



JW L Glaisher

JAMES WHITBREAD LEE GLAISHER—1848—1928.

DR. GLAISHER died on December 7, 1928, at the age of eighty years. At the time of his death he was the senior of the actual Fellows of Trinity College, Cambridge, was the senior member of the London Mathematical Society, and was almost the senior in standing among the Fellows of the Royal Society and among the Fellows of the Royal Astronomical Society. Throughout all his years he was devoted to astronomy, chiefly in its mathematical developments. In his prime he ranked as one of the recognised English pure mathematicians of his generation, pursuing mainly well-established subjects by methods that were uninfluenced by the current developments of analysis then effected in France and in Germany. Towards the end of his life he had attained high station as an authority on pottery, of which he had diligently amassed a famous collection.

Glaisher was the elder son of James Glaisher, F.R.S., himself an astronomer, a mathematician specially occupied with the calculation of numerical tables, and a pioneer in meteorology, not without risk to his life. For the father, one of the founders of the Aeronautical Society of Great Britain, was an aeronaut of note; with Coxwell, in 1862, he made the famous balloon ascent which reached the greatest height (about seven miles) ever recorded by survivors.

James Whitbread Lee Glaisher was born at Lewisham, Kent, on November 5, 1848. He was sent to St. Paul's School in London, which, in 1867, he left as Campden Exhibitioner. In that year he went into residence at Trinity College, Cambridge, which proved to be his home for the rest of his life. He was duly elected a Scholar in 1868, and, while he still was an undergraduate, he began original work. He graduated as Second Wrangler in 1871; the Senior Wrangler was John Hopkinson, also a Trinity Scholar, later the distinguished engineer. He was elected a Fellow of Trinity in the year of his graduation. That election was doubly notable: it was the first that was held after the parliamentary removal of the dissenters' disability of fellowship tenure; and all the three successful candidates (the other two being Hopkinson and the present Dean of Ely) were elected at their earliest date of candidature.

Glaisher was appointed assistant tutor of his college on October 12, 1871, an office that qualified for the lay retention of a fellowship, though the celibate restriction existed for another eleven years. He was tutor from 1883 to 1893, the then customary normal period of tenure of a tutorship. He remained a lecturer on the mathematical staff until 1901, having been continued beyond the normal maximum period by the Council of Trinity.

He never held any permanent appointment outside Cambridge. It was currently believed that he refused the office of Astronomer Royal, which had been offered to him on Airy's retirement in 1881; the duty would, of course,

have entailed residence at the Greenwich Observatory. He remained a bachelor. During the earlier years of his fellowship he lived in Whewell's Courts; his rooms then seemed a cheerless set of chambers, with book-cases for his growing library, but rather crowded by pigeon-hole cabinets for pamphlets, notes of calculations, and other documents. In 1885 he changed into a spacious New Court set of rooms, with a westerly view down the lime avenue across the river away to the Coton fields. With that change there came a change in the appearance of his surroundings. His library continued to increase as a matter of course. He began to collect objects of beauty and of rarity, in arts of several kinds. Once begun, his collections never ceased to grow, always under his earnest care. True, his favourite working corner between the fireplace and the window, remembered by every visitor, remained a mathematical shrine of duty to the very end of his life; and, there, a jealously reserved portion of each working day in Cambridge was spent in his mathematical researches, with a regularity that never failed even in the stress of illness. But his collections outgrew available space, downstairs, upstairs, even in his remote bedroom. He was granted an additional set of rooms at the top of his staircase and next to the upper floor of his own set; they, too, soon were filled. Then he hired a sort of warehouse, that also became filled in due course. It was his intention to bequeath his collections to the Fitzwilliam Museum; the authorities of that institution granted him a room (also soon filled) in the new wing of the buildings within which his treasures will now find their permanent home.

His personal pursuits, outside his teaching, his research, his attendances at scientific meetings, and his passion for collecting, were varied. He was a vigorous walker, covering ground at an amazing pace. In his youthful donnish days he rode a high bicycle of the "penny farthing" type, his tall lean frame lending itself to the claims of that forgotten machine; and he was president (1882-5) of the University Bicycle Club. In his middle life he often went to the United States in order to spend vacations with his friends, Prof. and Mrs. Woolsey Johnson and their sons; or, when they crossed the Atlantic, he would have them in Cambridge, or would travel with them on the Continent. Even in his early seventies he maintained the vitality and the appearance of comparative youth. Only in the last few years did his health give way, and then it broke badly; but the spirit was not quenched.

