

The Armagh Observatory and Planetarium

Annual Report and
Accounts for 2010/2011
Year Ended 31 March 2011



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The Armagh Observatory and Planetarium Annual Report and Accounts for Year Ended 31 March 2011

The Accounting Officers authorized these financial statements for issue

on

22 August 2011

*Laid before the Northern Ireland Assembly by the Department of Culture, Arts and Leisure
under clause 8 of the Armagh Observatory and Planetarium (Northern Ireland) Order 1995
as amended by Schedule 1, clause 6 of the Audit and Accountability (Northern Ireland) Order 2003*

26 October 2011

The Armagh Observatory and Planetarium Annual Report and Accounts for 2010/2011, Year Ended 31 March 2011

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Management Commentary

Background

The Armagh Observatory and the Armagh Planetarium are distinct institutions, part of a single statutory corporation and arms-length body (ALB) 'The Governors of the Armagh Observatory and Planetarium' described in the Armagh Observatory and Planetarium (Northern Ireland) Order 1995. This superseded the original 1791 Act of the Irish Parliament entitled 'An Act for Settling and Preserving a Public Observatory and Museum in the City of Armagh For Ever', and an Amendment of 1938 ('The University and Collegiate and Scientific Institutions Act [Northern Ireland], 1938'). The Northern Ireland Order 1995 has since been amended by the Audit and Accountability (Northern Ireland) Order 2003, the Insolvency (Disqualification from Office: General) Order (Northern Ireland) 2008 and a number of other amendments.

The Armagh Observatory is also a recognized charity, having been granted charitable status for tax purposes by Her Majesty's Revenue and Customs (HMRC) under Section 505 of the Income and Corporation Taxes Act 1988; the HMRC reference number is XN 46022. The principal function of the Observatory, founded in 1789 as part of Archbishop Richard Robinson's vision to see the creation of a university in the City of Armagh, is to undertake original research of a world-class academic standard that broadens and expands our understanding of astronomy and related sciences.

The Armagh Planetarium, which is also a recognized charity (HMRC reference number XN 48022), was founded by Dr Eric Mervyn Lindsay, the seventh director of the Armagh Observatory, and was officially opened on 1st May 1968. The Planetarium's primary function is to disseminate knowledge of a wide range of science and to promote public understanding of astronomy and science through its programme of educational services for schools and the wider public. The two sides of the corporation operate under two directors and receive core funding from the Northern Ireland Department of Culture, Arts and Leisure (DCAL). There is a total population of around 40 staff, approximately 30 in the Observatory and 10 in the Planetarium.

Aims and Objectives

The aim of the corporation is to advance the knowledge and understanding of astronomy and related sciences through the execution, promotion and dissemination of astronomical research nationally and internationally in order to enrich the intellectual, economic, social and cultural life of the community.

Principal Activities

Armagh Observatory The principal function of the Armagh Observatory is to undertake original research of a world-class academic standard that broadens and expands our understanding of astronomy and related sciences. Secondary functions include the organization's responsibility to maintain the unique more than 215-year long meteorological record at Armagh and to preserve and expand the heritage of astronomy at Armagh. The Observatory also carries out a vibrant programme of Science in the Community and undertakes a wide range of community service in astronomy and related sciences, representing Northern Ireland on the national and international stage.

Armagh Planetarium The principal function of the Armagh Planetarium is to disseminate knowledge of a wide range of science and to promote the public understanding of astronomy and science through its programme of educational services for schools and the wider public. Staff deliver interactive presentations using the latest projection and information technology to all age groups and abilities on a wide range of astronomical and scientific topics, including meteorite impacts, the planets, current astronomical phenomena and Earth sciences. The Planetarium, also through the large number of visitors coming through its doors, plays an important role in promoting and enhancing tourism within Armagh City and District.

Research The Observatory carries out front-line astronomical research in three key areas of astrophysics, namely: Solar-System Science, Solar Physics, and Stellar and Galactic Astrophysics. These fields encompass the dynamical structure, evolution and origin of objects in the inner and outer solar system; comparative planetology and meteor physics; the use of spacecraft such as Swift, SoHO, TRACE and Hinode, to study fundamental questions such as how the Sun's outer atmosphere is heated, what drives the solar wind and the Sun's variable magnetic activity (and its effect on climate); and a very wide range of detailed investigations into the formation and evolution of stars, taking into account factors such as mass loss through stellar winds, stellar oscillations, stellar magnetic fields, extreme chemical abundances, and the impact of binarity (two stars orbiting closely around one another) on our understanding of the evolution of stars and galaxies. In particular, our multi-strand multi-wavelength approach to the discovery of ultra-compact binaries will provide crucial input for understanding the first detected gravitational wave events. These research themes illustrate the Observatory's primary long-term research function. The projects are often funded by external (i.e. non-DCAL) funding agencies with lead times of typically a year or two; they are normally led by an individual Research Astronomer and often require up to 3–5 years for completion.

Meteorological Record In addition to this primary research role the Observatory maintains a unique more than 215-year long meteorological record and data-bank (<http://climate.arm.ac.uk/>), believed to be the longest daily climate series in the UK and Ireland from a single site. The climate station has been continuously maintained since 1795, with readings currently taken every day at 09:00 (GMT). Calibration of these data has enabled researchers and government agencies to use the Armagh series for reports and research into global warming. This is a subject of strategic importance for Northern Ireland as we move into an era of rapid climate change.

The Armagh Observatory's climate record provides a long historical baseline against which to judge how Northern Ireland's climate is responding to climate change world-wide.

Museum, Library and Archives The Observatory also has an important responsibility to maintain and preserve the fabric of the historic buildings, the library, historic books and archives, and the collection of scientific instruments and other artefacts built up over more than 220 years of continuous astronomical activity in Armagh. The main historic buildings of the Observatory have unique architectural features and house a valuable library, archives and museum collection that contains a growing collection of historic books and manuscripts and a wide range of astronomical images and photographic plates, scientific instruments, clocks and other artefacts concerning the development of astronomy at Armagh over more than two hundred years.

The Observatory's heritage policy is to progressively restore the historic buildings and scientific instruments in its possession, placing the restored material where possible close to its original location in the main Grade A listed building. The objective is to maintain the integrity of the Library and Archives as a coherent collection for future generations in the City of Armagh and to preserve this historic material and improve the environment in which it is held. The Observatory also seeks to widen access to this material so that researchers or visitors to the Observatory's web-sites, and others who may use the Observatory's facilities, will be able to use the material for individual research projects and appreciate more clearly the context in which the historic material was first used. The Observatory's Library and Archives is a rich scientific, educational and cultural resource, reflecting the Observatory's position as Northern Ireland's oldest scientific institution.

Science in the Community In addition to its core function to carry out an international level programme of scientific research in astronomy and related sciences, and to expand the heritage of astronomy at Armagh, the Armagh Observatory also carries out a vibrant programme of Science in the Community. There are several strands to this programme, which includes education and learning for all as well as public lectures and guided tours of the Observatory and the Grounds, Astropark and Human Orrery. In addition, there are more formal education and training programmes, for example those associated with the Observatory's programmes of work experience, student training and engagement with the local community, all of which draw on the specific expertise of research astronomers at Armagh.

In the past, projects have included construction of the Human Orrery (the first such exhibit in the world to be laid out with precision) and the creation of the first International Phenology Garden in Northern Ireland, which is closely linked to European and Cross-Border phenology projects and to the Observatory's own unique climate record. The Observatory also presents a biennial public 'Robinson Lecture' in honour of Archbishop Richard Robinson, the Observatory's founder; and in alternate years has worked with the Centre for Cross Border Studies to provide a biennial Cross-Border Schools Science Conference, held using the facilities of the Observatory and those of the Royal School Armagh and the Armagh Planetarium.

A highlight of the Observatory's outreach activities during 2010 has been the work of its Outreach PDRA, Miruna Popescu, who worked creatively with the Armagh Rhymers to develop a new outreach programme aimed at young children. This programme, keying into international EUNAWA activities, was called OASES: 'Over us All is the SELfsame Sky'.

Other significant achievements of the Observatory's programme of Science in the Community during 2010 included (1) discoveries made by school work-experience and summer-programme students under supervision of Observatory staff using data obtained from the Faulkes Telescopes (operated by Las Cumbres Observatory Global Telescope Network); (2) the provision of schools and general-public lectures, including the 2010 Robinson Lecture and making a significant contribution to the 2010 AVEC-organized Armagh Heritage Day; (3) general-public tours and group visits around the Observatory, Grounds and Astropark, including contributions to wider open-day programmes (e.g. European Heritage Open Days) and to lifelong learning (e.g. visits both by undergraduates and evening-class students); (4) the delivery by staff of invited public lectures to schools, amateur astronomy groups and the general public; and (5) working with the Armagh City and District Council to improve the City of Armagh's built heritage and attractiveness to visitors by assisting with the programme of Public Art.

Public Benefit The various strands of the Observatory's programme of Science in the Community highlight the contribution of the Observatory's astronomical heritage to Northern Ireland and to the City of Armagh. They help to explain to a wide audience the results of modern astronomy and the benefits of carrying out international-level astronomy, particularly for education, learning and training in the so-called 'STEM' subjects (Science, Technology, Engineering and Mathematics) of such importance for our knowledge-led economy. The Observatory makes a major contribution to the international profile of Northern Ireland; helps to develop science and science-based skills in the community; and provides an active programme of public lectures, guided tours, and work-experience activities which together contribute to wider UK and Northern Ireland Government initiatives aimed at deepening scientific knowledge and improving scientific literacy across the whole community.

The Observatory also plays a leadership role in the Armagh Visitor Education Committee (AVEC), particularly in assisting arrangements for the annual Armagh Heritage Day, usually held in May of each year, and in editing and publishing a book based on the proceedings of the first two such heritage days, namely 'Border Heritage: Tracing the Heritage of the City of Armagh and Monaghan County'. This was first published in 2008 by TSO (The Stationery Office; see <http://www.tsoshop.co.uk/>), and efforts to obtain funding for a reprint of the book with minor updates to facilities' information were successful during 2010/2011. The book helps to promote the shared cultural heritage of Northern Ireland and the City of Armagh, as well as the important role played by astronomy as one of Northern Ireland's international research strengths.

In summary, the Armagh Observatory provides a strong, positive image of Northern Ireland on the international stage. Members of staff play a full role in the international astronomical community, for example assessing grant and research proposals on behalf of

external funding agencies; reviewing scientific papers; editing international academic journals; and serving on the committees of bodies such as the Science and Technology Facilities Council (STFC), the Royal Astronomical Society and the Royal Irish Academy. During 2010, staff at the Armagh Observatory maintained an active programme of Science in the Community by providing guided tours of the Observatory and Astropark, holding special public lectures and exhibitions, delivering an outreach programme to schools, and supervising school children and undergraduates on a variety of work-experience programmes and summer research projects. The Observatory Grounds, Astropark and Human Orrery are continuously developed as an education and lifelong learning facility to enrich the lives of visitors to Armagh and residents alike. Partly as a result of this activity, the number of visitors to the Astropark increased significantly during 2010: the counter at the entrance to the 'Solar System' part of the Astropark registered approximately 75,000 visitors, some 20,000 more than the 2009 figure of around 55,000.

Equal Opportunities Policy

The corporation is an equal opportunities employer, committed to ensuring that the talents and resources of all members of the corporation are utilised to the full. The corporation does not discriminate directly or indirectly on the grounds of religious belief, political opinion, trade union membership, gender, marital status, sexual orientation, age, disability, race, colour or ethnic origin, against any member of staff, full-time or part-time, or job applicant, actual or potential, in any aspect of the corporation's activities, including matters of recruitment, training, promotion, appointment, nomination or selection for any position, job transfer or redundancy.

Policy on Payment of Suppliers

The corporation is committed to the payment of all invoices not in dispute within agreed contractual terms. The corporation also recognizes the importance of paying invoices received as soon as possible and does everything practically possible to meet the 10-day prompt payment target in the Accounting Officer guidance DAO 12/08 issued by the Department of Finance and Personnel. In the year to 31 March 2011 the average time to pay invoices, including those in dispute, was 12.1 days for the corporation.

Auditors

Under the Audit and Accountability (Northern Ireland) Order 2003, responsibility for the audit of the accounts of the Armagh Observatory and Planetarium has been vested in the Comptroller and Auditor General for Northern Ireland.

Employee Information and Consultation

The corporation takes every opportunity to inform and consult with all members of the organization on the corporation's activities and plans for the future through the dissemination of annual reports and operational plans, the provision of the latest information on research, educational and other activities through the web-sites, regular formal and informal briefing and discussion meetings, and consultations with staff representatives on employment-related and operational policies and procedures.

Further information on the Observatory is available at <http://star.arm.ac.uk/> and <http://climate.arm.ac.uk/>, and on the Planetarium at <http://www.armaghplanet.com>.

Corporate Governance

Board of Governors

The Board of Governors comprises the Church of Ireland Archbishop of Armagh (Chairman), the Dean and Chapter of the Church of Ireland Cathedral of Armagh (9 persons), 1 DCAL nominee, 1 Queen's University Belfast (QUB) nominee, and up to 3 additional members nominated by the Board of Governors. Nominees normally serve for an initial period of 5 years with the possibility of extension.

Chairman: His Grace, The Most Reverend A.E.T. Harper, The Archbishop of Armagh and Primate of All Ireland

The Dean: The Very Reverend Dean P.W. Rooke, St. Patrick's Cathedral, Armagh

The Precentor: The Reverend Canon T. Scott, also Rector of Magherafelt

The Chancellor: The Reverend Canon C.F. Moore, also Rector of Newtownhamilton, Ballymoyer and Belleek

The Treasurer: The Reverend Canon J.W. McKegney, also Rector of St. Mark's Parish, Armagh

The Archdeacon: The Venerable R.G. Hoey, also Rector of Camlough and Mullaglass

The Prebendary of Mullabrack: The Reverend Canon W.J.A. Dawson, also Bishop's Curate of Pomeroy

The Prebendary of Ballymore: The Reverend Canon R.J.N. Porteus, also Rector of Derryloran Parish (Cookstown)

The Prebendary of Loughgall: The Reverend Canon J.N.T. Campbell, also Rector of St. Mark's Parish, Portadown

The Prebendary of Tynan: The Reverend Canon W.M. Adair, also Rector of St. Columba's Parish, Portadown

Mr W.G. Berry QC (DCAL Nominee)¹

Professor A. Hibbert, Queens University Belfast (QUB Nominee)

The Right Honourable the Lord Ballyedmond, Ballyedmond Castle, Rostrevor (Board of Governors Nominee)

Professor R.D. Oudmaijer, University of Leeds (Board of Governors Nominee)

Management Committee

The Management Committee comprises the Church of Ireland Archbishop of Armagh or his nominee (Chairman), 3 Nominees from the Board of Governors, 6 DCAL nominees, 1 QUB nominee, 1 Science and Technology Facilities Council (STFC) nominee, 1 Dublin Institute for Advanced Studies (DIAS) nominee, and currently 2 additional members co-opted by the Board of Governors. Nominees and those co-opted by the Governors normally serve for an initial period of 3–5 years with the possibility of extension.

Chairman: His Grace, The Most Reverend A.E.T. Harper, The Archbishop of Armagh and Primate of All Ireland

Deputy Chairman: Dr F.N. Byrne (Co-opted, Board of Governors)

Professor A. Hibbert, Queens University Belfast (Co-opted, Board of Governors)

The Venerable Archdeacon R.G. Hoey, Camlough and Mullaglass (Board of Governors Nominee)

Professor R.D. Oudmaijer, University of Leeds (Board of Governors Nominee)

Mr E.P. Donnelly (DCAL Nominee)

Dr M. McKay, European Space Agency, Darmstadt, Germany (DCAL Nominee)²

Mr R.B. Hannam (DCAL Nominee)³

Mr A. Peoples (DCAL Nominee)

Mr J.I. (S.) Shields (DCAL Nominee)

Mrs P.E. Wilson (DCAL Nominee)

Professor P.L. Dufton, Queens University Belfast (QUB Nominee)

Professor M.R. Merrifield, University of Nottingham (STFC Nominee)

Professor T.P. Ray, Dublin Institute for Advanced Studies (DIAS Nominee)

Audit and Risk Management Committee

The Internal Audit Committee, a sub-committee of the Management Committee, comprises Dr F.N. Byrne (Chairman), Mr E. Donnelly, Professor P.L. Dufton, Professor A. Hibbert, and Mr A Peoples.

Directors and Secretary

Professor M.E. Bailey MBE MRIA — Director, Armagh Observatory

Dr T.R. Mason MBE — Director, Armagh Planetarium

Mr L.F. Young — Secretary

¹ From 2011 January 1

² From 2011 January 1

³ From 2011 January 1

The Armagh Observatory — Operating Review 2010/2011

The following research results, performance indicators for 2010/2011, and objectives for 2011/2012 are extracted from the Armagh Observatory Annual Report for Calendar Year 2010 (Financial Year 2010/2011). This contains an extensive summary of the whole of the Observatory's principal research and other activities during 2010. The full report is available at <http://star.arm.ac.uk/annrep/> or by contacting the Administrator at the Armagh Observatory, College Hill, Armagh, BT61 9DG, tel. +44-28-3752-2928; e-mail: info@arm.ac.uk.

Shared Future

Astronomy is part of world heritage and an important part of the shared future of people living on the island of Ireland. The Armagh Observatory is Northern Ireland's oldest scientific institution, and Northern Ireland government support for astronomy at Armagh is central to achieving the vision of the Department of Culture, Arts and Leisure (DCAL), namely "a confident, creative, informed and vibrant community", and its mission "to protect, nurture and grow Northern Ireland's Cultural Capital . . .". In return, astronomers at Armagh make distinctive contributions to major strands of government policy and project a key part of Northern Ireland's cultural and scientific heritage to millions of people world-wide.

There is a very significant public interest in astronomy and space science, and related fields. This interest is mirrored by the high frequency of media citations every year referring to the Armagh Observatory and its staff or their work, and is fed by the Observatory's high-quality academic focus and its multifaceted programme of Science in the Community. Astronomical research makes a fundamental contribution to knowledge and helps to attract people from all backgrounds, both young and old, into science and towards a more scientific way of thinking. Science, in Carl Sagan's phrase, "is a candle in the dark"; and astronomy — foremost amongst the sciences — helps people make sense of their place in the world and of Earth's place in the wider Universe.

Performance

Staff at the Armagh Observatory have maintained a high level of research activity and other outputs during the year, producing 45 publications in refereed scientific journals during 2010 as well as many other scientific papers and attracting a new record of approximately 503 identified mass-media citations to the Armagh Observatory, its staff and their work. During 2010, Armagh Observatory staff delivered approximately 74 technical and general public talks at meetings both locally and abroad, and maintained an active programme of in-house training including 28 internal seminars and colloquia, most of which were delivered by external visiting speakers. External Internet access to the Armagh Observatory has also remained at a very high level. During 2010 there were more than 981,000 Distinct e-Visitors (DEVs) to the Observatory's principal web-sites (<http://star.arm.ac.uk/>, <http://climate.arm.ac.uk/> and <http://arpc65.arm.ac.uk/~spm/>), 17.1 million 'hits', and a record 9.5 TB (1 TB = 1 million Megabytes) of data exported from the Armagh Observatory to users of astronomical information elsewhere.

In addition, total external grant receipts and other income during 2010/2011 amounted to a record £460.3k (cf. £356.7k during 2009/2010), of which £452.3k was attributable to external grant receipts (cf. £346.7k for 2009/2010). We note that this figure is exceptionally high owing in part to the receipt shortly before the end of the financial year of funds for the new EUNAWA programme, to start in 2011/2012. Nevertheless, even if this were ignored, the total external grant income for the year would still have significantly exceeded the anticipated figure in the 2010/2011 Business Plan (£341.8k). In short, Armagh Observatory staff have been extremely active in seeking, and often successfully obtaining, externally funded peer-reviewed research grants in an increasingly competitive financial environment.

Research Environment

The Observatory's computer facilities are used primarily for numerical analysis, computer modelling and data reduction. The computers and peripherals are largely funded by DCAL, but occasionally by external research grants, for example those funded by the STFC or PRTL. Staff have access to a number of iMac workstations, approximately 40 Linux workstations and peripherals, a number of portable computers, and a computer cluster comprising 10 dual-processor work nodes and one master node, with a total of 20 GB of memory. In addition, the Observatory has 80 TB of on-line storage capacity obtained during 2010 with additional funding from DCAL. The internal network is a 1 Gbps backbone ethernet linked with switched hubs. The external network is connected to the Joint Academic Network (JANET) through a 100 Mbps link provided through the Observatory's participation in the Northern Ireland Regional Area Network (NIRAN). The Armagh Observatory also has access to the Stokes Supercomputer at the Irish Centre for High-End Computing (ICHEC) as well as to occasional advanced training programmes. These computer facilities are used mainly for computationally intensive research projects in observational and theoretical astrophysics including data reduction and modelling, in areas such as solar physics, stellar atmospheres, stellar winds, radiation hydrodynamics, numerical magneto-hydrodynamics, and solar system dynamics.

The Observatory's suite of technical equipment is complemented by a Library and Archives which represents one of the premier specialist collections of its kind in the UK and Ireland. The library, archives and museum collection contains a unique and growing collection of historic books and manuscripts, as well as images, photographic plates, scientific instruments, clocks and other artefacts concerning the development of astronomy at Armagh over more than two hundred years.

The meteorological archive contains the longest continuous daily climate series from a single site in the UK and Ireland. The climate station has been continuously maintained since 1795, with readings currently taken every day at 09:00 (GMT). Calibration of these

data has enabled researchers and government agencies to use the Armagh series for reports and research into global warming. This is a subject of strategic importance for Northern Ireland as we move into an era of rapid climate change. The Armagh Observatory's climate record provides a long historical baseline against which to judge how Northern Ireland's climate is responding to climate change world-wide.

Armagh Observatory staff also have access to world-class international facilities that are provided through STFC and UK Government subscriptions or bilateral agreements and collaborations involving individual research staff. Observatory staff regularly obtain telescope time on national and international facilities such as the ESO Very Large Telescope (<http://www.eso.org/outreach/ut1fl/>) and various spacecraft missions (such as Swift, SoHO, TRACE, Hinode, XMM-Newton, and the Hubble Space Telescope). They obtain research grants from a wide range of grant awarding bodies (e.g. the STFC, the Royal Society, the Leverhulme Trust, British Council etc.), and through the Observatory's membership of the UK SALT Consortium (UKSC) have access to the 11-metre diameter Southern African Large Telescope (SALT; see <http://star.arm.ac.uk/SALT/>), located at the Sutherland Observatory, South Africa. Complementing these international facilities, restoration of the Observatory's historic telescopes has brought opportunities to reintroduce some visual observing from Armagh, while new computer and camera technology has enabled a variety of new automatic observational programmes to be introduced from Armagh, recording data autonomously whenever the sky is clear.

Principal Achievements During 2010 and 2010/2011

Photometric Follow-up of Transiting Exoplanets PhD student Tobias Hinse and John Southworth (University of Keele, UK) obtained 27 nights on the 1.02 m Zeiss Telescope at the Vainu Bappu Observatory (Kavalur, India; operated by the Indian Institute of Astrophysics [IAA], Bangalore) to carry out photometric follow-up of transiting extrasolar planets. The observations were carried out in collaboration with C. Muthumariappan and J. Jayakumar (IAA).

