GOD BLESS THE MICROSCOPE!

A HISTORY OF THE ROYAL MICROSCOPICAL SOCIETY OVER 150 YEARS

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FOREWORD

Robert Fox

Professor of the History of Science, University of Oxford

Over 150 years, the Royal Microscopical Society has brought together practising scientists, physicians, instrument makers, and enthusiasts, bound by a common interest in the advancement and use of microscopical techniques. To a remarkable and refreshing degree, the Society has maintained the interdisciplinary tone that characterized the inaugural meeting in Edwin Quekett's house in 1839, and still, today, the *Journal of Microscopy* and the *Proceedings* have a readership extending across the whole range of the scientific spectrum.

The Society was conceived at a time when specialist scientific societies were beginning to proliferate. It came hard on the heels of the Astronomical Society of London (founded in 1820; Royal from 1831), and the Zoological Society of London (1826), reflecting, like them, the faltering of an older tradition of undifferentiated societies modelled on the Royal Society of London. The Microscopical Society of London (as the Society was called until it received its Royal Charter in 1866) was also the product of a decade of particularly significant advances in microscopy, notable the new lens system of Joseph Jackson Lister, and it has continued to reflect and promote work at the scientific and the technical frontiers of microscopy ever since.

Like all scientific societies, the Royal Microscopical Society has passed through some turbulent phases as it has tried to adjust to shifts in practices and interests of its members. The advent of electron microscopy, for example, was at first not easily ridden, representing as it did a departure from the age of brass and glass in which the Society has its roots. On this occasion, the Society was a slow starter. Its

Electron Microscopy Section was not founded until 1965, in the wake of the notable Presidency of Dr V.E.Cosslett, FRS; by then, the Institute of Physics had had a specialist section for nearly twenty years.

Occasionaly lethargic responses of this kind seem to pepper the histories of virtually all scientific societies, and the Royal Microscopical Society is no exception either in this or in the intermittent financial and other crises it has had to face. In the first fifteen years of its existence, it struggled to balance the interests of the 'new' microscopy, with its emphasis on the microscope as a research tool, and the less exacting demands of the non-professional public that devoured the many editions of W.B.Carpenter's *The Microscope and its Revelations*, and flocked to the Society's soirées to peer and admire. It also had to cope with a membership of under two hundred, which made the all-important task of producing a worthy publication difficult. But, as Professor Turner's *History* shows, the Society emerged from this particular trough as successfully as it has emerged, more recently, from the disruptions of war and inflation, and the relentless march of specialization within the scientific community.

Plainly, the purpose of this book is not to preach. But the succession of travails and adjustments that it recounts, and the Society's present flourishing condition, convey an unmissable implicit lesson. Since the early nineteenth century, scientific societies have had an essential role both in communication among professionals and in the fashioning of the public image of science. There is nothing in the pages that follow to suggest that those functions are any less important, or, in the case of the Royal Microscopical Society, being fulfilled any less successfully than they have ever been.

ACKNOWLEDGEMENTS

I appreciate the honour of being asked by the Council of the Royal Microscopical Society to write the *History* of the Society on the occasion of its 150th Anniversary, and acknowledge its support in preparing the text and illustrations.

I am indebted to the President, Dr Gillian Bullock, and to Dr Brian Bracegirdle, Vice-President, who kindly read the chapters in draft; and to Professor Robert Fox, Professor of the History of Science at Oxford University, for writing the Foreword.

My thanks for assistance at various stages of preparing the *History* I extend to Dr S.Bradbury, Mr G. Douglas, Lt. Col. P.G. Fleming, Dr A.M. Glauert, and Mr A.V. Simcock; also to Mr Brian Archer for printing from my negatives the illustrations used in the book.

To my wife, Helen, I express my appreciation for help in producing a readable text from the mass of material that had to be assimilated.

NOTE ON SOURCES

The information used in the writing of this *History* has been taken, in the main, from the publications of the Society from 1840 till the present day. A list of these is given in Appendix 6. Biographical notes have been taken from the standard works: *Dictionary of National Biography*, *Dictionary of Scientific Biography*, *Dictionary of British and Irish Botanists and Horticulturists Including Plant Collectors and Botanical Artists*, edited by Ray Desmond (London: Taylor & Francis, 1977). Obituary notices may also be found in the publications of the Society.

Although the Council Minutes of the Society are important in providing insights and information not available elsewhere, they are variable in extent, being very short and cryptic during some decades according to the usage of the Secretary. Scrapbooks and jumbles of old files provided many of the illustrations used here, augmented by photographs lent by Fellows.

For further reading on the formation of scientific societies and on the nineteenth-century trade in microscopes, with bibliography, see G.L'E. Turner, *The Great Age of the Microscope: The Collection of the Royal Microscopical Society through 150 Years* (Bristol: Adam Hilger, 1989). Where instruments described in this Catalogue are referred to in the *History*, the Catalogue number is given in bold, viz. **[453]**.

References are given in a short form in the case of frequently cited journals:

TransMSL	*Transactions of the Microscopical Society of London.*
TransRMS	*Transactions of the Royal Microscopical Society*
MMJ	*Monthly Microscopical Journal*
JRMS	*Journal of the Royal Microscopical Society*
ProcRMS	*Proceedings of the Royal Microscopical Society*
JQMC	*Journal of the Quekett Microscopical Club*

The birthplace of the Society. Edwin Quekett's house, 50 Wellclose Square, where seventeen microscopists met on 3 September 1839 to found the Microscopical Society of London. This undated photograph (possibly 1920s) was presented to the Society by Dr C.Tierny on 21 October 1952.

CHAPTER 1

Introduction: Optical Instruments

The microscope and the telescope are the most important of that group of scientific instruments classified as optical, that is, as aids to the eye. These instruments serve what René Descartes (1596–1650) described as the noblest and most universal of the senses, and open up to the eye and mind of man the new worlds of the very distant and the very small. The invention of aids to vision has, however, a curious and interrupted history, subjected to sometimes conflicting influences. On the one hand there were scholars concerned with the study of geometrical optics, and on the other, craftsmen working to produce effective lenses. The resulting problems may be summarized thus:

Why was it that eyeglasses were not invented until about 1280 when the Romans had domestic glass-ware and first-rate lapidaries?

Why was it, with eyeglasses in production by 1300, that the telescope and the microscope were not invented until some 300 years later?

Why was it that lens systems were not designed until the early nineteenth century, and the physics of lens systems not satisfactorily formulated until the 1870s, some 110 years ago?

A number of scholars have considered aspects of the problem in more recent years, and there is no agreed solution in sight. Conceptual thought concerning the nature of light, the physiology of the eye, and the possibility of handling the information provided by a telescope or a microscope were the greatest stumbling blocks. The provision of clear quartz lenses, or less perfect glass lenses was nothing near such a problem. It is not possible in the short space available here to do more than briefly point to some possible solutions to the historical questions posed.

In popular histories on optics Roger Bacon (*c.*1219–*c.*1292), the Franciscan of Oxford University, is always invoked, and he is credited

with the invention of eyeglasses, telescopes, and the simple microscope. All this is a distortion of Bacon's writings, a distortion arising from the total hindsight of many writers over the past 300 years. To take just one example. The eleventh edition of the *Encyclopaedia Britannica* (1911), in the article on the telescope, says:

> William Molyneux, in his *Dioptrica Nova* (1692), p.256, declares his opinion that Roger Bacon (who died *c.* 1294) 'did perfectly well understand all kinds of optic glasses, and knew likewise the method of combining them so as to compose some such instrument as our telescope.'

What may have delayed the invention of eyeglasses are the theories of vision: the ancient Epicurean intromission theory (the forms of objects come to the eye), and the Euclidian and Ptolemaic emission theory (the eye sends out invisible rays). With such ideas, would a glass lens before the eye have had any meaning? Then there is the location of the sensitive ocular organ: the crystalline lens itself was accepted as the sensitive organ in medieval physiological optics. With this idea, would an additional lens in front of the eye have improved the vision? Could a lens before the eye have any beneficial effect at all, as interpreted by the bookish theorizers dressing up their arguments in mathematical clothing?