In person, Glaisher was very tall, slim all his days, with an upright figure which even his long spell of shattered health could only partially bend. His smile of appreciation was delightful and infectious; when appreciation waxed into admiration, his attractive eyes would glow in his enthusiasm. Singularly fluent, he never aimed at eloquence in speech, yet dignified passages abound in his formal addresses. He was a don, not of the old-fashioned type, scarcely of any recognisable type. There was no shred of pomposity in his bearing, which

was frank and simple. There was a persistent note of good nature, not devoid of an occasional touch of whimsical mischief, when he would quiz friends who looked unduly solemn. The deeper notes of human feeling were not wanting when those whom he held in regard had anxieties, and when, as occurred during his tutorship and at some other times, he had to help people to face issues of life and death. He was a sincere friend, loyal to the uttermost and the last, yet never wearing the heart of friendship on his sleeve.

II.

In 1875 Glaisher was elected a Fellow of the Royal Society. His first original paper, full of cognate historical matter, dealt with the non-evaluable sine integral, cosine integral, and exponential integral; it contained elaborate tables of those integrals, computed by himself; written by the beginning of 1870, while he still was an undergraduate, it was communicated to the Royal Society by Cayley. He served on the Council of the Society for three periods, 1883-4, 1890-2, 1917-9; during the last of these, he was one of the vice-presidents. In 1913 he was awarded the Sylvester medal.

He had joined the Royal Astronomical Society in 1871. He became a member of the Council in 1874, and remained a member of that body for the rest of his life: his fifty-four full years of continuous membership may be a "record," to use a popular word of to-day. He held the office of Secretary from 1877 to 1883. He was President of the Society for two distinct periods of office, 1886-8 and 1901-3; during those tenures it became his duty to present the Medal of the Society to G. W. Hill (1887), to Auwers (1888), to Kapteyn (1902), and to Struve (1903); and, on the respective occasions, he delivered masterly summaries of the original work of the several recipients. What gave him the most intimate pleasure within that Society was his membership of its dining club, of which he was president for many years. At the dinners he was a genial chief, and he proved an inspiration of debonair gaiety which found expression in the delightful human speeches he made on the less informal occasions when they and he entertained their fortunate guests.

Throughout his scientific life Glaisher devoted much attention to the affairs of the London Mathematical Society. He was elected a member of the Society on February 8, 1872, and he became a member of its Council in the succeeding November; and he retired from that body in 1906, after a period of service continuous within those dates. He was Vice-President in 1880, 1881, 1887, 1888, and he was President in 1884-6. Thus his own experience gave him full knowledge of the development of the Society almost from its beginning. At a meeting in 1925, to celebrate a belated jubilee of its existence, he gave a charmingly genial account (printed in the first volume of its 'Journal') of its activity, particularly in the early stages, and of the personal inspiration of leading members, such as Cayley, Sylvester, H. J. S. Smith, and Clifford. From

that account there was one omission, characteristic of the man ; it ignored his own contributions, personal and printed, to the Society's influence upon mathematical science. He was awarded the De Morgan medal in 1908. There is no record of his reply of thanks on the presentation of that medal ; but, as later in 1925, his words—he would have declined to call them a speech or an address—were the expression, not lightly forgotten, of a friendly retrospective review of the Society of which (so little did he say of himself) he might at the moment have been the least known member instead of the most honoured.

In early and middle years Glaisher was a frequent attendant at the annual meetings of the British Association. He took an active part in its work, as Secretary of Section A for a considerable period, and as a member of several committees, dealing with tables of numbers such as constants π , e , γ , of mathematical significance, or Bernoulli numbers, or enumeration of primes among successive millions of integers, or preparing special reports upon the progress of various branches of mathematical science. He was President of Section A at the Leeds meeting in 1890 ; his address dealt with relations between applied mathematics and pure mathematics, at a time when it still was not unnecessary in England to plead occasionally for a fuller recognition of pure mathematics.

