

# The Armagh Observatory and Planetarium

**Annual Report** and  
**Accounts** for 2008/2009  
Year Ended 31 March 2009



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Annual Report and Accounts for 2008/2009,  
Year Ended 31 March 2009**

*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*

*10 December 2009*

# **The Armagh Observatory and Planetarium Annual Report and Accounts for 2008/2009, Year Ended 31 March 2009**

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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 '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 This superseded the original 1791 Act of the Irish Parliament entitled 'An Act for Settling and Preserving a Public Observatory and Museum in the City of Armagh For Ever', and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 dream 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 institutions operate under two directors and receive core funding from the Northern Ireland Department of Culture, Arts and Leisure. There is a total population of around 50 staff, approximately 40 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

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.

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 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.

The Observatory also undertakes an active programme of Science in the Community, for example providing guided tours of the Observatory and its Grounds, Astropark and Human Orrery, holding occasional open days and exhibitions, organizing and delivering public lectures, supervising school children and undergraduates on work-experience programmes and summer research projects, and maintaining and improving the resource of the Grounds and Astropark as a unique inner-city parkland to enrich the lives of visitors to Armagh and residents alike. The Observatory attracts a high level of media interest (e.g. more than 300 mass-media citations to its work per year); its web-sites attract typically around a million distinct e-visitors annually from around the world; and more than 40,000 people visit the landscaped Observatory Grounds, Astropark and Human Orrery every year.

In addition to this primary research role the Observatory maintains a unique nearly 215-year long meteorological record and data-bank (<http://climate.arm.ac.uk/>), the longest in the UK and Ireland from a single site. Calibration of these data has enabled researchers and government agencies to use the Armagh series for reports and research into global warming, 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.

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 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 in the UK and Ireland over more than two hundred years.

The Armagh Planetarium is a leading educational establishment whose primary function 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.

## **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 or within 30 days of the presentation of a valid invoice, or delivery if later. In the year ended 31 March 2009, all of the corporation's invoices were paid within these limits.

## **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 organisation 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 H.J.W. Moore, also Rector of Ballinderry, Tamlaght and Arboe<sup>1</sup>  
The Precentor: The Reverend Canon T. Scott, also Rector of Magherafelt  
The Chancellor: The Reverend Canon J.M. Barton, also Bishop's Curate of Acton and Drumbanagher<sup>2</sup>  
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 R.J.N. Porteus, also Rector of Derryloran Parish (Cookstown)  
The Prebendary of Ballymore: The Reverend Canon W.J.A. Dawson, also Bishop's Curate of Pomeroy  
The Prebendary of Loughgall: The Reverend Canon J.N.T. Campbell, also Rector of St. Mark's Parish, Portadown<sup>3</sup>  
The Prebendary of Tynan: The Reverend Canon W.M. Adair, also Rector of St. Columba's Parish, Portadown<sup>4</sup>  
Councillor W. Gardiner-Watson (DCAL Nominee)  
Professor A. Hibbert, Queens University Belfast (QUB Nominee)  
The Right Honourable the Lord Ballyedmond, Ballyedmond Castle, Rostrevor (Board of Governors Nominee)  
Professor J.E. Dyson, University of Leeds (Board of Governors Nominee)<sup>5</sup>  
Dr R.D. Oudmaijer, University of Leeds (Board of Governors Nominee)<sup>6</sup>

## 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 up to 4 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)  
The Venerable Archdeacon R.G. Hoey, Camlough and Mullaglass (Board of Governors Nominee)  
Professor J.E. Dyson, University of Leeds (Board of Governors Nominee)<sup>7</sup>  
Dr R.D. Oudmaijer, University of Leeds (Board of Governors Nominee)<sup>8</sup>  
Professor A. Hibbert, Queens University Belfast (Board of Governors Nominee)  
Mr E.P. Donnelly (DCAL Nominee)<sup>9</sup>  
Dr E.M. (Á.) Downey (DCAL Nominee)  
Mrs S. Hogg (DCAL Nominee)  
Mr A. Peoples (DCAL Nominee)<sup>10</sup>  
Mr J.I. Shields (DCAL Nominee)<sup>11</sup>  
Mrs P.E. Wilson (DCAL Nominee)<sup>12</sup>  
Professor P.L. Dufton, Queens University Belfast (QUB Nominee)  
Professor M.R. Merrifield, University of Nottingham (STFC Nominee)  
Professor E.J.A. Meurs, Dublin Institute for Advanced Studies (DIAS Nominee)<sup>13</sup>  
Professor T.P. Ray, Dublin Institute for Advanced Studies (DIAS Nominee)<sup>14</sup>

## Internal Audit Committee

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

## Directors and Secretary

Professor M.E. Bailey MBE — Director, Armagh Observatory  
Dr T.R. Mason MBE — Director, Armagh Planetarium  
Mr L.F. Young — Secretary

<sup>1</sup> To 2008 August 31

<sup>2</sup> To 2009 February 22

<sup>3</sup> From 2009 February 23

<sup>4</sup> From 2008 September 1

<sup>5</sup> To 2008 November 20

<sup>6</sup> From 2008 November 20

<sup>7</sup> To 2008 November 20

<sup>8</sup> From 2008 November 20

<sup>9</sup> From 2008 November 1

<sup>10</sup> From 2008 November 1

<sup>11</sup> From 2008 November 1

<sup>12</sup> From 2008 November 1

<sup>13</sup> To 2009 February 27

<sup>14</sup> From 2009 March 4

# The Armagh Observatory — Operating Review 2008/2009

The following research highlights, performance indicators for 2008/2009, and objectives for 2009/2010 are extracted from the Armagh Observatory Annual Report for Calendar Year 2008 (Financial Year 2008/2009), which contains an extensive summary of the whole of the Observatory's principal research and other activities during 2008. 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](mailto:info@arm.ac.uk).

## Alignment with Northern Ireland Government Objectives

**Shared Heritage** There is a very significant level of public interest in astronomy, space science and related fields. This is mirrored by the Observatory's academic focus and addressed by its very active programmes of public outreach and public understanding of science. Astronomical research makes a fundamental contribution to knowledge, and helps to attract people — both young and old — towards science and into a more scientific way of thinking. Science, in Carl Sagan's phrase, is "a candle in the dark"; and astronomy — foremost amongst sciences — helps people to make sense of the world and the wider world around us.

Astronomy is part of world heritage and an important part of the shared heritage 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 the mission of the Department of Culture, Arts and Leisure (DCAL) "to protect, nurture and grow Northern Ireland's Cultural Capital for today and tomorrow." 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.

**Research** Staff at the Armagh Observatory have maintained a high level of research activity and other outputs during the year, producing 53 publications in refereed scientific journals during 2008 as well as many other scientific papers and attracting a record 413 identified mass-media citations to the Armagh Observatory, its staff and their work. Electronic access to the Armagh Observatory has remained at a very high level: during 2008 there were approximately a million 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/>), 13.6 million 'hits', and a record 7.0 TB (1 TB = 1 million Megabytes) of data were exported from the Armagh Observatory to users of astronomical information elsewhere.

During calendar year 2008, Armagh Observatory staff delivered more than 94 scientific papers and general public talks at meetings both locally and abroad, and maintained an active programme of in-house training including some 28 internal seminars and colloquia, many of which were delivered by external visiting speakers. In addition, Stefano Bagnulo organized an international workshop "Spectroscopy and Spectropolarimetry of A and B-type Stars: Research Tools, Techniques, and Goals", which was held at the Armagh Observatory from 2008 February 18 to February 22.

Total external grant receipts and other income during 2008/2009 amounted to £254.3k (cf. £219.4k for 2007/2008), of which £242.8k was attributable to external grant receipts (cf. £200.0k for 2007/2008). This figure, which significantly exceeded the anticipated figure in the 2008/2009 Business Plan (£219.1k), highlights the success of Armagh Observatory staff in proactively obtaining externally funded, peer-reviewed research grants in a very difficult financial climate.

**Presenting Northern Ireland on the International Stage** The Armagh Observatory presents a strong, positive image of Northern Ireland on the international stage. Members of staff play a full role in the international astronomical community: reviewing 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 2008, staff at the Armagh Observatory significantly expanded the Observatory's programme of Science in the Community by providing additional guided tours of the Observatory and Astropark, holding occasional exhibitions, organizing and delivering public lectures, supervising school children and undergraduates on work-experience programmes and summer research projects, and maintaining and improving the resource of the Observatory Grounds, Astropark and Human Orrery as a unique facility to enrich the lives of visitors to Armagh and residents alike. In recent years, the number of people visiting the Astropark has grown significantly, reaching approximately 45,000 in each of the last two years.

## Principal Achievements During 2008 and 2008/2009

### Advances in Astronomy and Astrophysics

**Magnetic Fields of Massive Stars** Stefano Bagnulo, Jorick Vink and Colin Folsom are co-Investigators of a large programme at the Canada-France-Hawaii Telescope (CFHT), a 3.6m telescope on Mauna Kea, Hawaii, which was granted 650 hours for spectropolarimetry of massive stars with the ESPaDONs polarimeter over the next five years to study magnetic fields. A newly recruited STFC PhD student (Bridget Kendrick) will be working full time on this project in association with colleagues at the University of Hertfordshire. Bagnulo and Folsom attended a conference in Kingston, Canada, at the end of June and early July 2008 to discuss the organizational details of this programme, as well as to present scientific papers.

**Mass Loss from Hot Massive Stars** Jorick Vink and colleagues (Joachim Puls and Paco Najarro) have reviewed various aspects of radiation-driven mass loss, encompassing both theoretical and observational perspectives. Their extensive review (116 pages) will be published in the Astronomy and Astrophysics Review series (Puls, Vink & Najarro, 2009, in press).



Jorick Vink and his former PDRA at Keele University, Patrick Müller, report that they have made significant progress in solving the problem of the wind hydrodynamics for a massive O-star stellar wind. Their new theoretical framework together with the iteration method developed by Müller & Vink (2009) supersedes the 35-year old method of Castor, Abbott & Klein (1975). The new method will allow Vink and collaborators to study mass loss in regions of the Universe for which empirical constraints on individual O stars are not readily available, for example massive stars in the early Universe.

**Rapid Temporal Survey (RATS) and the Search for Gravitational Wave Progenitors** Gavin Ramsay reports that, in collaboration with Paul Callanan's group at University College Cork, he and Paul Callanan obtained ESO Director's discretionary time to observe SAX 1808.4-3658. This is a binary system containing an accreting millisecond pulsar. It went into outburst in 2008 September, and the group was successful in obtaining separate sets of spectroscopic data using two of the Very Large Telescopes (VLTs) at Paranal, in Chile.

He further notes that using the Isaac Newton Telescope (INT) on La Palma, observations of a target object discovered as a result of the RATS project indicated the presence of an unusual source varying in brightness with a period of 20 minutes. Follow-up observations using the Nordic Optical Telescope (NOT) in 2008 September showed that the object had brightened by 4 magnitudes (i.e. by a factor of about 40). This indicates that the object is probably a dwarf nova, only the third known dwarf nova to show quasi-periodic oscillations during quiescence. The amplitude of these quasi-periodic oscillations is the largest yet seen in any dwarf nova.

Gavin Ramsay also reports that with colleagues he has been successful in obtaining Cycle 17 time on the Hubble Space Telescope.

**Subluminous B Stars** Subluminous B stars are hot, low-mass stars evolving between their major hydrogen-burning phase of evolution and their final white-dwarf end-state. Simon Jeffery reports that a recent investigation of the distribution of these hot subdwarf B stars versus surface temperature, surface gravity and hydrogen abundance, with colleagues Christopher Winter (a former PhD student) and Simon Hall (a TCD undergraduate, working on a final-year project at Armagh), has shown a correlation between the hydrogen abundance of the sdB star and its luminosity. The correlation is such that in the overall population there is a higher fraction of very rare helium stars (hydrogen-deficient or helium-rich He-sdB stars) at higher luminosity. This result suggests a new and potentially efficient way to discover helium stars.

**Ultracool Dwarfs: The 'Runts' of the Main Sequence** Gerry Doyle and colleagues have reported the discovery of a completely new category of radio emitting object which has immense implications for our understanding of stellar magnetic activity. The observations concerned the detection of periodic pulses of 100% circularly polarized radio emission, which appear to be produced at the poles of a large-scale magnetic field by the electron cyclotron maser instability, the same mechanism known to be responsible for the radio emission from the magnetized planets in our solar system. These observations show that ultracool dwarfs have kilo gauss (kG) fields and that they have active upper atmospheric conditions. Furthermore, they question the interpretation of radio emission from active stars over the last 20 years. Many questions remain about these objects, and in an effort to look into the short-term variability of the emission the group was awarded three 2.5 hour shifts at the Arecibo Observatory in late 2008 May. These were consecutive shifts, scheduled to observe the ultracool dwarf TVLM 513, which has a 1.96 hour rotation period, with 1-second time resolution. On successive nights it was observed that the pulses as seen with the lower time resolution VLA data have a lot of sub-structure, implying structures in the stellar atmosphere with dimensions no more than 600 km. They also showed a factor of five variability in flux over a 24 hour interval.

**Polarimetry of Outer Solar-System Objects** Stefano Bagnulo reports that, using the ESO VLT, he and co-authors have performed the first-ever polarimetric survey of trans-Neptunian objects (TNOs). These are small solar system bodies orbiting on the fringes of the planetary system beyond Neptune which are believed to contain the most primitive and thermally least-processed material from the early accretional phase of the solar system. Their study allows us to investigate the interrelationships between the various classes of small solar-system body, and their origin and evolution. The results of this work have shown that there are two different polarimetric behaviours for these kinds of body, possibly associated with different evolutionary stages of the objects.

