

A modern vision: Eri

Eric Mervyn Lindsay masterminded the development of Armagh Observatory in the middle of the 20th century, building it into the centre for research and education that it is today. **John McFarland** recounts Lindsay's story, of how one man's drive and ambition forged international collaborations that presaged today's world of shared research facilities.

Eric Mervyn Lindsay was born near Portadown, County Armagh, on 26 January 1907. He was the seventh and youngest son in Richard and Susan Lindsay's family of 13 children. Lindsay attended the King's Hospital School in Dublin, where he was taught mathematics by Arthur E Lyster, a former Assistant at Dunsink Observatory (Wayman 1987). It seems certain that Lindsay's innate interest in astronomy was nurtured during this time. He went on to enter the Queen's University of Belfast, graduating with a BSc in physics in 1928 and a MSc in 1929.

Lindsay then travelled to the Harvard College Observatory (HCO), arriving in the middle of September 1929 to commence graduate research for a doctorate on the distribution of stars in the southern sky under the Director, Prof. Harlow Shapley. Lindsay's principal thesis advisor was Bart J Bok and his thesis examiners included such illustrious names as Donald Menzel, Ernst Öpik, Cecilia Payne-Gaposchkin and Harlow Shapley, as well as Bok. During his oral examination, endeavouring to lighten the proceedings, Ernst Öpik asked Lindsay: "What is the colour-index of a Hollywood star?" Lindsay's only response was a vacant look from, as he later acknowledged, a mind that had totally seized (Lindsay 1972).

Lindsay obtained his PhD in 1934 (Lindsay 1934) whereupon he was offered the position of chief assistant to director John Stephanos Paraskevopoulos at the Boyden Station of the HCO, in Bloemfontein, South Africa. He held this post until 1937, when he became Director of Armagh Observatory, where he stayed until his death on 27 July 1974.

On 20 May 1935 Lindsay married Sylvia Mussells in Cape Town. Sylvia was a former assistant astronomer at the HCO and discoverer of the first dwarf galaxy, the Sculptor system (Shapley 1937, 1938a and 1938b). She was a daughter of George and Stella Mussells and was born in Danvers, Massachusetts, graduating from Radcliffe College in 1930. Her sister Muriel was married to Carl K Seyfert, known for the Seyfert galaxies, with their bright nuclear regions displaying abnormally large amounts of high-velocity gas in their central regions (Seyfert 1943). The Lindsays went on to

Abstract

The seventh director of the Armagh Observatory, Eric M Lindsay, had a vision for Irish astronomy that was at least a generation ahead of his time. He was foremost in recognizing the importance of establishing astronomical observatories at well-equipped "dark" sites with good astronomical seeing; he was instrumental in setting up the world's first international astronomical observatory, arguably a forerunner of ESO; and he supported and encouraged the public understanding of astronomy and its heritage in Armagh, as well as its wider educational potential. This year marks the 30th anniversary of Lindsay's death and it is appropriate to review his legacy to astronomy, the City of Armagh, and the broader astronomical community, by describing some of his human and scientific achievements.

have just one child, Derek Michael Lindsay, born in 1944. He eventually became professor of chemistry in the City College of the City University of New York. Derek died in America in 1999, six months before his mother Sylvia's death in December at the age of 92.

Return to Armagh

The period leading up to Lindsay's appointment as director of Armagh Observatory marked the end of a particularly low point in the history of the Observatory, with little funding and against a background of significant political difficulties in Ireland.

The fifth director, Joseph A Hardcastle, a grandson of Sir John Herschel, had succeeded John L E Dreyer in 1917. On 17 March 1917, Hardcastle had informed the governors of Armagh Observatory that he hoped to take up office towards the end of May that year. However, shortly before the Hardcastles were due to leave their home in Crowthorne for Armagh, Hardcastle was taken seriously ill and was unable to make the journey. Instead he travelled to his father's home in Oxted, where his condition deteriorated and he died on 10

November 1917 at the age of 49 (H[ollis] 1918, Moore 1967). Mrs Hardcastle and her family did, however, settle in Armagh and remained at the Observatory, caring for the residence, performing meteorological work, and checking the meteorological records for Herbert H Turner of the University of Oxford. Mrs Hardcastle left Armagh in October 1918 (Bennett 1990).

