

CURRICULUM VITAE IAN SHIPSEY (2017)

Ian Shipsey

Henry-Moseley Centenary Professor of Experimental Physics, Head Sub Department of Particle Physics, Associate Head, Department of Physics, Professorial Fellow, St. Catherine's College, University of Oxford
The Denys Wilkinson Building, Keble Road, Oxford, OX1 3RH

Tel: +44 (0) 1865 273353 Ian.Shipsey@physics.ox.ac.uk Skype: Ian.Shipsey

<https://www2.physics.ox.ac.uk/contacts/people/shipsey>

Education:

Undergraduate:	Queen Mary, University of London	Honors Physics	B.Sc.	1982	
Graduate:	Edinburgh University	[CERN (NA31)]	Particle Physics	Ph.D.	1986

Appointments:

Julian Schwinger Distinguished Professor of Physics	Purdue University	2007-2013
Professor/ Associate/ Assistant	Purdue University	1990-2006
Research Assistant Professor/Research Associate	Syracuse University	1986-1989

Selected Honors (Research)

1. Fellow, American Association for the Advancement of Science (2012).
2. EPS Particle Physics Prize awarded to the NA31 Collaboration (2005) and CMS & ATLAS Collaborations (2013).
3. Fellow, American Physical Society (2002).
4. National Young Investigator (NYI) Award (U.S. National Science Foundation) (1992-1998). (1 of 2 in elementary particle physics in experiment and theory in 1992.)
5. Texas National Research Laboratory Superconducting Super Collider Fellow, (1993-1994). (1 of 12 in 1993).

Other Recognition for Research (partial list since 2000)

1. Member, ATLAS at LHC Advisory Committee to the Collaboration Board (2018-2019).
2. Spokesperson, LSST UK particle physics institutions (2014-) & LSST:UK work package leader for sensors.
3. Executive Director LSST Corp. elected (2017-21 & 2008-12); Chair, Advisory Board LSST Dark Energy Science Collaboration (DESC) (2015-17) & member DESC Spokesperson Nominations Committee (2016-17).
4. Member, LSST Corporation Operations Taskforce (2016-2017). The taskforce designed procedures to give 20 international partner nations (including U.K.) input to the scientific strategy and observing schedule of LSST.
5. Chair, Compact Muon Solenoid (CMS) Collaboration Board, LHC elected (2013-2014).
6. Co-Coordinator, (co-Leader) LHC Physics Center, Fermilab 2009-11, and re-elected (2011-13).
7. Principal organizer & founder CMS Data Analysis School (2010-2015) & CMS Detector School (2013-4).
8. Vice-Chair/Chair-elect/Chair/past-Chair Division of Particles & Fields, American Physical Society (2012-15).
9. Chair, five internal CMS analysis reviews including three presenting evidence for the Higgs Boson (2011-12).
10. Convener, CMS Quarkonia Group (2010).
11. Member, LSST Board of Directors (2010-2013) & Chair of the LSST Nominations Committee.
12. Co-Spokesperson (co-Leader) CLEO/CLEO-c Particle Physics Collaboration elected to 3 consecutive terms (2001- 2004).
13. Invited Lecturer (5 since 2015): XIV ICFA School, Cuba (2017), LHC School National Center for Physics, Pakistan (2017), INFIERI School Sao Paolo (2017) & U. Hamburg (2015), CERN-FNAL LHC Physics School (2016).
14. 12 Memorial and Named Lectures.
15. Level 4 manager (detector module assembly) LHC US CMS FPix. All modules were fabricated and electrically tested at Purdue in 2006-2007. (2002-2008).
16. Mechanical design, fabrication and assembly group leader: silicon detector for CLEO III (1994-2000).
17. Co-leader the CLEO-c Taskforce of the CLEO Collaboration (2000-2001).

Selected Honors (Education)

1. Honorary Life Member, Phi Eta Sigma National Freshman Student Honor Society (USA) (2010) & Alpha Lambda Delta National Student Society (USA) (2010).