**Aurigid Meteor Outburst** A very rare outburst of the Aurigid meteor shower was predicted to occur at 11:36 ±20 min UT on 2007 September 1, due to Earth's encounter with dust from long-period comet C/1911 N1 (Kiess), ejected from the cometary nucleus some 2000 years ago. Outbursts of this type provide unique scientific opportunities to study long-period comets which, by their very nature, are very unlikely to come under the scrutiny of in situ spacecraft missions either now or in the foreseeable future. Three members of the Armagh Observatory (Apostolos Christou, Prakash Atreya, Martin Murphy) travelled to San-Francisco, California, USA, where the shower was anticipated to be best seen. They coordinated their efforts with a US-group led by Dr Peter Jenniskens of the SETI Institute. The outburst did occur as predicted, with meteors as bright as the planet Jupiter appearing at a peak rate of about 100/hr for a period of about 90 min, and several gigabytes of data on this outburst were recorded by the Armagh Observatory group. In 2008, these have been analyzed by software developed in-house by Atreya to yield information on the physical nature of the meteoroids and the structure of the dust stream of this long-period comet. Partial external financial support for this trip was obtained by the N3 activity of the European Planetology Network (EuroPlaNet) funded through the 6th Framework Programme of the European Union.

**New Temporary Satellite Capture Comet** David Asher and colleagues (Ohtsuka, Ito, Yoshi-kawa, and Arakida) have discovered that a comet first found in 1993 is a member of the rare class of comets known as temporary satellite captures (TSCs). These are objects that have been temporarily captured by the giant planet Jupiter and which orbit the planet as if they were another Jovian satellite. They show that comet 147P/Kushida-Muramatsu represents both the third longest temporary satellite capture event and the third longest orbiter around Jupiter, behind 111P/Helin-Roman-Crockett and D/1993 F2 (Shoemaker-Levy 9), the latter whose fragments collided with Jupiter in 1994 July. The present study explores the dynamical link, exemplified by 147P/Kushida-Muramatsu, between the Hilda region of the main asteroid belt and Jovian satellite capture orbits.

**Observational and Theoretical Studies of Comets** Stefano Bagnulo and colleagues (Bönnhardt, Tozzi, Muinonen, Nathues, and Kolokolova) have used the VLT in Chile to determine the linear polarimetric phase function for the short-period comet 2P/Encke, the first ever measured for a cometary nucleus.

**Threat of Dark Comets** David Asher reports that during 2008 he and Bill Napier (Cardiff University), a former senior research fellow at the Armagh Observatory, completed a major invited review article on the Tunguska impact event (1908 June 30). This was published in the 2009 February issue of *Astronomy and Geophysics*, the journal of the Royal Astronomical Society, and focused on the nature of the impactor and the importance or otherwise of a cometary component to the extraterrestrial impact hazard. The paper attracted a significant amount of media attention.

One hundred years ago an incoming object from space exploded above the Tunguska region of Siberia and devastated two thousand square kilometres of forest. The article reviews the question of an asteroidal (rocky and/or metallic) versus cometary (icy, or once icy and now substantially devolatilised) nature for the Tunguska impactor. The issue has been intensively debated for many years and its solution, by informing the more general question whether comets or asteroids dominate the variable influx of extraterrestrial debris on to Earth, will help to clarify the nature of the threat posed by so-called near-Earth objects (NEOs) — comets and asteroids — to civilization. The new work assesses the evidence for the importance of cometary populations, and presents evidence for the effect of the solar system's Galactic environment on the Oort comet cloud through the variable frequency versus time over many millions of years of extraterrestrial impact craters on Earth. The importance of comets has significant implications for hazard mitigation: cometary bodies, or cometary fragments generally, have much higher impact speeds and shorter warning times than their asteroidal counterparts.

**History of Astronomy** Mark Bailey reported the results of an investigation into the date of birth of the Observatory's founder, which showed that Archbishop Richard Robinson was baptized at Merton, Surrey, on 1708 July 13, so proving that the Archbishop was born in 1708 and not 1709 as had previously been believed. This explains why the City of Armagh celebrated the Archbishop's tercentenary in 2008 and not 2009. This work would not have been possible without the support and encouragement of many people, particularly members of the Armagh Visitor Education Committee, notably Carol Conlin (Armagh Public Library) and Mary McVeigh (Irish and Local Studies Library, Armagh).

The results of the investigation were published in *Cathedra*, p.11, Issue 1, 2008 (published by the Friends of St. Patrick's Church of Ireland Cathedral, Armagh), and as a chapter in the book *Border Heritage: Tracing the Heritage of the City of Armagh and Monaghan County* (published by The Stationery Office (TSO), Norwich, 2008). For full details, see <http://star.arm.ac.uk/preprints/2008/523.pdf> and <http://scholars.arm.ac.uk/avec/border-heritage-book.html>.

**Early Contacts Between Archbishop Richard Robinson and William Herschel** The Librarian, John McFarland, reports that he has located an entry in J.L.E. Dreyer's *The Scientific Papers of Sir William Herschel*, Vol. I, p.xx, 1912, that on 1766 December 10, soon after Herschel had arrived in Bath, he was introduced to the Primate of Ireland. Considering the frequency of Archbishop Richard Robinson's visits to Bath during subsequent years, this provides evidence of an independent astronomical influence on the Archbishop in the years leading up to the founding of the Observatory at Armagh in 1789, in addition to that of the Revd Dr James Archibald Hamilton, the first Astronomer of the Observatory.

**Astronomical Observations from Armagh** Observations conducted by Apostolos Christou and other Armagh Observatory staff and students of the mutual events of the satellites of Jupiter during 2003 were published in the refereed literature during early 2009; the meteor cameras on the roof of the Observatory have continued to collect data throughout the year, operating in a robotic mode that captures images automatically whenever they detect a change, such as a shooting star, in the field of view; and the new Polar Bear Survey Telescopes (PBSTs), a project led by Simon Jeffery in collaboration with Professor Don Pollacco (QUB) with technical assistance from Geoff Coxhead, took their first picture of the night sky on 2008 October 7. When fully operating, it is expected that the PBSTs will be able to monitor approximately 15,000 stars, producing up to 20 GB of data per night and reaching stellar magnitudes of the order of 13–14 (i.e. around 500 times fainter than the naked eye) with exposures of just 10 s at a time.

**Meteorological Observations from Armagh** Daily meteorological readings have continued to be taken at Armagh by the Grounds and Meteorological Officer, Shane Kelly, and other staff. The Observatory's meteorological records provide crucial information on how Northern Ireland's weather has responded to global climate change. All data are available at <http://climate.arm.ac.uk/>. In particular, although 2007 continued the trend of recent very warm years (the average temperature for 2007, i.e. 10.62°C, beat the previous 2006 record of 10.46°C), 2008 — with an average temperature at Armagh of 9.78°C — was the coolest year since 2001. It is interesting to note, for example, that the snowfall on 2008 October 28 and 29 was the first time that snow had fallen in Armagh in October for almost 75 years, that is, since 1934 October 30 and 31.

2008 was also noteworthy for including the wettest January since 1948 (the third wettest January on record), with a total precipitation for the month of 133.6 mm (5.26 inches), more than 70% higher than average, and the second warmest February day on record (15.2°C, on 2008 February 7). April was drier and sunnier than average, and the average temperature in May was the highest for 160 years, the (equal) second warmest May on record. August, however, was exceptionally wet (the seventh wettest August in Armagh since rainfall records began at the Observatory in 1838, and the wettest since 1956), and was the gloomiest August on record at Armagh, with the lowest number of sunshine hours since sunshine records began at Armagh in 1880. Although the mean annual temperature for 2008 was the lowest since 2001, it should be noted that 2008 was still mild compared to the mean annual temperature at Armagh since 1796, i.e. 9.06°C. Similarly, although 2008 contained several very wet months, the total precipitation for the year (859.25 mm) was only slightly higher than the 170-year long-term average at Armagh from 1838 to 2007 inclusive (i.e. 813.67 mm).

## Research Facilities

Computer facilities are used primarily for numerical analysis, computer modelling and data reduction; the computers and peripherals are largely funded by the 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 25 dual-processor work nodes and one master node with a total of 50 GB of memory. This is used 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 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 dedicated 10 Mbps link provided through the Observatory's participation in the Northern Ireland Regional Area Network (NIRAN). It is planned to increase the Observatory's network capacity as part of a series of continuing upgrades to maintain the Observatory's capacity to participate in important new developments such as the Virtual Observatory and Grid-computing. Access to Grid technology is currently provided via CosmoGrid (<http://www.cosmogrid.ie/>). This provides access to a high-performance supercomputer cluster at the Irish Centre for High-End Computing (ICHEC) as well as advanced training programmes.

The Observatory's suite of technical equipment is complemented by a Library and Archives that is one of the premier specialist collections of its kind in the UK and Ireland. The library, archives and museum collection together contain 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 in the UK and Ireland over more than two hundred years.

Armagh Observatory staff also have access to a wide range of international facilities, provided under the auspices of the STFC and UK Government subscriptions, or bilateral agreements and collaborations involving Armagh Observatory research staff. Thus, 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 SoHO, TRACE, Hinode, XMM-Newton, and the Hubble Space Telescope). They attract 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 professional observing from Armagh for research and student training, 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.

## Performance

Performance indicators (PIs) provide a means to assess the Observatory's performance in different spheres of activity, encompassing front-line scientific research in astronomy and related sciences; preservation and restoration of Northern Ireland's scientific, cultural and built heritage; maintenance and development of the unique climate archive; and the promotion of public understanding of science through a vibrant programme of Science in the Community including education, lifelong learning and public outreach.

In the past, four Key PIs were used to span all these objectives, namely (1) External Grant Income; (2) Refereed Scientific Journal Publications; (3) Distinct e-Visitors to the Observatory's web-sites; and (4) Identified Media Citations in the press, digital media and on radio and television. Data referring to each of these measures have been collected systematically over several years and are presented in each year's Annual Report. In recent years, the Observatory has also been required to assess its performance against a new set of Government Key PIs (see below); while a further important measure of the Observatory's improving performance over the years has been its result in the periodic Research Assessment Exercise.

## Research Assessment Exercise

The Research Assessment Exercise (RAE) has provided a benchmark against which the Armagh Observatory's research performance can be objectively assessed, and a measure against which its performance can be compared with other bodies, specifically departments of physics in leading UK universities.

The Observatory has participated in the RAE since 1992, in every case submitting 100% of its eligible staff to the Physics Unit of Assessment. In previous RAEs (1992, 1996 and 2001), research quality was assessed on what eventually became a 7-point scale (5\*, 5, 4, 3a, 3b, 2, 1, with 5\* the highest). In these RAEs Armagh Observatory staff achieved a Quality Research (QR) rating of 4, corresponding to research which equates to attainable levels of national excellence in virtually all (i.e. approximately 90%) of the research activity submitted for scrutiny; the balance (approximately 10%) being of even higher, international quality. The 'QR Grade 4' was achieved in 2001 by entering 8.0 FTE Category A eligible research staff; in previous RAEs (1992 and 1996) the number of such FTE staff had been 2.4 and 6.0.

The Observatory's 2008 RAE result was a significant improvement on these figures. Whereas in 2001 approximately 10% of the submission was assessed as being of international quality with the remaining 90% of UK-national quality (and none less than this), in 2008 a large majority (85%) of the Observatory's research was assessed as being of international quality and 15% of UK-national quality. This is a very good result and a distinct improvement on the previous RAE, particularly considering the many other activities

undertaken by Armagh Observatory staff that are not directly RAE-research related and that 100% of eligible staff were submitted to the RAE.

Confidential comments made by the RAE Assessment Panel were also very positive. For example, 90% of the Observatory's research outputs were deemed to be of international quality with substantial evidence of international recognition and excellence, including some internationally excellent and world-leading research (30% and 6% respectively). Outreach activity was considered to be world-leading and well-matched to the Observatory's mission statement, and the Observatory's active collaboration with other HEIs was acknowledged as too was the quality of its technical support. The nature of the Observatory in terms of attracting high-quality international visitors was noted positively.

Table 1 presents the overall quality profile achieved by Armagh Observatory research staff and provides additional information on underlying sub-profiles.

Overall Quality Profile and Sub-Profiles for Armagh Observatory (UoA 19 – Physics)							
		Quality Profiles (% of research quality at each level)					
		4*	3*	2*	1*	Unclassified	“International”
<b>Overall Quality Profile (weighted average):</b>		5.0	30.0	50.0	15.0	0.00	85.0
<b>Sub-Profiles:</b>	Research Outputs	6.0	30.0	54.0	10.0	0.00	90.0
	Research Environments	10.0	20.0	52.0	18.0	0.00	82.0
	Esteem Indicators	4.0	24.0	50.0	22.0	0.00	78.0

Table 1: Armagh Observatory RAE 2008 Results in UoA 19 Physics: Overall Quality Profile and Sub-Profiles. The important elements of the grading scale are defined as follows: 4\*: Quality that is world-leading in terms of originality, significance and rigour. 3\*: Quality that is internationally excellent in terms of originality, significance and rigour but which nonetheless falls short of the highest standards of excellence. 2\*: Quality that is recognized internationally in terms of originality, significance and rigour. 1\*: Quality that is recognized nationally in terms of originality, significance and rigour.

**New Government Key Performance Indicators (Key PIs)** Since 2006/2007, the Observatory has been required to assess its performance against a new set of key PIs, three of which are intended to be held in common both with the DCAL and other arms-length bodies (ALBs) supported by the Department. The three new key PIs were largely financial and administrative, namely (A) Rate of Return; (B) Administrative Efficiency; and (C) Staff Absence. It was agreed that the fourth key PI, reflecting the Observatory's research performance, would continue to be the number of refereed scientific journal publications per year (D). Thus, the complete set of Government-defined key performance indicators is 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, this ratio (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 of the Armagh Observatory in delivering a high-quality astronomical service at the lowest reasonable cost. A low value 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.

