefully agree heartily. We did not set out to compete with other groups — particularly our university and ASTeC neighbours in the North West — but to complement them. Yes, I know the term 'complementary' is grossly over-used, but we have genuinely focussed on applications, rather than principles, and on proton machines rather than electron light-sources, as others are fully engaged there. There is so much to be done in the accelerator field, and still not enough people to do it; plenty of scope for increasing the size of the cake so that everyone gets a bigger slice.

The staff grew slowly but steadily: Bob Cywinski was joined by Rob Edgecock, then Roger Barlow, Jaap van den Berg, Sue Kilcoyne and Becky Sевiour. The student population exploded: from one PhD student at the start to 16 PhD and 4 MSc students today. (We have a unique taught MSc programme.) Our first accelerator PhD thesis is now on the library shelf (see left, with its author): on its lonesome for now, but hopefully to be joined by others very soon. Many of the students spend some time away from the university, at labs like PSI, CERN, and CNAO.

A major feature at Huddersfield is MEIS. (Medium Energy Ion Scattering — not to be confused with any similar sounding accelerator project!) This is a 200 keV proton (or light ion) source, with a sophisticated target and DAQ system that detects the energies and angles of recoil ions. This joint distribution opens up possibilities to study the intimate details of the first few layers of the target structure, which is really useful for catalysis, corrosion, silicon chip manufacturers, and other surface science applications. The apparatus used to be at Daresbury (much of the kit goes all the way back to the old NSF injector), and when STFC decided they couldn't continue with it, they kindly let us give it a new home.
The whole apparatus - it fills two rooms - came down the M62 and over the Pennines in innumerable orange crates. It has taken two years of dedicated effort to reassemble it and recommission it, but this has finally been completed and we feel confident enough to have organised our an official opening on March 3rd this year. (All welcome ¨C see the web for details.) As well as its use for research and for commercial applications, which we are now starting to generate, it’s good for us as a university accelerator group to have a real - even if small - accelerator in our own labs.

For large accelerators one has to look further afield, and we have several joint projects with CERN: on LHC collimation (together with Manchester and RHUL), on the MEDICIS project for medical isotope production at Isolde, and on the proposed BioLEIR/MedPhys beamline. We are also working with the accelerator design team in Lund on several aspects of the European Spallation Source, on which work has already started. (The picture shows Bob Cywinski together with former ESS director Colin Carlisle at the foundation ceremony.) First beam is scheduled for 2019 ¨C that’s going to take a lot of hard work by a lot of accelerator scientists and engineers, giving real opportunities for collaborators to contribute.

We have developed a particular strength in target simulations. We’ve done a lot of studies of the ISIS target, and the Front End Test Stand at RAL. We use Geant4, Fluka, MCNPX and other programs to model the effects of beams on targets. Sometimes this is to study shielding requirements. Sometimes it is to optimise the design to increase the production rate of the desired neutrons or muons. Sometimes it is to look at the production of particular useful isotopes, perhaps for medical imaging, perhaps for other, more out-of-the-way uses, like the production of $^8\text{Li}$ as a neutrino source for the proposed DAEdALUS/ISODAR experiment.

This interest in targetry - and in FFAGs, another of our areas of research - has led to a strong involvement in accelerator driven reactors and thorium as a nuclear fuel which is safer and cleaner than uranium/plutonium. Huddersfield is the UK centre for ADSR and thorium nuclear studies. The topic arouses a lot of interest and we give lots of talks, get called by the media, and address meetings at party conferences and in the Houses of Parliament.

We also work on RF properties, particularly the use of metamaterials. At RF wavelengths these can be constructed macroscopically to have the desired permittivity and permeability properties ¨C which can be highly non-classical ¨C giving rise to some very interesting and potentially useful effects. Together with photonic crystals with explicitly constructed band gaps, these open up new possibilities for accelerating structures.
As an Institute for accelerator applications we also work on the use of, in particular, muons and neutrons, as are produced at ISIS and PSI. One recent study was an analysis of medieval cannon balls: these large round black balls turn out to contain iron inside — usually a rough cube, as shown on the left: a neutron image for which the outer lead layer is almost transparent. Nobody really seems to understand why: was there some military advantage in having a lighter centre? Or was it just cheaper? No instruction manuals seem to have survived from the 15th century to explain the manufacture.