Although Hardcastle's successor, the Revd William F A Ellison, appointed in 1918, took to his new duties with enthusiasm, it was clear that the position would be an uphill struggle for him. During this period it is difficult to avoid the impression that the Armagh Observatory had become an amateur establishment, albeit one that was, by amateur standards, exceptionally well equipped (Bennett 1990). By the end of Ellison's term of office, the Observatory was extremely run down, the last official additions of new equipment having been the 10-inch Grubb refractor erected in 1885 (Corvan 1975) and the 18-inch Calver reflector donated by Ellison.

When Ellison died in 1936 and the only post in astronomy in Ireland became vacant, Eric Lindsay was immediately interested in the opportunity to return to Northern Ireland and his application was successful. Lindsay's arrival in November 1937 followed the closure the previous year of Trinity College Dublin's Dunsink Observatory, but it also coincided with the founding of the Irish Astronomical Society (IAS) by a group of enthusiasts. Lindsay thus saw an opportunity, on the one hand, to draw the two great Irish observatories together, and on the other to strengthen the links between amateur astronomers throughout the island. He was soon deeply involved in discussions with the IAS and other bodies, while the Observatory continued to be run in a somewhat amateurish way. For example, The Observatory Minute Book for 1939 records that, due to a technical oversight, ratification of Lindsay's appointment did not come until 1939, when at a governors' meeting on 3 July the chairman announced that he had nominated Lindsay as the astronomer at the Armagh Observatory at 11 a.m. that day.

Research programme

Lindsay's vision was for the Armagh Observatory to achieve high standing as a modern

Eric Lindsay at Armagh

1: Eric Mervyn Lindsay on the occasion of the award of the OBE in 1963. (Courtesy of Patrick Corvan.)



“Where there is a shadow, somewhere there must be light.” Eric Lindsay

astronomical research institution, and he worked tirelessly towards this objective. An element of his vision was for the Armagh Observatory to have access to the latest astronomical data using forefront technology, while collaborating with other observatories and research groups. As Bok later remarked (1975): “Lindsay was one of the first astronomers to have had the vision of what access to a

powerful telescope in southern latitudes could mean to a northern observatory plagued by rainy skies.”

In an Observatory Minute Book entry from 17 April 1939, we read that Armagh was to be supplied with research material from Harvard Observatory, and that the first shipment of photographic plates had arrived in Armagh from the Boyden Station in March 1938,

together with a pair of mounted binocular microscopes on loan from Harvard to examine the plates. Lindsay’s main research field at this time was the study of the structure of the southern Milky Way. Also recorded in this minute was the establishment of the first Department of Astronomy at Queen’s University of Belfast (QUB) with Lindsay as the head of the department. Partly as a result of Ellison’s efforts in 1928 (Bennett 1990 p172), but reinforced by Lindsay’s appointment, the Observatory was to receive a guaranteed income from a government grant, initially of £300 per annum (rising from £100 per annum) for a period of five years, plus half as much again for capital expenditure.

Lindsay had certainly got off to an excellent start in his plans to elevate the Armagh Observatory to a place of prominence. The 1938 amendment to the original 1791 Act of Parliament setting up the Observatory enabled the membership of the Observatory’s board of governors and guardians to be increased so that there would now be, in addition to the archbishop of Armagh and the dean and chapter of the Anglican Cathedral of Armagh, five lay members instead of two, one to be appointed by the governors on behalf of the government, and one by QUB. The late W H McCrea, then professor of mathematics at QUB, served as a governor from the late 1930s until at least 1944. Towards the end of this period McCrea joined the Blackett team at the Admiralty where Lindsay had also been seconded (Mestel 1999).