It was a matter of course that he was a member of the Cambridge Philosophical Society. He often served on its Council in various capacities, frequently contributed papers to its ' Proceedings,' and was in regular demand as a referee upon papers that had been contributed by other writers. He was President in 1882-4.

Glaisher proceeded to the newly established Cambridge degree of Doctor of Science in 1887 ; at the time of his death he had come to be the senior in standing among his fellow doctors. He was made an honorary Doctor of Science by Dublin on the occasion of the tercentenary celebrations of Trinity College, and later he received the same honorary degree from the Victoria University. He was one of the British honorary Fellows of the Royal Society of Edinburgh, as also of the Manchester Literary and Philosophical Society ; and he was a foreign member of the National Academy of Sciences of Washington.

III.

He was president of the Cambridge Antiquarian Society in 1899-1901, an office of a kind that is rarely occupied by a man who is actively engaged in mathematical teaching and research and in the current administration of more purely scientific societies. But, as has already been indicated, the study of pottery was one of his hobbies ; what began as a hobby developed into one of the absorbing interests of his life ; indeed, that interest in his pottery became nothing less than a passion. Thus he would go for a holiday in Brittany ; but his holiday was not that of the meditative or sentimental traveller, observant

of old places, old costumes, old habits, set in an ancient picturesqueness untouched by the bustling hurry of modern cities. He would seek a local directory, find out all the local dealers in antiquities, and from them would acquire what seemed fitting additions to any one of the well defined sections of his collection. Even down to the end, in the latest months of his life, on days when he no longer felt equal to dining in his college hall less than a hundred yards away from his staircase, a London afternoon sale of pottery was a lure that his spirit could not resist. By systematic devotion and untiring personal diligence he became one of the leading collectors of his day, and his position in ceramics can be gathered from the following authoritative testimony* :—

Relatively late in life Dr. Glaisher began to give his attention to a very different sphere of activities ; in certain quarters he is perhaps better known as a student and collector of pottery than as a mathematician. On the subject of ceramics he published little—only a few papers read before the Cambridge Antiquarian Society in 1899 and subsequent years, and published in the Society's ' Proceedings,' an introductory chapter in the Catalogue of an Exhibition of English pottery held at the Burlington Fine Arts Club in 1914, and a supplement on Wrotham ware in the work on " English Pottery," by Messrs. Bernard Rackham and Herbert Read, published in 1924. But the vast collection of pottery formed by Dr. Glaisher during the last three or four decades, and bequeathed by him (with certain exceptions) to his University, will form a visible monument to his memory in the Fitzwilliam Museum of wide popular appeal. It is not too much to say that in future Cambridge will be the best place for the study of English pottery in its earlier phases, whilst even the general student of pottery will need to visit the Fitzwilliam if he wishes not to miss important documentary examples in many other classes. It was Dutch Delft ware which seems first to have attracted Dr. Glaisher's attention ; from this he passed to the kindred wares made during the seventeenth and eighteenth centuries in London, Bristol, and elsewhere in England, generally known, but in a measure anachronistically, as English Delft. With these it was natural to associate those other English wares of pre-industrial times which, though made in widely different parts of the country, from Staffordshire to Kent, and from Yorkshire to Devon, have in common so strong a national character, the so-called " slip " wares owing their decoration solely to clay and glaze, the primary materials of the potter. Dr. Glaisher was among the first to appreciate the splendid qualities of these unsophisticated wares at a time when most collectors found satisfaction in the civilised refinements of Wedgwood.

* For this estimate, I am indebted to the kindness of Mr. Bernard Rackham, F.S.A., of the Victoria and Albert Museum, London.

Since 1900 the fashion for collecting "slip ware" has grown so rapidly that the stocks available for the buyer are nearly exhausted. In these circumstances Dr. Glaisher found it necessary to look out for a new objective; this he found in the incunabula of English porcelain, and in recent years he had bought many interesting examples, especially of the figures made during the earlier years of the Chelsea, Bow, and Derby factories. A few weeks before his death he shared the interest aroused by certain figures of undetermined origin at the sale of Sir Hercules Read's collection at Sotheby's.

It must not be concluded from this short account that Dr. Glaisher's interest in pottery was narrow in its scope. Many foreign wares besides Delft, especially from little known potteries in Central Europe, are to be found in his collection, as well as Turkish dishes of the so-called "Rhodian" type of the finest quality.

