London Mathematical Society Historical Overview
Taken from the Introduction to *The Book of Presidents 1865-1965*

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The London Mathematical Society (LMS) is the primary learned society for mathematics in Britain today. It was founded in 1865 for the promotion and extension of mathematical knowledge, and in the 140 years since its foundation this objective has remained unaltered. However, the ways in which it has been attained, and indeed the Society itself, have changed considerably during this time. In the beginning, there were just nine meetings per year, twenty-seven members and a handful of papers printed in the slim first volume of the Society's *Proceedings*. Today, with a worldwide membership in excess of two thousand, the LMS is responsible for numerous books, journals, monographs, lecture notes, and a whole range of meetings, conferences, lectures and symposia. The Society continues to uphold its original remit, but via an increasing variety of activities, ranging from advising the government on higher education, to providing financial support for a wide variety of mathematically-related pursuits.

At the head of the Society there is, and always has been, a President, who is elected annually and who may serve up to two years consecutively. As befits a prestigious national organization, these Presidents have often been famous mathematicians, well known and respected by the mathematical community of their day; they include Cayley and Sylvester, Kelvin and Rayleigh, Hardy and Littlewood, Atiyah and Zeeman.[1] But among the names on the presidential role of honour are many people who are perhaps not quite so famous today, who don't have theorems named after them, and who are largely forgotten by the majority of modern-day mathematicians. Who were they? What mathematics did they do? And why haven't we heard of them?

This is what this book is about. It has been created to give you an idea of the men and women behind the mathematics and, more specifically, behind the London Mathematical Society. It will tell you when they lived, how they earned their living, what mathematics they did, and will leave you to form your own judgement as to whether they deserve to be remembered or not. But in order to give some sort of context to the biographies that will follow, it seems appropriate to provide an overview of developments concerning the Society itself, to lend some coherence to the volume as a whole. What follows, therefore, is a short history of the LMS from its inception to the present day.

The LMS is one of the oldest mathematical societies in the world, predating similar institutions in France, Germany, Italy and America by several years. Despite its local-sounding name, it has served as the national society for the British mathematical community almost since its foundation, giving Britain the distinction of being one of the first countries in the world to produce such an organisation. Indeed, perhaps only the Netherlands and Russia have national mathematical societies that can claim a longer history.[2] Yet it was the LMS, rather than its Dutch or Russian counterparts, which was to provide a stimulus and model for

[1] There do not appear to have ever been any official criteria laid down for the selection of the LMS President. Over the years, it has become conventional for them to be Fellows of the Royal Society, as almost all Presidents have had this distinction. But the very first, Augustus De Morgan, consistently refused to be made an F.R.S.

[2] Amsterdam's Koninklijk Wiskundig Genootschap was founded in 1778, and the Moscow Mathematical Society began to operate under the auspices of Moscow University in 1864.

subsequent mathematical societies around the world, serving as an influential catalyst in the communication and dissemination of mathematical knowledge.

The foundation of the LMS was inspired by the increasing need for specialised scientific outlets during the nineteenth century. Prior to this, the primary channels for the dissemination of mathematical discoveries in Britain had been the established general scientific societies, of which the Royal Society of London (founded in 1662) was the oldest and most prestigious. During the eighteenth century, the latter were gradually augmented by a variety of largely local societies, such as the Society of Antiquaries of London (1707), the Philosophical Society of Edinburgh (1739[3]) and the Manchester Literary and Philosophical Society (1781), which also accepted papers on a wide variety of topics, not necessarily scientific.

But as academic disciplines, and science in particular, became increasingly specialised throughout the eighteenth century, the need for subject-specific forums for scientific research grew. As a result, the early nineteenth century witnessed the formation and dramatic increase in the number of specialised scientific societies. In Britain, this manifested itself, not just in the establishment of local societies—for example, the Geological Society of Cornwall (1814), the Cambridge Philosophical Society (1819) and the Manchester Medical Society (1834)—but also in the foundation of national societies devoted to such subjects as geology (1807), astronomy (1820), zoology (1826), geography (1830), statistics (1834), and chemistry (1841). Yet it would be well into the second half of the nineteenth century before a national learned society solely devoted to mathematics would be founded in Britain.

Nevertheless, mathematical societies had existed, both in Britain and elsewhere, throughout the eighteenth century. Indeed the oldest of these had been founded in Germany as far back as 1690. Originally the rather quaintly named Kunst-Rechnungs-liebende Societät (Society of the Lovers of the Art of Calculation), the Hamburg Mathematische Gesellschaft remains the oldest mathematical society in continuous existence today. In Britain, the local mathematical societies that did exist, such as the Manchester Society, founded in 1718, and the Oldham Society (1794), were more akin to working men's clubs than learned societies. Although they flourished for a time, none of them survived.

Of these local mathematics societies, the most famous is certainly the Spitalfields Mathematical Society. This had been established in 1717 as a club for the improvement of the "studious artisan", especially the silk weavers of East London. The early members were working men with an interest in self-improvement; by 1744 we are told that "about half were weavers, and the rest were typically brewers, braziers, bakers, bricklayers". Given the modest financial resources of the majority of the members, it is not surprising that, until the 1790s, the Society could not afford its own rooms, the meetings being held instead in local public houses.