In 1940 Lindsay attended the Harvard summer school, where he made contacts for future observing programmes in South Africa and for scientific material to be brought to Armagh for research. Initial discussions had been made in this area as early as 1937, and some preliminary photographs already had been sent to Harvard from South Africa. A final programme, a study of the Carina region with regard to problems concerning the possible existence and features of a local cluster of stars, was drawn up and sent to the Boyden Station. This would be a collaboration between Armagh and Harvard astronomers. Most of Lindsay’s research was then on reducing the counts of 3 million stars, being a continuation of his work which had been published as a tercentenary paper in the *Harvard Annals* (Lindsay and Bok 1937).

Wartime service

During the early years of World War II, the military had some use of the Observatory (part of the outhouses were used as a gas storage

chamber and the Royal Engineers made ordnance surveys). However, the main Observatory building – the astronomer’s residence – was one of the buildings in Northern Ireland that the military was instructed not to commandeer. An entry in the *Observatory Annual Report* for the year 1940–41 notes that the first research studentship at the Observatory was established with the appointment of Miss Moira L Meredith, one of Prof. Ditchburn’s students from Trinity College Dublin. Miss Meredith later received a MSc from Trinity College Dublin (Meredith 1942), the first degree awarded for work carried out at Armagh Observatory.

Lindsay’s duties during this period included his QUB Department of Astronomy teaching quota, training of the University Air Squadron, and supervising the studies of the RAF pre-entry candidates. At a governors’ meeting on 8 September 1943, Lindsay referred to a letter from the Admiralty offering him a temporary war post as a principal scientific officer in operational research under Prof. Patrick M S Blackett; the governors readily agreed to this Whitehall-based appointment (see also Grew 1975). In the *Observatory Report* for the period October 1944 to June 1946, it is noted that Lindsay was released from the Admiralty on 11 May 1946; he was back at the Observatory the following day.

The Armagh–Dunsink–Harvard (ADH) Telescope

By June 1945 Lindsay had applied to the Parliamentary Grants Committee of the Royal Society for the sum of £15 000 for the construction of a Schmidt-type telescope in the southern hemisphere. The Committee recommended to the Council of the Royal Society that the application be accepted and that means be taken to obtain the sum. The Council applied to the Imperial Treasury for the finance. In the meantime the Post-War Needs Committee decided to incorporate the Armagh scheme in its general plan for astronomy and the sum of £15 000 was increased to £25 000. This telescope, and any others that might be decided upon, would be for the use of all British observers. However, while this was a great advance, it did not satisfy Lindsay’s vision for the development of the Armagh Observatory. Lindsay travelled to America to visit the staffs of the United States Naval Observatory, Georgetown University Observatory, and the Howard University Observatory, all in Washington DC. He also visited the Harvard College and Warner and Swasey Observatories.

At a governors’ meeting on 29 August 1946, Lindsay submitted a scheme drawn up by Harlow Shapley and himself for the joint operation by the Armagh, Dunsink and Harvard Observatories of the 32/36-inch Baker–



2: The Armagh Observatory, showing Comet Hale-Bopp on 28 March 1997. (Courtesy of Mark Bailey.)

Schmidt ADH telescope. £5000 each was granted by the Belfast and Dublin governments, with the remainder, £15 000, donated by Harvard. The three observatories would share equally in the observing time. The telescope was to be located at the Boyden Station of the Harvard College Observatory, in Bloemfontein, South Africa, with the infrastructure to be maintained by Harvard.

Harlow Shapley wrote that, in his opinion, the signing of the ADH telescope agreement between the governments in Belfast and Dublin and the Harvard Observatory was the most valuable written document in the Harvard archives: “Its importance lies in the fact that it is jointly signed by the Catholic Bishop of Dublin and the Protestant Archbishop of Armagh, North Ireland – a document unique in history, I believe, and symbolic of the willingness and desire to cooperate across religious and political boundaries when led by the stars,” (Shapley 1948a). In fact, the ADH agreement in 1947 represented the first intergovernmental agreement between the two jurisdictions in Ireland, and was not signed by the Catholic Bishop of Dublin, but by the Protestant Archbishop of Armagh, Dr John Gregg, on behalf of Armagh Observatory, Mr P de Brún and Mr D Macgrianna on behalf of the Dublin Institute for Advanced Studies (DIAS), and Mr E Reynolds on behalf of Harvard University. Shapley also listed the creation of the ADH telescope as one of his nine astronomical highlights of 1948, writing: “The telescope’s function as an instrument of goodwill and international co-operation is generally recognized” (Shapley 1948b). It is also generally recognized that the reopening of the Dunsink Observatory and the

