

## CONTACT DETAILS

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## PERSONAL DETAILS

Name	Anthony Terence Doyle
Date of Birth	28th January 1963
Place of Birth	Leeds, UK
Nationality	British
Family Status	Married with three children

## FELLOWSHIPS

Sep. 11 - Aug. 12	CERN Scientific Associate
Sep. 07 - Mar. 11	STFC Senior Research Fellow
Apr. 05 - present	Fellow of the Royal Society of Edinburgh
Sep. 04 - Aug. 07	PPARC Senior Research Fellow
Apr. 01 - present	Fellow of the Institute of Physics
Oct. 00 - Aug. 01	PPARC Senior Research Fellow
Jan. 98 - present	Alexander von Humboldt Fellow (University of Hamburg)
Sep. 97 - Dec. 97	DESY Guest Researcher
Sep. 94 - Aug. 95	DESY Guest Researcher
Jan. 94 - Apr 94	DESY Guest Researcher

## EMPLOYMENT

Aug. 02 - present	Professor, University of Glasgow
Aug. 99 - Jul. 02	Reader, University of Glasgow
Oct. 90 - Jul. 99	Lecturer, University of Glasgow
Oct. 87 - Sep. 90	SERC Research Associate in Physics, University of Manchester
Oct. 84 - Sep. 87	SERC Research Student, University of Manchester
Jun. 84 - Sep. 84	Vacation Student, University of Manchester

## EDUCATION

<i>Tertiary</i> (1981-1987)	University of Manchester Oxford Road, Manchester.
Qualifications:	PhD in Experimental Particle Physics, 'Charged hadron production at large transverse momenta using high energy photon and hadron beams', (Oct. 1987); Dp Adv Std Sc in Experimental Particle Physics, 'The WA69 Trigger', (May 1985); BSc (Hons, First Class) Physics (June 1984).

<i>Secondary</i> (1974-1981)	Cardinal Heenan High School, (pre-1978 St Thomas Aquinas Grammar School) Tongue Lane, Leeds.
Qualifications:	
A Levels (1981)	Chemistry, General Studies, Mathematics, Physics.
AO Level (1980)	General Studies.
O Levels (1979)	Biology, Chemistry, English Language, English Literature, French, Geography, Latin, Mathematics, Physics.

## SUMMARY

Tony Doyle is a professor of physics and research group leader of the particle physics experiment (PPE) group at the University of Glasgow. As an Alexander von Humboldt Fellow, DESY Visiting Scientist and member of the ZEUS Collaboration, he worked on the analysis of Structure Functions and Hadronic Final States in Deep Inelastic Scattering. He is GridPP Technical Director, working with a collaboration of Particle Physicists and Computing Scientists from the UK and CERN, who have built the UK Grid for Particle Physics. Most recently, as an STFC Senior Research Fellow and member of the ATLAS Collaboration, he has been working on analysis methods to search for the Higgs boson at the LHC. This task requires petabyte-scale data resources and led to research in Grid Data Management, improved simulation and enhanced analysis methods, including multivariate analyses and advanced statistical methods to extract the Higgs signal from the significant backgrounds.

He is currently a CERN associate and was until recently the only STFC Senior Research Fellow in the UK. He is also a Fellow of the Alexander von Humboldt Foundation, Institute of Physics and Royal Society of Edinburgh. He led the PPE group during a constrained funding period where the group has grown and currently comprises 75 members with a recurrent research income of more than £2m per year. He has improved their international profile, retaining fellows and attracting high-quality international students, doubling the number of PhD students in the past two years. The current grant portfolio is over £8m. The group has internationally-recognised expertise in fundamental research, detector and Grid technology development as well as spin-off into medical and security as well as other areas, leading to many successful RCUK, EU and SFC grants.

He has contributed to more than 300 widely-cited publications in particle physics as well as Grid computing/computing science, with an associated h-index greater than 50. He has presented work at more than 100 conferences including reviews at major international conferences. He led the UK Grid for Particle Physics (GridPP), the largest UK e-Science project (£100m over 10 years). He is recognised by the research councils for his work on knowledge exchange in this area, having served on ten UK e-Science project committees and oversight bodies as well as nine international organisation bodies.

He was a physics panel expert reviewer for the most recent Research Assessment Exercise (RAE08) and a member of the RSE Physics, Astronomy & Electrical Engineering Sectional Committee. He continues to referee international proposals from the Danish Natural Science Research Council, EPSRC, JISC, Nuffield Foundation, Science Foundation Ireland, STFC, the Volkswagen Foundation, German Ministry for Research and Education (BMBF) and elsewhere. He has served on major Research Council and JISC grant-awarding bodies and advisory panels.

He is Particle Physics Theme Leader in the Scottish Universities Physics Alliance (SUPA) and Chairman of the Scottish Universities Summer Schools in Physics (SUSSP). He is one of four academic members of the University of Glasgow Physics & Astronomy School management team. He is also one of two research coordinators, reviewing all School research grant applications. He has supervised 12 PhD and 4 Masters students to completion at internationally recognised high standards. He has acted as external examiner for 23 PhD students from various European and UK universities and external examiner for the undergraduate physics programme at the University of Birmingham.

Doyle played a leading role in the Deep Inelastic Scattering (DIS) measurements at the DESY laboratory in Hamburg working on the ZEUS experiment. These measurements have historically been central in the development of our understanding of the theory of nuclear interactions in terms of Quantum Chromodynamics (QCD), which describes the interactions of quarks and gluons.

He is currently working as a member of the ATLAS collaboration on various analyses to identify Higgs production, in particular the  $tt$ ,  $hW$  and  $hZ$  channels with lepton triggers where  $h \rightarrow bb$ , as well as combining these with other channels. This has improved previously observed performances, using neural network-based approaches and improved jet variables. He is also Deputy Chairman of the ATLAS Publications Committee overseeing and refereeing all of the ATLAS papers and notes prior to release.

## PARTICLE PHYSICS RESEARCH

I am currently working on various analyses to identify Higgs production using data from the ATLAS experiment. I have been active in numerous areas of ATLAS analysis and software development. For example, we are developing searches for the low mass Higgs boson in the mass range around  $120 \text{ GeV}/c^2$ , via  $hW$ ,  $htt$  and  $hZ$  decay channels with subsequent  $h \rightarrow bb$  decay. Three aspects of the work arise: the organisation of the simulation validation frameworks using advanced metadata techniques, validation of the software chain for these specific channels with emphasis on the understanding of the ATLAS SCT, and improvements in the significance of the Higgs search using neural network-based approaches.