Despite its humble beginnings, membership of the Spitalfields Society is known to have included John Dollond, the renowned manufacturer of optical instruments, Thomas Simpson, mathematical writer and professor at the Royal Military Academy in Woolwich, and Benjamin Gompertz, a mathematician and actuary remembered today for Gompertz's law of mortality. Another reputed member was Abraham de Moivre, although no evidence of this has been found. By 1793, the Society's membership had grown large enough (in both size

[3] Renamed the Royal Society of Edinburgh after 1783.

and means) to warrant the acquisition of a permanent room in Crispin Street, East London, and for the next few decades, the society apparently flourished. From the 1820s, however, it began to experience a rapid drop in numbers, perhaps due to the decline of working class members, until by the 1840s there were fewer than twenty members left.

In June 1845, the remaining members decided on dissolution. But rather than let their valuable library be dispersed, they asked the Royal Astronomical Society to consider incorporating it with its own. Augustus De Morgan (of whom more later), was a fellow of the RAS who served on the committee appointed to inspect the old society. He reported that it had quite changed from its clay and pewter days: "We found an FRS, an F.Ant.S, an F.Linn.S, a barrister, two silk manufacturers, a surgeon, a distiller, &c.". Moreover, he added, "Their library is a good one." It was thus decided that: "the books, records, and memorials of the Mathematical Society should be made over to the Astronomical Society [and] that all the members of the former society not already Fellows of this Society should be thereupon elected Fellows without payment of any contribution whatsoever."

Although the Spitalfields Society was dissolved before the formation of the LMS, the significance of the Spitalfields Society has been acknowledged by several LMS members over the years; indeed, two LMS Presidents, Augustus De Morgan and J.W.S. Cassels, have published accounts of its history. In his *Budget of Paradoxes*, De Morgan gave a charming account of their weekly meetings, noting "that each man had his pipe, his pot, and his problem". Indeed, he pointed out that the Spitalfields Society's allowance of smoking and drinking at its meetings was in sharp contrast to the more sober gatherings of its successor. Writing of the LMS in 1866, De Morgan stated that "not a drop of liquor is seen at our meetings, except a decanter of water: all our heavy is a fermentation of symbols; and we do not draw it mild".[4]

From 1845 until 1865, the main national outlet for the work of British mathematicians was through the Royal Society, but this was not the only option.[5] Some mathematicians joined the Statistical Society, but its priority was more the *collection* of data than its mathematical analysis. A more satisfying alternative was the Astronomical Society. Founded in 1820, it had become one of Britain's most important scientific societies, receiving its Royal Charter in 1831, and including among its members such mathematicians as Charles Babbage, John Herschel, Augustus De Morgan, and even foreign scholars of the calibre of Bessel and Gauss. As a result, much of the content of its meetings, and therefore its publications, was mathematical in nature. With its incorporation of the Spitalfields Society in 1845, it became the nearest thing Britain had to a national mathematics society.

Meanwhile at the local level, the Cambridge Philosophical Society continued to publish mathematical papers. But mathematics was far from being its sole concern and, in any case, its membership was open only to graduates of the University of Cambridge. Nevertheless, Cambridge was as likely a place as any to have served as the starting point for a new mathematical society. The enduring legacy of Newton and the reputation of the infamous mathematical Tripos examination, ensured that, throughout the nineteenth century, Cambridge was unrivalled in Britain as the foremost provider of mathematical instruction in

[4] In the present day, the LMS continues to commemorate its predecessor in the form of the annual Spitalfields Day meetings, held in remembrance of the Spitalfields Society.

[5] Although the British Association for the Advancement of Science had been formed in 1831 and had a mathematical section, it met only once a year, and in any case, its agenda was entirely different from that of an academic society.

the country. To pass the Tripos exam with the highest mathematical honours, namely to be classed as a "Wrangler," opened doors to a career in government, law, the church, or even academia.[6] Ironically, however, although Cambridge was by far Britain's biggest producer of mathematics graduates, institutionally it was still very insular, with little regard for mathematics elsewhere and does not seem to have been home to that critical number of mathematicians sufficiently motivated to form such a body.

In contrast, principally because of its size, London had many more practising mathematicians, not just in academia, with many pursuing the subject while earning a living as lawyers, actuaries, civil servants, clergymen and schoolteachers.[7] Moreover, higher education was rapidly expanding, with the recently-founded University College London leading the way as the prime source of mathematical education in the capital. While the level of its mathematics did not yet rival that taught at Cambridge, under the expert guidance of Augustus De Morgan it soon began to produce graduates of a high mathematical standard. So, while it was by no means inevitable, it is not a complete surprise that when a new society was formed, it came into being in the capital.

What was to become the London Mathematical Society arose from a chance remark in a conversation between two former students of University College London in the summer of 1864. During a discussion of mathematical problems, it occurred to them that "it would be very nice to have a Society to which all discoveries in Mathematics could be brought, and where things could be discussed, like the Astronomical [Society]". The two young men were Arthur Cowper Ranyard and George Campbell De Morgan,[8] the son of Augustus De Morgan, their professor at University College. Conscious of the key role the Professor's reputation could play in attracting members to the Society, it was agreed "that George should ask his father to take the chair at the first meeting".

The tentative title agreed between the two friends was the "London University Mathematics Society", but on Professor De Morgan's advice, that name was changed to the "University College Mathematical Society". The revised title features on a circular, dated 10 October 1864, and signed by Ranyard and George De Morgan, inviting mathematicians to the first preliminary meeting of the society. The meeting was held on the evening of 7 November, in the botanical theatre of University College. The chief decision that appears to have been taken on this occasion was a final alteration to the name of the Society. Anxious that the Society should not limit itself to University College members alone, those present voted to change the name to its present incarnation: the London Mathematical Society.

