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| **Institution:** Swansea University |
| **Unit of Assessment:** 9 - Physics |
| **a. Overview** |

The Department of Physics at Swansea University conducts distinctive research across two strong, internationally recognised, groups in Atomic, Molecular and Quantum Physics (AMQP) and Particle Physics Theory (PPT). The current academic composition of these groups is shown below, with the group leaders highlighted in bold:

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| AMQP | Will Bryan, **Mike Charlton**, Peter Dunstan, Stefan Eriksson, Niels Madsen, Sophie Schirmer, Helmut Telle, Dirk Peter van der Werf, Steve Wilks and Saijun Wu. |
| PPT | Gert Aarts, Christopher Allton, Adi Armoni, David Dunbar, Simon Hands, Timothy Hollowood, Prem Kumar, Biagio Lucini, Carlos Núñez, Warren Perkins, Maurizio Piai and **Graham Shore**. |

The growth of the Department's research is reflected by increases in both research student numbers and in research income over the period. Research income per academic FTE (HESA Cost Centre data 2011/12) is nearly £100k**,** with the equivalent number of postgraduate research students being 1.5. Part of the College of Science, the Department benefits from a well-resourced environment that supports high quality research, as well as from an effective management system that fosters an interdisciplinary ethos. The unit's contribution to the discipline is evidenced through accolades, prizes, invitations to conferences and engagement with organisations and groups involved in physics research at the highest national and international levels.

## b. Research strategy

The Department's vision is to be an internationally focussed centre of excellence that enhances, supports and sustains physics research of the highest calibre. This is fully in line with University's ambitions and support for our unit. The strategy aims to: (a) maximize impact by focussing on research with high academic standing, where relevant by exploiting national and international facilities to promote our experimental and High Performance Computing (HPC) efforts; (b) develop staff, and particularly early career researchers (ECRs), to enable them to excel in their work; (c) constantly improve and enhance the research infrastructure and environment, mostly through income secured from a range of sources; and (d) nurture a strong, dynamic postdoctoral and postgraduate research community.

### Performance since RAE 2008

Ongoing research is largely based upon activities present in the 2008 submission, and both our groups have met all their associated research targets. The groups are now financially self-sustaining, and we have advanced plans to expand further, as summarised below. We have created a vibrant community of 22 academics, including seven Research Fellows who have been assimilated into the regular staff complement. Furthermore, interdisciplinary research directions identified for investment and development during the assessment period have begun to yield dividends. The Swansea University Time Allocation Survey shows that in the census period **our Faculty staff spent an average of two thirds of their time on research**.

Members of the AMQP group have remained highly active in *antihydrogen research* with the ALPHA collaboration, obtaining groundbreaking results including the **first trapping of the anti-atom**, its **long-term confinement** and the **first measurement** of its spectral properties. Swansea is the largest university group in this world-leading effort. We are host to scientists that have made a sustained and vital contribution to establishing and growing antihydrogen research as a dynamic sub-area of physics. There is substantial outreach activity developing around this theme, supported by an EPSRC Impact Acceleration account, and as presented in our Impact submission. *Cold atom research* has been strengthened with the addition of Wu. *Multidisciplinary research* has received a boost with the recruitment of Schirmer, who has a wide-ranging research agenda stretching from quantum physics to engineering and medicine. Work with the KATRIN (KArlsruhe TRItium Neutrino) *neutrino mass collaboration* has been enhanced, and the development of in-house

facilities, including a *femtosecond-laser laboratory* used to commission instrumentation for use at the STFC Central Laser Facility, has been achieved.

The PPT group has continued to advance the research themes identified as world-leading in RAE2008. The Quantum Field Theory (QFT) and Strings sub-group has made further significant advances in *gauge-gravity duality, integrability, QFT in curved spacetime* and *supergravity*. The Lattice Gauge Theory (LGT) team has developed its pioneering work on *gauge theories at non-zero temperature and density* and on *strongly-interacting beyond the standard model (BSM) theories*. As anticipated in 2008, both sub-groups have responded to the emerging *phenomenology at the LHC*, pursuing complementary approaches to *strongly-coupled dynamics in phenomenologically viable BSM models of electro-weak symmetry breaking* and to the *quark-gluon plasma created in heavy-ion collisions.* The development of **High Performance Computing** expertise within the lattice group led to a prominent role in the establishment of the **£42m HPC Wales** facility, a Welsh Government project for High Performance Computing to stimulate industrial growth, and an example is featured in our Impact submission. The success of the PPT group has depended upon the strategy of hiring (and developing) top-class international ECRs as Advanced Research Fellows.