The results for these Government-defined key PIs for prior years for which we have data, as well as targets for 2009/2010 and 2010/2011, are shown in Table 2 (note that, for comparison, we have also calculated the new PIs for prior years). Results for a variety of other PIs that are routinely collected to assess the Observatory's performance in different areas of activity are shown for information in Table 3. 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/>.

It should be noted that all items with the exception of financial matters refer to calendar year. We also remark, in order to avoid any confusion, that total external income received in-year in cash terms per financial year is not the same as the total external grant income per financial year shown in the accounts, and used in the calculation of the new key PI 'A' Rate of Return (Table 2). The latter is calculated on an accruals basis following Resource Accounting rules.

In recent years, although the DCAL has been generous in providing the Observatory with occasional additional research development funds, too often the level of core funding to meet the Observatory's needs has been insufficient, leading to the institution of a 'hand to mouth' existence that has placed a very considerable strain on Observatory staff. Despite this, staff at the Observatory have maintained a very high level of research and other outputs, with essentially all its key performance indicators on positive, ascending trajectories.

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		6.6		0.4		41	32
2005 or 2005/2006	18.1		7.4		0.4		47	35
2006 or 2006/2007	19.0	20.0	10.3	10.0	0.2	12.0	47	40
2007 or 2007/2008	20.7	20.0	7.7	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
<b>2009 or 2009/2010</b>		<b>21.5</b>		<b>8.2</b>		<b>10.0</b>		<b>50</b>
<b>2010 or 2010/2011</b>		<b>21.5</b>		<b>8.2</b>		<b>10.0</b>		<b>50</b>

Table 2: New key performance indicators agreed with the 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. Table last updated 2009 April 15.

Performance Indicator	Result for 2008 or 2008/2009	Result for Prior Year	Target for 2009 or 2009/2010
External Grant Income Received In-Year (£000s)	242.8	200.0	300.0
Other External Income Received In-Year (£000s)	11.5	19.5	15.0
Distinct e-Visitors (millions)	1.00	1.59	1.80
Web-Site 'Hits' (millions)	13.6	14.0	15.0
Data Exported (TB)	7.01	4.47	5.00
Identified Media Citations	413	325	250
Astropark Visitors Numbers	45687	45344	40000

Table 3: End -Year Results for other Performance Indicators. Table last updated 2009 April 15

## Business Plan Outturn 2008/2009

The principal Business Plan objectives for 2008/2009 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 the advanced training of such students at the beginning of their astronomical careers, and by playing a full role together with other academic partners in plans to upgrade NIRAN, and through this the Observatory's connection to the Internet (currently 10 Mbps) — done in part; and
- advance plans for the design of a new Library, Archives and Historic Scientific Instruments building, partial funding for which has been provisionally identified within the DCAL indicative Capital budget from 2010/2011 — not done.

In addition, the Observatory planned to maintain its currently very active programmes of education and public outreach, and of Science in the Community, and to play a leading role in various public events both locally (e.g. contributing to the tercentenary of the birth of the Observatory's founder, Archbishop Richard Robinson) and on the island of Ireland (e.g. in co-organizing the Ninth European Symposium for the Protection of the Night Sky, to be held in Armagh from 17–20 September 2009), and farther afield (e.g. by playing a full and active UK-and-Ireland role in the International Year of Astronomy 2009). These additional Business Plan objectives were all progressed significantly or completed during 2008/2009.

We note that (a) the detailed design for a new Library, Archives and Historic Scientific Instruments building was not advanced in 2008/2009 because of insufficient resources to procure the expertise to carry out the necessary development work; and (b) the necessary upgrade to the Observatory's connection to the Internet was not advanced as planned because the NIRAN upgrade itself was delayed by a year. Both these objectives are key strategic goals for the Observatory and are retained for completion during 2009/2010, subject to funding and other matters outside the Observatory's control.

## Objectives for 2009/2010

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 2009/2010 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 3–5 PhD students and providing a high-quality research environment to facilitate the advanced training of students at the beginning of their astronomical careers, and by playing a full role together with other academic partners in plans to upgrade NIRAN and through this the Observatory's connection to the Internet (currently 10 Mbps); and
- advance plans for the design of a new Library, Archives and Historic Scientific Instruments building, partial funding for which has been provisionally identified within the DCAL indicative Capital budget from 2010/2011.

The Observatory also plans to maintain its programmes of Science in the Community, and to play a leading role in public events associated with the United Nations International Year of Astronomy 2009 (IYA 2009), designated by the UN to mark the 400th anniversary of Galileo's first use of a telescope for astronomical observations. As part of IYA 2009, the Observatory is co-organizing the Second Cross-Border Schools Science Conference in Armagh (29–30 April 2009) and the Ninth European Symposium for the Protection of the Night Sky (to be held in Armagh from 17–20 September 2009); and a member of staff is playing a leading role in the promotion and administration of IYA 2009 throughout the island of Ireland.

In addition to its programmes of frontline scientific research and public understanding of science, the Observatory has an important function to promote and preserve the historic library, archives and museum collection at Armagh, which together represent a very significant component of Northern Ireland's scientific heritage. Work that began during 2008/2009 to conserve and restore some elements of this collection will be continued during 2009/2010, and efforts will be made to digitize the most important archives, making the material accessible via the Internet to researchers, scholars and the general public from anywhere in the world.

## Targeting Social Need (TSN)

The Observatory's New TSN Action Plan was last reviewed in 2009 February (see <http://star.arm.ac.uk/TSN.html>). Although New 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 remain relevant to the Observatory's wider responsibilities as a recognized charity.

# The Armagh Planetarium — Operating Review 2008/2009

## Armagh Planetarium’s Mission

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

## Armagh Planetarium – DCAL strategic focus

This mission also supports the strategic focus of the Department of Culture, Arts and Leisure which seeks to create and maintain “*a confident, creative, informed and vibrant community.*” The key objective of the Department (and of Armagh Planetarium) is: “*to protect, nurture and grow our cultural capital for today and tomorrow.*”

This strategic focus has led to the deliberate positioning of Armagh Planetarium as a place where impressionable young minds can be encouraged to make career choices in the sciences. The choice it appears may often be made subliminally, to the extent that the people who have given feedback have said that they did not realize the full extent of the Planetarium’s influence until much later when they were more mature and involved in their career in science. They related vivid memories of seeing things in our theatre which inspired them, and filled them with awe. These people include Dr Mike McKay, now head of human spaceflight at the European Space Agency (ESA) in Darmstadt, Professor Carl Murray of Queen Mary College University of London, involved in the groundbreaking Cassini Mission to Saturn and Dr Mark Doherty Head of the EO Exploitation and Services Division, Earth Observation Programme Directorate, based at ESRIN, Frascati Italy.

It is difficult for the Planetarium to quantify such a socially important target. Realistically, to discover these outcomes is a 15 year experiment, and society will only discover this beneficial influence much later.

The Planetarium also acts as a repository of astronomical information, and we have a web address [info@armaghplanet.com](mailto:info@armaghplanet.com) which receives a steady stream of requests for explanations of astronomical observations and night time phenomena. Thus the Planetarium is a place which attracts adult visitors whose curiosity about the natural world is intact.

Our most pressing need is to maintain the number of visitors coming to see our shows and displays. We continually strive to update and upgrade our equipment as we are part of an extremely fast evolving area in computing, with faster processors, more memory and greater pixel counts on our dome leading to better images to fire the imagination. We make extensive use of computer-generated imagery (CGI), and it is pertinent to note that one of the industries which may be less affected by the current financial calamity is the computer imaging and gaming sector, with new jobs being created.

## Performance Measures 2008/2009

The table below provides the end of year performance figures.

Performance Measure	Target	Outcome
Visitor numbers	50,000	36,139
Outreach numbers	10,000	18,142
Virtual Planetarium visitors	50,000	174,978
TSN numbers reached included above	1,000	738
Income from admissions <sup>1</sup>	£200,000	£130,239
Income from Outreach Services	£7,000	£11,839
Income from shop and mail order sales	£93,000	£58,765
External income as a % of total income	37.5%	27.6%
Total cost per visitor/outreach	£13.0	£14.1
Absence days – average per person	10 days	1.4 days
Overall visitor satisfaction rating	-	80%

	Show	Overall	Staff	Displays	Booking
Visitor satisfaction ratings to be monitored <sup>2</sup>	85%	80%	79%	78%	82%

### Notes

1 Admissions income is biased towards families who pay less per head than school visitors.

2 Visitor satisfaction is monitored using feedback forms which are filed anonymously.

## **Visitor numbers**

The projected total of on-site visitor numbers for the year is disappointingly low. Research carried out in December showed that school visitors were being deterred by increases in transport charges to get to Armagh and other pressures on school budgets.

To address the shortfall the Planetarium is seeking to have a greater brand presence in the public mind through increased advertising. We have a new TV and radio campaign that will be running from Easter onwards. We have new print media advertising, a web based ticket sales promotion through Heritage Island based in Dublin, as well as other promotions. We are working on increasing school visitors through the Science Technology Engineering & Mathematics (STEM) educational project. We anticipate an increase in visitors from the south of Ireland and also from England as people economise on overseas holidays. We also have the second of two cost free advertising poster series (six weeks of adverts plus newspaper articles) organised with the Belfast Telegraph. We are working with NITB and Armagh City & District Council on new advertising which promotes the Planetarium as a unique NI attraction and as a flagship Armagh attraction. Apart from the newspaper adverts already mentioned we also have collaborated with Northern Ireland Tourist Board and their TV adverts prominently feature the Planetarium. We have formed a relationship with the teaching team at Victoria College in Belfast, so that we may be able to direct cash-strapped school visitors to attend events at Victoria run jointly by the school and the Planetarium.

## **Outreach numbers**

In contrast to the on-site visitors the Outreach numbers are pleasingly high. This is in no small part due to the decision to continue to support large science festival and events wherever possible, and reinstating our schools outreach due to demand caused by the transport cost crisis.

## **Virtual Planetarium visitors**

Our website statistics show that the Virtual Planetarium received 174,978 hits since it was opened by the Minister in September. This is 260% more than we estimated.

## **TSN numbers reached included above**

This number is lower than predicted as Special needs groups tend to comprise very small numbers with an equal number of assistants to the special needs visitors. This figure is also underreported as most schools now have special needs children in their group and they are not always counted.

## **Income from admissions**

This figure is 35% under target and is directly related to the number of visitors passing through our doors.

## **Income from Outreach Services**

This figure also reflects the greater numbers than predicted achieved for this service: it is 69% over target. This will also be affected by the increased price that we are now charging for STEM visits to schools. We also have opened up a new small revenue stream which will accrue from teacher training sessions with our International Space School Educational Trust (ISSET) partners. This is small, but has the potential to grow as the teachers make more use of this service.

## **Income from shop and mail order sales**

This figure is 37% below target. To address this shortfall we will be making changes to the shop and mail order operation to try and increase our sales, especially over the internet.

## **External income as a % of total income**

This figure is consistent with the 28.6% shortfall in the overall visitor numbers being 28% off target.

## **Total cost per visitor/outreach**

This figure is much higher than we would like but it will fall as visitor numbers increase. It shows an increase of 8.5%.

The overall result for the past year is disappointing, considering that we ran a strong line up of new shows for all age groups. The feedback that we had from visitors was overwhelmingly positive with very few complaints; it is just that we did not have enough of them. The Outreach outcome is pleasing and we will now seek to further improve these figures. The overall conclusion is that to maximize visitor numbers we must advertise more to attract visitors to the Planetarium, while maintaining a varied set of shows to cater for all of the different age groups.



## Positive results

- Very successful New Year event for the Chinese community
- Enhanced service for all of Northern Ireland's population as well as visitors from the Republic and further afield.
- Good review by Education Inspectorate.
- Armagh Planetarium is a significant cultural asset.
- Armagh Planetarium's programmes encourage young people to take up careers in science.
- New Outreach programmes for adult classes which promotes scientific literacy and a well-informed community.
- The Planetarium is a well known tourist attraction around the world.
- New advertising to attract both local and overseas visitors to experience this unique venue on the island of Ireland.
- The Planetarium is a unique venue in Ireland and an important part of the cultural infrastructure of Museums and Galleries.
- Our activities support the needs of children of all age groups, and of people of all ages to gain information about science and astronomy in an easy accessible way.
- The Planetarium is inclusive and welcomes people of all ages and from all parts of society.
- The Planetarium administrative and education team are all much better qualified than at any time in the past.
- We are seeing a significant growth in income from staff consultancy work for similar organisations.
- The Planetarium is working much more on the international stage with collaborative training and research schemes.
- The Director's IPS Presidency is allowing Armagh to lead the International Planetarium community.

## Primary performance measures/targets

In order to measure our effectiveness in pursuing these objectives in 2009/2010 we will record performance against targets for the primary performance measures set out in the table below:

### Objectives for 2009/2010

The Planetarium's mission and strategic focus remain as outlined at the start of this commentary. The key performance measures for the year ahead are:

### Performance measures 2009/2010

Performance Measure	Target
Visitor numbers	42,000
Outreach numbers	15,000
Virtual Planetarium visitors	200,000
TSN numbers reached included above	1,000
Income from admissions	£150,000
Income from Outreach Services	£14,000
Income from shop and mail order sales	£65,000
External income as a % of total income	31.7%
Total cost per visitor/outreach	£14.3
Absence days – average per person	10 days
Overall visitor satisfaction rating	90%

In addition to the above we will:

- track staff absences due to illness against the DCAL target of 5% for 2009-2010.;
- monitor distinct e-mail visitors to our website;
- monitor visitor satisfaction ratings.

### Actions required in 2009/2010 to achieve performance targets

The primary Key Performance Indicator is visitor numbers, as this reflects the core business of the Planetarium. The projected visitor figures are a conservative estimate of 42,000 visitors during the year, a 16% increase.

Our Outreach target for 2009/2010 has been set at 15,000.