The newly-retitled society held its inaugural meeting at University College London at eight o'clock on the evening of Monday 16 January 1865. After being elected its founding President, Augustus De Morgan gave an idiosyncratic opening address in which he laid down his thoughts on the Society's key objectives. Believing that its prime purpose should be "the cultivation of pure Mathematics and their most immediate applications," he hoped that,

[6] In addition, although not required for graduation, to pass the more demanding Smith's Prize exam, which many high Wranglers did, almost guaranteed a fellowship at one of the Cambridge colleges.
[7] Of course, these mathematicians were much more widely spread than those at Cambridge and, of course, they were not working in the same (academic) environment.
[8] Apart from their vital role as founders of the LMS, neither of these men was actively involved with the Society for very long. The younger De Morgan died in 1867, and Ranyard quickly lost interest, later becoming a very active member of the Royal Astronomical Society.

ideally, every branch would be amply supported by the membership, so that the Society would not become dominated by one particular field of study.

Fundamentally, however, the Society's brief was to further the bounds of mathematical knowledge. As De Morgan concluded: "If it should chance that we find a disposition among the members of this Society to leave the beaten track and cut out fresh paths, or mend the old ones, we may make this Society exceedingly useful." One year later, at the Society's first Annual General Meeting, De Morgan was able to report that the papers presented in its first year had, in his opinion, largely adhered to his founding objectives. Perhaps more significantly, he also "called attention to the novelty and importance of many of the papers, and remarked that this was the only society in England where such papers could be received."

At this stage, the Society's rejected name of "University College Mathematical Society" would have been more accurate than its new name since, of the twenty-seven founding members, no fewer than twenty-six were, or had been, associated in some way with University College. Yet, despite this apparent bias, many members had received tuition elsewhere, exactly one-third being Cambridge men, eight of whom were Wranglers.[9] Even at this formative stage, not every member was based in London. E.J. Routh, a student of De Morgan in the late 1840s, had been Senior Wrangler in 1854, the year in which James Clerk Maxwell came second, and was famous for his impressive record of coaching Cambridge students to success in the mathematical Tripos. Another founding member and former De Morgan student, Robert Clifton, was professor of natural philosophy at Owen's College, Manchester (now Manchester University).

Although we are told that "it was Mr. De Morgan who … did away with the original restriction of membership to persons associated with University College," it is likely that other members were involved. Chief of these would have been the geometer Thomas Archer Hirst, who, as the Society's first Vice-President, played a major part in enlarging the scope of its operations. Hirst, a mathematics teacher at University College School in 1865, had been one of the first British mathematicians to obtain a Ph.D. (from Marburg in 1852). A rising figure in the British scientific community, he was known and well respected by mathematicians across Europe – a rarity for a British mathematician at that time – and had many friends and contacts among British mathematicians. De Morgan's initial involvement with the LMS certainly helped to attract early members, but it was the efforts of Hirst that ensured the Society's success in its early years.

The Society's first recruit provided the sole link between London's old and new mathematical societies. Benjamin Gompertz had been President of the Spitalfields Mathematical Society at its dissolution in 1845, so it seems more than fitting that his was the first new name to be added to the Society's list of members following its inauguration. Since he is best remembered for his law of human mortality, it also seems strangely appropriate that his was the first death of an LMS member to be recorded, occurring in July 1865, when the Society was just six months old.

It was not long before the Society drew the biggest names in contemporary English mathematics. Arthur Cayley and James Joseph Sylvester were elected on the same day in June 1865. They were joined in October by the Oxford-based mathematician Henry John

[9] At this time it was not unusual for the best students to receive degrees at other universities prior to entering Cambridge, studying for the Tripos and graduating all over again.

Stephen Smith. Smith's work covered geometry, elliptic functions and especially number theory. Cayley, who was to contribute to almost every area of pure mathematics, especially invariant theory, matrices, group theory and geometry, became one of the Society's most active members, contributing no fewer than 78 papers in 30 years. Sylvester shared many of Cayley's mathematical interests and was similarly keen to help the Society establish a high scientific reputation. Although his contributions to the LMS were less in number and frequency than those by Cayley, they were no less significant mathematically, featuring work on topics for which he is well known today, such as matrices, number theory and partitions, as well as papers in applied mathematics.

The new society grew rapidly, nearly doubling its membership in only five months. The rise in numbers was maintained throughout its formative years, during which the LMS continued to attract professional mathematicians of considerable stature. These included the Irish geometer and algebraist George Salmon, economist and logician William Stanley Jevons, prolific textbook writer Isaac Todhunter, geometer and applied mathematician William Kingdon Clifford, and the mathematical physicists James Clerk Maxwell and William Thomson (later Lord Kelvin). That such eminent and gifted mathematicians were among the first to join such a new body illustrates the very high esteem in which its first President was held by his contemporaries. De Morgan's influence gave the LMS much needed initial momentum, but it was papers by later members such as these that would place it on a level with other scientific societies.

Yet, despite the increasingly national character of the Society's membership, during its first two years it remained very much a University College-based venture. With De Morgan as President, all of its meetings were held at the college and it was still listed officially as a University College student body. But the Society's character had dramatically changed. As it approached its second anniversary, membership stood at nearly one hundred, but over half had no connection with its founding institution. Perhaps in recognition of this, in November 1866 the LMS moved its meetings to loaned rooms at Burlington House on Piccadilly. This move, which coincided with De Morgan's retirement from the presidency, finally severed the Society's link with University College.