I led software development within the ATLAS group, focussing on new simulation software: the main effort, incorporating work from three RAs and a PhD student led to an extended framework (ATLFAST-C) including identification and mis-identification for the particles detected in ATLAS (electrons, photons, muons, jets). The software enables ATLAS events to be simulated efficiently at the required level of precision (typically 2-3%) compared to more detailed simulations.

A further aspect of the ATLAS work, where I supervised two RAs and a PhD student, is the development of the ATLAS tag database which enables ATLAS events of interest to be extracted more efficiently from the huge data samples anticipated at LHC start-up. A Tag Navigation Tool (TNT) developed by our group is being applied, amongst many other areas, to the validation of the ATLAS fast simulation validation work, which in turn contributes to the efficient analysis of simulated Higgs background events.

On the physics analysis side, I am working on Higgs discovery at the LHC, as part of the larger group effort in this important area of future physics discovery. The most recent work has improved the probability for Higgs signals to be observed above background by taking the shape of the invariant mass distribution fully into account in the log-likelihood analysis. We are specifically investigating the  $htt$ ,  $hW$  and  $hZ$  decay channels with subsequent  $h \rightarrow bb$  decay as well as combining these with other channels. We have improved previously observed performances using neural network-based approaches, improving the significance by a factor two. We are implementing these analyses within the ATLAS software framework. Future work will enable this work to continue to completion, with a spotlight on improved low-mass Higgs search analysis techniques, now that the software foundations are in place.

The low-mass Higgs search builds upon standard model analyses with four academics, two RAs and eight students who are currently active in ATLAS analysis and software development. Our CDF group members are also developing searches for the low mass Higgs boson in the mass range  $115\text{-}200 \text{ GeV}/c^2$ . We review Higgs analyses as part of a coherent effort at Glasgow focussed on  $h \rightarrow bb$  and  $h \rightarrow \tau\tau$ .

I was awarded a PPARC senior research fellowship to develop analyses and infrastructure at HERA and the LHC. This senior research fellowship was approved to continue by STFC in 2007. My work in ATLAS led to my appointment as ATLAS publications committee deputy chairman where I took steps to improve the editorial procedure in response to a publication rate increasing by a factor four in 2011.

The future of the field depends upon large experimental facilities. I signed the UK Neutrino Factory proposal in order to contribute to the neutrino factory target studies work package. We aim to determine the optimal geometry of the target for a neutrino factory, based on shock studies being performed at RAL, and simulations of the MICE beam-line. I also contributed to the ILD Letter of Intent, one of two detectors proposed for the International Linear Collider.

I played a leading role in the Deep Inelastic Scattering (DIS) measurements at the DESY laboratory in Hamburg working on the ZEUS experiment. These measurements have historically been central in the development of our understanding of the theory of nuclear interactions in terms of Quantum Chromodynamics (QCD), which describes the interactions of quarks and gluons. The advent of HERA at DESY, the first electron-proton collider, enabled energies to be reached that were two orders of magnitude beyond those previously studied.

I acted as physics coordinator, leading two ZEUS physics working groups, and was appointed a DESY visiting scientist during sabbatical leave from Glasgow. This was at an exciting stage of development of the experiment, where all of the ZEUS top-cited papers were produced, and resulted in a significant number of publications [31,37-39,42,44,46,52-55,57-59,62-64]. I played a major role in the analysis of fragmentation [20,44,80] and structure functions [23,25,58,64,97], as well as the measurement of multi-jet [46] and diffractive [18,21,53] events in DIS. This led to investigations of the future capabilities of the HERA experiments (following the HERA luminosity upgrade) with respect to the measurement of structure functions [19].

My achievements as physics coordinator led to my appointment as ZEUS physics chairman where I took steps to improve the editorial procedure. This resulted in an improved publication rate [81-98] and a significant number of submissions (35 papers) to the ICHEP98 conference, the premiere biennial event in the particle physics calendar. I reviewed the field of structure functions at the ICHEP98 and CIPANP2000 conferences [23,25].

I played a major role in interpreting and communicating the results from the HERA experiments which resulted in a number of invited plenary talks at major workshops, summer schools and conferences. I presented a series of academic training and summer school lectures on HERA physics and DIS as well as seminars around the UK.

I initiated studies of fragmentation in the Breit frame [20,22,44, 99] and event shapes in DIS [24, 145], leading to a first paper on ZEUS event shapes published in 2003 [145]. I also contributed, as PhD thesis supervisor, to the first results on applying NLO, power correction and resummation techniques to the event shape data [184]. I recently completed work on the analysis of the charm contribution to the structure function in DIS, supervising a research student in this area. I continue to serve on the ZEUS Editorial Panel, having acted as editorial board member and contributor to earlier analyses and 'wise person' for five recent papers [146,149,176,209,235].

### SELECTED INVITED LECTURES & PRESENTATIONS

The Grid: first light at the LHC	British Computer Society Meeting, Glasgow	Jun. 11
From HERA/Tevatron to the LHC	2 <sup>nd</sup> Multiple Partonic Interactions Workshop, Glasgow	Nov. 10
The Large Hadron Collider	35 <sup>th</sup> Physics Meeting for Teachers, Stirling	Jun. 09
The Grid for the LHC	British Computer Society Meeting, Edinburgh	Jun. 09
GridPP: collaboration with industry	EGEE Business Day, Westminster	May 08
GridPP	INFN Collaboration Meeting, Padova	Dec. 06
Higgs Discovery at the LHC	SUPA PP Theme Start-Up Meeting, Glasgow	Oct. 05
Deep Inelastic Scattering	CTEQ-IPPP Summer School Lectures, St Andrews	Jun. 01
Structure Functions	EU Lattice Network Start-Up Meeting, Glasgow	Oct. 00
Event Shapes in DIS at HERA	Low-x Workshop, Oxford	Jul. 00
Structure Functions at High $Q^2$	CIPANP2000 Conference, Quebec	May 00
Event Shapes and Forward Jets	Hadron99 Conference, Beijing	Aug. 99
Hadronic Final States	Low-x Workshop, Tel Aviv	Jun. 99
Physics at HERA	CERN Academic Training Lectures, Geneva	May 99
Structure Functions	ICHEP98 Conference, Vancouver	Jul. 98
HERA Physics	IoP98 Conference, Manchester	Apr. 98
Highlights from ZEUS	DIS98 Workshop, Brussels	Apr. 98
Diffraction	Lecture, SLAC 25 <sup>th</sup> Summer Institute, Stanford	Aug. 97
Hadronic Final States Summary	DIS97 Workshop, Chicago	Apr. 97

### GRID DEVELOPMENT

I am currently Technical Director and was, for 7 years, Project Leader of the UK Grid for Particle Physics (GridPP), a collaboration of twenty Institutes, incorporating CERN [II, IV, VI, VIII]. I led Phases 1 and 2 of the largest single e-Science project in the UK (£100m over 10 years from STFC and the Universities), towards their successful completion. I was responsible for all aspects of the project and chaired the weekly Project Management Board meetings.