Towards Detecting Life on Other Worlds During 2010, Stefano Bagnulo travelled to the European Southern Observatory in Chile to participate in a series of observations with the long-term goal of detecting life on other worlds. The Director General of the European Southern Observatory had granted permission for Michael Sterzik (ESO) and Stefano Bagnulo to use the EFOSC2 instrument, normally attached to one of the telescopes at the La Silla Observatory, for laboratory experiments. Instead of observing celestial objects, they performed laboratory spectropolarimetric measurements on a variety of organic samples, including leaves of different plants (e.g. phylodendrum and ficus) and cyano-bacteria collected in the desert of Atacama, in Chile, one of the driest places on Earth.

In the context of the search for life beyond Earth, cyano-bacteria are particularly interesting. They have the capacity to survive under extreme weather conditions (i.e. with almost no water and at both very high and very low temperatures), somewhat similar to conditions that might be encountered in small bodies of the solar system, for example comets or the satellites of Jupiter and Saturn.

The aim of these measurements was to determine whether polarimetric observations can be used to detect biotic material in other objects of the solar system and, with future instrumentation for the Extremely Large Telescope, on exo-planets. The results of these experiments will be published in a specialist journal on bioastronomy in collaboration with a group from the Faculty of Biology of the Pontificia Universidad Católica de Chile, in Santiago.

Newly Discovered Long-Term Companion of the Earth In 2010 November Christou found that the newly discovered near-Earth asteroid 2010 SO₁₆, discovered by NASA's Wide-field Infrared Survey Explorer (WISE) satellite, was locked in a co-orbital state with the Earth. He and David Asher subsequently discovered that this object is a far more stable co-orbital libration than any of the three previously known objects of this type. This work, describing a newly discovered long-term companion of the Earth moving in an unusual 'horseshoe' orbit, was published in Monthly Notices of the Royal Astronomical Society during early 2011, attracting substantial press coverage.

Recovery of Rare Companion of Mars Following a suggestion by Apostolos Christou, David Asher led Faulkes Telescope sessions on 2010 January 21–22 with two work-experience students, Christina Larkin and Catherine O'Prey, from Victoria College, Belfast, to recover the unusual asteroid 2007 UR₂. This is only the second known object to be found moving in a so-called 'Martian horseshoe' orbit, i.e. one going around the Sun on nearly the same orbit as Mars. The observations, the first made of the asteroid since its discovery in 2007, recovered the asteroid about 7 arc-minutes (i.e. about a quarter the angular diameter of the Moon) away from its predicted position, thus enabling the orbit to be significantly improved and ensuring that further observations of the asteroid would be possible at its next suitable opposition in approximately two years time. Without these observations there was a high probability that the object would have been lost. The success of this Faulkes Telescope project provides a good example of synergy between the Observatory's frontline science research objectives and those of its main learning programme, centred on the provision of school work-experience placements and research projects involving undergraduate or postgraduate study. For more information, see <http://star.arm.ac.uk/press/2010/Faulkes-Jan/>.

Understanding Helium-Dominated Accretion Flows Gavin Ramsay's group obtained a significant amount of time during 2010 on the Liverpool Telescope to undertake long-term monitoring of the rare 'AM CVn' cataclysmic variable systems, in which a white dwarf is observed to be accreting largely hydrogen-poor material from a companion star. The group also obtained one observation every two days with the NASA 'Swift' satellite, to determine how the UV and X-ray fluxes vary over the course of an outburst cycle of the unusual AM CVn system KL Dra. This object is a close binary system with an orbital period of just 25 minutes, in which material (in this case largely helium) is being transferred from one star to another via an accretion disc. The discovery that the disc undergoes an outburst on an apparently regular ~60-day cycle means the KL Dra is an excellent system in which to study the

properties of helium-dominated accretion flows. A press release about this work, issued by the Observatory together with the Royal Astronomical Society, attracted significant international attention (see http://star.arm.ac.uk/press/2010/helium_stars100524.html).

Massive Star Research Jorick Vink notes the following work carried out with others in the field of massive-star research. The highlights refer to (a) measuring the masses of the most massive stars; (b) estimating the maximum mass of black holes originating from single massive stars; and (c) the discovery of an exceptionally active luminous blue variable (LBV) star.

Considering these in turn, there has historically been a mismatch between the estimates of the mass of massive O-type stars determined from stellar spectroscopy and stellar structure. C. Weidner (University of St. Andrews, Scotland) and Vink have investigated this problem using masses determined from a sample of massive binary stars, which allows otherwise model-independent masses to be determined using Kepler's laws. Good agreement was found between the two independent methods of determining stellar masses, increasing our confidence in stellar mass estimates determined from massive-star stellar evolution and atmosphere models (Weidner & Vink, 2010).

K. Belczynski (Los Alamos National Laboratory, USA, and University of Warsaw, Poland) and colleagues including Jorick Vink have investigated the frequency distribution of the masses of compact objects, i.e. neutron stars and black holes (BHs), that could originate as a result of the evolution of single stars in regions of different astrophysical chemical environments. A dependence of the maximum stellar-mass BH on metallicity was investigated using the metallicity-dependent stellar mass-loss rates of Vink et al. (2001), showing that the highest mass BHs observed in the Galaxy, i.e. $M_{\text{BH,max}} \approx 15 M_{\odot}$ in the current high-metallicity environment ($Z = Z_{\odot} = 0.02$), can be explained with stellar models and the adopted wind mass-loss rates. The maximum BH mass obtained for moderate metallicity ($Z = 0.3Z_{\odot} = 0.006$) is $M_{\text{BH,max}} \approx 30 M_{\odot}$, which is a striking finding as the mass of the most massive known stellar BH is $M_{\text{BH,obs}} \approx 23\text{--}24 M_{\odot}$, and this is located in a small star-forming galaxy with moderate metallicity.

It was also found that in a very low metallicity environment (e.g. similar to that in a globular cluster) the maximum BH mass could be as high as $M_{\text{BH,max}} \approx 80 M_{\odot}$ (for $Z = 0.01Z_{\odot} = 0.0002$). It is interesting to note that the X-ray luminosity from Eddington-limited accretion onto an $80 M_{\odot}$ BH is comparable to the luminosity of some known ultra-luminous X-ray sources. For full information, see Belczynski et al. (2010).

Finally, A. Pastorello (Queen's University, Belfast) and a team of colleagues including Jorick Vink have studied an extremely active luminous blue variable (LBV) star in the nearby dusty spiral galaxy NGC 3432 (Pastorello et al., 2010). Although the modulated light curves of the object are typical of LBVs during the S-Dor variability phase, the extremely luminous maxima and the high frequency of outbursts are unexpected. Such extreme variability may be associated with repeated ejection episodes during a giant eruption of an LBV. Alternatively, it could suggest a high level of instability of the star shortly before core-collapse, or possible interaction of the main star with a binary companion. In this context, the variable in NGC 3432 shares a number of interesting similarities with the famous stellar system HD 5980 in the Small Magellanic Cloud, which includes an erupting LBV and an early Wolf-Rayet star.

Collaborations and Invited Lectures Staff at the Observatory are involved in numerous research collaborations and have delivered in excess of 70 public talks and scientific presentations during 2010. We illustrate this activity by noting that Maria Madjarska began a new international collaboration entitled 'Eruptive Solar Prominences and Relation to Coronal Mass Ejections', with J.-C. Val and K. Bocchialini (Institut d'Astrophysique Spatial, Orsay, France) and K. Koleva (Institute of Astronomy, Bulgarian Academy of Sciences, Bulgaria). Similarly, Stefano Bagnulo participated in the prestigious NATO Advanced Study Institute on "Special Detection Technique (Polarimetry) and Remote Sensing" in Kiev, Ukraine, and delivered a lecture entitled 'Stellar Spectropolarimetry: Basic Principles, Observing and Data Reduction Techniques, and Diagnostics of Magnetic Fields', and an invited review entitled 'Polarimetry of Small Bodies of the Solar System with Large Telescopes'. Mark Bailey delivered several invited lectures, for example 'Risk and Natural Catastrophes: The Long View' (University of Cambridge 'Darwin' lecture series); 'The Origin of Short-Period Comets: Some Old Ideas and New Results' (Rosetta Lander Workshop, Open University, Milton Keynes); 'Carleton and Halley's Comet: Cometary Astronomy from the Earliest Times to the Start of the Modern Era' (Carleton Summer School, Clogher, Co. Tyrone); and 'The Origin of Comets and the Oort Cloud' (STFC Introductory Summer School in Solar-System Physics, University of Leeds. The Darwin Lecture has been watched by more than 6,000 people in its first year online. Maria Madjarska also gave an extensive lecture, entitled 'The Quiet Sun', at the STFC Advanced Summer School ('The High Resolution Sun: Theory and Observations') at the Jeremiah Horrocks Institute, the University of Central Lancashire, and a keynote lecture ('Small-Scale Transient Phenomena: Plasma Properties and Diagnostics') at the Armagh ADAS conference.

Observing Time Observatory staff have continued to be extremely successful in obtaining observing time on national and international telescope facilities, including spacecraft, to develop their research programmes and provide data with which to test new theories. Among these we note the following:

- (a) Jorick Vink reports that he together with Götz Gräferer (PI) and other members of the Massive Star FLAMES II Consortium have obtained VLT/Sinfoni time to observe and analyse the most massive stars in our local Universe. The same consortium (PI C.J. Evans, University of Edinburgh) also obtained additional time with VLT/FLAMES to observe $\sim 1,000$ stars in the Tarantula Nebula at several epochs to study the binarity of the most massive stars.
- (b) Vink also reports that he is part of several other teams that have recently obtained significant amounts of telescope time: (1) a team led by R. Oudmaijer (University of Leeds) that has obtained 45 hours of VLT/X-Shooter time to observe over 100 Herbig stars to understand the accretion on to these intermediate-mass ($2\text{--}10 M_{\odot}$) young stars; (2) a team led by R. Kotak (Queen's University Belfast) that has obtained additional VLT/UVES time to understand interacting SN II in so as to constrain the mass-loss history of their progenitor massive stars, possibly Luminous Blue Variables; and (3) a team led by J. Drake (Harvard University, Cambridge, USA) that has obtained more than a million seconds of time on the Chandra X-ray Observatory, to observe the massive-star

population of our nearest local ‘starburst’ region Cyg OB2 in the X-ray regime; and (4) a part of a team led by R. Prinja (University College London) that was awarded more than 200 hours of e-Merlin time to study the same stellar population at radio wavelengths.

- (c) Gavin Ramsay reports that his group obtained a further 5 nights on the Isaac Newton Telescope in 2010 June for the RAPid Temporal Survey (RATS) project, and 9 hours on the Liverpool Telescope with PhD student Tom Barclay as PI, to continue long-term monitoring of AM CVn systems. The group also obtained one observation every two days with the NASA ‘Swift’ satellite, to determine how the UV and X-ray fluxes vary over the course of an outburst cycle of the unusual AM CVn system KL Dra. This is a close binary system in which material is being transferred from one star to another via an accretion disc.

Gavin Ramsay also notes that he has been awarded time on the Isaac Newton Telescope on La Palma for a project to identify short-period variable stars in the Kepler field. This will be the first time that such a study has been performed at the depth envisaged. Time has also been awarded (96 ksec) on the satellite XMM-Newton to observe the ultra-compact binary KL Dra over an outburst cycle. Observations will be made every two days and will result in X-ray and UV data. This will be the first time such an in-depth study has been made of a helium accreting system at these energies. He has also gained a short amount (3 hrs) of time on the Gemini South Telescope to obtain spectroscopic observations of ultra-compact binary candidates identified in the RATS survey. Finally, he is part of a group led by S. Katajainen that has been awarded time on the ESO VLT 8.2 m telescope, obtaining 11 hours for a search for polarization in a sample of ultra-compact binaries. This will be able to identify whether any of these objects has a significant magnetic field, which is an important factor determining how these systems evolve.

- (d) Simon Jeffery reports that he has obtained 7 nights on the South African Astronomical Observatory 1.9 m telescope from 2011 March 23–30, 4.5 nights on the ESO 2.2 m telescope (Fiber-fed Extended Rand Optical Spectrograph [FEROS]) at La Silla, Chile, from 2011 May 6–11, and 4 hours service mode on the ESO VLT 8.2 m telescope (Ultraviolet and Visual Echelle Spectrograph [UVES]); all for projects concerning the chemistry of helium-rich hot subdwarfs as a stellar evolution tracer.

Grants Observatory staff were extremely successful during 2010 in obtaining external grants to support their work and develop new projects. Among these we note the following:

- (a) The Observatory was awarded a quota of one STFC-funded studentship for students beginning in 2010/2011. This is the first time the award has been based on the new STFC studentship algorithm. For comparison, a total of 235 studentships were available in the fields of astronomy, particle physics and nuclear physics, covering all areas of research funded by the STFC.
- (b) The Observatory’s application, led by Apostolos Christou, for a new three-year visitor’s grant was approved at the level of £15k, a modest uplift on the previous STFC visitor grant.
- (c) Apostolos Christou also obtained a small grant (£0.5k) from the Royal Astronomical Society to support an invited amateur astronomer speaker at the International Meteor Conference 2010, which was held in Armagh together with the Fireballs Workshop during the period 2010 September 14–19.
- (d) Visiting Astronomer John Landstreet reports that with effect from 2010 April 1 he has been awarded a five-year CAN \$160k Discovery Grant by the Natural Sciences and Engineering Council of Canada to help pay for travel and subsistence and other research costs associated with his continuing research as an Emeritus Professor.
- (e) Carol Conlin (Armagh Public Library) reports that her grant application together with the Armagh Observatory (Co-I Mark Bailey) for a second year of support from the Pilgrim Trust and the Northern Ireland Museums Council to improve the conditions for public access to the two organizations’ libraries and archives, and for the necessary cataloguing, conservation and collections management of their respective collections has been successful. A total of £19.9k external grant income will provide more than 50% of the total project costs during 2011. The Observatory thanks the Keeper and Assistant Keeper of the Armagh Public Library for their enthusiastic support for this library and archives project.
- (f) The Armagh Observatory is one of six international partners in the European Universe Awareness project (EUNAWE): ‘Building on the International Year of Astronomy — Making Young Children Aware of the Universe’, led by Professor George Miley, University of Leiden, The Netherlands. The countries involved are Germany, Italy, South Africa, Spain, The Netherlands, and the United Kingdom. UNAWE is an International Astronomical Union (IAU) endorsed programme that uses the beauty and grandeur of the Universe to encourage young children, particularly those from an underprivileged background, to have an interest in science and technology and foster their sense of global citizenship from the earliest age. UNAWE was founded five years ago and is already active in 40 countries comprising a global network of almost 500 astronomers, teachers and other educators.

The grant (Co-I Mark Bailey) has been allocated to European Universe Awareness (EUNAWE), a European branch of the global UNAWE programme, and is aimed at implementing Universe Awareness programmes in six countries over three years by organizing teacher-training courses and developing hands-on material for children. In the long term, EUNAWE aims to help produce the next generation of European engineers and scientists and to make children from underprivileged areas realize that they are part of a much larger European community. As a result of this initiative, the Observatory will receive approximately (€200k) of the total project funding (€1.9M) to support ‘EUNAWE’ activities throughout the UK during the next three years. The post of UK National Project Manager will be advertised in early 2011/2012.

- (g) Miruna Popescu, working with the Armagh Rhymers Educational and Cultural Organization, obtained a grant (held and administered by the Armagh Rhymers) of £30k to support a new outreach programme called OASES ('Over us All is the SEIfsame Sky'). This grant was provided as part of the European Union's PEACE III Small Grants Programme, promoted by Armagh City and District Council and managed by the PEACE III Southern Cluster Partnership for the Special EU Programmes Body (SEUPB). The project provided astronomy, art and music workshops to primary school children on both sides of the border. The objective of the programme, which was fully achieved, was to enhance knowledge and understanding of astronomy and the wider universe amongst this age group, a key 'Universe Awareness' (UNAWE) objective, using 'OASES' as a vehicle to promote peace and reconciliation in the community.
- (h) Mark Bailey, working with Marek Kukula (Royal Observatory Greenwich) and partners in the Royal Observatory Edinburgh, obtained a small award of £3k from the Royal Astronomical Society (RAS) to produce, print and display a set of 'From Earth To The Universe (FETTU)' images in the Royal Albert Hall, from 2010 October 19 to November 5. The new FETTU images for this exhibition were created by Miruna Popescu.

Conferences, Workshops and Scientific Meetings In common with other research groups, astronomers at Armagh Observatory play a leading role in organizing conferences, scientific workshops and associated scientific meetings in astronomy and related sciences. Among these we note the following:

- (a) **Solar Physics Conferences:** Gerry Doyle reports that he served on the Scientific Organizing Committee of a number of solar physics conferences, workshops and specialist discussion meetings, including: (i) 'Modelling of Dynamic Solar Plasmas' (J.G. Doyle, M. Madjarska, NAM 2010, Glasgow, Scotland); (ii) ST15: New Views of the Solar Corona as Seen from HINODE and SDO' (D. Banerjee and J.G. Doyle); (iii) Asia Oceania Geosciences Society 7th Annual Meeting 2010, Hyderabad International Conference Centre, India, 5–9 July 2010; (iv) 'E21: The Challenge of the Hidden Scales in Solar Dynamic Phenomena', COSPAR 2010, Bremen, Germany, 18–25 July 2010; and (v) 'The 2010 Atomic Data and Analysis Structure Workshop', Armagh Observatory, 2010 October 3–5.
- (b) **Brown Dwarfs and Exoplanets:** Gerry Doyle also co-organized a discussion meeting on brown dwarfs and giant planets at the UK National Astronomy Meeting, namely 'Magnetospheric Physics: Exploring the Links Between Jovian-Type Planets and Ultracool Dwarfs' (J.G. Doyle, N. Achilleos, NAM 2010, Glasgow, Scotland).
- (c) **ISSI Meeting:** Maria Madjarska organized and chaired a team meeting at the International Space Science Institute (ISSI), Bern, Switzerland during 2010 January 25–28, "Small-Scale Transient Phenomena and their Role in Coronal Heating". She also gave a number of talks at the meeting in collaboration with other members of the Armagh Solar Physics group.
- (d) **AstroNet Workshop:** Apostolos Christou delivered a short course at the AstroNet EU Training Network Infrastructure Workshop at the University of Surrey (2010 June 10–11) on the theme of Coorbital Dynamics in the Solar System.
- (e) **4th International MiMeS Workshop:** The Magnetism in Massive Stars ('MiMeS') collaboration is an international partnership set up to exploit the unique characteristics of ESPaDOnS, a bench-mounted high-resolution spectrograph and polarimeter designed to obtain a complete optical spectrum 370–1050 nm in a single exposure in order to obtain information about the magnetic properties of massive stars. The acronym ESPaDOnS is short for an Echelle SpectroPolarimetric Device for the Observation of Stars. The four primary science drivers of MiMeS are to address key questions in stellar astrophysics (see http://www.physics.queensu.ca/~wade/mimes/MiMeS_Science.html), for example (1) the origin and evolution physics of fossil magnetic fields; (2) the physics of atmospheres, winds, envelopes and magnetospheres of hot stars; (3) the rotation and rotational evolution of massive stars; and (4) the evolution of magnetic fields of O and B-type stars and the origin of magnetic fields of neutron stars and magnetars. The Armagh MiMeS workshop, the fourth in the series, was organized by Stefano Bagnulo and Jorick Vink during the period 2010 July 26–30. Full details of the meeting and the list of participants are available at <http://star.arm.ac.uk/mimes/Home.html> and <http://star.arm.ac.uk/mimes/Participants.html>.
- (f) **Fireball Data Workshop ('Fireworks'):** Approximately 25 astronomers from different countries attended the 'Fireworks' workshop, organized by Detlef Koschny and Maria Gritsevich (European Space Agency Research and Science Support Department, Noordwijk, The Netherlands) and Apostolos Christou (Armagh Observatory). The meeting took place in the Armagh Observatory during 2010 September 15–16 immediately before the International Meteor Conference 2010. It brought together some of the key players in Europe and farther afield who are operating systems to collect reports and information on fireballs (exceptionally bright meteors). The goal was to exchange information and build on the experience of different groups with the long-term objective of setting up a single world-wide fireball database. Fireballs are of growing scientific and public interest, the scientific interest focusing on the nature and origin of these relatively large pieces of cometary or asteroidal material (ranging in size from a few centimetres up to metres or more), and whether they move in streams or reach the Earth entirely randomly, with implications for the safety of humans and spacecraft in low-Earth orbit. Members of the general public, however, often simply require an explanation of what they have seen. As a result, they may be attracted into a deeper scientific interest in astronomy and celestial phenomena.
- (g) **International Meteor Conference 2010:** The 29th International Meteor Conference (IMC 2010) of the International Meteor Organization (IMO) was held in Armagh during 2010 September 16–19. It was organized by David Asher, Geert Barentsen, Apostolos Christou and Miruna Popescu, with help from Tom Barclay, Joachim Bestenlehner, Tobias Hinse, Shane Kelly, John McFarland, Aileen McKee, Naslim Neelamkodan, Alison Neve, Bernard Toner, Kamalam Vanninathan and Shenghua Yu, as well as officers of the IMO and others. Lectures and plenary sessions were held in the Studio Theatre in the Market Place, Armagh,

and accommodation was provided in local hotels, local B&B guesthouses and the Armagh City Youth Hostel, which additionally served as an excellent venue for the social programme of the meeting.

The growing professional and advanced amateur interest in observing meteors of all types and identifying their principal sources and modes of evolution in the interplanetary medium is indicated by the fact that this meeting was the largest ever held by the IMO, with approximately 130 participants from more than 20 countries, including the USA, Venezuela, Nepal, India, Japan and Australia. The Armagh meeting was also the first time the International Meteor Conference (IMC) had been held anywhere in the UK or Ireland. It was noteworthy in drawing together both professional meteor scientists and the very active (and professional) international ‘amateur’ community.

The conference was preceded by the Fireball Data Workshop held at the Observatory. This workshop was attended by several of the IMC participants having a specialized interest in fireballs. Subsequently the IMC was opened on 2010 September 17 with a keynote lecture by Dr Bill Cooke of the Meteoroid Environments Office at NASA’s Marshall Space Flight Center, who highlighted the efforts of amateur astronomers worldwide in helping to protect the NASA space program from potentially hazardous meteoroid. Full information about the conference is available as links from the Observatory’s web-site and the IMO web-page at: <http://www.imo.net/imc2010/>.

