



The Armagh Observatory
Business Plan
2005/2006

Business Plan for Period 1 April 2005 to 31 March 2006

Prepared by the Director

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Executive Summary

1. The Armagh Observatory has achieved considerable success during the past year (2004/2005). The number of refereed journal publications, namely 41 plus one book, has been the highest since 1998; the number of identified media citations, namely 282, has remained at a high level, considerably above the target figure of 200; and the number of Distinct e-Visitors to the Observatory websites (<http://star.arm.ac.uk/>, <http://climate.arm.ac.uk/> and <http://arpc65.arm.ac.uk/~spm/>) has continued to grow. At the time of writing (January 2005) total external grant receipts for Financial Year 2004/2005 are currently estimated to be approximately £241,000. It is too early to know a definite figure, but the estimate is close to the target of £250,000 set in April 2004.
2. The yearly trends of these various performance indicators are shown in Table 1 and Figure 1. Note that:
 - In recent years the Observatory has regularly obtained substantial levels of non-DCAL funding to support its research, currently averaging more than £250,000 per year, maintaining a high level of research activity throughout the period and an exceptionally high public profile.
 - During the past five years alone, astronomers at Armagh have averaged almost 35 publications *per year* in refereed scientific journals, and have appeared in or been quoted in newspapers and other media at least 250 times *per year*. In short, the Armagh Observatory is a flourishing astronomical research institute which continues to play an influential role in the professional advancement of astronomy and in public understanding of science and education.
3. With sufficient resources to carry out its work, the Observatory remains in a strong position to maintain this activity and to play an influential role in both UK and international astronomy for years to come. However, the anticipated flat funding for Financial Year 2005/2006 will reduce core recurrent funding to the same level in cash terms as that for 2003/2004, i.e. from the present 2004/2005 value of £754,000 to £660,000 (2005/2006). This represents a 12.5% cut in cash terms that will inevitably put severe constraints on the Observatory's ability to sustain its planned programmes of research, outreach and public understanding of science.
4. The organization's capacity to plan strategically is now being put at risk by the Department's apparent inability to provide it with a secure core funding line. Moreover, the lack of additional research development funds places severe constraints on the organization's ability to position itself strongly for the next Research Assessment Exercise. There is a clear risk that a decade of improved performance in virtually every aspect of the Observatory's activities (see Figure 1, p.3) could be undermined by systemic underfunding.
5. If the Observatory is to avoid falling into this trap, it requires a stable level of core funding adequate for its needs and to support a reasonable number of research-active staff. In 2001 there were 8 such staff in post, but this has now fallen to 6 and there is a clear need to recruit at least 2 and preferably 3 or 4 such staff, preferably young, ambitious and promising research scientists.
6. Further background information about the Armagh Observatory is provided in Appendix A.

It is noteworthy that the Observatory is the oldest scientific institution in Northern Ireland, the longest continuously operating astronomical research institute in the UK and Ireland. It is fully functioning, and remains a completely viable — and successful — research institute. In addition to its scientific research, which generates cultural capital, the Observatory also provides a very positive image of Armagh City and District — and of Northern Ireland — on the world stage, and makes major contributions both to DCAL departmental objectives and to the wider initiatives of the Northern Ireland Programme for Government.

Objectives for Financial Year 2005/2006

The anticipated parliamentary grant-in-aid for 2005/2006 is £660,000 (Resource Funding), the same in cash terms as in 2003/2004. This very significant real cut in the Observatory's grant-in-aid puts many of the medium to long-term objectives of the Observatory at serious risk. In particular, because a high fraction of the Observatory's overall running costs is related to core items such as salaries and fixed costs such as heat, light, power, insurance etc., the anticipated funding for 2005/2006 will put severe strain on the Observatory's ability even to maintain its planned programmes of research, outreach and public understanding of science for 2005. Such harsh treatment of a scientific institution which has demonstrated

Calendar Year	External Grant Income (£000s)	Refereed Journal Publications	Identified Media Citations	Distinct e-Visitors (DEVs)	RAE Grade	Total DCAL Grant Income (£000s)
2001	221	32	302	318,000	4	713.5
2002	306	33	267	354,000		733.5
2003	270	34	226	470,000		781.5
2004	241	41	282	576,000		884.0
2005 Required Income:						773.4
2005 Targets:	200	35	200	400		

Table 1: The trend of various performance indicators (PIs) versus calendar year, including the total DCAL grant income received in cash terms in the corresponding financial year. (The figures include the announced capital and recurrent funding together with any in-year additional slippage funding received.) Also shown is the total budget *required* for 2005/2006, namely £748,400 (Recurrent) and £25,000 (Capital). External grant income for 2004/2005 represents a preliminary, unaudited estimate. Performance targets for calendar year 2005 (financial year 2005/2006) are expressed in round figures.

a decade of significantly improved performance flies in the face of Government policies that aim to *increase* spending on science and on programmes to encourage young people to consider careers in the traditional ‘hard’ sciences.