I led the first phase of the project '*GridPP1: from Web to Grid*' which was completed with 88% of the 190 high-level tasks completed and with all 44 metrics within specification. The significance of these developments, where a Global Grid infrastructure was set up and tested, was widely recognised. I was interviewed and quoted in the UK and International press on various developments as "the Grid becomes reality" in e.g. New Scientist and The Guardian as well as in most computing magazines and their online counterparts. Personal dissemination of the results also included overviews for the DTI ("Meeting the Particle Physics Computing Challenge") and PPARC ("Gearing up for the Grid"). The significance of these international developments was reported in The Economist as the "World's Largest Grid".

I also led Phase 2 '*GridPP2: from prototype to production*' where, in preparation for LHC start-up, I instigated a series of Site Readiness Reviews, which visited all the GridPP sites in the UK and provided management, operations, technical and experiment feedback to ensure that everyone was aware of the

issues, obligations, plans, costs and service levels. The project continued to meet its targets in terms of management and delivery and was extended through to April 2008, when I stepped down to become Technical Director to focus on physics exploitation as a member of the ATLAS collaboration. I was quoted worldwide in over 40 press articles in April 2008 ranging from The Sunday Times, Toronto Sun, Business Standard, The Times of India, MSN, News.com, Goa Herald, Breaking News (Trinidad and Tobago) and elsewhere. I was interviewed by the Australian Broadcasting Corporation, BBC World Service and Cybershack (Australia).

As Project Leader I directed the UK Grid programme and ensured the delivery of a computing service to the experiments, extending from the computing fabric for the Tier Centres, to generic middleware and the Grid-enablement of the experiments. I edited the proposals, coordinated planning documents in various areas and wrote three summary articles for UK e-Science All Hands Meetings [215-217]. The project was subject to a mid-term review by the PPARC Oversight Committee who concluded "Excellent progress, management, control, reporting and thinking (both tactical and strategic)... It is difficult to imagine more impressive progress all round." At a PPARC Grid Steering Committee meeting, the committee expressed their great confidence in GridPP's progress and management. I contributed towards establishing the LHC Computing Grid (LCG) project, based at CERN, and have been active in the international management structure and LCG committees as GridPP Project Leader.

The GridPP2 project was subject to a mid-term review by the Oversight Committee who concluded "The GridPP2 programme has continued to impress and shows every likelihood of delivering against its ambitious programme. As a management team they have demonstrated tremendous stewardship of a complex technical area and have made excellent use of the available resources. As the largest UK e-Science project and part of the world's largest Grid, it has established the UK as a leading centre for HEP on the Grid and is poised to consolidate this position through GridPP3. The Oversight Committee strongly endorses the existing programme of activity and would recommend funding the continuation project." The £30m GridPP3 project was subsequently approved at the final meeting of PPARC. The next phase '*GridPP3: from production to exploitation*' took a widely deployed production system to a system for exploitation of physics results from the LHC. The scope of this Grid work encompasses my role as GridPP3/GridPP4 Technical Director, emphasising experimental use of the Grid for LHC physics.

I instigated the ScotGrid project, a component in the UK development of a computational data grid for particle physics analyses [I]. This joint Edinburgh-Glasgow project established a Tier-2 centre with IBM-UK as the industrial partner. The ScotGrid-Glasgow Compute Farm was set up in 2002 and provided a model for Tier-2 operations. This farm contributes directly to ATLAS and LHCb data analyses and has been integrated to the EU DataGrid, EGEE, EGI and UK e-Science Grid systems. I led the procurement of the Glasgow system which has been upgraded every two years from 2006 and currently comprises more than 10k HEPSPEC CPU and more than 1 PetaByte of data (the largest single computing resource in the University). The system is the most successful in the UK and has now processed more than 10 million jobs for hundreds of users supporting a wide range of applications (ATLAS, LHCb, BaBar, CDF via SAM-Grid, Grid Data Management OptorSim simulations, Bioinformatics, ZEUS, Medipix, Information Retrieval, Device Modelling, MICE and UKQCD). ScotGrid was extended to incorporate activities at Durham, and its influence extends more widely across Scotland, reflecting the success in developing a production Grid recognised by the wider community.

I led UK middleware developments in Grid Data Management, working closely with colleagues at CERN within the EU DataGrid and EGEE programmes. 34 technical publications on Grid Data Management were produced as part of GridPP developments. These covered various aspects of Grid optimisation, metadata, replication, standards and deployment. A further seven overviews were written on the GridPP project. The preprints are available from <http://ppewww.ph.gla.ac.uk/preprints/>.

Year	2001	2002	2003	2004	2005	2006	2007	Total
Publications	1	6	7	4	7	6	8	39

The expertise we built up during this period meant that we were given responsibility to provide solutions for metadata development applied to the experiments; extend generic metadata tool development; deploy scalable and robust service architectures; and integrate novel replica optimisation techniques applied to the Grid. The links established between our group and Edinburgh and Glasgow computing scientists helped in establishing the UK National e-Science Centre in Scotland [III]. I served on ten UK e-Science committees (see the Research Administration section).

Locally I supervised a team of 4 RAs and one postgraduate student working on Grid Data Management, focussing on metadata development. I also worked with an RA to develop optimised approaches to analysis on the worldwide LHC Computing Grid envisaged in 2008. This simulation work showed that dynamically replicating data between sites using analysis access patterns decreases the running time and network usage of grid jobs by up to a factor 3. This area is acknowledged to be of key long-term importance. A total of more than 50 papers have now been written by the Glasgow Grid group. As part of the wider GridPP Technical Director role I am now preparing a programme for improved efficiency on the UK Grid, taking into account this and other longer-term developments. I also led Grid deployment effort to establish a Scottish Grid Service in support of research throughout Scotland supporting a wide variety of disciplines.