- (h) **The Transient Universe:** The biannual (autumn) meeting of the Astronomical Science Group of Ireland (ASGI) was organized by Simon Jeffery (Chair, ASGI) with the support of a very capable Local Organizing Committee and held in Dublin in the Royal Irish Academy over the two days 2010 September 23–24. The meeting, which was attended by approximately 90 participants, was supported by the Royal Irish Academy, Science Foundation Ireland, the Royal Astronomical Society, the ASGI, Andor Technology Plc, the Irish Times, and Fáilte Ireland, and attracted speakers principally from the UK, Ireland and other parts of Europe, as well as the USA.
- (i) **15th Annual Atomic Data and Analysis Structure (ADAS) Conference:** The 15th annual ADAS Workshop, organized jointly by the University of Strathclyde (Professor Hugh Summers) and the Armagh Observatory (Professor Gerry Doyle), was held in the Rotunda Theatre, St. Patrick’s Trian, Armagh, from 2010 October 3–6. ADAS is an interconnected set of computer codes and data collections used for advanced modelling of the radiating properties of ions and atoms in plasmas. It can be used to address plasmas ranging from the interstellar medium through to the solar atmosphere, and from laboratory thermonuclear fusion devices to technological plasmas, and can assist in the analysis and interpretation of spectral emission and detailed plasma models. The primary topics of this year’s workshop were (1) advances in astrophysical spectral diagnostics; (2) how to improve the quality of atomic data; and (3) atomic and plasma models in fusion and astrophysics. Full information about the workshop is available on the ADAS website at <http://www.adas.ac.uk/workshop2010.php>. Approximately 50 science participants and accompanying guests from a dozen countries worldwide attended the meeting.
- (j) **Robotic Telescope Workshop:** PhD students Eamon Scullion and Tobias Hinse organized a one-day meeting on 2010 October 4 to discuss for the first time the suggestion to build a 1–2 metre robotic telescope on the island of Ireland for the promotion of education and learning in the natural sciences at primary and secondary school level, and to carry out high-level astronomical research at institutes on both sides of the Border. In addition to staff and students from Armagh Observatory the meeting was also attended by representatives from Dundalk Institute of Technology.

Science in the Community In addition to its core function to carry out an international level programme of scientific research in astronomy and related sciences, and to expand the heritage of astronomy at Armagh, the Armagh Observatory also carries out a vibrant programme of Science in the Community. There are several strands to this programme, which includes education and learning for all as well as public lectures and guided tours of the Observatory and the Grounds, Astropark and Human Orrery. In addition, there are more formal education and training programmes, for example those associated with the Observatory’s programmes of work experience, student training and engagement with the local community, all of which draw on the specific expertise of research astronomers at Armagh.

The various strands of the Observatory’s programme of Science in the Community highlight the contribution of the Observatory’s astronomical heritage to Northern Ireland and to the City of Armagh. They help to explain to a wide audience the results of modern astronomy and the benefits of carrying out international-level astronomy, particularly for education, learning and training in the so-called ‘STEM’ subjects (Science, Technology, Engineering and Mathematics) of such importance for our knowledge-led economy. The Observatory makes a major contribution to the international profile of Northern Ireland; helps to develop science and science-based skills in the community; and provides an active programme of public lectures, guided tours, and work-experience activities which together contribute to wider UK and Northern Ireland Government initiatives aimed at deepening scientific knowledge and improving scientific literacy across the whole community. During 2010, staff at the Observatory issued 38 press releases, all of which were published in one form or another, and more than 500 mass-media citations were identified referring to the Observatory, its staff and their work.

In summary, the Observatory is an international research institute that makes a major contribution to promoting the City of Armagh and Northern Ireland on the world stage. It attracts a high level of media interest; its web-sites attract around a million distinct e-visitors (DEVs) annually from around the world; and approximately 50,000 people every year visit the landscaped Grounds and Astropark: a unique inner-city parkland developed to enrich the lives of residents and visitors to Armagh alike.

Climate Change John Butler reports that a paper by his former PhD student Ana García-Suárez and himself, namely “Relative humidity at Armagh Observatory, 1838—2008”, has been accepted for publication in the International Journal of Climatology for

2011. Briefly, the work presents a calibrated atmospheric humidity series for the Armagh Observatory, beginning in 1838 and continuing to the present day. This is believed to be the longest such series presented so far. Daily wet-bulb and dry-bulb temperature readings are corrected for the time of reading and for known instrumental errors to determine mean monthly, seasonal and annual relative humidity (RH) at 09:00 GMT from 1838 to 2008 and at 21:00 GMT from 1844 to 1964.

Whereas the mean seasonal and annual time series of RH at this site show only marginal evidence for a trend in RH since the 1880s, there is significant decadal and multi-decadal variability, some of which appears to be cyclic. Wavelet analysis indicates the presence of two quasi-periodic components in RH, one ranging from 23.4 to 25.5 years and the other from 36 to 51 years. Although one cannot draw firm conclusions from data originating from just one site, it seems likely that the immediate explanation for such cycles in RH may be found in long-term atmospheric circulation changes over Ireland. The work also shows that two conspicuous peaks in RH during the nineteenth century coincide with major infestations of potato blight in Ireland.

Meteorological Readings at Armagh Daily meteorological readings are taken by the Grounds and Meteorological Officer, and by other staff. The data are of growing interest and importance for wider studies of climate change, and are the subject of increasingly close scrutiny and use by external researchers owing to the valuable information they contain on how Northern Ireland's weather patterns may be changing as a result of climate change. All data are publicly available at <http://climate.arm.ac.uk/>. It is interesting to note that after a maximum annual average temperature of 10.62°C in 2007, both 2008 and 2009 were significantly cooler with annual average temperatures of 9.77°C and 9.87°C respectively. The downward trend in the annual average temperature continued into 2010, the corresponding annual average being 8.74°C, making 2010 the coolest year since 1986 (annual average temperature 8.62°C). Total precipitation for 2010 was 796.85mm, slightly lower than recent previous years. Graphs showing the annual average temperatures from 1796 to 2010 and total annual precipitation from 1838 to 2010 are shown in Figures 1 and 2 respectively.

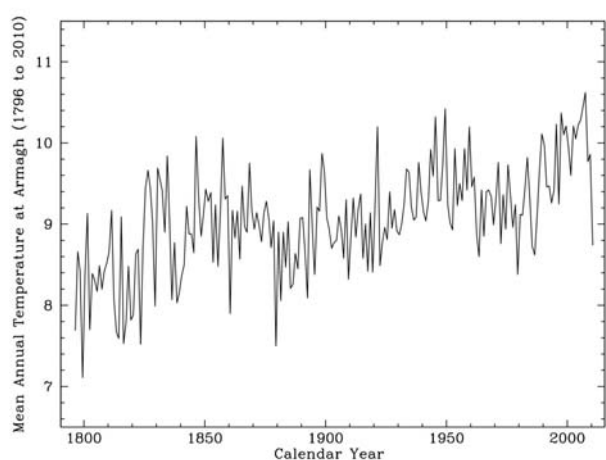


Figure 2: Mean annual temperatures at Armagh, 1796–2010

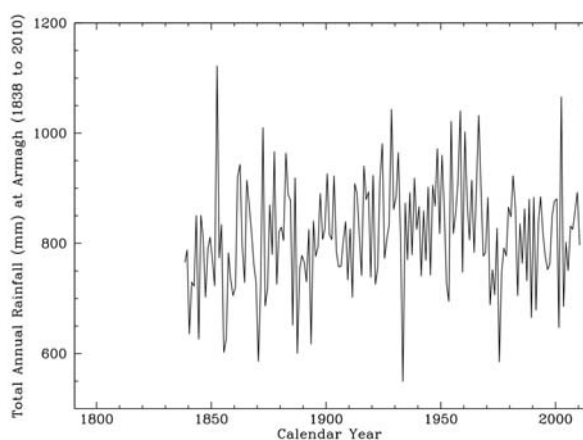


Figure 1: Total annual precipitation (mm) at Armagh, 1838–2010.

Weather Notes for 2010 The weather in Northern Ireland is extremely variable, and scarcely a year goes by without one or another extreme or unusual weather event being recorded. For example, 2010 July was a particularly wet month, the fourteenth wettest July since the Observatory's daily rainfall records began in 1838, with a total of 122.5 mm (4.8 inches). Excluding 2007 July (with 131.2 mm) this was the wettest July since 1958. 2010 September was also very wet, with a total rainfall of 132.0 mm (5.2 inches), the tenth wettest September on record and the wettest September since 1999. Similarly, 2010 November, with a total precipitation of 115.2 mm, was nearly 60% wetter than average. Nevertheless, despite these wet months 2010 was slightly drier in Armagh than recent years: seven months were drier than average (e.g. December was the driest December since 1987), four wetter than average, and one (June) only slightly wetter than average.

Cold December The year will be mostly remembered, however, for the exceptionally cold weather during late November and December. The average temperature during 2010 November was 4.77°C and that during 2010 December was -0.33°C. This was the second coldest December in Armagh since the Observatory's records began around 1795 (the three coldest Decembers being those of 1878, 2010 and 1796, with average temperatures of -0.5°C, -0.3°C and 0.6°C respectively). 2010 December also had 24 days of air frost, snowfall on six days, and a lowest minimum air temperature of -11.9°C, which occurred during the morning of December 21. 2010 will also be remembered for providing spectacular winter scenery: a glorious white Christmas, with frost and snow staying on trees and hedgerows for the most of the two weeks leading up to Christmas day, and lying snow (though no snowfall) on 25th December before the rapid thaw which began on 26th December and extended into the New Year with associated disruption to Northern Ireland's water supply.

The exceptionally cold December, together with the earlier cold spell in 2010 January, combined to make 2010 the coldest year since 1986. It is noteworthy that 2010 November 28 was the second coldest November day (i.e. lowest T_{max}) since the Observatory's records of T_{max} and T_{min} began in August 1843. On this day the maximum temperature, T_{max} was -1.5°C which equalled the previous second lowest maximum November temperature, that of 1977 November 26, which was the lowest November T_{max} since 1915 November 17 ($T_{max} = -1.6°C$). Similarly, 2010 November 28 and 29 both had very low nighttime temperatures (i.e. lowest daily minimum temperatures T_{min}). 2010 November 28 was the third coldest November night on record ($T_{min} = -7.8°C$) and 2010 November 29 the sixth coldest ($T_{min} = -7.4°C$). In the Armagh temperature record since 1843, only 1919 and 1915 had colder November nights: 1919 November 15 and 14 had $T_{min} = -8.3°C$ and $-7.9°C$ respectively; and 1915 November 17 and 18 both had $T_{min} = -7.7°C$.

2010 December was colder still, the winter solstice 2010 December 21 having the coldest daytime temperature (i.e. lowest T_{\max}) recorded at Armagh since 1843. This lowest $T_{\max} = -8.0^{\circ}\text{C}$ made 2010 December 21 one of the coldest days in Armagh during the last 200 years, certainly the coldest since the 'max-min' thermometer series was started in 1843 August (167 years), and probably the coldest since 1814 January (196 years), for example 1814 January 13 which with morning and evening spot temperatures of -12.2°C and -13.3°C respectively reportedly had 'the hardest frost recorded here for the space of 20 years'. The minimum temperature on 2010 December 21 was $T_{\min} = -11.9^{\circ}\text{C}$, the fourth lowest December temperature on record, and leading to a new record low average temperature for the day of -10.0°C .

Grounds and Astropark The Observatory's Grounds and Astropark provide an inner-city haven for wildlife, and with appropriate conservation management are becoming an area of growing biodiversity including both flora and fauna.

The Grounds and Meteorological Officer, Shane Kelly, reports that the effect on wildlife, such as birds, of the severe weather in 2010 November and December is difficult to assess, but it appears that most populations are in a healthy state.

Snow began to lie on 2010 November 27 and stayed on the ground until December 10. Similar conditions lasted from December 17 to 26. Over these periods the air minimum temperature fell as low as -11.9°C with ground temperatures getting down to -15.5°C . To help counteract these severe conditions feeding posts for the birds were set up for the duration and food at them was replenished several times a day. It is notable from observations over the period that Redwings and Fieldfares were completely absent compared to the previous year (2009 December and 2010 January), when significant numbers of both turned up in the grounds. Indeed it was not until 2011 March that a small number of Fieldfares began to make an appearance. Feeding posts were also established to aid mammal species during 2010 November/December and areas cleared of snow.

By early Spring 2011, Wrens, Long-tailed Tits and Goldcrests had not yet been spotted. Whereas Bullfinches (Amber List) appear to be thriving, Treecreepers, which were spotted in the Grounds for the first time in 2009, had not been seen up to 2011 April. It is expected that raptors will make an appearance as breeding progresses.

The Observatory's policy is to target species that seem to be absent or existing in small numbers by incrementally establishing suitable habitats for them. Thrushes and hedgehogs will benefit from the creation of more damp and sheltered areas where snails and slugs can proliferate. Frogs may also migrate to these wetter areas. A conifer stand will be created which will in the long term be advantageous to Goldcrests and Treecreepers.

The 2010 phenology garden data has been forwarded to the International Phenology Network coordinating laboratory in the Institute of Plant Sciences, Humboldt-University, Berlin.

Collaboration with QUB on the Isotopic Composition of Rainwater Dr Luc Rock, an RCUK Research Fellow in the Queen's University Belfast School of Planning, Architecture and Civil Engineering (SPACE), reports that in 2008 October a collaboration was established between QUB and Armagh Observatory to provide support for an undergraduate research project undertaken by Ms Melanie Thrush and supervised by Luc Rock. The Armagh Observatory provided daily precipitation samples, which were analyzed at the Stable Isotope Facility at QUB to determine their oxygen (O) and hydrogen (H) isotopic compositions. Although this project finished in 2009 March, the collaboration was maintained and collection of daily precipitation samples continued. This proved beneficial, as in 2009 September Ms Abigail Goodman started a PhD project focusing on the spatial and temporal variability of the isotopic composition of precipitation across the island of Ireland, also under the supervision of Dr Rock. Hence the daily samples provided by the Armagh Observatory form a key part of A. Goodman's research project. Preliminary data obtained from the Armagh samples were presented at the European Geosciences Union (EGU) General Assembly in 2010 (see Goodman et al., 2010), and they also supported a presentation for the Biogeosphere-Atmosphere Stable Isotope Network (BASIN) 2011 conference 'The Roles of Stable Isotopes in Water Cycle Research', held at Keystone, Colorado, 2011 March 29–31. Dr Rock notes that without the support of the Armagh Observatory and especially the assistance of S. Kelly it would be very difficult to undertake a long-term monitoring study. The latter is crucial in order to understand changes in precipitation patterns.

Collaboration with QUB on Biological Soiling of Stone in Northern Ireland The Observatory is assisting Queen's University Belfast in another environmental studies project aimed at better understanding the potential impact, owing to climate change, of predicted increased winter wetness on stone buildings. The project, "Biological Soiling of Stone in Northern Ireland: Potential Impacts of Climate Change", is managed by Catherine Adamson, a postgraduate student in the QUB School of Geography, Archaeology and Palaeoecology (GAP) under the supervision of Professor Bernard Smith and Dr Patricia Warke (both School of GAP, QUB).

The project consists of a set of exposure trials to investigate biological colonisation on fresh stone combined with information gathered as part of the natural stone database project. This will incorporate more established soiling and decay information from historic buildings and monuments. The exposure trial aspect of the project consists of 9 sites across Northern Ireland, examining the rate and type of biological colonisation of sandstone.

The exposure trial blocks have now been out for 19 months of 21 (the final blocks to be brought in during May 2011). Microscopic and laboratory analysis of collected blocks will be combined with meteorological station weather data and local site information to determine which factors may be influencing colonisation. Much analysis remains to be done on the blocks which have been collected, but all sites have shown considerable biological colonisation, including algae, fungi and lichens. The most recent visit (March 2011) to the Armagh Observatory site showed continuing lichen development. The Armagh site has been a valuable part of the exposure

trial experiments as the main ‘low rainfall’ area site for Northern Ireland, with the added benefit of having a meteorological station in the same location.

The Armagh Robotic Telescope Simon Jeffery and telescope technician Jack Wright obtained their first images of deep-space objects using the new Armagh Robotic Telescope at Armagh Observatory on the evening of 2011 February 1. This was a significant milestone in the transition to full operations of the new telescope, the first major telescope to be installed at the Observatory for nearly a hundred years. The astronomers used the telescope that evening to demonstrate that all major telescope systems were operating as designed and obtained images of the Andromeda galaxy, the Pleiades, and other nebulae and star clusters.

The new telescope comprises a 17-inch PlaneWave Corrected Dall-Kirkham telescope mounted on a Paramount ME German equatorial mount with a Starlight Xpress H36 CCD camera housed in a 3.5-metre Sirius Observatories Dome. Its installation complements the Observatory’s existing Polar Bear and Meteor Patrol cameras, which are already automatically gathering data whenever the sky is clear, as well as the much older telescopes and telescope domes, notably the 1883 Calver telescope and the Grubb 10-inch refractor, the latter installed in 1885 in the historic ‘Robinson Dome’, named in memory of the Observatory’s third director, the Revd Dr Thomas Romney Robinson FRS.

Although not quite the largest telescope in Armagh (the mirror of the 1883 Calver telescope is slightly larger), it is by far the most powerful because of its modern optics and sensitive camera. Moreover, it can be operated entirely from a computer by an astronomer working from a desk a few metres away, or in principle fully automatically. These features optimise the number of clear nights when it can be used. The number of usable hours of observing at Armagh corresponds to a surprisingly large average of one night in three, provided the astronomer can use gaps between the clouds and light pollution from city lights is kept to a minimum.

Once fully operating, the telescope will be used for research in solar-system science and stellar and Galactic astrophysics. Astronomers will be able to determine the structure of pulsating stars using the technique of asteroseismology and look for evidence of planets circling other stars. They will also be able to observe the peculiar behaviour of long-period variable stars, which vary slowly in brightness on time-scales of months to years, and the varying brightness of accretion discs surrounding supposed massive black holes in active galactic nuclei.

The telescope will also be used to determine the positions and shapes of asteroids in the solar system (and of the satellites of major planets) using the method of ‘mutual events’, in other words by precise timing of the occultation of a star by an asteroid or the occultation or eclipse of one satellite by another as they revolve around their ‘parent’ planet. Finally, it is expected that the telescope will be used to observe unexpected objects, such as comets, and rare high-energy stellar explosions known as ‘flares’, novae and supernovae, and will support observations made by other telescopes at Armagh and by larger telescopes elsewhere.

Data Storage System Following provision of additional DCAL funding during 2010/2011, the Observatory’s now has a professional standard data-storage facility sufficient to meet present needs and to provide an expansion path into the future. The new system provides approximately 80 TB of on-line storage capacity and has removed the Observatory’s reliance on a more vulnerable network of RAID systems. The backup functions of the RAID systems have been transferred to the new system as well as a large quantity of astronomical data. The new system is working well and is expected to provide the Observatory with a reliable and secure data storage facility for at least the next several years.

Performance Monitoring

Performance Indicators Results for various performance indicators are summarized in Tables 1 and 2. The new performance indicators introduced by DCAL during 2006/2007 are defined as follows:

- A. **“Rate of Return”**. This is the ratio of total external income as a percentage of total income per financial year following resource accounting rules. In recent years, the result (which takes no account of the value of the Observatory’s significant use of external facilities) has averaged around 20%. In general, a high value is better, though it must be remembered that the Observatory is not a commercial organization.
- B. **“Administrative Efficiency”**. This is the ratio of total governance and administration costs as a percentage of total expenditure per financial year. This provides a measure of the efficiency or ‘value for money’ of the Armagh Observatory in delivering a high-quality astronomical service at the lowest reasonable cost. A low percentage administrative cost is better.
- C. **“Staff Absence”**. This is the average number of days absence per person per calendar year (days per person per year). A low value is better.
- D. **“Refereed Publications”**: the number of scientific papers published per calendar year in refereed scientific journals. In general, a high value is better, though high-quality, influential work is more important and can also appear in other media such as books, conference publications and so on.

Results for these key PIs for 2006/2007 et seq. as well as for the prior years for which we have data and targets for future years are shown in Table 1. Results for these and other PIs that are routinely collected to assess the Observatory’s performance in different areas of activity are also shown in Table 2. In addition to these specific performance indicators, various other data are routinely

recorded for statistical or internal management purposes, many of which are presented in tabular or narrative form in each year's Annual Report. For past reports, see <http://star.arm.ac.uk/annrep/>.

Calendar or Financial Year	Rate of Return Key PI 'A'		Admin. Efficiency Key PI 'B'		Staff Absence Key PI 'C'		Refereed Publications Key PI 'D'	
	Actual (%)	Target (%)	Actual (%)	Target (%)	Actual (d/p/yr)	Target (d/p/yr)	Actual (per year)	Target (per year)
2004 or 2004/2005	19.9	–	6.5	–	0.4	–	41	32
2005 or 2005/2006	18.1	–	7.2	–	0.4	–	47	35
2006 or 2006/2007	19.0	20.0	9.8	10.0	0.2	12.0	47	40
2007 or 2007/2008	20.7	20.0	7.4	8.8	0.5	11.0	57	45
2008 or 2008/2009	20.2	21.5	8.2	8.2	1.7	10.0	53	50
2009 or 2009/2010	24.2	21.5	8.0	8.2	3.0	10.0	41	50
2010 or 2010/2011	19.4	21.5	7.8	8.2	1.1	9.0	45	50
2011 or 2011/2012		21.5		8.2		9.0		50
2012 or 2012/2013		21.5		8.2		9.0		50
2013 or 2013/2014		21.5		8.2		9.0		50
2014 or 2014/2015		21.5		8.2		9.0		50

Table 1: The trend of annual results for key performance indicators agreed with DCAL during 2006. The first column denotes the calendar or financial year. The percentage Rate of Return (Key PI 'A') corresponds to the ratio of total external income to total income per financial year; Admin. Efficiency (Key PI 'B') represents the ratio of the total expenditure of the Observatory on governance and administration to total expenditure, again per financial year; Staff Absence (Key PI 'C') denotes the average number of days absence per person per calendar year (d/p/yr); and Refereed Publications (Key PI 'D') denotes the number of refereed journal papers produced by Observatory staff in each calendar year.

Performance Indicator	Prior Year (2009 or 2009/2010)	Current In-Year Result (2010 or 2010/2011)	Current-Year Target (2010 or 2010/2011)
A: 'Rate of Return'	24.2%	19.4%	21.5%
B: 'Admin. Efficiency'	8.0%	7.8%	8.2%
C: 'Staff Absence' (days/person/year)	3.0	1.1	9.0
D: 'Refereed Journal Publications'	41	45	50
External Grant Income Received In-Year (£000s)	346.7	452.3	300.0
Other External Income Received In-Year (£000s)	9.9	8.0	15.0
Distinct e-Visitors (millions)	0.91	0.98	0.90
Web-Site 'Hits' (millions)	15.5	17.09	15.0
Data Exported (TB)	7.82	9.51	8.00
Identified Media Citations	442	503	250
Astropark Visitors Numbers	55000	75000	45000

Table 2: In-year results for Armagh Observatory Performance Indicators.

It should be noted that in this report all items with the exception of financial matters refer to calendar year. We also remark, in order to avoid any confusion, that total external grant income received in cash terms per financial year is not the same as the total external grant income per financial year shown in the accounts or total external income as defined implicitly in key PI 'A' Rate of Return (Table 1). The latter is calculated on an accruals basis following Resource Accounting rules.

In summary, Tables 1 and 2 demonstrate the very high efficiency of the Observatory's corporate governance and administration systems (the latter costing typically rather less than 10% of total income per year), the exceptionally strong commitment of Armagh Observatory staff to their work, illustrated by remarkably low staff-absence figures, and their high research productivity. In particular, there is an increasing trend in the number of high-quality scientific papers published in refereed scientific journals every year, a growth in the public profile enjoyed by the Observatory (e.g. as evidenced by the growth in the number of mass-media citations to the Observatory or its work), and a very significant number of people visiting the Observatory's web-sites and the Observatory's Grounds and Astropark every year (Table 2).