The allocated funds will be directed towards achieving the following principal objectives during 2005/2006, namely to:

- maintain existing high-quality research programmes;
- obtain grants and additional external funding to support new research projects;
- strengthen the Observatory’s research capability in solar system and stellar astrophysics in readiness for the next Research Assessment Exercise (RAE 2008; census date 31 October 2007);
- enhance the Observatory’s access to and use of necessary research infrastructure, such as CosmoGrid, the Southern African Large Telescope (SALT), and the Northern Ireland Regional Area Network (NIRAN);
- widen access to the heritage material in its possession; and
- progress plans for a new Library, Archive and Historic Scientific Instruments Building.

The corresponding targets for these objectives, which together span the Observatory’s principal areas of activity (research, education and public outreach, and heritage), are indicated in Table 1.

The key task for the year is to obtain a stable level of core funding and to gain access to additional funds for the recruitment of additional research staff. This is to maintain current activity and to lay a strong foundation for the forthcoming Research Assessment Exercise (2002–2007). The required income (namely £748,400 Recurrent and £25,000 Capital) and projected expenditure for 2005/2006 is shown in Table 2.

Last Up-Date 4 February 2005	2005/2006 Required (£k)	Financial Year			
		2005/2006 Budget (£k)	2004/2005 Projected (£k)	2003/2004 Actual (£k)	2002/2003 Actual (£k)
Incoming Resources					
DCAL Capital Grant	25.0	6.0	6.0	6.5	7.5
Additional In-year Capital and Project Funding	–	–	145.9	103.1	–
SALT	–	–	40.0	40.0	40.0
DCAL Buildings, Domes and Telescopes Project	22.2	22.2	25.0	30.0	31.0
DCAL Recurrent Grant Announced	748.4	660.0	660.0	660.0	616.0
Additional In-year Recurrent Funds	–	–	94.0	–	–
Total DCAL Grant	795.6	688.2	970.9	839.6	694.5
Additional Funds from External Grants	45.2	45.2	41.0	30.6	42.0
Other Income	9.7	9.7	9.5	14.0	9.1
Total Incoming Resources	850.5	743.1	1021.4	884.2	745.6
Less Resources Expended					
Capital Equipment	25.0	25.0	6.0	6.5	7.5
Additional In-year Capital and Project Funding	–	–	145.9	103.1	–
SALT	–	–	40.0	40.0	40.0
DCAL Buildings, Domes and Telescopes Project	22.2	22.2	25.0	30.0	31.0
Salaries	599.9	599.9	564.4	526.0	484.6
Student Fees	8.0	8.0	8.1	7.6	6.4
Library, Archives and Historic Scientific Instruments ...	22.0	22.0	30.0	12.6	20.9
JANET Access Costs	25.8	25.8	29.6	13.6	14.4
Computer Consumables	13.0	13.0	13.0	12.1	11.1
Travel and Subsistence	23.0	23.0	25.0	22.7	20.8
Insurance	14.0	14.0	13.6	16.5	15.3
Heat, Light and Power	17.7	17.7	16.5	12.9	12.2
Property Repairs and Grounds	31.0	31.0	35.0	32.3	24.4
Stationery, Post and Telephone	9.2	9.2	9.0	9.0	8.5
Audits	5.7	5.7	5.5	3.9	4.1
Professional Fees	3.0	3.0	6.5	5.1	–0.2
Other Operating Costs	31.0	31.0	28.4	32.9	43.3
Total Resources Expended	850.5	850.5	1001.5	886.8	744.3
Surplus = Income – Expenditure	0.0	–107.4	19.9	–2.6	1.3
Transfer to unrestricted reserves	0.0	–107.4	19.9	–2.6	1.3

Table 2: Summary of income and expenditure funded by the DCAL versus financial year (FY). Capital and other projects sometimes extend over more than one financial year, and in these cases the corresponding figures include amounts deferred to future years and/or released from prior years. The Table was last updated on 20 January 2005. All tabulated values have been rounded to the nearest £100.

1 Review of Financial Year 2004/2005

The principal objectives for 2004/2005 were to:

- maintain existing high-quality research programmes – done;
- obtain grants and additional external funding to support new research projects – done;
- strengthen the Observatory’s research capability in solar system and stellar astrophysics;
- strengthen the Observatory’s access to research infrastructure such as CosmoGrid, the Southern African Large Telescope (SALT), and obtain high-bandwidth connections to the internet through the Northern Ireland Metropolitan Area Network (NIMAN) – done;
- widen access to the heritage material in its possession – done; and
- advance plans for a new Library, Archive and Historic Scientific Instruments Building – done.

