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Sir Robert Stawell Ball, 1840-1913*

by Gordon L. Herries Davies

At 6.45 on the evening of Wednesday 6 July 1892 some six hundred gentlemen of the highest distinction forgathered within the spacious confines of the Leinster Hall located in this city's Hawkins Street. They were assembled to participate in Trinity College's Tercentenary Banquet, the occasion being one of the glittering highlights of that lavish series of events with which our College celebrated the three hundredth anniversary of its foundation. The diners that evening were placed at sixteen separate tables and it is to Table F that I wish to direct your attention. At the table were seated the Dean of Canterbury, the Lord Justice of Appeal in Ireland, Sir Alfred Lyall, who had recently returned after six years as the Lieutenant-Governor of the North-West Provinces, and Sir West Ridgeway, who was soon to depart for the east to assume the office of Governor of Ceylon. There was Sir Frederic Burton, the Director of the National Gallery in London's Trafalgar Square, and there was Trinity's own Professor Cunningham whose second son, then aged but nine, was destined one day to have his own monument standing in the shadow of Nelson within Britain's naval valhalla. And at the lower end of Table F, located between Mr Isaac Roberts the amateur astronomer and Professor Simon Newcomb the delegate of Johns Hopkins University, there was seated the subject of my discourse, a short, plump and jovial individual — Sir Robert Stawell Ball, the Astronomer Royal of Ireland and the Andrews Professor of Astronomy in our University.

Robert Stawell Ball was born in Dublin on 1 July 1840 in a house which still stands, number 3 in Granby Row, a short street linking Dorset Street with what is today Parnell Square. One of his early memories was that of leaning out of his nursery window so that he might witness the passage down Dorset Street of the cortège of Daniel O'Connell as it made its way out to Glasnevin on 5 August 1847. At the time of Ball's birth his father was Assistant Librarian and Keeper of Records in the Under Secretary's Office in Dublin Castle but his real interest lay in science. He was prominent in the affairs of the Geological Society of Dublin; for twenty years after

* The Trinity Monday Discourse delivered in the Graduates' Memorial Building on 7 May 1984.

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1837 he was a Secretary of the Royal Zoological Society of Ireland; and in 1844 he became Director of the Trinity College museum, a post in which he gave such satisfaction that in 1850 the Board awarded him the degree of LL.D. *honoris causa*. In 1836 Ball senior had attended the Bristol meeting of that peripatetic body the British Association for the Advancement of Science and in Bristol he had made the acquaintance of a Miss Amelia Hellicar. They were married on 21 September in the year following. Robert Stawell Ball was the second of their seven children and the eldest of their three sons, all three of whom were to hold chairs of science within this College.

The young Robert Stawell Ball — Robert was his father's name and Stawell was the maiden name of a lady who had married into the Ball family as far back as 1728 — grew up in Granby Row in an atmosphere redolent with things scientific. In the back-yard his father had a large Wardian case of ferns — the Victorian craze for fern-gardens was approaching its zenith — and the house itself frequently assumed the character of a menagerie as animals on their way to or from the zoo were afforded temporary board and lodging. Ball remembered as a child riding around the kitchen seated upon the back of a giant tortoise and he recollected that upon another occasion his sister Kate had rushed into the parlour exclaiming excitedly that there were 'lovely little things crawling on the stairs'; a consignment of snakes had escaped from its container. To Granby Row there came regularly many of the leading naturalists of the day including the distinguished comparative anatomist Sir Richard Owen and that most beloved of all British nineteenth-century naturalists, the tragically short-lived Edward Forbes who doubtless entertained the Ball children with his comic drawings and his humorous verse.