The GridPP approach to management and leadership has influenced other e-Science projects, within and beyond STFC. In leading the project from conception, I have personally presented more than 90 talks on Grid development, in addition to published work. The significance of these developments has been widely reported and I have been interviewed and quoted in the UK and international press. We have pioneered large-scale project management techniques, as well as developing and deploying a very large Grid across the UK meeting the needs of more than 5,000 end users. Starting from a few testbed systems, the scale of the Grid in the UK is currently more than 10,000 CPUs with 15PB of Grid-accessible storage. The system is fully-deployed in all of the major LHC physics analyses.

### INVITED PRESENTATIONS

I presented 90 invited talks in an 8-year period on various aspects of the Grid.

See <http://ppewww.ph.gla.ac.uk/~doyle/gridtalks/>.

Year	2001	2002	2003	2004	2005	2006	2007	2008
Talks	5	19	16	15	13	8	8	5

### RESEARCH ADMINISTRATION

As a research group leader, my aim is to improve group output against a backdrop of STFC cuts: we have achieved this, attracting high-quality international students, retaining fellows and improving overall income. The group has grown in the past year and currently comprises 75 members including 8 academics, 24 research fellows and associates (10 honorary), 28 postgraduate students, 3 technicians and secretarial/administrative support, with a recurrent research budget of more than £2m per year (corresponding to 2% of the total GU annual research income). The current grant portfolio is over £10m. We have internationally-recognised expertise in fundamental research, detector and Grid technology development as well as spin-off into artificial vision as well as other areas.

Within the university I am one of four academic members of the School Management Team as well as one of two research coordinators responsible for reviewing grant proposals prior to submission. I am currently SUPA particle physics theme leader: I proposed and wrote the SUPA LHC upgrade programme in collaboration with colleagues from Edinburgh [F]. This provides the basis for the particle physics case for SUPA2 and incorporates planned facility sharing with the Institute for Gravitational waves Research (IGR).

I selected and reviewed the status of all particle physics experiments within the UK as a member of the Particle Physics Experiments Selection Panel where I was also referee for individual dark matter, neutrino and collider experiments. I was the first experimental member of the Particle Physics Theory Committee judging all theory grant proposals and was a referee on computing/phenomenology applications. I was a member, and I am currently designated Chairman of the Institute for Particle Physics Phenomenology Steering Committee. I was a member of the PPARC Particle Physics Advisory Panel, with specific responsibility for the 10-year roadmap for strong interaction physics and grid computing. I gained recognition as an expert on DIS physics and was appointed convenor of seven working groups at international workshops. I initiated the HERA Monte Carlo Workshop, which enabled development of analysis tools essential to the study of this complex field. I reviewed papers from the ZEUS experiment as one of 24 members of the experiment's Editorial Panel, acting as 'wise person' for seven papers from the collaboration [110, 112, 113, 123, 138, 145, 184]. I review papers from the ATLAS experiment as one of 12 members of the experiment's Publication Committee, acting as Editorial Board Chairman for two recent papers from the collaboration [260, 261]. I am Deputy Chairman (Chairman designate) of this Committee.

I led the GridPP and ScotGrid research programmes and was one of a team of six computer scientists and physicists to develop a proposal for the UK National e-Science Centre. I was appointed to other committees

and oversight bodies associated with the UK e-Science programme, e.g. the JISC Committee for Support of Research, Pegasus Advisory Group (London School of Economics), Open Middleware Infrastructure Institute (OMII) UK Board (Southampton), and e-Science Institute (e-SI) Programme Committee (Edinburgh). I am a member of the ATLAS-UK computing planning group and was the UK leader for data management for the EU DataGrid project.

### RESEARCH ROLES AND POSITIONS

Partner, Hadron Collider School (HASCO), Göttingen, EU ERASMUS Programme	Jul. 11 - present
Member, European Physical Society	May. 11 - present
Representative, ATLAS Data Preservation in HEP (DPHEP), International Programme	Apr. 11 - present
Member, CERN Scientific Information Policy Board (SIPB)	Mar. 11 - present
Deputy Chairman, ATLAS Publications Committee	Mar. 11 - present
Chairman, Inst. for Particle Physics Phenom. (IPPP) Steering Cttee. (Durham)	May 11 - present
Member, ATLAS Publications Committee	Oct. 10 - present
Leader, Scottish Universities Physics Alliance (SUPA) Particle Physics Theme	Sep. 09 - present
Expert Reviewer, Research Assessment Exercise (RAE08) Physics Panel	Jan. 08 - Sep. 08
Research Group Leader, Particle Physics Experiment (Glasgow)	Apr. 08 - present
Convenor, Higgs Maxwell Meeting Committee (Durham, Edin., Glasgow, Lancaster)	Apr. 08 - present
Technical Director, GridPP Collaboration	Apr. 08 - present
Research Coordinator, School/Department of Physics & Astronomy	Aug. 06 - present
Member, RSE Physics, Astronomy & Electrical Engineering Sectional Committee	Oct. 06 - Oct. 10
Member, Pegasus Advisory Group (London School of Economics)	Jun. 06 - Mar. 08
Member, Open Middleware Infrastructure (OMII) UK Board (Southampton)	Jul. 06 - Mar. 08
Member, Enabling Grids for E-science (EGEE) Collaboration Board (EU)	Apr. 06 - Mar. 08
Member, e-SI (e-Science Institute) Programme Committee (Edinburgh)	Oct. 05 - Mar. 08
Deputy UK Representative, LCG Management Board	Oct. 05 - Mar. 08
Member, SUPA Particle Physics Theme Team	Apr. 04 - present
Member, EGEE UK and Ireland Management Board	Apr. 04 - May 10
Member, LCG Collaborative Tools Group	Apr. 04 - Jun. 05
Chairman, CCLRC/GridPP Tier-1/A Board	Sep. 03 - Mar. 08
Deputy UK Representative, LCG Project Overview Board	Sep. 02 - Mar. 08
Member, UK National Grid Service (Grid Operations Support Centre) Board	Aug. 01 - Mar. 08
Member, PPARC Particle Physics Advisory Panel (PPAP)	Oct. 01 - Sep. 05
Deputy UK Representative, EU DataGrid Project Management Board	Sep. 01 - Sep. 03
Member, LHC Computing Grid (LCG) Project Execution Board (CERN)	Sep. 01 - Mar. 08
Member, LCG Software Computing Committee (SC2) (CERN)	Aug. 01 - Oct. 05
Fellow, Institute of Physics (Member, Sep. 84 - Apr. 01)	Apr. 01 - present
Project Leader, GridPP Collaboration	Mar. 01 - Mar. 08
Member, e-Science Data Information and Knowledge Transformation (eDIKT) Board	Mar. 01 - Sep. 04
Member, High Energy and Nuclear Physics InterGrid Collaboration Board	Mar. 01 - Apr. 04
Member, JISC Committee for Support of Research	Mar. 01 - Feb. 04
Member, Inst. for Particle Physics Phenomenology (IPPP) Steering Cttee. (Durham)	Dec. 00 - Dec. 06
Member, National e-Science Centre (NeSC) Executive Board	Dec. 00 - Sep. 04
Project Leader, ScotGrid (Scottish Grid Service)	Dec. 00 - Mar. 10
Member, ZEUS Planning Group	Oct. 00 - present
Member, ZEUS Editorial Panel	Oct. 00 - present
Member, ATLAS-UK Computing Executive Board	Jul. 00 - present
Referee, Danish Natural Science Research Council, EPSRC, Nuffield Foundation, PPARC, Science Foundation Ireland, STFC, Volkswagen Foundation, BMBF proposals	Apr. 00 - present
UK and GridPP Contact Person, Grid Data Management	Apr. 00 - present
Budget Holder, ZEUS-UK Collaboration	Jan. 00 - Dec. 01
Member, PPARC Particle Physics Theory Grants Committee	Apr. 99 - Sep. 01
Coordinator, Glasgow PPE Group IT Strategy	Apr. 99 - Mar. 08
Editor, HERA Monte Carlo Workshop Proceedings (DESY-PROC-1999-02)	Jan. 99 - Aug. 99
Physics Chairman, ZEUS Collaboration	Oct. 97 - Sep. 98