The key additional task for the year was to widen the Observatory’s access to research development funds and to lay a strong foundation for the forthcoming Research Assessment Exercise benchmark. This was to involve working with the DCAL not just to provide an adequate level of core funding for astronomical research, but also to obtain the further funds necessary for the recruitment of additional research staff and to maintain and improve the Observatory’s access to high-quality research infrastructure.

In the event, it is unfortunate to record that no additional funding could be obtained for new staff positions during the reporting year, and the first six-months’ budget settlement for 2004/2005 was the worst for many years. Nevertheless, there remains a strong argument both to maintain the present level of core funding in real terms and to provide the Observatory with additional research development funds.

First, the Observatory has participated in the RAE for more than a decade, but has *never* benefited from access to the performance related additional funding enjoyed by comparable research groups in the university sector. Indeed, the Observatory’s position in this respect is doubly difficult owing to its small size, and this is not helped by further clipping of the institution’s wings. Unlike larger bodies there are very limited opportunities to transfer resources *within* the organization, and the inability to obtain additional research development funds puts the Armagh Observatory at a considerable disadvantage so far as expansion and strategic planning is concerned.

Additional research staff would give the Observatory an opportunity to broaden the scope of its present research. They would also provide the capacity to respond more flexibly to new research funding opportunities, thereby enhancing its ability to lever additional research income from the UK Research Councils and other grant-awarding bodies, so further increasing the Observatory’s output. Additional research development funds would thus enable the Observatory to operate more effectively in an extremely competitive third-level research sector.

Moreover, the Observatory attracts substantial external funding per unit of DCAL grant-in-aid, currently averaging more than £250,000 per year, and has closely met or exceeded essentially all the performance targets set in the previous year, all of which are on ascending trajectories. It is extremely difficult to maintain this performance, and associated staff morale, in a situation where good performance is not rewarded.

In addition to the above principal objectives, the Observatory has continued to play an influential community role in astronomy, for example through its high-level involvement in bodies such as the Astronomical Science Group of Ireland (ASGI) and in helping to organize the first joint meeting between the ASGI and the Institute of Physics in Ireland, held in Armagh from 1–4 April 2004, the largest astronomy meeting ever held in the City. The Observatory also plays a leading role in promoting the public awareness of astronomy and related sciences, especially through talks and public lectures, the release of media information sheets about its work, the appearance of staff or their work in various mass-media, and the provision of information through web-pages and links displayed on the Observatory’s principal web-site (<http://star.arm.ac.uk/>). The Observatory’s commitment to the Southern African Large Telescope project has continued with the support of the DCAL, and the largely HLF and DCAL-funded project to restore the historic telescopes and telescope domes has been progressed satisfactorily.

Performance

As proxy indicators of performance in each of the Observatory’s principal areas of activity (research, education and public outreach, and heritage) records are maintained of (A) External Grant Income (per financial year); (B) the number of Refereed Journal Publications (per calendar year); (C) the number of

Identified Media Citations (per calendar year); and (D) the number of Distinct e-Visitors (DeVs) to its web-sites (per calendar year). Although other data are recorded for internal management and statistical purposes (e.g. numbers of presentations, seminars and invited talks, grants and telescope time etc.), a detailed annual analysis of such indicators is less informative than a thorough periodic assessment of the Observatory's research performance in the round, making allowance for the available resources and, for example, the Observatory's relatively small size compared to many university departments and research institutes with which the Observatory is often compared. The Observatory has participated in the Research Assessment Exercise (RAE) since 1992, and during this period has maintained a Quality Research (QR) rating of Grade 4. In the 2001 RAE this grade corresponded to: "Quality that equates to attainable levels of national excellence in virtually all of the research activity submitted, showing some evidence of international excellence."

The trends of these principal performance indicators, provided in Table 1, are shown graphically in Figure 1. Note that all items refer to calendar year, with the exception of financial matters (e.g. external grant income for 2004 refers to the financial year 2004/2005 and so on).

So far as the particular indicators are concerned, the Observatory's total non-DCAL income (approximately £250,000, a preliminary unaudited figure) slightly exceeds the value for external grant income alone (a preliminary, unaudited estimate of £241,000); the number of refereed journal publications is a lower limit to the total number of refereed papers, which is a subset of the Observatory's entire research output; the number of identified media citations is a lower limit to the actual number of mentions of the Observatory or its staff in various mass-media; and the number of Distinct e-Visitors (DeVs) is the number of distinct hosts served by the Observatory's web-site. This too is a lower limit, owing to caching by big servers and sharing or repeat visits from the same IP number. The number of DeVs can also vary significantly, depending on which computer programme is used to analyse the web-traffic. Here, we have chosen the average of two independent estimates, namely 381,000 and 771,000. In future years we plan to record just the lower figure.