The young Robert Stawell Ball's first school was the Bective House Seminary for Young Gentlemen located in North Great George's Street, but his mother was an anglophile determined that through their speech her children should betray no trace of their Irish origin. So in 1851, aged eleven, Ball was despatched to a school at Tarvin Hall near Chester, but his mother's intentions were to be disappointed because throughout his life Ball's accent left no doubt as to his Irish origins. The course of Watling Street passed close to the school at Tarvin Hall, but if Ball ever heard the ghostly tramp of the cohorts of the Twentieth Legion on their route from Deva to Mancunium then that experience did nothing to excite his interest in the classics. He confesses that he hated both Greek

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and Latin; his passion was for science in all its manifestations and the explosion that resulted from his experiments in pyrotechnics on Guy Fawkes's Day in 1854 left him scarred for the remainder of his life. But it was in mathematics that he now began to display unusual talents and it became his hope that upon leaving school he would be able to return to Dublin there further to pursue his mathematical studies within the wall of this College. It must have seemed a natural progression but a sad event suddenly imperilled his entire academic future. On 30 March 1857 his father died suddenly at the early age of fifty-five and grave doubts arose as to whether the straitened circumstances in which Mrs Ball now found herself would permit any of her sons to enjoy the privilege of a Trinity education. But throughout his life Ball was a man of the greatest tact, charm, and eloquence. Now home from England he was more than a match for his newly widowed mother. He besought her to allow him to enter Trinity and he promised that if only the necessary funds could be found, then he for his part would devote himself to his studies with the greatest assiduity. His mother was won over and application was made for a state pension on the ground of her late husband's strenuous service in the cause of science. The pension was speedily granted by Queen's Letter; Ball's path into Trinity was clear. It is interesting to note that many years later, on the occasion of Queen Victoria's visit to Ireland in 1900, the two surviving Ball brothers wrote to the Queen thanking her for the munificence displayed towards their mother back in 1857 — munificence which had rendered possible their own two careers of distinction in science together with the no less distinguished career of their brother Valentine who had died in 1895. We are told that when she received the letter at Vice-Regal Lodge the aged Queen-Empress was 'greatly touched'.

In India the Mutiny raged and on 7 October 1857 a national fast was observed in remembrance of its victims. Six days later, on 13 October 1857, Ball entered Trinity. His Tutor was John Kells Ingram, a man who has with breathtaking aplomb been described as 'well-nigh the most perfectly educated man of his age'. Be that as it may, Ingram seems to have been unable to give his new pupil any firm sense of academic orientation. Ball remained strangely uncertain about the shaping of his College career. Just three days after entering College, he wrote in his diary:

I really think about the ministry of the Lord.

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Nine days later there appeared the entry:

I went to college chapel for the first time to-day in my academics. I then came home and wrote, and studied the beginning of St. Luke. After dinner, chapel again; in the evening, more of St. Luke.

But Ball seems not to have been finding much lofty inspiration in the chapel services, or it may be that he had suddenly become aware of St Luke's status as the patron saint of physicians because the same diary entry continued:

I begin to think in earnest about the medical profession, but I am afraid it is very hard to get on in.

By the closing days of his first College term all thought of enrolment in the Hippocratic brotherhood had melted away and another — I hesitate to say more lowly — objective had come into view when he wrote in his diary on 1 December:

I really think I have made up my mind to join the engineering school.

In the event the Church, medicine, and engineering all failed to claim his attention and he followed instead the course leading to a double moderatorship in Mathematics and in Experimental and Natural Science. In later years he observed that he had found his period in College to be the most interesting and important of his entire career and he took particular delight in George Salmon's lectures upon conic sections and in Richard Townsend's prelections in geometry. As an undergraduate he clearly displayed unusual abilities, but it does have to be observed that his achievements seem to have been based upon a painstaking plodding progression rather than upon soaring flights of intuitive brilliance. He tells us that as a Sophister he worked according to a carefully prepared programme for never less than ten hours per day, but his strenuous efforts certainly paid dividends. He won a number of College prizes; in 1860 he was elected both a Scholar of the House and to a Lloyd Exhibition; and his undergraduate career was crowned in 1861 when he became a double Senior Moderator, being ranked first in Experimental and Natural Science and third in Mathematics, in both of which departments he was the recipient of a Gold Medal. One other facet of his prowess deserves mention: he shares with Dr W.G. Grace the distinction of having struck a cricket ball out of the

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College Park and through the window of a building in Nassau Street.

