Professor Kenway Montgomery Smith

Foreign Member of the Lithuanian Academy of Sciences since 2003

Professor Kenway Smith is an Honorary Senior Research Fellow in the School of Physics and Astronomy, University of Glasgow.

Date of Birth: 04-07-1940
Qualifications: B.Sc., Ph.D. (both Glasgow)
Brief Details of Previous Appointments:
Date of First Appointment to the University of Glasgow: October 1962,
Assistant Lecturer 1962-1965,
Lecturer 1965-1976,
Senior Lecturer 1976-1988,
Reader 1988-1991,
Professor of Physics, since 1991 (all Glasgow),
CERN Associate (CERN, Geneva) 1989-1990
Visiting Professor, University of Guelph, Ontario, Jan.-April, 1976
Membership of Learned Societies, Professional Bodies, etc.: FRSE, F.Inst.P., C.Phys.
Projects led: ATLAS, XIMAGE (E.U.), IMPACT (Technology Foresight)
Current Teaching Responsibilities: Departmental co-ordinator of physics component of IBLS Level 3 B.Sc. (Biotechnology) course and lectures on energy resources, EXCOS (Cosmology and Particle Physics), E.M.Waves (3H M.Sci.), High Energy Astrophysics (4H M.Sci.), 3H supervisions (P.&E.E. – 2 groups), Hons.Lab. Demonstrating, member of Hons. Exam. Committee
Current University and Faculty Responsibilities: Member of Senate and Science Faculty
The Royal Society of Edinburgh, 1996
Number of Publications in the Past Five Years: 89
Research Interests: Experimental Particle Physics, Detector Development
Research history:

Following completion in 1965 of my Ph.D. thesis on low energy beta decay phenomena, (electron capture and higher order processes), I joined a group led by Professor John

Rutherglen in investigations of polarisation effects in high energy electron and photon interactions at the NINA 4GeV electron synchrotron. By 1968, the centre of activity in UK high energy physics shifted to the European centre, CERN, where I was able to spend a sabbatical year as a member of a team led by Dr. John Thresher. Stimulated by the discovery of parity violation in nuclear beta decay and by the recently observed violation of the combined CP symmetry in neutral K meson decay, the team investigated other discrete symmetry transformations through charged K meson decays. Sensitive limits to violations of the charge-conjugation and time-reversal symmetries were set by this and related experiments.

In the early 1970's, the Glasgow group's programme of research at CERN evolved into studies of unstable resonant states, based on experiments at the Omega multi-particle spectrometer. The development of the quark model of meson and baryon resonances led to predictions of more exotic particles and the need for more comprehensive detection systems, of which the Omega spectrometer was one of the earliest and most successful. The discovery in 1974 of evidence for the 'charmed' quark stimulated an investigation with this spectrometer of its production properties, using a specially constructed beam of high energy photons. The Glasgow group made significant contributions to this investigation, both in building the experiment and in analysing the data collected.

The 1980's saw the emergence of colliding beam accelerators as the most effective way of raising the available energy in particle collisions to the level where new phenomena could be uncovered. Part of the Glasgow group moved its activities from CERN to the electron storage ring accelerator PETRA, located at the DESY laboratory in Hamburg. The experimental programme there was successful in revealing the nature of the sub-structure of the photon when probed at high four-momentum transfer, through gamma-gamma scattering processes.

During the 1980's, the emphasis in high energy physics moved from unstable resonances to quarks and gluons and, with the construction of the LEP colliding beam accelerator at CERN, we were able to participate as part of the ALEPH collaboration. Initially under the leadership of Professor Ian Hughes, construction was undertaken in Glasgow of ALEPH electromagnetic calorimeter modules. This was perhaps the most ambitious project yet undertaken by the group, both in magnitude and because of the time constraints. With the appointment of Professor Hughes as Head of Department, I assumed the leadership of the Glasgow ALEPH group and responsibility for the construction programme. Installation of the apparatus was successfully completed on time, early in 1989. The LEP machine turned on in August, 1989, and has taken data with improved efficiency and higher rates through the succeeding years, providing a magnificent collection of experimental analyses which underpin the success of the Standard Model of elementary particle interactions. I feel privileged to have participated in such an enterprise, and to have contributed even in a small way to this success.

My research contributions have tended to be more concentrated on the development of experimental techniques and apparatus, requiring familiarity with very high voltage, ultra-short pulse techniques, high speed electronics, high powered UV laser technology and, more recently, semiconductor technology. The latter development has taken maximal advantage of the close collaboration and support facilities offered by our colleagues of the Department of Electrical and Electronic Engineering, providing 'in-house' detector design and fabrication capabilities. Initially our work was concerned with the possible use of GaAs semiconductor particle detectors for applications as radiation hard, high speed sensors at the new, Large Hadron Collider accelerator, now under construction at CERN. As part of the ATLAS collaboration which is preparing for physics at the LHC, the Glasgow group is participating in the construction of the forward semiconductor microstrip detectors for the inner tracker. A comprehensive investigation of the radiation hardness properties of prototype GaAs detectors by the RD8 collaboration, of which I was co-spokesman, forced us to conclude that these should not be used, in the end, for LHC tracking, so we are now concentrating on silicon microstrip detectors instead.

Nevertheless, GaAs offers substantial benefits in a range of X-ray imaging applications, and our development work on these detectors continues. In particular, we were members of an EU Brite-Euram project, XIMAGE, which sought to develop next generation digital X-ray imagers for dentistry, and of a UK Technology Foresight project, IMPACT, which aimed at large area pixel detectors for applications such as protein crystallography at synchrotron radiation sources. We are founder members of the CERN-supported MEDIPIX collaboration which seeks to develop semiconductor pixel detectors for non-HEP applications, exploiting the read-out electronics developed by the CERN Microelectronics Group, and have recently obtained EU support for the "3D-RID" proposal, the development of so-called "3-D" detectors, based on an idea of Professor Sherwood Parker in the U.S. (Prototypes of these have already been shown by Parker and colleagues to offer enhanced lifetimes in high radiation environments and lower operating voltages.) In Glasgow the Detector Development Group, which I lead, continues to be active also in research towards understanding and enhancing radiation-hardness in semiconductor detectors, either through "defect engineering", (within the RD48 "ROSE" collaboration), cryogenic operation, (within the RD39 collaboration investigating the "Lazarus Effect"), or through the use of new materials such as SiC or GaN.

Responsibilities:

In addition to my local responsibilities for Detector Development within the Experimental Particle Physics Group, and as co-holder of our Rolling Grant from the UK PPARC funding agency, I am presently Chairman of the ATLAS Inner Detector Institute Board and Deputy Chairman of the ATLAS Collaboration Board.

I am at present a member of the UK Particle Physics Experiments Selection Panel and have served previously on the UK Particle Physics Grants Sub-Committee and as Chairman of the ATLAS UK Collaboration Board and UK Semiconductor Tracker Management Committee.

As well as acting as co-spokesman of the international RD8 (GaAs) collaboration, I co-ordinated an EU Human Capital and Mobility project to develop GaAs detectors, with INTAS and PECO extensions involving colleagues in Protvino and Tomsk, in the former case, and Vilnius and Prague in the latter. The most recently funded EU project (3D-RID) mentioned above will strengthen the successful links which already exist with Prague, and Royal Society support will enable us to continue to work closely with the Vilnius groups.

The information is based on a personal file and http://www.ppe.gla.ac.uk/~smith/
Photo – http://atlasexperiment.org/photos/portraits-2.html
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