founding of the Dublin Institute for Advanced Studies’ School of Cosmic Physics can be partly attributed to Lindsay’s support and encouragement, working behind the scenes (Brück 1975).

Lindsay’s long association with South Africa and his energetic support first for establishing the ADH telescope at the Boyden Station, and then in 1955 with the establishment of the Boyden Observatory as the first international observatory, involving Northern Ireland, Eire, Belgium, Germany, Sweden and the USA, led him in that country to become something of a legend in his own time (Moore 1975). A brief account of Lindsay’s influence on South African astronomy can be found in the article by Jarrett (1975).

The European Southern Observatory

Not only was the ADH telescope the first large Schmidt camera to be mounted in the southern hemisphere, but the Boyden Council, established in 1955, was arguably the forerunner of the European Southern Observatory (ESO). In January 1954 six European countries, including Britain, issued a statement expressing a desire to construct an international observatory in the southern hemisphere. South Africa was initially proposed as the site because several European countries already had facilities there. It was felt that with a collective approach an observatory rivalling the great western United States observatories could be achieved. Also, the southern skies contained several important astronomical objects such as the Magellanic Clouds and the galactic centre. Walter Baade proposed a 120-inch reflector and a 48-inch Schmidt telescope as the main instrumentation. Britain withdrew from the project in favour of



3: Lunar crater Lindsay, located at 13.3°E longitude and 7.0°S latitude, is the large crater in the centre of the picture. (Courtesy of Mark and Nigel Stronge, East Antrim Astronomical Society.)

the Anglo-Australian Observatory. Ultimately, however, after extensive site-testing in South Africa and South America, it was decided to erect the new European Southern Observatory at La Silla in Chile, where there was considered to be superior atmospheric seeing conditions, and the official dedication of the ESO buildings took place in March 1969 (Blaauw 1988–91 and Blaauw 1991).

Improving facilities at Armagh

At a governors' meeting on 27 November 1946, Lindsay expressed his wish to be able to make useful observations from Armagh as and when weather conditions were favourable. He formed the plan to convert the 18-inch Calver reflector, originally donated in 1918 by his predecessor, Revd Ellison, into a Schmidt-type telescope. In 1947 a grant of £1100 was given by the Royal Society to convert it into a 12/18-inch Schmidt telescope and a local man, Mr Tom Scott, later agreed to provide £800 for a dome – to be known as the Tom Scott Dome – to house the new telescope. This was the first Schmidt telescope to be erected in the British Isles.

Turning to staff, the Astronomer's Annual Report of 24 October 1947 noted that a joint Armagh Observatory–Queen's University Appointments Committee had recommended that each year the Observatory should apply to the government for the sum necessary for the efficient running of the Observatory and make known the level of staffing required, with appropriate salary scales for the director and staff. The Appointments Committee should be given authority to appoint the staff and, when a vacancy occurred, to appoint the director. In the latter appointment the chairman of the Committee, the Archbishop of Armagh, would have the power of veto.

By the late 1940s not only had Lindsay secured access to a new, wide-field telescope in the southern hemisphere, strengthened scientific collaboration with Dublin and reintroduced observational astronomy at Armagh, but he had also identified a route to expand the number of staff. Lindsay duly reported to the governors' meeting of 22 March 1948 that the



4: W H McCrea and E M Lindsay in the grounds of the Armagh Observatory in August 1960.