In only two years, the Society had more than trebled in size. The sharp rise in membership illustrates the very real need which existed for a mathematical society at this time. At its inauguration, the Society's name may have seemed something of an exaggeration; two years later, however, it was something of an understatement. The London Mathematical Society had been transformed into what was, in effect, the national mathematical society.

The LMS soon began to attract the attention of mathematicians overseas. In 1870, in an influential report on the state of French mathematics, the distinguished geometer Michel Chasles referred approvingly to the foundation of the LMS and called on his countrymen to emulate the example of their British cousins. Not long after, in 1872, the Société Mathématique de France was founded in Paris. In 1888, inspired by a visit to England during which he had attended LMS meetings, the American mathematician Thomas Fiske founded the New York Mathematical Society, which by 1894 had grown into the American Mathematical Society. The LMS also served, at least in part, to influence the foundation of other mathematical societies, such as the Circolo Matematico di Palermo (1884) and the Deutsche Mathematiker-Vereinigung (1890).

As one of the earliest foreign mathematicians to become aware of the Society, Chasles had initially applied for ordinary membership of the LMS in 1867. The Society, however, chose to distinguish him by electing him as its first honorary foreign member. This category soon expanded to include members such as Charles Hermite, Leopold Kronecker, Eugenio Beltrami, Sophus Lie, Felix Klein, Henri Poincaré, David Hilbert and Georg Cantor. By means of this honour, the Society was able both to extend its membership and increase its standing internationally. The category still exists today, with current honorary members including Paul Cohen, Jean-Pierre Serre, Steve Smale and Jacques Tits.

Not all foreign LMS members were honorary. Several mathematicians from abroad became ordinary members. For example, from America, E.H. Moore and Charles Sanders Peirce joined, as did Peirce's protégé Christine Ladd in 1881. Ladd's membership was significant, not merely because she was not British, but because she was a woman. In Britain women could not even take degrees until 1878. A similar situation existed in the United States, but Ladd managed to obtain permission to study at Johns Hopkins University under Sylvester. A capable mathematician, she completed her Ph.D. in 1882 but, due to the rules then in place, was not awarded the degree until 1926.

Christine Ladd was the second woman to join the LMS. The first had been Charlotte Angas Scott, an outstanding mathematician who, although having been placed "equivalent to eighth wrangler" in the Cambridge Tripos exam of 1880, being a woman, was not included on the list of graduates. Scott's participation at LMS meetings was impaired by the difficulty she experienced in gaining college-level employment in Britain. In 1885, four years after her election to the Society, she accepted a post at Bryn Mawr College in Philadelphia and soon became an active member of the American Mathematical Society, to whose *Bulletin* she contributed several papers.

A more customary career-path for a woman had been followed by another early female LMS member, Sophie Bryant—although her credentials were anything but conventional. One of the first women to be awarded a degree in Britain, Bryant was also the first British woman to attain a doctorate. Although she spent her career in education, later becoming headmistress of the North London Collegiate School, she retained an interest in mathematical research. Elected to the Society in 1882, she holds the distinction of being the first woman to present a paper at a Society meeting, reading "On the geometrical form of perfectly regular cell-structure" in 1885.

The acceptance of full female membership was a progressive step for the LMS, quite out of character with the more established scientific societies. It was many years before other societies followed suit: for example, the first female Fellow of the Royal Society was not elected until 1945. However, reflecting the continued male dominance of mathematics departments worldwide, women's contributions to the LMS have always been vastly outnumbered by those of their male colleagues. Perhaps inevitably, female representation on the LMS Council has always been low, and it was not until the Society was nearly 100 years old that a woman became President, when Mary Cartwright was elected to the office in 1961. Only one other LMS President since then has been a woman.

Although we have already referred to the many professional mathematicians who provided the Society with valuable prestige and academic recognition in its early years, they were far from representative of the total membership. Discounting the select few who held mathematical professorships at universities, most LMS members were amateurs, being

unconnected with any academic institution and regarding mathematics purely as an interesting diversion from their professional activities. Some, Robert Harley for instance, were clergymen. Others, like Charles Merrifield, were civil servants. More than a few were schoolteachers, such as J. J. Walker and Sophie Bryant. A significant number were lawyers, including three Presidents, Samuel Roberts, Sir James Cockle and Alfred Kempe. One, Percy MacMahon, was for many years an officer in the British army. For the majority of early LMS members mathematics was a pastime, not a vocation.

Harold Davenport has noted that the Society "brought together not only the leading mathematicians of the country but also others who were pursuing mathematical research in isolation, while earning a living in some profession". J.W.L. Glaisher also drew attention to "isolated workers" such as Roberts, Merrifield and Walker, "who otherwise would not easily have had opportunities of becoming personally acquainted with one another," or indeed with the mathematical celebrities of the day. These particular amateur mathematicians not only had their mathematical interests fostered by the Society's activities, but by achieving the presidency they gained a standing in the wider mathematical community which otherwise would have been impossible for them to achieve. The Society thus played a key role in bringing mathematicians from diverse backgrounds into contact with one another and deserves much of the credit for the improvement of mathematical communication in Britain towards the end of the nineteenth century.

The Society was also largely responsible for acquainting the British mathematical public with mathematicians and mathematical literature from overseas. The recruitment of foreign members plus the growing number of LMS members who belonged to newly-created mathematical societies overseas, both contributed to the Society's international standing as well as to increasing the potential audience for British mathematical research.