Business Plan Outturn 2010/2011

The principal Business Plan objectives for 2010/2011 were to:

- obtain external grants and funding to support new research projects — **done**;
- strengthen the Observatory's research capacity and capability in Solar-System Science, Solar Physics, and Stellar and Galactic Astrophysics, by recruiting 3–4 PhD students and providing a high-quality research environment to facilitate their advanced training as well as that of the postdoctoral staff at the Observatory at the beginning of their astronomical careers — **done**;
- progress plans for the design of a new Library, Archives and Historic Scientific Instruments building, a project that plays a central role in the Observatory's forward look — **not done**; and
- build on the success of IYA 2009 by developing recent and past initiatives in education and public outreach that have grown from the Observatory's world-class programme of Science in the Community — **done**.

In addition to programmes of frontline scientific research and public understanding of science, the Observatory has an important function to promote, preserve and widen access to the Observatory Grounds and Astropark, and to the historic library, archives and museum collection at Armagh, which together represent a very significant component of Northern Ireland's scientific heritage. During 2010/2011 it was planned to continue, as resources allowed, a programme to conserve further elements of this collection, improve the conditions in which the collection is held, and to digitize some of the most important archives in order to make them accessible via the Internet to researchers, scholars and the general public from anywhere in the world — **done**.

Objectives for 2011/2012

The Armagh Observatory is a vibrant international research institute that plays a full role in international astronomy whilst developing and promoting the rich heritage of Northern Ireland astronomy and presenting an attractive and positive image of Northern Ireland on the international stage. The principal Business Plan objectives for 2011/2012 are to:

- obtain external grants and funding to support new research projects;
- strengthen the Observatory's research capacity and capability in Solar-System Science, Solar Physics, and Stellar and Galactic Astrophysics, by recruiting 3–4 PhD students and providing a high-quality research environment to facilitate their advanced training as well as that of the postdoctoral staff at the Observatory at the beginning of their astronomical careers;
- build on the Observatory's involvement in the DCAL Learning Strategy by developing new initiatives in education and public outreach associated with the Observatory's programme of Science in the Community; and
- progress plans for the design of a new Library, Archives and Historic Scientific Instruments building, a project that plays a central role in the Observatory's forward look.

In addition to these programmes of frontline scientific research and public understanding of science, the Observatory has an important function to promote, preserve and widen access to the Observatory Grounds and Astropark, and to the historic library, archives and museum collection at Armagh, which together represent a very significant component of Northern Ireland's scientific heritage. During 2011/2012 it is intended to continue, as resources allow, a programme to improve the documentation and storage conditions of the historic library, archive and astronomical museum collection.

New Targeting Social Need (TSN) Action Plan 2011

The Observatory's New TSN Action Plan was last reviewed in 2011 January. Although TSN is no longer a major overarching theme of Northern Ireland government policy, the principles underlying TSN and the Observatory's New TSN Action Plan align with other Government policies and remain relevant to the Observatory's programme of Science in the Community and its responsibilities as a recognized charity.

The Armagh Planetarium — Operating Review 2010/2011

Armagh Planetarium's mission is to advance and promote the knowledge and understanding of astronomy and related sciences to all members of the community.

This mission is in accord with the strategic focus of the Department of Culture, Arts and Leisure (DCAL) that has as its overall aim the creation and maintenance of “a confident, creative, informed and vibrant community.”

The key objective of DCAL and of Armagh Planetarium is: “to protect, nurture and grow our cultural capital for today and tomorrow.” This strategic focus has led to our deliberate positioning of Armagh Planetarium as a place where impressionable young minds can be encouraged to make career choices in the sciences.

The Planetarium's work promotes DCAL's Public Service Agreements 2, 5, 6,9, 10 and 19

- **PSA 2** promotes the achievement of skills for prosperity. The Planetarium is an active supporter and promoter of the STEM agenda that will allow more children to choose careers in scientific subjects.
- **PSA 5** promotes tourism. The Planetarium is a unique venue in Ireland and an important part of the cultural infrastructure of Museums and Galleries. It is a well-known tourist attraction around the world, and attracts local and overseas visitors to experience the Planetarium, especially during the summer season. Our advertising is designed to promote the Planetarium as widely as possible to these potential visitors.
- **PSA 6** relates to children and the family. The Planetarium is a place where families can come with their children to experience the amazing depth of the cosmic story. We promote curiosity, an essential childhood skill.
- **PSA 9** is about contributing to Northern Ireland's economic, health and educational goals by increasing participation and access to Culture, Arts and Leisure activities. The Planetarium runs events for all members of the community and actively supports ethnic minority communities, e.g. the Chinese community through the annual Chinese New Year event. It provides easy access to the space sciences for all of Northern Ireland's population as well as visitors from the Republic of Ireland and further afield. The Planetarium buildings are a significant cultural asset. As many of our visitors are young people we also provide an environment promoting future career paths in science, and we provide a safe place for children to visit as part of their school community or as part of their family.
- Our Outreach programme achieves the same outcome, and our adult classes provide for the enhancement of the public's understanding of science and helps promote the establishment of a scientifically literate and well informed community.
- **PSA 10** is about helping children and young people achieve their full potential through education. The Planetarium's work is primarily educational and our activities support the needs of children of all age groups. In addition, people of all ages are able to learn about science and astronomy in an easy accessible way. We welcome people of all ages and make a special effort to ensure that we are inclusive for those with special needs, learning difficulties or any form of disability. Our policy is very clear, that we will make the effort to provide a stimulating and informative visit to everyone. We also do this through our recruitment policy which does not seek to exclude people but rather to nurture and encourage staff to achieve their full potential by stretching themselves and discovering talents that they may not have fully appreciated or used.
- **PSA 19** is about raising standards in our schools. The Planetarium works to achieve this by supporting the new Northern Ireland curriculum and providing curriculum broadening experiences for school visitors. Our Outreach work also promotes this objective in the same way. We also service schools from all parts of the educational spectrum, including special needs, nursery, and all of the key stages.

Thus, the prime function of Armagh Planetarium is education: *everything* that we do at the Planetarium is related to education in the broadest sense. The synopsis below categorizes our work into a number of subsets to better understand the breadth and reach of the educational activities offered by the Planetarium. On-site educational activities at the Planetarium comprise:

- Direct interaction with visitors to explain astronomy and associated sciences. This is related to the community support, public understanding of science and lifelong learning objectives of government.
- Working with visiting school children to support their learning, and this is designed to enhance the new Northern Ireland curriculum and promote the science, technology, engineering and maths (STEM) agenda.
- Preparing and presenting regular adult education lifelong learning programmes for Queen's University.
- Working with special interest groups, including PROBUS groups, senior citizens, community organizations, minority groups, new Targeting Social Need groups, special needs schools and amateur astronomy societies.
- Answering astronomical queries from the general public by email, letter and telephone. We receive several such requests for help every day. Our staff provide expert assessment and explanations of possible meteorite finds.
- Producing Astronotes, a monthly newsletter which is written and edited by Planetarium staff. This is an important flagship for what we do, and we receive requests to reprint our articles.
- Presenting weekend, school holiday and summer activities for families and tourists on site.
- Interacting with Planetarium visitors who are given the opportunity to deal directly with our dedicated education staff.
- Collaborating with other bodies including Tourism Ireland, Heritage Island, the Northern Ireland Tourist Board and Armagh City and District Council to promote Armagh as a destination for visitors.
- Developing a new training initiative for student teachers in collaboration with Stranmillis University College.

Outreach activities

- Performing outreach work with schools, community groups, and special events across Ireland.
- Taking the StarDome mobile planetarium to schools and other venues.
- Presenting talks, guest lectures, demonstrations etc. on request.

Internet activities

- Keeping the Planetarium's website current and developing new material. This fulfils our educational support role and provides an information service for students.
- Creating and producing instructional internet products for all age groups, Demonstration video clips are posted on the web at <http://www.youtube.com/user/ArmaghPlanetarium> & on Teacher Tube http://www.teachertube.com/viewVideo.php?video_id=162877&title=How_Do_Rockets_Work___Armagh_Planetarium).
- Maintaining and creating content for our social networking, blog and video sharing resources for users on the web. (<http://twitter.com/#search?q=armaghplanet>), <http://armaghplanetarium.blogspot.com/>). These are recent developments and are prompting an encouraging response.

HIGHLIGHTS OF THE YEAR 2010/2011

Queen's University Belfast Adult Education programme

For the past five years we have been running adult education courses in astronomy at Queen's University Belfast. These are run as daytime and evening courses and have had a steady stream of interested adults attend. We see this as a service to the community and will continue to run these courses for as long as there are participants.

Stranmillis University College

We view teacher training as a vital part of the stimulation of school pupils' interest in pursuing careers in science, technology, engineering and maths (STEM). Promotion of the STEM agenda is a vital part of government policy as it is seen as a critical part of the renewal of local industry as we must stimulate new enterprises and new jobs, and scientific knowledge is a good starter for the creation of high tech jobs. In addition, we have started to promote careers as science communicators for trainee teachers to see it as a possible career path. We have been working with Stranmillis University College this year and intend to ask St Mary's University College to join in from the start of the next academic year.

New Workshop – Seeing the Invisible

We have created a new workshop for schools at the Key Stage (KS) 3 level called Seeing the Invisible which will teach them about the electromagnetic spectrum and we are working on a parallel development with an iPad app (program) to supplement the workshop.

Education and Training Inspectorate (ETI)

The ETI inspectors who have visited us have provided an excellent chance to view our efforts in a strict educational context. Their experience in the schools allows us to directly compare and evaluate what we do at the Planetarium and how it meets curriculum-broadening needs. We do not directly address the curriculum, as that is the job of the teachers, but our job is to add to the teachers' efforts and do things that would be difficult for them to do in school. This allows us to be creative with our work, and to deliver a high quality product that supports the three important planks of the curriculum, namely, IT, literacy and numeracy - all of the Planetarium work is designed around this basic framework. Furthermore, we are obtaining direct assessments from the teachers and the pupils on what they have gained/learned from the experience. This direct feedback is very important, and all statements are now supported with factual examples.

Digistar 4

The most dramatic event of the past year was our successful for slippage funding that would allow us to upgrade the Digistar 3 (D3). This is a critical award, and has come at a critical time, as it will enable us to renew the D3 computer projection system with the latest Digistar 4 (D4). Although our existing D3 has been very reliable it was designed in 2004 – 2005. In computer terms this is obsolete and it had become difficult to service and maintain the D3 as many of the components were becoming tricky to source. The new D4 system is built around modern modular server architecture, and this will make it much easier to service and maintain. The new SONY SRX 110 backup projectors can show images with greater resolution and brightness: the level of detail is striking and they can cope with more subtly coloured images and videos.

The installation of Digistar 4 commenced on 14 March 2011. There were a number of technical problems that have been resolved successfully. Education Support Officers have been trained to use the new equipment. The Theatre Manager and Director's training covered the new software and the hardware maintenance protocols that are essential to keep the D4 in good health. Some minor electrical modifications to the existing air handling systems were done to better ventilate the projectors. During the shut down other essential maintenance was also carried out. The Planetarium reopened to the public with a new children's show on Good Friday, 22 April 2011.

Outreach

The Planetarium's Outreach Programme will be maintained as it is still very popular and the lack of schools' discretionary funding will mean that it will remain an important part of our work.

Conferences: Engineers Ireland

In May 2010 we ran a very successful conference for Engineers Ireland that netted us a good income. We are actively seeking to have further conferences for small numbers of professionals. We can handle a maximum of 90 in the theatre.

Professional Societies

The Planetarium is actively represented on the Council of the International Planetarium Society (IPS): the Director is now an office bearer as the Past President having presided over a well attended conference in Alexandria, Egypt in July 2010. We are members of many organizations dedicated to science communication.

Displays and Shows

We have been running a number of interactive shows for KS2 and KS3 pupils as well as new shows for small children. The advent of the D4 means that we will need some time to rebuild the in house shows as we want to completely update them and rewrite the scripts. We have ordered two new shows, one for the re-opening at Easter is for young visitors: it is an animated cartoon presentation Legends of the Night Sky: Perseus and Andromeda. We already own its predecessor from the same company about Orion. The other show is called Ice Worlds and will be launched in the summer.

We hope to start a project to renew our display spaces within the next three-year planning period. We intend to work with our good connections within the European Space Agency to effect much of this change. The reason is that our existing displays are over five years old, and in terms of the fast rate of change of information from space probes and telescopes, this is very old. A good example is the explosion in the discovery of new extra solar planets, which are being recorded on a monthly basis.

Video conferencing

Our new video conferencing project is operational. When our KS3 schools astronomy program was publicised recently through the C2K video conferencing system, it was oversubscribed by 40 more schools than the system could handle. We were working with new software that enabled schools to sign on without having to buy the top grade equipment that gives the best results. These lap-top based programmes are very effective but need two people to successfully run them. The upside is that one of our staff can talk to four schools at a time and the feedback has been very positive. This is another form of outreach; with the added benefit to us that no one needs to travel if the school can be addressed remotely. The face-to-face events are also important, so this is just another way in which we can expand our work into schools. We are currently working through this oversubscription list, and see this as a potential new revenue stream.

iPhone and iPad apps

The iPhone and iPad apps completed last year are our starting venture into a field that we think will become increasingly important as mobile smart phones and iPads morph into ever smaller and more powerful hand held computers with phone capabilities. We have new projects in hand for these systems

BBC2 – Stargazing Live

The January 2011 BBC2 astronomy programme Stargazing Live was a big boost for numbers and we noted that the visitor figures were up year on year. We hope that the new programme by the same team on the Wonders of the Universe will help our numbers also. We played a role in helping to plan the programme with the BBC researchers at the end of last year.

Cosmic Cuilcagh

In March 2011 as part of Creative March, specially funded events were held at the Marble Arch Geopark on the Fermanagh-Cavan border. We worked with the Geopark and Ulster Museum staff and amateur astronomers from the Irish Astronomical Association. We also used this event to publicise the STEM agenda. The schools element of this event was heavily oversubscribed and a lot of schools unable to get a slot. We will visit the area again and run another event to allow these schools to have a chance to experience the StarDome.

Armagh Rhymers

We worked with this local group along with the Observatory on a schools cross border project. This will be repeated again in 2011/2012.

Advertising and Marketing

We are facing considerable difficulties with marketing, as the cuts to our budget will make it difficult to sustain our planned marketing drive. We have marketing material in place with Heritage Island and are also working closely with Armagh City and District Council (ACDC) who have finally realised that the most unique feature in Armagh is the Observatory and Planetarium. We are planning to jointly market the city with the Planetarium as a hook, and are planning to have small astronomical teaser adverts around the city.

Key Performance Indicators 2010/2011

The targets that we set for the year in the business plan are extracted and are called the key performance indicators or KPIs: they are a direct measure of our success (see Table 1 below).

It is obvious that our target for visitors in our 2010/2011 Business Plan has not been achieved this year. This reflects the very hard marketplace in which the Planetarium operates and the effect of adverse weather conditions and burst pipes in December 2010 and January 2011 and the closure of the Planetarium for five weeks for the installation of Digistar4 in March 2011.

The cost to schools in terms of time and payments for transport is becoming very difficult to meet as their budgets are pared to the bone. This situation is unlikely to change in the short or medium term as the recession has barely bitten into their operating budget. The rise in VAT, and more specifically the continuing very high cost of fuel is likely to impact on our operation for the foreseeable future. We have discussed this with DCAL and with the Learning Strategy Group that they have set up, as it is a common problem for W5 and us, and also to the Museums, although as they do not charge for entry it is not easy to make a more direct comparison. If we did not charge for entry, we may get more school visitors, but there is also the psychological matter of having to travel for at least an hour from Belfast. We face very tough times. The charge for entry is an important part of our budget, and so if it declines we are placed under considerable pressure.

One suggestion made to DCAL and the Planetarium's Management Committee, and which they both have accepted, is that the Director should approach the Minister of Education to discuss the possibility of setting up a general transport grant or subsidy which all NI visitor centres we could use to help the schools visit at a lower cost. The local bus companies may also be interested, as it is certainly not in their interest to lose day trip customers. We are currently trying to get more information from colleagues in Scotland where they operate a scheme that could be the model for our bid. This is also a ripe target for sponsorship, but it will be a hard sell in the current climate. This is likely going to be a volatile new risk on our risk management matrix.

The results of our latest visitor surveys statistics show that in most matters 9 out of 10 visitors enjoy their visit. However, they also clearly show that it is time for us to deal with the issue of the café that receives consistently bad reviews with 3 out of 10 visitors unhappy with it in one way or another. We have tried now for a number of years to have a franchisee operate the café. This is clearly not going to work, so we are planning to radically reorganise this part of our operation and run it ourselves, as this is the only way in which we will retain control of this asset. This will happen in the new financial year.

Key Performance Indicators	Actual 2010/2011	Percentage Of budgeted Target to date %	2010/2011 Budget Business Plan Figures
Visitor numbers	35,018	81	43,000
Outreach numbers	26,566	266	10,000
TSN numbers (included above)	893	89	1,000
Admissions income	£115,883	81	£143,300
Outreach income	£17,160	172	£10,000
Shop and Mail order income	£46,157	62	£75,000
External income as % of total income	20.2%	63	31.9%
Total cost per visitor/outreach	£16.30	116	£14.10
Administration costs as % of total costs	10.4%	69	15.0%
Absence – percentage	2.1		1.0

Visitor % satisfaction ratings to be monitored	Show	Overall	Staff	Displays	Booking	Café
	92	91	91	88	85	71

Table 1 – KPIs and Visitor Satisfaction Surveys

Planetarium Website

We underwent a total makeover of our site in the middle of last year and continue to expand what we offer on the site. We continue our experimental use of Facebook, Twitter and a daily blog on the site (see below). We have standardized how we quantify our electronic impact by using Google Analytics software to present statistics and these are presented at the accountability meetings.

Social Networking Blog

The blog is maintained and written by our senior Science Communicator who is maintaining a lively program of topics that leads to more exposure for our site. The comments from followers are all favourable, and in some cases our written blogs and comments have been passed on to many other readers through recommendations. This is a very powerful way of communicating with a mass audience, and especially to those interested in astronomy in general as well as people with more specific focused interests, for example in meteorites. We have also investigated the production of new video clips, which we have successfully tested, and we plan to make more of these in the future, but with more sophisticated software.

Astronotes

On January this year we moved from a print copy of Astronotes to a totally electronic version that is distributed to a greater audience base worldwide. This is a more economical way to issue Astronotes: as a by-product it has helped us to make the cost savings that are necessary to balance the books for the year. Astronotes is our shop window and is very successfully run by the staff that have programmed it, written the articles and edited them. It is quite time consuming, but worthwhile for our international and local profile.

GOVERNANCE ISSUES

Risk Register: Management Matrix

DCAL has provided us with a template to be applied to the risks that we perceive as affecting our operations. The risks are listed and then the treatment and management of the risk is considered. Numeric values are applied and the aim is to have the traffic light system of colour codes yield a managed colour of green that is acceptable. Red risks are urgent and amber implies that we need to apply more management to the risk to ameliorate its possible effect. We are advised that we should have no more than 10 risks on our list. The register is reviewed quarterly and the one provided is the current state of play.

Audit and Risk Management Committee

This important committee is viewed by DCAL as a key element in the governance matrix of assurance that they require to be sure that we are running our affairs in accord with good governance targets. It is very important to realise that the government's appetite for risk is very low, at least for arm's length bodies such as ourselves. It is imperative that we comply with all demands so that we can have some of the administrative burden lightened as time goes by. This administrative overhead is currently much too large, but it is a consequence of being funded by government.

Staff

Staff numbers at the Planetarium is at the lowest possible level compatible with maintaining an operation six days a week, and seven during the summer. We need to keep a close eye on staff deployment, as it is likely that with the current financial situation, the reduction and eventual close down of our Outreach activities is now most unlikely, as to do so would remove one of the areas where we are showing growth. To fulfil our mission to promote STEM we will have to maintain and possibly expand our Outreach programme. The long-standing problematic pension issue has been partially resolved and all of the arrears pay which was due has also been paid out, although there remains an issue of a compensation for loss of pay lump sum.

A new Joint Administrator to replace Lawrence Young, who will be retiring later this year, has been appointed (Joe Copeland). Our thanks are due to Mr Young who has performed a very varied set of duties with aplomb and thorough professionalism: we wish him a long and healthy retirement.

It will be necessary to plan carefully for the retirement of the Planetarium Director in a few years time, as it has been recognised by the auditors that the Director is filling several roles, acting as the Planetarium's technical person for the Digistar and the computer systems as well as Director. In addition he takes an active part in the creative work of the Planetarium in the theatre and making up workshops for schools.

Health and Safety

There is one outstanding Health and Safety issue relating to a member of the public who fell over at the entrance to the Digital Theatre. The matter is in the hands of our insurers.

Business planning

The delay in the agreed four year NI budget in the Assembly has stayed our business planning timetable, as has the installation of our new Digistar 4. Our 2011-2012 annual business plan is the first year of the forward strategic plan, and we have aligned our projects and plans to support the overall Programme for Government targets (PfG) as before, and also with the newly minted NI Museums Policy that was released in March. The delay in our business plan has enabled us to better align and co-ordinate our plans with the PfG targets.

Accountability Reviews

DCAL agreed that we could reduce the number of accountability meetings to three per year. DCAL also agreed to raise our delegated limits to £10K for both capital and recurrent purchases. Accountability meetings will be concentrating on the documents relating to the KPI targets set for the year, and also a discussion of the quarterly assurance statements.

Programme for Government (PfG)

The Planetarium's Business Plans and Strategic Plan will be closely aligned to the new PfG and the Public Service Agreements (PSA) that have been renewed for the next planning period.

Museums Policy

A new DCAL Museums policy has been published and our plans take note of the targets that are outlined there for the future. As with the PfG and PSAs, our plans and delivery will need to be closely aligned with the priorities identified in this document.

OBJECTIVES FOR 2011 - 2012

Key Performance Indicators	Target
Aspirational Visitor numbers (Economic Appraisal target)	60,000
Predicted Visitor numbers	43,000
Outreach numbers	10,000
Website visitor numbers	To be monitored
TSN numbers	1,000
Income from admissions	£143.3K
Income from Outreach Services	£10K
Income from shop and mail order sales	£75K
External income as a % of total income	29.2%
Total cost per visitor /outreach	£14.10

Actions required in 2011/2012 to achieve KPIs/targets

The past year has presented us with a very difficult environment in which to sell a service. We kept our admission prices frozen and provide numerous discounts and special offers on admission prices to increase numbers and will need to continue this for 2011/2012. Our primary target this year must be to increase visits from all sectors of the population.

1. We will invite involvement in a new teacher training partnership with St Mary's University College, while retaining our link with Stranmillis University College. We would like to expend the student placements of trainee teachers from both colleges in the Planetarium as well as offering special induction sessions for the first year trainee teachers to demonstrate what we can offer teachers to support their classroom activities. We will show them the full spectrum of our shows, workshops and demonstrations and use their skills to develop new material for the workshops that will be suited to the different age ranges.
2. We have a new element to our business via video conference linkages. This is part of the C2K network that is installed in all Northern Ireland schools. The Planetarium is a new element of the video conferencing network, and our presence and activities supports the Science, Technology, Engineering and Mathematics (STEM) agenda. We plan to promote this and seek to evolve it into a revenue-earning activity: but in the short term we seek to make sure that all of the local schools know about our ability to interact with classes in real time. Our provisional model involves: (a) speaking to the class teacher before we have a link set up; (b) have a video link session with the class and the teacher; (c) include a trip to the Planetarium to cover a supporting topic which cannot be done outside the theatre. The visit will also include one of our newly designed workshops, and there will be a follow up video link session. We are consulting with Education and Training Inspectorate (ETI) inspectors who are validating this plan.