Amongst the very latest of his interests also was the formation of a collection of samplers, of which latterly he had acquired several of great rarity, including the earliest dated samplers hitherto recorded.

Not the University only, but the nation at large, will have cause to be grateful for his knowledge, his enthusiasm, and his good judgment as a collector; were it not for his constant watchfulness, many a fine example of old English craftsmanship would sooner or later have found its way across the Atlantic.

It may be added that he had made (and at the time of his death was still engaged in) a catalogue of his collection already amounting to nearly forty manuscript volumes, which may well prove a valuable addition to the literature of ceramics.

IV.

When he was a lecturer on the Trinity staff, Glaisher had his share of work that belonged to the ordinary round, such as astronomy or hydrostatics for the Tripos range, or a "poll" course. His treatment was admirably clear, and combined copious verbal explanation with more than copious chalking on the board; towards the end of an hour, his immediate atmosphere (not to mention his gown) seemed laden with chalk-dust. His happiest efforts were devoted to subjects such as differential equations, combinations of observations, and elliptic functions; and in each of these ranges his lectures at that date were a revelation to his students. The Tripos was never mentioned; the subject was expounded systematically from the beginning. His exposition was all the more illuminating because concurrently (though unknown to his class) he was writing paper after paper dealing with details unmentioned in the text-books, if any; and enterprising students were encouraged to proceed to original sources. When the course was mainly intended for the average Tripos student, he did not range far outside the specified schedule; what he

gave was a continuous exposition, not a succession of ingenious rules or book-work tabloids. When he felt himself free to range more widely, without the restrictions implied by schedules, his lectures were an intellectual treat. Thus his course on combination of observations was at once critical, constructive, comprehensive; he was singularly clear in specifying assumptions made, and simultaneously he indicated restrictions imposed by assumptions, the bearing of which might be beyond the immediate appreciation of the students. Above all, he revelled at his best in elliptic functions. It was not that he was opening unknown regions of new theories: he never even mentioned the general theory of functions, scarcely known at Cambridge in the late seventies even by title; his results were a sheer algebraical development of Jacobi's work, the calculations being made with the ease of a practised master. Some of us, who then were members of his class, used to imagine that he had discovered all possible formulae in elliptic functions and q -series, and that they were being incorporated in an expected treatise in the grand style. His enthusiasms were infectious; in his lectures there came a human note, something of the nature of the man, a little fun, a whimsical touch now and then, not untypical of the geniality which marked his intercourse with fellow men.

Yet Glaisher never published a volume of his own, copious writer as he was. Perhaps the sheets of that quarto treatise on elliptic functions existed only in our undergraduate imaginations; perhaps they ceased gradually when he found that much of his subject was mainly an incident in the general theory of functions, associated with the names of Cauchy, Weierstrass and Riemann. Perhaps, also, in the midst of his own researches, he was reluctant to devote the time and the labour that are demanded by the preparation of a treatise; there is a germane passage in his presidential address (1885) to the London Mathematical Society which might be an autobiographical confession of his own hesitation in attempting such a task. But when others moved forward, sometimes stimulated in their progress by himself, he was ever the first and the most generous in the recognition of their labour.

He examined for the Mathematical Tripos with fair frequency. On one of the occasions he edited a volume of 'Solutions of the Cambridge Senate House problems and riders for the year 1878,' taking the trouble to incorporate occasional supplementary notes which went far beyond a "solution." He often examined for the Fellowships at Trinity, acting particularly as a referee for dissertations in the earlier years from 1873, when first they were optional, and soon became practically obligatory on candidates who hoped for success. He had a sympathetic pride in this influence of the Trinity Fellowship competition, almost going out of his way to proclaim, by selected instances, its success in stirring young mathematicians to original research. At a time when the Tripos flourished in the heyday of its fame, he was no worshipper of the spirit of that examination. In the report of the Cambridge Syndicate, which

led to modifications in the Tripos operating first in 1882, there had been a conservative reluctance in recommending the abolition of the order of merit, though there had been a mildly platonic desire for such action. Glaisher's desire was more than platonic, as evidenced by his remarks in 1885 when referring to this stage in its history :

Great as has been the value to the University of the order of merit, it has yet in recent years been the deadly enemy to the spread of research and the advance of our science ;
and he might have added explicitly (later remarks, made at the same time, imply his opinion) that the Tripos was hardly even a shadow of full examination except for the very few candidates who, either innately or by special coaching, were skilful in answering the isolated conundrums of examiners.