Perhaps the surest sign of the growing maturity of British mathematicians in the international arena was the staging of the fifth International Congress of Mathematicians at Cambridge in 1912. "There was a time not long ago," said the algebraist Edwin Elliott, "when British Mathematicians may have been thought too self-centred. If the judgment were ever correct, it is no longer. We are alive to what is being done elsewhere, and now aim at cooperation." Despite the negative effects of the First World War, the trend towards internationalisation continued during the 1920s. In Britain its chief advocate was G. H. Hardy, who during the first half of the twentieth century had an unparalleled influence over British mathematics.

Hardy's effect on the LMS was equally profound. Indeed, the impression he made on the Society was deeper than anyone since its foundation. One of the most charismatic mathematicians of the twentieth century, he is the only person to have held the office of President twice, as well as serving on the Council for nearly four decades. Believing that the LMS should occupy a central role in British mathematics, he made every effort to boost the Society's prestige, always regarding it with special affection. As he later said: "This Society has always meant much more to me than any other scientific society to which I have belonged. My record of attendances, since I became secretary … has no blemish; I have been at every meeting both of the Council and of the Society, and have sat through every word of every paper."

Hardy was particularly keen to encourage international collaboration in order to strengthen British mathematics. He used his position in the LMS to invite distinguished scholars from overseas to visit Britain and, in some cases, to collaborate. In the 1920s, such mathematicians

included the American algebraist and number theorist L. E. Dickson, Hungarian all-rounder Georg Pólya, Danish analyst and number theorist Harald Bohr, and the American geometer and topologist Oswald Veblen. Another visitor, the Russian analyst and measure theorist Abram Besicovitch, stayed on, with Hardy helping to find him an academic position in Britain.

The 1930s saw the British mathematical community become increasingly more international with Hardy again playing a key role. Following the rise to power of the Nazis in Germany in 1933 and the worsening political situation throughout Europe, many German and eastern European scholars were forced to emigrate for fear of persecution. Hardy helped to recruit many of the displaced mathematicians for British universities, assisting Hans Heilbronn and Richard Rado in particular to obtain positions. Amongst the other émigré mathematicians who made Britain their adopted home were Paul Erdős, Kurt Mahler, Kurt Hirsch, Bernhard Neumann and Walter Ledermann. Following Hardy's example, these refugee mathematicians took an active interest in the affairs and publications of the LMS, attending its meetings, publishing papers in its journals, becoming officers on its Council, and, in the case of Heilbronn, its President.

By the outbreak of the Second World War, the membership of the LMS, and by extension the British mathematical community, had grown to include not only the best homegrown talent, but also many of the finest young mathematicians from central Europe. While not all first-rate mathematicians made Britain their new home—Richard Courant and Emmy Noether both emigrated to America, for example—the influx of European refugees strengthened British mathematical resources immeasurably.

Although the LMS had been founded as a research-orientated body, in 1865 research had been very much an extra-curricular activity for an academic. At that time, not even the most prestigious professor at Oxford or Cambridge was required to undertake research, while the high teaching and examining load imposed on the more junior tutors and lecturers severely restricted their creative mathematical activity. In the Britain of 1865, then, neither research nor training in research techniques were high institutional or professional priorities. But during the intervening period, for a variety of reasons, a research ethos came into being in British universities so that by 1940 research had become a part of many faculty members' duties. This growth of the mathematical research profession is reflected in the membership of the LMS. From the Society's first enrollment of 27, it had reached 250 by 1900. By its centenary in 1965, membership totalled around 800; and today there are over 2000 members.

At the beginning the Society's principal function was to hold monthly meetings at which papers would be presented, but it was also intended that these papers "should be lithographed and circulated among the members". Yet having one's paper read at a meeting was no guarantee of publication in the *Proceedings*, for the Society's policy regarding refereeing was more than usually stringent. Glaisher tells of his astonishment that such a young Society should have been so precise with respect to reporting upon papers: "Two independent referees were always appointed, their separate reports obtained and read, and the question of the publication of the paper was decided by ballot. In no case in the writer's experience was there any bias; nor was any distinction made in favour of distinguished mathematicians or on personal grounds. All papers were adjudicated upon by exactly the same procedure and with the same impartiality."

It appears that this rigorous refereering policy was unique to the LMS. Moreover, so effective was its operation that no alterations were considered necessary for some considerable time. By comparison, contemporary procedures at other learned societies appear far more lenient. At the Royal Society, one written report was sometimes considered sufficient, while at the Royal Astronomical Society "it was rarely that a paper was refereed, and a verbal report from a single referee was generally accepted". In this respect, as with its acceptance of female members, the LMS again set a trend that its older contemporaries would eventually follow.

However, the Society very soon became a victim of its own success. The sharp rise in membership and papers contributed to its meetings led to an increase in the cost of printing and distribution. Consequently, the first volume of the Society's *Proceedings*, covering the period from January 1865 to November 1866, contained just eleven of the 37 papers presented during that time. The need for financial retrenchment was to be a characteristic feature of the Society's formative years. It has been observed with good reason that "if ever a major scientific society was run on a shoe-string, this one was."

In their initial circular of 1864, George De Morgan and Ranyard had assured prospective members that "the annual subscription will not exceed half a guinea." However, the cost of producing the *Proceedings* quickly resulted in the need to more than double the membership rate from 10 shillings to one guinea in November 1867. But despite the increased revenue that this rise provided, by 1873 the Society was in deficit due to its escalating publication of papers. The Society was thus faced with surviving on an even tighter budget than before. Frugal measures such as reducing journal subscriptions, cutting back on printing, and charging members for reprints of papers were all seriously considered until in 1874 a generous gift of £1000 from Lord Rayleigh resolved the financial difficulty.

