RAS Awards and Prizes

RAS Awards 2007

Each year the RAS recognizes outstanding achievement in astronomy and geophysics by the award of medals and prizes. Candidates are nominated by Fellows and the awards made by a committee of Fellows, ensuring that these scientists have earned the respect and admiration of their peers in the research community.

The Gold Medal
Prof. Joseph Silk

The Gold Medal for Astronomy is awarded to Prof. Joseph Silk, FRS, of the Nuclear & Astrophysics Laboratory, Oxford.
In a series of papers starting in 1967, Joe Silk gave key predictions – later verified experimentally – on the angular fluctuations expected in the temperature of the cosmic microwave background, including the effects of curved space, and then incorporating cold dark matter. He also predicted the damping scale of the baryon condensations, now called Silk damping.

In 1984/5 he, with Srednicki, developed the idea that massive weakly interacting particles that decoupled thermally in the very early universe might now be detectable through their annihilation products. These predictions motivated many experiments searching for dark matter.

With Dekel in 1986 he wrote a paper on the origin of dwarf galaxies incorporating cold dark matter and feedback from exploding stars; this too had a major influence on the subsequent direction of the field. In another heavily cited paper with Rees he developed the concept of AGN feedback and the relationship between the masses of the central black hole and the host galaxy.

Silk has made many other contributions to astronomy, for example to the theory of star formation, high-energy astrophysics, and the physics of the intergalactic medium. He has also written books such as *The Left Hand of Creation*, *The Big Bang*, *A Short History of the Universe* and *The Infinite Cosmos*.

The Gold Medal
Prof. Brian Kennett

The Gold Medal for Geophysics is awarded to Prof. Brian Kennett FRS, of the Research School of Earth Sciences, The Australian National University.
Brian Kennett is one of the most complete seismologists of his generation, adding geodynamic insight to an unusual combination of theoretical, numerical and observational skills. He has made seminal advances in understanding the Earth's internal processes, ranging from studies of reflection seismology to the free oscillations of the Earth. In addition, he has pioneered the development of influential new methods for understanding in physical terms the propagation of seismic waves in complex media.

Brian Kennett has also been heavily involved on the international stage. He was instrumental in developing two of the most widely used reference models for Earth structure, papers that have been cited hundreds of times. He also developed the technique of joint seismic tomography. His work includes a parallel thread of innovative and influential contributions concerning inverse problems, both analytical and numerical, using Monte Carlo techniques to solve highly nonlinear geophysical inverse problems, for example, and tailoring inversion algorithms to unique features of geophysical problems.

Brian Kennett has also made significant contributions to the worldwide geophysical community, influencing and mentoring people at all stages of their careers, authoring a highly acclaimed two-volume advanced text *The Seismic Wavefield*, and serving as president of the International Association of Seismology and Physics of the Earth's Interior (1999–2003). He has been editor of *Physics of the Earth and Planetary Interiors* (2003–2006), and Pacific region editor of *Geophysical Journal International* (1979–1999).

The Herschel Medal
Prof. Max Pettini

The Herschel Medal of the Society is awarded to Prof. Max Pettini of the University of Cambridge.
Max Pettini has made seminal contributions to extragalactic astronomy. His most important achievement has been the development of a comprehensive picture of cosmic chemical evolution using observations of galaxies and the intergalactic medium.

In addition, Pettini was a co-discoverer (with Steidel, Dickinson, Giovalisco and Adelberger) of the Lyman break galaxies, the first population of young galaxies directly observed in the rest ultraviolet with redshifts greater than three. This group has since made one groundbreaking discovery after another, characterizing the star formation properties, stellar masses, chemical compositions, internal kinematics and structures of the dominant galaxy population in the first 3 billion years of cosmic history.

Pettini has led a separate programme of high-resolution spectroscopy of quasar absorption systems. His measurements of the evolution of metal abundances from redshifts greater than 5 to the present provide independent constraints on the star formation and nucleosynthetic histories of the universe.

The Jackson-Gwilt Medal
Dr Stephen Shectman

The Jackson-Gwilt Medal is awarded to Dr Stephen Shectman of the Carnegie Institution of Science.
It is awarded for his outstanding work in astronomical instrumentation and telescope construction. Shectman was the project scientist for the two Magellan 6.5 m telescopes and is largely responsible for the superb quality and innovative Gregorian design that enabled their use with wide-field spectrographs. He also wrote the control system for these impressive telescopes.