Appointments Committee had appointed Dr E B Armstrong, formerly a QUB physics lecturer, to senior assistant, and Dr Ernst Öpik, formerly director of Tartu Observatory, to research associate. There is some confusion over Öpik's position at Tartu (Joeveer and Saar 2003); in essence, he had been deputy research director. Öpik was one of the foremost astronomers of his generation and had spent four years in a displaced persons camp at Hamburg and Pinneberg. The Foreign Office gave considerable help in obtaining his release and persuading the International Relief Organisation to pay the passage of himself and his family to Armagh. Armstrong and Öpik's appointments were effective from 1 January 1948. In his 1948 annual report, Lindsay commented that after 157 years the staff of the Observatory had now increased from one to three astronomers.

Armagh Planetarium

Efforts to establish the Armagh Planetarium illustrate Lindsay's tenacity in pursuit of his goals. In the 1940s many requests were received from the general public for visits to the Observatory. Numbers had grown to about 4000 visitors each year, and this without advertising. With the limited staff and their focus on astronomical research, Lindsay concluded that a planetarium would be the way to cater for the growing public interest in astronomy.

Lindsay first considered dedicating a planetarium in Armagh as a memorial to the American troops who had been stationed in Northern Ireland during World War II. A meeting had been convened in late 1943 with the then prime minister of Northern Ireland, Sir Basil Brooke, and the ministers of education and finance. Although the prime minister expressed his personal support for a planetarium, he felt that with wartime pressures such

a venture would need to have considerable public support. A planetarium committee was formed and held its first meeting on 30 March 1944 in the, now demolished, Armagh City Hall. However, after many fundraising efforts locally and also by Lindsay in the USA over the course of the following two decades, funds remained insufficient.

Lindsay had found himself having to concentrate more on Observatory matters during this period, seeking more staff and research and library facilities. He had resigned as head of the QUB Astronomy Department in July 1953 at the end of a six-year QUB lecturers' financial agreement, citing his increasing load of administrative work and scientific research. This decision meant a significant reduction in the income of the Observatory of some £450 per annum.

It was not until a meeting between Lindsay, the Armagh town clerk, Mr Don Ryan, and officials from the Ministry of Commerce in November 1964 that the planetarium prospects began to look brighter. The Ministry eventually agreed to fund 60% of the total cost of the facility provided it was a tourist development project and that one or more public bodies would contribute the rest. After negotiations with the Armagh city and county councils, the remainder of the funding was agreed; on 4 March 1965 it was announced that a planetarium was to be constructed in Armagh. Things moved swiftly: the planetarium was constructed under the guidance of Patrick Moore, its first director, and took its first visitors in February 1968. Following Patrick Moore's resignation shortly after the official opening on 1 May 1968, Thomas Rackham served as director until 1971. Subsequent directors have been Terence Murtagh (1971–90), Ian Griffin (1990–95) and Thomas Mason (1996–present).

As the Armagh Planetarium was nearing completion, Lindsay returned to an earlier idea of his, the creation in Armagh of an Institute for Advanced Studies. There had been several unsuccessful attempts to establish a university in Armagh over the previous four centuries, the latest by the founder of the Armagh Observatory, Archbishop Richard Robinson, in the late 18th century. Turning his gaze to the Archbishop Palace in Armagh, a substantial Georgian building in 150 acres of land, Lindsay saw the ideal location for his Institute. The church authorities were sympathetic and considered allowing the building and 20 acres of land to be used. However, there was a strong government commitment for the establishment of a new university in Ulster at Coleraine, and Lindsay's plan did not come to fruition (Bennett 1990 p206).

Astronomical research

Lindsay's main research interest was on the structure of the southern Milky Way and other

southern hemisphere objects, in particular the Magellanic Clouds. In their tercentenary paper (Lindsay and Bok 1937), Lindsay had carried out star counts between the magnitude limits 10.0 and 13.5 on 947 Metcalf and Bache plates taken between 1914 and 1921 at the Boyden Station when the station was located in Arequipa, Peru. The plates covered a total area of approximately 10 000 square degrees of the sky and Lindsay counted more than one million stars.