Organiser, HERA Monte Carlo Workshop, DESY	Jan. 97 - Aug. 99
Member, PPARC Particle Physics Experiments Selection Panel	Oct. 95 - Oct. 98
Referee, UK Dark Matter, CRESST, MINOS, CDF experiments	Oct. 96 - Oct. 98
Referee, Z. Phys. C and Euro. Phys. C journal papers	Oct. 94 - present
Physics Coordinator, Deep Inelastic Scattering Group, ZEUS collaboration	Sep. 94 - Aug. 95
Member, Organising Committee for Durham HERA Workshop	Mar. 94 - Sep. 95
Physics Coordinator, Hadronic Final States in DIS Group, ZEUS collaboration	Sep. 93 - Aug. 94
Convener, Working Groups, HERA (Durham), DIS95 (Paris), HERA Future (DESY), DIS97 (Chicago), Low-x (Berlin), Low-x (Tel Aviv), Low-x (Oxford) Workshops	Feb. 93 - Jul. 00
Editor, IoP Conference Series Proceedings (J. Phys. G133)	Dec. 92 - May 93
Secretary, IoP Nuclear and Particle Physics Conference	Apr. 91 - Apr. 93

#### OUTREACH AND KNOWLEDGE EXCHANGE

I have played a role in various particle physics outreach activities e.g. open days for prospective undergraduates (see teaching administration) and events organised for younger children (most recently at the STFC-sponsored Big Bang exhibition at the Glasgow Science Centre and Masterclasses in the department). I have been quoted in the UK and International press on various developments. e.g. Australian Broadcasting Corporation, BBC Scotland, BBC World Service, The Guardian, The Herald, New Scientist, The Scotsman.

Recent talks were presented for the GU Open Day "Big Bang at the Large Hadron Collider", Masterclass School Children "The Grid", British Computer Society "The Grid for the Large Hadron Collider" and 35th Sterling Physics Meeting for School Teachers "The Large Hadron Collider". I have also been invited to describe the Grid to academics from diverse fields from aquaculture, arts and humanities, biology, chemistry, computer science, earth sciences, economics, education, engineering, management, mathematics, medicine, neuroscience, physics & astronomy, psychology and social sciences as well as various businesses. Examples of Grid talks for industry include:

gLite adoption and opportunities for collaboration with industry	EGEE Business Day, Westminster	May 08
Working towards a Real-Time Grid for Particle Physics	Open Group, Glasgow	May 08
GridPP, The Grid and Industry	PPARC KITE Club Grid Brokering Meeting, Cambridge	May 06
GridPP - An Operational Grid	IBM Users Group Advisory Committee, Brussels	May 02

#### TEACHING

I have presented 15 undergraduate courses to a wide range of engineering, astronomy, computing and physics students in all years. I significantly developed the courses each year in directions which reflected educational needs and feedback from students. I have been to various courses and workshops on the use of computer-based learning in teaching and have used computer-based and practical demonstrations to illustrate topics within my lectures.

I enjoy all aspects of postgraduate supervision and have supervised 12 PhD students and 4 Masters students to successful completion and been internal examiner for 15 PhD students. Postgraduate students have generally excelled in their research: my first PhD student's thesis won an international prize from the Association of the Friends and Sponsors of DESY, in competition with institutions from 33 different countries in all areas of science; one M.Sc. IT thesis won the Glasgow University prize. I have acted as external examiner for 23 PhD students from various European and UK universities. I have tutored at the summer school for all UK experimental high energy physics students on six occasions. I have recently supervised students on analysis projects for Grid Data Management, on the ZEUS experiment, based at DESY, and on the ATLAS experiment, based at CERN. Most recently a 4th year honours course on "Elementary Particles" was presented (with very good feedback from students). An honours project on the statistical analysis techniques required for Higgs discovery at the LHC was also undertaken.

#### LECTURE COURSES

Optics (E1A), Magnetism (E1A), Cosmology (Ast1), Digital Microelectronics (MCA1), Sub-atomic Physics (P2), C Programming (P2), Classical and Quantum Waves (P2), Special Relativity (Ast2), Tutorials-Statistics/Electricity and Magnetism/Waves (P2), Tutorials-Waves/Optics/Diffraction (P2), Tutorials-Lasers/Circuits and Systems (P3H), High Energy Astrophysics (Ast3/4H), Numerical Methods (P3H), Radiation Detection (P4H), Elementary Particles (P4H), HERA Physics (postgraduate).