Proton therapy is another area very important for us. We work with the Cancer Centre at Clatterbridge, and also the centres at Pavia in Italy and Nice in France, and look forward to the opening of the NHS centres in Manchester and UCL. Like many others, we have argued the case for proton therapy in the UK, we are delighted that this is now actually going to happen, and we look forward to contributing to the work in the coming months and years.

We’ve come an astoundingly long way in 4 years. While there are still some people who claim never to have heard of Huddersfield, despite our ‘University of the year’ award, there are not many left. We’ve done some amazing things already, and we’re only just getting started.

Roger Barlow
Director of the Huddersfield IIAA

Workshop on Accelerators for Medicine

On Tuesday February 17th 2015, STFC will be hosting a joint Workshop in conjunction with the IOP Particle Accelerators and Beams Group, on accelerators for medicine. The workshop will provide a high level overview of the work being carried out, the key players in the area and highlight any other relevant activities and events that are scheduled to take place. The workshop will be held at the Franklin Theatre at the Institute of Physics in London.

The event will include talks from both UK and international speakers. Five UK accelerator experts will to talk about their work in this area and the international experts will provide perspectives from overseas. These talks will help to stimulate a discussion on how the UK can develop its strategy and optimise its impact in the context of the global programme in this area. The aim of the workshop will be to gather the views of the community and a discussion will be held to talk about the relevant areas in which the STFC can play a leading role.

The event will run from 10.00 until 17.00.

You can register for this event at http://www.stfc.ac.uk/ASBworkshop
2014 PAB Group Prize for Outstanding Professional Contributions

Chris receives his prize from Phil Burrows, PAB Group Chair

At the AGM last March, we were delighted to award the 2014 Group Prize for Outstanding Professional Contributions to Christopher Prior, Leader of the Intense Beams Group at ASTeC.

The citation reads:

To Christopher Prior for his seminal contributions to the mathematical modelling of intense particle beams — in particular for his development of novel simulation methods and codes; for his generation of innovative accelerator concepts; for his educational and intellectual leadership; and for his many related contributions to the success of state-of-the-art accelerator facilities in the UK and around the world.

The PAB Group is seeking suitable nominations for the 2015 PAB Group Prize, and would want to encourage you to nominate suitable candidates.

Further information can be found at:
http://www.iop.org/activity/groups/subject/pab/prize/page_56571.html
This year’s National Vacuum Electronics Conference (NVEC) took place on the 5th June 2014 at Daresbury Laboratory (STFC) in the Cockcroft Institute. The aim of the conference is to focus on early career researchers and staff members (PhD student / PDRA level) and it provides an excellent opportunity for researchers and engineers from both academia and industry to present and discuss on-going developments and advances in Vacuum Electronics, RF Science and Engineering research.

The opening plenary talk was on ‘Commissioning of the Mice RF System’, given by Andrew Moss of ASTeC, and was followed by eleven further talks during the day, covering a wide range of topics from vacuum tube design (klystrons and gyrotrons), equivalent circuit models for cavity tuning, metamaterial research, Terahertz radiation, to gun and cavity design. These were provided by students from University of Huddersfield, Lancaster, London and Strathclyde and generated lively discussion. In addition CST provided a talk during the lunch break on the latest upgrades to Microwave Studio.

Next year’s NVEC is to be hosted at University of Strathclyde.

Alan Wheelhouse, Daresbury
The STFC Innovations Club is hosting an event on Novel magnetic sensors and their applications. The workshop will address the following type of sensors and their applications:

- Quantum Well Hall Effect (QWHE) sensors
- Portable SQUID magnetometers
- Fluxgate magnetometers
- Characterisation tools for functional magnetic materials

The sensors based on advanced Quantum Well Hall Effect (QWHE) display unprecedented sensitivity and dynamic range (>180dB) allowing magnetic fields down to 1nT to be measured in an active volume of less than 0.001 mm3.

- These sensors support 2D planar and conformal array geometries on rigid and flexible substrates which opens possibilities not possible with induction techniques.
- There also have advantages in integrated circuits, mass production, repeatability, low power consumption, ease of use and lower costs.

A SQUID (superconducting quantum interference device) is a very sensitive magnetometer used to measure extremely subtle magnetic fields, based on superconducting loops containing Josephson junctions. SQUIDs are sensitive enough to measure fields as low as 5 aT (5×10^-18 T) and reach a noise level of ~fTHz-1/2.