After early work on Reticon detectors, Shectman developed the 2-D Frutti photon-counting detectors for faint-object spectroscopy at the Las Campanas Observatory that were copied elsewhere. He built the high-resolution Echelle spectrograph used with Bechold to probe quasar absorption lines and with Preston on metal-poor stars, as well as the multi-object fibre spectrograph for the 100-inch du Pont telescope. He was influential in the development of drift scanning techniques.

In recent years he has worked on the high-resolution Echelle spectrograph for Magellan, the echellette spectrograph and the Magellan Planet Finder, as well as developing the techniques of Ground-Layer Adaptive Optics. He is now a major creative influence behind the design of the Giant Magellan Telescope.

RAS Awards and Prizes

The Chapman Medal

Prof. André Balogh

The Chapman Medal is awarded to Prof. André Balogh of Imperial College London.

Prof. André Balogh has led several investigations of outstanding merit in the area of solar–terrestrial physics. In particular he was, until his recent retirement, principal investigator for the magnetometer on the groundbreaking four-spacecraft Cluster mission. The high-quality data from Balogh's magnetometer (and using techniques only available using four spacecraft, for example direct measurements of the curl of the magnetic field, a technique called the curlometer), led to many discoveries.

Under his leadership, the Cluster science group at Imperial College London has made many important discoveries on the bow shock, magnetopause, cusps and solar wind, using pioneering multi-spacecraft techniques. The magnetometer data are also used in multi-instrument collaborations, providing vital information in determining, for example, the thickness of collisionless shocks and the processes involved in magnetic reconnection. In addition, Balogh played a key leadership role in rebuilding the mission following the Ariane 501 disaster in 1996, culminating in the successful launch of Cluster on two Soyuz rockets in 2000. The operation and calibration of the Cluster magnetometers is and has been exemplary.

Balogh was also latterly principal investigator for the Ulysses magnetometer. Data from this instrument have again played a world-leading role, determining, for the first time, the unexpected high-latitude structure of the solar and heliospheric magnetic fields and the large-scale three-dimensional structure of the heliosphere and its variation between solar minimum and solar maximum. Observations of magnetofluid turbulence at high latitudes have been novel also. Ulysses gathered important new information on the propagation of interplanetary coronal mass ejections and co-rotating interaction regions. Balogh also energetically promoted a mission to Mercury, and led the first proposal on this to ESA; ultimately this became the BepiColombo mission.

Fowler Prize for Astronomy

Dr William Percival

The Fowler Award for Astronomy is given to Dr William Percival of the Institute of Cosmology and Gravitation, University of Portsmouth.

Will Percival has made outstanding contributions to observational cosmology that have had a major international impact. As a postdoctoral research fellow at Edinburgh, Will Percival led a key analysis of the 2 degree Field Galaxy Redshift Survey. He was first author on a 2001 paper "The 2df Galaxy Redshift Survey: The Power Spectrum and Matter Content of the Universe" that has acquired over 400 citations. The results of this paper have been used extensively by the 2df team and many others, most notably by the WMAP team. Percival and the 2df team achieved an important breakthrough with their detection of baryon oscillations in the power galaxy spectrum. This key discovery occurred simultaneously with a similar detection by the Sloan Digital Sky Survey team and provided an accurate estimate of the density ratio of baryonic to dark matter.

Percival has recently led a comprehensive analysis of baryon oscillations and the shape of the galaxy power spectrum using both the 2df and SDSS data sets. This provides the most comprehensive analysis of the clustering of galaxies ever undertaken.

Fowler Prize for Geophysics

Dr Christine Thomas

The Fowler Award for Geophysics is given to Dr Christine Thomas of the University of Liverpool.

Tine Thomas is a leading figure in the new generation of seismologists. Her speciality is array seismology, which involves the use of dense seismic networks to image the fine-scale structure of the Earth's deep interior. As a result of the dramatic improvement in digital instrumentation and computing power over the past decade, newly recorded data from large seismic arrays can now be processed using techniques originally developed in optical physics and oil industry seismology, bringing a new era of unprecedented resolution.