3. We have been awarded funding from the Regional Training Unit in the Republic of Ireland as part of our plan to run a new 4 day teacher training summer session for teachers of the classes which are underrepresented in our school visitor profile, Key Stages 2 and 3. We are planning to organise as many other monthly events as possible. We will continue to support science festivals and special events locally and in the Republic of Ireland. The Education and Library Boards recognise the importance of the STEM programme and we are actively exploring other ways to help teachers deliver the STEM objectives. We hope that this will lead to a greater participation with Key Stage 3 school parties. We also are part of a large multinational consortium applying for European Union Framework 7 funding for a project title Galileo Teacher Training Project (GTTP).
4. Our educational offerings will continue to be quality assured by the ETI. This is in accord with our intention to continue providing curriculum support for schools. It is not our business to do the teachers' jobs, but rather to show our school visitors curriculum broadening activities. This process will continue.
5. We must find a way to promote the Planetarium more, without incurring any great costs. We know that the product is great and of high quality, but we must increase visitor numbers. We will be placing as many articles as possible with local newspapers, magazines and other print media, while seeking to increase the number of personal appearances by Planetarium staff in the electronic media.
6. We plan to increase the number and quality of our in house productions on the Digistar. This will include theatre shows and short video clips for our website. They will be cartoon shows for young people and new live content shows for the family and adult audiences that are the most popular with our visitors.
7. We plan to increase the number of surveys and data collections from all of our visitors to improve our service and induce more repeat visits.
8. We have changed our opening hours from 10 am to 5 pm to be consistent with other attractions.
9. We plan to collaborate more with other organizations with the same objectives, e.g. W5, the Ulster Museum, the UK Space ambassadors programme and our colleagues in the Republic of Ireland at Blackrock Castle in Cork.
10. We must seek further external funding sources to supplement our income and to enable us to renew and modernise the display spaces.
11. We plan to create more activities for our youngest visitors, as they are not well catered for at the moment.

Armagh Observatory and Planetarium — Financial Review for the Year Ended 31 March 2011

Pension Scheme Disclosures

The Armagh Observatory and Planetarium provide pension benefits to staff through the Northern Ireland Local Government Officers' Superannuation Committee (NILGOSC) pension scheme, which is a statutory defined benefit scheme where employees are promised a specific benefit in the future regardless of the current or future investment performance of the scheme. Under the accounting rules relating to defined benefit pension schemes, Financial Reporting Standard (FRS) 17, the Observatory and Planetarium are required to disclose in their accounts their respective share of the overall scheme surplus/(deficit) and the estimated costs of providing retirement benefits to employees in the accounting periods in which the benefits are earned by the employees, and the related finance costs and any other changes in value of pension assets and liabilities. Details of the disclosures for the Observatory are shown in pages 46 to 48, note 20 and for the Planetarium in pages 61 to 63, note 19.

FRS17 deficits in the organization's balance sheets decreased significantly in the year: at 31 March 2011 the Observatory deficit was £364,000 (2009/2010: £1,444,000), and the Planetarium deficit was £369,000 (2009/2010: £1,136,000). This is principally due to a change in the actuary's assumption for the Consumer Prices Inflation (CPI) index. Previously, CPI was based on the Retail Prices Inflation (RPI) index less 0.5% p.a. In the 2010/2011 pension disclosures the CPI index was changed to RPI less 0.8% p.a. due to changes in the way RPI and CPI are calculated (known as the "formula effect"). As a result, in the balance sheets the value of liabilities has fallen and in the Statement of Financial Activities there is a one-off past service credit in the calculation of pension service costs.

The overall result on the Statement of Financial Activities for 2010/2011 after pension adjustments for the Observatory is a surplus of £1,088,314 (page 34) and for the Planetarium is a surplus of £774,057 (page 51). The operating result for the years 2009/2010 and 2010/2011 can be computed as follows:

Reconciliation of net movement of funds after pension adjustment with the operating surpluses for 2009/2010 and 2010/2011

Armagh Observatory	2010/2011	2009/2010
	£	£
Net movement in funds for the year after pension adjustments	1,088,314	(794,331)
Reversal of pension scheme adjustments:		
Pension service cost	(259,000)	106,000
Employer's pension contributions	(109,295)	(91,455)
Pension scheme finance costs	16,000	53,000
Actuarial (gain)/loss on pension scheme	(736,000)	727,000
Operating surplus before pension scheme adjustments	19	214

Armagh Planetarium	2010/2011	2009/2010
	£	£
Net movement in funds for the year after pension adjustments	774,057	(671,889)
Reversal of pension scheme adjustments:		
Pension service cost	(282,000)	32,000
Employer's pension contributions	(51,425)	(43,112)
Pension scheme finance costs	22,000	35,000
Actuarial (gain)/loss on pension scheme	(462,000)	655,000
Operating surplus before pension scheme adjustments	632	6,999

Armagh Observatory

Operating result

After adjusting for pensions, the overall result for the year was a surplus of £19 (2009/2010: £214), which was transferred to unrestricted funds leaving a balance of £82,256 (2009/2010: £82,237) in unrestricted funds before pension adjustments (page 43, note 13 in the accounts). Restricted funds of £7,293 remain unchanged from the previous year.

Income

Details of income received are on page 38, note 2.

The baseline recurrent funding from DCAL was £1,027,000. DCAL provided a recurrent uplift of £210,000 and additional in year funding for enhancements of the Observatory's research infrastructure (£51,000), improving access to the demesne (£30,000) and equal pay funding (£25,400). DCAL provided capital grant of £126,000 (2009/2010: £28,312) for computers and data storage, meteorology and grounds equipment and library air conditioning.

Income from research and other grants increased significantly during the year to £452,267 (2009/2010: £346,733). The STFC Post-Doctoral Research grants awarded initially in 2008/2009 continued and the Observatory was successful in obtaining additional grant funding from a number of other grant awarding bodies; the Leverhulme Trust, the Discover Science and Engineering Programme, the European Commission FP7 EuroPlaNet project and UNAWE. The total contribution from research and other grants towards research supervisory salary costs and estate and indirect costs was £115,419 (2009/2010: £109,205).

Expenditure

Details of expenditure are on pages 38 to 40, notes 3 to 7. The main variances in expenditure were as follows:

- (i) total salary costs of £475,226 (2009/2010: £804,717) decreased significantly (£329,491) due to the inclusion of negative pension service costs as required by the pension actuary. If the actuarial reduction was ignored, salary costs would have been £843,522 – an increase of £38,805 (4.8%) due to salary inflation of 3% from 1 April 2010 for staff paid in accordance with NICS salary scales, increased employer's pension costs and an increase in fixed-term contract staff funded by external grants;
- (ii) student maintenance grants of £141,565 (2009/2010: £110,397) increased because of higher average numbers of students during the year and an inflationary increase by the STFC in the student maintenance grant;
- (iii) although Observatory staff and students continued to travel extensively throughout the year to undertake collaborative research projects, attend scientific meetings and conferences and to deliver talks and papers, travel funded by research grants fell from £42,623 in 2009/2010 to £24,577 in 2010/2100;
- (iv) scholarship and training costs of £16,823 (2009/2010: £16,015) including corporate governance training costs shared with the Planetarium for members of the Board of Governors, Management Committee and the Directors and student tuition fees remained broadly the same;
- (v) computer consumables costs of £36,075 (2009/2010: £19,112) increased due to purchase of small items of equipment, software licences and hard disk storage units;
- (vi) library and publications costs of £46,082 (2009/2010: £36,396) increased due to increased costs of journal and periodicals and additional binding demands;
- (vii) archive materials and services of £33,129 (2009/2010: £19,975) included additional costs of £10,908 for archiving services funded by the Armagh Public Library. The Observatory and the Armagh Public Library had jointly obtained funding of £22,465 from the Pilgrim's Trust and the Northern Ireland Museums Council to assist with this work that commenced in January 2010;
- (viii) costs of the Northern Ireland Regional Network (NIRAN) internet provision of £19,147 (2009/2010: £22,665 and 2008/2009: £25,621) reflects a full year reduction secured following the tendering exercise conducted by NIRAN in 2009;
- (ix) property and grounds maintenance costs of £55,842 (2009/2010: £25,670) increased significantly due to resurfacing of pathways, boiler repairs and backlog redecoration and property repairs;
- (x) professional fees relating to property of £7,040 (2009/2010: £11,630) were lower due to reductions in demands associated with capital projects;
- (xi) stationery, printing and advertising costs of £14,696 (2009/2010: £1,857) increased significantly due to the publication of reprint of Border Heritage book (£9,924).

Debtors

Grant debtors (page 42, note 10) amounting to £8,481 (2009/2010: £20,316) decreased with the payment in-year of the funds due from debtors at 31 March 2010.

Accruals

Accruals (page 42, note 11) of £44,753 (2009/2010: £93,963) decreased with the in-year payments for 2009/2010 activities relating to buildings works, the dome for the Variable Star Telescope, archive materials, and for the change in pay scales for staff in Administrative Officer and analogous grades due to the NICS Equal Pay agreement and 2009/2010 salary inflation.

Deferred income

Deferred income (page 42, note 11) represents income from research and other grants that have been deferred to be matched against expenditure on the grants in future years. The main reason for the increase in the balance to £156,776 (2009/2010: £59,850) is the combination of receipt of the EUNAWE research grants (£82,395) and transfer of unused STFC balances into 2011/2012 (£63,766) partially offset by expenditure on the Leverhulme research grant in 2010/2011 of £17,565.

Fixed Assets

Additions to fixed assets (page 41, note 9) of £133,735 comprise: (i) £5,915 for the Variable Star Telescope dome, (ii) £6,870 for grounds and meteorology equipment, (iii) £24,527 for air conditioning equipment in the Observatory library, (iv) £43,186 for data-storage equipment, (v) £50,172 for computer equipment and (vi) £3,064 for PCs funded by STFC.

Factors Influencing Future Financing Requirements

DCAL has announced recurrent funding of £1,015,000 for 2011/2012 which, together with contributions from research and other grants, may not be sufficient to fund budgeted unrestricted costs for the year.

If the contingent liability for the settlement sum arising from the Equal Pay agreement made between the NICS Management and the Trade Union Side (page 49, note 25) is realised additional recurrent funds of approximately £47,000 will be required. Additionally due to the effect of the capital programme in 2010/2011, non-cash resources for additional depreciation charges of £15,000 will be required.

Unrestricted operating costs are funded primarily by DCAL recurrent grant. The balance of the funding of approximately £93,000 is currently provided by contributions from STFC PDRA and other research grants and miscellaneous income in an increasingly competitive financial environment. As the current STFC PDRA research grants will end during 2011, an application to obtain further STFC PDRA grants has been submitted and Observatory staff will continue to seek other funding streams to maintain this important source of funds.

Armagh Planetarium

Operating result

After adjusting for pensions, the overall result for the year was a surplus of £632 compared to a surplus in 2009/2010 of £6,999. The surplus was transferred to unrestricted funds leaving a balance of £13,413 (2009/2010: £12,780) in unrestricted funds before pension adjustments (page 59, note 13 to the accounts).

Income

The baseline recurrent funding from DCAL remained at £483,000. DCAL increased recurrent funding in 2010/2011 by £22,600 for arrears of pay as a result of the equal pay settlement in accordance with increases in NICS salary scales backdated to February 2009. DCAL also provided capital grants of £290,000 to meet expenditure on Digistar 4, Planetarium dome refurbishment and computer and camera equipment.

Visitor numbers decreased in the year causing much lower levels of income from admissions and gross profit from shop and mail order sales; admissions income was £115,883 (2009/2010: £143,953), shop and mail order gross profit was £20,305 (2009/2010: £33,145). The number of Outreach activities increased income to £17,160 (2009/2010: £11,630).

The Planetarium received a total of £29,915 (2010/2010: £23,900) from restricted grants comprising £6,175 for Cross Border Collaboration, £8,300 for an ESERO UK Grant, £9,440 from DCAL for the Cosmic Cuilcagh project and £6,000 from the STFC Large Award Science in the Community scheme.

Details of income received are on page 55, note 2 to the accounts.

Expenditure

The main variances in expenditure were as follows:

- (i) total salary costs of £52,680 (2009/2010: £343,544) decreased significantly (£290,864) due to the inclusion of negative pension service costs as required by the pension actuary. If the actuarial reduction was ignored, salary costs would have been £386,104 – an increase of £42,560 (12.4%) due mainly to the full year effect in 2010/2011 of staff appointed in 2009/2010, average salary inflation of 3% for staff paid in accordance with NICS salary scales and increased employer's pensions costs;
- (ii) agency staff costs of £3,673 (2009/2010: £9,586) were reduced as cover for periods between staff leaving and the appointment of replacements was provided by permanent or temporary staff;
- (iii) travel and subsistence of £10,656 (2009/2010: £8,406) increased due to a higher volume of number of expenses incurred by staff on Outreach and overseas activities;
- (iv) equipment maintenance and computer consumables of £32,505 (2009/2010: £71,220) decreased substantially due to reduction in maintenance costs of the Digistar 3 projection and theatre lighting systems;
- (v) production costs of £18,580 (2009/2010: £24,047) reflected reduction of costs of in relation to the translation of Planetarium shows into the Irish language;
- (vi) training costs of £2,469 (2009/2010: £3,689) increased due to additional corporate governance training costs shared with the Observatory for members of the Board of Governors, Management Committee and the Directors;
- (vii) vehicle expenses of £7,551 (2009/2010: £7,723) include notional leasing costs of £3,480 for a vehicle provided free of charge for outreach and other educational services. The same amount is included as notional income in miscellaneous income;
- (viii) advertising costs of £14,500 (2009/2010: £22,286) decreased as the number of advertising campaigns was reduced;
- (ix) heat, light and power costs of £54,520 (2009/2010: £45,736) increased in the year. Oil and electricity costs and usage was higher than the previous year;

- (x) property repairs costs of £31,745 (2009/2010: £21,681) increased due to related to external and internal redecoration and repairs to heating and air condition systems;
- (xii) professional fees and licences of £6,804 (2009/2010: £8,883) reduced because of a reduction in demands for actuarial valuations of pensions offset by increased professional fees for repairs;
- (xiii) printing and stationery costs of £8,220 (2009/2010: £14,074) reduced due to electronic production of Astronotes and no reprint of corporate brochures;
- (xiv) losses and special payments of £4,669 (2009/2010: £0) relate to the Planetarium subsidising pension costs of three members of staff who are contracted to pay a lower rate of pension contribution.

Details of expenditure are on pages 56 to 57, notes 3 to 6.

Debtors

Trade and grant debtors (page 58, note 10) of £4,801 (2009/2010: £1,982) were higher than the previous year because of monies unpaid for a large number of school visits in February 2011 and Outreach activity in February and March 2011.

The VAT debtor of £62,213 (2009/2010: £9,981) reflected reclaimable VAT at 31 March 2011 for the Digistar 4 and dome refurbishment projects.

Creditors

Trade creditors (page 59, note 11) of £44,991 (2009/2010: £29,382) were higher than the previous year. The main reason for the increase was unpaid VAT on Digistar 4 equipment.

Deferred income represents funds from research and other grants that have been deferred to be matched against expenditure on the grants in future years. Deferred income of £18,264 (2009/2010: £9,400) was higher due to unspent balances from Ultach Trust, Royal Society, Cross Border Collaboration and Cosmic Cuilagh projects.

Fixed Assets

Additions to fixed assets (page 58, note 8) of £291,226 (2009/2010: £21,604) comprised £250,351 for Digistar 4, £30,000 for dome resurfacing and £10,875 for computer and camera equipment. The Planetarium wrote off £79,729 relating to obsolete project equipment.

Factors Influencing Future Financing Requirements

DCAL has announced recurrent funding of £463,000 for 2011/2012 which, with contributions shop profits and income for admissions and Outreach, may not be sufficient to fund budgeted unrestricted costs for the year.

The Planetarium relies heavily on income from admissions, profit on shop sales, Outreach and other income to supplement the funding provided by DCAL for unrestricted costs. In 2010/2011 incomes from these sources amounted to £186,434 (2009/2010: £238,948) of total income. The key task for the Planetarium in subsequent years is to build up visitor and Outreach numbers and in so doing maximise the full potential of the Planetarium's science education services and provide additional sources of income for operational costs to supplement funding from DCAL.

If the contingent liability for the settlement sum arising from the Equal Pay agreement made between the NICS Management and the Trade Union Side (page 64, note 24) is realised additional recurrent funds of approximately £26,000 will be required. Additionally due to the effect of the capital programme in 2010/11, non-cash resources for additional depreciation charges of £15,000 will be required.

Remuneration Report — Armagh Observatory

The salary and pension entitlements of the Director of the Observatory were as follows:

Director	Salary 2009/2010	Salary 2010/2011	Accrued Pension at 31 March 2011	Real Increase in Accrued Pension 31 March 2011	Accrued Lump Sum at 31 March 2011	Real Increase in Lump Sum 31 March 2011	CETV at 31 March 2010	CETV at 31 March 2011	Real Increase in CETV
	£	£	£	£	£	£	£	£	£
M.E. Bailey	60,807	61,077	23,888	1,089	65,555	203	520,412	532,461	(4,350)

This section is subject to audit.

Signed:

Professor Mark Bailey MBE MRIA
Accounting Officer for the Armagh Observatory

Date: 22 August 2011

Remuneration Report — Armagh Planetarium

The salary and pension entitlements of the Director of the Planetarium were as follows:

Director	Salary 2009/2010	Salary 2010/2011	Accrued Pension at 31 March 2011	Real Increase in Accrued Pension 31 March 2011	Accrued Lump Sum at 31 March 2011	Real Increase in Lump Sum 31 March 2011	CETV at 31 March 2010	CETV at 31 March 2011	Real Increase in CETV
	£	£	£	£	£	£	£	£	£
T.R. Mason	60,757	61,077	11,706	1,051	29,009	90	209,929	223,132	6,732

This section is subject to audit.

Signed:

Dr Tom Mason MBE
Accounting Officer for the Armagh Planetarium

Date: 22 August 2011

The CETVs above have been calculated in accordance with guidance used by the Northern Ireland Civil Service in Employer Pension Notice EPN06/2010.

1. The Directors of the Observatory and Planetarium are the persons in senior positions having authority and responsibility for directing and controlling the activities of their respective organizations.
2. The salary of each Director shown above is based on the Northern Ireland Civil Service Grade 6 pay scale. No bonus was paid in the year and neither of the Directors receives any benefits in kind.
3. The service contracts of the Directors are open-ended until they reach the normal retirement age of 65.
4. Pension benefits are provided through the Northern Ireland Local Government Officers' Superannuation Committee Pension Scheme (NILGOSC). In the period up to 31 March 2009 members paid contributions of 6% of pensionable earnings to the scheme up until retirement. From 1 April 2009 banded contribution rates were introduced and for the year 2010/2011 the Directors paid contributions of 7.2% on pensionable pay.
5. The main benefits payable on retirement for service up to 31 March 2009 are: (i) a retirement pension at a rate of 1/80th of final pensionable pay for each year of membership of the scheme; and (ii) a lump sum retirement grant at a rate of 3/80ths of pensionable pay for each year of membership of the scheme. On death after retirement, the surviving spouse will receive a pension payable for 3 months (6 months if there are dependent children) paid at the same rate as the monthly retirement pension at the date of death and thereafter a spouse's pension of half of the retirement pension for life. On death in service, the scheme pays a lump sum death grant of twice pensionable pay, normally to the surviving spouse or, if the member was not married, to next of kin. For service from 1 April 2009 retirement pension will be at a rate of 1/60th of pensionable pay for membership built up after 31 March 2009 and further rights on pension augmentation, flexible retirement and family pension rights on death were introduced. Details of the changes can be obtained at <http://www.nilgosc.org.uk>.

6. The real increase in pension payable, lump sum and cash equivalent transfer value (CETV) shown above have been adjusted to take account of inflation and market investment factors. The CETV figures include the value of any pension benefit in another scheme that the individual has transferred to NILGOSC.
7. A CETV is the actuarially assessed capitalised value of the pension scheme benefits accrued by a member at a particular point in time. The benefits valued are the member's accrued benefits and any contingent spouse's pension payable from the scheme. A CETV is a payment made by a pension scheme to secure pension benefits in another scheme when the member leaves a scheme and chooses to transfer the benefits accrued in their former scheme.

Statement of the Responsibilities of the Governors and Accounting Officers

Under the Audit and Accountability (Northern Ireland) Order 2003 the Governors are responsible for keeping proper accounts and proper records in relation to the accounts, and for preparing a statement of accounts in respect of each financial year in such form and containing such information as DCAL, with the approval of the Department of Finance and Personnel, shall direct. The Accounting Officer of DCAL has designated the respective Directors of the Armagh Observatory and Planetarium as the corporation's Accounting Officers. As Accounting Officers the Directors take personal responsibility for the propriety and regularity of the public finances for which they are answerable and for the keeping of proper accounts. They are required to sign the accounts thereby accepting personal responsibility for their proper presentation and to sign the Statement on Internal Control. Their relevant responsibilities as Accounting Officers, including their responsibilities for the propriety and regularity of the public finances and for the keeping of proper records, are set out in Managing Public Money Northern Ireland.

The accounts are prepared on an accruals basis and give a true and fair view of the corporation's state of affairs at the end of the financial year and of its income and expenditure, total recognised gains and losses and cash flows for the financial year. The accounts have been prepared in accordance with the Statement of Recommended Practice "Accounting and Reporting by Charities" (SORP 2005). The financial statements comply with the guidance issued by the Department of Finance and Personnel on the form and contents of the Annual Reports and Accounts of Executive Non-Departmental Public Bodies and in particular:

- suitable accounting policies have been selected and applied consistently (subject to changes arising on the adoption of new accounting standards);
- reasonable and prudent judgements and estimates have been made;
- applicable accounting standards have been followed, subject to any material departures disclosed and explained in the financial statements;
- the financial statements have been prepared on the going concern basis, unless it is inappropriate to presume that the corporation will continue in business.

The Accounting Officers are also responsible for safeguarding the assets of the corporation and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

Statement of Disclosure of Information to the Auditors

So far as the Accounting Officers of the Armagh Observatory and the Armagh Planetarium in office at the date of the approval of these financial statements are aware:

- there is no relevant audit information relating to their respective organizations of which the auditors are unaware; and
- they have taken all the steps that they ought to have taken as Accounting Officers in order to make themselves aware of any relevant audit information relating to their respective organizations and to establish that the auditors are aware of that information.

Armagh Observatory — Statement on Internal Control

As Accounting Officer for the Armagh Observatory I have responsibility for maintaining a sound system of internal control that supports the achievement of the policies, aims and objectives of the Armagh Observatory, whilst safeguarding public funds and the assets of the Armagh Observatory for which I am personally responsible in accordance with the responsibilities assigned to me by the Governors of the Armagh Observatory and Planetarium and in Managing Public Money Northern Ireland.