With the monetary obstacle removed, the publication of papers increased dramatically. By 1900, over 900 papers had been published in the *Proceedings*, with the number of pages for that year exceeding 700. The next century saw massive expansion in the Society's publication activities. In 1926 the *Journal* was founded, followed by the *Bulletin* in 1969. More recently, 1997 saw the launch of a purely electronic journal, the *LMS Journal of Computation and Mathematics*, whilst joint publication ventures have included the *Journal of Applied Probability* from 1964, *Nonlinearity* (from 1988), and the *History of Mathematics* book series (from 1989). Other publication ventures include the *LMS Monographs* and *Lecture Notes* book series, which first appeared in 1968, along with the *LMS Student Texts* (from 1983). On a more informal note, since 1973, the Society has published a monthly *Newsletter* for its members, which over the years has grown into a lively forum for articles of general mathematical interest, book reviews, and discussion, in addition to routine notices and announcements.

From its earliest days, the Society's publications were dominated by papers on pure mathematical subjects. In 1873 the council reported: "It appears desirable to point out that the rules of the Society permit one-third of the evenings to be given to the discussion of Applied Mathematics. Hitherto nothing like this proportion of the time has been so occupied. It might perhaps conduce to the interests of the Society if the Applications of Mathematics occupied a somewhat more prominent place than they do at present." Even after the abolition of Rule 36, which had stated that "At no two successive Meetings shall the papers be entirely on Applied Mathematics," no noticeable increase in papers on applied topics was forthcoming. Glaisher noted that "a constantly recurring source of regret during the whole time that I was on the Council [was] that the Society did not attract to itself papers on Applied Mathematics".

But it would be far from accurate to say that the Society consisted solely of pure mathematicians. Many of the highest ranking British mathematical physicists of the time were members, including James Clerk Maxwell, Lord Kelvin and Lord Rayleigh. All three contributed papers to meetings during the early years, such as Maxwell's "On the displacement in a case of fluid motion" (1870) and Rayleigh's "Progressive waves" (1877). Other less frequent contributors were E. J. Routh who, in 1874, presented a paper on the "Stability of a dynamical system with two independent motions", and G. H. Darwin, whose paper "On probable error in statistics" (1874) was among the first on that subject to be read before the Society.

In his centenary article on the history of the Society, Sir Edward Collingwood tells us that in its early years "the Society had at least as many applied mathematicians as pure mathematicians among its members and indeed many leading pure mathematicians wrote quite extensively on applied mathematics and *vice versa*". A good example of this is Cayley. Although most famous today for his work on matrices and invariant theory, his contributions to the LMS evince a strong interest in applied mathematics, particularly dynamical astronomy. Indeed, Volume 6 of the *Proceedings* (1874-5) contains six papers by Cayley, five of which are on problems of potential and attraction. Maxwell also worked in both pure and applied mathematics, being a key figure in the development of vector algebra on the one hand, and electricity and magnetism on the other. Clifford, too, was active in both fields, publishing papers on biquaternions and dynamics in the *Proceedings*. Another member who is primarily remembered today as a pure mathematician, but who in fact had extensive interests in applied fields was William Burnside. Although best remembered for his work in group theory, he also contributed papers to the *Proceedings* on topics such as kinematics and fluid dynamics.

Overall, papers in applied mathematics spanned an impressive array of topics, including potential theory, kinematics, elasticity, optics, and the kinetic theory of gases; papers by mathematical physicists such as J. J. Thomson, Horace Lamb and Sir Joseph Larmor, mostly on electricity and fluid mechanics, dominated such contributions during the 1880s and 1890s. Applied mathematics, although outweighed, was not outclassed.

This situation changed after 1900. Applied mathematical contributions eventually became increasingly rare as the membership of applied mathematicians dwindled.[10] By the First World War, a particular feature – some might say weakness – of the *Proceedings* was the increasing domination of pure (and particularly analytic) topics at the expense of applied mathematics. In his valedictory presidential address to the Society in 1916, the eminent mathematical physicist Sir Joseph Larmor alluded to complaints of the "aloofness, and even aridity, of much recent work". Indeed, he continued, "Of recent years the question must have presented itself to not a few of our authors whether the *Proceedings*, developing in so abstract a direction, are now quite as suitable a place for the publication of mathematical physics as they were in the days when Maxwell and Kelvin, and Rayleigh and Routh, were frequent contributors." "There was a time," he said, "when … many of us made a point of taking an interest in all the papers that [the Society] published. It would be a great thing if we could get back again towards that state of affairs."

[10] This was, to some extent, a reflection of a shift in the overall focus of British mathematics at this time. In the late nineteenth century, the prime area of British mathematics was mathematical physics. But by the early twentieth century, the great applied mathematicians of the late Victorian era (e.g. Maxwell, Kelvin and Stokes) had been replaced by a new generation of pure mathematicians, such as Young, Hardy, and Littlewood.

In 1926, apparently on Hardy's initiative, the *Journal of the LMS* was founded to provide a new venue for briefer, more succinct articles, leaving the *Proceedings* as a forum for lengthier research papers. But if Larmor and other applied mathematicians had hoped that the *Journal* would provide a less one-sided view of British mathematical research, they were to be disappointed. The new publication had a strongly pure flavour from the very beginning. As Hardy commented in 1928: "I think … that the *Journal* will probably remain a journal of pure mathematics, and I will not pretend that the prospect causes me any particular distress."