In 1858 the Board of the College established fourteen University Studentships for graduates, each tenable for seven years and each affording the fortunate tenant the substantial income of up to £100 annually. To one of these studentships Ball was now appointed as he began to prepare himself for that most challenging of academic events, the Trinity Fellowship Examination. Thrice did he present himself for that ordeal — in 1863, 1864, and 1865 — and thrice his hopes were dashed. But in this fact there is hardly to be discerned disgrace; Ball had to face some unusually strong competition. In '63 the successful candidate was Thomas Ebenezer Webb, a future Q.C. and Regius Professor of Laws; in '64 it was John Pentland Mahaffy; and in '65 it was Anthony Traill, both the latter gentlemen of course being future Provosts. Ball was nevertheless deeply disappointed and he long remained regretful of his failure to secure the coveted Fellowship. It was a regret shared on his behalf by others within the College. When, in 1904, changes in the procedure for election to Fellowship were under discussion John Joly wrote to Ball:

... I may tell you that one of the strongest arguments with a good many men in favour of a change is the fact that you did not get a Fellowship!

But life had to go on and as early as his first failure to win Fellowship, Ball had begun to suspect that his future might, after all, have to lie in the calling of the cloth. He commenced attendance at Divinity Lectures, but without any great enthusiasm. Years later he wrote:

I must confess, however, that I did not find the study of the controversies concerning the heresies of the Early Church a matter of absorbing interest.

About his future he was nevertheless philosophical. This is his diary entry for 28 January 1864:

It is said that the best way of attaining happiness is to look steadily at the worst contingency that can happen, and calculate on that. If this be so, I have come now to look at my ultimate destination — a country curacy!

Perhaps he would never have been a successful rural pastor; certainly his ethics were in one respect far removed from that 'turn the

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other cheek morality' that he must surely have encountered in St Luke chapter 6 during his Junior Freshman studies in that Gospel. His youngest brother Charles had just gone to a new school and was having trouble with the school bully. This was Ball's fraternal advice penned on 4 August 1865:

. . . do not call him a 'coward' a 'dirty bully', or kick his shins or pick up stones, but if he be at all your own size, hit him in the eye with all your might. . . .

Whether or not Ball was really suited to that country curacy was soon to prove quite immaterial; a door was about to open upon what was to become his true life's work. On 8 November 1865 Ball received an invitation. Would he like to become tutor to the three youngest sons of the Earl of Rosse at Birr Castle? Initially Ball entertained doubts. He confessed to being ill-equipped in the performance of one of a tutor's principal responsibilities, namely the instruction of his charges in the classics. On the other hand, was Lord Rosse not a distinguished scientist, and a former President of the Royal Society, and would residence at Parsonstown not afford excellent opportunity of intercourse with distinguished savants who were guests at the castle? But even more crucial in urging Ball towards his decision was the remarkable instrument which towered above the smooth lawns fronting the castle. At Birr the third Earl of Rosse had constructed a gigantic astronomical telescope — the great Leviathan of Birr — which, with its seventy-two inch speculum, was to remain the world's largest telescope from its completion in 1845 until it was finally surpassed in 1917 by the Hooker Reflector of the Mt Wilson Observatory in California. Ball was interested in astronomy. Shortly after leaving school he had been given a copy of a little volume of American origin entitled *The orbs of Heaven*. 'It delighted me', he wrote long after, 'as few books have ever done before or since'. In College he had studied astronomy using the *Elements of astronomy* by Trinity's own John Brinkley — a volume which Ball held in high esteem — and he had devoured Newton's *Principia* and the *Mécanique céleste* of Laplace. Now Ball placed his terms before Lord Rosse: he would accept the tutorship at Birr provided his Lordship would grant him the privilege of using Leviathan in exploration of the heavens. Lord Rosse readily agreed; the die was cast. Ball had embarked upon a career in astronomy which was to last for almost half a century — upon a career which

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was to bring him international renown in what he regarded as the most sublime of all the natural sciences.