A growing emphasis on **interdisciplinary research** has been supported by the integration in 2010 of the Departments of Biosciences, Computer Science, Geography, Mathematics and Physics within the overarching College of Science. As foreseen in RAE2008, the Nano-scale Physics subgroup (Dunstan and Telle) has greatly expanded its activities in **biological applications**, developing lasting cross-disciplinary collaborations via the University's **Institute of Life Science** (ILS). Key roles were undertaken in establishing laboratories within the ILS, and in particular in the development of *scanning microscopy and Raman spectroscopy* in the **Centre for NanoHealth** (CNH). Directed by Wilks, the CNH is a £21m joint initiative between the Colleges of Medicine, Science and Engineering at Swansea University, in partnership with industry and the Abertawe Bro Morgannwg University Health Board. Other cross-disciplinary work involves nano-fabrication for cold atoms research (**Engineering**), code optimisation (**Computer Science**) and quantum studies of biological systems (**Biosciences and Medicine**).

In 2010 the three Welsh Physics Departments made a £10m bid to HEFCW to create a joint Institute for Advanced Study with the aim of establishing the environment for a step-change in investment for physics in Wales. Whilst this vision has yet to come to fruition, cooperation between the Departments has enhanced significantly and further joint initiatives are underway.

**Sustainability and future plans**

The visibility of our research success has promoted renewed interest in Swansea Physics, which has translated into a greatly increased undergraduate student cohort (by a factor of around 2.5; intake is now over 120 per annum). The Department's business plan anticipates a further 50% increase in student numbers (including a 50% increase in PGR students) by 2016/17. Thus, the Department is in **a strong *and sustainable* financial position** with an excellent platform for further development.

The primary objectives for the Department's development over the next five years are to deliver a **thriving research environment** that continues to attract talented staff and research students, to foster stronger collaborative links with industry and to further increase the quality and quantity of novel and rigorous pure and applied research that has international reach and significance. The Department's sustained growth over the census period, in terms of staff, students and research income, is planned to continue for at least the next five years. This is aligned to the University's strategic objective to **increase the quality and scale of its research**, with a focus on closer engagement with industry.

Our major goal is to establish a new area in Physics at Swansea. Mindful of the priorities for investment in science in the UK and in Wales, we will **diversify into areas of applied physics** related to Life Sciences, Health and Engineering. Our aim is to dramatically grow this activity, in collaboration with Swansea's Colleges of Medicine and Engineering, with a grouping of around 10

academic staff to include new radiation and medical physics facilities, from which we foresee exciting challenges for, and beyond, physics. This is fully in line with institutional growth plans, and with the scientific directions set out for the UK and for Wales, as reflected by the EPSRC Physics Grand Challenges and the Science for Wales strategy. Responding to these agendas will foster the strategic development of the Department and allow us to diversify our interests, training and income streams.

Thus, significant investments in Physics infrastructure (around £20m) are planned. These include a move to purpose-built accommodation on the University's Singleton Campus and the development of leading-edge facilities to support world-class research in an industry-focused area of applied physics in Swansea's new £250m Science and Innovation Campus, which will open in 2015.

We will continue to support the world-class capabilities of the PPT group in STFC Challenge areas, including exploring the early Universe, fundamental particles and their interactions and the laws of physics under extreme conditions. Our effort in antihydrogen research (an area identified as excellent by the EPSRC and to be maintained) will be carried forward with fresh challenges, such as performing detailed experiments on the action of gravity on antimatter. Going further we will **strengthen our core AMQP and PPT activities** and will make **two significant academic appointments** in each in 2014.