Total external grant income during 2004/2005, namely £241,000, was slightly below the target figure of £250,000 set in April 2004, and was again significantly boosted by contributions from the largely HLF-funded telescope domes and historic telescopes restoration project. As a group, the five Research Astronomers at Armagh have continued to bring into the Observatory more external funding in terms of non-DCAL grant income than their gross DCAL-funded salary costs, a remarkable achievement. This statistic alone demonstrates the potential for resonant growth associated with additional research staff. The target for external grant income for 2005/2006 has been set at £200,000, owing to the projected retirement of one Astronomer during 2005. Considering the fierce competition for research grants, this still represents a challenging target.

The number of refereed journal publications in 2004 has shown a substantial increase compared with the level of recent years, a highly commendable result given that the number of core research staff at the Observatory has shown no increase at all. Similarly, the number of identified media citations has remained at a high level, substantially above the target of 200 per year, and the number of DeVs continues to grow. Taken together, these results demonstrate a very satisfactory performance in research output, public profile and the external impact of the Armagh Observatory, despite the near-constant number of research-active staff.

The chosen performance measures (Table 1 and Figure 1) show that the Observatory has maintained a very high level of research activity during the reporting period, has attracted substantial amounts of external income, and has maintained an exceptionally high public profile. For such a small research group, the frequency with which members of staff appear in or are quoted in newspapers and other media is probably second to none.

New TSN Action Plan

New Targeting Social Need (TSN) is an overarching government policy that has the aim of tackling social need and social exclusion. It is intended as a long-term programme to mitigate the problems arising from social need, focusing particularly on issues of unemployment and ways to increase employability; on inequality in fields such as health, education and housing; and on factors that contribute to social exclusion which need a cross-departmental approach.

New TSN is not a spending programme, but a theme which runs through spending programmes and which requires resources to be redirected within such programmes towards areas shown objectively to be in greatest need. Following a decision by the DCAL in 2003 to consolidate the TSN policies of the agencies, NDPBs and Statutory Bodies that it currently supports, the Armagh Observatory and Armagh Planetarium policies on New Targeting Social Need have been incorporated into an overarching DCAL

