

# CURRICULUM VITAE

Steven Jay Schwartz

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## Personal Record

### PERSONAL DATA

Born:	15 September 1951	Warren, PA, USA	
Citizenship:	Dual UK/USA	Residency:	UK
Sex:	Male	Marital Status:	Married
Office Address:	Space and Atmospheric Physics, Imperial College London, London SW7 2AZ UK		The Blackett Laboratory South Kensington,
Office Telephone:	020-7594 7660	Fax:	020 7594 7772
Email:	s.schwartz@imperial.ac.uk		

### FURTHER EDUCATION

1969-1973	Cornell University, Ithaca, NY
1973-1977	Cambridge University, Cambridge, UK

### QUALIFICATIONS and DISTINCTIONS

1972	Tau Beta Pi National Science and Engineering Honorary Society
1973	Phi Kappa Phi National Honorary Society
1973	B.Sc. Engineering Physics "with distinction"
1973-76	Winston Churchill Scholar, Churchill College, Cambridge
1977	Ph.D. Applied Mathematics and Theoretical Physics, Cambridge
1982-83	Nuffield Foundation Science Research Fellow
2006	Chapman Medal of the Royal Astronomical Society

### PROFESSIONAL BODIES

Fellow	Royal Astronomical Society
Member	American Geophysical Union
Member	International Astronomical Union
Fellow	Institute of Physics

### VISITING RESEARCH APPOINTMENTS

1979,82,84	Senior Visiting Scientist, Los Alamos National Laboratory
1981,82	Astronome-adjoint, Observatoire de Paris, Meudon, France
1983	Visiting Scientist, Max-Planck-Institut für Aeronomie, Lindau, FRG
1998	Sabbatical year at Centre d'Etude Spatiale des Rayonnement, CNRS, Toulouse, France

### APPOINTMENTS

1977-79	SERC Postdoctoral Research Assistant, Queen Mary College
1979	Temporary Lecturer, Applied Mathematics, Queen Mary College
1979-1987	Lecturer, School of Mathematical Sciences, Queen Mary College
1987-1994	Reader in Space Science, Queen Mary and Westfield College
1994-2004	Professor of Space Plasma Physics, Queen Mary, University of London
2005-	Professor of Space Physics, Imperial College London
2009-	Head, Space & Atmospheric Physics, Imperial College London

## Research Highlights

- Refutation of the wide-spread belief that **cosmic rays** trapped by self-excited turbulence within a supernova remnant cooled irreversibly as the remnant expands.
- Examination of internal energy redistribution within the **solar wind**, and related aspects of solar wind microphysics.
- Combined theoretical, observational and simulational attack on the origin of energetic ion beams upstream of the **Earth's bow shock**, and subsequently on the internal structure and particle dynamics of such shocks.
- Important large survey, with accompanying theoretical analysis, of the detailed electron dynamics and inferred potential structure at **collisionless shocks**.
- Unique studies identifying **slow mode shocks** in the deep geomagnetic tail, providing best direct evidence to date of fast (Petschek) magnetic reconnection, a process invoked in a variety of plasma environments, from terrestrial laboratory experiments through solar flares to exotic astrophysical sites.
- Comprehensive studies on the properties and energy transport efficiency of general **magneto-acoustic-gravity modes** in the solar atmosphere.
- Discovery of a new class of explosive events, now termed **Hot Flow Anomalies**, and correct initial interpretation as the interaction of an interplanetary current sheet with the Earth's bow shock. Elucidation of the essential theoretical ideas, further case studies, and statistics followed.
- A coherent theoretical/observational approach to "**quasi-parallel**" **collisionless shocks**. Major results include:
  - The fundamental role played by two/three dimensional structures we have termed **SLAMS**.
  - The natural manner in which such shocks accelerate particles out of the thermal population, thereby providing the necessary intermediate "seed" population required by cosmic ray **Fermi acceleration** theories.
- Comprehensive study of **mirror modes** as found in the Earth's magnetosheath, including kinetic observational signatures and theoretical analysis of both electron and ion response.
- Major role in the ESA **CLUSTER space mission**, including UK Project Scientist for the UK Cluster Science Centre, Co-Investigator for the PEACE electron instrumentation, CIS ion instrument and FGM magnetometer, and central participation in ESA's Cluster Science Data System activities.
- First direct measurement of the propagation of a crack in the surface of a neutron star during a **magnetar** "star-quake" through novel use of the Cluster electron data.
- Lead proposer and current ESA Science Study Team Co-Chair for **Cross-Scale** candidate European Space Agency Cosmic Vision mission. Cross-Scale successfully proceeded to its Assessment Study phase in 2008.