**c. People, including:**

**I. Staffing strategy and staff development**

**Staffing strategy:** our long-time strategy has been, and will continue to be, to attract research leaders to spearhead new developments and then recruit staff producing internationally recognised work to support those efforts. The aim is to achieve a sustainable research environment where ECRs work alongside established leaders, who act as formal mentors. Our two groups have been successfully nurtured using this model. We recruit from a highly competitive arena, with our two latest academic staff arriving from DAMTP, Cambridge and NIST, Gaithersburg, USA (lab of W.D. Phillips, Nobel Laureate). The University Policy on Fellows (a guaranteed permanent position for those holding a competitive Advanced Fellowship, through which Aarts, Armoni, Kumar, Lucini, Piai, van der Werf and Schirmer have been assimilated into the regular academic strand) has been a crucial enabler and we have brought researchers to Swansea who have thrived and gone on to establish strong international reputations.

In AMQP our developing capabilities and facilities in quantum science and applications are ripe for further investment, and we will make two new appointments. As detailed, we will broaden activities by appointing world-class researchers in applied physics related to Life Sciences, Health and Engineering. The recent arrival of Schirmer, who has a strong research agenda on applications of quantum science, is aligned to this direction. The PPT group has an international presence in QFT and LGT, making Swansea an attractive place for researchers (for instance, we regularly receive more than 200 applications for our two-year PDRA positions in PPT). Particle Theory is a highly competitive field and a prime strategic aim is to maintain the international vitality and visibility of our group. We will make two further staff appointments to achieve this in 2014.

**Career development support:** the University's **Performance Enabling** process provides clarity on the support and training available to staff to enable them to perform to their optimum level. The process incorporates individual staff key performance indicators (for instance, research outputs and grant income) related directly to measures of organisational success in research into an on-line Professional Development Review form. In 2012 the University won a *Times Higher Leadership and Management Award* and a *UHR Excellence Award* for this initiative. The University is committed to the implementation of the **Concordat to Support the Career Development of Researchers**, being one of the second tranche of HEIs to be awarded the *HR Excellence in Research Award* from the European Commission (successfully retained in 2013). CROS (*National Careers in Research Online Survey*) and PIRLS (*Principal Investigators and Research Leaders Survey*) ran in 2009 and 2011, showing that the research staff at Swansea felt better supported, more valued and more engaged than the national trend.

The **Academic and Professional Enhancement Centre**, Swansea (APECS), coordinates a comprehensive skills development programme. Aligned to the *Vitae Research Development Framework*, it represents a significant investment tailored to supporting researchers in the post-Roberts environment. The contribution of research staff is fully recognized and University support mechanisms are complemented by an inclusive Departmental culture promoting a sense of belonging. Recently, Schirmer and Madsen participated in **Welsh Crucible**, a prestigious programme of personal, professional and leadership development for Wales's best ECRs. The programme encourages participants to find new ways of thinking and working, ensure their research has impact, and to develop skills in public engagement. Lucini has participated in the **Royal Society Science and Innovation Course**. In July 2013, with support from the College of Science, Hands attended the HEFCW-sponsored **Welsh Senior Research Leaders Programme.**

Since RAE2008 almost all of the non-professorial cohort of Physics staff have been promoted; over half now hold Chairs. **All Faculty ECRs have been promoted** within three years of joining the Department. Those holding an Advanced Fellowship have no administrative duties and a 50% teaching load. Physics postdoctoral ECRs are 100% research and go on to successful careers. Several of them have obtained permanent positions at other Institutions (e.g., Bertsche/Manchester, Larsson/CERN, Patella and Rago/Plymouth).

**Competitive research fellowships:** most staff appointed recently have been in receipt of an Advanced Fellowship in the census period: Aarts and Armoni (PPARC, later STFC, ARFs, 2004-2009); Lucini (Royal Society URF, 2005-2013); Schirmer (EPSRC ARF, 2006-2012); van der Werf (RCUK Fellow, 2005-10); Piai (Wales Institute of Mathematical and Computational Sciences Fellow, 2007-2010). Royal Society Leverhulme Trust SRFs were awarded to Madsen (2010-2011), van der Werf (2012-2014) and Aarts (2013-2015), and Charlton held an EPSRC SRF (2007-2012).