Much of Thomas's well-cited work has concentrated on the enigmatic thermo-chemical boundary layer, D″, that lies at the base of the Earth's mantle. This layer plays a pivotal role in convective processes in the mantle and core, and hence influences such diverse phenomena as plate tectonics and the generation of the Earth's magnetic field. She has developed novel methods to image this region, and has been highly successful in collaborating with scientists from other disciplines in order to understand better the nature of the lowermost mantle, for example interpreting seismic results in terms of transitions between perovskite and the recently discovered post-perovskite phases, with important thermodynamical implications.

Tine Thomas is a committee member of the British Geophysics Association and serves as chair of the Education Board. She is very well known internationally and is collaborating with researchers in Europe, North America and Asia. She is an excellent role model for young women in science and a valuable ambassador for UK geophysics.

Award for Service

Dr Günther Eichhorn

The Award for Service to Astronomy is given to Dr Günther Eichhorn of the Smithsonian Astrophysical Observatory.

Günther Eichhorn was, until 2007, the project manager for NASA's Astrophysics Data System, leading the small team of six who develop and operate it. He is a hands-on programmer and developed much or most of this specialized database system and its web interface, including connections to astronomical research papers available electronically and a large set of scanned images of archive copies. Through his efforts, by far the majority of the astronomical literature is available on-line through the web, at least through a bibliographic reference, virtually always with an abstract and usually with links to the full article. The system has been put together by astronomers who understand the way that scientists carry out research, principally by Eichhorn himself. It is no exaggeration to say that his work has revolutionized the way that astronomical research is carried out – almost every astronomical reference is available in seconds without leaving one's desk. The system is democratic, both in that all articles are equal and all users are equal (open access).

Eichhorn was formerly a space scientist working on the properties of interplanetary dust. His PhD was from Heidelberg. His creation has affected the life of the nation, as well as the life of the global scientific community, by making primary scientific literature available to all, including amateurs and teachers, raising the sophistication of the level of interaction of some of them with astronomy. As an example of the penetration through hyperlinks in ADS of primary research literature into more general literature, it is routine to find ADS-hyperlinked references to *MNRAS* and *ApJ* in Wikipedia articles on astronomy or astronomical history.

GROUP ACHIEVEMENT AWARD

2dF Galaxy Redshift Survey

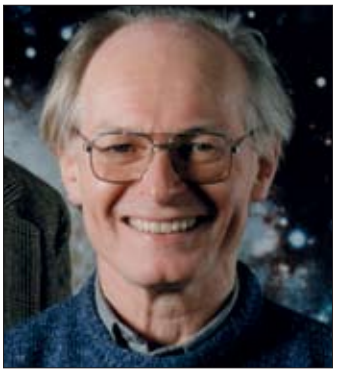
The Group Achievement Award goes to the 2dF Galaxy Redshift Survey team, a joint UK-Australian group chaired by Matthew Colless in Australia and John Peacock in the UK.

The 2dF Galaxy Redshift Survey is surely the largest observational project undertaken to date by UK and Australian astronomers without direct, personal, hardware involvement. Taking advantage of the unique capabilities of the 2dF instrument (indeed, forming a major driver for the initiation and specification of the instrument), the 2dFGRS was uniquely ambitious, timely, far-sighted and targeted at carefully assessed and important scientific goals. The recently completed observational side of the project led to the accumulation of almost a quarter of a million galaxy redshifts (far more than any previous spectroscopic survey), whose analysis by a world-leading team has already produced more than 40 *MNRAS* papers from the 2dF team alone (with typical ADS citation rates of 100–300, in spite of the fact that these are all relatively recent publications). Similar numbers of papers have been published by other authors, based on the public release of the 2dFGRS dataset and even as SDSS catches up with the 2dFGRS it is clear that the survey will also have many legacy benefits.

This Anglo-Australian team has made the 2dFGRS an observational *tour de force*: topics addressed by the project have included the number and luminosity density of galaxies, the power spectrum and the matter content of the universe, the luminosity dependence of galaxy clustering, the amplitudes of fluctuations in the 2dFGRS and the CMB, and implications for galaxy biasing, the environmental dependence of galaxy star-formation rates near clusters, and correlation functions, peculiar velocities and the matter density of the universe.

GEORGE DARWIN LECTURER

Prof. Alan Watson



The 2008 George Darwin Lecturer is Prof. Alan Watson FRS, of the University of Leeds.