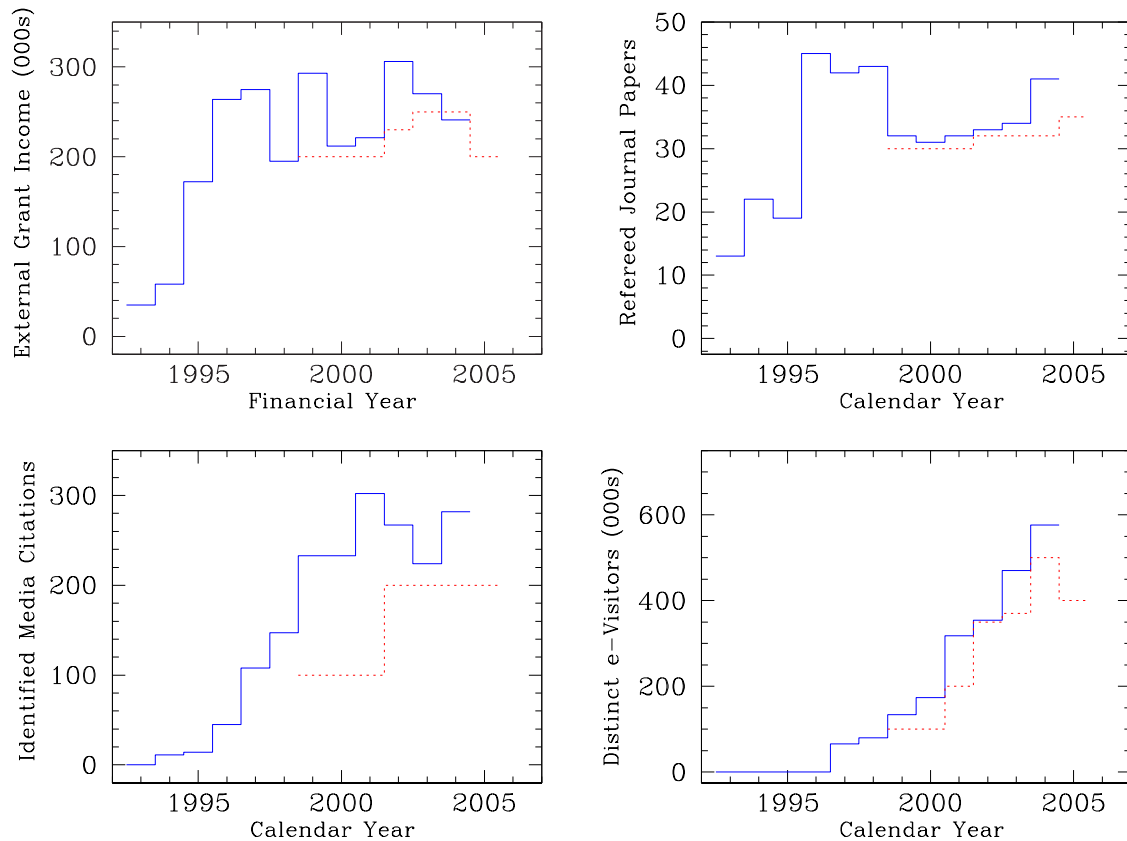


Figure 1: Histograms showing various performance indicators for the Armagh Observatory during the past decade. The Figure shows respectively the variation of External Grant Income (£000s) per financial year, the number of Refereed Journal Publications, the number of Identified Media Citations, and the number of Distinct e-Visitors, all per calendar year. The financial year runs from 1 April to 31 March, so external grant income for 2004 corresponds to the period 1 April 2004 to 31 March 2005 and so on. Dotted lines indicate prior-year Business Plan targets.

policy. For convenience we have continued to make the Armagh Observatory’s New TSN policy available on the internet and in hard copy on request. The New TSN Policy for 2005, which was most recently reviewed in January 2005, is available on the internet at <http://star.arm.ac.uk/TSN.html> and is appended to this Business Plan as Appendix B.

2 Alignment of Armagh Observatory and DCAL Objectives

2.1 Cultural Capital

Cultural Capital is a key theme underlying the DCAL Strategic Plan. It depends on the fact that the largely creative Culture, Arts and Leisure sector produces products not just for immediate consumption and short-term benefits but for long-term utilization and as a contribution to the social and economic development (and external perception) of Northern Ireland as a whole.

2.1.1 Research

The Armagh Observatory’s principal function as an astronomical research institute is to *produce and sustain* Cultural Capital. This work is long-term, and makes a primary contribution to mankind’s accumulated knowledge about the world in which we live.

The activity contributes, within Northern Ireland, to the generation of a more confident, scientifically

literate, informed and prosperous community. It also helps to provide Northern Ireland with a rich scientific heritage and a unique cultural and educational resource.

2.1.2 Education and Public Outreach

An important secondary responsibility of the astronomers at Armagh is to care for and maintain the Observatory Grounds and Astropark, the Historic Library, Archives, and Buildings, and to preserve and display to the best advantage the historic telescopes and scientific instruments. These activities provide a rich addition to the ecclesiastical and built heritage of the City of Armagh. They also provide important synergies with the other specialist Libraries and Museums in the City (another DCAL responsibility), so helping Armagh to achieve a “critical mass” in this area.

The Observatory’s active programme of education and public outreach attracts visitors to Armagh, primarily to the Armagh Observatory Grounds and Astropark, and to the Human Orrery and Phenology Garden. During 2004 approximately 20,000 visitors made use of the Observatory Grounds and Astropark.

Thus, the Observatory’s achievements in astronomical research, as well as its efforts to promote greater public understanding of science, align closely with the DCAL’s aims to widen access to Northern Ireland’s cultural heritage, to create a confident, informed and vibrant community, and to protect, nurture and grow Northern Ireland’s cultural capital for the enjoyment of both present and future generations.

In addition, the Armagh Observatory makes a unique contribution to projecting a positive image of Armagh City and District — and of Northern Ireland — on the world stage, and so contributes to greater awareness and economic prosperity of the whole region.

2.1.3 Benefits of Astronomical Research

1. Astronomy plays an increasingly important role in modern society. As an educational tool it attracts and maintains the interest of young people in science. It provides ‘clean’ examples of the use of science and technology, and makes a major contribution to knowledge of global environmental change.
2. Modern astronomy is an involving, inspirational activity with a unique ability to spark the imagination and to attract young people towards science and engineering. It has an impact that can last a lifetime and inspire future generations.
3. Scientists engaging in basic research contribute immeasurably to the intellectual vibrancy of society. They also help to provide the conditions for a strong R&D base and those for society to participate in, and sometimes lead, scientific and technological projects of global significance.
4. Research into astronomy leads naturally to increased public awareness of science and to the development of a more scientifically literate population. The fruits of astronomical research rekindle our unique ‘ability to wonder’: you can become like a seven or eight year old again.
5. High-level scientific exchange and involvement in joint international projects, puts Armagh and Northern Ireland on the international stage, for example through the Armagh Observatory’s involvement in the Southern African Large Telescope project. Such collaboration also helps to encourage international co-operation and mutual understanding of cultural diversity.
6. The UK and Ireland’s shared cultural heritage of astronomy leads to improved knowledge and understanding of both countries’ significant contributions to this international endeavour, contributing directly to greater mutual understanding and promoting ‘North-South’ and ‘East-West’ collaboration within the British Isles.