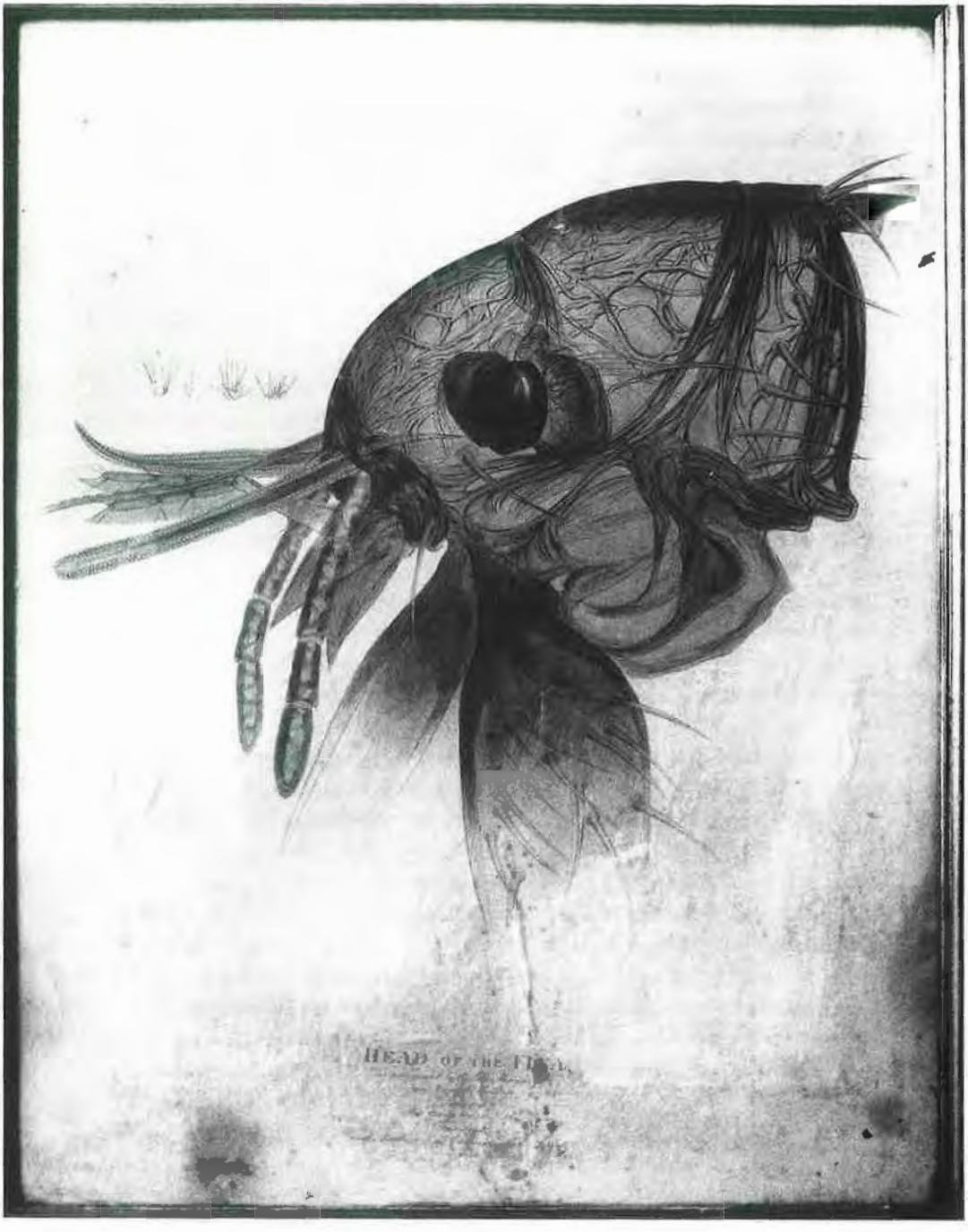
Bacon's *Perspectiva*, which was Part v of the *Opus maius*, was composed during the 1260s, and the Polish scholar, Witelo (*c.*1230–*c.*1275), who published his own *Perspectiva* in 1278, was familiar with it. John Pecham (*c.*1230–1292) completed his *Perspectiva communis* by 1279, when he was elected Archbishop of Canterbury, and he in turn was indebited to Witelo. Pecham, a theologian, had written an elementary textbook for students, including the rainbow, paraboloid mirrors, and burning mirrors. All are treated as problems in geometry. Perhaps it is just a coincidence that these three works all named *Perspectiva* were produced in the period just before the invention of eyeglasses in about 1286. The late Professor Rosen wrote a meticulously researched study on the invention of eyeglasses, and he concluded that the inventor is not known, but is likely to have been a glass-worker of Pisa. The oldest mention of eyeglasses themselves occurs in a series of regulations of the Venetian guild of workers in glass in 1300. Rosen also revealed the extent of uncritical copying, and the following is a simple example. Alessandro Spina (died 1313) of Pisa is said to have been the inventor by Robert Smith in his *Optics* (1738), and

Smith's text is lifted by Pieter Harting for his account in *Het Microscoop* (1848; German translation 1859), and this in turn is translated by Clay and Court for their *History of the Microscope* (1932).

Perhaps we should stop looking to the theologian, philosopher, or mathematician, and look to the men of affairs for the origins of eyeglasses. In the latter part of the thirteenth century the Republic of Venice was a world power, with extensive possessions in the East. The wealthy trading classes were literate, and their trading, insurance, and banking depended on book-keeping. Surely aids to the myopic, hypermetropic, and presbyopic were greatly to be desired. It was not economic to scrap a skilled book-keeper with defective eyesight. Perhaps there was an economic imperative that brought eyeglasses into being: the convex lens for the long-sighted. It may turn out that the book-keeper and the glass-blower were jointly responsible.

Moving three hundred years on, it is reasonable to look at the literature produced at the end of the sixteenth century, just before compound optical instruments came into being. Francesco Maurolico (1495–1575), a Benedictine, published a number of tracts in the middle of the century on the camera obscura, the eye, and the curves of eyeglasses for correcting sight. He worked within the long established conceptual framework, accepting the lens of the eye as the sensitive organ, and still believed that the image at the eye was erect (this in spite of the evidence from the camera obscura). Important in this context is the book by Giambattista della Porta (1535–1615), *De refractione* (1593). He deals with the lenses used in eyeglasses, but does not mention anything like a telescope or microscope. In this it is like *Ad Vitellionem paralipomena* (1604) by Johannes Kepler (1571–1630). Six years later, Kepler is writing expressly in the context of the recent invention of the telescope by a 'Belgian'. In 1610, Kepler has been quite delighted to hear of Galileo's telescope and its revelations, and was sorry he had not been able to use such an important aid in his own astronomical work. In Kepler's *Dioptrice* (1611) optical instruments formed by the combination of lenses are prominent, the two forms of astronomical telescope, Galilean (more properly Dutch) and the Keplerian models. There are compound eyepieces and a scheme for a microscope.

The news from Middelburg in the Netherlands spread West as well as South, and the earliest recorded use of a telescope is that by Thomas Harriot (*c.*1560–1621), near London, on 26 July 1609 (Old Style). What is clear is that the world's most skilled technical optician had no



1 A lithograph made from a drawing by the Reverend J.B.Reade, *c.* 1836, entitled 'Head of the Flea as represented by the solar microscope in canada balsam'.

knowledge of a telescope in 1604, and Harriot and Galileo were using telescopes in 1609. A thorough history of the origins of the telescope was written by the Dutchman, Cornelis de Waard, *De Uitvinding der Verrekijkers* (1906), and he gave this as his opinion, based on archives in Middelburg: 'Sacharias Janssen [a spectacle maker] is the sole Hollander, of whom we know, who before 1608 possessed a telescope'. Janssen's neighbour, Hans Lipperhey, had his patent application refused on 2 October 1608 because the invention was already known. Another important observation of De Waard is to do with the microscope: 'Before the diffusion of the telescope one finds no mention of the microscope'.

To extend the eye's capacity to see small objects, that is, to widen the angle the object makes with the pupil of the eye, a single lens or a combination of lenses is required. The telescope could be expected to generate interest in combining lenses in a variety of ways until a compound microscope was formed. Even so, there were several difficulties in forming clear images with the compound microscopes of the seventeenth and eighteenth centuries, so much so that better clarity and resolution were to be had from simple microscopes.

Glass itself is one of the technical hindrances to improving optics. There is the quality and type of glass used, the method of making lenses, and the nature of light itself. A lens acts to some extent like a prism, and breaks up the light into its component colours, so producing coloured edges to the image, a defect known as chromatic aberration. It was only in the 1750s that John Dollond was able to make an achromatic objective for a telescope by combining two lenses made from different types of glass: crown and flint. The much smaller objective lenses used in a compound microscope were very difficult to make achromatic, and there was no commercial production until the first decade of the nineteenth century. Another defect, spherical aberration, produces a slight blurring of the image that arises from the spherical curvature of the surfaces of the lenses. This defect was not corrected until the 1830s, when a founder of the Microscopical Society of London, Joseph Jackson Lister (1786–1869), showed how to design an optical system using combinations of achromatic pairs of lenses (see Chapter 2). The physical theory behind the formation of the image in a microscope was eventually formulated as recently as the 1870s, the physicist responsible being Ernst Abbe (1840–1905) of the University of Jena working in collaboration with the manufacturer, Carl Zeiss (see Chapter 3).