Ball moved to Parsonstown in January 1866 and soon thereafter he was introduced to the somewhat cumbersome intricacies of Leviathan. Often, on those all too rare clear nights, he would go out to the telescope still attired in his evening dress after some function in the Castle. The huge instrument — one visitor aptly described it when in its zenith as looking very like an Irish round tower — required an operating staff of four and those men were long to remember Ball as the man who kept them up ‘terrible late’ at night. It was at Birr that Ball experienced the earliest of those two heavenly events which were ever to remain in his memory as occasions of the utmost splendour and majesty. That first event took place on the night of 13-14 November 1866 and the words shall be his own written almost twenty years after the event.

On the ever-memorable night I was occupied as usual in observing nebulae with the present Earl of Rosse at the great reflecting telescope. In the early part of the evening the sky was clear, and the night was dark; but no unusual phenomenon occurred until about ten o'clock. I was at that moment watching a nebula at the eyepiece, when I was startled by an exclamation from the assistant by my side. I looked up just in time to see a superb shooting star stream across the heavens. Soon came another star, and then another, and then in twos and threes. . . . We ceased the observations with the telescope and ascended to the top of the wall, which forms one of the supports of the great telescope. This position commanded an extensive view of the heavens, and from it Lord Rosse and myself, on a beautiful starlight, witnessed that gorgeous display of celestial fireworks which has given fresh impetus to astronomy. It was not merely the incredible number of the shooting stars that was remarkable. They came no doubt in thousands which no man could number, but what was especially to be noticed was the intrinsic brilliancy of each individual star. There were innumerable meteors that night any one of which would have elicited a note of admiration on any ordinary occasion.

Ball's young pupils seem not to have been aroused from their beds to witness the spectacular events of that night, but it should be noted that one of those pupils was Charles Algernon Parsons the future inventor of the modern steam turbine after whom one of our College buildings is now named and in whose honour an international conference is next month being held within Trinity's walls.

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Ball's stay at Parsonstown was brief. In 1867 the Government transformed the Museum of Irish Industry and Government School of Science located at 51 St Stephen's Green East into a new teaching institution — into the Royal College of Science for Ireland, an institution designed to offer a scientific education to those who, for whatever reason, were unable to enter one of Ireland's other institutes of higher learning. At the insistence of Trinity's Professor Samuel Haughton, Ball became a candidate for the chair of Applied Mathematics and Mechanism within the new college. He was appointed, and now possessed of firm prospects he felt able, on 5 August 1868, to marry Miss Frances Elizabeth Steele, the daughter of William Edward Steele, the Assistant Secretary of the Royal Dublin Society. The Ball family had a tradition of bestowing upon its sons the maiden names of those ladies who had entered the family by marriage, and, possessed as he was of a Puckish sense of humour, Ball doubtless found satisfaction in the nomenclative opportunity presented by his own marriage. As might have been anticipated, his eldest son was in due course christened Robert Steele Ball.

At Parsonstown Ball had already laid the foundation of a distinguished career in science. Now, in the Royal College of Science, he not only proceeded to build upon those foundations, but he began to establish for himself reputations in two other related areas of achievement. Firstly, he embarked upon a career as the author of successful scientific treatises, and secondly he began to appear with increasing frequency in the guise of one of the most popular public lecturers of the day. To these three strands in Ball's life — Ball the scientist, Ball the author, and Ball the prelector — I will return shortly. It suffices here to note that it was the students of the Royal College of Science who first became aware of Ball's genius for the public exposition of the basic principles of science. It was a group of those students — now all successful men of the world — who in London on St Patrick's night in 1905 entertained their erstwhile professor to dinner no less than thirty-one years after he had quitted his post in St Stephen's Green. I cannot help but wonder how many of our present students may offer us an equivalent prandial remembrance in the year 2015!