What concerned Hardy more was the comparative lack of geometrical papers in the Society's publications. But this, he said, was "the fault of the geometers and not of the editorial committee; it is no use trying to encourage one subject by futile attempts to stifle another". In any case, he maintained, papers on other subjects, such as the algebraic theory of partitions, ensured that the journal was not completely dominated by analytic topics. But it was perhaps no surprise that, at least initially, the new journal tended to favour areas of particular interest to Hardy and other analysts: "If then the *Journal* is one-sided," he said, "it is one-sided in a way which I like."

Early volumes of the LMS journals make fascinating reading, not only because of the contributions of numerous mathematical celebrities, but also because they contain some very interesting, and in some cases highly significant, mathematics. The first of these came right at the beginning, with Sylvester's "Proof and generalization of Sir Isaac Newton's hitherto undemonstrated rule for the discovery of imaginary roots," which he presented to the Society in June 1865. Another short note by him in 1871 on the Goldbach conjecture partially anticipated work by Hardy and Littlewood in the 1920s. A paper by H. J. S. Smith of 1875 was one of the earliest to employ measure-theoretic methods to integrate a discontinuous function. Also included are papers by Klein on elliptic functions and Mittag-Leffler on an extension of Taylor series, as well as a geometric paper by Hilbert, and Poincaré's second complément to his *Analysis situs*.

There are also numerous papers by Henry Baker on geometry and Lie groups, some interesting contributions by Forsyth on differential equations, while MacMahon's publications in combinatorics helped to establish that subject as a mainstream mathematical area. It is also intriguing to find works on subjects not now associated with the authors, such as a paper by Karl Pearson "On a certain atomic hypothesis" or A.N. Whitehead on "The geodesic geometry of surfaces in non-Euclidean space". Moving on to the twentieth century, there is the first appearance of Burnside's $p^{\alpha}q^{\beta}$-theorem in 1904, followed a year later by W.H. Young's work on point-sets and independent formulation of the Lebesgue integral. There is nearly half a century of material on Diophantine equations by Mordell and roughly the same amount on groups by Philip Hall, plus some of the earliest British work on topology by Henry Whitehead.

A lengthy paper on transfinite numbers and order types marks Bertrand Russell's only contribution to the Society, later being adapted for incorporation into his and A. N. Whitehead's monumental *Principia mathematica*. Contributions by Ramanujan, small in number but nontrivial in content, reveal his extraordinary dexterity in analytic number theory. Among the numerous papers by Hardy and Littlewood, their independent work on laying the foundations of Tauberian theory can be found in papers published in 1909 and 1910. But perhaps two of the most significant papers were published within a few years of each other in the 1930s. Frank Ramsey's innocently-titled "On a problem of formal logic" (1930)

contained the first statement of Ramsey's theorem and, consequently, laid the foundations of Ramsey Theory, while Alan Turing's 1937 paper "On computable numbers, with an application to the *Entscheidungsproblem*" was to have dramatic implications for both mathematics and artificial intelligence.

In terms of the overall content of its journals, the Society's first century can be roughly divided into three periods. During the first (1865-1900) virtually every mathematical topic was covered, from number theory to differential geometry, elliptic functions to quaternions, invariant theory to non-Euclidean geometry, as well as the applied topics mentioned above. Not surprisingly, there are many papers on topics much in vogue at the time (e.g. projective geometry, the algebra of quantics), but which are outdated today. After 1900 the number of papers on analysis rose from 14% in the previous period to nearly 40% between 1900 and 1940. The final period, from the Second World War to the Society's centenary in 1965, saw analysis give way to a rise in the number of algebraic and topological papers.

As soon as its finances permitted, the LMS sought to promote and reward mathematical achievement by means of prizes and awards. Its premier award, the De Morgan Medal, was endowed through subscriptions of members in honour of the Society's first president. Initially awarded in 1884 to Arthur Cayley, the medal has been given triennially to distinguished mathematicians ever since. Other prizes regularly awarded by the LMS include two Berwick Prizes, two Whitehead Prizes and the Polya Prize, all instituted in commemoration of figures in the Society's twentieth-century history.

Since its foundation, the LMS has met in a variety of locations but, until recently, never owned its own premises. As mentioned earlier, for the first two years of its operation it was based at University College London, but moved in November 1866 to rooms in Old Burlington House, Piccadilly. However, in 1870 that building was demolished to make way for the present structure, so the Society moved again, this time to rooms let to the Asiatic Society at number 22 Albemarle Street. The next move occurred midway through the First World War, when it returned to loaned rooms in the rebuilt Burlington House. By the 1990s, the Society was finally able to purchase a property to serve as its official headquarters, and in 1998, they moved into 57-58 Russell Square, now appropriately named De Morgan House.

The LMS library has occupied nearly as many locations. At the Society's first Annual General Meeting, in January 1866, it had been "moved by Prof. Sylvester and seconded by Prof. Hirst, that the Committee be empowered to spend a sum not exceeding £10 upon mathematical journals". Steps were also taken to sound out other societies and organisations with the prospect of exchanging publications and gradually a collection of journals began to accumulate. The LMS collection of mathematical books also began in 1866 with an important benefaction comprising most of the mathematical library of the astronomer Sir John Lubbock. The bequest, which contained many valuable items, was presented by his son, later the first Lord Avebury. However, as the Society had nowhere to house its library, it resided for four years at University College on the shelves of an amenable physiology professor, William Sharpey. When the Society moved to Albemarle Street in the autumn of 1870, it was transferred from University College to a small room at the top of the house, where it remained until the move of 1916, when it was transferred to the Science Museum in South Kensington. The final relocation took place in 1928, when it was brought back to University College, where it can be found today.