Alan Watson's career-long interest in all aspects of high-energy astroparticle physics led him to his leading role in the international collaboration behind the construction and operation of the Pierre Auger Observatory in Argentina, now producing significant data on the very highest energy cosmic rays.

Astroparticle physics demands large-scale and long-duration observations. Alan Watson was head of the Leeds Haverah Park extensive air shower project, running for almost 20 years from 1976, which produced the first evidence for the absence of the celebrated Greisen–Kuzmin–Zatsepin cut-off in the cosmic-ray energy spectrum above 4×10^{19} eV, as well as providing key data relating to the arrival distribution and mass composition of cosmic rays. This group also searched for high-energy gamma-ray sources, and broadened that search using detectors at the South Pole and elsewhere.

But it is the very highest energy cosmic rays, particles with energies above 10^{20} eV, that proved most intriguing. They are very rare, arriving at Earth at a rate of one per square kilometre per century, and the processes that accelerate them to such extraordinarily high energies are essentially unknown. In order to investigate this new physics, Jim Cronin and Alan Watson proposed in 1992 the construction of a huge new observatory, now operating as the Pierre Auger Cosmic Ray Observatory. Early results show a correspondance between the distribution of the sources of the high-energy cosmic rays and the spread of active galactic nuclei across the sky. Alan Watson has taken a leading role in the international collaboration behind the Pierre Auger Project and was until recently spokesperson for the project.

HAROLD JEFFREYS LECTURER

Monica Grady

The 2008 Harold Jeffreys Lecturer is Monica Grady, professor of planetary and space science at the Open University.

Formerly at the Natural History Museum, London, where she curated the UK's national collection of meteorites, Monica Grady has an international reputation for her work on the carbon and nitrogen isotope geochemistry of primitive meteorites, and also for that on martian meteorites and interstellar components within meteorites. The IAU honoured her by naming minor planet (4731) Monica Grady for her carbon-isotope work leading to new understanding of the geological processes involved in the formation of meteorites. She has also played a major part in field expeditions to collect meteorites from Antarctica and from the Nullarbor region of Australia. Monica Grady is well known for her community role in UK astronomy and planetary science. She is currently a member of the STFC Science Committee, having previously served on the PPARC Science Committee (2005–2007), the PPARC Solar System Advisory Panel (2004–2005) and the ESF European Space Science Committee (2003–2006). Her associate editorships of leading journals have included *Geochimica Cosmochimica Acta* (2002–2005), the *International Journal of Astrobiology* (from 2002), and *Elements* (from 2004). She is an energetic and enthusiastic public speaker, with a rare ability to present frontline science at different levels appropriate for each audience, notable in her 2003 Royal Institution Christmas Lectures "A Voyage in Space and Time".

HONORARY FELLOWS

- **Michel Mayor**, professor of astronomy at the University of Geneva, has played a leading role in the discovery and characterization of extrasolar planetary systems, and in developing the high-precision instrumentation needed to find ever-smaller planets and measure the oscillation modes of the host stars.

  Mayor pioneered the development of a succession of radial-velocity instruments of ever-higher precision and, with graduate student Didier Queloz, discovered the first extra-solar planet, 51 Peg b, in 1995.

- **Tim de Zeeuw**, of Leiden Observatory, is in essence an analytical galaxy dynamicist, a field to which he has made fundamental contributions. His interests have blossomed over the decades to include numerical work, observations of galaxies and their interpretation. He has a remarkably broad view of astrophysics and his counsel has been widely sought, nationally and internationally. Not only have his research accomplishments been deep and influential, but also he has used the experience and expertise gained to great effect.

- **Michael Hoskin** is the foremost historian of astronomy in the UK and has done more than anyone to promote the subject and give it a distinctive academic identity.

  He is the leading expert on the astronomy of the Herschel family, having published many papers and a series of books on the subject. He founded and edited the *Journal for the History of Astronomy,* and initiated the pioneering supplement *Archaeoastronomy*, and was co-founder and co-editor of the influential journal *History of Science*.

- **Dr Spiro Antiochos**, Center for Space Research, Naval Research Laboratory, USA, is one of the most eminent solar physicists in the USA and has played a highly influential role in the past 20 years in promoting US solar physics and bringing it to its current high state of activity and relevance. Scientifically he has made seminal advances in understanding various aspects of solar activity, notably chromospheric evaporation in solar flares, the formation and structure of prominences, and the process of breakout as a cause of coronal mass ejections.