Ball was elected to Fellowship of the Royal Society on 12 June 1873 and during the following year there fell vacant within this University the Andrews chair of astronomy with its associated post of Royal Astronomer of Ireland. Again Haughton interested himself in Ball's career by urging him to apply for these vacant offices, but Ball hesitated on the ground that an application would be

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presumptuous from one so little experienced in astronomy. He decided to seek the advice of a man he held in deep respect, his former professor, Richard Townsend. Townsend too encouraged Ball to enter the lists and upon this advice Ball acted. The Provost, Humphrey Lloyd, was supporting another candidate, but even Provosts are not omnipotent, and it was Ball who won the appointment. Denied a Fellowship ten years earlier, he had now returned to Trinity as a Professor. In the chair his duties were hardly onerous, but he now became a stalwart member of the College community. Rarely was he absent from the service in College Chapel on Sunday mornings and thereafter he and his friends would walk across the Phoenix Park to take lunch with the Ball family at their Dunsink home. Prominent among those friends were his former rival Mahaffy, the physicist George Francis Fitzgerald, and the glacial geologist Maxwell Henry Close. We can but wonder whether they walked through the Park on Sunday 7 May 1882 there to witness the aftermath of the previous evening's ghastly tragedy. What is certain is that four years later, on 23 January 1886, Ball was summoned to Dublin Castle to receive the accolade of knighthood from the Lord-Lieutenant.

It was while he was at Dunsink that there occurred that second natural event which Sir Robert found so enthralling and deeply moving. It was an event which had its origins here upon earth, but it was an event which initially seemed remote from Ireland's shores. On 26 and 27 August 1883 the island group of Krakatoa, located in the Sunda Strait between Java and Sumatra, was rent by a series of gigantic volcanic explosions. The sound was heard at points up to three thousand miles distant from Krakatoa; the island group virtually disappeared; and some 150 cubic kilometres of fine dust were thrown high into the earth's atmosphere. The presence of the dust yielded some remarkable celestial events. The sun acquired a blue hue — sometimes a silvery hue — the moon turned green, and in November and December 1883 observers throughout the British Isles were treated to the spectacle of a series of most magnificent sunsets — the 'Chelsea Sunsets' depicted in full Turneresque style by the artist William Ascroft. Sir Robert was fascinated by the entire sequence of events. He repeatedly alluded to the Krakatoa disaster in his lectures and popular writings; he reproduced Ascroft's depiction of the Chelsea Sunset of 26 November in his book *The earth's beginning* first published in 1901; and the events in the Sunda Strait seem to have reinforced his mistaken belief in the volcanic origin of the lunar craters.

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Sir Robert played an active part in the organisation of Trinity's Tercentenary celebrations in 1892, but when he attended that Tercentenary Banquet in the Leinster Hall he knew that his remaining days at Dunsink were numbered. Earlier in the year there had died the distinguished astronomer John Couch Adams, leaving vacant the Lowdean chair of astronomy and geometry in Cambridge. After his usual initial hesitation, Sir Robert became a candidate for the chair and his appointment was announced following a meeting of the electors held on 20 February 1892. He was delighted. To his sister he wrote excitedly:

I suppose it is perhaps the highest scientific chair in England, if not in Europe, the Solar System, the Milky Way, or the Universe!