**International and visiting appointments:** the College of Science regards research leave and sabbaticals as an important component of its culture and has put in place a policy to encourage these. Armoni had a funded sabbatical at the Kavli-IPMU, Tokyo, Japan (October 2012 to August 2013). Bryan is a Distinguished International Visiting Fellow, Dublin City University (since June 2011). Hollowood was a Visiting Fellow at CERN in Summer 2009. In 2012, Kumar was a Visiting Professor at the Tata Institute of Fundamental Research, Mumbai, India and at the Centre for High Energy Physics, Indian Institute of Science, Bangalore, India. Schirmer held a Marie Curie Visiting Professorship position at the University of Kuopio in 2008. Telle has a Visiting Professorship at Instituto Pluridisciplinar, Universidad Complutense de Madrid (2011-2013).

The Department regularly **hosts world-renowned researchers**. Recent senior visitors to the PPT group include Mikhail Shifman (Minnesota) and Marcos Marino (CERN and Geneva University). The group also hosted Seyong Kim (Sejong University, Korea) for a six-month sabbatical (October 2011-February 2012), supported by an STFC visitor grant, and in August 2010, Ashoke Sen, FRS (HRI, Allahabad, India), who, in 2012, won the Fundamental Physics Prize. International visitors in the PPT seminar programme, who usually stay for several days, average around 15 per annum. Visitors to the AMQP group include Bill Phillips (Nobel Laureate), who was hosted for three days.

**Equality of opportunity**: the unit implements and promotes the University's Equality and Diversity Policy. **Over 60% of the academic staff and 75% of our PDRAs are from overseas**, with nationalities including Argentine, Australian, Chinese, Dutch, Finnish, German, Indian, Israeli and Italian. The Department is also strongly committed to increasing the percentage of female researchers, at all career levels. New Faculty appointments in the census period have been equally distributed between genders. The University's commitment to gender equality is evidenced by its retention of the **Athena SWAN Bronze Award** in 2013, which recognises excellence in the areas of Science, Engineering, Technology and Medicine for Women in the Higher Education Sector. The College is preparing its first application for its own Bronze Athena-SWAN award in November 2013. Hands is actively engaged for the Department in this process. The Department also has the support of the **Women in Universities Mentoring Scheme** (WUMS), a Welsh

University initiative to enhance women's academic career progress. The Department is an **IOP Juno Supporter** and is enhancing its commitment by working towards Practitioner status. The University is also a member of **Stonewall's Diversity Champions Programme**, Britain's good practice employer's forum on sexual orientation.

## c. II. Research students

Our postgraduate research programme has **a vibrant community of around 30 PhD candidates and a growing cohort of two MRes students** (the MRes programme having been established in 2012). The last four years have seen a steady increase in the ratio of PGR FTE to academic FTE, to 1.5:1. Postgraduates are recruited after an open selection process. Both the AMQP and PPT groups have dedicated Admissions Tutors who oversee this process in an efficient and timely fashion. Vacancies are advertised internationally, exploiting research links with other groups to attract high quality PGR students. Eligibility criteria depend on the funding body and with the majority of our bursaries funded by Research Councils, most of our students are UK nationals. Around 15% of the PGR students that graduated in the census period are non-UK. Our recently introduced Masters by Research programmes will shortly have their first graduating cohort. An aim of our new HPC Masters course is to promote the recruitment of overseas students, eventually onto PhD programmes.

**Training and support mechanisms:** The University and College provide a supportive and friendly environment in which to study that combines scientific rigour with applied relevance. Support and supervision is undertaken within a robust framework, ensuring effective induction and enculturation into the University and the College, with a comprehensive programme of **training tailored to individual needs** and robust progression monitoring procedures. All postgraduate students are assigned main and second supervisors who define a research project, mentor the student and monitor progress throughout. Students are first guided through relevant literature and appropriate background material, before fixing the scope of the research to be undertaken.