2.2 Resonance with Government Policy

The Government has set a 10-year goal to increase the ratio of UK R&D spending to national GDP from 1.9% to 2.5%, with science spending increasing at an average rate of 5.8% in real terms. Northern Ireland, and the DCAL in particular, can help to match this through their support for astronomy.

It is also Government policy to improve science teaching and learning by promoting activities in education and public outreach that lead to greater participation in physical sciences and engineering in higher education. For example, the Office of Science and Technology’s “Science and Society” spending will increase from £4.25M per year in 2005/2006 to over £9.0M by 2006/2007. The Armagh Observatory’s programme of school work experience and summer training (in excess of 100 contact days in 2004), as

well as its other public outreach activities, helps significantly to widen access to science both amongst young people and the general public.

3 Summary

The anticipated parliamentary grant-in-aid for 2005/2006 is £660,000 (Resource Funding), the same in cash terms as in 2003/2004. This very significant real cut in the Observatory's grant-in-aid puts many of the medium to long-term objectives of the Observatory at serious risk. In particular, because a high fraction of the Observatory's overall running costs is related to core items such as salaries and fixed costs such as heat, light, power, insurance etc., the anticipated funding for 2005/2006 will put severe strain on the Observatory's ability even to maintain its planned programmes of research, outreach and public understanding of science for 2005. Such harsh treatment of a scientific institution which has demonstrated a decade of significantly improved performance flies in the face of Government policies that aim to *increase* spending on science and on programmes to encourage young people to consider careers in the traditional 'hard' sciences.

The allocated funds will be directed towards achieving the following principal objectives during 2005/2006, namely to:

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The corresponding targets for these objectives, which together span the Observatory's principal areas of activity (research, education and public outreach, and heritage), are indicated in Table 1.

The key task for the year is to obtain a stable level of core funding and to gain access to additional funds for the recruitment of additional research staff. This is to maintain current activity and to lay a strong foundation for the forthcoming Research Assessment Exercise (2002–2007). The required income (namely £748,400 Recurrent and £25,000 Capital) and projected expenditure for 2005/2006 is shown in Table 2.

A Institutional Background

Vision

The Vision of the Armagh Observatory is:

“To maintain and build on its position as a thriving astronomical research institute, and to continue to expand our understanding of the Universe and of humanity’s place in it.”

The Mission 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.”

The Armagh Observatory (see <http://star.arm.ac.uk/>) is the oldest scientific institution in Northern Ireland, founded by Archbishop Richard Robinson in 1790 as part of his dream to see the creation of a university in the City of Armagh. It stands close to the centre of the City of Armagh together with the Armagh Planetarium in approximately 14 acres of attractive, landscaped grounds known as the Armagh Astropark. The Astropark, which is managed by the Observatory, includes two sundials and scale models of the solar system and the Universe, and features a number of outdoor exhibits and interpretation panels (see <http://star.arm.ac.uk/astropark/>). A new public outreach facility, the Human Orrery (see <http://star.arm.ac.uk/orrery/>), has recently been opened in the Observatory grounds to the south-east of the main building of the modern Observatory.

The principal function of the Armagh Observatory, which is a third-level institution funded by the Northern Ireland Department of Culture, Arts and Leisure (DCAL), is to undertake original research of a world-class academic standard that broadens and expands our understanding of astronomy and related sciences. Current key programmes focus on Stellar Astrophysics, the Sun, Solar System astronomy, and Solar System – Earth relationships including the Sun’s influence on climate and the impact of interplanetary dust, comets and asteroids on the Earth. The Observatory also maintains a unique 210-year long meteorological record and data-bank (<http://climate.arm.ac.uk/>), the longest in the UK and Ireland from a single site, and plays a key role together with the Armagh Planetarium in promoting the public understanding of astronomy and related sciences.

Senior research staff at the Observatory are employed as Research Astronomers on a scale equivalent to the NICS Grade 7, which is roughly equivalent to the level of a university senior lecturer, reader or professor. In the past, postgraduate students have been registered at various UK and other European universities, but they are usually registered at the Queen’s University of Belfast (QUB), which has recognized the Observatory as an approved institution for the supervision of PhD and MPhil. students. This leads to a fluctuating population of around 20 research staff, including students, supported by a pool of 2 technical (computer-related) staff, 1 librarian, 1 group secretary, 1 finance officer, and a senior administrator shared (50%) with the Armagh Planetarium. The 14 acres of landscaped grounds and the Armagh Astropark are maintained by a grounds/meteorological support officer, who is also responsible for taking the daily meteorological readings, and an assistant groundsman.