Lindsay was one of the first, from these star counts, to demonstrate the full extent of the large dark nebula in Ophiuchus at around galactic longitude 340° (Bok 1975). In this work the regions of the southern sky at low galactic latitudes remained incompletely surveyed; Lindsay carried out further star-counts in a separate investigation which was essentially completed in 1940 but the results were not published for a further 10 years (Lindsay 1951). Lindsay published many papers concerning the Magellanic Clouds, some with the present author, a selection of which includes: discovering and classifying star clusters in both clouds (Lindsay 1956a, Lindsay 1958, Shapley and Lindsay 1963, Lindsay and McFarland 1971); discovering and classifying emission objects in both clouds (Lindsay 1955, Lindsay 1956b, Lindsay 1961, Lindsay 1963, Lindsay and Mullan 1963, Andrews and Lindsay 1964, McFarland *et al.* 1975); discovering and cataloguing variable stars in the Large Magellanic Cloud (Lindsay 1974a and 1974b) and investigating the connection between the tidal arm and the wing of the Small Magellanic Cloud (Lindsay and McFarland 1970). Hodge (1975) later commented: "Lindsay's pioneering studies of the star clusters of the Magellanic Clouds produced remarkably complete and authoritative catalogues of these important objects."

The Irish Astronomical Journal

The formation of the Irish Astronomical Society coincided with Lindsay's arrival at Armagh. In 1949 the Society decided to publish its own magazine, the *Irish Astronomical Journal* (IAJ). The chief purpose of the journal was the communication of non-technical reviews of modern astronomy and related topics. The first issue of this quarterly journal was published in March 1950 under the editorship of E J Öpik. Lindsay was a member of the IAJ's editorial board and the president of the IAS at the time of the journal's first appearance (Lindsay 1950). He remained a faithful supporter of and contributor to the IAJ, which remained in production until 2000, albeit with a period of cessation of publication in the late 1950s and early 1960s (Gunn and McFarland 2000).

Appreciation

Eric Mervyn Lindsay was an exceptional

individual, of great charm and patience, and with the facility to convey his enthusiasm and love of astronomy to people from all walks of life. Moreover, as related by Millman (1975) he was not above the occasional practical joke. In McCrea's words (1975) he "was a devoted astronomer and a devoted Irishman", and he left his mark not just in his professional work but also in the amateur astronomical community, where through the Armagh Planetarium and his work with the IAS and the IAA he was regarded as the father of Irish amateur astronomy (Beesley 1975, Corvan 1975).

For many he was, in the words of Dunning (1975), "a *lumen in coelo*, a shining light in a sad period of darkness in the history of Northern Ireland", words reflecting those of Lindsay himself (cited by Grew 1975): "We do not know the truth. But sometimes we get a glimpse of the shadow of the truth. And where there is a shadow, somewhere there must be light."

During his lifetime his achievements were recognized by being elected a Fellow of the Royal Astronomical Society (1937) a Member of the Royal Irish Academy (1939) and being awarded an OBE in 1963. At the General Assembly of the International Astronomical Union in Grenoble in 1976 it was agreed that a lunar crater be named after Lindsay. The crater selected was formerly known as Dollond C, 33 km in diameter, and situated between Mare Tranquillitatis and Mare Nubium (Millman 1978). In a footnote to Millman's letter, Öpik estimated that the crater was formed by the impact of an asteroid 1.6 km across about 4×10^9 years ago.

Following the National Astronomy Meeting in April 2003 held at Dublin Castle under the auspices of the Astronomical Science Group of Ireland (ASGI), a proposal to create a Lindsay Scholarship was enthusiastically supported by the ASGI at its autumn meeting at the National University of Ireland Maynooth in September 2003. It is envisaged that the Lindsay Scholar would carry out a PhD research programme, registered at any ASGI-affiliated university, at either Armagh Observatory or DIAS on a project of common interest to help stimulate collaboration between astronomy groups in Northern Ireland and the Republic of Ireland. The first Scholar would be based in Armagh starting on 1 October 2004, and the second at DIAS. In future years, assuming the availability of sufficient funds, the Scholarship would alternate between the two institutions. ●

John McFarland, Armagh Observatory.

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