In the first three months of their appointment, students are encouraged to follow appropriate advanced undergraduate courses. These are followed by general PG-level courses (for instance, in PPT the students are given 15-hour courses in non-perturbative field theory, supersymmetry, string theory and lattice gauge theory), and these are followed by short (4-8 hour) courses in more specialist subjects. We have **frequent research seminars** (in term time, usually two per week). Specialist courses in Laser Physics and training seminars in experimental techniques are given to students in the AMQP group. During their studies, PGR students have full access to all Departmental/College facilities and support staff. Each year after the first, students present their work to the relevant research group in a formal seminar. Students are encouraged and **financially supported to go to international conferences** to give poster or oral contributions. We make use of our research and industrial links to offer our students secondments at other institutions and private companies. Recent examples include Gregory Moraitis (one year at CERN in 2010), Ed Bennett (two months at IBM Watson Lab, Cambridge, Massachusetts, in 2011), Alessandro Amato (who has spent nine months at Regensburg University from December 2012), Wynne Evans (three months at Bielefeld University in 2013) and Tim James (with a four month Karlsruhe House of Young Scientists Scholarship in 2011).

All PGR students attend **in-house training courses** on (i) research skills development, (ii) health and safety and (iii) teaching skills. In the 2008-2011 period, the University made strategic use of Roberts Funding to develop a robust research student training strategy. This included the appointment of a full-time Research Students Skills Officer and the implementation of a **research student training programme**. APECS co-ordinates a comprehensive skills training and development programme for research students with courses available to all PGRs.

**Progress monitoring and employability:** supervisors constantly assess student performance through informal meetings and discussions in a manner typical of our discipline. This is underpinned with formal scrutiny performed by a small monitoring committee that includes the PPT and AMQP Admissions Tutors. For each student, the monitoring process involves the supervisor

and an assessor, who are requested to submit reports on the student's progress and to give feedback. This process has been **recognised as an exemplar** by the University Academic Board for Postgraduate Research and is now embedded within a University-wide system of reporting and assessment. The most recent DLHE survey showed that **91% of our graduated PhD students were in graduate employment.**

**Supervision of other students:** the Department is strongly committed to the training of future researchers and regularly hosts students from a wide range of institutions (recent examples include Milan, Turin, Tel Aviv and Santiago de Compostela) for visits of between three months and one year in which we supervise a research project (not involving their official supervisor and often leading to a publication). In the census period Telle has also supervised six KATRIN students at KIT (Germany) and Schirmer has supervised three PhD students at Cambridge and one visiting Chinese student.

**d. Income, infrastructure and facilities**

**Specialist infrastructure and facilities:** the Department benefits from various laboratories and research facilities, often co-funded by the University (which invested over £300k in our research infrastructures in the census period) and Research Councils. These include the **£2m Positron laboratory**, used to develop equipment and techniques for the ALPHA antihydrogen collaboration, and a **Beowulf cluster with low latency interconnections** (used by the PPT group). The Department hosts also a state-of-the-art **femtosecond-laser laboratory** (Bryan) and a **laser development laboratory**, funded by the KATRIN collaboration and managed by Telle. We are regular users of specialist facilities at CERN (the unique **Antiproton Decelerator** for antihydrogen research) and at RAL (the **Artemis** laser for femtosecond atomic and molecular physics).

From 2010 to 2013, Swansea hosted a **BlueGene/P supercomputer**, funded by STFC and managed on behalf of the High Performance Computing DiRAC consortium (supporting the computational physics programme in the remit of the STFC), and contributed running costs (at around £100k per annum) and a system administrator. The capital cost was met by a competitive STFC grant awarded to Hands. The operational model used has informed the newly funded STFC "DiRAC 2" HPC facility, on which 238m core-hours have been awarded to the LGT subgroup (BlueGene/Q system). The University has also supported the development of **cold-atom physics and quantum optics** and Swansea now hosts two purpose-built laboratories (Eriksson and Wu). Laboratory refurbishment has been accompanied by the provision of specialist equipment for studies of **multi-photon laser cooling, holographic detection of atoms and a nanofabrication facility** for sub-wavelength optical nano-fibres at an investment cost of around £250k.

