

Present Position: Emeritus and Research Professor (since 2003), School of Physics and Astronomy, University of Leeds

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Date of Birth: 26 September 1938 (Edinburgh, Scotland)

Education: University of Edinburgh: BSc (1st Class Honours in Physics) 1960

PhD: Physics of Condensation of Water Vapour 1964

Principal Research Interests

Ultra-high energy cosmic rays, ultra-high energy gamma-rays and high-energy astrophysics

I was a leading member of the UK Extensive Air Shower project at Haverah Park from 1964 until its closure in the early 1990s. This project led to the best estimates of the energy spectrum, mass composition and arrival direction distribution of cosmic rays available at that time and was regarded as the premier project in the field for about 15 years.

I then became the UK Principal Investigator for a project carried out at the South Pole, jointly with collaborators from the University of Delaware, USA, which ran from 1987 to 1994. Initially the aim of this work was to look for gamma-rays from the supernova, SN1987A, but it broadened through collaboration with an early phase of the IceCube neutrino project (AMANDA) targeted at the mass composition of cosmic rays above 10^{14} eV.

In 1991 I initiated, with the Nobel Laureate Professor Jim Cronin (University of Chicago), the concept of a huge cosmic-ray observatory, the Pierre Auger Observatory. Based in Argentina, it is now an international collaboration of about 400 scientists from 16 countries. Measurements of unprecedented accuracy are being made at this Observatory which is dedicated to the study of cosmic rays above 10^{18} eV. The Auger Observatory is regarded as an excellent example of international cooperation in this field: I was co-spokesperson and spokesperson for this project for two periods each of 6 years and have an emeritus spokesperson since 2007.

While on sabbatical at the Whipple Observatory in 1994, I played a key role in the discovery of flaring of Markarian 421 in TeV gamma rays.

I remain research active through collaborations with Auger colleagues at the Universities Granada and Santiago de Compostela. The main focus of my current work is on the question of the mass of cosmic rays at the highest energies and on the measuring parameters related to hadronic physics. I have supervised about 40 PhD students over my career.

Ten Selected Publications (from over ~300) selected to give some idea of the breadth my interests

1. A A Watson and J G Wilson, "Fluctuation Studies of Large Air Showers: the composition of primary cosmic ray particles above 10^{18} eV", *J Phys A* **7**, 1199 (1974)
2. T K Gaisser et al., "Search for photons of energy > 50 TeV from SN1987A in early 1988", *Phys Rev Letters* **62**, 1425 (1989)
3. M A Lawrence, R J O Reid and A A Watson, "The Cosmic Ray Energy Spectrum above 4×10^{17} eV as measured with the Haverah Park Array," *J Phys G* **17**, 733 (1991)
4. A D Kerrick et al. [The Whipple Telescope Collaboration] "Outburst of TeV photons from Markarian 421," *Astrophys. J. Letters* **438**, L59 (1995)
5. Nagano M and Watson A A, 'Observations and Implications of the Ultra-High Energy Cosmic Rays', *Reviews of Modern Physics* **2** 689 2000
6. M Ave, N Busca, A V Olinto, A A Watson and T Yamamoto "Cosmogenic Neutrinos from ultra-high energy nuclei" *Astroparticle Physics* **23** 19 2005
7. J Abraham et al. [Pierre Auger Collaboration], "Evidence for the suppression of the flux of cosmic rays above 4×10^{19} eV" *Physical Review Letters* **101** 061101 (2008)
8. J Abraham et al. [Pierre Auger Collaboration], "Measurement of the Depth of Maximum of Extensive Air Showers above 10^{18} eV" *Physical Review Letters* **104** 09101 (2010)
9. P Abreu et al. [Pierre Auger Collaboration], "Measurement of the proton -air cross-section at $\sqrt{s} = 57$ TeV", *Physical Review Letters* **109**: 0620, 2012
10. A Aab et al [Pierre Auger Collaboration] "Observation of large scale anisotropy in the arrival directions of cosmic rays above 8×10^{18} eV" *Science* **357** 1266 (2017)