2. Induction into “Purdue University Book of Great Teachers” (2004). (Approximately 300 faculty in the 148-year history of the university have received this honour.)
3. Life Fellow, the Purdue University Teaching Academy (1998). The Academy has approximately 300 fellows.
4. Charles B. Murphy Award for Outstanding Undergraduate Teaching (Purdue) (1998). (The highest undergraduate teaching award. Four awards are made annually. Purdue has approximately 2,200 faculty.
5. The Spira Award (Physics Professor of the Year) (1994); Top Ten Teacher, College of Science (2001).

Research Biography:

1. *ATLAS* (2015-): he designed and oversaw commissioning of Oxford’s new silicon detector fabrication facility OPMD that will construct 1/3 of the pixel modules for an ATLAS endcap pixel detector. He is Oxford ATLAS group leader. With his students, he is making measurements of the properties of the Higgs boson and using the Higgs as a probe for new physics. He will serve on the ATLAS Advisory Board to the Collaboration Board (2018-19).
2. *Large Synoptic Survey Telescope*: (2008-present) he initiated UK particle-physics LSST involvement, he has interfaced LSST with UK CCD camera vendor e2v, is work package leader for LSST:UK STFC PPRP funded CCD characterization, is spokesperson of the fledgling particle physics component of LSST:UK (9 institutions). He is an elected LSST Corp. Executive Director (2017-21; 08-12). He established a wave-front reconstruction research program with NOAO. He is Chair of the LSST DESC Advisory Board (2015-17). His science interest is measurement of dark energy via cosmic shear weak lensing tomography.
3. *Instrumentation*: (throughout career) for particle physics, cosmology & photon science: micro pattern gas & silicon-based detectors.
4. *Mu3e*: (2017-) he has initiated a new group at Oxford to search for lepton-flavour violation with the Mu3e experiment at PSI, & fabrication of novel ultra-low mass CMOS silicon sensor modules for the experiment.
5. *Photon Science*: (2016-) he has co-initiated a new collaboration (Oxford Physics, RAL and Open University) to develop CICADA a very high-speed hybrid pixel X-ray imaging system, optimised to operate at FEL facilities such as LCLS2 at SLAC to individually image X-ray diffraction patterns at intervals as short as 1 micro-second. He initiated Oxford membership in the Medipix4 Collaboration. This CERN-based initiative is a consortium of Universities and National Labs that are supporting the development of two novel radiation imaging systems providing significant advances in resolution, readout speed, and sensitivity to both energy and time. We are forming a cluster of interested departments at Oxford to take advantage of these systems. Currently this targets the following research: large area detectors and particle tracking in Physics, new detectors for electron microscopy in Materials Science, improvements in resolution for Time of Flight Mass Spectrometry in Chemistry, and work by the Luminescence Dating Laboratory in Archaeology.
6. *CLEO at the Cornell Electron Storage Ring* (1986-2012): he constructed key CLEO instrumentation including the muon detector and was a designer and fabrication manager of the CLEO-III silicon vertex detector. He made the most precise measurements of four of the nine quark couplings in nature, discovered $Y(5S)$ strange-beauty-meson production, pioneered studies of charmed baryons, and beauty-quark rare-decay searches. An intellectual leader and prominent proponent of CLEO-c/CESR-c, he played a crucial role in obtaining funding for the experiment and was elected three times co-Leader of CLEO/CLEO-c. Built on time and on budget, CLEO-c achieved its science objectives, opening a new frontier in the weak and strong interactions through per cent level experimental tests of Lattice QCD calculations of decay constants and form factors, producing over 100 referred journal publications in PRL & PRD.
7. *CMS at LHC*: (2001-15) as Quarkonia Convener he made the first LHC Upsilon cross-section measurement, an important test of non-perturbative QCD. He and his student observed Upsilon suppression in LHC heavy-ion collisions, a smoking gun of the long-sought Quark-Gluon Plasma. With his post docs he formed one of two CMS teams that observed strange-B-meson di-muon decay, a long-sought process with high-sensitivity to new physics. He was sensor-module production manager of the Forward-Pixel detector, a key CMS instrument. He was co-Leader, the LHC Physics Center (LPC), Fermilab (2009-12). Under his leadership, LPC became a jewel in CMS’s crown. Elected CMS Collaboration Board Chair (2013), he designed and established the CMS Data Analysis School and co-designed the CMS Instrumentation Upgrade School.