The system of internal control is designed to manage risk to a reasonable level, rather than to eliminate all risk of failure to achieve policies, aims and objectives; it can therefore only provide reasonable and not absolute assurance of effectiveness. The system of internal control is based on an ongoing process designed to identify and prioritise the risks to the achievement of the Armagh Observatory's policies, aims and objectives, to assess the likelihood of the events occurring and the impact should they be realised, and to manage the risks effectively, efficiently and economically. The system of internal control has been in place in the Armagh Observatory for the year ended 31 March 2011 and up to the date of approval of the annual accounts, and accords with Department of Finance and Personnel guidance. The main procedures in place to monitor the effectiveness of the system of internal control are as follows:

- Regular meetings with officials from DCAL to consider operational and strategic issues and matters relating to the system of internal control.
- Quarterly Assurance Statements submitted to DCAL on internal control.
- Periodic review of the Armagh Observatory Risk Register by the Director and the Administrator, the Armagh Observatory and Planetarium Audit and Risk Management Committee, and DCAL.
- Continuous assessment of the quality of research through peer review of grant applications, applications for telescope time, and the submission of scientific papers to academic journals of national and international standing.
- Peer review of the research quality, capability and output of the Observatory through participation in the Research Assessment Exercise and its successor the Research Excellence Framework (REF 2014).
- Regular reports by administrative staff on progress against principal financial targets and the projected financial outcome for the year and progress reports by staff responsible for major projects.
- Detailed progress reports to the Management Committee and Board of Governors at their regular meetings and inclusion of performance measures and results against targets in the annual operating plan.
- Annual reports on the system of internal control from internal auditors to the Armagh Observatory and Planetarium Audit and Risk Management Committee, which provide an opinion on the adequacy and effectiveness of the system and contain recommendations for improvement.
- Annual reports from external auditors to the Management Committee and the Board of Governors on the material issues relating to the annual accounts, which provide an opinion on whether the accounts give a true and fair view of the affairs of the organization and of its incoming resources and application of resources.

The principal risks to the achievement of the Armagh Observatory's policies, aims and objectives have been identified and recorded in the Armagh Observatory Risk Register together with the controls in place and any further controls required to manage the risk effectively, efficiently and economically. Reports on emerging issues and strategies to deal with any associated risks are made to DCAL and to the Management Committee and Board of Governors of the Armagh Observatory and Planetarium at their regular meetings.

The risk associated with the use and processing of personal information is managed and controlled by: (i) the Corporation's Policy on Retention and Use of Personal Information which identifies the type of information held, the purposes for which it is held, the circumstances under which it is distributed to third parties and the officer responsible for ensuring that the Corporation complies with its obligations under the Data Protection Act; (ii) the restriction of access to such information to authorised personnel with user password protection; and (iii) the controlled and secure storage, distribution and disposal of this information.

There is an unresolved issue concerning whether the compensatory sum, backdated six years from 31 January 2009 in the agreement on Equal Pay reached by the Northern Ireland Civil Service (NICS) Management and the Trade Union Side in December 2009, applies to Armagh Observatory staff on the same pay scales as those NICS staff covered by the agreement. The Armagh Observatory is working with DCAL to obtain a resolution of this exceptional situation.

As Accounting Officer, I have responsibility for reviewing the effectiveness of the system of internal control. My assessment is informed by the work of the internal auditors and the senior staff within the Armagh Observatory who have responsibility for the development and maintenance of the internal control framework, and by the comments made by the external auditors in their management letter and other reports. I have been advised on the effectiveness of the system of internal control and plan to address any weaknesses so as to ensure continuous improvement of the system.

A number of minor weaknesses were identified during the financial year 2010/2011 as part of the annual internal audit and appropriate action has been taken to resolve them

Signed:

Professor Mark Bailey MBE MRIA
Director, Armagh Observatory

Date: 22 August 2011

Armagh Planetarium — Statement on Internal Control

As Accounting Officer for the Armagh Planetarium I have responsibility for maintaining a sound system of internal control that supports the achievement of the policies, aims and objectives of the Armagh Planetarium, whilst safeguarding public funds and the assets of the Armagh Planetarium for which I am personally responsible in accordance with the responsibilities assigned to me by the Governors of the Armagh Observatory and Planetarium and in Managing Public Money Northern Ireland.

The system of internal control is designed to manage risk to a reasonable level rather than to eliminate all risk of failure to achieve policies, aims and objectives; it can therefore only provide reasonable and not absolute assurance of effectiveness. The system of internal control is based on an ongoing process designed to identify and prioritise the risks to the achievement of the Armagh Planetarium's policies, aims and objectives, to assess the likelihood of the events occurring and the impact should they be realised, and to manage them effectively, efficiently and economically. The system of internal control has been in place in the Armagh Planetarium for the year ended 31 March 2011 and up to the date of approval of the annual accounts, and accords with Department of Finance and Personnel guidance. The main procedures in place to monitor the effectiveness of the system of internal control are as follows:

- Regular meetings with officials from DCAL to consider both operational and strategic issues and matters relating to the system of internal control.
- Quarterly Assurance Statements submitted to DCAL on internal control.
- Periodic review of the Armagh Planetarium Risk Register by the Director and the Administrator, the Armagh Observatory and Planetarium Audit and Risk Management Committee and DCAL.
- Detailed progress reports to the Management Committee and Board of Governors at their regular meetings, and inclusion of performance measures and results against targets in the annual operating plan.
- Annual reports from the internal auditors to the Armagh Observatory and Planetarium Audit and Risk Management Committee on the system of internal control, which provide an opinion on the adequacy and effectiveness of the system and contain recommendations for improvement.
- Annual reports from external auditors to the Management Committee and the Board of Governors on the material issues relating to the annual accounts, which provide an opinion on whether the accounts give a true and fair view of the affairs of the organization and of its incoming resources and application of resources.
- Regular reports by administrative staff on progress against principal financial targets and the projected financial outcome for the year and progress reports provided by staff responsible for major projects.

The principal risks to the achievement of the Armagh Planetarium's policies, aims and objective have been identified and recorded in the Armagh Planetarium Risk Register together with the controls in place and any further controls required to manage the risk effectively, efficiently and economically. Reports on emerging issues and strategies to deal with any associated risks are made to DCAL and to the Management Committee and Board of Governors of the Armagh Observatory and Planetarium at their regular meetings.

The risk associated with the use and processing of personal information is managed and controlled by: (i) the Corporation's Policy on Retention and Use of Personal Information which identifies the type of information held, the purposes for which it is held, the circumstances under which it is distributed to third parties and the officer responsible for ensuring that the Corporation complies with its obligations under the Data Protection Act; (ii) the restriction of access to such information to authorised personnel with user password protection; and (iii) the controlled and secure storage, distribution and disposal of this information.

There is an unresolved issue concerning whether the compensatory sum, backdated six years from 31 January 2009 in the agreement on Equal Pay reached by the Northern Ireland Civil Service (NICS) Management and the Trade Union Side in December 2009 applies to Armagh Planetarium staff on the same pay scales as those NICS staff covered by the agreement. The Armagh Planetarium is working with DCAL to obtain a resolution of this exceptional situation.

There is a further unresolved issue concerning whether the payment by the Armagh Planetarium of an element of employee's superannuation contribution to the Northern Ireland Local Government Officers' Superannuation Committee will give rise to a backdated liability for National Insurance. The Armagh Planetarium has accrued for this potential liability in the accounts and will work with DCAL to resolve the issue.

As Accounting Officer, I have responsibility for reviewing the effectiveness of the system of internal control. My assessment is informed by the work of the internal auditors and the senior staff within the Armagh Planetarium who have responsibility for the development and maintenance of the internal control framework, and by the comments made by external auditors in their management letter and other reports. I have been advised on the effectiveness of the system of internal control and plan to address any weaknesses so as to ensure continuous improvement of the system.

A number of minor weaknesses were identified as part of the annual audit for the financial year 2010/2011 and appropriate action has been taken to resolve them.

Signed:

Dr Tom Mason MBE
Director, Armagh Planetarium

Date: 22 August 2011

The Armagh Observatory and Planetarium

THE CERTIFICATE AND REPORT OF THE COMPTROLLER AND AUDITOR GENERAL TO THE NORTHERN IRELAND ASSEMBLY

I certify that I have audited the financial statements of Armagh Observatory and Planetarium for the year ended 31 March 2011 under the Audit and Accountability (Northern Ireland) Order 2003. These comprise the Statements of Financial Activities, the Balance Sheets, the Cash Flow Statements, and Statements of Recognised Gains and Losses, and the related notes. These financial statements have been prepared under the accounting policies set out within them. I have also audited the information in the Remuneration Reports that is described in those reports as having been audited.

Respective responsibilities of the Governors, Accounting Officers and auditor

As explained more fully in the Statement of the Responsibilities of the Governors and Accounting Officers, the Governors and Accounting Officers are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view. My responsibility is to audit the financial statements in accordance with the Audit and Accountability (Northern Ireland) Order 2003. I conducted my audit in accordance with International Standards on Auditing (UK and Ireland). Those standards require me and my staff to comply with the Auditing Practices Board's Ethical Standards for Auditors.

Scope of the audit of the financial statements

An audit involves obtaining evidence about the amounts and disclosures in the financial statements sufficient to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or error. This includes an assessment of: whether the accounting policies are appropriate to the Armagh Observatory and Planetarium's circumstances and have been consistently applied and adequately disclosed; the reasonableness of significant accounting estimates made by the trustees; and the overall presentation of the financial statements. In addition, I read all the financial and non-financial information in the Annual Report to identify material inconsistencies with the audited financial statements. If I become aware of any apparent material misstatements or inconsistencies I consider the implications for my certificate.

In addition, I am required to obtain evidence sufficient to give reasonable assurance that the incoming and outgoing resources reported in the financial statements have been applied to the purposes intended by the Assembly and the financial transactions conform to the authorities which govern them.

Opinion on Regularity

In my opinion, in all material respects the incoming and outgoing resources have been applied to the purposes intended by the Assembly and the financial transactions conform to the authorities which govern them.

Opinion on financial statements

In my opinion:

- the financial statements give a true and fair view, of the state of Armagh Observatory and Planetarium affairs as at 31 March 2011 and of its incoming and outgoing resources, cash flows and recognised gains and losses for the year then ended; and
- the financial statements have been properly prepared in accordance the Audit and Accountability (Northern Ireland) Order 2003 and the Department of Culture, Arts and Leisure directions made thereunder.

Opinion on other matters

In my opinion:

- the part of the Remuneration Report to be audited has been properly prepared in accordance with Department of Culture, Arts and Leisure directions issued under the Audit and Accountability (Northern Ireland) Order 2003; and
- the information given in the Management Commentary and the Statement of Disclosure of Information to the Auditors included in the Annual Report, for the financial year for which the financial statements are prepared is consistent with the financial statements.

Matters on which I report by exception

I have nothing to report in respect of the following matters which I report to you if, in my opinion:

- adequate accounting records have not been kept; or
- the financial statements and the part of the Remuneration Report to be audited are not in agreement with the accounting records; or
- I have not received all of the information and explanations I require for my audit; or
- the Statement on Internal Control does not reflect compliance with Department of Finance and Personnel's guidance.

Report

I have no observations to make on these financial statements.

KJ Donnelly
Comptroller and Auditor General
Northern Ireland Audit Office
106 University Street, Belfast,
BT7 1EU

Date: 19 September 2011

Armagh Observatory

Statement of financial activities for the year ended 31 March 2011

	Notes	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
Incoming resources					
DCAL grants	2	1,133,400	126,000	1,259,400	1,025,312
Other grants and receipts	2	-	452,267	452,267	346,733
Interest receivable		788	-	788	380
Rents		4,865	-	4,865	6,097
Miscellaneous income		2,364	-	2,364	3,444
Transfer to deferred income	11	-	(156,776)	(156,776)	(59,850)
Transfer from deferred income	11	-	5,511	5,511	24,723
Transfer between funds		84,032	(84,032)	-	-
Total incoming resources		1,225,449	342,970	1,568,419	1,346,839
Resources expended					
Direct expenditure of the corporation	3	662,517	209,235	871,752	1,131,458
Fundraising and publicity	4	-	-	-	-
Management and administration of the corporation	6	194,618	-	194,618	143,781
Capital expenditure		-	133,735	133,735	85,931
Total resources expended		857,135	342,970	1,200,105	1,361,170
Net incoming/(outgoing) resources for the year before cost of capital					
		368,314	-	368,314	(14,331)
Cost of capital		-	-	-	(3,267)
Net movement in funds after cost of capital		368,314	-	368,314	(17,598)
Cost of capital reversed		-	-	-	3,267
Net movement in funds before finance income		368,314	-	368,314	(14,331)
Finance income/(costs) - pension scheme		(16,000)	-	(16,000)	(53,000)
Net movement in funds after finance income		352,314	-	352,314	(67,331)
Actuarial (loss)/gain on pension scheme		736,000	-	736,000	(727,000)
Net movement in funds after actuarial (loss)/gain		1,088,314	-	1,088,314	(794,331)
Balances brought forward at 1 April		(1,361,308)	7,293	(1,354,015)	(559,684)
Balances carried forward at 31 March	13, 14	(272,994)	7,293	(265,701)	(1,354,015)

All amounts above relate to continuing operations of the corporation.

The income and expenditure summary is included at Note 8.

Cost of capital at 3.5% was charged on the average net assets of the corporation, excluding the net book value of donated assets. As this was a notional charge the cost of capital was reversed in the Statement of Financial Activities in 2009/2010.

Statement of recognised gains and losses

	2011	2010
Net movement in funds for the year after other finance income	352,314	(67,331)
Net movement on government grant reserve	48,876	(1,448)
Net movement on donated assets reserve	(29,527)	(29,527)
Actuarial (loss)/gain on pension scheme	736,000	(727,000)
Recognised gains/(losses) for the year	1,107,663	(825,306)

Armagh Observatory

Balance sheet at 31 March 2011

	Notes	2011 £	2010 £
Tangible assets	9	3,608,352	3,589,003
Current assets			
Debtors	10	61,088	68,906
Cash at bank and in hand	18, 19	331,527	211,757
		392,615	280,663
Creditors: amounts falling due within one year	11	(310,036)	(206,398)
Net current assets		82,579	74,265
Net assets excluding pension liability		3,690,931	3,663,268
Long-term liabilities - pension scheme	20	(364,000)	(1,444,000)
		(364,000)	(1,444,000)
Net assets		3,326,931	2,219,268
Funds			
Unrestricted funds	13	(272,994)	(1,361,308)
Restricted funds	14	7,293	7,293
Government grant reserve	12	757,563	708,687
Designated funds	16	2,835,069	2,864,596
		3,326,931	2,219,268

The financial statements on pages 34 to 50 were approved on 22 August 2011 and were signed by:

Professor Mark Bailey MBE MRIA, Accounting Officer for The Armagh Observatory

Armagh Observatory

Cash flow statement for the year ended 31 March 2011

	Notes	2011 £	2010 £
Net cashflow from operating activities		119,029	136,857
Returns on investments and servicing of finance			
Interest received		788	380
Interest paid and similar charges		(47)	(20)
		741	360
Capital expenditure			
Purchase of tangible assets		(133,735)	(85,931)
Capital grants received		133,735	85,931
		-	-
Net cash inflow/(outflow) before financing and management of liquid resources		119,770	137,217
Management of liquid resources			
Movement in First Trust deposit account		(190,001)	(121,553)
Net cash (inflow)/outflow from management of liquid resources		(190,001)	(121,553)
Increase/(decrease) in cash in the year	18, 19	(70,231)	15,664

Reconciliation of operating result to net cash flow from operating activities

	2,011 £	2,010 £
Net incoming resources per statement of financial activities	368,314	(14,331)
Interest received	(788)	(380)
Interest paid and similar charges	47	20
Depreciation	114,386	116,906
Pension service costs	(360,000)	15,000
Release of deferred credit - Government grant reserve	(84,859)	(87,379)
Release of deferred credit - donated asset reserve	(29,527)	(29,527)
(Increase)/decrease in debtors	7,818	17,874
Increase/(decrease) in creditors	103,638	118,674
Net cash inflow/(outflow) from operating activities	119,029	136,857

Notes to the financial statements for the year ended 31 March 2011

1 Accounting policies

These financial statements are prepared on the going concern basis under the historical cost convention, as modified by the revaluation of certain tangible fixed assets, and in accordance with The Audit and Accountability (Northern Ireland) Order 2003, directions made thereunder by the Department of Culture, Arts and Leisure (DCAL) and applicable accounting standards. The principal accounting policies are set out below.

Tangible fixed assets

The cost of tangible fixed assets is their purchase cost or valuation together with any incidental costs of acquisition. Depreciation is calculated so as to write off the cost or valuation of tangible fixed assets, less their estimated residual values, on a straight-line basis over the expected useful economic lives of the assets concerned. Land is not depreciated.

The principal annual depreciation rates used are as follows:

	%
Furniture and fittings	10 - 15
Office equipment	10 - 25
Scientific equipment and other equipment	15 - 25
Buildings	1 - 3
Astropark	5
Exhibits and grounds	6 - 10

Land and buildings are included in the balance sheet at depreciated replacement cost, estimated value in use or market value.

Government grants

The Government Financial Reporting Manual requires that grants are to be shown as a movement in reserves rather than as income. However, as the corporation is required to prepare accounts in accordance with the Statement of Recommended Practice (SORP) for charities, DCAL has given the corporation permission to continue to treat grants as income.

Grants that relate to specific capital expenditure are treated as deferred income which is then credited to the income and expenditure account over the related asset's useful life. Other grants are credited to the statement of financial activities when received.

Pension scheme

The corporation provides pension benefits to its employees by participating in the Northern Ireland Local Government Officers' Superannuation Committee (NILGOSC) Pension Scheme, which is a defined benefit scheme. Annual contributions to the NILGOSC scheme are based on actuarial advice. The operating costs of providing retirement benefits to the corporation's employees are recognised in accounting periods in which the benefits are earned by employees, and the related finance costs and other changes in value of the assets and liabilities are recognised in the period in which they arise.

Fund accounting

The corporation has various types of funds for which it is responsible, and which require separate disclosure. These are as follows:

Restricted funds

Grants or donations received which are earmarked by the donor for specific purposes. Such purposes are within the overall aims of the organisation.

Unrestricted funds

Funds which are expendable at the discretion of the Governors in furtherance of the objectives of the corporation.

Armagh Observatory

2 Incoming Resources

The accounts reflect the receipt of the following grants:

Grants from the Department of Culture, Arts and Leisure (DCAL)

	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
Recurrent grant	1,027,000	-	1,027,000	817,000
In-year recurrent grant	106,400	-	106,400	105,000
In-year recurrent grant - CPD fees/archive materials	-	-	-	15,000
Capital grant	-	-	-	28,312
In-year capital grant	-	126,000	126,000	60,000
	1,133,400	126,000	1,259,400	1,025,312

Other grants and receipts

	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
STFC Research, Visitor and Travel grants	-	269,404	269,404	253,493
Miscellaneous travel grants	-	922	922	2,658
The Royal Society	-	500	500	-
Leverhulme Trust	-	51,253	51,253	51,117
Discover Science and Engineering Programme:				
- IYA 2009 activities	-	5,813	5,813	16,595
- Light Pollution Conference	-	-	-	5,385
- Astro Art Fun Project	-	-	-	2,155
Light Pollution Conference registration fees	-	-	-	2,482
IMC 2010	-	11,729	11,729	-
15th ADAS Workshop	-	2,355	2,355	-
OASES Project	-	11,611	11,611	-
Joint Collection Management and Public Access Project with the Armagh Public Library	-	10,908	10,908	2,808
European Commission FP7 EuroPlaNet Project	-	5,177	5,177	9,840
EUNAWA	-	82,395	82,395	-
Other grants and receipts	-	200	200	200
	-	452,267	452,267	346,733

3 Direct expenditure of the corporation

	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
Salaries and wages	343,050	132,176	475,226	804,717
Student maintenance grants	117,721	23,844	141,565	110,397
Scholarship and training	13,908	2,915	16,823	16,015
Travelling and subsistence	32,737	24,577	57,314	73,667
Technical maintenance	5,339	-	5,339	3,959
Computer consumables	35,383	692	36,075	19,112
Library and publications	46,082	-	46,082	36,396
Archive materials and services	22,220	10,909	33,129	19,975
Northern Ireland Regional Area Network	19,147	-	19,147	22,665
Contribution to UKSC and SALT operating costs	15,500	-	15,500	7,000
Meetings and conferences	8,480	-	8,480	1,331
Visitor programme	2,240	-	2,240	2,998
IMC 2010	-	12,229	12,229	-
15th ADAS Workshop	-	1,893	1,893	-
Public Understanding of Science expenses	710	-	710	546
Atomic Data & Analysis Structure subscription	-	-	-	2,074
International Year of Astronomy 2009 expenses	-	-	-	3,678
Light Pollution Conference	-	-	-	6,928
	662,517	209,235	871,752	1,131,458

Armagh Observatory

4 Fundraising and publicity

	Unrestricted funds 2011	Restricted funds 2011	Total funds 2011	Total funds 2010
	£	£	£	£
	-	-	-	-

5 Travel and subsistence

Restricted travel and subsistence is funded in the main from external grant aid from the Science and Technology Facilities Council (STFC).

6 Management and administration of the corporation

	Unrestricted funds 2011	Restricted funds 2011	Total funds 2011	Total funds 2010
	£	£	£	£
Insurance	12,174	-	12,174	12,567
Heat, light and power	36,566	-	36,566	35,592
Property and grounds maintenance	55,842	-	55,842	25,670
Grounds agency staff costs	16,765	-	16,765	17,067
Cleaning consumables	2,328	-	2,328	1,160
Cleaning agency staff costs	6,303	-	6,303	5,912
Postage and telephone	4,202	-	4,202	4,037
Recruitment costs	2,103	-	2,103	1,797
General expenses	7,883	-	7,883	7,119
Management Committee	896	-	896	1,766
Office and miscellaneous equipment	9,090	-	9,090	4,904
Bank charges	47	-	47	20
Audit	11,780	-	11,780	9,777
Professional fees - property	7,040	-	7,040	11,630
Other professional fees	6,903	-	6,903	2,906
Stationery, printing and advertising	14,696	-	14,696	1,857
Depreciation	-	114,386	114,386	116,906
Release from grants reserve	-	(84,859)	(84,859)	(87,379)
Release from donated asset reserve	-	(29,527)	(29,527)	(29,527)
	194,618	-	194,618	143,781

Armagh Observatory

7 Average staff numbers and related costs

Average staff numbers

	2011	2010
	Number	Number
Permanent staff	14.5	14.0
Fixed-term contract staff	4.7	4.5
Agency staff	1.2	1.2
	20.4	19.7

Included within permanent staff numbers is the corporation's Administrator whose salary is apportioned on a 50:50 basis between the Observatory and Planetarium.

Costs

	2011	2010
	£	£
Permanent staff		
Wages and salaries	562,049	536,173
Social security costs	48,887	42,040
Employer's pension contributions	100,409	84,112
Pension service cost (note 20)	(368,295)	14,545
	343,050	676,870
Fixed-term contract staff costs		
Wages and salaries	112,638	110,006
Social security costs	10,652	10,498
Employer's pension contributions	8,886	7,343
	132,176	127,847
Total permanent and fixed-term contract staff		
Wages and salaries	674,687	646,179
Social security costs	59,539	52,538
Employer's pension contributions	109,295	91,455
Pension service cost (note 20)	(368,295)	14,545
	475,226	804,717
Agency staff costs	23,068	22,979
Total staff costs	498,294	827,696

Permanent staff costs include 50% of the salary costs of the corporation's Administrator.

The pension service cost of (£368,295) is the actuarial present value of pension benefits earned by staff during the year.