Glass for optical purposes should have no colour, and should be completely uniform throughout. Contamination by some metals in quite small quantities will colour glass green or brown, and this is difficult to avoid. To produce good optical glass requires very hot furnaces and much better control of atmosphere than is necessary for window glass. The technical problems were not overcome until the new technical optical industry began to develop at the beginning of the nineteenth century, in particular the Bavarian firm of Utzschneider, Reichenbach & Liebherr, which Joseph Fraunhofer (1787–1826) joined in 1806 (see chapter 2 in G.L'E. Turner, *The Great Age of the Microscope: The Collection of the RMS through 150 Years*, 1989). The full fruits of scientific/technical collaboration were not to be obtained until Ernst Abbe and Otto Schott, working in Jena for five years, were able to present to the public in 1866 their first Trade Catalogue of the Jena Glass Laboratory. Optical glass could now be made to have dispersion and refraction in the combinations required by the designers of technical optics.

One may see from this brief survey that what appears to be a simple technical problem presented very great difficulties in its solution. In the nineteenth century, the skill of the craftsman and the theoretical knowledge of the scientist combined to bring the light microscope to its highest pitch of performance. The Microscopical Society was both the result of, and a force to promote this dramatic development. Its foundation followed the publication of Lister's pragmatic work, while the high point of membership (663 in 1891) came at the time of Abbe's formulation of image theory. In the twentieth century, a fresh impetus was given to the Society by the invention of the electron microscope and diversification for light microscopy.

CHAPTER 2

The Microscopical Society of London is Founded

The Society began life in Wellclose Square, east of the Tower of London, between Cable Street and the Western Docks. The Square still exists, but not number 50, once the home of Edwin Quckett. The house was still there, though rather the worse for wear, in 1895, when the then President, A.D.Michael, devoted his Address to tracing the Society's history. He described a visit to Wellclose Square:

> . . . the shadow of the neighbouring docks is on it, and its principal features seem to be rag and bottle shops, marine store dealers, and street stalls . . . . The place, I fear, will not now impress our traveller as having either a scientific or a fashionable aspect, but if he passes the Catholic Seamen's Club, and observes the houses surrounding the enclosure he will notice that many of them are old, and have been good, substantial brick houses, pleasant enough to live in; and that some bear considerable remains of artistic ornament. Following round the enclosure he will pass Messrs. Geo. Wybrow's pickle manufactory, and between that and Messrs. Greenfield, Harvey & Co.'s brewery, he will find a house that certainly looks as if it had stood there for considerably more than half a century; at the present moment its bell-handles are broken relics, and the ridge tiles would be the better for a little repair; but this house is No. 50 Wellclose Square.

At Edwin Quckett's house, on 3 September 1839, seventeen microscopists met 'to take into consideration the propriety of forming a society for the promotion of microscopical investigation, and for the introduction and improvement of the Microscope as a scientific instrument'. This initiative followed naturally upon a decade during which the microscope had undergone far-reaching improvements. In

1830 had appeared Joseph Jackson Lister's paper 'On the Improvement of Achromatic Compound Microscopes', in which he announced his work on lens systems that dramatically reduced spherical aberration. The publication in the *Philosophical Transactions of the Royal Society* was followed by the development of microscope objectives embodying Lister's invention, and by other improvements in stand design and specimen preparation. The decision to found a society was the culmination of regular informal meetings of microscopists instigated by Nathaniel Ward and James Scott Bowerbank. The Rev. J.B.Reade in his Presidential Address to the Society in 1870 reported that, at one of these gatherings, Bowerbank made the now famous comment: 'God bless the Microscope; let us have a Society!'.

Both Bowerbank and Ward were among the seventeen founders, as were Lister himself, Reade, Cornelius Varley, Andrew Ross, and George and Conrad Loddiges. It is interesting to note that Ward was a neighbour of Edwin Quekett in Wellclose Square, living at No.7, and that other original members of the new Society whose homes were also in the Square were Edwin's brother, the Rev. William Quekett at No.57, Charles Foulger at No.46, and the entomologist, Edward Newman at No.45. The seventeen members present at the originating meeting were:

> The Rev. J.T. Bean, Mr (later Dr) J.S. Bowerbank, Dr A. Farre, Messrs. Francis, Greening, Jackson, Lister, G. Loddiges, C. Loddiges, E.J. Quekett, the Rev J.B. Reade, Messrs. M.J. Rippingham, A. Ross, R.H. Solly, C. Varley, N.B. Ward, A. White.

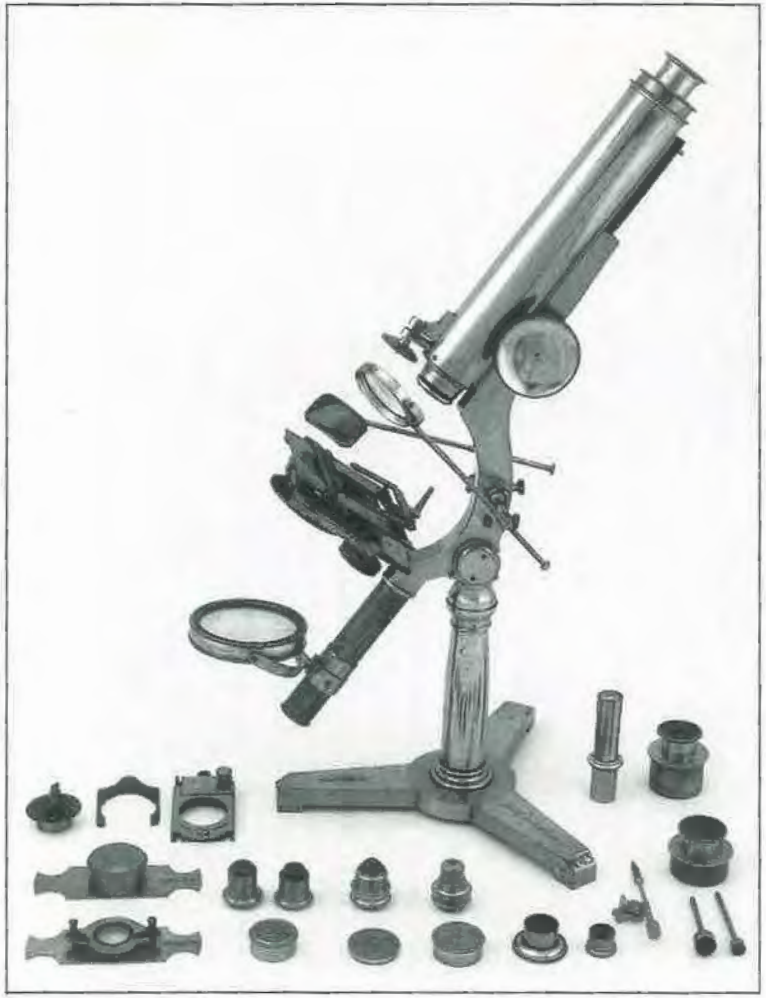
James Scott Bowerbank (1797–1877), who was elected President of the Society in 1846, was a Londoner, a partner in his father's distillery, and a lecturer on botany and human anatomy. He was elected a Fellow of the Royal Society in 1842, and published an important study on sponges: *A Monograph of the British Spongiadae*, 4 vols (Ray Society, 1864–82). He was notably active in learned societies, being a founder not only of the Microscopical Society, but also of the Paleontographical Society and of the Zoological Society. Bowerbank was an indefatigable entertainer of like-minded friends, and A.D.Michael tells the story that he kept by him a box of showy, striking slides that he called his 'goodness racious box'. Any visiting stranger who wished to use Bowerbank's microscopes was first shown slides from the box in order to discover whether his interest in microscopy were serious, or merely superficial. If the latter, he stayed with the 'goodness gracious box' all evening.

Dr Arthur Farre (1811–1887), FRS, was the first Secretary of the new Society, and became President in 1850. He was a leading medical practitioner, who was a lecturer on comparative anatomy at St Bartholomew's Hospital, and later Professor of Obstetrics at King's College. The high proportion of medical men among the early members of the Society bears witness to the importance of the improved, post-Lister microscope in all branches of medicine.