Selected Committees and Panels (25 US/international panels since 2003 representative examples include:)

1. Member, International Advisory Board Circular e+e- Collider, IHEP, Chinese Academy of Science, (2015-18).
2. Member, International Committee for Future Accelerators (IUPAP – ICFA) (2013-2015).

3. Chair, Coordinating Panel on Advanced Detector R&D, Division of Particles and Fields (APS) 2012-2017.
4. Chair, Electron Ion Collider Instrumentation Advisory Board BNL/TJNAL (2011), member (2012- 2017).
5. Member: Review Board of IHEP, Chinese Academy of Sciences (2018); JSPS Review Board, Kavli IPMU, Tokyo, (2012-2018); Science Policy Committee of the SLAC National Accelerator Laboratory Board of Overseers (2011-18); Higgs Centre Advisory Board, U. Edinburgh (2016-18); DOE & NSF High Energy Physics Advisory Panel (HEPAP) (2010-2014); DOE & NSF Particle Astrophysics Scientific Assessment Group (PASAG) (2009); Fermi National Accelerator Laboratory Program Advisory Committee (2007-2011); FNAL Board of Overseers (2012-13); Argonne National Laboratory Physical Sciences and Engineering Directorate (2011-13).
6. Chair, Panofsky Prize Committee, Division of Particles & Fields, American Physical Society (2004-06).

Presentations National/International Conferences/Meetings (60 since 2000 representative examples include):

1. “Future of Particle Physics”, summary plenary ICHEP2016 (Chicago), IPA2014 (London) & Snowmass (2013).
2. “Instrumentation in Particle Physics”, Future Circular Collider Workshop, Rome (2016).
3. “LSST and Particle Physics”, Particle Physics Advisory Panel (STFC) Community Meeting (2015 & 2014).
4. “The Next Three Years for CMS at the LHC”, summary plenary talk USCMS Annual Meeting (2012).
5. “The Search for the Higgs Boson and Dark Matter at the LHC”, QCD & Cosmology Moriond (2012).
6. “The Large Synoptic Survey Telescope CCD Design”, IEE2009, Dresden, Germany (2009).
7. “Leptonic and Semileptonic Decays from CLEO-c,” DPF2009, Detroit (2009).

Seminars & Colloquia at Universities and other Institutions (50 since 2000 representative examples include):

1. “The Large Synoptic Survey Telescope”, Glasgow University, (2016), Sheffield University (2017).
2. “The Future of Particle Physics”, JINR, Dubna (2017).
3. “The Discovery of a Higgs-Like Boson at the LHC”, National Centre for Physics, Islamabad (2017) and Tata Institute, Mumbai (2013).
4. “From Quarkonia to the Higgs”, Lawrence Berkeley National Laboratory (2011), Penn State University (2012).
5. “Physics at the LHC”, National Taiwan University (2012).
6. “Recent Results in Heavy Quark Physics at CLEO-c”, Fermi National Accelerator Laboratory (2010).

Publications: Shipsey has over 1,100 publications, most with CLEO and CMS, 19 with more than 500 cites. Total citations: 79,000+ h-index 138 (source: InSPIRE on 20, September, 2017).

Shipsey has written several authoritative reviews including: “*Charm Mixing and Rare Decays*” G. Burdman and I. Shipsey Ann. Rev. Nucl. Part. Sci. (2003) and “*Particle and Nuclear Physics Instrumentation and its broad connections*” D. Marteau, R. Lipton, H. Nicholson and I. Shipsey, Reviews of Modern Physics <https://journals.aps.org/rmp/pdf/10.1103/RevModPhys.88.045007> (2016).

He is noted for clear, effective communication to a wider audience: examples are several News and Views articles for Nature: “*Weighty Questions*” I. Shipsey, Nature 435 185-187 (2005), and “*Lattice Window on Strong Force*” I. Shipsey, Nature Vol. 427 12 February (2004).

Funding: (only largest representative grants listed).

PI of the Purdue Particle Physics Programme (2001-2013) \$21M U.S. DOE (shared with 12 co-Is).

PI of the Oxford Particle Physics Consolidated Grant (2015-2019) £7.3M (80% value) STFC (shared with 23 co-Is).