**POSTGRADUATE ROLES**

PhD Supervisor: 6 students on the ATLAS experiment	Oct. 05 - present
MSc Supervisor: 2 students on the ATLAS experiment	Oct. 04 - present
PhD Supervisor: 3 students on Grid Data Management	Oct. 01 - Mar. 10
PhD Supervisor: 6 students on the ZEUS experiment	Oct. 91 - Sep. 06
PhD Backup Supervisor: 7 students on the ATLAS experiment	Oct. 92 - present
PhD Backup Supervisor: 3 students on neutrino factory	Oct. 03 - present
IT MSc Supervisor: 3 students on computing projects	May 92 - Jun. 06
Tutor: RAL Summer School for Young High Energy Physicists	Sep. 99 - Sep. 01
	Sep. 92 - Sep. 94
External PhD Examiner: Lund, Madrid, UC Dublin, Birmingham (2), Brunel, Edinburgh (2), Imperial (2), Liverpool (3), Lancaster, Manchester (3), Oxford (2), QMUL (2), UCL (2)	Oct. 92 - present
Internal PhD Examiner: Glasgow (15)	Oct. 92 - present
IT MSc Examiner: Glasgow (2)	Jun. 94 - Jun. 97

I was appointed undergraduate external examiner at Birmingham University, reviewing and reporting on all aspects of their courses. I organised a highly successful School on LHC Physics in August 2009. I was appointed Chairman of the Scottish Universities Summer Schools in Physics (SUSSP) Organising Committee in March 2010, its 50th anniversary year. (This is a recognised charity, supporting 1-2 international summer schools per year). As SUPA Particle Physics Theme Leader, I undertook a comprehensive review of the postgraduate courses associated with the theme, in consultation with colleagues, resulting in a number of improvements.

As a lab head, I took measures to improve teaching methods by devising a new series of experiments, rewriting all scripts, introducing improved methods of practice in preparing demonstrators and introducing computer control into the laboratory. As a class head of engineers' classes and second year physics, I streamlined and integrated the presentation of the various courses and improved the tutorial systems. I have developed the use of computers in teaching within the department and contributed to various committees concerned with this development. I also contributed to the development of the Exploring the Cosmos course and served on the department's teaching and postgraduate prize committees. As organiser of the department open days, I expanded them to present information on physics and astronomy courses to prospective students as well as give them opportunities to have hands-on experience.

**ROLES**

Science (STEM) Ambassador, Scottish schools	Apr. 10 - present
Chairman, Scottish Universities Summers Schools in Physics (SUSSP)	Feb. 10 - present
External Examiner, Physics & Astronomy Undergraduate Programme (Birmingham)	Dec. 09 - present
Chairman, John Rutherglen Prize Committee (Glasgow, Lancs., Liv'pool, M'cr, Sheff.)	Apr. 08 - present
Member, School/Department of Physics & Astronomy Management Team	Oct. 07 - present
Co-Director, 65 <sup>th</sup> SUSSP Summer School on LHC Physics	Dec. 07 - Aug. 09
Co-Director, 57 <sup>th</sup> SUSSP Summer School on LHC Phenomenology	Apr. 01 - Aug. 03
Chairman, IT Strategy Committee	Oct. 01 - Mar. 08
Member, Teaching Committee	Oct. 98 - Sep. 00
Member, Committee on Educational Strategy and Resource (CESAR)	Oct. 98 - Sep. 99
Class head, P2 Physics Class	Oct. 98 - Sep. 00
Member, Postgraduate Prize Committee	Oct. 98 - Sep. 00
Class head, First-year Engineers' Physics Classes	Oct. 96 - Sep. 97
Member, Computing and IT Review Committees	May 92 - Mar. 08
Organiser, Departmental Open Days	Sep. 95 - Sep. 99
Member, Recruitment Committee	Sep. 95 - Sep. 99
Member, P1/P2 Staff-Student Committee	Oct. 91 - Sep. 00
Laboratory head, First-year Engineers' Physics Laboratory	May 91 - Sep. 96
Member, 42 <sup>nd</sup> SUSSP Summer School Organising Committee	Apr. 91 - Aug. 93
Demonstrator: P1, P2, EE1 and E1A laboratories	Oct. 90 - Sep. 00
Supervisor: P1, P2 and P3H supervision groups	Oct. 90 - Sep. 00

## PUBLICATIONS

Publications are in the field of experimental particle physics and associated Grid developments where collaborative papers are generally given alphabetical author listings. The context for such publications is reviewed in <http://inspirebeta.net/record/786211>.

Papers highlighted below are those where I played a significant role as part of a large collaboration. Workshop reports and proceedings are recognised by their limited authorship and are an acknowledged way of communicating within the field. In addition to the limited authorship papers [13-25], I wrote three of the ZEUS collaboration papers [44, 46, 53]. I was either physics coordinator or chairman during 1993-97 when the most widely cited ZEUS papers were produced (marked as *famous paper* with more than 250 citations). I coordinated and contributed significantly to the analyses described in [31, 37-39, 42, 52, 54, 55, 57, 58, 60, 62-66, 80-108, 110, 112, 113, 123, 138, 145, 184] as well as being on the ZEUS editorial boards for [41, 43, 47, 48, 50, 51, 59, 120, 122, 124, 133, 139, 143, 146, 149, 176, 209, 235].

I am currently deputy ATLAS Publications Committee Chairman charged with reviewing the recent notes and papers from ATLAS [276-321] and was on the editorial boards, playing a particularly significant role for [276, 277, 295, 301]. The output from the collaboration has increased by a factor four during this exciting year. I led UK Grid developments from 2001-08 resulting in various technical and computing science publications [322-333]. In addition, I also contributed to various ATLAS and other computing technical notes [334-342]. Future directions in the field in neutrinos and the linear collider are expressed in letters of intent proposals [343, 344]. My individual paper contribution to a total of more than 300 papers, as well as my research publication profile and influence has increased significantly in the past fifteen years.

## PUBLICATION PROFILE

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Publications	2	1	2	4	8	7	6	20	13	13	14	10
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Publications	17	8	16	15	19	16	15	18	10	24	21	64

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### WA69 Collaboration: R.J. Apsimon et al.