A notable botanist, who was a member of the group at Edwin Quekett's house, was George William Francis (1800–1865), FLS. It is most likely that he came with the Loddiges, for he was apprenticed to their firm. He emigrated to Australia in 1849, and became founder Director of the botanic garden at Adelaide.

Elected the seventh President of the Society in 1852 was George Jackson (1792–1860), another of the founders. He was a Devonian, a farmer's son, who attended Ashburton grammar school, and trained as a surgeon. But it was as a mechanic and inventor that he made his name, and his skill was eventually used to make prototype microscopes, in cooperation with Lister. He also made thermometers, hydrometers, and barometers, devised a camera for himself, and produced photo-micrographs.

Described as 'the pillar and source of the microscopy of the age', Joseph Jackson Lister (1786–1869) was a Quaker, and a wine-merchant by profession. Inevitably, his son, the great surgeon and pioneer of asepsis, has taken most of the glory of the family name. But Joseph Jackson's contribution to the perfection of the objective lens systems of the microscope marks a spectacular turning-point in its development. His pioneer work took place between 1824 and the publication of his remarkable paper of 1830. In it, Lister reported that an achromatic combination of a negative flint-glass lens with a positive crown-glass lens has two aplanatic focal points. For all points between these foci the spherical aberration is overcorrected; for points outside, it is undercorrected. If, then, a doublet objective is formed that is composed of two sets of achromatic lens combinations, spherical aberration is avoided if the object is at the shorter aplanatic focus of the first lens pair, which then passes the rays on to the longer aplanatic focus of the second element. This design removed, for the first time, the fuzziness of the image caused both by chromatic and spherical aberrations and, in addition, nullified coma. The new principle elevated the making of microscope objectives from the traditional trial-and-error procedure to a scientific one, and it continues as the



2 The first microscope purchased by the Microscopical Society of London on 30 November 1841. It was made by James Smith of 50 Ironmonger Row, and cost £46 4*s* 6*d*; see Turner, *The Great Age of the Microscope* (1989), **171**.

3 Edwin Quekett's microscope bequeathed to the Microscopical Society of London, and received in 1847; see Turner, *The Great Age of the Microscope* (1989), **172**.

basis for the design of low-power objectives. As a result of this paper, Lister was elected a Fellow of the Royal Society on 2 February 1832.

Lister began grinding and polishing lens in his own home. The result was, he said in a letter to Sir John Herschel, beyond his expectations:

> . . . without having ever before cut brass or ground more than a single surface of a piece of glass, I managed to make the tools and to manufacture a combination of three double object-glasses, without spoiling a lens or altering a curve, which fulfilled all the conditions I proposed for a pencil of 36 degrees.

Some of Lister's optical lathe chucks, polishing sticks, and experimental lenses are still extant [**382**]. The optical instrument makers in London did not immediately adopt Lister's ideas when designing their objectives. In 1837, however, he gave details for the construction of an objective of ⅛-inch focal length to Andrew Ross, while in 1840, he instructed James Smith in the techniques for constructing ¼-inch objectives, which were for a long time known as 'Smith's quarters' among microscopists. Such new objectives, commercially available for the first time, turned the microscope into a serious scientific instrument, and it continued to develop rapidly until the 1880s, when the limit of resolution of the light microscope was reached.

George and Conrad Loddiges were father and son. Joachim Conrad Loddiges (1738–1826) had come to England from Hanover, where he had worked as a gardener to King George II, and settled in Hackney, London. His sons, George and William, established a horticultural business that was said to rival Kew Gardens. George (1786–1846) designed his own magnificent palm-house in Hackney, and published, between 1817 and 1834, *The Botanical Cabinet*, with plates mostly drawn by himself. His botanical research involved the use of the microscope, and led to his association with the other founders of the Society. George must have brought his young son, Conrad (1821–1865), to the founding meeting in Wellclose Square.

The three Quekett brothers were resident in Wellclose Square, and were closely concerned with the new venture. The Rev. William Quekett was immortalized as the original of Charles Dickens' sketch in *Household Words*, entitled 'What a London Curate can do if he tries'. Edwin and his younger brother, John, were both surgeons and microscopists, and both died in middle age. Edwin (1808–1847) was a brilliant medical student, and practised medicine from his home, but

he was best known as a lecturer in botany at the London Hospital medical school. Young John (1815–1861) was apprenticed to study medicine with Edwin and at the London Hospital, but he made his reputation as a histologist, for he produced over sixteen thousand preparations for the histological collection of the Royal College of Surgeons, of whose Hunterian Museum he was assistant conservator. When Richard Owen retired from control of the Museum, John Quekett succeeded him, and was also appointed Professor of Histology, as well as being elected a Fellow of the Royal Society shortly before his early death. John Quekett's *Practical Treatise on the Use of the Microscope* (1848) went through three editions, and was translated into German. In his recent study of John Quekett, Dr Brian Bracegirdle assessed the *Treatise* as the first major work on object preparation in any language, and praised it as thoroughly practical, and set out in a fully scientific manner (*ProcRMS*, 23, pt 3, 1988). Quekett's lifelong enthusiasm for the microscope is witnessed to by the story that, while still at school, he delivered a course of lectures on microscopy, using an instrument made out of a roasting jack, a parasol, and odd bits of brass from a marine store dealer.

The Rev. Joseph Bancroft Reade (1801–1871) was a Cambridge graduate and a Fellow of the Royal Society, a founder of the Microscopical Society, and its fifteenth President. He was a pioneer in the use of the solar microscope, and an expert in photomicrography. The invention of photography had been announced at the beginning of the same year that the Society was founded, and Reade, working largely on photomicrographs, was one of the earliest to invent successful improvements of the new technique. His important contribution was the use of gallic acid, a chemical accellerator, which turned out to be the key to the latent image process afterwards perfected by Fox Talbot. Interestingly enough, Talbot learned of Reade's ingredient from Andrew Ross, who at the time was making lenses for both men. Reade also invented an astronomical eyepiece that was entered at the Great Exhibition of 1851, as well as a hemispherical condenser [**354**], and an illuminating prism [**353**].

Hugh Powell, James Smith, and Andrew Ross were the three leading London optical instrument makers who put into practical effect the transformation of the microscope brought about by Lister's lens research. Andrew Ross (1798–1859), who was among the seventeen founders of the Society, worked initially in Clerkenwell. In 1837, he took premises at 33 Regent Street, Piccadilly, and began signing his

products 'Andw. Ross & Co', the 'company' indicating his association with Lister, who probably financed Ross's move to the West End. For the six years following his move, Ross worked closely with Lister, making lenses to his specification. Ross invented and published details of a correction collar for use with high-power objectives. That he knew a great deal about lens systems for the microscope is proved by his lengthy article on the subject in *The Penny Cyclopaedia of the Society for the Diffusion of Useful Knowledge* (1839).

Another botanist, whose specialism was plant physiology, was Richard Horsman Solly (1778–1858), already at the time of the meeting in 1839 both a Fellow of the Royal Society and of the Linnean Society. Solly served for several years as a member of the Council of the Microscopical Society of London.

Cornelius Varley (1781–1873) was that unusual combination, a professional artist who was deeply interested in science. His scientific knowledge came from his uncle, who adopted him at the age of ten. Samuel Varley was a London jeweller, clockmaker, and instrument-maker, who gave lectures on experimental philosophy, and founded the Chemical and Philosophical Society. Cornelius became a successful water-colourist, but maintained his connections with science, for he worked with Andrew Pritchard on the development of a diamond lens for the microscope, and invented and patented a graphic telescope [**402**, **403**].

The first Treasurer of the Society, as well as one of the seventeen founders, was Nathaniel Bagshaw Ward (1791–1862). Ward combined the two main professional strands in the new Society, medicine and botany, for he practised as a doctor in Wellclose Square, but is chiefly remembered for his invention of the Wardian Case, which provided a safe means of transporting live plants over great distances, and also of growing ferns and mosses successfully within an ordinary house.

The last of the seventeen founders who can be identified was Adam White (1817–1878), a Scotsman and Fellow of the Linnean Society, who worked in the Zoological Department of the British Museum.