Service to Particle Physics: As Chair, Division of Particles and Fields of the American Physical Society Shipsey co-designed the year-long U.S. community study “*Planning the Future of U.S. Particle Physics (Snowmass 2013)*” <https://arxiv.org/abs/1401.6075> . This was primary input to the DOE/NSF P5 Report. Shipsey summarized the study closing the process in August, 2013. His ICHEP 2016 plenary summary was on the same theme: “*Vision and Outlook: The Future of Particle Physics*” <https://arxiv.org/abs/1707.03711> & [PoS\(ICHEP2016\)037](https://arxiv.org/abs/1707.03711) .

Conference Organization: Member, IAC or principal organizer of 35 conferences and workshops since 2000. Representative recent examples include: Co-Chair 1st LSST DESC collaboration meeting outside the US, Oxford (2016), Chair 1st “LHC SEARCH for New Physics” conference in series outside the US, Oxford (2016); co-Chair “Quantum Sensors for Particle Physics”, Argonne National Laboratory (2017); co-Chair “Technologies for Discovery II”, Caltech (2016).

Peer Reviewer: Phys. Lett. B., Phys. Rev. Lett. & D, JINST, Nucl. Inst. & Meth., U.S. DOE, U.S. NSF, IEEE, McGraw-Hill, EU, STFC, Royal Society, Government Research Agencies: Netherlands, Canada and Japan.

Contributions to Undergraduate Education:

1. Total Undergraduate student research projects supervised: 30.
2. Co-founder (1998-2000) US National Science Foundation Summer Research Experience for Undergraduates in Physics at Purdue University. The programme continues to this day.
3. “*Introductory Astronomy- A Laboratory Manual*” 6th Edition McGraw-Hill ISBN 0-07-353949-X (2005).
4. 17 years of experience lecturing large format and small format semester-long classes in physics and astrophysics.

Contributions to Graduate Education: (MS : 1) (Ph.D. : 15) **Total Postdoctoral Scholars Supervised:** 12

Current: 4 Oxford DPhil students, 2 Oxford post docs

External Education Committees: Member, Committee on Postgraduate Physics Education in Scotland, (2009). Ph.D. Opponent, Lund, Sweden (2010) and Edinburgh (2014).

Outreach Activities: Extensive physics outreach to K-12 including presentations in schools, in conjunction with registered charities to children at risk, at undergraduate research conferences and the public (prior to 2014 US, now mostly UK); NASA Minority Undergraduate Student Training Mentor (2009-10).

Ian is profoundly deaf. He has given over 90 colloquia (at most of the top 50 US universities) and talks to the public on hearing, cochlear implants and perception since the miracle of a cochlear implant restored his hearing. A recent example is here: <https://podcasts.ox.ac.uk/bionic-hearing-science-and-experience>

University Service (Purdue): A. Department of Physics: Principal Investigator, U.S. DOE High Energy Physics Award, Purdue University, supporting research in particle physics & astrophysics of 15 Purdue PIs and 40 personnel (2002-12); Chair, Head of the Department of Physics Search Committee (2008); 5 Physics Faculty Hiring Committees (2001-2011) & 7 Faculty Promotions Committees (2001-2011). **B. College of Science:** College of Science faculty promotions committee (2007-11); Committee to Hire Distinguished Professors (2008), Chair, Distinguished Professors Promotion Review Committee, (2007). **University:** Faculty Compensation and Benefits Committee, (2005-2010); President’s Advisory Council on Disabilities (2004-11). Science-scape: a summer camp for girls entering the 7th, 8th, and 9th grades designed to increase the participation of women in the physical sciences.