We are working to support the aims of the Programme for Government and the Department's draft Public Service Agreements, as the desired outcomes overlap and coincide with the Planetarium's aims and objectives. The primary aim of the Armagh Planetarium is to promote the public knowledge and understanding of astronomy and related sciences. To do this effectively need to be recognised as the leading centre for space science, astronomy and related science education and advice in Ireland. Following the refurbishment of the Planetarium in 2005/2006 we have been working to rebuild our capacity to produce shows and live demonstrations in-house. We

are continuing to develop the Planetarium and its educational services as an important component of the NI educational provision, with the Planetarium as a named resource for schools. To achieve this aim the following key objectives have been identified.

### **Review of Admission Charges**

We are reviewing our admission charges: an increase in a family ticket from the current £18 for a family (of up to 5, mother, father & three children) to £20 will generate £14,000 of extra income. We are reviewing the price charged to school visitors to boost their numbers during slow times of the year, such as September October and January. We have already increased our Outreach charges to £350 per day.

### **Allocation of Staff Resources on site and Outreach**

We will continue to support science festivals and other special events locally and in the Republic, and are actively promoting our ability to help teachers deliver the STEM objectives. We anticipate that this will lead to a greater participation with KS3 school parties. We have new programmes ready to use in the Digital Theatre and staff have been trained in running teacher training events and small workshops on space related subjects. There is a high demand for the Outreach service and this will continue this year. We also have a new Outreach service that is jointly administered by us and Blackrock Castle Observatory in Cork: the primary targets are in Cork, Waterford, Wexford and Kerry. Thus, we have an external joint Outreach service maintained in a part of the island where it has little or no impact on our visitor numbers, but will achieve a high profile for the joint venture.

### **New Public Shows**

We have a number of new shows ready for this year: “*We are Astronomers*”, “*Invaders of Mars*” and “*Two small pieces of glass*”, and a new show for young visitors. We continue to run four different versions of *Pole Position* which have been scripted, designed and programmed in-house. A new venture this year is to translate four of our existing shows into Irish to service the demand for Irish medium shows from local schools. We are collaborating on this project with experts from the BBC and Armagh City and District Council.

### **New School Shows**

We have several new live, made in-house, interactive shows run by Planetarium staff as the gold standard. These will be run as part of a triangle of activities for school visitors, including hands on activities. The average trip also includes visits to the shop and an opportunity to look at the exhibits.

### **Exhibition Area & Display changes**

We will continue to seek more up-to-date display items within our limited budget. As the Ulster Museum’s meteorite display will be returning to the Museum in the autumn, we have replaced the celestial objects on display as these are very popular with the public. New meteorites are due to be installed soon, one of which will be the largest NiFe meteorite on display in Ireland.

### **Enhanced European collaboration: Northern Ireland Space Office (NISO)**

Our contribution to the European astronomy scene now includes not only the Northern Ireland Space Office (NISO) at the Planetarium but also a presence on the International Astronomical Union (IAU) planning committee that is responsible for events related to the UN-supported International Year of Astronomy which runs throughout 2009 (IYA 09). Our lobbying also has firmly placed Armagh Planetarium in the European agenda, and we are involved in new projects with the Faulkes Robotic Telescopes, Earth Observation schools programme (European Union Hands on Universe project), and have applied for funding to do more, in partnership with our European colleagues. We also continue to work with the European Space Agency, EURISY, UNESCO and the British Council on various international projects that are operational or being planned. Planetarium staff serve on influential committees of many of these agencies which are deciding the future direction of space education.

### **Worldwide collaboration: IPS president and planning**

The Planetarium continues to punch above its weight on the international scene and evidence of this is the Director’s role as IPS President for the next two years. This entails working with the other IPS officers to make sure that the professional planetarium organization represents the interests of its worldwide membership. It also involves travelling to other places where the planetarium professionals are not yet fully integrated into the worldwide community: a recent trip to India has translated into a strong bid by Indian planetarians to form themselves into an affiliate member of the IPS.

### **Targeting Social Need (NTSN)**

We continue to include as many underprivileged or otherwise disadvantaged schools or other bodies in our work as possible, being conscious of the New Targeting Social Need element (NTSN) of our Outreach Programme. We offer evening adult education services in Belfast and Omagh, one is run in association with the Queen’s University of Belfast and the other is a community-based adult learning programme at the Tara Centre in Omagh.

## Pension Scheme

The Armagh Observatory and Planetarium provide pension benefits to staff through the Northern Ireland Local Government Officers' Superannuation Committee (NILGOSC) pension scheme. The NILGOSC scheme is a defined benefit statutory scheme where employees are promised a specific benefit in the future regardless of the current or future investment performance of the scheme. A summary of the principal benefits of the scheme is contained in the Remuneration Reports and further information is available at the NILGOSC website <http://www.nilgosc.org.uk/>.

In view of the long term nature of the obligations on the employer in a defined benefit scheme and the uncertainty over the return on scheme assets, actuarial valuations of the scheme are required at regular intervals, normally every three years. The last such valuation of the NILGOSC scheme was carried out at 31 March 2007 and revealed a total funding deficit of £396 million, which will have to be recovered by increasing employers' contribution rates in future years. The employers' contribution rate for 2008/2009 was 15% (2007/2008: 13%) and it is anticipated that this will increase to 16% in 2009/2010 with further increases in following years.

Under the accounting rules related to defined benefit pension schemes, Financial Reporting Standard (FRS) 17, the Armagh Observatory and Planetarium are required to disclose in their accounts their respective share of the overall scheme 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 2008/2009 which have been prepared by the scheme actuary are shown in the notes to the accounts. The effect on the operating results for the year is as follows:

### Reconciliation of operating surplus/(deficit) with net movement of funds for 2008/2009

	Armagh Observatory		Armagh Planetarium	
	2008/2009	2007/2008	2008/2009	2007/2008
	£	£	£	£
Operating surplus/(deficit) for the year	474	(50,530)	(564)	(1,308)
Pension service cost	2,000	(39,000)	(1,000)	1,000
Pension finance income	4,000	21,000	(6,000)	7,000
Actuarial gain/(loss) on pension scheme	(556,000)	341,000	(272,000)	150,000
Net movement in funds for the year	(549,526)	272,470	(279,564)	156,692

## Armagh Observatory

The Observatory had an operating surplus for the year of £474, which is a very satisfactory outcome when compared with the deficit of £50,530 in 2007/2008. The Observatory's share of the 2008/2009 uplift in recurrent grant from DCAL of £157,000 which increased DCAL recurrent funding to £817,000 (2008: £660,000) together with a further in-year recurrent grant from DCAL of £60,000, a re-allocation of recurrent grant from the Armagh Planetarium of £5,000 and cost cutting/deferment of expenses allowed the Observatory to reach a balanced outcome for the year.

Receipts from research and other non-DCAL grants (note 2 to the Accounts) were £242,772 (2007/2008: £199,975). The reduction in income of £57,280 from the Cosmogrid research project, which was completed in 2007/2008, was more than offset by increased income from STFC Research, Visitor and Travel grants. Two new STFC-funded research projects started in the latter part of 2008/2009 providing funds for the employment of 3 Post Doctoral Research Assistants together with a contribution towards the supervisor salary costs of the projects and the Observatory's estate and indirect costs for a period of three years.

The Observatory was also successful in obtaining additional funds of £13,400 from the Leverhulme Trust Visiting Professorship grant scheme, £22,090 for the International Year of Astronomy 2009 activities, £5,324 for the Light Pollution and Dark Skys of Ireland Symposium to be held later in 2009 and £8,000 from Trinity College Dublin for the International Heliophysical Year activities.

The main variances in expenditure (notes 3 to 7 to the accounts) were as follows:

- (i) salaries of permanent staff of £627,069 (2007/2008: £593,699) increased by £33,370 (5.6%) due to salary inflation arising from the nationally agreed NICS pay award and an increase of 2% in employer pension contributions;
- (ii) fixed-term research staff salary costs of £93,823 (2007/2008: £137,701) were lower than last year because of lower average staffing levels with the completion of the Cosmogrid project;
- (iii) student maintenance grants of £98,735 (2007/2008: £111,940) were £13,205 lower than last year because the Lindsay Scholar was not appointed in 2008/2009 and the costs of the summer students were funded by Nuffield Foundation bursaries;
- (iv) travel and subsistence costs funded by unrestricted funds of £28,436 (2007/2008: £23,432) were £5,004 higher than last year due to increased research activity with the increase in the number of senior research astronomers last year.

- (v) travel and subsistence costs funded by external research grants of £38,936 (2007/2008: £28,479) increased by £10,457 due to the increased level of grant funding for these purposes from the Leverhulme Trust, the Royal Society, the STFC Roberts Skills Training scheme and miscellaneous travel grants;
- (vi) the STFC-funded course on Solar-Terrestrial Physics in 2007/2008 costing £20,421 was not repeated in 2008/2009;
- (vii) library, archiving and publications costs of £35,478 (2007/2008: £26,360) increased by £9,118 due to higher costs of journals and periodicals from exchange rate differences, the cost of the Armagh Public Library archiving services which amounted to £5,579 in the year and costs of £1,290 for the restoration of historic Birr papers;
- (viii) a contribution of £3,200 was made in the year to the operating costs of the 10-metre class telescope at the Sutherland Outstation of the Southern African Astronomical Observatory along with £1,000 to the UKSC amounting in total to £4,200 (2007/2008: £500);
- (ix) property and grounds maintenance costs for the year were £26,939 (2007/2008: £24,071). The main areas of spend in the year were £4,697 on repairs to the heating system, £5,463 on the refurbishment of the Observatory House and £4,073 on remedial electrical work arising from fixed-wire testing of the system;
- (x) office and miscellaneous equipment costs of £5,600 (2007/2008: £2,921) included £3,140 spent on stacking chairs and tables for the library;
- (xi) other professional fees of £9,784 (2007/2008: £2,317) increased by £7,467 due to increased actuary's fees of £4,000 (fully funded by in-year recurrent grant from DCAL) to project the movement in the pension scheme provision for budgetary purposes and fees of £2,383 for the valuation of the Observatory's historic books and instruments for insurance purposes;
- (xii) depreciation for the year amounted to £112,171 (2007/2008: £129,327), a reduction of £17,156. The previous year's cost included non-recurrent additional depreciation to write off the net book value of the telephone system replaced by the VOIP system and the SGI Origin 2200 computer which was no longer in operational service. Depreciation costs are offset by the release of grants received on fixed assets and a release from the donated asset reserve for the depreciation costs of donated buildings.

Grant debtors amounted to £44,191 (2007/2008: £9,613), an increase of £34,578 made up of funds due from the STFC for the new PDRA and PhD student grants and from the National University Galway for IYA 2009. Sundry debtors decreased to £197 (2007/2008: £3,541) with the payment in 2008/2009 of an insurance claim due at 31 March 2008.

Accruals of £21,702 at 31 March 2009 (2007/2008 £15,739) increased by £5,963 due to increases in invoices due at the year-end for internal audit provision, electricity and maintenance costs.

Included in fixed asset additions of £76,950 for the year are £30,099 for the variable star telescope and £9,990 for display units for the Astropark.

Operational reserves were £82,023 at 31 March 2009 (2007/2008: £81,549). The Observatory considers that reserves of between one and two months of total forecast expenditure, between £98,000 and £196,000 to be sufficient to meet financial risks. The level of operational reserves at 31 March 2009 of £82,023, after adjusting for the pension scheme deficit, are sufficient to fund the cash flow requirements from research grants but are insufficient to meet other financial risks and accordingly the Observatory will seek to increase reserves to a more acceptable level by continuing to bid for a suitably indexed step-increase in core funding and by seeking additional externally funded research grants.

### **Factors which will Influence Future Financing Requirements**

In 2009/2010 the Observatory will require additional recurrent funding of approximately £105,000 to maintain the planned programmes of research, outreach and science in the community and a further £50,000 to advance plans for the design of a new Library, Archives and Historic Scientific Instruments building, partial funding for which has been provisionally identified within the DCAL indicative capital budget from 2010/2011.

### **Armagh Planetarium**

The Planetarium had an operating deficit for the year of £564 (deficit 2007/2008: £1,308). The Planetarium's share of the 2008/2009 uplift in recurrent grant from DCAL was £93,000, which increased DCAL recurrent funding to £483,000 (2008: £390,000). £5,000 of this was re-allocated in-year to the Observatory and a further £4,000 in-year recurrent funding was received from the DCAL for additional actuary's fees.

Admissions income of £130,239 (2007/2008: £150,643) was lower than last year due to lower visitor numbers. Lower visitor numbers also had an adverse effect on shop/mail order gross profit which decreased by £5,164 from last year.

The main variances in expenditure (notes 3 to 6 to the accounts) were as follows:

- (i) salaries of permanent staff of £254,134 (2007/2008: £276,596) reduced by £22,462. Cost increases due to salary inflation and an increase of 2% in the employers' pension contribution rate were offset by a reduction in the number of staff and lower levels of overtime due to reduced visitor numbers;
- (ii) agency staff costs in 2008/2009 were nil (2007/2008: £19,046). Work previously undertaken by agency staff is now covered by fixed-term staff;
- (iii) travel and subsistence costs of £17,052 (2007/2008: £13,667) increased by £3,385 due to additional travel by the Director on International Planetarium Society business;

- (iv) equipment maintenance of £37,858 (2007/2008: £50,932) was £13,074 lower than last year due to maintenance costs on the air conditioning, lighting and projection equipment which were incurred in 2007/2008 but not in 2008/2009;
- (v) production expenses of £9,875 (2007/2008: £33,209) were lower than last year because fewer shows were purchased;
- (vi) exhibition and events costs of £33,666 (2007/2008: £21,735) were higher mainly due to the refurbishment of the Copernicus Hall exhibits;
- (vii) website design costs of £2,000 (2007/2008: £16,875) were lower than the previous year because of the costs of the design of the Virtual Planetarium website which took place in 2007/2008;
- (viii) advertising costs of £44,304 (2007/2008: £18,139) were £26,165 higher due to increased levels of advertising in the year;
- (ix) professional fees of £12,481 (2007/2008: £7,249) were higher than the previous year due to additional costs for actuary's fees of £4,000, which were fully funded by additional DCAL recurrent grant;
- (x) Recruitment costs were nil in the year (2007/2008: £4,378) because no recruitment took place in the year.