V.

The tale of Glaisher's papers, mathematical and astronomical, was large, amounting in all to nearly four hundred. They were unevenly distributed over his long scientific activity. Thus down to the end of 1873, when he was only twenty-five years of age, he had published over sixty papers, not all of them brief. During the next ten years, the period of most prolific production with him as with so many men of constructive ability, more than one hundred and fifty papers were published. In 1883 he became a tutor of Trinity and held that busy office for the canonical period of ten years ; yet, in that time, he secured leisure enough to produce more than fifty papers. The succeeding decade saw the production of about another fifty ; the increased leisure, allowed by freedom from the tutorship, was now being devoted in growing measure to his collection of pottery and faïence. During the rest of his life rather more than another fifty were published : his production never ceased completely. Even in his latest years, when his main interest had undoubtedly migrated to ceramics, and through the final period amid the distractions of discomfort and pain and ill-health, he continued to devote to the very end at least one hour of any working day to mathematical writing.

The subjects over which Glaisher's published investigations range belong to certain well-defined regions.

He had an unflinching interest in the history of mathematics, almost in an antiquarian spirit, from time to time. Topics such as the early developments of numerical computation, the beginning of the use of the decimal system, the work of Napier and Briggs in the construction of logarithms, some record of an author (perhaps otherwise obscure) of some mathematical discovery, acquired vitality under his treatment. One of his later papers (1922) dealt with the early history of the plus and minus signs ; another (1924) with certain puzzle-questions in early arithmetical writings.

Not a few of his early papers dealt with definite integrals. His results had a gravely limited significance, partly owing to the use of real variables only which belonged to the Cambridge habit, partly owing to very narrow restricted methods, without any consideration of their functional bearing; he was satisfied with the methods which had proved fruitful under the genius of Euler and Legendre. Though not blind to the pitfalls inevitable in such a treatment of definite integrals, he made no excursions into the vast modern theory of integration which has revolutionised the subject out of all ancient recognition.

He was keenly active in the construction of tables almost from his earliest youth, and his devotion to numerical calculations for their own sake gave him inexpressible pleasure. In this respect he was merely continuing action which began with filial piety to his father's enumeration of prime numbers; and he had an interest in Riemann's work on that question, though he did not follow it out in the recent researches of Hardy and Littlewood.

The theory of numbers in some developments—not on the wider issues raised by the work of Gauss and Kummer, though he was well acquainted with these—exercised a fascination over his mind. A similar remark applies to elliptic functions, solely in the Jacobian development of series connected with the theta functions, or in the combinations of the first and second elliptic integrals after Legendre. Above all, he combined these interests: papers came in endless profusion, dealing with series in one or other of these regions, with ever additional weird series having special functional numbers for their coefficients, with new and strange identities, and with new results relating to series that could be expressed in known non-algebraical numbers or constituting fresh constants. Or he would deal with the question of the resolution of any integer into the sum of four squares and into the sum of other numbers of squares, or with the relation between the tale of prime divisors of an integer of the form $3p + 1$ and those of the form $3p + 2$: ultimately and somehow connecting these with elliptic functions and associated periodic series.

The subject of differential equations, mainly ordinary equations and the integration particularly of ordinary linear equations in series, absorbed much of his activity in his most fruitful years. Down to the time of his earlier investigations, English progress in the subject had centred in formulæ: "elegant" symbolic solutions had been accumulated by the diligent ingenuity of Cambridge mathematicians such as Gaskin and Leslie Ellis; and the method, so far as it was a method, had been systematised by Boole in his well-known volume. Of all this lore Glaisher was a master: in its range he was a creator, his most significant paper being an elaborate memoir (in the 'Philosophical Transactions' for 1882) dealing with Riccati's equation. In 1871 and 1872, Cayley and Darboux, separately, had made a diversion by their theory of the singular solutions of ordinary equations of the first order: that theory, through Glaisher's exposition and occasional amplification, became the stock-in-trade

of successive generations of Trinity undergraduates. And wandered he never so far afield, he found himself returning time and again to his beloved elliptic functions.