University Service Oxford University (2013-2017): A. Sub-department of Particle Physics: Chosen by my new academic colleagues to be Head of the Sub Department (HoSD) of Particle Physics (28 Academics) since 8/14 and to be PI and coordinator of Oxford Particle Physics Consolidated Grant 2015-19: £8M (awarded 8/15, supports 18 academics). *As HoSD (partial list of activities):* established the Kavli Institute for the Physics and Mathematics of the Universe, University of Tokyo Oxford DPhil Scholarship (fully funded by the University of Tokyo and so far supporting eight DPhil students working in particle physics and astrophysics); co-established the JINR Dubna Oxford DPhil Scholarship (one co-funded student admitted 2017/18); developed a donor relationship that led to the creation in perpetuity of 1 fully-funded DPhil scholarship for an overseas student, introduced earlier recruitment of RS URF and STFC Rutherford Fellowships resulting in a larger (x3-5) pool of candidates and consequently a more rigorous internal competition for the selection (Oxford was awarded two PP RS URFs in 2017 (up from zero) and 1 STFC Rutherford in 2016 to match 1 already held); organized a set of interdisciplinary meetings between the sub-departments of astrophysics, particle physics and theory in 2014, that led to the development of whitepapers that formed the basis for the developing Oxford PP strategic plan through 2030; established the PP Advisory Board (PPAB) consisting of nine leading particle physicists from the US, Europe, China, and Japan (the PPAB have been an effective sounding board giving valuable advice on the strategic direction of the Sub-department); expanded the recruitment and increased the average number of PP graduate students per year over the past three years by 40% to an average of 18; introduced new prizes to recognize achievement in research among graduate students; introduced the Particle Physics Christmas Lecture for alumni and friends of the Physics Department; introduced the Graduate Student Research Symposium (2017); commissioned reviews of the graduate particle physics curriculum that led to significant modernization. Created the PP Outreach Committee that has significantly increased outreach activities in

the Sub-Department. (Activities are Coordinated with Oxford Physics Outreach). Created the PP Alumni committee.

B. Department of Physics: Chair, Gongs Committee (2016-present), member (2014-15). Chair, Cost Recovered Services Committee (2016-17). Chair, Technical Services Committee (from 2018). Represented Physics at the 2015 Recognition of Distinction exercise. Chair, Instrumentation Facilities Working Group (IFWG) 2015-present. The IFWG is producing a strategic vision for the DWB in the 2020's. Part I concerns DWB Level 3: the reorganization of some SRF and laboratory space and renovation of the high-bay laboratory (The Heavy Lab). The plan was endorsed by PMC, Capital Steering Group (CSG) funds were awarded for the bulk of the plan and the Heavy Lab renovation is currently in the construction phase. The renovated Heavy Lab will be available to any academic across the Department that needs a large clean environment to bid, and succeed in gaining funding, for the assembly of large scale instrumentation. Part II proposes the creation of a new laboratory for dark matter and neutrino physics instrumentation by reconfiguring existing laboratory space on Level 5 of DWB. A draft proposal and design has been developed. Following input from a structural engineer, the proposal will be submitted to the CSG in 2018. Part III which is still in the early stages of development introduces the concept of renovating part of DWB Level 4 to become bookable highly quality meeting space (a crucible) for use by experimentalists and theorists from across the department: academics, postdocs and students, and engineers to develop new research ideas and proposals to fund them. Part IV which is also still in the early stages of development starts by noting that there has been impressive progress in the past two decades in our ability to measure magnetic fields very precisely with, for example, SQUIDS and small accelerations with optical and atom interferometers. The pace is quickening, advances in quantum metrology/sensing with, for example SC qubits and ion traps, have benefitted from significant investments and rapid developments in quantum information science. These advances enable new possibilities for 'small-scale on a table top' experiments to investigate novel fundamental particles and their interactions. A research programme is rapidly gaining in scale and momentum in the U.S. but this type of work is almost absent in the U.K. Space has been identified on Level 4 of DWB and discussions are being held by John Wheeler and Shipsey with the STFC and with potential partner institutions about funding a centre hosted by Oxford Physics. An early version of these ideas was discussed at the 2017 Away Day. A taskforce (a subgroup of the IFWG) has been put in place to develop the case and will begin work in earnest in 2018. The case will be presented to PMC and the Research Forum in 2018. Finally, Ferreria, Wheeler and Shipsey established the Oxford Fundamental Physics Colloquium series in Michaelmas 2017. Through a series of talks from invited speakers, opportunities are provided to discuss some of the most recent developments in both theoretical and experimental physics with a particular focus on the interplay between the two in probing the laws of nature. It is hoped that these talks will be of broad interest and catalyze conversations across the whole department.