## Selected Publications

### *Cosmic Rays*

**Schwartz, SJ** and J Skilling: The escape of cosmic rays from supernova remnants: Are adiabatic losses inevitable?, **Astron. Astrophys.**, **70**, 607-616, 1978.

### *Electron Heating at Collisionless Shocks*

**Schwartz, SJ**, MF Thomsen, SJ Bame, and J Stansberry: Electron heating and the potential jump across fast mode shocks, **J. Geophys. Res.**, **93**, 12923-12931, 1988.

### *Quasi-parallel Shocks and "SLAMS"*

**Schwartz, SJ**, and D Burgess: Quasi-parallel shocks: A patchwork of three-dimensional structures, **Geophys. Res. Lett.**, **18**, 373-376, 1991.

**Schwartz, SJ**, D Burgess, WP Wilkinson, RL Kessel, M Dunlop, and H Lühr, Observations of Short Large-Amplitude Magnetic Structures at a quasi-parallel shock, **J. Geophys. Res.**, **97**, 4209-4227, 1992.

Giacalone, J, D Burgess, **SJ Schwartz**, and DC Ellison: Ion injection and acceleration at parallel shocks: Comparisons of self-consistent plasma simulations with existing theories, **Astrophys. J**, **402**, 550-559, 1993.

Giacalone, J, **SJ Schwartz**, and D Burgess: Observations of suprathermal ions in association with SLAMS, **Geophys. Res. Lett.**, **20**, 149-152, 1993.

### *"Hot Flow Anomalies"*

**Schwartz, SJ**, CP Chaloner, PJ Christiansen, AJ Coates, DS Hall, AD Johnstone, MP Gough, AJ Norris, RP Rijnbeek, DJ Southwood and LJC Woolliscroft: An active current sheet in the solar wind, **Nature**, **318**, 269-271, 1985.

**Schwartz, SJ**, G Paschmann, N Sckopke, TM Bauer, M Dunlop, AN Fazakerley, MF Thomsen, Conditions for the formation of hot flow anomalies at Earth's bow shock, **J. Geophys. Res.**, **105**, 12639-12650, 2000.

Sibeck, DG, NL Borodkova, **SJ Schwartz**, et al, Comprehensive study of the magnetospheric response to a hot flow anomaly, **J. Geophys. Res.**, **104**, 4577-4593, 1999.

### *Solar Atmosphere and Solar Wind*

**Schwartz, SJ**: Plasma instabilities in the solar wind: A theoretical review, **Rev. Geophys. Sp. Phys.**, **18**, 313-322, 1980.

**Schwartz, SJ**, PS Cally and N Bel: Chromospheric and coronal Alfvénic oscillations in non-vertical magnetic fields, **Solar Physics**, **92**, 81-98, 1984.

**Schwartz, SJ** and E Marsch: *The radial evolution of a single solar wind plasma parcel*, **J. Geophys. Res.**, **88**, 9919-9932, 1983.

### *Magnetars*

**Schwartz, SJ**, S Zane, RJ Wilson, et al., The gamma-ray giant flare from SGR1806-20: Evidence for crustal cracking via initial timescales, **Astrophys. J. Lett.**, **627**, L129-L132, 2005.

### *Terrestrial Magnetosheath*

**Schwartz, SJ**, D Burgess, and JJ Moses: Low frequency waves in the Earth's magnetosheath: Present status, **Ann. Geophysicae**, **14**, 1134-1150, 1996.

Cooling, BMA, CJ Owen, and **SJ Schwartz**, The role of magnetosheath flow in determining the motion of open flux tubes, **J. Geophys. Res.**, **106**, 18763-18775, 2001.

### *Space Missions*

**Schwartz, SJ**, T Horbury, C Owen, et al., Cross-Scale: Multi-scale coupling in space plasmas, DOI: 10.1007/s10686-008-9085-x, **Experimental Astronomy**, 2008.

Total Publications: 101 in refereed journals, 27 first authored. h=25.