Average student numbers and related costs

	2011	2010
	Number	Number
PhD students	10.8	9.5
	2011	2010
	£	£
Student maintenance grants	141,565	110,397

There was one additional PhD student in the year whose maintenance grant was funded by the STFC

Armagh Observatory

8 Income and expenditure summary

	2011 £	2010 £
Gross income	1,434,684	1,260,908
Expenditure		
Direct expenditure of the corporation (note 3)	871,752	1,131,458
Fund raising and publicity (note 4)	-	-
Management and administration of the corporation (note 6)	194,618	143,781
	1,066,370	1,275,239
Other finance income	(16,000)	(53,000)
(Deficit)/surplus for the year	352,314	(67,331)

9 Tangible fixed assets

	Freehold Land & buildings £	Exhibits and grounds £	Astropark £	Furniture Fittings £	Office & Historic Eqpt. £	Equipment & Historic telescopes £	Total £
Cost or valuation							
At 1 April 2010	4,088,688	23,593	367,490	73,573	35,240	565,301	5,153,885
Additions	5,915	-	-	6,587	-	121,233	133,735
Disposals	-	-	-	(3,691)	-	-	(3,691)
At 31 March 2011	4,094,603	23,593	367,490	76,469	35,240	686,534	5,283,929
Depreciation							
At 1 April 2010	820,447	9,516	275,622	63,443	29,054	366,800	1,564,882
Charge for year	48,134	1,871	18,375	1,660	1,816	42,530	114,386
Disposals	-	-	-	(3,691)	-	-	(3,691)
At 31 March 2011	868,581	11,387	293,997	61,412	30,870	409,330	1,675,577
Net book value							
At 31 March 2011	3,226,022	12,206	73,493	15,057	4,370	277,204	3,608,352
Net book value							
At 31 March 2010	3,268,241	14,077	91,868	10,130	6,186	198,501	3,589,003

Tangible fixed asset additions of £133,735 as shown above were funded as follows:

	£	
DCAL	Capital grant	126,000
DCAL	In-year capital grant	4,671
STFC	Research grants	3,064
		133,735

If the land and buildings had not been valued, they would have been included at the following amounts:

	2011 £	2010 £
Cost	715,334	709,419
Aggregate depreciation	(191,411)	(175,442)
Net book value based on historic cost	523,923	533,977

Depreciation on fixed assets for the year was £114,386 (2010: £116,906).

Land and buildings include grounds and buildings with a net book value of £2,489,927 at 31 March 2011 which were donated to the corporation in 1790 by Archbishop Richard Robinson, the founder of the corporation (31 March 2010: £2,518,561).

10 Debtors

	2011 £	2010 £
Grant debtors	8,481	20,316
Prepayments	43,857	47,857
Sundry debtors	-	278
Pension scheme	8,750	455
	61,088	68,906

11 Creditors: amounts falling due within one year

	2011 £	2010 £
Trade creditors	22,562	20,979
Accruals	44,753	93,963
Deferred income	242,721	91,456
	310,036	206,398

Analysis of deferred income

	2011 £	2010 £
Balance at 1 April 2010	91,456	56,329
Transfer to statement of financial activities	(5,511)	(24,723)
Transfer from statement of financial activities	156,776	59,850
Balance at 31 March 2011	242,721	91,456

12 Government grants reserve

	Land and buildings £	Exhibits and grounds £	Astropark £	Furniture Fittings £	Office Eqpt. £	Equipment & Historic telescopes £	Total £
Balance at 1 April 2010	395,065	7,026	91,868	10,129	6,188	198,411	708,687
Additions	5,915	-	-	6,587	-	121,233	133,735
Amortised	(18,607)	(1,871)	(18,375)	(1,660)	(1,816)	(42,530)	(84,859)
Balance at 31 March 2011	382,373	5,155	73,493	15,056	4,372	277,114	757,563

Armagh Observatory

13 Unrestricted funds

	2011 £
Balance at 1 April 2010	(1,361,308)
Incoming resources	1,225,449
Resources expended	(857,135)
Other finance income	(16,000)
Adjustment to the statement of recognised gains and losses	736,000
Balance at 31 March 2011	(272,994)

The unrestricted funds include a deficit of £364,000 (2010: £1,444,000) in respect of pension scheme liabilities of the pension fund.

It is the policy of the Armagh Observatory to retain a reasonable level of unrestricted cash funds for future cash needs to fund salary and other costs of research grants, which are normally paid in arrears, and to provide a contingency fund for development opportunities and possible exceptional expenditure.

The Observatory considers that funds of between £50,000 and £100,000, approximately 5% of total annual expenditure are sufficient to meet financial risks. The level of unrestricted funds at 31 March 2011 of £82,256 is currently sufficient to meet foreseeable contingencies. This policy will be reviewed by the Director on an annual basis at the end of the financial year.

Unrestricted funds after reversal of the pension adjustments are as follows:

	£
Unrestricted funds at 31 March 2011	
Balance on unrestricted funds at 31 March 2011	(272,994)
Reversal of pension scheme debtor at 31 March 2011	(8,750)
Reversal of pension scheme liability at 31 March 2011	364,000
Unrestricted funds at 31 March 2011 after reversal of pension adjustments	82,256

Armagh Observatory

14 Restricted funds

	Balance 1/4/2010	Incoming resources	Resources expended	Transfer between funds	Transfer from defrd. income	Transfer to defrd. income	Balance 31/3/2011
	£	£	£	£	£	£	£
DCAL grants							
SALT	5,031	-	-	-	-	-	5,031
Capital	-	-	-	-	-	-	-
In-year capital grant	-	126,000	(130,671)	-	4,671	-	-
	5,031	126,000	(130,671)	-	4,671	-	5,031
Other grants							
STFC grants	-	269,404	(122,878)	(83,600)	840	(63,766)	-
Discover Science and Engineering Programme: IYA 2009 and Astro Art Fun	-	5,813	(5,813)	-	-	-	-
Light Pollution & Dark Skies Symposium	-	-	-	-	-	-	-
Leverhulme Trust	-	51,253	(45,815)	-	-	(5,438)	-
Lindsay Scholarship Fund	2,037	-	-	-	-	-	2,037
Miscellaneous travel grants	-	922	(922)	-	-	-	-
The Royal Society	-	500	(500)	-	-	-	-
European Commission FP7 EuroPlaNet Project	-	5,177	-	-	-	(5,177)	-
Joint Collection Management and Public Access Project - Armagh Public Library	-	10,908	(10,908)	-	-	-	-
IMC 2010	-	11,729	(11,729)	-	-	-	-
15th ADAS Workshop	-	2,355	(2,123)	(232)	-	-	-
OASES Project	-	11,611	(11,611)	-	-	-	-
EUNAWÉ	-	82,395	-	-	-	(82,395)	-
Miscellaneous grants	-	200	-	(200)	-	-	-
	2,037	452,267	(212,299)	(84,032)	840	(156,776)	2,037
Donations	225	-	-	-	-	-	225
	7,293	578,267	(342,970)	(84,032)	5,511	(156,776)	7,293

DCAL Grants

The Observatory received capital grant of £126,000 and a further in-year capital grant of £4,670 from DCAL during the year for expenditure on the Variable Star Telescope dome, computer data storage systems and PCs, air conditioning for library and weather observation and garden equipment.

Other Grants and Receipts

The Observatory received funding from the STFC to fund a number of research projects during the year:

- The contribution of plasma jets and sporadic radiative events to the coronal heating puzzle.
- The mass loss and death of massive stars.

Funding was received from the Leverhulme Trust for a research project: Ultracool Dwarfs: A New Class of Stellar Lighthouse.

These grants fund salary, travel and other direct costs of the research projects and provide a contribution towards the principal investigator's salary costs and indirect and estate costs.

Armagh Observatory

15 Analysis of transfer between funds

The transfer from restricted to unrestricted funds represents funds received from the STFC and other grants towards grant supervisory salary costs and other general running costs of the Observatory.

16 Designated funds

	2011 £	2010 £
Revaluation of land and buildings		
Balance at 1 April 2010	340,677	340,677
Transfer to donated assets reserve	-	-
Revaluation of land and buildings	-	-
Balance at 31 March 2011	340,677	340,677
Donated assets reserve		
Balance at 1 April 2010	2,523,919	2,553,446
Transfer from revaluation of land and buildings	-	-
Revaluation of donated land and buildings	-	-
Amortised	(29,527)	(29,527)
Balance at 31 March 2011	2,494,392	2,523,919
Total designated funds at 31 March 2011	2,835,069	2,864,596

Buildings and grounds with a net book value at 31 March 2011 of £2,489,927 (2010: £2,518,561) were donated to the corporation in 1790 by Archbishop Richard Robinson, the founder of the corporation.

The corporation's land and buildings were revalued at 31 March 2007 by Land and Property Services, an agency within the Department of Finance and Personnel, on the following bases:

Land and buildings	Basis of valuation
Operational land and buildings which are unique due to their specialised nature and design	depreciated replacement cost
Operational non-specialised land and buildings	existing use value
Other land and buildings	market value

17 Analysis of net assets between funds

	Designated Funds £	Unrestricted Funds £	Restricted Funds £	Total Funds £
Tangible assets	3,601,059	-	7,293	3,608,352
Current assets	-	392,615	-	392,615
Current liabilities	-	(310,036)	-	(310,036)
Pension liability	-	(364,000)	-	(364,000)
Net assets/(liabilities)	3,601,059	(281,421)	7,293	3,326,931

18 Analysis of net funds

	1 April 2010 £	Cash Flow £	31 March 2011 £
Cash at bank and in hand	78,160	(70,231)	7,929
Liquid resources	133,597	190,001	323,598
Net funds	211,757	119,770	331,527

Liquid resources comprise short term deposits held at the bank.

Armagh Observatory

19 Reconciliation of net cash flow to movement in net funds

	2011 £	2010 £
(Increase)/decrease in cash in financial year	(70,231)	15,664
Increase/(decrease) in deposit)	190,001	121,553
Increase/(decrease) in net funds in the year	119,770	137,217
Net funds at 1 April	211,757	74,540
Net funds at 31 March	331,527	211,757

20 Pension scheme

An actuarial valuation of the NILGOSC scheme was carried out at 31 March 2010. The funding level (ratio of assets to past service liabilities) at 31 March 2010 was 82% compared to 89% at 31 March 2007 corresponding to a funding deficit of £783million (£396m at 31 March 2007), which will have to be recovered by increasing employers' contribution rates. The employers' contribution rate for 2010/2011 of 17% will increase to 18% in 2011/2012 and it is anticipated that there will be further increases in subsequent years.

The NILGOSC actuary, Hymans Robertson LLP, has provided the following details for the purposes of accounting for the Observatory's share of the scheme deficit in accordance with FRS 17 at 31 March 2011.

Financial assumptions

	31/3/2011 %	31/3/2010 %	31/3/2009 %
Rate of increase in salaries	5.1	5.3	4.6
Inflation/pension increase	2.8	3.8	3.1
Discount rate	5.5	5.5	6.9
Expected return on assets	6.9	7.2	6.5

Mortality assumptions

	2011 Years	2010 Years
Longevity at age 65 for current pensioners:		
- Men	22.9	20.8
- Women	25.7	24.1
Longevity at age 65 for future pensioners:		
- Men	24.9	22.3
- Women	27.7	25.7

The fair value of assets in the scheme and expected rates of return

	Long term rate of return 31/3/2011 %	Value at 31/3/2011 £k	Long term rate of return 31/3/2010 %	Restated Value at 31/3/2010 £k	Long term rate of return 31/3/2009 %	Value at 31/3/2009 £k
Equities	7.5	2,500	7.8	2,168	7.0	1,424
Bonds	4.9	454	5.0	394	5.4	273
Property	5.5	195	5.8	169	4.9	137
Cash	4.6	97	4.8	84	4.0	117
		3,246		2,815		1,951

Asset values at 31 March 2011 are at bid values as required under FRS 17.

Armagh Observatory

Scheme balance sheet

	31/3/2011	31/3/2010
	£k	£k
Fair value of assets	3,246	2,815
Present value of scheme liabilities:		
Present value of unfunded liabilities	-	-
Present value of funded liabilities	(3,610)	(4,259)
Total value of scheme liabilities	(3,610)	(4,259)
Deficit in the scheme	(364)	(1,444)

Analysis of amount charged to operating profit in respect of the scheme

	Year to 31/3/2011	Year to 31/3/2010	Year to 31/3/2009
	£k	£k	£k
Current service cost	136	73	79
Past service cost	(395)	33	-
	(259)	106	79

Analysis of amount charged to other finance expenses

	Year to 31/3/2011	Year to 31/3/2010	Year to 31/3/2009
	£k	£k	£k
Expected return on scheme assets	203	128	186
Interest on scheme liabilities	(219)	(181)	(182)
Net return	(16)	(53)	4

Recognition in the statement of financial activities

	Year to 31/3/2011	Year to 31/3/2011	Year to 31/3/2010	Year to 31/3/2010
	£k	%	£k	%
Current service costs	136	22.4	73	13.3
Past service costs/(gains)	(395)	(65.0)	33	6.0
Interest costs	219	36.0	181	33.0
Expected return on assets	(203)	(33.4)	(128)	(23.4)
Total	(243)	(40.0)	159	28.9
Actual return on assets	277		821	

Reconciliation of defined benefit obligation

	Year to 31/3/2011	Year to 31/3/2010
	£k	£k
Opening defined benefit obligation	4,259	2,600
Current service cost	136	73
Interest cost	219	181
Contributions by members	40	39
Actuarial losses/(gains)	(532)	1,419
Past service costs/(gains)	(395)	33
Benefits paid	(117)	(86)
Closing defined benefit obligation	3,610	4,259

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Reconciliation of fair value of assets

	Year to 31/3/2011 £k	Year to 31/3/2010 £k
Opening fair value of assets	2,815	1,951
Expected return on assets	203	128
Contributions by members	40	39
Contributions by the corporation	101	91
Actuarial gains/(losses)	204	692
Benefits paid	(117)	(86)
Closing fair value of assets	3,246	2,815

Amount for current and previous accounting years

	Year to 31/3/2011 £k	Year to 31/3/2010 £k	Year to 31/3/2009 £k	Year to 31/3/2008 £k	Year to 31/3/2007 £k
Fair value of assets	3,246	2,815	1,951	2,543	2,543
Present value of defined benefit obligation	(3,610)	(4,259)	(2,600)	(2,642)	(2,965)
Surplus/(deficit)	(364)	(1,444)	(649)	(99)	(422)
Experience gains/(losses) on assets	204	692	(785)	(189)	(30)
Experience gains/(losses) on liabilities	206	-	-	106	1

Amount recognised in the statement of recognised gains and losses (SRGL)

	Year to 31/3/2011 £k	Year to 31/3/2010 £k	Year to 31/3/2009 £k	Year to 31/3/2008 £k	Year to 31/3/2007 £k
Actuarial gains/(losses)	736	(727)	(546)	341	(346)
Increase/(decrease) in irrecoverable surplus from membership fall and other factors	-	-	-	-	-
Actuarial gains/(losses) recognised in the SRGL	736	(727)	(546)	341	(346)
Cumulative actuarial gains/(losses)	(358)	(1,094)	(367)	179	(162)

21 Commitments

There were no outstanding capital commitments at 31 March 2011 (2010: £nil).

22 Investment in Southern African Large Telescope Project

	2011 £	2010 £
Total investment at 31 March	185,096	185,096
Provision for impairment at 31 March	(185,096)	(185,096)
Net book value at 31 March	-	-

The Southern African Large Telescope (SALT) project involved the construction of a 10-metre class telescope with related buildings at the Sutherland Outstation of the South African Astronomical Observatory in Northern Cape Province. The main objective is to advance science and education in South Africa through the promotion of deep-sky astronomy, and by participating in the project the Armagh Observatory has attained rights to use the telescope.

23 Related-Party Transactions

None of the members of the Board of Governors, the Management Committee, the Director or other related parties have undertaken any material transactions with the Armagh Observatory during the year. The Armagh Observatory has had various material transactions with a number of Government Departments, Executive Agencies and Non-Departmental Public Bodies in Northern Ireland and the UK. Most of these transactions have been with DCAL, the Central Procurement Directorate (CPD), the Science and Technology Facilities Council (STFC) and the Southern Education and Library Board (SELB). DCAL provides recurrent and capital grants (page 38, note 2), the STFC provides grants for research projects (page 38, note 2) and CPD and SELB are the Centres of Procurement Expertise for the corporation.

24 Financial Instruments

As the cash requirements of the Observatory are met through grants from DCAL and other grant funding bodies, financial instruments play a more limited role in creating risk than would apply to a non-public sector body of a similar size. The majority of financial instruments relate to contracts to buy non-financial items in line with the Observatory's expected purchase and usage requirements and the Observatory is therefore exposed to little credit, liquidity or market risk.

25 Contingent Liability

There is an unresolved issue concerning whether the compensatory sum, backdated six years from 31 January 2009 in the agreement on Equal Pay reached by the Northern Ireland Civil Service (NICS) Management and the Trade Union Side in December 2009, applies to Armagh Observatory staff on the same pay scales as those NICS staff covered by the agreement. The Armagh Observatory is working with the DCAL to obtain a resolution of this exceptional situation.

The potential liability for the payment of this settlement, estimated at £47,000 at 31 March 2011, has been treated as a contingent liability pending further clarification of this issue.

26 Additional disclosures to comply with the Financial Reporting Manual (FRoM)

FRoM requires non-departmental public bodies to regard grant-in-aid received as contributions from controlling bodies giving rise to a financial interest in the residual interest of the body and hence accounting for as financing, that is by crediting them to income and expenditure reserve. In addition FRoM requires grant-in-aid to be accounted for on a cash basis.

However, as the corporation is required to prepare accounts in accordance with the SORP for charities, DCAL has given the corporation permission to continue to treat grants as income. If the Observatory were required to comply with the FRoM the result of this compliance would be as follows:

Statement of Financial Activities prepared under FRoM

	2011	2010
	£	£
Incoming resources		
Incoming resources from research and other non-DCAL grants	301,002	316,355
Other incoming resources	8,017	9,921
Total incoming resources	309,019	326,276
Resources expended		
Direct expenditure of the corporation	871,752	1,131,458
Fundraising and publicity	-	-
Management and administration of the corporation	194,618	143,781
Capital expenditure	133,735	85,931
Notional cost of capital	-	3,267
Total Resources expended	1,200,105	1,364,437
Net deficit for the year	(891,086)	(1,038,161)
Credit in respect of notional cost of capital	-	3,267
Finance (costs)/income - pension scheme	(16,000)	(53,000)
Actuarial (loss)/gain - pension scheme	736,000	(727,000)
Amount transferred to funds	(171,086)	(1,814,894)

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Analysis of funds prepared under the FReM

	2011	2010
	£	£
Balance at 1 April 2010	2,226,023	3,046,580
Adjustment to opening funds	(6,755)	-
Movement in government grant reserve	48,876	(1,448)
Movement in designated funds	(29,527)	(29,527)
Grant-in-aid received in the year	1,259,400	1,025,312
Net operating costs for the year	(171,086)	(1,814,894)
Balance at 31 March 2011	3,326,931	2,226,023

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Statement of financial activities for the year ended 31 March 2011

		Unrestricted funds 2011	Restricted funds 2011	Total funds 2011	Total funds 2010
	Notes	£	£	£	£
Incoming resources					
DCAL grants	2	504,789	291,226	796,015	504,604
Other grants and receipts	2	70	29,915	29,985	24,160
Admissions		115,883	-	115,883	143,953
Rents		2,600	-	2,600	2,600
Interest receivable		-	-	-	13
Disposal of fixed assets		-	-	-	-
Miscellaneous income		4,634	-	4,634	4,091
Outreach income		17,160	-	17,160	11,630
Shop and mail order gross profit	22	20,305	-	20,305	33,145
Transfer to deferred income		-	(18,264)	(18,264)	(5,365)
Transfer from deferred income		-	9,400	9,400	-
Transfer between funds		6,495	(6,495)	-	-
Total incoming resources		671,936	305,782	977,718	718,831
Resources expended					
Direct expenditure of the corporation	3	144,211	14,556	158,767	495,991
Fundraising and publicity	4	15,053	-	15,053	22,671
Management and administration of the corporation	5	178,615	-	178,615	160,454
Capital expenditure		-	291,226	291,226	21,604
Total resources expended		337,879	305,782	643,661	700,720
Net incoming/(outgoing) resources for the year before cost of capital					
		334,057	-	334,057	18,111
Cost of capital		-	-	-	(169,402)
Net movement in funds after cost of capital		334,057	-	334,057	(151,291)
Cost of capital reversed		-	-	-	169,402
Net movement in funds before finance income		334,057	-	334,057	18,111
Finance income/(costs) - pension scheme		(22,000)	-	(22,000)	(35,000)
Net movement in funds after finance income		312,057	-	312,057	(16,889)
Actuarial (loss)/gain on pension scheme		462,000	-	462,000	(655,000)
Net movement in funds after actuarial (loss)/gain		774,057	-	774,057	(671,889)
Balances brought forward at 1 April		(1,120,108)	-	(1,120,108)	(448,219)
Balances carried forward at 31 March	13, 14	(346,051)	-	(346,051)	(1,120,108)

All amounts above relate to continuing operations of the corporation.

The income and expenditure summary is included at Note 7.

Cost of capital at 3.5% was charged on the average net assets of the corporation.

As this was a notional charge the cost of capital was reversed in the Statement of Financial Activities in 2009/2010.

Statement of recognised gains and losses

	2011 £	2010 £
Net movement in funds for the year	312,057	(16,889)
Surplus on revaluation of land and buildings	-	-
Net movement on government grant reserve	92,562	(187,960)
Actuarial (loss)/gain on pension scheme	462,000	(655,000)
Recognised gains/(losses) for the year	866,619	(859,849)

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Balance sheet at 31 March 2011

	Notes	2011 £	2010 £
Tangible assets	8	5,622,792	5,530,230
Current assets			
Stock	9	7,409	11,217
Debtors and prepayments	10	86,272	27,879
Cash at bank and in hand	17, 18	27,059	51,378
		120,740	90,474
Creditors: amounts falling due within one year	11	(97,791)	(74,582)
Net current assets		22,949	15,892
Net assets excluding pension liability		5,645,741	5,546,122
Long-term liabilities - pension scheme	19	(369,000)	(1,136,000)
		(369,000)	(1,136,000)
Net assets		5,276,741	4,410,122
Funds			
Unrestricted funds	13	(346,051)	(1,120,108)
Government grant reserve	12	986,711	894,149
Designated funds	15	4,636,081	4,636,081
		5,276,741	4,410,122

The financial statements on pages 51 to 65 were approved on 22 August 2011 and were signed by:

Dr Tom Mason MBE, Accounting Officer for the Armagh Planetarium

Armagh Planetarium

Cash flow statement for the year ended 31 March 2011

	Notes	2011 £	2010 £
Net cashflow from operating activities		(21,574)	23,990
Returns on investments and servicing of finance			
Interest received		-	13
Profit in sale of assets		-	-
Bank and credit card processing charges		(2,745)	(2,917)
		(2,745)	(2,904)
Capital expenditure			
Purchase of tangible assets		(291,226)	(21,604)
Capital grants received		291,226	21,604
		-	-
Net cash inflow/(outflow) before financing		(24,319)	21,086
Financing			
Repayment of principal under hire purchase agreements		-	-
Increase/(decrease) in cash	17, 18	(24,319)	21,086

Reconciliation of operating result to net cash flow from operating activities

	2011 £	2010 £
Net incoming resources per statement of financial activities	334,057	18,111
Interest received	-	(13)
Profit on sale of assets	-	-
Interest paid and similar charges	2,745	2,917
Depreciation	198,664	209,564
Deferred credit release	(198,664)	(209,564)
Pension service costs	(327,000)	(8,000)
Decrease/(increase) in stock	3,808	327
Decrease/(increase) in debtors	(58,393)	8,645
Increase/(decrease) in creditors	23,209	2,003
Net cash (outflow)/inflow from operating activities	(21,574)	23,990

Armagh Planetarium

Notes to the financial statements for the year ended 31 March 2011

1 Accounting policies

These financial statements are prepared on the going concern basis under the historical cost convention, as modified by the revaluation of certain tangible fixed assets, and in accordance with The Audit and Accountability (Northern Ireland) Order 2003, and directions made thereunder by the Department of Culture, Arts and Leisure (DCAL) and applicable accounting standards. The principal accounting policies are set out below.