Accruals of £11,617 at 31 March 2009 (2007/2008: £25,429) were lower than last year because of the release in 2008/2009 of the back pay accrual.

Included in fixed asset additions of £67,741 is £41,743 for the purchase of a new accounts, electronic point-of-sale and ticketing system.

### **Factors which will Influence Future Financing Requirements**

The key task for the Planetarium in 2009/2010 and subsequent years is to build on 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 the DCAL.

## Remuneration Report — Armagh Observatory

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

Director	Salary 2007/2008	Salary 2008/2009	Accrued Pension at 31 March 2009	Real Increase in Accrued Pension	Accrued Lump Sum at 31 March 2009	Real Increase in Lump Sum	CETV at 31 March 2008	CETV at 31 March 2009	Real Increase in CETV
	£	£	£	£	£	£	£	£	£
M.E. Bailey	57,869	58,515	20,828	611	62,483	1,833	418,600	465,951	29,416

This section is subject to audit.

**Signed:**

**Professor Mark Bailey MBE**  
Accounting Officer for the Armagh Observatory

**Date: 21 July 2009**

## Remuneration Report — Armagh Planetarium

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

Director	Salary 2007/2008	Salary 2008/2009	Accrued Pension at 31 March 2009	Real Increase in Accrued Pension	Accrued Lump Sum at 31 March 2009	Real Increase in Lump Sum	CETV at 31 March 2008	CETV at 31 March 2009	Real Increase in CETV
	£	£	£	£	£	£	£	£	£
T.R. Mason	57,779	58,515	9,217	678	27,650	2,035	158,994	180,981	15,202

This section is subject to audit.

**Signed:**

**Dr Tom Mason MBE**  
Accounting Officer for the Armagh Planetarium

**Date: 21 July 2009**

The factors used in calculating the CETVs above have been updated by the Government Actuary from 1 October 2008 and the CETVs at 31 March 2008 have been restated to take account of these changes.

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 organisations.
2. The salary of each Director shown above comprises gross salary and a performance bonus. Gross salary is based on the Northern Ireland Civil Service Grade 6 pay scale. The maximum performance bonus entitlement in the year was £300. 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. On retirement, benefits payable 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.
5. The following main changes were made to the NILGOSC pension scheme from 1 April 2009: (i) employees must have a contract of employment of 3 months or more to be eligible to join; (ii) the member's contribution rate will vary according to salary paid; (iii) retirement pension will be at a rate of 1/60<sup>th</sup> of pensionable pay for membership built up after 31 March 2009; and (iii) further rights on pension augmentation, flexible retirement and family pension rights on death were introduced. Further 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 which the individual has transferred to the 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 the DCAL, with the approval of the Department of Finance and Personnel, shall direct. The Accounting Officer of the 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 of 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 the Non-Departmental Accounting Officer Memorandum issued by the Department of Finance and Personnel.

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" issued in October 2000 (SORP 2000). 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 Government Accounting 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 2009 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 the DCAL to consider both operational and strategic issues and matters relating to the system of internal control.
- 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 periodic Research Assessment Exercise.
- 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 from internal auditors to the Internal Audit 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 organisation and of its incoming resources and application of resources.
- Periodic review of the Armagh Observatory Risk Register by the Director and the Administrator, and also by the Armagh Observatory and Planetarium Internal Audit Committee. 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 the 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.

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 2008/2009 as part of the annual audit and appropriate action has been taken to resolve them.

**Signed:**

**Professor Mark Bailey MBE**  
**Accounting Officer for the Armagh Observatory**  
**Date: 21 July 2009**

## 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 Government Accounting 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 2009 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:

- Periodic review of the Armagh Planetarium Risk Register by the Director and the Administrator, and also by the Armagh Observatory and Planetarium Internal Audit Committee. 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 the DCAL and to the Management Committee and Board of Governors of the Armagh Observatory and Planetarium at their regular meetings.
- Detailed progress reports to the Management Committee and Board of Governors at their regular meetings, and inclusion of performance measures in the annual operating plan.
- Regular meetings with officials from the DCAL to consider both operational and strategic issues and matters relating to the system of internal control.
- Annual reports from the internal auditors to the Internal Audit 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 organisation 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 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.

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.

There is an unresolved issue concerning the payment by the Planetarium of an element of employees' superannuation contribution to the Northern Ireland Local Government Officers Superannuation Committee. I am seeking professional advice with a view to resolving this issue as soon as possible.

A number of minor weaknesses were identified as part of the annual audit for the 2008/2009 financial year and appropriate action has been taken to resolve them.

**Signed:**

**Dr Tom Mason MBE**  
**Accounting Officer for the Armagh Planetarium**  
**Date: 21 July 2009**

# 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 the Armagh Observatory and Planetarium for the year ended 31 March 2009 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 Total 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

The Governors and Accounting Officers are responsible for preparing the Annual Report, which includes the Remuneration Reports, and the financial statements in accordance with the Audit and Accountability (Northern Ireland) Order 2003 and Department of Culture Arts and Leisure directions made thereunder and for ensuring the regularity of financial transactions. These responsibilities are set out in the Statement of the Responsibilities of Governors and Accounting Officers.

My responsibility is to audit the financial statements and the part of the Remuneration Reports to be audited in accordance with relevant legal and regulatory requirements, and with International Standards on Auditing (UK and Ireland).

I report to you my opinion as to whether the financial statements give a true and fair view and whether the financial statements and the part of the Remuneration Reports to be audited have been properly prepared in accordance with the Audit and Accountability (Northern Ireland) Order 2003 and Department of Culture Arts and Leisure directions made thereunder. I report to you whether, in my opinion, the information, which comprises the Management Commentary and the Statement of Disclosure of Information to Auditors, included in the Annual Report is consistent with the financial statements. I also report whether in all material respects the expenditure and income have been applied to the purposes intended by Assembly and the financial transactions conform to the authorities which govern them.

In addition, I report to you if the Armagh Observatory and Planetarium has not kept proper accounting records, if I have not received all the information and explanations I require for my audit, or if information specified by the Department of Finance and Personnel regarding remuneration and other transactions is not disclosed.

I review whether the Statements on Internal Control reflect the Armagh Observatory and Planetarium's compliance with the Department of Finance and Personnel's guidance, and I report if they do not. I am not required to consider whether these statements cover all risks and controls, or form an opinion on the effectiveness of the Armagh Observatory and Planetarium's corporate governance procedures or its risk and control procedures.

I read the other information contained in the Annual Report and consider whether it is consistent with the audited financial statements. This other information comprises the unaudited part of the Remuneration Reports. I consider the implications for my certificate if I become aware of any apparent misstatements or material inconsistencies with the financial statements. My responsibilities do not extend to any other information.

### Basis of audit opinions

I conducted my audit in accordance with International Standards on Auditing (UK and Ireland) issued by the Auditing Practices Board. My audit includes examination, on a test basis, of evidence relevant to the amounts, disclosures and regularity of financial transactions included in the financial statements and the part of the Remuneration Reports to be audited. It also includes an assessment of the significant estimates and judgments made by the Governors and Accounting Officers in the preparation of the financial statements, and of whether the accounting policies are most appropriate to the Armagh Observatory and Planetarium's circumstances, consistently applied and adequately disclosed.

I planned and performed my audit so as to obtain all the information and explanations which I considered necessary in order to provide me with sufficient evidence to give reasonable assurance that the financial statements and the part of the Remuneration Reports to be audited are free from material misstatement, whether caused by fraud or error, and that in all material respects the expenditure and income have been applied to the purposes intended by the Assembly and the financial transactions conform to the authorities which govern them. In forming my opinion I also evaluated the overall adequacy of the presentation of information in the financial statements and the part of the Remuneration Reports to be audited.

### Opinions

In my opinion:

- the financial statements give a true and fair view, in accordance with the Audit and Accountability (Northern Ireland) Order 2003 and directions made thereunder by the Department of Culture Arts and Leisure, of the state of the Armagh Observatory and

Planetarium's affairs as at 31 March 2009 and of its net movement in funds after cost of capital, cash flows and total recognised gains and losses for the year then ended;

- the financial statements and the part of the Remuneration Reports to be audited have been properly prepared in accordance with the Audit and Accountability (Northern Ireland) Order 2003 and Department of Culture Arts and Leisure directions made thereunder; and
- information, which comprises the Management Commentary and Statement of Disclosure of Information to the Auditors, included within the Annual Report, is consistent with the financial statements.

#### **Opinion on Regularity**

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

#### **Report**

I have no observations to make on these financial statements.

**KJ Donnelly**  
**Comptroller and Auditor General**  
**Date: 9 October 2009**

**Northern Ireland Audit Office**  
**106 University Street, Belfast BT7 1EU**

## Armagh Observatory

### Statement of financial activities for the year ended 31 March 2009

	Notes	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
<b>Incoming resources</b>					
DCAL grants	2	886,000	68,000	954,000	869,000
Other grants and receipts	2	-	242,772	242,772	199,975
Interest receivable		2,446	-	2,446	7,283
Rents		5,469	-	5,469	5,794
Miscellaneous income		3,592	-	3,592	6,387
Transfer to deferred income	11	-	(39,575)	(39,575)	(19,301)
Transfer from deferred income	11	-	29,747	29,747	24,542
Transfer between funds		84,852	(84,852)	-	-
<b>Total incoming resources</b>		<b>982,359</b>	<b>216,092</b>	<b>1,198,451</b>	<b>1,093,680</b>
<b>Resources expended</b>					
Direct expenditure of the corporation	3	854,100	139,079	993,179	1,040,047
Fundraising and publicity	4	-	-	-	-
Management and administration of the corporation	6	125,785	63	125,848	109,118
Capital expenditure		-	76,950	76,950	34,045
<b>Total resources expended</b>		<b>979,885</b>	<b>216,092</b>	<b>1,195,977</b>	<b>1,183,210</b>
<b>Net incoming/(outgoing) resources for the year before cost of capital</b>					
		2,474	-	2,474	(89,530)
Cost of capital		-	(26,908)	(26,908)	(33,003)
<b>Net movement in funds after cost of capital</b>		<b>2,474</b>	<b>(26,908)</b>	<b>(24,434)</b>	<b>(122,533)</b>
Cost of capital reversed		-	26,908	26,908	33,003
<b>Net movement in funds before finance income</b>		<b>2,474</b>	<b>-</b>	<b>2,474</b>	<b>(89,530)</b>
Finance income - pension scheme		4,000	-	4,000	21,000
<b>Net movement in funds after finance income</b>		<b>6,474</b>	<b>-</b>	<b>6,474</b>	<b>(68,530)</b>
Actuarial (loss)/gain on pension scheme		(556,000)	-	(556,000)	341,000
<b>Net movement in funds after actuarial (loss)/gain</b>		<b>(549,526)</b>	<b>-</b>	<b>(549,526)</b>	<b>272,470</b>
Balances brought forward at 1 April		(17,451)	7,293	(10,158)	(282,628)
<b>Balances carried forward at 31 March</b>	13, 14	<b>(566,977)</b>	<b>7,293</b>	<b>(559,684)</b>	<b>(10,158)</b>

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% has been charged on the average net assets of the corporation, excluding the net book value of donated assets. As this is a notional charge the cost of capital is reversed in the Statement of Financial Activities.

### Statement of total recognised gains and losses

	2009 £	2008 £
Net movement in funds for the year after other finance income	6,474	(68,530)
Net movement on government grant reserve	(5,695)	(65,755)
Net movement on donated assets reserve	(29,527)	(29,527)
Actuarial (loss)/gain on pension scheme	(556,000)	341,000
<b>Total (losses)/gains recognised for the year</b>	<b>(584,748)</b>	<b>177,188</b>

## Armagh Observatory

### Balance sheet at 31 March 2009

	Notes	2009 £	2008 £
<b>Tangible assets</b>	9	3,619,978	3,655,200
<b>Current assets</b>			
Debtors	10	86,780	52,465
Cash at bank and in hand	18, 19	74,540	92,035
		161,320	144,500
<b>Creditors: amounts falling due within one year</b>	11	(87,724)	(71,378)
<b>Net current assets</b>		73,596	73,122
<b>Net assets excluding pension liability</b>		3,693,574	3,728,322
<b>Pension liability</b>	20	(649,000)	(99,000)
<b>Net assets</b>		3,044,574	3,629,322
<b>Funds</b>			
Unrestricted	13	(566,977)	(17,451)
Restricted	14	7,293	7,293
Government grant reserve	12	710,135	715,830
Designated	16	2,894,123	2,923,650
		3,044,574	3,629,322

The financial statements on pages 25 to 40 were approved on 21 July 2009 and were signed by:

\_\_\_\_\_  
Professor Mark Bailey MBE, Accounting Officer for the Armagh Observatory

## Armagh Observatory

### Cash flow statement for the year ended 31 March 2009

	Notes	2009 £	2008 £
<b>Net cashflow from operating activities</b>		(15,904)	(123,559)
<b>Returns on investments and servicing of finance</b>			
Interest received		2,446	7,283
Interest paid and similar charges		(37)	-
Other finance income - pension scheme		(4,000)	(21,000)
		(1,591)	(13,717)
<b>Capital expenditure</b>			
Purchase of tangible assets		(76,950)	(34,045)
Capital grants received		76,950	34,045
		-	-
<b>Net cash (outflow)/inflow before financing and management of liquid resources</b>		(17,495)	(137,276)
<b>Management of liquid resources</b>			
Movement in First Trust deposit account		46,263	149,837
<b>Net cash outflow/(inflow) from management of liquid resources</b>		46,263	149,837
<b>Increase/(decrease) in cash in the year</b>	18, 19	28,768	12,561

### Reconciliation of operating result to net cash flow

	2009 £	2008 £
Net incoming resources per statement of financial activities	6,474	(68,530)
Interest received	(2,446)	(7,283)
Interest paid and similar charges	37	-
Depreciation	112,171	129,327
Pension service costs	(2,000)	39,000
Release of deferred credit - Government grant reserve	(82,644)	(99,800)
Release of deferred credit - donated asset reserve	(29,527)	(29,527)
(Increase)/decrease in debtors	(34,315)	(12,788)
Increase/(decrease) in creditors	16,346	(73,958)
<b>Net cash outflow from operating activities</b>	(15,904)	(123,559)

# Armagh Observatory

## Notes to the financial statements for the year ended 31 March 2009

### 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 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 SORP for charities, the 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. In addition to expenditure on the provision of services, such funds may be held in order to finance capital investment and working capital.