Applications of magnetic sensors

- High-accuracy magnetometry, long-range position sensing, angular position sensing, current sensing, magnetic scanning of documents
- Non Destructive Testing (NDT), monitoring asset integrity, use of radiation hard camera for nuclear industry
- Magnetic near-field communications and sensing, the markets span oil & gas, defence and niche custom applications with products in low data-rate underwater communications, data logging, sensing and induction power transfer
- Extremely low magnetic fields detection (e.g. detection of underground water level and its salinity).

For more information contact: Dr Vlad Skarda, STFC (vlad.skarda@stfc.ac.uk)

To register go to: Novel Magnetic Sensors and Their Applications
A brand new brochure (Sep 2014) will help accelerator scientists explain the benefits of their work to the general public. By using real-life examples and scenarios everybody can relate to, Accelerators: Powering Cutting Edge Research explores the many areas in which accelerator science has made a positive impact on modern life.

The brochure has been produced by STFC, the Cockcroft Institute and the Institute of Physics. It has been commissioned to raise public awareness of the benefits of particle accelerators in research, through case studies that answer questions such as:

- How can we meet our energy needs without adding to greenhouse gas emissions?
- How will border protection agencies, and the technology they use, continually evolve to face the ever growing threat of terrorist attacks?
- How can we find new ways of preserving our cultural heritage?

Featuring particle accelerators from around the world, the brochure highlights how accelerators influence our everyday lives by covering topics such as:

- Energy- solar cells, keeping the lights on at power stations and turning carbon monoxide into fuel.
- Radiotherapy- treating cancer patients, improving diagnosis and radiotherapy efficiency, and developing new cancer treatments.
- Medicine- treating HIV, detecting Parkinson’s disease and dealing with diabetes.
- The environment- storing hydrogen, studying clouds and decontaminating Fukushima.
- Industry- fuelling the economy, making life sweeter and making aircraft safer.
- Security- detecting terrorist threats, solving mysterious deaths and fighting counterfeiters.
PAB GROUP & UK EVENTS

**Workshop on Accelerators for Medicine — STFC in conjunction with IoP  PAB Group**
IoP, London, Franklin Theatre
17th February 2015,

**AGM of the PAB Group**
John Anderson Building, University of Strathclyde, Glasgow
14th April 2015

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**Useful Links**

- [http://www.scitech.ac.uk/](http://www.scitech.ac.uk/)
- [http://www.cockcroft.ac.uk/](http://www.cockcroft.ac.uk/)
- [http://www.adams-institute.ac.uk/](http://www.adams-institute.ac.uk/)
- [www.diamond.ac.uk](http://www.diamond.ac.uk)
- [http://www.desy.de/index_eng.html](http://www.desy.de/index_eng.html)
- [http://www.linearcollider.org/newsline/](http://www.linearcollider.org/newsline/)
INTERNATIONAL CALENDAR

CLIC Workshop 2015
CERN
26-30 Jan 2015
http://indico.cern.ch/event/336335/timetable/#20150126.detailed

EuCard2/Xbeams workshop devoted to space charge issues in charged particle beams
http://www.cockcroft.ac.uk/events/SpaceCharge15

International Particle Accelerator Conference, IPAC’15 (IEEE, APS)
Jefferson Lab, Richmond, VA, USA, 3-8 May 2015
https://www.jlab.org/conferences/ipac2015/

Free Electron Laser Conference, FEL’15
Daejeon, Korea, 23-28 Aug 2015

13th International Conference on Heavy Ion Accelerator Technology (HIAT 2015)
Yokohama, Japan, 7-11 Sep 2015
www.nishina.riken.jp/hiat2015

4th International Beam Instrumentation Conference (IBIC’15)
Melbourne, Australia 13-17 Sep. 2015

15th International Conference on Accelerator and Large Experimental Physics Control Systems (ICALEPCS 2015)
Melbourne, Australia
17-23 October 2015
http://www.icalepcs2015.org/

Upcoming schools

Joint Universities Accelerator School (JUAS)
Archamps, Haute Savoie, France
12-20 March 2015
IoP PAB Committee

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Dr. Riccardo Bartolini (Diamond Light Source & JAI)
Dr. Adina Toader (Manchester)
Dr. Jonathan Smith (Tech-X UK): Industrial representative
James Henderson (Strathclyde); co-opted student

Deadline for submissions to the next newsletter is
29 May 2015

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