That the Society was able to survive for so long on meagre resources was in no small way due to the efficient and economical management of its honorary secretaries. During the Society's first few months there was a rapid turnover in this position, but the situation soon stabilized and for nearly three decades the Society was served by two secretaries of outstanding efficiency: Morgan Jenkins (in office from 1865 to 1895) and Robert Tucker (1867 to 1902). Both were long-standing and faithful members of the Society and both were Cambridge wranglers, although neither was a particularly notable mathematician. They spent much of their respective careers years as mathematics teachers in London and they occasionally presented competent, if unremarkable, papers to the Society's meetings—Jenkins on number theory and spherical trigonometry, and Tucker on geometrical subjects. However, it is for their outstanding services as unpaid officers of the LMS that they are chiefly remembered. Together, they kept the Society's affairs running smoothly for 28 years, and, as J. W. L. Glaisher acknowledged: "The debt the Society owes to its two early Secretaries, who held office for so long, is very great. They placed it on a secure foundation."

Dividing the duties between them, the two secretaries carried out the whole of the day-to-day business of the Society, down to the smallest detail. Tucker, the more energetic of the two, obtained papers for the meetings, writing to members "to induce them to read papers when the supply was deficient, as it not infrequently was in early days; he sent the papers to the referees, each accompanied by a letter, and did his best to have both reports ready for the next meeting, writing frequent letters and post cards to dilatory referees; and he copied portions, often of great length, from the reports and sent them to the authors; he also attended to passing the papers through the press, and wrote the accounts of the meetings for publication in the various journals". He also kept the minutes at each meeting, his distinctive scrawl being familiar to anyone who has tried to examine the minute books of this period!

Morgan Jenkins had a smaller workload, but was no less conscientious. His job was to superintend the election of members as well as votes on the publication of papers. He kept immaculate records, ensuring that they were regularly updated, and personally sent out notices of meetings to every member. In his obituary of Jenkins, Glaisher wrote that "For many years the *Proceedings* were sent out personally to the members by the Secretaries, each Secretary taking one half of the alphabet. The present writer's copy fell in Mr. Jenkins's half, and it always came to him addressed in his careful and accurate handwriting, for, unlike Mr. Tucker, whose handwriting was rapid and sometimes hard to decipher, Mr. Jenkins always wrote slowly, forming every letter with care, and correcting errors by an erasure with a penknife".

In 1895 their partnership came to an end with the retirement of Jenkins after an uninterrupted service of three decades. Tucker finally retired in 1902, having held his office for 35 years. In that time he had edited over thirty volumes of the *Proceedings* and attended virtually every single meeting. The body of work undertaken by both men on behalf of the Society during those years is incalculable. As Edwin Elliott remarked in 1898: "Such a use of what might have been the leisure of half a life-time has put mathematical science under an obligation for which no gratitude would be excessive."

In its 140-year history, the LMS has seen numerous changes, but none more so than in the last forty years, during which time the Society has undergone a transformation. After several unsuccessful attempts in the nineteenth century, the LMS was finally granted a Royal Charter on the occasion of its centenary in 1965. The Society had been registered as a limited company since 1894, and by the 1960s was showing increasing signs of financial prosperity.

Profits from its publications began to accrue, enabling the widening of activities and the employment of part-time support staff.

But the financial situation changed out of all recognition with the Hardy bequest in 1963. Hardy, who died in 1947, had long been especially fond of the LMS, and had made provisions for the Society in his will. After his surviving sister died, a substantial legacy of investments, totaling around £50,000, was received by the Society. One of the first uses of this money was the establishment of a scheme to bring the work of mathematicians from overseas to the attention of a British audience. To commemorate Hardy's work, not just in mathematics, but in the internationalisation of the subject, a Hardy Lectureship was set up in 1967 to enable distinguished overseas mathematicians to visit the United Kingdom for an extended period to work and exchange ideas.[11]

After the Hardy bequest, the Society changed dramatically as its activities diversified and its day-to-day operation became larger and more complex. While its central aim of holding meetings and publishing papers remains unchanged, recent years have seen a huge increase in the diversity of activities in which the Society is involved – from popularisation to public policy. Its meetings are no longer solely in London, with a variety of conferences, symposia and popular lectures being held around the country. As well as its journals, the Society now publishes a range of lecture notes, monographs and student texts. The LMS has active committees on education, computer science and women in mathematics. It also liaises with and provides information to schools and universities, business and industry, as well as the civil service and government departments.

Acknowledgement of the increase in the Society's activities eventually came in 1980, with the appointment of its first full-time employee to administer its affairs. That employee was Susan Oakes, who has worked loyally and assiduously on the Society's behalf for a quarter of a century. Today at its headquarters in De Morgan House, the LMS has a full quota of staff, but Susan is by far the longest serving, rivaling Jenkins and Tucker as someone to whom the Society owes a particularly special debt of gratitude.

The Society that entered the new millennium bears little resemblance to the modest collection of University College alumni who gathered for their first meeting in January 1865. The recent relocation to De Morgan House was fitting, both as a reflection of its status as Britain's national mathematical society and also as a tribute to its first President. But, as this survey attests, to focus only on the "big names" would give a very distorted view of the subject. Not everyone who has been associated with the Society was a great mathematician, and we do well to remember those of lesser fame. For, as the list of Presidents contained in the present volume illustrates, without them, the history of the London Mathematical Society would be far from complete.

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