Of Sir Robert's life in Cambridge I will say little — he became a Fellow of King's College and Director of the Cambridge University Observatory — but there is one trivial incident that I cannot leave unmentioned. In the autumn of 1895 there arrived in Cambridge a young Trinity physicist, John Sealy Edward Townsend, the son of Professor Edward Townsend of Queen's College Galway. Linking Ball and the young man there was perhaps a certain bond of sympathy because between them they had essayed no less than seven unsuccessful attempts at the Trinity Fellowship Examination! Be that as it may, Townsend introduced to Sir Robert a young and lonely New Zealander physicist recently arrived to work in the Cavendish Laboratory. Now ever since 1882 Sir Robert had been Scientific Adviser to the Commissioners of Irish Lights, and when he discovered that the New Zealander was working on the detection of radio waves — what were then termed 'electric waves' — Sir Robert pricked up his ears. Might some device employing these waves not be used around the Irish coast in foggy weather to warn ships when they were standing into danger? He therefore visited the New Zealander at the Cavendish to see his experiments and he entertained the young man to dinner at the high table in King's, an occasion upon which his guest tells us that Sir Robert 'spoke of me in such flattering terms that I felt inclined to disappear out of sight'. But Sir Robert's praise was surely not misplaced; the name of that young New Zealander was Ernest Rutherford.

As a scientist Rutherford stands in a category far superior to that of Ball. Ball today rests modestly in St Giles's Cemetery in Cambridge; Rutherford lies in the Abbey alongside Darwin, Kelvin, Lyell, and Newton. The time has come for me to review Ball's

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achievements within those three categories that I mentioned earlier: Ball the research scientist, Ball the lecturer in science, and Ball the author in science.

Of Ball's research in astronomy little needs be said. He has to his credit no achievements of any great significance. At Dunsink he merely continued the research programme inaugurated by his predecessor Francis Brünnow — a somewhat unimaginative programme involving the laborious task of measuring the parallax of star after star. Ball noted that no observed stellar parallax then exceeded a single second of arc, but equally he noted that not one star in ten thousand had yet been systematically examined. Among the unexamined multitude were there perhaps some stars which might prove to have parallaxes of more than one second of arc and which were therefore closer to us than any stars as yet measured? This was the problem to which Ball addressed himself and while he was at Dunsink he examined the parallax of some 450 stars without finding any possessed of that wider parallax for which he sought. Here Ball was again displaying the characteristics of the uninspired plodder which we noted in him as an undergraduate. It does have to be admitted, however, that as an observational astronomer he was somewhat handicapped. Long hours at the telescope had resulted in severe ocular problems; in the 1880s he lost the use of his right eye and it finally had to be removed in 1897. Perhaps it was this affliction which encouraged Ball to forsake the research frontier in observational astronomy and to become instead a populariser of the science.

But Ball's want of significant research achievement in astronomy by no means leaves him bereft of reputation as a research scientist. He may have been widely famed as an astronomer, but his real research achievement lay in the borderlands between geometry and mechanics. From 1869 onwards he devoted much of his intellectual energy to the examination of the principles governing the movement of rigid bodies around fixed points and this led him to the formulation of what he termed 'the Theory of Screws'. A full analysis of Ball's abstruse studies in this area is entirely beyond my competence and would in any case be out of place in the present context. Those eager for deeper insights into the nature of the Theory of Screws should turn first to Ball's highly original and much acclaimed presidential address to Section A of the British Association meeting at Manchester in 1887. It suffices here to note that his work on the Theory of Screws has been deemed sufficient to earn Ball his place

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among the foremost mathematicians at work within these islands during later Victorian times.