Tangible fixed assets

The cost of tangible fixed assets is their replacement or valuation together with any incidental costs of acquisition. Depreciation is calculated so as to write off the cost or valuation of tangible fixed assets, less their estimated residual values, on a straight-line basis over the expected useful economic lives of the assets concerned. Land is not depreciated.

	%
Digistar	10
Furniture and fittings	10 - 15
Office equipment	15 - 25
Equipment	10 - 25
Buildings	2 - 3
Exhibits	10 - 25
Vehicles	25

Land and buildings are included in the balance sheet at depreciated replacement cost, estimated value in use or market value.

Government grants

The Government Financial Reporting Manual requires that grants are to be shown as a movement in reserves rather than as income. However, as the corporation is required to prepare accounts in accordance with the Statement of Recommended Practice (SORP) for charities, DCAL has given the corporation permission to continue to treat grants as income.

Grants that relate to specific capital expenditure are treated as deferred income which is then credited to the income and expenditure account over the related asset's useful life. Other grants are credited to the statement of financial activities when received.

Pension scheme

The corporation provides pension benefits to its employees by participating in the Northern Ireland Local Government Officers' Superannuation Committee (NILGOSC) Pension Scheme, which is a defined benefit scheme. Annual contributions to the NILGOSC scheme are based on actuarial advice. The operating costs of providing retirement benefits to the corporation's employees are recognised in accounting periods in which the benefits are earned by employees, and the related finance costs and other changes in value of the assets and liabilities are recognised in the period in which they arise.

Armagh Planetarium

Fund accounting

The corporation has various types of funds for which it is responsible, and which require separate disclosure. These are as follows:

Restricted funds

Grants or donations received which are earmarked by the donor for specific purposes. Such purposes are within the overall aims of the organisation.

Unrestricted funds

Funds which are expendable at the discretion of the Governors in furtherance of the objects of the corporation. In addition to expenditure on the provision of services, such funds may be held in order to finance capital investment and working capital.

Stocks

Stocks are stated at the lower of cost and net realisable value. In general, cost is determined on a first in first out basis. Provision is made, where necessary for obsolete, slow moving and defective stocks.

2 Incoming Resources

The accounts reflect the receipt of the following grants:

Grants from the Department of Culture, Arts and Leisure (DCAL)

	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
Recurrent grant	483,000	-	483,000	483,000
In year recurrent grant	22,600	-	22,600	-
Virement Revenue to Capital	(811)	811	-	-
Capital grant	-	290,000	290,000	21,604
In-year capital grant	-	415	415	-
	504,789	291,226	796,015	504,604

Other grants and receipts

	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
Friends of the Planetarium	70	-	70	260
Discover Primary Science	-	-	-	2,200
Ultach	-	-	-	6,000
Naiscoil Ard Mhacha	-	-	-	9,700
Cross Border Collaboration	-	6,175	6,175	-
STFC	-	6,000	6,000	6,000
ERERO UK Grant	-	8,300	8,300	-
DCAL Cosmic Cuilcagh Project	-	9,440	9,440	-
	70	29,915	29,985	24,160

Armagh Planetarium

3 Direct expenditure of the corporation

	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
Salaries and wages	52,680	-	52,680	343,544
Agency staff	3,673	-	3,673	9,586
Equipment leasing	1,180	-	1,180	1,180
Travelling and subsistence	10,656	-	10,656	8,406
Equipment maintenance and consumables	32,505	-	32,505	71,220
Library and subscriptions	3,751	-	3,751	6,438
Production expenses	18,580	-	18,580	24,047
Exhibitions and events	11,146	14,556	25,702	20,158
Training	2,489	-	2,489	3,689
Vehicle expenses	7,551	-	7,551	7,723
	144,211	14,556	158,767	495,991

4 Fundraising and publicity

	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
Advertising and brochures	14,500	-	14,500	22,286
Hospitality	553	-	553	385
	15,053	-	15,053	22,671

5 Management and administration of the corporation

	Unrestricted funds 2011 £	Restricted funds 2011 £	Total funds 2011 £	Total funds 2010 £
Insurance	18,428	-	18,428	18,078
Heat, light and power	54,520	-	54,520	45,736
General property repairs	31,745	-	31,745	21,681
Cleaning services and consumables	22,862	-	22,862	20,339
Office and café furnishings	2,366	-	2,366	1,910
Postage and telephone	13,424	-	13,424	13,544
General expenses	617	-	617	499
Bank and credit card processing charges	2,745	-	2,745	2,917
Audit	9,956	-	9,956	9,001
Professional fees and licences	6,804	-	6,804	8,883
Management Committee and meetings	737	-	737	1,634
Rates	232	-	232	175
Printing and stationery	8,220	-	8,220	14,074
Recruitment	1,290	-	1,290	1,915
Bad debts	-	-	-	68
Depreciation	-	198,664	198,664	209,564
Release from grants reserve	-	(198,664)	(198,664)	(209,564)
Losses and special payments	4,669	-	4,669	-
	178,615	-	178,615	160,454

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6 Average staff numbers and related costs

Average staff numbers

	2011	2010
	Number	Number
Permanent staff	6.5	6.5
Fixed-term contract staff	4.0	3.5
Agency staff	0.2	0.5
	10.7	10.5

Costs

	2011	2010
	£	£
Permanent staff		
Wages and salaries	224,738	222,786
Social security costs	18,536	16,337
Employer's pension costs	39,935	35,012
Pension service cost (note 19)	(258,435)	(9,024)
	24,774	265,111
Fixed-term contract staff costs		
Wages and salaries	85,830	68,305
Social security costs	5,576	4,116
Employer's pension costs	11,490	8,100
Pension service cost (note 19)	(74,990)	(2,088)
	27,906	78,433
Total permanent and fixed-term staff		
Wages and salaries	310,568	291,091
Social security costs	24,112	20,453
Employer's pension costs	51,425	43,112
Pension service cost (note 19)	(333,425)	(11,112)
	52,680	343,544
Agency staff costs	3,673	9,586
Total staff costs	56,353	353,130

Staff costs relating to the corporation's Administrator are apportioned on a 50:50 basis between the Observatory and Planetarium.

The pension service cost of (£333,425) is the actuarial present value of pension benefits earned by staff during the year.

7 Income and expenditure summary

	2011	2010
	£	£
Gross income	686,492	697,227
Expenditure		
Direct expenditure of the corporation	158,767	495,991
Fund raising and publicity	15,053	22,671
Management and administration of the corporation	178,615	160,454
	352,435	679,116
Other finance income	(22,000)	(35,000)
(Deficit)/surplus for the year	312,057	(16,889)

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8 Tangible fixed assets

	Digistar £	Freehold Land and buildings £	Equipment £	Exhibits £	Vehicles £	Total £
Cost or valuation						
At 1 April 2010	906,054	5,733,408	358,192	147,997	8,702	7,154,353
Additions	250,351	30,000	10,875	-	-	291,226
Disposals	-	-	(79,729)	-	-	(79,729)
At 31 March 2011	1,156,405	5,763,408	289,338	147,997	8,702	7,365,850
Depreciation						
At 1 April 2010	751,601	543,966	212,009	107,845	8,702	1,624,123
Charge for year	37,067	120,253	29,099	12,245	-	198,664
Disposals	-	-	(79,729)	-	-	(79,729)
At 31 March 2011	788,668	664,219	161,379	120,090	8,702	1,743,058
Net book value						
At 31 March 2011	367,737	5,099,189	127,959	27,907	-	5,622,792
Net book value						
At 31 March 2010	154,453	5,189,442	146,183	40,152	-	5,530,230

Tangible fixed asset additions of £291,226 as shown above were funded as follows:

	£
DCAL capital grant	291,226

If land and buildings had not been revalued, they would have been included at the following amounts:

	2011 £	2010 £
Cost	1,351,239	1,321,239
Aggregate depreciation	(394,635)	(369,550)
Net book value based on historic cost	956,604	951,689

9 Stocks

	2011 £	2010 £
Finished goods and goods for resale	7,409	11,217

10 Debtors

	2011 £	2010 £
Trade and grant debtors	4,801	1,982
Sundry debtors	-	-
Prepayments	9,722	12,804
VAT	62,213	9,981
Pension scheme	9,536	3,112
	86,272	27,879

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11 Creditors: amounts falling due within one year

	2011	2010
	£	£
Trade creditors	44,991	29,382
Accruals	34,536	35,800
Deferred income	18,264	9,400
	<u>97,791</u>	<u>74,582</u>

Analysis of deferred income

	2011	2010
	£	£
Balance at 1 April	9,400	4,035
Transfer to miscellaneous income	-	-
Transfer to statement of financial activities	(9,400)	-
Transfer from statement of financial activities	18,264	5,365
Balance at 31 March	<u>18,264</u>	<u>9,400</u>

12 Government grants reserve

	Digistar	Buildings and grounds	Equipment	Exhibits	Total
	£	£	£	£	£
Balance at 1 April 2010	154,453	553,361	146,183	40,152	894,149
Additions	250,351	30,000	10,875	-	291,226
Disposals	-	-	-	-	-
Amortised	(37,067)	(120,253)	(29,099)	(12,245)	(198,664)
Balance at 31 March 2011	<u>367,737</u>	<u>463,108</u>	<u>127,959</u>	<u>27,907</u>	<u>986,711</u>

13 Unrestricted funds

	2011
	£
Balance at 1 April 2010	(1,120,108)
Incoming resources	671,936
Resources expended	(337,879)
Other finance income	(22,000)
Adjustment to the statement of recognised gains and losses	462,000
Balance at 31 March 2011	<u>(346,051)</u>

The unrestricted funds reserve includes a deficit of £369,000 (2010: £1,136,000) in respect of pension scheme liabilities of the pension fund.

Unrestricted funds after reversal of the pension adjustments are as follows:

	£
Unrestricted funds at 31 March 2011	
Balance on unrestricted funds at 31 March 2011	(346,051)
Reversal of pension scheme debtor	(9,536)
Reversal of pension scheme liability	369,000
Unrestricted funds at 31 March 2011 after reversal of pension adjustments	<u>13,413</u>

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14 Restricted funds

	Balance 1/4/2010	Incoming resources	Resources expended	Transfer between funds	Transfer from defrd. income	Transfer to defrd. income	Balance 31/3/2011
	£	£	£	£	£	£	£
DCAL grants							
Capital	-	291,226	(291,226)	-	-	-	-
Virement Revenue to Capital							-
Total DCAL grants	-	291,226	(291,226)	-	-	-	-
Other grants and receipts							
DPS/Forfas ESERO Ireland	-	-	-	(2,636)	2,636	-	-
Ultach Trust BBC Irish Shows	-	-	-	-	4,264	(4,264)	-
Royal Society - Local Heroes Project - Bell Burnell		-	-	-	2,500	(2,500)	-
STFC	-	6,000	(6,000)	-	-	-	-
Cross Border Collaboration Project	-	6,175	-	(2,450)	-	(3,725)	-
ESERO UK Grant	-	8,300	-	(525)	-	(7,775)	-
DCAL Cosmic Cuilcagh Project	-	9,440	(8,556)	(884)	-	-	-
Total other grants and receipts	-	29,915	(14,556)	(6,495)	9,400	(18,264)	-
	-	321,141	(305,782)	(6,495)	9,400	(18,264)	-

DCAL grants

DCAL provided funding of £291,226 for the purchase of equipment.

Discovery Primary Science

The Planetarium participates in the Discover Primary Science project, funded and managed by Forfás on behalf of the Office of Science and Technology in Ireland. The purpose of the project is to develop an interest in science for primary school children in Ireland.

Ultach grant

The Planetarium received a total of £4,264 in 2009/10 from Ultach to produce and promote the Irish language version of Planetarium shows.

Science and Technology Facilities Council (STFC)

The STFC Large Award Science in the Community scheme provided £6,000 for the creation and development of assets for the initial ISIS environment under the ELVIS STFC Large Award.

15 Designated funds

	2011 £	2010 £
Revaluation of land and buildings		
Balance at 1 April 2010	4,636,081	4,636,081
Revaluation	-	-
Balance at 31 March 2011	4,636,081	4,636,081

The corporation's land and buildings were revalued at 31 March 2007 by Land and Property Services, an Agency within the Department of Finance and Personnel on the following bases:

Land and buildings

Operational land and buildings which are unique due their specialised nature and design
Operational non-specialised land and buildings
Other land and buildings

Basis

depreciated replacement cost
existing use value
market value

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16 Analysis of net assets between funds

	Designated funds £	Unrestricted funds £	Restricted funds £	Total funds £
Tangible fixed assets	5,622,792	-	-	5,622,792
Current assets	-	120,740	-	120,740
Creditors: amounts falling due within one year	-	(97,791)	-	(97,791)
Pension	-	(369,000)	-	(369,000)
Net current liabilities	-	(346,051)	-	(346,051)
Creditors: amounts falling due after more than one year	-	-	-	-
Net assets/(liabilities)	5,622,792	(346,051)	-	5,276,741

17 Analysis of net cash funds

	1 April 2010 £	Cashflow £	Non cash movement £	31 March 2011 £
Cash at bank and in hand	51,378	(24,319)	-	27,059
Net funds	51,378	(24,319)	-	27,059

18 Reconciliation of net cashflow to movement in net cash funds

	2011 £	2010 £
Increase/(decrease) in cash in financial year	(24,319)	21,086
Net funds at 1 April	51,378	30,292
Net funds at 31 March	27,059	51,378

19 Pension scheme

An actuarial valuation of the NILGOSC scheme was carried out at 31 March 2010. The funding level (ratio of assets to past service liabilities) at 31 March 2010 was 82% compared to 89% at 31 March 2007 corresponding to a funding deficit of £783m (£396 million at 31 March 2007) which will have to be recovered by increasing employers' contribution rates. The employers' contribution rate for 2010/2011 of 17% will increase to 18% in 2011/2012 and it is anticipated that there will be further increases in subsequent years.

The NILGOSC actuary, Hymans Robertson LLP, has provided the following details for the purposes of accounting for the Planetarium's share of the scheme deficit in accordance with FRS 17 at 31 March 2011.

Financial assumptions used by the actuary were:

	31/3/2011 %	31/3/2010 %	31/3/2009 %
Rate of increase in salaries	5.1	5.3	4.6
Inflation/pension increase	2.8	3.8	3.1
Discount rate	5.5	5.5	6.9
Expected return on assets	6.9	7.2	6.5

Mortality assumptions

	2011 Years	2010 Years
Longevity at age 65 for current pensioners:		
- Men	22.9	20.8
- Women	25.7	24.1
Longevity at age 65 for future pensioners:		
- Men	24.9	22.3
- Women	27.7	25.7

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The fair value of assets in the scheme and expected rates of return

	Long term rate of return 31/3/2011 %	Value at 31/3/2011 £k	Long term rate of return 31/3/2010 %	Value at 31/3/2010 £k	Long term rate of return 31/3/2009 %	Value at 31/3/2009 £k
Equities	7.5	1,384	7.8	1,207	7.0	801
Bonds	4.9	252	5.0	219	5.4	154
Property	5.5	108	5.8	94	4.9	77
Cash	4.6	54	4.8	47	4.0	66
		1,798		1,567		1,098

Asset values at 31 March 2010 are at bid values as required under FRS 17.

Scheme balance sheet

	31/3/2011 £k	31/3/2010 £k	31/3/2009 £k
Fair value of assets	1,798	1,567	1,098
Present value of scheme liabilities:			
Present value of unfunded scheme liabilities	(4)	(5)	(5)
Present value of funded liabilities	(2,163)	(2,698)	(1,547)
Total value of scheme liabilities	(2,167)	(2,703)	(1,552)
Deficit in the scheme	(369)	(1,136)	(454)

Analysis of amount charged to operating profit in respect of the scheme

	Year to 31/3/2011 £k	Year to 31/3/2010 £k	Year to 31/3/2009 £k
Current service cost	47	22	43
Past service cost	(329)	10	-
	(282)	32	43

Analysis of amount charged to other finance expenses

	Year to 31/3/2011 £k	Year to 31/3/2010 £k	Year to 31/3/2009 £k
Expected return on scheme assets	113	72	105
Interest on scheme liabilities	(135)	(107)	(111)
Net return	(22)	(35)	(6)

Recognition in the statement of financial activities

	Year to 31/3/2011 £k	Year to 31/3/2011 %	Year to 31/3/2010 £k	Year to 31/3/2010 %
Current service costs	47	19.6	22	9.6
Past service cost	(329)	(137.7)	10	4.3
Interest costs	135	56.5	107	46.5
Expected return on assets	(113)	(47.3)	(72)	(31.3)
Total	(260)	(108.9)	67	29.1
Actual return on assets	154		459	

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Reconciliation of defined benefit obligation

	Year to 31/3/2011 £k	Year to 31/3/2010 £k
Opening defined benefit obligation	2,703	1,552
Current service cost	47	22
Past service costs/(gains)	(329)	10
Interest cost	135	107
Contributions by members	12	11
Actuarial losses/(gains)	(357)	1,042
Estimated unfunded benefits paid	(1)	(1)
Benefits paid	(43)	(40)
Closing defined benefit obligation	2,167	2,703

Reconciliation of fair value of assets

	Year to 31/3/2011 £k	Year to 31/3/2010 £k
Opening fair value of assets	1,567	1,098
Expected return on assets	113	72
Contributions by members	12	11
Contributions by the corporation	44	39
Contributions in respect of unfunded benefits	1	1
Actuarial gains/(losses)	105	387
Unfunded benefits paid	(1)	(1)
Benefits paid	(43)	(40)
Closing fair value of assets	1,798	1,567

Amount for current and previous accounting years

	Year to 31/3/2011 £k	Year to 31/3/2010 £k	Year to 31/3/2009 £k	Year to 31/3/2008 £k	Year to 31/3/2007 £k
Fair value of assets	1,798	1,567	1,098	1,440	1,452
Present value of defined benefit obligation	(2,167)	(2,703)	(1,552)	(1,615)	(1,785)
Surplus/(deficit)	(369)	(1,136)	(454)	(175)	(333)
Experience gains/(losses) on assets	105	387	(442)	(131)	(17)
Experience gains/(losses) on liabilities	186	-	-	(57)	(1)

Amount recognised in the statement of recognised gains and losses (SRGL)

	Year to 31/3/2011 £k	Year to 31/3/2010 £k	Year to 31/3/2009 £k	Year to 31/3/2008 £k	Year to 31/3/2007 £k
Actuarial gains/(losses)	462	(655)	(266)	150	(272)
Increase/(decrease) in irrecoverable surplus from membership fall and other factors	-	-	-	-	-
Actuarial gains/(losses) recognised in the SRGL	462	(655)	(266)	150	(272)
Cumulative actuarial gains/(losses)	(540)	(1,002)	(347)	(81)	(231)

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20 Commitments

There were no capital commitments at the 31 March 2011 (2010: £nil).

21 Related-Party Transactions

None of the members of the Board of Governors, the Management Committee, the Director or other related parties have undertaken any material transactions with the Armagh Planetarium during the year. The Armagh Planetarium has had various material transactions with a number of Government Departments, Executive Agencies and Non-Departmental Public Bodies in Northern Ireland and the UK. Most of these transactions have been with DCAL, the Southern Education and Library Board (SELB) and the Central Procurement Directorate (CPD). DCAL provide recurrent and capital grant (page 55, note 2) and the SELB and the CPD are the Centres of Procurement Expertize for the corporation.

22 Shop and mail order trading account

	2011	2010
	£	£
Sales	46,157	77,661
Less: cost of sales		
Opening stock at 1 April 2010	11,217	11,544
Add: Purchases	22,044	44,189
	33,261	55,733
Less: closing stock at 31 March 2011	(7,409)	(11,217)
	25,852	44,516
Gross profit	20,305	33,145
Gross profit %	44	43

Note: Other costs relating to the Shop and Mail Order operations are included with other Planetarium costs under resources expended.

23 Financial Instruments

As the cash requirements of the Planetarium are met through grants from DCAL and other grant funding bodies, financial instruments play a more limited role in creating risk than would apply to a non-public sector body of a similar size. The majority of financial instruments relate to contracts to buy non-financial items in line with the Planetarium's expected purchase and usage requirements and the Planetarium is therefore exposed to little credit, liquidity or market risk.

24 Contingent Liability

There is an unresolved issue concerning whether the compensatory sum, backdated six years from 31 January 2009 in the agreement on Equal Pay reached by the Northern Ireland Civil Service (NICS) Management and the Trade Union Side in December 2009, applies to Armagh Observatory staff on the same pay scales as those NICS staff covered by the agreement. The Armagh Planetarium is working with the DCAL to obtain a resolution of this exceptional situation.

The potential liability for the payment of this settlement, estimated at £26,000 at 31 March 2011, has been treated as a contingent liability pending further clarification of this issue.

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25 Additional disclosures to comply with the Financial Reporting Manual (FRM)

FRM requires non-departmental public bodies to regard grant-in-aid received as contributions from controlling bodies giving rise to a financial interest in the residual interest of the body and hence accounting for as financing, that is by crediting then to income and expenditure reserve. In addition the FRM requires grant-in-aid to be accounted for on a cash basis.

However, as the corporation is required to prepare accounts in accordance with the SORP for charities, DCAL has given the corporation permission to continue to treat grants as income. If the Planetarium were required to comply with the FRM the result of this compliance would be as follows:

Statement of Financial Activities prepared under FRM

	2011	2010
	£	£
Incoming resources		
Incoming resources from other non-DCAL grants	21,121	18,535
Admissions	115,883	143,953
Outreach	17,160	11,630
Shop and mail order gross profit	20,305	33,145
Other incoming resources	7,234	6,964
Total incoming resources	181,703	214,227
Resources expended		
Direct expenditure of the corporation	158,767	495,991
Fundraising and publicity	15,053	22,671
Management and administration of the corporation	178,615	160,454
Capital expenditure	291,226	21,604
Notional cost of capital	-	169,402
Total Resources expended	643,661	870,122
Net deficit for the year	(461,958)	(655,895)
Credit in respect of notional cost of capital	-	169,402
Finance (costs)/income - pension scheme	(22,000)	(35,000)
Actuarial loss - pension scheme	462,000	(655,000)
Amount transferred to funds	(21,958)	(1,176,493)

Analysis of funds prepared under the FRM

	2011	2010
	£	£
Balance at 1 April	4,410,122	5,269,971
Adjustment to opening funds	-	-
Movement in government grant reserve	92,562	(187,960)
Movement in designated funds	-	-
Grant-in-aid received in the year	796,015	504,604
Net operating costs for the year	(21,958)	(1,176,493)
Balance at 31 March	5,276,741	4,410,122



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