## Research Activities

### SCIENTIFIC POSITIONS and SERVICES to NATIONAL and INTERNATIONAL BODIES

Honorary Auditor	Royal Astronomical Society (1980-1981)
Member	AMPTE-UK Science Team (1983-end of AMPTE mission)
Member	British National Committee for Geodesy and Geophysics, Subcommittee on Geomagnetism and Aeronomy (1987-1990)
Member	SERC Astronomy and Planetary Science Board Theory Panel (subsequently Theory and Computation Panel) (1987-1991)
Member	SERC Astronomy and Planetary Science Board Studentships and Fellowships Panel (1987-1990)
Chair	UK Phase A Study for a UK Co-ordinated Data Handling Facility for Cluster (1988-1989)
Member	SERC Astronomy and Planetary Science Data Archiving Panel (1989)
Member	UK Project Management Committee for SOHO/Cluster (1989-1995)
Project Scientist	UK Co-ordinated Data Handling Facility for Cluster (1991-present)
Member	European Space Agency Cluster Science Data System Implementation Working Group and various task sub-groups thereof (1991-present)
Member	European Space Agency's European Space Information System Space Physics Working Group (1992-1995)
Member	SERC Solar-Terrestrial Physics Strategy Working Group (1994-1995)
Member	PPARC Theory Research Assessment Panel (1996-1998)
Member	British Antarctic Survey Programme Review Group (1997-2000)
Co-ordinator	Report to PPARC Astronomy Committee: <i>Solar Terrestrial Physics in the UK: Scientific Goals and Projects for the Next Millennium</i> (the "Schwartz Report"), April 1998
Division Chair	International Association of Geomagnetism and Aeronomy (Div IV: 1999-2003)
Member	Royal Society Space Research Committee (1998-2000)
Member	PPARC Astronomy Committee (2000)
Member	PPARC GRID Steering Committee (2000-2001)
Member	European Space Agency Solar System Working Group (2002-2005)
Member	PPARC Space Science Advisory Committee (2002-2005)
Member	Search Committee for Director of Laboratoire de physique et chimie de l'environnement, Orléans, France. (2002)
Chair	PPARC Solar Orbiter Science Review Panel (2004)
Member	ESA Payload Review Panel for Bepi Colombo mission to Mercury (2004)
Co-Chair	ESA Cross-Scale Science Study team for this candidate Cosmic Vision mission (2008-)
Chair	STFC ad-hoc Programmatic Review consultation panel on Space Science and Exploration (2008)
Member	ESA Cross-Scale Industrial Assessment Study Review Panel (2008-2009)
Co-Chair	ESA Cross-Scale Science Study Team (2008-present)
Member	Project Board of the International Space Innovation Centre (2009-present)

**RESEARCH STUDENTS SUPERVISED**

D Fisk	Instabilities in the Solar Wind
D Burgess	Aspects of Particle Dynamics in the Solar Wind
F Douglas	Electron Behaviour at Shocks
I Haycock	Jump Conditions at Real Shocks
W Wilkinson	Ion Kinetic Processes at Quasi-perpendicular Collisionless Shocks
X Blanco-Cano	Ions and Turbulence Near the Earth's Bow Shock
B Cooling	Factors Influencing Magnetic Reconnection at the Magnetopause
M Longmore	Multi-spacecraft observations at Earth's bow shock and a survey of the dayside magnetosheath
W Masood	Electron Velocity Distributions and Lion Roars in the Magnetosheath
L Billingham	Upstream Transients at Planetary Bow Shocks

**PREVIOUS RESEARCH ASSISTANTS**

Dr. F Navé	Solar wind turbulence
Dr. C Ovenden	Solitons in the solar wind
Dr. H Shah	Alfvénic turbulence and particle interactions
Dr. P Cally	Magneto-Acoustic-Gravity Modes in the Solar Atmosphere
Mr. B Twycross	Programming for AMPTE data analysis
Dr. R Thompson	Programming for AMPTE data analysis
Dr. P Turcan	Programming for AMPTE data analysis
Dr. D Burgess	Ions at the Earth's bow shock
Dr. S Chapman	Theoretical models of the AMPTE chemical releases
Dr. T Abdelatif	MHD modes in the solar atmosphere
Dr. A Wright	Solar system magnetohydrodynamics
Dr. J Giacalone	Ion acceleration at the Earth's bow shock
Dr. W Wilkinson	Kinetic aspects of the Earth's bow shock
Dr. F Pantellini	Mirror mode waves in the magnetosheath: theory/simulations
Dr. JA Leckband	Mirror mode waves in the magnetosheath: observations
Dr. SD Bale	Foreshock Langmuir waves and electrons
Dr. JJ Moses	Studies of foreshock waves and polar cap/tail flux addition
Dr. IR Mann	Magnetospheric cavity modes and resonances
Dr. G Chisham	Electron behaviour in foreshock and mirror mode waves
Dr. AR Hare	QSAS Chief Programmer
Dr. S Matsoukis	Theoretical studies of kinetic plasma wave processes
Dr. A Serroukh	Cluster Scientific Support Officer
Dr. V Génot	Electron processes in the magnetosphere
J Barnes	PPARC Cluster Programmer
B Lefebvre	PPARC/STFC Post-doctoral Research Assistant

**CURRENT ASSOCIATED RESEARCH PERSONNEL**

AJ Allen	STFC Senior Scientific and Managerial Officer for Cluster
A Rochel	STFC Rolling Grant Software Development Officer
J Mitchell	STFC PDRA