I turn now to Ball's second field of distinguished achievement. He was a highly successful public lecturer. He embarked upon this career during the tenure of his chair in the Royal College of Science and some of his earliest presentations were to bodies such as the Belfast Athenaeum and the Royal Dublin Society. But the geographical range of his lecture engagements was speedily to be expanded. His was an age when Britain was deeply concerned with the maintenance of its status as the workshop of the world — an age when Britain viewed with increasing alarm the proud achievements of Germany in optics, in steel production, in electrical engineering, and in industrial chemistry. In this, the second Industrial Revolution, science was clearly the key to national prosperity; science must be fostered in the national interest. But within Britain uncertainty reigned as to exactly how this end was to be achieved. It was, of course, an age dominated by the ethos of Samuel Smiles's *Self-help*, a book which has as its opening words the aphorism 'Heaven helps those who help themselves'. And that was the advice taken to heart by so many members of the British working and lower middle classes. If science was a means towards both personal and national advancement, then science would be their study. They flocked in their thousands to hear science lectures in Working Men's Institutes, in Polytechnics, and in Literary and Philosophical societies. Ball speedily found himself active upon this British lecture circuit. His first such lecture engagement was at the Midland Institute in Birmingham in 1874 and for the next few decades posters advertising his visits regularly decorated hoardings in venues such as Accrington, Burslem, Coatbridge, Dumbarton, Ealing, Falkirk, Gateshead, and Huddersfield. This, in theatrical parlance, was equivalent to playing the provincial repertory circuit; Ball very naturally desired a West End engagement. That star-billing came on 11 February 1881 when he achieved the prelector's blue riband — when he found himself delivering one of the famed Friday Evening Discourses at the Royal Institution in London's Albemarle Street. He proved to be an outstanding success. Thereafter he appeared in that historic lecture-theatre upon many occasions, his courses of Christmas lectures for young people proving especially popular. But Ball had ambitions to widen his horizons yet further and in 1884 he undertook the first of his three lecture tours in North America. The final of those three tours — a tour during the winter of 1901-1902 — must have been a particularly gruelling experience.

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He delivered his first lecture in Boston only ten hours after coming ashore at New York and over the next eleven weeks he delivered a total of some forty-five lectures in centres as far west as Cedar Falls, Iowa. We can only admire the stamina of a sixty-one year old Ball who accepted a routine of one night stands with nocturnal Pullman car journeys from one lecture venue to the next, and all this undertaken amidst the rigours of a Mid-Western winter. Why did he impose upon himself so punishing a schedule? We have his own answer. When a contemporary enquired whether he ever tired of lecturing he responded:

Ask the good golfer if he gets weary hole after hole. Ask "W.G." if he gets weary century after century. When you have some skill in your art the exercise of it is delightful.

Perhaps, like many another academic, Ball basically lacked confidence in himself — felt that his achievements were hollow and uncertain — and it may be that he sought constant reassurance through the acclaim of his lecture audiences.

His public lectures rarely embodied the results of his own scientific research. They were popular lectures designed for general audiences, and by the 1880s he had an extensive repertoire of thoroughly rehearsed discourses. To one organiser of lectures he wrote:

I can congeal you with the 'Ice Age' or burst up with the thunders of Krakatoa. I can tell you awful whoppers about 'Time and Tide', or petrify you with a burst of eloquence about 'Invisible Stars'. I usually put the greatest rot into a lecture called 'Other Worlds'! There is a faint (very faint) soupçon of theology in 'An evening with the Telescope'.

All his lectures were illustrated by means of a variety of visual aids — especially by lantern-slides — and on one occasion he was forced to improvise at somewhat short notice. He had gone to lecture at Dartmoor Prison to 950 convicts but he found himself unable to use his slides because the Governor felt it unwise to allow the audience to be seated in a darkened room. That Dartmoor lecture was almost unique in Ball's career in one other respect because for it he received no fee. Normally he demanded payment upon a substantial scale. When a lady in England wrote to Dunsink asking him to deliver a lecture without fee in the aid of some charity he responded:

I certainly do often lecture in England, but then it is always on behalf of a certain married lady with five children who is solely

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dependent upon her husband for support. To speak plainly, I cannot afford the time to give lectures unless I am well paid for them.

At the lectern he was in every sense a professional.