## 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 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
Recurrent grant	817,000	-	817,000	660,000
In-year recurrent grant	60,000	-	60,000	-
In-year recurrent grant - actuary's fees	4,000	-	4,000	-
In-year recurrent grant from the Armagh Planetarium	5,000	-	5,000	-
Capital grant	-	25,000	25,000	6,500
In-year capital grant	-	43,000	43,000	27,500
Skills and Science Funding Package	-	-	-	175,000
	886,000	68,000	954,000	869,000

#### Other grants and receipts

	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
STFC Research, Visitor and Travel grants Programme for Research in Third Level Institutions - Cosmograd project	-	181,554	181,554	123,376
Miscellaneous travel grants	-	5,484	5,484	917
Lindsay Scholarship	-	-	-	8,252
The Royal Society	-	6,720	6,720	9,950
Leverhulme Trust Visiting Professorship	-	13,400	13,400	-
Discover Science and Engineering Programme: - IYA 2009 activities	-	22,090	22,090	-
- Light Pollution Conference	-	5,324	5,324	-
Trinity College Dublin (IHY 2007 - 2009)	-	8,000	8,000	-
Other grants and receipts	-	200	200	200
	-	242,772	242,772	199,975

### 3 Direct expenditure of the corporation

	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
Salaries and wages	635,981	84,911	720,892	731,400
Student maintenance grants	90,942	7,793	98,735	111,940
Scholarship and training	8,715	-	8,715	9,587
Travelling and subsistence	28,436	38,936	67,372	51,911
Cross-Border Schools Science Conference 2007	-	-	-	(1,975)
STFC Course on Solar-Terrestrial Physics	-	-	-	20,421
Technical maintenance	4,303	-	4,303	4,302
Computer consumables	13,108	331	13,439	13,494
Library, archives and publications	35,478	-	35,478	26,360
Northern Ireland Regional Area Network	25,621	-	25,621	25,850
Contribution to UKSC and SALT operating costs	4,200	-	4,200	500
Meetings and conferences	2,497	1,719	4,216	2,405
Visitor programme	3,187	1,167	4,354	1,668
Public Understanding of Science expenses	3,632	-	3,632	1,730
Royal Society Solar Summer Science Exhibition	-	-	-	1,454
Atomic Data & Analysis Structure subscription	-	1,318	1,318	-
International Year of Astronomy 2009 expenses	-	2,904	2,904	-
Pension service cost	(2,000)	-	(2,000)	39,000
	854,100	139,079	993,179	1,040,047

## Armagh Observatory

### 4 Fundraising and publicity

	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
	-	-	-	-

### 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 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
Insurance	9,132	-	9,132	9,479
Heat, light and power	31,413	-	31,413	29,110
Rates	-	-	-	293
Property and grounds maintenance	26,939	-	26,939	24,071
Grounds agency staff costs	15,968	-	15,968	16,314
Cleaning costs	759	-	759	947
Cleaning agency staff costs	5,158	-	5,158	2,452
Postage and telephone	4,276	-	4,276	5,243
Recruitment costs	519	-	519	768
General expenses	5,679	63	5,742	5,748
Management Committee	1,638	-	1,638	654
Office and miscellaneous equipment	5,600	-	5,600	2,921
Bank charges	37	-	37	-
Audit	6,557	-	6,557	5,983
Other professional fees	9,784	-	9,784	2,317
Stationery, printing and advertising	2,326	-	2,326	2,818
Depreciation	-	112,171	112,171	129,327
Release from grants reserve	-	(82,644)	(82,644)	(99,800)
Release from donated asset reserve	-	(29,527)	(29,527)	(29,527)
	125,785	63	125,848	109,118

## Armagh Observatory

### 7 Average staff numbers and related costs

#### Average staff numbers

	2009	2008
	Number	Number
Permanent staff	14.0	14.0
Fixed-term contract staff	3.5	5.0
Agency staff	1.2	1.2
	18.7	20.2

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

	2009	2008
	£	£
<b>Permanent staff</b>		
Wages and salaries	511,373	490,646
Social security costs	40,343	39,897
Pension costs	75,353	63,156
	627,069	593,699
<b>Fixed-term contract staff costs</b>		
Wages and salaries	82,480	118,678
Social security costs	7,581	9,806
Pension costs	3,762	9,217
	93,823	137,701
<b>Total permanent and fixed-term contract staff</b>	720,892	731,400
Agency staff costs	21,126	18,766
<b>Total staff costs</b>	742,018	750,166

Permanent staff costs include 50% of the salary costs of the corporation's Administrator and the costs of cleaning and security costs shared with the Planetarium.

#### Average student numbers and related costs

	2009	2008
	Number	Number
PhD students	8	9

  

	2009	2008
	£	£
Student maintenance grants	98,735	111,940

There are 2 additional STFC-funded PhD students who carry out their studies at the Armagh Observatory and receive student maintenance grants from other academic institutions.

### 8 Income and expenditure summary

	2009	2008
	£	£
<b>Gross income</b>	1,121,501	1,059,635
<b>Expenditure</b>		
Direct charitable expenditure (note 3)	993,179	1,040,047
Fund raising and publicity (note 4)	-	-
Management and administration of the corporation (note 6)	125,848	109,118
	1,119,027	1,149,165
Other finance income	4,000	21,000
<b>Surplus/(deficit for the year)</b>	6,474	(68,530)

# Armagh Observatory

## 9 Tangible fixed assets

	Freehold Land & buildings £	Exhibits and grounds £	Astropark £	Furniture Fittings £	Office Eqpt. £	Equipment & Historic telescopes £	Total £
<b>Cost or valuation</b>							
At 1 April 2008	4,038,688	23,593	367,490	68,918	35,240	478,333	5,012,262
Additions	-	-	-	-	-	76,950	76,950
Disposals	-	-	-	(596)	-	(5,901)	(6,497)
<b>At 31 March 2009</b>	<b>4,038,688</b>	<b>23,593</b>	<b>367,490</b>	<b>68,322</b>	<b>35,240</b>	<b>549,382</b>	<b>5,082,715</b>
<b>Depreciation</b>							
At 1 April 2008	726,415	5,774	238,872	61,785	24,853	299,363	1,357,062
Charge for year	47,016	1,871	18,375	1,127	2,385	41,398	112,172
Disposals	-	-	-	(596)	-	(5,901)	(6,497)
<b>At 31 March 2009</b>	<b>773,431</b>	<b>7,645</b>	<b>257,247</b>	<b>62,316</b>	<b>27,238</b>	<b>334,860</b>	<b>1,462,737</b>
<b>Net book value</b>							
<b>At 31 March 2009</b>	<b>3,265,257</b>	<b>15,948</b>	<b>110,243</b>	<b>6,006</b>	<b>8,002</b>	<b>214,522</b>	<b>3,619,978</b>
<b>Net book value</b>							
<b>At 31 March 2008</b>	<b>3,312,273</b>	<b>17,819</b>	<b>128,618</b>	<b>7,133</b>	<b>10,387</b>	<b>178,970</b>	<b>3,655,200</b>

Tangible fixed asset additions of £76,950 as shown above were funded as follows:

	£
DCAL grant Capital grant	25,000
DCAL grant In-year capital grant	43,000
STFC research grants	7,044
Funds from deferred income	1,906
	<b>76,950</b>

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

	2009 £	2008 £
Cost	659,419	659,419
Aggregate depreciation	(160,601)	(145,760)
<b>Net book value based on historic cost</b>	<b>498,818</b>	<b>513,659</b>

Depreciation on fixed assets for the year was £112,172 (2008: £129,327).

Land and buildings include grounds and buildings with a net book value of £2,547,195 at 31 March 2009 which were donated to the corporation in 1790 by Archbishop Richard Robinson, the founder of the corporation.

## Armagh Observatory

### 10 Debtors

	2009	2008
	£	£
Grant debtors	44,191	9,613
Prepayments	42,392	39,311
Sundry debtors	197	3,541
	<u>86,780</u>	<u>52,465</u>

### 11 Creditors: amounts falling due within one year

	2009	2008
	£	£
Trade creditors	9,693	9,138
Accruals	21,702	15,739
Deferred income	56,329	46,501
	<u>87,724</u>	<u>71,378</u>

### Analysis of deferred income

	2009	2008
	£	£
Balance at 1 April	46,501	51,742
Transfer to statement of financial activities	(29,747)	(24,542)
Transfer from statement of financial activities	39,575	19,301
Balance at 31 March	<u>56,329</u>	<u>46,501</u>

### 12 Government grants reserve

	Land and buildings	Exhibits and grounds	Astropark	Furniture Fittings	Office Eqpt.	Equipment & Historic telescopes	Total
	£	£	£	£	£	£	£
Balance at 1 April	380,043	10,768	128,618	7,132	10,389	178,880	715,830
Additions	-	-	-	-	-	76,950	76,950
Amortised	(17,489)	(1,871)	(18,375)	(1,127)	(2,385)	(41,398)	(82,645)
Balance at 31 March	<u>362,554</u>	<u>8,897</u>	<u>110,243</u>	<u>6,005</u>	<u>8,004</u>	<u>214,432</u>	<u>710,135</u>

## Armagh Observatory

### 13 Unrestricted funds

	<b>2009</b>
	<b>£</b>
Balance at 1 April	(17,451)
Incoming resources	982,359
Resources expended	(979,885)
Other finance income	4,000
Adjustment to the statement of total recognised gains and losses	(556,000)
<b>Balance at 31 March</b>	<b>(566,977)</b>

The unrestricted funds reserve includes a deficit of £649,000 (2008: £99,000) 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 reserves for future cash needs arising from the lack of core funding to at least sustain the present level of science and outreach, 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 reserves of between one and two months of total forecast expenditure, between £98,000 and £196,000 to be sufficient to meet financial risks. The level of cash reserves at 31 March 2009 of £82,023, after adjusting for the pension scheme deficit, are sufficient to fund the cash flow requirements from research grants but are insufficient to meet other financial risks and accordingly the Observatory will seek to increase reserves to a more acceptable level by continuing to bid for a suitably indexed step-increase in core funding and by seeking additional externally funded research grants.

This policy will be reviewed by the Director on an annual basis at the end of the financial year.

	<b>£</b>
<b>Unrestricted reserves at 31 March 2009</b>	
Balance on unrestricted reserves at 31 March 2009	(566,977)
Pension scheme liability	649,000
<b>Reserves at 31 March 2009</b>	<b>82,023</b>

# Armagh Observatory

## 14 Restricted funds

	Balance 1/4/2008	Incoming resources	Resources expended	Transfer between funds	Transfer from defrd. income	Transfer to defrd. income	Balance 31/3/2009
	£	£	£	£	£	£	£
<b>DCAL grants</b>							
SALT	5,031	-	-	-	-	-	5,031
Capital	-	25,000	(25,000)	-	-	-	-
In-year capital grant	-	43,000	(44,906)	-	1,906	-	-
	5,031	68,000	(69,906)	-	1,906	-	5,031
<b>Other grants</b>							
STFC grants	-	181,554	(116,964)	(76,652)	19,819	(7,757)	-
TCD - International Heliophysical Year	-	8,000	-	(8,000)	-	-	-
Light Pollution & Dark Skys Symposium	-	5,324	-	-	-	(5,324)	-
International Year of Astronomy 2009	-	22,090	(10,316)	-	-	(11,774)	-
Leverhulme Trust Visiting Professorship	-	13,400	(5,400)	-	-	(8,000)	-
Lindsay Scholarship Fund	2,037	-	-	-	-	-	2,037
Miscellaneous travel grants	-	5,484	(5,484)	-	-	-	-
The Royal Society	-	6,720	(8,022)	-	8,022	(6,720)	-
Miscellaneous grants	-	200	-	(200)	-	-	-
	2,037	242,772	(146,186)	(84,852)	27,841	(39,575)	2,037
<b>Donations</b>	225	-	-	-	-	-	225
	7,293	310,772	(216,092)	(84,852)	29,747	(39,575)	7,293

## **Armagh Observatory**

### **DCAL Grants**

The Observatory received capital grant of £25,000 and a further in-year capital grant of £43,000 from the DCAL during the year for expenditure on equipment.

### **Other Grants and Receipts**

#### **STFC research and visitor grants**

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

- A Fresh Look at the Sun: New Opportunities with the Launch of Solar-B.
- The contribution of plasma jets and sporadic radiative events to the coronal heating puzzle.
- The mass loss and death of massive stars.