And it was in this subject of elliptic functions that he specialised, particularly in the Jacobi theory. When he began teaching and investigation, the subject was hardly recognised in the Cambridge course, and was only incidentally allowed to occur in the Tripos examination : at that epoch applied mathematics (in the Cambridge sense) was autocratically dominant. Glaisher was the first systematic exponent of elliptic functions in Cambridge in his lectures, and thereby exercised a significant influence upon the conservative mathematical spirit of his University.

VI.

Glaisher's original papers were published in a variety of places, practically all in home quarters. Occasionally they appeared in the 'Transactions' or the 'Proceedings' of the Royal Society ; sometimes in the 'Monthly Notices,' rarely in the 'Memoirs,' of the Royal Astronomical Society ; now and then in the 'Philosophical Magazine.' But there were two places of preferential publication : one was the 'Proceedings' of the London Mathematical Society ; the other was the 'Quarterly Journal' and the 'Messenger of Mathematics,' effectively one and the same. He was an editor of the 'Messenger' from 1871, an editor of the 'Quarterly Journal' from 1878 : in these journals he could publish his own investigations as he pleased. But from the beginning and throughout, he received into the pages of the 'Quarterly Journal' and the 'Messenger' the researches of others, with special encouragement to very young men : thus he printed the earliest mathematical papers, written in their undergraduate days, of J. J. Thomson (now the Master of Trinity), H. H. Turner (now Savilian Professor of Astronomy in Oxford), and the present writer, whose first paper he welcomed with the query : "Why do pure mathematicians begin by writing about hydrodynamics ?"

In addition to his papers, Glaisher prepared a number of addresses ; some of them were official, some of them personal tributes. Among them may be recorded his 'Nature' notice of Cayley, early in 1895 ; his biographical notice of J. C. Adams prefixed to the 'Scientific Papers' ; and the introduction to the 'Collected Scientific Papers of H. J. S. Smith.' His grasp of essential characteristics made any such account of singular interest and he suffused it with his own geniality. Yet, when occasion arose, there could emerge the strong expression of the sense of any injustice done, as he conceived it, such as the early treatment of the investigation of Adams concerning the discovery of Neptune, or the behaviour of an individual responsible for the action of the French Academy in the treatment of a memoir by H. J. S. Smith. Glaisher was perhaps at his appreciative and genial best in the occasional scientific

address. His careful lecture, delivered in the ante-chapel of Trinity in 1887, in commemoration of the bicentenary of the publication of Newton's 'Principia,' was a tribute of homage to a great spirit. His address as President of the London Mathematical Society [*Proc. Lond. Math. Soc.* (1), 18 (1887), 4-38] is a valuable monograph on the long history of the Senate House Examination, since 1824 more commonly called the Mathematical Tripos. No less attractive is his 1915 address on "Logarithms and Calculation" at the Napier Tercentenary celebration in Edinburgh, with its description of the fascination which Napier's logarithms in particular and computation in general can exercise upon certain types of mind: a fascination manifestly exercised on Glaisher, who described it as though he were a prophet inspiring the very elect. The last of these addresses in 1925—it has already been cited—may continue to stand as the best authentic history of the early stages of the London Mathematical Society.

In mathematical science Glaisher now appears to have been a stimulus to others rather than a pioneer whose manifold investigations can be acclaimed as memorable. The earlier years of his teaching at Cambridge were a time of transition in the mathematical ideals of the University. Cayley was almost a voice in the wilderness; Glaisher himself described Cambridge pure mathematicians as generals without armies. When he had ceased teaching, Cambridge pure mathematics had marched beyond his active vision mainly under men whom, as students, he had guided at the beginning. His voice was that of a teacher, yet not in the least similar to the great Cambridge coaches, for he contributed to his science and ranged far beyond conventional examination learning. He was a personality in his day; and he has left a name, high among the noted names of his own generation, in two widely different fields of constructive thought and human activity.

A. R. F.

22 January, 1929.

(Reprinted, by permission, from the *Journal of the London Mathematical Society.*)