The immediate result of the meeting on 3 September 1839 was a resolution that a Microscopical Society should be formed, and the appointment of a provisional committee to carry the resolution into effect. This consisted of Bowerbank, Lister, G. Loddiges, E. Quekett, Reade, Solly, and Ward. The formal account of the reasons for setting up the Society formulates the need it was designed to meet, in elegant Victorian prose:

> For some years past, several of the metropolitan microscopical observers have been in the habit of occasionally meeting in each other's houses, for the purpose of comparing the powers and other merits of different microscopes, of testing the accuracy of each other's observations of minute objects and structure, – and of submitting doubtful and obscure microscopical phenomena to instruments of different constructions.
>
> But while the benefit and pleasure arising out of these casual associations were acknowledged by all who participated in them, the inconvenience of having no fixed or central place of meeting, and the inadequacy of most private residences to accommodate the increasing numbers of the lovers of the microscope, desirous of joining such an association, began to be severely felt; and thus the design of instituting a Society for the advancement of the science of the microscope, originated as the legitimate consequence of the exigencies of the microscopical investigator, and not as a secession from, or subdivision of, any previously constituted scientific body.

The final sentence of this quotation alludes to a problem that often arises with a new learned society, namely, the fear that it will draw off members, and perhaps more importantly, papers from older bodies. This fear was actually referred to by Professor Richard Owen in the first Presidential Address, and dismissed as 'entirely groundless'. The majority of papers presented to the new Society were strictly concerned with the improvement or use of the microscope, or 'the direct and legitimate offspring of the stimulus to microscopic researches resulting from our present association'. The body most directly affected must surely have been the Linnean Society, since so many of the Microscopical Society's early members were Fellows of the Linnean. In fact, the two societies have continued to thrive to this day.

But this is to digress from the founding of the Society. The committee set up on 3 September drew up a constitution, and chose the name 'The Microscopical Society of London'. The suffix -al was added at the behest of the Rev. J.B. Reade, to prevent, as he recounted in his Presidential Address, 'the possibility of ourselves being mistaken for microscopic objects'. A public meeting was planned, to be held in the rooms of the Horticultural Society, 21 Regent Street, on 20 December 1839. At this meeting, Professor Richard Owen took the chair and was elected President, while Ward became Treasurer, and Farre Secretary. Forty-five men inscribed their names as original members, and it was

4 Arthur Farre (1811–1887), President 1850–51, photographed in 1859. It is possible that the Ross microscope shown is the one purchased by the Society in 1843, and which was exchanged for a binocular instrument made by Thomas Ross in 1863; see Turner, *The Great Age of the Microscope* (1989), 152. See also Fig. 18.

resolved that all who joined before 29 January 1840 should also be considered original members. In the early membership lists, these names are asterisked. A Council was appointed, consisting of the following:

> J.S. Bowerbank, Thomas Edwards, Dr F. Farre, G. Gwilt, George Jackson, Dr John Lindley, George Loddiges, the Rev. C. Pritchard, Edwin Quekett, M.J. Rippingham, R.H. Solly, Robert Warrington.

The new Society's constitution began with a definition of the 'Objects of the Society':

> The Microscopical Society of London is constituted for the promotion and diffusion of improvements in the optical and mechanical construction, and in the mode of application, of the microscope:-
> For the communication and discussion of observations and discoveries tending to such improvements, or relating to subjects of microscopical observations:-
> For the exhibition of new or interesting microscopical objects and preparations, and for the formation of an arranged collection of such objects:-
> For affording the opportunity and the means of submitting difficult and obscure microscopical phenomena to the test of instruments of different powers and construction:-
> For the establishment of a Library of standard Microscopical Works.

The running of the Society is then described. There shall be ordinary members, honorary members, and associates (see Appendix 4). The ordinary members are required to pay an admission fee of one guinea, and an annual subscription of the same sum. They have the option of 'compounding for their future annual subscriptions', that is, taking out life membership, for the sum of ten guineas. Ordinary members are entitled to attend all meetings, to make use of the Society's library and collection, and to bring one visitor to any meeting. Honorary members are to number no more than twenty, and must be resident outside Great Britain. Associates and honorary members pay no fees, and cannot propose candidates for membership, vote, or introduce visitors. More than two years' arrears of subscription shall lead to public announcement of the member's name, and if he fails to pay within three months,

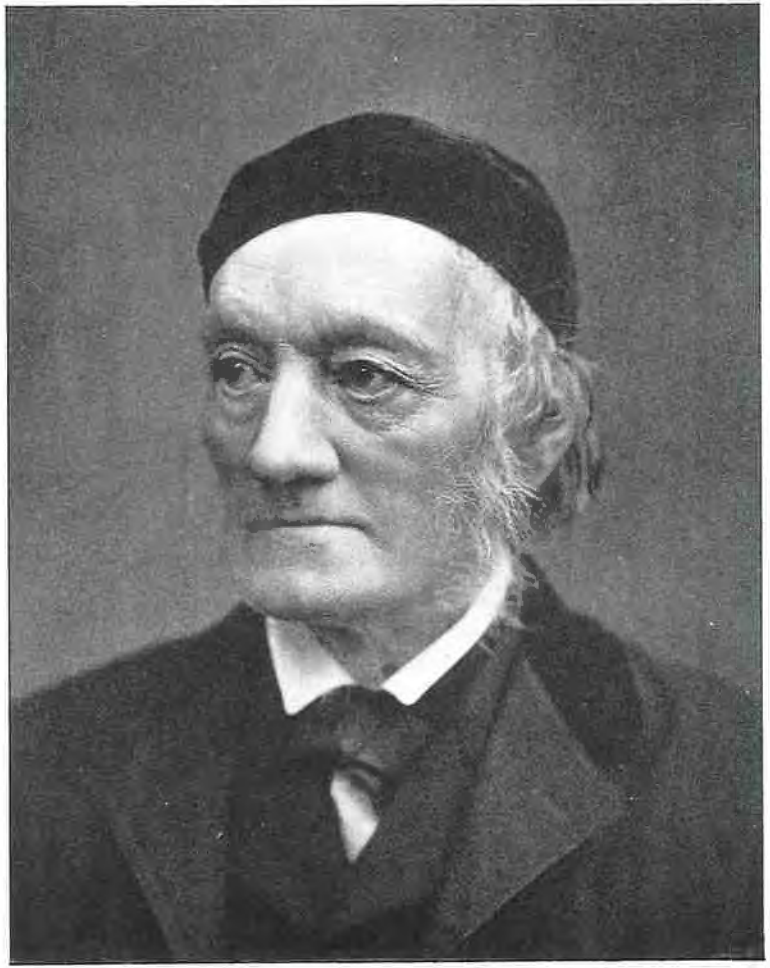
he is liable for removal from the members list. This step is taken by resolution of the Council, public notice, and a two-thirds majority.

Apart from the Anniversary (ie. Annual) Meeting to be held in February, regular monthly ordinary meetings of the Society are to be held, with admission of members at 7 pm, formal business at 8 pm to include elections by ballot, and the reading and discussion of scientific papers. From 9 pm, an informal 'conversazione' will follow. The constitution also provided for the vetting by Council of all scientific papers submitted; the occasional publication of a selection of papers as *The Transactions of the Microscopical Society of London*, to be available for sale to the public, and to members at a reduced price; the establishment of a lending library; and the use by members at meetings only of a collection of microscopic objects.

The Council of the Society, charged with the duty of conducting its business, is to comprise, besides the President, Secretary, and Treasurer, twelve members (five forming a quorum), of whom four are to retire each year, to be replaced by four new members elected at the December meeting. The Council is to hold its meetings on the same day as ordinary meetings of the members. The officers are to elected annually by ballot, with the exception of members of the Council not due to go out of office under the rotation system. The President is to be eligible to serve for only two successive years.

The final act of the provisional committee was both eminently practical and of long-term significance. It decided that the dimensions of the glass slips used by members to mount specimens should be fixed at 3 inches by one inch, and 3 inches by one-and-a-half inches. Because of the influence exerted by the Microscopical Society, the first of these standards, 3x1 inch, was gradually adopted throughout the microscope trade, a valuable piece of standardization still current today. In line with this practical approach, the first purchase by the Society was a cutting board and diamond cutter for making glass slides.

In the months between the founding public meeting in December 1839, and the first Anniversary Meeting in February 1841, there was much to be done and decided. The Horticultural Hall was settled upon as the regular venue for meetings, at an annual charge of £20. The problem of publishing papers read at meetings was usefully solved in January 1841, when Daniel Cooper submitted to the Council the prospectus of a proposed *Microscopic Journal*, to be edited by himself, and printed by John Van Voorst of Paternoster Row, in which abstracts of papers delivered to the Society could be printed. This was seen as an



5 Sir Richard Owen (1804–1892), first President of the Microscopical Society of London, 1840–41. From a photograph by Elliott & Fry.