These grants fund salary, travel and other direct costs of the research project 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

	2009 £	2008 £
<b>Revaluation of land and buildings</b>		
Balance at 1 April	340,677	340,677
Transfer to donated assets reserve	-	-
Revaluation of land and buildings	-	-
Balance at 31 March	340,677	340,677
<b>Donated assets reserve</b>		
Balance at 1 April	2,582,973	2,612,500
Transfer from revaluation of land and buildings	-	-
Revaluation of donated land and buildings	-	-
Amortised	(29,527)	(29,527)
Balance at 31 March	2,553,446	2,582,973
<b>Total designated funds at 31 March</b>	<b>2,894,123</b>	<b>2,923,650</b>

Buildings and grounds with a net book value at 31 March 2009 of £2,547,195 (2008: £2,575,829) 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 the Valuation & Lands Agency, an Agency within the Department of Finance and Personnel on the following bases:

<b>Land and buildings</b>	<b>Basis of valuation</b>
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	3,604,258	8,427	7,293	3,619,978
Current assets	-	161,320	-	161,320
Current liabilities	-	(87,724)	-	(87,724)
Pension liability	-	(649,000)	-	(649,000)
<b>Net assets</b>	<b>3,604,258</b>	<b>(566,977)</b>	<b>7,293</b>	<b>3,044,574</b>

### 18 Analysis of net funds

	1 April 2008 £	Cash Flow £	31 March 2009 £
Cash at bank and in hand	33,728	28,768	62,496
Liquid resources	58,307	(46,263)	12,044
Net funds	92,035	(17,495)	74,540

Liquid resources comprise short term deposits held at the bank.

## Armagh Observatory

### 19 Reconciliation of net cash flow to movement in net funds

	2009 £	2008 £
<b>Increase in cash in financial year</b>	28,768	12,561
Decrease in deposits	(46,263)	(149,837)
<b>Decrease in net funds in the year</b>	(17,495)	(137,276)
Net funds at 1 April	92,035	229,311
<b>Net funds at 31 March</b>	74,540	92,035

### 20 Pension scheme

An actuarial valuation of the NILGOSC scheme was carried out at 31 March 2007. The funding level (ratio of assets to past service liabilities) at 31 March 2007 was 89% compared to 85% at 31 March 2004 corresponding to a funding deficit of £396 million, which will have to be recovered by increasing employers' contribution rates. The employers' contribution rate for 2008/2009 of 15% will increase to 16% in 2009/2010 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.

#### Financial assumptions

	31/3/2009	31/3/2008	31/3/2007
Rate of increase in salaries	4.6%	5.1%	4.7%
Inflation/pension increase	3.1%	3.6%	3.2%
Discount rate	6.9%	6.9%	5.4%
Expected return on assets	6.5%	7.3%	7.2%

#### Mortality assumptions

	2009 Years	2008 Years
Longevity at age 65 for current pensioners:		
- Men	19.6	19.6
- Women	22.5	22.5
Longevity at age 65 for future pensioners:		
- Men	20.7	20.7
- Women	23.6	23.6

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

	Long term rate of return 31/3/2009 %	Value at 31/3/2009 £k	Long term rate of return 31/3/2008 %	Restated Value at 31/3/2008 £k	Long term rate of return 31/3/2007 %	Value at 31/3/2007 £k
Equities	7.0%	1,424	7.7%	2,006	7.8%	1,899
Bonds	5.4%	273	5.7%	293	4.9%	356
Property	4.9%	137	5.7%	205	5.8%	259
Cash	4.0%	117	4.8%	39	4.9%	29
		1,951		2,543		2,543

Asset values at 31 March 2009 are at bid values as required under FRS 17. Asset values at 31 March 2008, which were at mid-market value, are not materially different from their bid values at this date.

	31/3/2009 £k	31/3/2008 £k
Fair value of assets	1,951	2,543
Present value of scheme liabilities:		
Present value of unfunded liabilities	-	-
Present value of funded liabilities	(2,600)	(2,642)
Total value of scheme liabilities	(2,600)	(2,642)
Deficit in the scheme	(649)	(99)

## Armagh Observatory

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

	Year to 31/3/2009	Year to 31/3/2008	Year to 31/3/2007
	£k	£k	£k
Current service cost	79	115	71
Past service cost	-	-	-
	79	115	71

### Analysis of amount charged to other finance expenses

	Year to 31/3/2009	Year to 31/3/2008	Year to 31/3/2007
	£k	£k	£k
Expected return on scheme assets	186	182	169
Interest on scheme liabilities	(182)	(161)	(151)
Net return	4	21	18

### Recognition in the statement of financial activities

	Year to 31/3/2009	Year to 31/3/2009	Year to 31/3/2008	Year to 31/3/2008
	£k	%	£k	%
Current service costs	79	14.7%	115	19.8%
Interest costs	182	33.8%	161	27.8%
Expected return on assets	(186)	(34.6%)	(182)	(31.4%)
Total	75	14.0%	94	16.2%
Actual return on assets	(591)		(92)	

### Reconciliation of defined benefit obligation

	Year to 31/3/2009	Year to 31/3/2008
	£k	£k
Opening defined benefit obligation	2,642	2,965
Current service cost	79	115
Interest cost	182	161
Contributions by members	32	35
Actuarial losses/(gains)	(229)	(530)
Estimated benefits paid	(106)	(104)
Closing defined benefit obligation	2,600	2,642

### Reconciliation of fair value of assets

	Year to 31/3/2009	Year to 31/3/2008
	£k	£k
Opening fair value of assets	2,543	2,543
Expected return on assets	186	182
Contributions by members	32	35
Contributions by the corporation	81	76
Actuarial gains/(losses)	(785)	(189)
Benefits paid	(106)	(104)
Closing fair value of assets	1,951	2,543

### Amount for current and previous accounting years

	Year to 31/3/2009	Year to 31/3/2008	Year to 31/3/2007	Year to 31/3/2006	Year to 31/3/2005
	£k	£k	£k	£k	£k
Fair value of assets	1,951	2,543	2,543	2,472	2,028
Present value of defined benefit obligation	(2,600)	(2,642)	(2,965)	(2,540)	(2,187)
Surplus/(deficit)	(649)	(99)	(422)	(68)	(159)
Experience gains/(losses) on assets	(785)	(189)	(30)	377	55
Experience gains/(losses) on liabilities	-	106	1	(1)	-

## Armagh Observatory

### 21 Commitments

There were no outstanding capital commitments at 31 March 2009 (2008: £nil).

### 22 Investment in Southern African Large Telescope Project

	2009	2008
	£	£
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 the Department of Culture, Arts and Leisure, the Central Procurement Directorate, and the Science and Technology Facilities Council.

### 24 Financial Instruments

As the cash requirements of the Observatory are met through grants from the Department of Culture, Arts and Leisure 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.

## Armagh Planetarium

### Statement of financial activities for the year ended 31 March 2009

	Notes	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
<b>Incoming resources</b>					
DCAL grants	2	482,000	66,975	548,975	574,000
Other grants and receipts	2	1,375	7,990	9,365	3,746
Admissions		130,239	-	130,239	150,643
Rents		2,600	-	2,600	2,600
Interest receivable		20	-	20	28
Disposal of fixed assets		2,334	-	2,334	1,086
Miscellaneous income		7,650	-	7,650	3,677
Outreach income		11,839	-	11,839	23,669
Shop and mail order gross profit	22	18,197	-	18,197	23,361
Transfer to deferred income		-	(4,035)	(4,035)	(845)
Transfer from deferred income		-	766	766	5,300
Transfer between funds		955	(955)	-	-
<b>Total incoming resources</b>		<b>657,209</b>	<b>70,741</b>	<b>727,950</b>	<b>787,265</b>
<b>Resources expended</b>					
Direct expenditure of the corporation	3	455,134	3,000	458,134	534,726
Fundraising and publicity	4	44,868	-	44,868	18,906
Management and administration of the corporation	5	158,771	-	158,771	157,089
Capital expenditure		-	67,741	67,741	76,852
<b>Total resources expended</b>		<b>658,773</b>	<b>70,741</b>	<b>729,514</b>	<b>787,573</b>
<b>Net outgoing resources</b>					
<b>for the year before cost of capital</b>		(1,564)	-	(1,564)	(308)
Cost of capital		-	(191,636)	(191,636)	(198,027)
<b>Net movement in funds after cost of capital</b>		<b>(1,564)</b>	<b>(191,636)</b>	<b>(193,200)</b>	<b>(198,335)</b>
Cost of capital reversed			191,636	191,636	198,027
<b>Net movement in funds before finance income</b>		<b>(1,564)</b>	<b>-</b>	<b>(1,564)</b>	<b>(308)</b>
Finance income - pension scheme		(6,000)	-	(6,000)	7,000
<b>Net movement in funds after finance income</b>		<b>(7,564)</b>	<b>-</b>	<b>(7,564)</b>	<b>6,692</b>
Actuarial (loss)/gain on pension scheme		(272,000)	-	(272,000)	150,000
<b>Net movement in funds after actuarial (loss)/gain</b>		<b>(279,564)</b>	<b>-</b>	<b>(279,564)</b>	<b>156,692</b>
Balances brought forward at 1 April		(168,655)	-	(168,655)	(325,347)
<b>Balances carried forward at 31 March</b>	13, 14	<b>(448,219)</b>	<b>-</b>	<b>(448,219)</b>	<b>(168,655)</b>

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% has been charged on the average net assets of the corporation.

As this is a notional charge the cost of capital is reversed in the Statement of Financial Activities.

### Statement of total recognised gains and losses

	2009 £	2008 £
Net movement in funds for the year	(7,564)	6,692
Surplus on revaluation of land and buildings	-	-
Net movement on government grant reserve	(131,124)	(112,114)
Actuarial (loss)/gain on pension scheme	(272,000)	150,000
<b>Total recognised gains and losses relating to the year</b>	<b>(410,688)</b>	<b>44,578</b>

## Armagh Planetarium

### Balance sheet at 31 March 2009

	Notes	2009 £	2008 £
<b>Tangible assets</b>	8	5,718,190	5,849,314
<b>Current assets</b>			
Stock	9	11,544	9,278
Debtors and prepayments	10	36,524	22,373
Cash at bank and in hand	17, 18	30,292	66,866
		78,360	98,517
<b>Creditors: amounts falling due within one year</b>	11	(72,579)	(92,172)
<b>Net current assets</b>		5,781	6,345
<b>Net assets excluding pension liability</b>		5,723,971	5,855,659
<b>Pension liability</b>	19	(454,000)	(175,000)
<b>Net assets</b>		5,269,971	5,680,659
<b>Funds</b>			
Unrestricted reserves	13	(448,219)	(168,655)
Government grant reserve	12	1,082,109	1,213,233
Designated	15	4,636,081	4,636,081
		5,269,971	5,680,659

The financial statements on pages 41 to 54 were approved on 21 July 2009 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 2009

	Notes	2009 £	2008 £
<b>Net cashflow from operating activities</b>		(41,161)	(72,370)
<b>Returns on investments and servicing of finance</b>			
Interest received		20	28
Profit in sale of assets		2,334	1,086
Bank and credit card processing charges		(3,767)	(3,312)
Other finance income - pension scheme		6,000	(7,000)
		4,587	(9,198)
<b>Capital expenditure</b>			
Purchase of tangible assets		(67,741)	(76,852)
Capital grants received		67,741	76,852
		-	-
<b>Net cash outflow before financing</b>		(36,574)	(81,568)
<b>Financing</b>			
Repayment of principal under hire purchase agreements		-	-
		-	-
<b>Decrease in cash</b>	17, 18	(36,574)	(81,568)

### Reconciliation of operating result to net cash flow

	2009 £	2008 £
Net incoming resources per statement of financial activities	(7,564)	6,692
Interest received	(20)	(28)
Profit on sale of assets	(2,334)	(1,086)
Interest paid and similar charges	3,767	3,312
Depreciation	198,865	189,885
Deferred credit release	(198,865)	(188,966)
Pension service costs	1,000	(1,000)
Decrease/(increase) in stock	(2,266)	1,385
Decrease/(increase) in debtors	(14,151)	13,553
Increase/(decrease) in creditors	(19,593)	(96,117)
<b>Net cash (outflow)/inflow from operating activities</b>	(41,161)	(72,370)

# Armagh Planetarium

## Notes to the financial statements for the year ended 31 March 2009

### 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 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. The principal annual rates used are as follows:

	%
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 SORP for charities, the 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 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
Recurrent grant	483,000	-	483,000	390,000
Recurrent grant transferred in-year to Armagh Observatory	(5,000)	-	(5,000)	-
In-year recurrent grant - actuary's fees	4,000	-	4,000	-
Capital grant	-	25,000	25,000	59,000
In-year capital grant	-	41,975	41,975	-
Skills and Science Funding Package	-	-	-	125,000
	482,000	66,975	548,975	574,000

### Other grants and receipts

	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
Friends of the Planetarium	1,375	-	1,375	930
Discover Primary Science	-	2,490	2,490	-
North Eastern Education and Library Board - IYA 2009	-	3,000	3,000	-
The Royal Society Local Heroes Grants Scheme - Bell Burnell	-	2,500	2,500	-
EU Socrates Programme - Hands on Universe project	-	-	-	2,816
	1,375	7,990	9,365	3,746

## Armagh Planetarium

### 3 Direct expenditure of the corporation

	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
Salaries and wages	345,289	-	345,289	369,173
Agency staff	-	-	-	19,046
Equipment leasing	1,180	-	1,180	1,180
Travelling and subsistence	17,052	-	17,052	13,667
Equipment maintenance and consumables	37,858	-	37,858	50,932
Library and subscriptions	5,734	-	5,734	4,967
Production expenses	9,875	-	9,875	33,209
Exhibitions and events	30,666	3,000	33,666	21,735
Training	895	-	895	656
Website design	2,000	-	2,000	16,875
Vehicle expenses	3,585	-	3,585	4,286
Pension service costs	1,000	-	1,000	(1,000)
	455,134	3,000	458,134	534,726

### 4 Fundraising and publicity

	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
Advertising and brochures	44,304	-	44,304	18,139
Hospitality	564	-	564	767
	44,868	-	44,868	18,906