Research interests of Observatory staff currently focus on (i) Stellar and Galactic Astrophysics (including star formation, astrophysical jets, cool stars, hot stars, helium stars), (ii) the Sun (the dynamic solar atmosphere, chromosphere and corona), (iii) Solar System Astronomy (including celestial mechanics, planetary science, and the dynamical evolution and interrelationships of comets, asteroids, meteoroids and interplanetary dust), and (iv) Solar System – Terrestrial Relationships (including solar variability, climate, accretion of interplanetary dust and NEOs). In addition, Observatory staff participate in an active programme of education and lifelong learning via lectures, popular astronomy articles and interviews with the press, radio and television. Further details concerning the research interests of the Observatory staff may be obtained from the Observatory web-site at: <http://star.arm.ac.uk/>.

The Armagh Observatory participates in the UK Research Assessment Exercise (RAE), held in 1992, 1996, and 2001. This gives external partners, such as UK charities and the research councils, information upon which to base their funding allocations. The RAE also provides a measure by which the Observatory can gauge its performance against corresponding groups in university departments. Staff at the Observatory achieved a Grade 4 in the Physics Unit of Assessment in each of the 1992, 1996, and 2001 RAEs, corresponding to “Quality that equates to attainable levels of national excellence in virtually all of the research activity submitted, showing some evidence of international excellence.” The census date for the next RAE, called “RAE 2008”, is 31 October 2007.

In addition to this primary research role, the Observatory also has an important responsibility to maintain and preserve the fabric of the historic buildings, the library, historic books and archives, and the collection of scientific instruments and other artefacts built up over more than two hundred years of continuous astronomical activity in Armagh. The main historic buildings of the Observatory have unique architectural features and together house one of the most valuable scientific collections, including books, instruments and archives, in Northern Ireland.

The scientific and architectural heritage provided by astronomy at Armagh is a highly significant asset, and the entire collection of scientific artefacts, instruments and historic telescopes spans virtually every aspect of modern astronomy. In many cases, the underlying motivation and reasons for the developments of astronomy at a particular time can be explained with reference to discoveries at Armagh, or to artefacts and other items held within the Library and Archives. This gives astronomers at Armagh a unique opportunity to explain both the development of their subject over more than two hundred years and the context in which modern research is carried out.

In summary, the Armagh Observatory is a modern research institute with a rich heritage. It provides a high-quality research environment and a range of opportunities to explain the reasons for mankind's long fascination with the celestial sphere, extending from roots more than five thousand years ago to the most recent results of the space age. The Observatory's location, conveniently close to the centre of the City of Armagh, means that it is well placed to contribute to a greater understanding of the role of scholarship and research in the development of Armagh and the wider region. It provides opportunities in education and lifelong learning to people of all ages and from all backgrounds, and has an important role to play in explaining and expanding Northern Ireland's scientific and built heritage for the benefit of future generations.

B Armagh Observatory New TSN Action Plan 2005

The Vision of the Armagh Observatory is:

“To maintain and build on its position as a thriving astronomical research institute, and to continue to expand our understanding of the Universe and of humanity’s place in it.”

The Mission 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.”

Who We Are

The Armagh Observatory (see <http://star.arm.ac.uk/>) is the oldest continuously functioning astronomical research institute in Great Britain and Ireland, founded by Archbishop Richard Robinson in 1790 as part of his dream to see the creation of a university in the City of Armagh. It stands close to the centre of the City of Armagh together with the Armagh Planetarium in approximately 14 acres of attractive, landscaped grounds known as the Armagh Astropark. The Astropark, which is managed by the Observatory, includes two sundials and scale models of the solar system and the Universe, and features a number of outdoor exhibits and interpretation panels (see <http://star.arm.ac.uk/astropark/>). A new public outreach facility, the Human Orrery (see <http://star.arm.ac.uk/orrery/>), has recently been opened in the Observatory grounds to the south-east of the main building of the modern Observatory.

The principal function of the Armagh Observatory, which is a third-level institution funded by the Northern Ireland Department of Culture, Arts and Leisure (DCAL), is to undertake original research of a world-class academic standard that broadens and expands our understanding of astronomy and related sciences. Current key programmes focus on Stellar Astrophysics, the Sun, Solar System astronomy, and Solar System – Earth relationships including the Sun’s influence on climate and the impact of interplanetary dust, comets and asteroids on the Earth. The Observatory also maintains a unique 210-year long meteorological record and data-bank (<http://climate.arm.ac.uk/>), the longest in the UK and Ireland from a single site.