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 [8] 'Inclusive production of  $\eta^0$  mesons in  $\pi p$ ,  $Kp$  and  $\gamma p$  collisions at energies around 100GeV', Z. Phys. C54 (1992) 185-191.  
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- [330] 'Dynamic Data Replication in LCG 2008' C. Nicholson, D. G. Cameron, A. T. Doyle, A. P. Millar, K. Stockinger *Journal of Concurrency and Computation: Practice and Experience* Volume 20 Issue 3 (2008)
- [331] 'GridPP - The UK Grid for Particle Physics', D. Britton et al., UK e-Science All Hands Conference, Edinburgh, September 2008.
- [332] 'GridPP: the UK grid for particle physics', D. Britton et al, UK e-Science All Hands Conference, Phil. Trans. R. Soc. A June 28, 2009 367:2447-2457; doi:10.1098/rsta.2009.0036
- [333] 'Deploying a Resilient Grid for UK Particle Physics', D. Britton et al, GLAS-PPE/2009/03/

#### ATLAS-CONF notes

See <https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/CONFNOTES/> (more than 250 notes)

#### Technical Documents and Internal Notes

- [334] 'Housing metadata for the common physicist using a relational database', K. Merritt et al, presented at the Computing in High Energy Physics (CHEP) 2004 Conference, Interlaken, Switzerland.
- [335] 'The Comparator Toolkit Functional Specification', C. Collins-Tooth and A.T. Doyle, ATL-COM-SOFT-2005-002 <http://cdsweb.cern.ch/search.py?sysno=002508548CER> 20pp. GLAS-PPE/2005/11/
- [336] 'Report of the LHC Computing Grid Project RTAG 12: Collaborative Tools', S. Goldfarb et al, CERN-LCG-PEB-2005-07 <http://lcg.web.cern.ch/LCG/PEB/Documents/RTAG12-Report.doc> 58pp.
- [337] 'Unlucky for some: the thirteen cores use cases of HEP metadata', S. Hanlon et al., GridPP report, 19pp. GLAS-PPE/2005/03/
- [338] 'HEP metadata schema: experiments' experience', M. Burgon-Lyon et al., GridPP report 18pp. GLAS-PPE/2005/04/
- [339] 'Grid Data Management: Simulations of LCG 2008' A.T. Doyle, C. Nicholson, presented at the Computing in High Energy Physics (CHEP) 2006 Conference, Mumbai, India. GLAS-PPE/2006/04/
- [340] 'Integration of the ATLAS Tag Database with Data Management and Analysis Components', C. Nicholson, J. Cranshaw, A.T. Doyle, M. Kenyon, D. Malon, H. McGlone, presented at the Computing in High Energy Physics (CHEP) 2007 Conference, Victoria, Canada. GLAS-PPE/2007/12/
- [341] 'Sensitivity Studies using ttH at the LHC', A.T. Doyle, S. Ferrag, C. Wright, ATLAS-PHYS-PUB-2008, 15pp.
- [342] 'Particle Identification Efficiencies for the ATLFast Correctors Tool', S. Allwood-Spiers, C. Collins-Tooth, A.T. Doyle, S. Ferrag, G. Steele, C. Wright, M. Wright, ATL-COM-SOFT-2010-017, 41pp.

#### Proposals

- [343] 'Proposal for a programme of Neutrino Factory research and development', D. Rodger et al. UKNF-PROPOSAL-2003-09-07, Sep 2003, 80pp.
- [344] 'The International Large Detector: Letter of Intent', DESY 2009-87, 163pp.

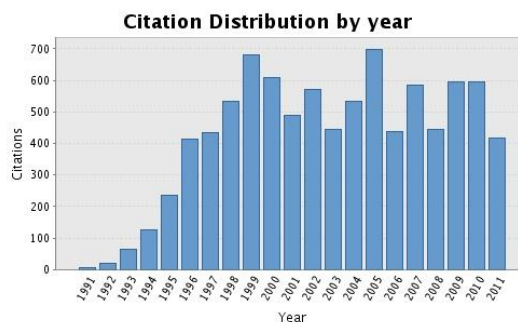
#### Editorial roles

- [345] 'Nuclear and particle physics', A.T. Doyle, I.J.D. MacGregor (editors), Conference proceedings, Glasgow, 1993, IOP conference series, 133.
- [346] 'Monte Carlo generators for HERA physics', A.T. Doyle, G. Grindhammer, G. Ingelman, H. Jung (editors), Workshop Proceedings, Hamburg, Germany, 1998-1999, DESY-PROC-1999-02.

**CITATION STATUS**

An INSPIRE/Web of Science citation analysis of my published papers is summarised below<sup>1</sup>.

<i>INSPIRE</i>		<i>Web of Science</i>	
Total eligible papers:	267	Total Articles in Publication List:	280
Total number of citations:	13813	Articles With Citation Data:	267
Average citations per paper:	51.7	Sum of the Times Cited:	8948
Famous papers (250-499 citations):	11	Average Citations per Article:	33.5
Very well-known papers (100-249):	28	h-index:	51
Well-known papers (50-99):	41		
Known papers (10-49):	126		
Less known papers (1-9):	52		
Unknown papers (0):	9		
h-index:	64		



Note that INSPIRE is more complete than Web of Science w.r.t. citations data in particle physics.

**RECENT GRANTS**

Grants are in the fields of experimental particle physics research and Grid development. I am principal investigator for various multi-million pound grants from the EU, SFC and STFC. My individual written contributions to these grant submissions, as well as my input to the proposed work, has increased significantly in the past ten years.

- [A] EU Framework VII Award (2010): "EGI: European Grid Infrastructure", £150,833. 4 years. Co-Investigator with Prof. D. Britton.
- [B] STFC Award (2010): "GridPP4: The UK Grid for Particle Physics", £1,005,944, 2 years. Co-Investigator with Prof. D. Britton.
- [C] STFC Award (2010): "Experimental Particle Physics", £4,131,261, 2+2 years. Principal Investigator.
- [D] STFC Award (2009): "Experimental Particle Physics", £1,585,307, 1 year. Principal Investigator. Personal contribution to the ATLAS, ILC, neutrino factory and computing programmes.
- [E] STFC Grid Award (2010): "GridPP Hardware Resources at the University of Glasgow", £394,200, 2 years, Principal Investigator with Prof. D. Britton.
- [F] STFC Grid Award (2010): "GridPP Resources at the University of Glasgow - Bridged funding from EGEE to GridPP4", £97,972, 11 months, Principal Investigator with Prof. D. Britton.
- [G] SFC Award (2010): "Scottish Universities Physics Alliance: SUPA LHC", £762,000 for PPE group from (£7,143,000) £47,574,000 (GU) total, 4 years, Co-Investigator/Particle Physics Theme Leader. Amounts subject to GU/SFC approval.
- [H] STFC Lambert Agreement Proposal (2008): "ATLAS Software Installation Tools", £20,000, 3 months Principal Investigator.
- [I] STFC Outreach Award (2008): "Big Bang Exhibition at the Glasgow Science Centre", £5,000, 3 months, Principal Investigator.
- [J] EU Framework VII Award (2008): "Enabling Grids for E-sciencE (EGEE-III)", £212,223, 2 years. Principal Investigator with Prof. D. Britton.
- [K] STFC Grid Proposal (2008): "GridPP Hardware Resources at the University of Glasgow", £428,900, 2 years. Principal Investigator with Prof. D. Britton.
- [L] STFC Lambert Agreement Award (2007): "ATLAS Software Installation Tools", £25,000, 4 months Principal Investigator.
- [M] STFC Senior Research Fellowship Award (2007): "STFC Senior Research Fellowship", £87,442, 3 years 7 months, Principal Investigator.
- [N] SFC Award (2007): "Proposal to Establish the Scottish Grid Service (ScotGrid) Project Team", £25,000, 6 months, Principal Investigator.
- [O] STFC Grid Award (2007): "GridPP Manpower Resources at the University of Glasgow", £1,798,058, 3 years 7 months. Principal Investigator with Prof. D. Britton.