As members of the CNH, Dunstan and Telle acquired state of the art (£1m) facilities and infrastructure (£0.5m) to expand spectroscopy techniques into soft matter characterization and produced novel equipment platforms that exploit scanning probe technologies and nano-scale optical spectroscopy, creating a unique facility for basic research and collaboration. There is capacity for further expansion of these and related activities; this forms part of our ongoing development strategy. Dunstan is also a member of the Multidisciplinary Nanotechnology Centre (MNC), in the College of Engineering.

**Income:** HESA Cost Centre data shows average income for research grants and contracts to be £99.3k per academic FTE (excluding in-kind resources such CPU time – the LGT subgroup had core-hours on DiRAC2, Hartree and HPC Wales valued at around £3m). Research has been funded by a number of **national and international organisations**, including Research Councils (STFC, EPSRC and ESF), the Leverhulme Trust, Royal Society, Wales European Funding Office and HPC Wales. The PPT group has been supported continuously at a high per-capita level (for theory) by successive STFC consolidated/rolling grants, recently with awards of £1m and over. EPSRC support for antihydrogen work has been in place for over 15 years, often with multi-million pound awards. In the census period, our Department has also been successful in obtaining European Union FP7 funding in the form of Marie Curie fellowships for ECRs and for network participation. Recently we approached potential industrial investors. BSMBench Ltd is sponsoring

code development in Lattice Gauge Theory, aiming to port the resulting algorithm to model financial markets. We will continue to exploit opportunities offered by our traditional sources (most of which are UK-based), whilst widening our portfolio by increasing research income from European funding agencies and attracting more funding from industry and Welsh Government.

**Consultancies and professional services:** the Analytical Laser Spectroscopy Unit (ALSU) (part of the AMQP group) provides consultancy to outside organisations and industry. In the census period Telle has advised and provided feasibility studies to **AWE Aldermaston's Materials Science Division** in relation to Raman spectroscopy. A major effort lies within the KATRIN collaboration (Telle). ALSU carry out feasibility studies related to methodologies and developing measurement equipment for the Tritium Laboratory Karlsruhe (TLK); TLK provided funding for this of around £6-7k per annum, which increased in 2013 to £30k for a feasibility study in the **ITER fusion project framework**. CNH (Dunstan and Telle) also undertakes consultancy activity, providing **services to SMEs** (e.g. Sandvik Osprey Ltd, Haydale and Qioptiq Space Technology) on the use of Raman techniques applied to biomedical problems.

**Time awarded at international facilities:** the ALPHA collaboration is granted around 1500 hours of beam time per annum at CERN's Antiproton Decelerator. In order to carry out their programme in Lattice Gauge Theory, Allton, Hands and Lucini have been granted computer time on European HPC centres by DEISA (DECI-5 call, 2009, 4.1m core-hours) and by PRACE (66.2m core-hours overall in three regular calls in the assessment period).

## e. Collaboration and contribution to the discipline or research base

The Department makes a major contribution to the discipline with success evidenced by the range and depth of its connections with academia, industry and research users, including bi- and multi-lateral collaborations spanning more than 20 institutions in 10 nations. **Collaborations** include:

- Charlton, Eriksson, Madsen and van der Werf fulfil key roles in the **ALPHA** Antihydrogen research collaboration at CERN, which is now able to trap anti-atoms for tests of symmetry by comparisons with hydrogen, and are founding members of the **GBAR** collaboration, which aims to measure the action of gravity on antimatter;
- Charlton and Telle are members of the **KATRIN** experiment, investigating open issues in neutrino physics;
- Aarts, Allton, Hands and Lucini are members of the European **HadronPhysics2** network, which promotes access to five European Research Infrastructures;
- Through CNH and EPSRC (Building Global Engagements in Research initiative), Dunstan is undertaking a work programme on nano-wires with **MINATEC** (Léti Division), Grenoble.

**Examples of collaborations with research users and industry:**

- Lucini is developing a computer program with BSMBench Ltd based on Lattice Gauge Theory techniques to study **the evolution of financial markets.**
- Schirmer has links with companies in different areas including quantum information and communication (MagiQ, IdQuantique, Telcordia, HP), medical imaging (ACUITAS) and Hitachi, a partner on her ARF who provided funding for a CASE studentship (2008-2011).