6 The Rev. Joseph Bancroft Reade (1801–1870), President 1869–70.

excellent solution to the difficulty of fulfilling the constitutional requirement to publish, and Mr Cooper's proposal was accepted (see Appendix 6).

Daniel Cooper was the son of J.T.Cooper, a well-known chemical lecturer, who was one of the first publicly to use oxy-hydrogen light in place of sunlight to create public spectacles of microscopic effects. Daniel studied medicine, and became an army surgeon, though his interests remained scientific and literary. He founded the Botanical Society of London, delivered botanical lectures, and worked as an assistant in the Natural History department of the British Museum. As well as founding the *Microscopic Journal and Structural Record* in 1841, he had earlier remodelled and edited *Bingley's Useful Knowledge*, and all this was achieved before his early death at the age of twenty-six. Since Cooper died in 1842, *The Microscopic Journal* appeared for only two years, the second year under the joint editorship of George Busk, of whom more later. Nevertheless, the journal gave an excellent start to the proceedings of the Microscopical Society of London, being well printed and illustrated, and including extracts from several foreign periodicals. The volume for 1841 contained 200 pages, and that for 1842, 370 pages, plus plates.

In the course of its first year, the Society began to acquire books, the first purchase being a treatise, with atlas and 64 coloured copperplates, by C.G.Ehrenberg, *Die Infusionsthierchen als volkommene Organismen* (1838), which cost £13.10*s*. The purchase of microscopes for the use of members was also considered, and at the Council meeting on 21 October 1840, it was 'resolved that estimates be obtained from Messrs. Ross, Powell, and Smith severally for compound microscopes of first-rate quality. The estimates to specify the cost of the instrument; of what it is to consist; and within what period of time the maker will undertake to furnish the same.' A sub-committee considered the estimates, but in the first year a stand only was acquired, presumably for lack of funds. The considerable sum of £23.1*s*.1*d*. had to be spent on printing and stationery as the Society got under way. Another sub-committee was put to work to draw up by-laws for the Society, and these, when approved, were printed,together with a list of members, for distribution at the First Anniversary Meeting, held at 21 Regent Street on 15 February 1841.

The chair was taken at this meeting, as it had been at the inaugural public meeting, by Richard (later Sir Richard) Owen (1804–1892), the Society's first President. At this time, Owen was in his thirties, but

already a Fellow of the Royal Society, lecturer on comparative anatomy at St Bartholomew's Hospital, and Hunterian Professor at the Royal College of Surgeons. He had just completed his catalogue, in five volumes, of the physiological specimens in the Hunterian collection, and had begun his major work on odontography. He was closely involved in the Great Exhibition of 1851, and the Paris Exhibition of 1855. As Superintendent of the natural history collections of the British Museum from 1856 to 1883, he oversaw their rehousing at South Kensington. Owen was one of the great figures of the Victorian age, with a brilliant intellect, and a personality that made him a public figure at an early age. He was granted a Civil List pension at the age of thirty-eight, and ten years later, Queen Victoria made available to him Sheen Lodge, Richmond Park, for he enjoyed close contact with the royal family. He worked with the Prince Consort on plans for the Great Exhibition, and lectured to the royal children. His output of published works was prodigious, and he was regarded as the leading anatomist and naturalist of the time, only eclipsed in his final years by Charles Darwin. Yet his career was a stormy one, for he was intolerant of any rivals, and attacked them mercilessly. Owen's support for the newly-founded Microscopical Society of London was given with characteristic energy and commitment, and was valuable because of his prestige. He paid tribute to the Society in his Presidential Address to the Leeds meeting of the British Association in 1858:

> The microscope is an indispensible instrument in embryological and histological researches, as also in reference to that vast swarm of animalcules which are too minute for ordinary vision. I can here do little more than allude to the sytematic direction now given to the application of the microscope to particular tissues and particular classes due in this country to the counsels and example of the Microscopical Society of London.

The meeting of 15 February began with the report of Council, announcing that the membership stood at 177, and that, in the course of the year, 18 papers had been read at meetings. The auditors' report revealed that the Society had a balance of £290.15*s*.3*d*. Profesor Owen then delivered his Address, devoting a large part of it to a survey of the papers presented during the year. He divided these into four categories:

> I Papers relating to the Improvements of the Microscope itself
> II Microscopical Observations connected with Botany and