<sup>1</sup> Citation data should be interpreted with care, see e.g. <http://arxiv.org/abs/physics/0701012>.

SPIRES generally contains more articles than Web of Science. The context is summarised in the Publications section. An author has an h-index of 50 if 50 of his papers have at least 50 citations each.

- [P] PPARC Grid Application (2006): "The UK Grid for Particle Physics (GridPP3)", £29.5m, 3 years 7 months. Principal Contact with Prof. D. Britton [new Project Leader] and Prof. S.L. Lloyd (QMUL).
- [Q] PPARC Rolling Grant Award (2006): "Experimental Particle Physics", £5,626,579, 3+2 years. Principal Investigator from April 2008: personal contribution to the ZEUS, ATLAS, neutrino factory and computing programmes.
- [R] PPARC e-Science Award (2007): "ATLAS Comparator (continuation)", £12,034, 3 months, Principal Investigator.
- [S] EU Framework VI Award (2006): "Enabling Grids for E-science (EGEE-II)", £112,244, 2 years. Principal Investigator.
- [T] SFC SUPA Award (2005) "SUPA Higgs Fellow", £144,360, 4 years, Principal Investigator.
- [U] SFC SRIF3 Award (2005) "Scottish Grid Service" (equipment), £800,000, 4 years, Principal Investigator.
- [V] PPARC e-Science Award (2004): "ATLAS Comparator", £120,730, 33 months, Principal Investigator with Prof. D.H. Saxon.
- [W] PPARC Rolling Grant Award (2004): "Experimental Particle Physics", £3,438,906, 2+2 years. Principal Investigator: Prof. D.H. Saxon: personal contribution to the ZEUS, ATLAS, neutrino factory and computing programmes.
- [X] EU Framework VI Award (2004): "Enabling Grids for E-science (EGEE-II)", £112,244, 24 months. Principal Investigator.
- [Y] PPARC Award (2004): "GridPP Project Leader", £261,054, 2/3rd salary, 3 years, with Prof. D.H. Saxon (Principal Investigator).
- [Z] PPARC Award (2004): "GridPP2: Grid Data Management", £153,602, 3 years, Principal Investigator with Prof. D.H. Saxon and Dr R. St Denis.
- [AA] PPARC Award (2004): "GridPP2: Grid Data Management", £451,988, 3 years, Principal Investigator with Prof. D.H. Saxon and Dr R. St Denis.
- [BB] PPARC Award (2004): "The UK Grid for Particle Physics (GridPP2)", £15.9m, 3 years, Principal Contact with Dr D. Britton (IC) and Prof. S.L. Lloyd (QMUL).
- [CC] PPARC Award (2003): "Tier-2 Coordinator", £25,082, 1 year, Principal Investigator with Prof. D. Saxon.
- [DD] PPARC Award (2001): "GridPP Project Leader", £270k, 4/5th salary, 3 years, with Prof. D.H. Saxon (Principal Investigator).
- [EE] PPARC UK Award (2001): "The UK Grid for Particle Physics (GridPP1)", £17m, 3 years, Principal Contact with Dr. S.L. Lloyd (QMUL).
- [FF] EPSRC Award (2001): "National e-Science Centre", £5.5m, 3 years, with Prof. R. Kenway (Principal Investigator), Dr. S. Anderson, Dr. A. Trew (Edinburgh), Prof. M. Calder.
- [GG] PPARC Award (2001): "Grid Data Management (EU DataGrid)", £74,511, 2 years RA salary, Principal Investigator with Profs. D.H. Saxon, M.P. Atkinson.
- [HH] PPARC Award (2001): "Grid Data Management (EU DataGrid)", £143,022, 3 years RA salary, Principal Investigator with Prof. D.H. Saxon.
- [II] JREI SHEFC Award (2001): "The LHC Computing Challenge for Scotland (ScotGrid)", £814,000, 3 years, Principal Investigator with Drs. S. Playfer, A. Trew (Edinburgh), Prof C. van Rijsbergen.
- [JJ] PPARC Senior Research Fellowship Award (2000): "Standard Model Physics and Beyond at HERA and LHC", £108,943, 3 years.

#### Grid Development: Funding Documents

- [I] JREI/SHEFC 'The LHC Computing Challenge for Scotland', approved December 2000: <http://ppewww.ph.gla.ac.uk/~doyle/JREI/ScotGrid.doc>
- [II] PPARC 'GridPP: The UK Grid for Particle Physics', (From Web to Grid), approved July 2001: <http://ppewww.ph.gla.ac.uk/~doyle/GridPP/GridPP.doc> (.htm)  
<http://ppewww.ph.gla.ac.uk/~doyle/GridPP/addendum.doc> (.htm)
- [III] EPSRC 'Proposal to establish the National UK e-Science Centre in Edinburgh', approved July 2001.
- [IV] PPARC 'GridPP: The UK Grid for Particle Physics' (From Prototype to Production), approved December 2003: <http://www.gridpp.ac.uk/docs/gridpp2/>
- [V] PPARC 'The Grid for LHC Exploitation', (approved December 2005): [http://www.gridpp.ac.uk/pmb/docs/LHC\\_Exploitation\\_Grid.doc](http://www.gridpp.ac.uk/pmb/docs/LHC_Exploitation_Grid.doc)
- [VI] PPARC 'GridPP: The UK Grid for Particle Physics' (From Production to Exploitation), approved December 2006: <http://www.gridpp.ac.uk/docs/gridpp3/>
- [VII] SFC 'Scottish Grid Service (ScotGrid)', EoI approved May 2006, proposal submitted August 2007: <http://www.scotgrid.ac.uk/phase2/SRDG/>
- [VIII] STFC 'GridPP4: The UK Grid for Particle Physics', (submitted February 2010, approved August 2010)