### 5 Management and administration of the corporation

	Unrestricted funds 2009 £	Restricted funds 2009 £	Total funds 2009 £	Total funds 2008 £
Insurance	15,964	-	15,964	14,753
Heat, light and power	51,182	-	51,182	53,566
General property repairs	20,427	-	20,427	22,442
Cleaning services and consumables	15,949	-	15,949	13,253
Office and café furnishings	542	-	542	5,361
Postage and telephone	13,804	-	13,804	14,282
General expenses	933	-	933	272
Bank and credit card processing charges	3,767	-	3,767	3,312
Audit	6,388	-	6,388	4,788
Professional fees and licences	12,481	-	12,481	7,249
Management Committee and meetings	1,817	-	1,817	674
Rates	-	-	-	293
Printing and stationery	15,517	-	15,517	10,375
Recruitment	-	-	-	4,378
Depreciation	-	198,865	198,865	189,885
Release from grants reserve	-	(198,865)	(198,865)	(188,966)
Losses and special payments	-	-	-	1,172
	158,771	-	158,771	157,089

## Armagh Planetarium

### 6 Average staff numbers and related costs

#### Average staff numbers

	2009	2008
	Number	Number
Permanent staff	6.5	8.0
Fixed-term contract staff	4.3	3.0
Agency staff	-	1.5
	10.8	12.5

#### Costs

	2009	2008
	£	£
<b>Permanent staff</b>		
Wages and salaries	211,031	228,164
Social security costs	10,041	17,810
Pension costs	33,062	30,622
	254,134	276,596
<b>Fixed-term contract staff costs</b>		
Wages and salaries	77,013	78,705
Social security costs	4,786	5,409
Pension costs	9,356	8,463
	91,155	92,577
<b>Total permanent and fixed-term staff</b>	345,289	369,173
Agency staff costs	-	19,046
<b>Total staff costs</b>	345,289	388,219

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

### 7 Income and expenditure summary

	2009	2008
	£	£
<b>Gross income</b>	660,209	710,413
<b>Expenditure</b>		
Direct charitable expenditure	458,134	534,726
Fund raising and publicity	44,868	18,906
Management and administration of the corporation	158,771	157,089
	661,773	710,721
Other finance income	(6,000)	7,000
<b>Surplus/(deficit) for the year</b>	(7,564)	6,692

## Armagh Planetarium

### 8 Tangible fixed assets

	Digistar	Freehold Land and buildings	Equipment	Exhibits	Vehicles	Total
	£	£	£	£	£	£
<b>Cost or valuation</b>						
At 1 April 2008	906,054	5,733,408	571,745	298,557	8,702	7,518,466
Additions	-	-	62,641	5,100	-	67,741
Disposals	-	-	(297,798)	(155,660)	-	(453,458)
<b>At 31 March 2009</b>	<b>906,054</b>	<b>5,733,408</b>	<b>336,588</b>	<b>147,997</b>	<b>8,702</b>	<b>7,132,749</b>
<b>Depreciation</b>						
At 1 April 2008	677,467	303,460	469,726	209,797	8,702	1,669,152
Charge for year	37,067	120,253	14,691	26,854	-	198,865
Disposals	-	-	(297,798)	(155,660)	-	(453,458)
<b>At 31 March 2009</b>	<b>714,534</b>	<b>423,713</b>	<b>186,619</b>	<b>80,991</b>	<b>8,702</b>	<b>1,414,559</b>
<b>Net book value</b>						
<b>At 31 March 2009</b>	<b>191,520</b>	<b>5,309,695</b>	<b>149,969</b>	<b>67,006</b>	<b>-</b>	<b>5,718,190</b>
<b>Net book value</b>						
<b>At 31 March 2008</b>	<b>228,587</b>	<b>5,429,948</b>	<b>102,019</b>	<b>88,760</b>	<b>-</b>	<b>5,849,314</b>

During the year the fixed asset register was reconciled with the accounts. Disposals amounting to £453,458 represent the cost of fixed assets disposed off during 2008/2009 and during the refurbishment of the Planetarium and other assets no longer in the fixed assets register.

Tangible fixed asset additions of £67,741 as shown above were funded as follows:

	£
DCAL capital grant	66,975
Funds from deferred income	766
	<b>67,741</b>

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

	2009 £	2008 £
Cost	1,321,239	1,321,239
Aggregate depreciation	(344,465)	(319,380)
<b>Net book value based on historic cost</b>	<b>976,774</b>	<b>1,001,859</b>

### 9 Stocks

	2009 £	2008 £
Finished goods and goods for resale	11,544	9,278

## Armagh Planetarium

### 10 Debtors

	2009 £	2008 £
Trade and grant debtors	14,706	8,361
Sundry debtors	-	903
Prepayments	12,479	11,097
VAT	9,339	2,012
	36,524	22,373

### 11 Creditors: amounts falling due within one year

	2009 £	2008 £
Trade creditors	56,927	64,727
Accruals	11,617	25,429
Provision for losses and special payments	-	1,171
Deferred income	4,035	845
	72,579	92,172

### Analysis of deferred income

	2009 £	2008 £
Balance at 1 April	845	5,300
Transfer to miscellaneous income	(79)	-
Transfer to statement of financial activities	(766)	(5,300)
Transfer from statement of financial activities	4,035	845
Balance at 31 March	4,035	845

### 12 Government grants reserve

	Digistar £	Buildings and grounds £	Equipment £	Exhibits £	Total £
Balance at 1 April 2008	228,587	793,867	102,019	88,760	1,213,233
Additions	-	-	62,641	5,100	67,741
Disposals	-	-	-	-	-
Amortised	(37,067)	(120,253)	(14,691)	(26,854)	(198,865)
Balance at 31 March 2009	191,520	673,614	149,969	67,006	1,082,109

### 13 Unrestricted funds

	2009 £
Balance at 1 April	(168,655)
Incoming resources	657,209
Resources expended	(658,773)
Other finance income	(6,000)
Adjustment to the statement of total recognised gains and losses	(272,000)
Balance at 31 March	(448,219)

The unrestricted funds reserve includes a deficit of £454,000 (2008: £181,000) in respect of pension scheme liabilities of the pension fund.

## Armagh Planetarium

### 14 Restricted funds

	Balance 1/4/2008	Incoming resources	Resources expended	Transfer between funds	Transfer from defrd. income	Transfer to defrd. income	Balance 31/3/2009
	£	£	£	£	£	£	£
<b>DCAL grants</b>							
Capital	-	66,975	(67,741)	-	766	-	-
<b>Total DCAL grants</b>	-	66,975	(67,741)	-	766	-	-
<b>Other grants and receipts</b>							
Discover Primary Science	-	2,490	-	(955)	-	(1,535)	-
NELB - IYA 2009	-	3,000	(3,000)	-	-	-	-
The Royal Society	-	2,500	-	-	-	(2,500)	-
<b>Total other grants and receipts</b>	-	7,990	(3,000)	(955)	-	(4,035)	-
	-	74,965	(70,741)	(955)	766	(4,035)	-

#### DCAL grants

DCAL provided funding of £66,975 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.

#### North Eastern Education and Library Board (NELB)

The Planetarium received £3,000 from the NELB to fund a number of presentations as part of the Planetarium's contribution to the International Year of Astronomy 2009.

#### The Royal Society

The Royal Society provided £2,500 for a series of science and arts activities to celebrate the scientific achievements of Professor Jocelyn Bell Burnell.

#### Transfer between funds

The transfer from restricted to unrestricted funds comprises funds received from the Discover Primary Science programme for the development of scientific activities for schools.

### 15 Designated funds

	2009 £	2008 £
<b>Revaluation of land and buildings</b>		
Balance at 1 April	4,636,081	4,636,081
Revaluation	-	-
<b>Balance at 31 March</b>	<b>4,636,081</b>	<b>4,636,081</b>

The corporation's land and buildings were revalued at 31 March 2007 by the Valuation & Lands Agency, 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

## Armagh Planetarium

### 16 Analysis of net assets between funds

	Designated funds £	Unrestricted funds £	Restricted funds £	Total funds £
<b>Tangible fixed assets</b>	5,718,190	-	-	5,718,190
Current assets	-	78,360	-	78,360
Creditors: amounts falling due within one year	-	(72,579)	-	(72,579)
Pension	-	(454,000)	-	(454,000)
<b>Net current assets</b>	-	(448,219)	-	(448,219)
Creditors: amounts falling due after more than one year	-	-	-	-
<b>Net assets</b>	5,718,190	(448,219)	-	5,269,971

### 17 Analysis of net cash funds

	1 April 2008 £	Cashflow £	Non cash movement £	31 March 2009 £
Cash at bank and in hand	66,866	(36,574)	-	30,292
<b>Net funds</b>	66,866	(36,574)	-	30,292

### 18 Reconciliation of net cashflow to movement in net cash funds

	2009 £	2008 £
(Decrease)/increase in cash in financial year	(36,574)	(81,568)
Net funds at 1 April	66,866	148,434
Net funds at 31 March	30,292	66,866

### 19 Pension scheme

An actuarial valuation of the NILGOSC scheme was carried out at 31 March 2007. The funding level (ratio of assets to past service liabilities) at 31 March 2007 was 89% compared to 85% at 31 March 2004 corresponding to a funding deficit of £396 million, which will have to be recovered by increasing employers' contribution rates. The employers' contribution rate for 2008/2009 of 15% will increase to 16% in 2009/2010 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.

#### Financial assumptions used by the actuary were:

	31/3/2009	31/3/2008	31/3/2007
Rate of increase in salaries	4.6%	5.1%	4.7%
Inflation/pension increase	3.1%	3.6%	3.2%
Discount rate	6.9%	6.9%	5.4%
Expected return on assets	6.5%	7.3%	7.2%

#### Mortality assumptions

	2009 Years	2008 Years
Longevity at age 65 for current pensioners:		
- Men	19.6	19.6
- Women	22.5	22.5
Longevity at age 65 for future pensioners:		
- Men	20.7	20.7
- Women	23.6	23.6

## Armagh Planetarium

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

	Long term rate of return 31/3/2009 %	Value at 31/3/2009 £k	Long term rate of return 31/3/2008 %	Value at 31/3/2008 £k	Long term rate of return 31/3/2007 %	Value at 31/3/2007 £k
Equities	7.0%	801	7.7%	1,135	7.8%	1,085
Bonds	5.4%	154	5.7%	166	4.9%	203
Property	4.9%	77	5.7%	117	5.8%	148
Cash	4.0%	66	4.8%	22	4.9%	16
		1,098	7.3%	1,440	7.2%	1,452

Asset values at 31 March 2009 are at bid values as required under FRS 17. Assets values at 31 March 2008, which were at mid-market value, are not materially different from their bid values at this date.

	31/3/2009 £k	31/3/2008 £k	31/3/2007 £k
Fair value of assets	1,098	1,440	1,452
Present value of scheme liabilities:			
Present value of unfunded scheme liabilities	5	5	5
Present value of funded liabilities	1,547	1,610	1,780
Total value of scheme liabilities	1,552	1,615	1,785
Deficit in the scheme	(454)	(175)	(333)

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

	Year to 31/3/2009 £k	Year to 31/3/2008 £k	Year to 31/3/2007 £k
Current service cost	43	36	27
Past service cost	-	-	-
	43	36	27

### Analysis of amount charged to other finance expenses

	Year to 31/3/2009 £k	Year to 31/3/2008 £k	Year to 31/3/2007 £k
Expected return on scheme assets	105	104	95
Interest on scheme liabilities	(111)	(97)	(86)
Net return	(6)	7	9

### Recognition in the statement of financial activities

	Year to 31/3/2009 £k	Year to 31/3/2009 %	Year to 31/3/2008 £k	Year to 31/3/2008 %
Current service costs	43	11.3%	36	18.0%
Interest costs	111	29.2%	97	48.5%
Expected return on assets	(105)	(27.6%)	(104)	(52.0%)
Total	49	12.9%	29	14.5%
Actual return on assets	(333)		(53)	



## Armagh Planetarium

### Reconciliation of defined benefit obligation

	Year to 31/3/2009	Year to 31/3/2008
	£k	£k
Opening defined benefit obligation	1,615	1,785
Current service cost	43	36
Interest cost	111	97
Contributions by members	23	12
Actuarial losses/(gains)	(170)	(281)
Estimated unfunded benefits paid	(1)	-
Estimated benefits paid	(69)	(34)
Closing defined benefit obligation	1,552	1,615

### Reconciliation of fair value of assets

	Year to 31/3/2009	Year to 31/3/2008
	£k	£k
Opening fair value of assets	1,440	1,452
Expected return on assets	105	104
Contributions by members	23	12
Contributions by the corporation	41	37
Contributions in respect of unfunded benefits	1	-
Actuarial gains/(losses)	(442)	(131)
Unfunded benefits paid	(1)	-
Benefits paid	(69)	(34)
Closing fair value of assets	1,098	1,440

### Amount for current and previous accounting years

	Year to 31/3/2009	Year to 31/3/2008	Year to 31/3/2007	Year to 31/3/2006	Year to 31/3/2005
	£k	£k	£k	£k	£k
Fair value of assets	1,098	1,440	1,452	1,361	1,080
Present value of defined benefit obligation	(1,552)	(1,615)	(1,785)	(1,432)	(1,154)
Surplus/(deficit)	(454)	(175)	(333)	(71)	(74)
Experience gains/(losses) on assets	(442)	(131)	(17)	204	29
Experience gains/(losses) on liabilities	-	(57)	(1)	4	4

## 20 Commitments

There were no capital commitments at the 31 March 2009 (2008: £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 the Department of Culture, Arts and Leisure and the Central Procurement Directorate.

## Armagh Planetarium

### 22 Shop and mail order trading account

	2009	2008
	£	£
<b>Sales</b>	58,765	68,320
<b>Less: cost of sales</b>		
Opening stock	9,278	10,663
Add: Purchases	42,834	43,574
	52,112	54,237
Less: closing stock	(11,544)	(9,278)
	40,568	44,959
<b>Gross profit</b>	18,197	23,361
<b>Gross profit %</b>	31.0	34.2

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 the Department of Culture, Arts and Leisure 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.



Published by Corporate Document Services and available from:

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