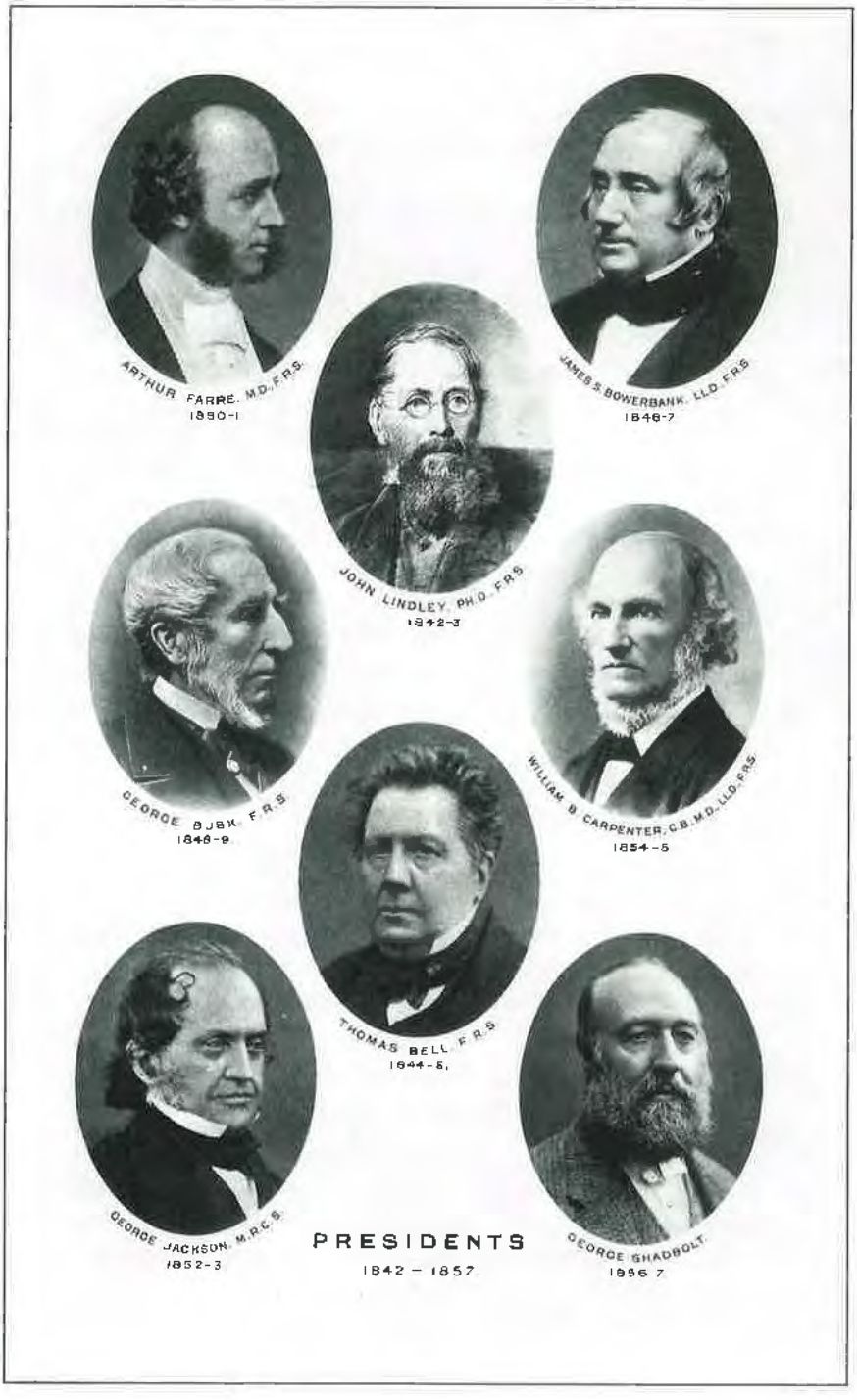
Vegetable Physiology

III Microscopical Observations connected with Zoology and Animal Physiology

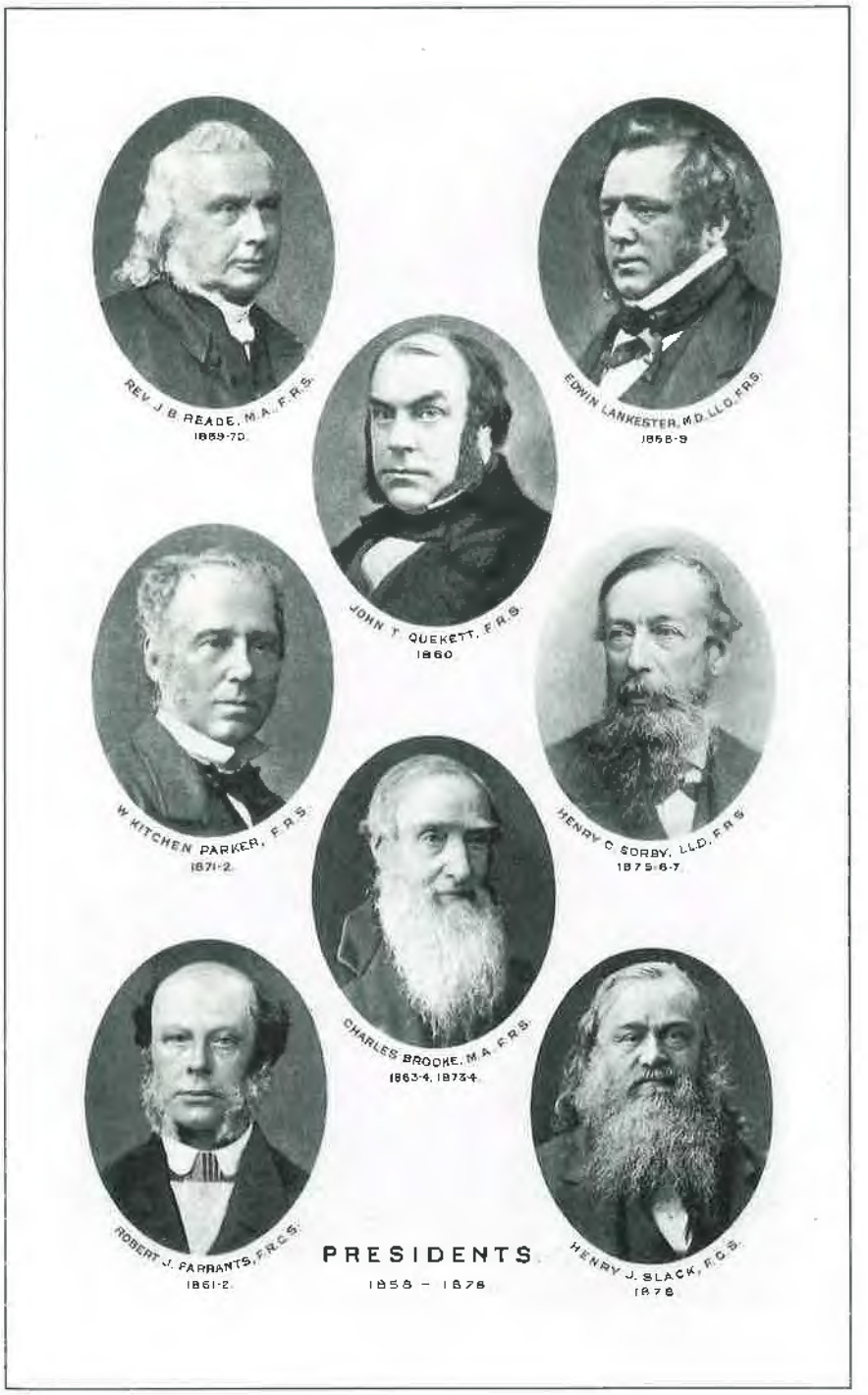
IV Application of the Microscope to Palæontology and Geology

Among the contributors singled out by Owen for mention were: George Jackson and Andrew Ross on the instrument itself; Edwin Quekett, Arthur Farre, and John Lindley on botanical topics; J.S. Bowerbank, John Dalrymple and C.G. Vernon Harcourt on zoology; Bowerbank again, and Samuel Leonard on fossils.

The Microscopical Society of London was thus launched, with notable success. Its membership included twenty-two Fellows of the Royal Society, among them the then President, the Marquis of Northampton, leading academics and instrument makers, and a particularly representative group of medical men and botanists. It was clear by the time of the First Anniversary that there was no lack of enthusiasm to attend meetings and deliver papers. Microscopy was beginning to forge links between practitioners in an increasing number of branches of science, giving the Society social and intellectual variety and stimulus.



7 Vignettes of eight Presidents, 1842–1857.



8 Vignettes of eight Presidents, 1858–1878.

THE

MICROSCOPIC JOURNAL,

AND

STRUCTURAL RECORD

FOR

1841.

WITH FORTY ILLUSTRATIVE DIAGRAMS, BY JOSEPH DINKEL.

EDITED BY

DANIEL COOPER,

MEMBER OF THE COLLEGE OF SURGEONS, LONDON; ASSOCIATE OF THE LINNÆAN SOCIETY;
MEMBER OF THE MICROSCOPICAL SOCIETY OF LONDON; AUTHOR OF
"THE FLORA METROPOLITANA," ETC., ETC.

LATE
AN ASSISTANT IN THE ZOOLOGICAL DEPARTMENT OF THE BRITISH MUSEUM; CURATOR
TO THE BOTANICAL SOCIETY OF LONDON; AND LECTURER ON BOTANY AT THE
THEATRE OF ANATOMY AND MEDICINE, WEBB STREET, BOROUGH.

LONDON:

PUBLISHED FOR THE PROPRIETORS BY

JOHN VAN VOORST, PATERNOSTER ROW.

9 Title page of *The Microscopic Journal and Structural Record for 1841*. See Appendix 6.

CHAPTER 3

The First Twenty-five Years

In the months following the First Anniversary there was discussion as to whether a librarian and curator should be appointed, and the candidate most favoured was John Quekett. In the event, no such post was created, but in June 1841, Quekett took over from Arthur Farre as Secretary, and became the mainstay of the Society for the next twenty years. During this period, he read seventeen papers at meetings that were published in the *Transactions*, as well as making many more informal contributions. He was, above all, an accomplished microscopist, and his attributes were appropriately described by R.J.Farrants in his Presidential Address for 1861, the year of Quekett's death:

> He was thoroughly familiar with the practical use of the instrument, dextrous and delicate in manipulation, singularly skilful in preparing objects for examination, diligent and patient in research, sagacious and cautious in interpreting the phenomena the microscope revealed – above all, he was honest and candid in recording his observations.

The importance to the Society of possessing first-class microscopes for the use of members was recognized from the foundation by the appointment of a sub-committee of the Council to inquire into ordering a microscope from each of the three leading London makers, Powell [**118**], Ross, and Smith [**171**]. In his second Presidential Address, Professor Owen was able to report that the three microscopes had been ordered, and those from Powell and Smith delivered. In the same Address, reference was made to one of the perennial concerns of Victorian microscopists, the need to minimize vibration when using high-power objectives. It was reported that arrangements were in hand 'to have fixed tablets [*sic*] inserted in the wall to afford a support to the

microscope'. The Council of the Horticultural Society had given permission for these to be set up in the meeting room.

Owen's successor as President, taking office in 1842, was Professor John Lindley (1799–1865), a leading botanist, who held the chair of botany at University College, London, for thirty-one years. When his father, a nurseryman near Norwich, failed in business, young Lindley came to London at the age of twenty, and obtained work with Sir Joseph Banks at the Royal Society as an assistant librarian. His first publication, dating from 1819, the year of his arrival in London, was a translation of Richard's *Analyse du fruit* that took him only three days of concentrated work. Predictably, this was the first of a long series of botanical books, of which the chief was *The Vegetable Kingdom* of 1846. He was elected a Fellow of the Royal Society in 1828, and was awarded its Royal Medal in 1857. In his first Presidential Address, Lindley reported the death at the age of twenty-six of Daniel Cooper, the founder Editor of *The Microscopic Journal and Structural Record*, which was to have been the vehicle for publishing the Society's *Transactions*. This left the Society once again facing the problem of publication with its financial implications. It was decided that publication should be on an occasional basis. In the autumn of 1844, the first volume of *The Transactions of the Microscopical Society of London* appeared, consisting of twenty-three papers read at ordinary meetings during the years 1840 to 1843. Volume 2, published in 1849, contained twenty-seven papers delivered between March 1844 and December 1848, while volume 3, of 1851, published thirty-one papers given between January 1847 and May 1851. The comparatively infrequent appearance of published papers was seen to be affecting the status of the Society, since members were finding it more satisfactory to use the journals of other bodies that appeared more frequently. At the Tenth Anniversary meeting in 1850, the President, George Busk, said:

> Our meetings and discussions, the exhibition of objects and the pleasing interchange of thoughts and observations these meetings afford, are all useful, agreeable, and instructive; but in the eyes of the world we shall be judged by our published works; and it is therefore to uphold the high character of our Society that I have brought this matter of its *Transactions* so prominently before you.

