

WILLIAM MARSHALL SMART

William Marshall Smart, Regius Professor Emeritus of Astronomy in the University of Glasgow, was born on 1889 March 9, in Doune, Perthshire. He was the son of Peter Fernie Smart and Isabella Marshall Harrower, the eldest of four brothers and one sister. The life of a small Scottish town at the end of the 19th century did not offer great material benefits. Of these childhood days, he wrote: ‘The horrors of the debtors’ prisons and the later humane legislation relating to debtors were not forgotten by the last Victorians. The result was the adoption of the general principle that “No article should be bought unless there is money to pay for it.” My parents brought the family up strictly on this principle – to the contentment of all.’ But the sterling values of thrift, of the belief of family ties, and of faith in the efficacy of hard work and education made a solid foundation upon which to build a distinguished academic career, and a personal life of rich fulfilment.

After early schooling in the Doune parish school, the young William Smart went to the McLaren High School in Callender, where his interest in science and mathematics was aroused by a teacher, James Leckie. He early showed his academic abilities by being placed first in the County Council Bursary Examination in 1903. In 1906 he proceeded, with a Glasgow Perthshire Society Bursary, to Glasgow University. At the university, he read Mathematics, Natural Philosophy (Physics) and Chemistry, receiving the Cunninghame Medal for Mathematics and the Breadalbane and Ferguson Scholarships.

For Astronomy, which he took as a subsidiary subject, his teacher was Ludwig Becker. His interest in the subject must have been aroused, for on graduation from Glasgow University with First Class Honours in 1911, he became a scholar of Trinity College, Cambridge, and holder of the Sheepshanks Exhibition in Astronomy. At Cambridge, he took pure and applied Mathematics (including Astronomy), achieving a First in Part I of the Mathematics Tripos, and becoming a Wrangler in Part II. He was awarded the Tyson Medal, and graduated in 1914. In 1916, he received the Rayleigh Prize.

At Cambridge, the influence of H.F. Baker led to an early emphasis on celestial mechanics. The first Trojan asteroid had been discovered in 1906, and the hitherto purely academic triangular solution of Lagrange now had some practical significance. Smart’s first paper to the RAS (which appeared in *Memoirs* for 1917) was a study of the librations of Trojan planets. His subsequent original contributions to

celestial mechanics were not extensive – a paper in 1921 excluding the possibility that the excessive rate of revolution of Mercury's perihelion could be due to an undiscovered planet at the triangular point, and a paper in 1925 on the evolution of binary star systems as a result of mass-loss by radiation. Both these papers are now 'dated', although at the time when they were written the problems appeared significant. However, he kept an interest in celestial mechanics, and near the end of his academic career (in 1953) he published *Celestial mechanics*, in which he gave a masterly account of the principles of the subject, which thus became accessible to readers who did not share with him the benefit of a rigorous mathematical training.

If it had not been for the First World War, he might have remained with celestial mechanics. As it was, he left Cambridge in 1915 for the Royal Naval College, Greenwich. A year later, he was on active service, as Instructor-Lieutenant, serving on HMS *Emperor of India*, a flagship of the division of battleships of the Grand Fleet; and he remained on active service until the end of the war. Afterwards, he would remember his naval experiences with affection, and more than a touch of nostalgia. No doubt he remembered with advantages – but he clearly felt his time on active service to have been an important part of his life. To someone who knew him only much later in his life, he seemed always to be at ease in any company, and made others feel at ease as well.

As a result of his wartime service, he acquired a life-long concern with navigation. His first paper to *Monthly Notices*, in 1919, was on the simplification of tables for nautical navigation, a paper that bore fruit in his publication (with Cdr F.N. Shearme, RN) of the *Admiralty manual of navigation* (1922) and *Position line tables* (1924). Coincidentally, his last paper to *Monthly Notices* (in 1946) was also on a navigational problem – the correction of the departure formula for the spheroidal shape of the Earth. In between, he had written four books on navigation; and when he was nominated as Halley Lecturer in 1941, he chose as his topic 'Sea and Air Navigation'. The Second World War found him teaching navigation once more – this time to RAF Cadets on crash courses at Glasgow University.