What We Do

Astronomy provides a singular perspective on our place in the Universe, addressing fundamental questions such as the origin of the Earth, the origin of Life, and ‘Are we Alone?’. Research into astronomy plays an increasingly important role in modern society, for example by:

- attracting and maintaining the interest of young people in science, and towards a scientific way of thinking;
- contributing to a better understanding of global environmental change, for example global warming;
- predicting the effects of asteroid impacts, and the effects of space debris and meteoroids on artificial satellites.

The research interests of Armagh Observatory staff currently focus on (i) Stellar and Galactic Astrophysics (including star formation, astrophysical jets, cool stars, hot stars, helium stars, star-spots, flares, circumstellar dust), (ii) the Sun (the dynamic solar atmosphere, chromosphere and corona), (iii) Solar System Astronomy (including celestial mechanics, planetary science, and the dynamical evolution and interrelationships of comets, asteroids and interplanetary dust), and (iv) Solar System – Terrestrial Relationships (including solar variability, climate, accretion of interplanetary dust and Near Earth Objects). In addition, Observatory staff participate in an active programme of education and lifelong learning, via lectures, popular astronomy articles, and interviews with the press, radio and television. Further details concerning the research interests of all the Observatory staff may be obtained from the Observatory web-site at: <http://star.arm.ac.uk/>.

Astronomy is a highly creative cultural activity. It enjoys a strong public profile, particularly in the printed and electronic media, and in books and film, for example in Hollywood classics such as *2001: a Space Odyssey* and blockbusters such as *Armageddon* and *Deep Impact*. The fruits of astronomy have inspired artists and musicians, poets and authors, as well as scientists, engineers and philosophers. They

have often provided the inspiration for works of art, musical compositions, and theatrical performances. In summary, the subject provides an invaluable resource for education, entertainment and leisure, being featured in film, television documentaries, books and magazines that are seen or read by millions worldwide.

How We Contribute to New TSN

Astronomy is an involving, inspirational activity with the capacity to attract people, especially the young, towards science, engineering and information technology. The Armagh Observatory seeks to strengthen this interest by promoting wider access to scientific knowledge amongst all sections of the community, and disseminating the results of its scientific research through a high-profile programme of education and public outreach. The principal elements of this policy include:

- attracting visitors to Armagh, primarily to the Armagh Astropark, the Observatory Grounds and Phenology Garden, and the new Human Orrery;
- maintaining and extending the Observatory's unique meteorological record, the longest in the UK and Ireland from a single site;
- maintaining and preserving for future generations the Observatory's *cultural* heritage, for example its listed buildings, library and archives, historic scientific instruments, telescopes and telescope domes, and the landscaped grounds and Astropark;
- providing lectures and presentations to interested individuals and groups that together include people of all ages and from all backgrounds;
- partnership with institutions and organizations having similar public education objectives to those of the Armagh Observatory, for example the Astronomical Science Group of Ireland, the Armagh Natural History and Philosophical Society, amateur astronomy organizations, and university research groups;
- answering technical questions about astronomy from members of the public and disseminating astronomical results to the press, radio and television;
- maintaining and developing a web-site to facilitate access to the latest research findings on astronomy and related sciences;

The Armagh Observatory is fully committed to implement the New TSN Policy. The Observatory encourages a culture in which resources in appropriate areas of its activities and interactions with the public are targeted so far as possible on individuals, groups, agencies, and geographical areas that have greatest social need. In this way, the Observatory contributes directly to Northern Ireland's New TSN Policy and Programme for Government, especially in enhancing access to science, and providing wider choice in education and lifelong learning opportunities for all.

Armagh Observatory New TSN Action Table 2005

Business Area:	Astronomy and Related Sciences
Social Need to be Tackled:	Access to Scientific Knowledge
Desired Outcome:	Increased scientific knowledge, promotion of lifelong learning opportunities amongst individuals and disadvantaged groups
New TSN Objectives:	Targets or Actions and Time-Scales:
<p>Objective 1 Improve opportunities among disadvantaged sections of the community to experience scientific research and learning in a high-technology environment, by:</p> <p>Objective 2 Improve access to Northern Ireland's scientific and cultural heritage, by:</p>	<p>(a) facilitating an ongoing work experience programme for a person with disabilities; and (b) monitoring participation on student programme placements with reference to New TSN.</p> <p>(a) promoting e-access to astronomical and meteorological information; and (b) encouraging visits to the Observatory by people from socially disadvantaged areas or scientifically disadvantaged backgrounds.</p>

Armagh Observatory
 January 2005