**Leadership:** an overview of several indicators of leadership and standing for the census period is given in the table and **representative examples** are provided.

| Indicator | PPT | AMQP | Indicator | PPT | AMQP |
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| Fellowships of Learned Societies | 4 | 3 | Invited Lectures, Plenary Talks and Keynotes | 91 | 53 |
| Competitive Research Fellowships | 5 | 5 | Committees and Advisory Bodies | 15 | 18 |
| Visiting Professorships and Fellowships | 18 | 5 | Conference and School Organisations | 12 | 12 |
| Awards and Prizes | 3 | 8 | Journal Editorships | 4 | 4 |

**Fellowships of Learned Societies, Visiting Professorships and Fellowships**

- Núñez is a "World Fellow" at CP3-Origins, University of Southern Denmark.
- Charlton and Shore were elected Inaugural Fellows of the Learned Society of Wales in 2011, to which Hands, Hollowood and Wilks were elected in 2013.
- Núñez and Shore are affiliates of the Higgs Centre (Edinburgh).

**Awards and Prizes**

- Charlton, Madsen and van der Werf received the 2011 American Physical Society John Dawson award for Excellence in Plasma Physics Research.
- The work of the ALPHA collaboration (incl. Charlton, Eriksson, Madsen, van der Werf) on trapped antihydrogen was awarded the Physics World 2010 Physics Highlight of the Year.
- Aarts was awarded a Royal Society Wolfson Merit Award in April 2013.
- Hollowood and Shore won third prize in the prestigious Gravity Research Foundation 2012 Essay Competition for a paper entitled *The Unbearable Beingness of Light*.

**Journal Editorships**

- Since 2009, Núñez has been a member of the editorial board of the *Journal of High Energy Physics*, the most prestigious journal in high energy physics; he has also edited a special number on *"Gauge-Strings Duality"* for the journal *Advances in High Energy Physics*.
- Charlton has been a member of the board of the *Journal of Physics B* (2003-8) and is on the founding board of the *European Physical Journal: Techniques and Instrumentation*.
- Hands is an editor for the *European Physical Journal A* and has edited the special topic issue *"Lattice Field Methods in Hadron and Nuclear Physics"*.
- Schirmer is a founding editor of the newly created *Journal on Nanoscale Systems: Mathematical Theory and Applications*.

**Committees and Advisory Bodies**

- Charlton was involved in scientific oversight at CERN as a member of the SPSC (2009-12); he is international advisor to Swiss and French Research Agencies (since 2011), a member of EPSRC Physics Grand Challenges Advisory Group (since 2010) and a member of EPSRC College (re-elected in 2010).
- Hands is chair of the STFC Particle Physics Grant Panel (2011-2014), has been chair of the ECT* Scientific Board (Trento, Italy, 2010-2012) and in 2012 was on the US DoE Comparative Review Panel for Particle Physics Theory.

**Conference and School Organisation**

- Aarts chaired the conference *Strong and Electroweak Matter 2012* (Swansea, July 2012) with co-organisers Allton, Hands, Lucini, Piai and Shore. It included a special lecture by Prof. Peter Higgs.
- Armoni, Hollowood, Kumar, Lucini, Núñez, Piai and Shore have organised the conferences/workshops *Large N @ Swansea* (2009), *Holograv 2012* and *Strong Fields, Strings and Holography* (2013).
- Perkins ran the *40th British Universities Summer School in Theoretical Elementary Particle Physics* (Swansea, 2010).
- Madsen organised the school *Physics with Trapped Charged Particles* (Les Houches, France, 2012).

**Invited Lectures**, **plenary talks and keynotes**

- Dunbar gave the opening talk at *Gauge Theory and String Theory* (Zurich, Switzerland, 2008).
- Armoni gave three lectures at the *Schladming Winter School on Theoretical Physics* (Schladming, Austria, 2009).
- Charlton delivered 3 lectures to the 174$^{th}$ Enrico Fermi Summer School on *Physics with Many Positrons* (Varenna, Italy, 2009).
- Schirmer gave a series of invited lectures on Quantum Control (National University of Defence Technology in Changsha, China, 2010).
- Aarts gave a keynote plenary at the *Lattice Symposium* in 2012 (Cairns, Australia, 2012).