To this aspect of his work one should add what is probably his most famous book – *Spherical astronomy*. First published in 1931, it has run to many editions, and is still on the current lists. To the present generation of young astronomers, 'Smart' means *Spherical astronomy*; for they know that, when they are forced to consider such troublesome matters as coordinate systems, time, precession and the like, they will find in 'Smart' a clear and straightforward explanation. His experience in teaching navigation to non-astronomers is, I suspect, one reason for the great success of this book.

In 1919, William Smart returned to Cambridge as John Couch Adams Astronomer and Chief Assistant at the University Observatory, then under the direction of A.S.Eddington. The post was a much-coveted one; but it carried with it an obligation to pursue, as far as was practicable, observational programmes with the main working telescope of the Observatory, which at that time was the Sheepshanks 12-inch coudé refractor. And so, in 1921, he published (with H.E.Green) a paper on photographic photometry of Nova Cygni 1920. This was followed, from 1929 to 1937, by eight papers on photometry with sodium/argon and potassium/argon photoelectric cells. Most of the objects observed were variable stars. On the Sheepshanks telescope, the limiting magnitude was about +5 mag, and so the observations themselves have long since been superseded. But this was pioneer work, characterized by care in reduction and minute attention devoted to reliable evaluation of sources of error. In his book *Combination of observations* (1958) his experience of practical problems is evident.

In 1903/4, A.R.Hinks and H.N.Russell had taken a set of parallax plates with the Sheepshanks telescope. Smart decided to use these as a set of first-epoch plates for proper motion studies. He began an extensive programme (with H.E.Green) of second-epoch plates, using the 'back-to-back' method whereby one plate is exposed through the glass. The reliability of this method was carefully assessed in a paper in 1921, with proper motions determined for the Pleiades. Comparison with Schlesinger's proper motions (in 1925) gave the satisfactorily-small mean differences of only $0.35''/\text{century}$ in α and $0.07''/\text{century}$ in δ . Ten papers dealing with observations of proper motion appeared in *Monthly Notices*. Smart's last research paper, in 1941, was on the systematic corrections to the proper motions of the *General catalogue*.

But his major work, for which he will be best remembered, concerns the analysis of the systematic aspects of the observed motions of the stars, from both proper motions and radial velocities. In 1919, Eddington (fresh from his triumph at Sobral) was beginning to move in the direction of astrophysics and cosmology. However, at Greenwich he had been involved with proper motion and radial velocity observations, and he had distilled his considerations of stellar kinematics in his first book, *Stellar movements and the structure of the universe*, published in 1914. It must be remembered that in 1914 the existence of the Galaxy as a *dynamical* entity was by no means certain; Fig. 1 of Eddington's book shows the Sun at the *centre* of the Galaxy. Eddington had proposed the 'two-stream' model for representing the anisotropy of stellar motions, while shortly afterwards K.Schwarzschild proposed the alternative 'ellipsoidal' model.

Now it is arguable whether the ellipsoidal hypothesis had any more firm a physical basis than the two-stream hypothesis; from the point

of view of modern density-wave theory both models seem naive. But this is using hindsight. Smart's first paper on this subject appeared in 1923 – an analysis of the Cambridge proper motions in terms of the two-stream model. He was to remain faithful to this model throughout his career, and he was at pains to point out that, while the two models are not identical, there are (under certain circumstances) definite relationships between the parameters of the two models.

His monumental work on stellar kinematics comprises over thirty papers from 1923 to 1940, with occasional joint authorship with H.E.Green (Cambridge), T.R.Tannahill (Glasgow) and, on one occasion, S.Chandrasekhar. The principal methods and some of the results were brought together in a text-book called *Stellar dynamics* (1938). This soon became a standard text, and was brought up to date and re-issued in 1968 under the more appropriate title *Stellar kinematics*.