It has been said that during his lifetime Ball lectured to a million people. An exaggeration, perhaps, but substantial though the true figure must still have been, it was in his third field of achievement — through his writings — that he reached by far his widest audience. He wrote for the daily press, he published in the reviews, and he completed almost twenty books. A few of those books, and most notably his *Treatise on the theory of screws* of 1900, were designed as manuals for his intellectual peers, but most of his books were intended for exactly the same types of people as those who flocked to hear his lectures. There is his *Star-land* of 1889, his *In starry realms* of 1892, his *Story of the sun* and *In the high heavens* both of 1893, and there is his classic *The story of the heavens* of 1888, some chapters of which were written as Ball lay upon a floor at Dunsink seeking relief from the agony of lumbago. All these volumes, handsomely produced and most engagingly written, were intended to place before the general public the latest findings of modern astronomy, and in this they succeeded admirably. *The story of the heavens* became a weekly part work, and almost all of his popular works passed through numerous editions. Indeed, his *Atlas of astronomy*, first published in 1892, reached a fifth edition as recently as 1955, more than forty years after its author's death. Ball was even a pioneer in the scientific paper-back market. In 1890 the Dublin *Daily Express* reprinted eight of his articles from the pages of the paper under the title of *A hundred million of suns* and some twenty years later, to cash in upon the enormous public interest occasioned by the return of Halley's Comet, he in 1909 allowed his publishers to reprint from his *Story of the heavens* the chapters dealing with comets and shooting stars and the resultant book was sold for one shilling with a striking, comet-streaked paper cover. Presumably Ball's modern counterparts are at this very moment contemplating similar commercial ventures because Halley's Comet will in 1986 be making its first reappearance since Ball's day.

In *Who's who* Ball recorded for himself just two recreations: cruising and golf. Perhaps his love of the sea owed something to his ancestry because before they came to Ireland the Balls had hailed from Devon. He certainly adored shipboard life and the spacious

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horizons available to the maritime traveller. One of his more memorable nautical journeys was a cruise up the Norwegian coast in 1896 to Varanger Fiord in the Arctic, there to observe an eclipse of the sun. The observations were thwarted by an overcast sky and it is interesting to note from one of Ball's letters that even the Arctic itself proved to be something of a disappointment. He wrote:

Some of us had conjured up a vision of polar bears warming their paws at the Aurora Borealis! But what have we found? Tall hats, pneumatic tyres, mowing machines, steam merry-go-rounds, barbed wire fencing, and the Salvation Army!

Clearly the pollution of our natural environment is by no means solely a twentieth-century phenomenon. It was in Irish waters that Ball found his greatest Neptunian satisfaction. As scientific advisor to the Commissioners of the Irish Lights he rarely missed the Commissioners' annual cruise around the Irish coast and at sea it was one of his joys to retreat into his cabin there further to reflect upon his beloved Theory of Screws. Perhaps he found some special inspiration in the motions of the Commissioners' paddle-steamer the *Princess Alexandra* as she nosed her way into the Atlantic swell off the Fastnet or in Tory Sound.

Golf — Ball's second declared recreational activity — was a game to which he turned in his fifties and he evidently found his monocular vision to be no serious handicap. Perhaps the estimation of the trajectory of a golf-ball from tee to green was a singularly appropriate pastime for one who had spent so much of his life studying the paths of bodies through the heavens. Certainly during his days in Cambridge he became an enthusiastic and very competent player, his favourite course being that at Royston. He played there on Monday 15 January 1912. It was perhaps his last game. He was a sick man. His partner that day found him able to progress around the course only with difficulty and a number of holes had to be left aside so that they could regain the local station in time for the train back to Cambridge. Ball's illness was to prove mortal. He struggled on through 1912 but in the spring of 1913 he took to a bed from which he scarcely rose again. He died on 25 November 1913, his funeral service being held four days later in King's College Chapel. In a letter of condolence to Lady Ball the Master of Trinity College Cambridge wrote of a much lamented son of Trinity College Dublin:

Ever since he came to us from Ireland he has been sowing and reaping affection on all sides — so kind, so cheery, so beautifully

Gordon L. Herries Davies

sympathetic. I cannot dwell upon our *public* loss. When shall we ever again have a lecturer whose science and wit and playfulness combined can absolutely rivet any audience from a savant to a little child?

This is the man whom I invite you to remember and to honour this Trinity Monday — Robert Stawell Ball, elected a Scholar of this College on Trinity Monday one hundred and twenty-four years ago.