Research Recognition since 1998

- 2014 – 2016: Visiting Professor at the University of Durham, UK
- 2011 Cormac O’Ceallaigh Medal awarded by IUPAP Cosmic Ray Commission
Faraday Gold Medal of UK Institute of Physics
- 2011 - 2012: Leverhulme Emeritus Fellowship
- 2010 - 2017: Honorary Professor, University of Edinburgh
- 2009 Honorary Degree, ‘Doutor Honaris Causa’, University of Santiago de Compostela, Spain
- 2008 Sarojini Damodaran International Fellowship to visit India, December 2008 (2 weeks)
- 2007 - Spokesperson Emeritus for Pierre Auger Observatory
- 2003 – 2008: Affiliate of the Kavli Institute of Cosmological Physics, University of Chicago
- 2004 Visiting Scientist at University of Santiago de Compostela (support from Junta de Galicia)
- 2002 Distinguished Visiting Professor, University of Chicago: September to December 2002
- 2001-2007: Spokesperson for the Pierre Auger Observatory
- 2001 PPARC Senior Research Fellow: January 2001 to September 2003
- 2000 Elected Fellow of the Royal Society of London, FRS
- 1999 Royal Society Exchange Visitor to Mexico (2 weeks)
- 1998 Elected Fellow of the Institute of Physics (FInstP)

Some Invited Lectures:

- 2016 Niels Bohr Lecture at Niels Bohr Institute, Copenhagen, September
Invited lecture on History of Cosmic Rays, University of Granada, October
- 2014 Frohlich Colloquium at University of Liverpool, February
- 2012 Invited Speaker at American Physical Society meeting, “100 Years of Cosmic Rays”, March
Janossy-Marx Lecture at Eotvos University, Budapest, May
Invited speaker at Hess Centenary Conference in Berlin, August
Invited Public Lecture at University of Alberta, September
Jentschke Lecture at DESY, Hamburg, October
Invited Speaker at APS Meeting in Atlanta, USA, March
- 2008 Lecture at Inauguration of Kepler Centre for Astro- and Particle Physics, Tubingen,
Hoxton Lecture at University of Virginia, USA, April
George Darwin Lecturer, Royal Astronomical Society, London, October
Manne Siegbahn Lecture, Alba Nova, University of Stockholm, Sweden, October
Homi Bhabha Centenary Public Lecture, Ootacamund, Tamil Nadu, India, December
- 2007 Invited Speaker at Symposium to honour Livio Scarsi and Beppe Occhialini, Palermo, October
- 2005 Invited Speaker at Centenary Celebration for Bruno Rossi: Padova and Venice, September
- 2002 Evening Discourse at the Royal Institution London: March
- 2001 Invited speaker at Heisenberg Centennial Meeting, Munich,
- 2000 Elizabeth Spreadbury Lecture, University College London: February

Recent Media Appearances

- September 2016: ‘Last Word’ (on J W Cronin) BBC Radio 4
- May 2013: Guest on Melvyn Bragg’s ‘In Our Time’, BBC Radio 4
- February 2013: Guest on Jim Al-Khalili’s ‘Life Scientific’, BBC Radio

Administrative Activities associated with research

Numerous national committees in area of astronomy (Gravitational Waves, radio astronomy, X-ray astronomy and optical astronomy). Having to get my research funds mainly from the astronomy budget line, but never having sought any telescope time, led to me being seen as an informed neutral/honest broker. For example I chaired the German-UK panel that led to the gravity wave project, GEO600, (following the success of LIGO this is an achievement that gives me particular satisfaction) and was on many committees concerned with the gravity wave program and several developments in X-ray astronomy, including XMM.

International committees: APPEC in Europe; CPAN in Spain; Institute of Theoretical Physics, Granada; ESA for Fundamental Physics and JEM-EUSO; Japan for JEM-EUSO project and major (six yearly) review of ICRC in Tokyo. Member of Advisory Board of School of Cosmic Physics 2011- 2021. Member of numerous international advisory committees for conferences. Member of IUPAP Cosmic Ray Commission (1987 – 1991)