His Presidential Address to the RAS in 1951 was entitled 'The First Half of the Twentieth Century: A Partial Review'. In it he said 'I think that there is a tendency at the present time to be too much absorbed by the many speculative aspects of astronomy, however fascinating these may be, and to neglect in our general conceptions much of the patient work in fundamental astronomy carried out quietly and almost unobtrusively in many of the observatories scattered over the globe, and on which the whole structure of our contemporary knowledge is reared'. I hear an echo of the frugal days of his childhood in Doune. For a speculative theory is in a sense a mortgage to the future; is not the way of probity in scientific research to establish each foothold as firmly as possible before proceeding to the next step? This attitude shows itself most clearly throughout his work in his insistence on mathematical rigour. I recall his saying to me on one occasion 'Remember, my boy, once you have written down your equations, you must cease to be a scientist, and become a mathematician'. (I am abashed to recall that I countered with an opposite quotation from Eddington – for whom he had the greatest respect.)

In 1937, Smart left Cambridge to become Ludwig Becker's successor as Regius Professor of Astronomy in the University of Glasgow. It was only in part a homecoming. From his sojourn south of the border, he had acquired an English accent and a fondness for the game of cricket. He was proud of his Scots ancestry, but he had no patience with what he considered to be peculiar Scottish pretensions. In particular, he was a severe critic of the quality of Scottish education, which, rightly or wrongly, he considered to be on the decline. But he was no mere passive critic; for fourteen years he sat as a governor of Morrison's Academies, Crieff.

There is no doubt that he was very disappointed with the situation that he found in Glasgow. The University Observatory (which covered

both meteorology and astronomy) had been built just a century before, on Dowanhill, then a distant suburb of Glasgow, but now right within the expanded city. The scientific work of the observatory had come almost to a standstill, and the buildings were in a very poor state of repair. In addition, pressure was being applied from certain quarters to have the Professorship of Astronomy reduced to a lectureship, on the grounds that astronomy was not (or should not be) an autonomous university discipline.

The Chair was saved. But, faced with this unpromising situation, Smart decided to abandon the old observatory. The University sold the site, and with a fraction of the proceeds built a smaller observatory in University Gardens, at the main university site on Gilmore Hill. It was a students' observatory, with a 7-inch equatorial refractor and a small transit instrument. The building also housed the astronomical library from the old observatory, and provided, for the Professor and his Assistant, accommodation which (by modern standards) was spacious in the extreme. Characteristically, no room was provided for a secretary or typist. Professor Smart always wrote his letters by hand, usually with a simple pen and inkstand. To him, this was a matter of courtesy. The new observatory was opened on 1939 April 17, the guest of honour being Sir Arthur Eddington.

By this time, there was already a small graduate school under Professor Smart, and he was beginning to make his mark on the undergraduate teaching at the university. Then came the Second World War; and the activities of the Department of Astronomy were once more curtailed. This was really the end of Smart's research career. While, after the war, the department saw some modest expansion, and while the name of 'Smart' could still bring to Glasgow from Europe established astronomers interested in stellar kinematics, he published nothing himself after 1941 (except for the paper on navigation already mentioned) although he maintained a lively and well-informed interest in current developments over a wide range.

It is easy to see in the War a cause for this premature cessation of research. Certainly the war came at a crucially bad time for the development of astronomy in Glasgow. But there was more to it than that. Astronomy after the war was just not the same! The radio astronomers, in making the headlines, were doing important work – but they could hardly have any interest in precise positional astronomy when to them an 'accurate' position meant $\pm\frac{1}{2}^\circ$. In other fields of astronomy, the 'speculators' were taking over. I do not say this pejoratively. To everything there is a season, and the enormous advances in astronomy during the last three decades owe at least as much to imaginative speculation as they do to precise observation and rigorous analysis.

In this turmoil, stellar kinematics lost its identity, to become just a part of a complex mosaic of observation and theory related to the formation and evolution of stars and galaxies. So far so good – but I dare to say that there have been many times, of recent years, when much work would have been saved, and many false trails ignored, if we had had more of Smart's cautious, rigorous approach.

Be that as it may, this new astronomy was a world in which he could not be at ease. But neither could he be idle. To the last years of his tenure of the Regius Chair, we owe a series of technical books (*Celestial mechanics; Foundations of analytical geometry; Combination of observations*) and additions to his long roster of popular books (*John Couch Adams and the discovery of Neptune; The origin of the Earth; Some famous stars* and (later) *The riddle of the Universe*).

He was much sought after as a lecturer. Over the years, his official lectureships included Thomson Lecturer, Aberdeen; Elder Lecturer, Glasgow; Fison Memorial Lecturer, Guy's Hospital, London; and Halley Lecturer, Oxford. He regularly gave lectures to the general public, in Glasgow and elsewhere, and during the second war gave lectures to the Armed Forces in series organized jointly by the RAS and the BAA. His many contributions to the popularization of astronomy were recognized by the award to him of the Lorimer Medal of the Edinburgh Astronomical Society.

He was President of the Scottish Branch of the BAA (as it was then called) in 1943–5, and presided over their centenary celebrations, which were attended by Sir Harold Spencer Jones and Sir Edmund Whittaker. He was a Founder-Member of the Royal Institute of Navigation. He was elected a Fellow of the Royal Society of Edinburgh in 1943, serving as Council Member from 1949 to 1952, and again from 1957 to 1959, and as Vice-President from 1952 to 1955.

He was elected a Fellow of the RAS on 1915 January 8. He served as Secretary of the RAS from 1931 to 1937, as Vice-President from 1937 to 1938, and as President from 1949 to 1951.

Whatever the prevailing winds of philosophy, to Professor Smart the heavens were continually telling the glory of God. For he was a devout Christian, a regular churchgoer, and for seventeen years a member of the Representative Church Council of the Scottish Episcopal Church. And he agreed with St Augustine that the Christian family was the pillar of the Church.

For he was above all a family man. In 1919 he married Isabel Macquarie Carswell, daughter of Dr James Carswell, HM Commissioner of the Board of Control. They set up home in the West House of the old Observatory building on Madingley Road in Cambridge, and there they reared three sons. He devoted much care

and concern to the upbringing of his children, and derived therefrom a deep pleasure. It was a great satisfaction to him, in his retirement, to know that his three sons had all reached high academic distinction – John (Jack) as Professor of Philosophy, Adelaide University; Alastair as Professor of Fine Art, Nottingham University; and Ninian as Professor of Philosophy, Birmingham University, and latterly Professor of Religious Studies, Lancaster University.

During much of their time in Glasgow, the Smarts occupied one of the professor's houses on the main university square. Joining them for dinner was a delightful and warm experience. Even in the still-austere days of the mid-1950s, gracious living was possible. After the meal had been cleared away, the familiar pipe would appear and be lit, and the conversation would drift widely – from the tactics at the Battle of Jutland, perhaps, or (certainly) to the latest test-match scores; sometimes even a little astronomy crept in. Isabel Smart, herself a talented poet, would add a leavening of the arts.

When Professor Smart retired in 1959 September, he and Isabel went to live with Ninian and his family in Tunbridge Wells. I remember his saying to me at that time that there were three things in particular to which he was looking forward in his retirement. One was that he would be able to attend RAS meetings regularly again. The second was that he would once more be able to watch some first-class county cricket. Thirdly, and especially, that he would be able to spend more time with his grandchildren, and share in their growing-up. Later, he would always describe himself as 'of the household of Professor Ninian Smart'.

Certainly he was a frequent visitor to Burlington House after his retirement, and he became President of the RAS Club in 1960. However, after the family moved to Lancaster, he found it increasingly difficult and irksome to make the longer journey to London, and he resigned the presidency in 1968.

Isabel Smart died in 1974. In his 87th year, with his family close to him, William Smart died, in Lancaster, on 1975 September 17.

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