Following this criticism, a new attempt was made to incorporate the *Transactions* in a regularly published journal. Edwin Lankester and George Busk himself undertook to edit for the publisher, Samuel

Highley, *The Quarterly Journal of Microscopical Science*, which was to include as an integral part, but with separate pagination, the *Transactions of the Microscopical Society of London*. Members of the Society were to receive the combined quarterly issues free of charge. The first volume, published in 1853, also contained an important illustrative innovation. A paper by Joseph Delves entitled 'On the Application of photography to the Representation of Microscopic Objects', was illustrated by two micrographs printed on albumen paper and bound into the volume. This is almost certainly the first appearance of a micrograph in a scientific journal. The publication of this volume also began a connection with the printer, William Clowes, which continued with only a short break between 1857 and 1868, until the end of 1975 (see Appendix 6).

One of the reasons for the infrequent publication of papers in the early years of the Society was shortage of funds. Membership – and the Society relied for its income on subscriptions – did not increase rapidly. It was not until 1853 that the figure of 200 members was reached, and in 1849 membership dropped as low as 143. Such fluctuations were by no means unusual in the early years of a society, but it is clear that George Busk was entirely justified in seeing frequency of publication as crucial. Between 1850, when he made his comments on this topic, and 1854, membership rose from 153 to 228.

Through the 1840s, the Society's Presidents continued to be leading figures in botany or in medicine. Lindley's successor was Thomas Bell (1792–1880), Professor of Zoology at King's College, an anatomist and a specialist in dentistry. He also wrote on fossils, and was a Fellow, and for a period a Secretary of the Royal Society. In retirement, he moved to Selborne in Hampshire, and in 1877 published a new edition of Gilbert White's great work. In his Presidential Address of 1845, he urged the more extended use of the microscope in pathology:

> On reviewing the list [of papers], I cannot but regret that we have not a single record of any investigation in the department to which, of all others, I should be inclined to give the palm of real utility; I mean the morbid changes of structure – those alterations which occur in the passage from health to disease, the distinctions between simple and malignant diseases, and other matters of the same kind, which we can alone hope to determine by means of the microscope.

Bell's successor as President was James Scott Bowerbank, whose

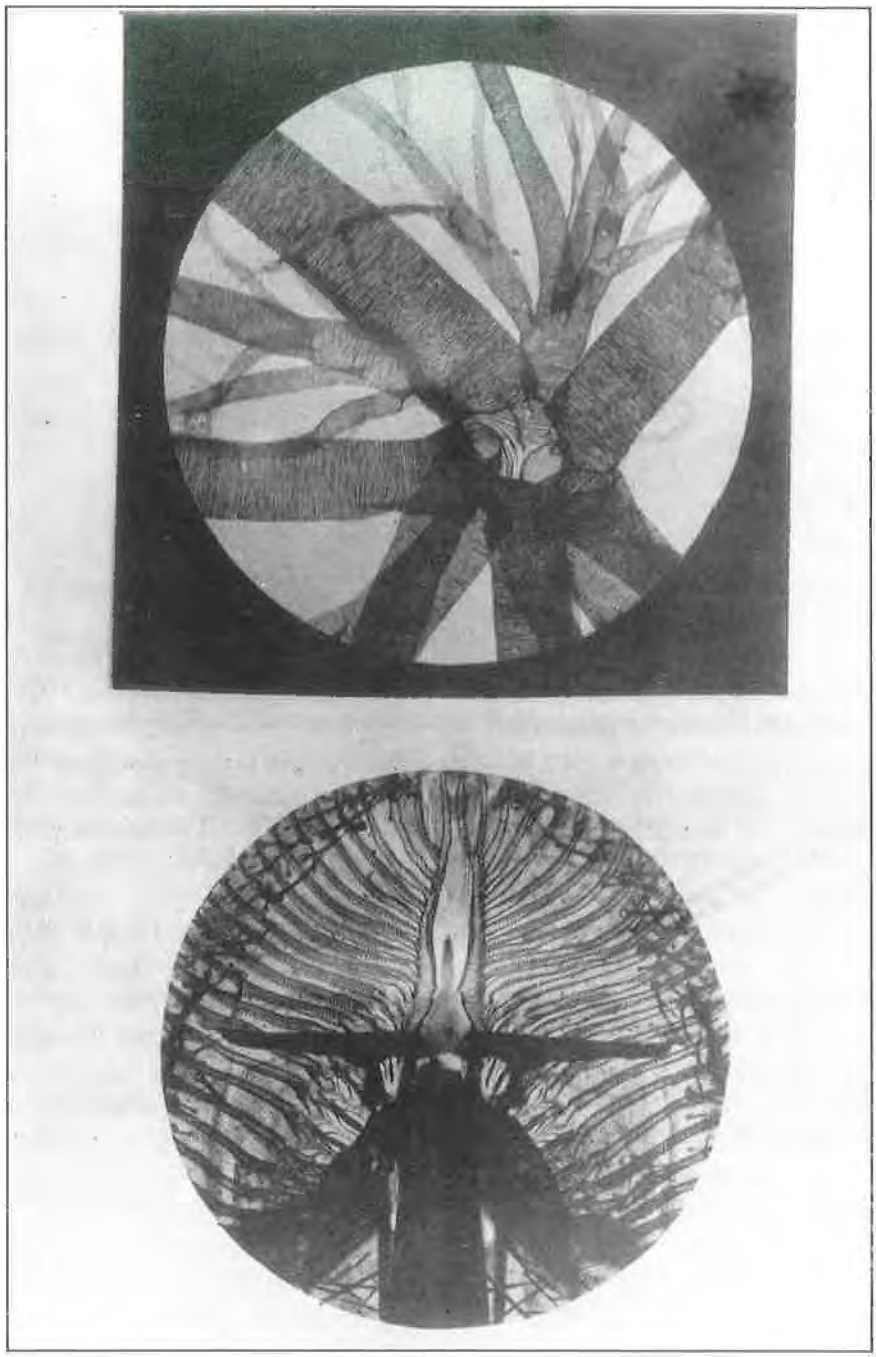
close association with the Society's foundation has already been described. In his Address in February 1847, Bowerbank reported on the progress in the manufacture of microscopes in the preceding decade:

> In the month of January, 1830, Mr Lister published his valuable paper 'On the improvements of Achromatic Compound Microscopes', and upon the principles there enunciated have been founded nearly the whole of the great modern improvements of the instrument, effected by Messrs. Powell, Ross and Smith . . . . Since the year 1836, there have been 724 of these beautiful instruments constructed by our three great makers, beside numerous adaptations of modern achromatic combinations to old instruments; and during the past year 99 achromatic microscopes have been made and disposed of by the same parties. Some of these have been sent to India, to America, and to other distant parts of the world, but by far the greater number have passed into the hands of members of the medical profession, to whom they have now become almost as necessary as the scalpel and the lancet.

The annual number of microscopes sold by the leading makers continued to be referred to by Presidents at intervals, and showed a steady increase. In 1852, the figure was 179 microscopes sold, while in 1857 this had risen to 385.

It may well be that this success was in part attributable to an interesting fact reported by George Busk in his Address of 1849, namely, that optical glass of high quality was at last being produced not only on the Continent, from where it had to be imported by the London optical instrument makers, but in Britain, notably by Messrs Chance of Birmingham. This innovation was said to be the result of the 1848 revolution in France that had led to the emigration of French glass-workers to England.

George Busk (1807–1886), whose Presidency concluded the first ten years of the Society, was, like Bell, a surgeon, who spent the first years of his career as a naval doctor on the hospital ship *Dreadnought*. He became President of the Royal College of Surgeons in 1871, and also worked extensively in paleontology, helping – as many other members of the Society did – with the work of describing and classifying the specimens brought back from the many scientific voyages of the time. Many of his papers were published in the Society's *Transactions*, and he



10 Two photomicrographs of the spiracle and tracheae of the silkworm and the proboscis of the fly prepared by J.Delves and S.Highley in 1852. Published in the *Transactions of the Microscopical Society of London*, 1 (1853) by binding in a sheet of albuminized photographic paper.

was editor not only of the ill-fated *Microscopic Journal*, but also, as already stated, of the *Quarterly Journal of Microscopical Science*.

In the years 1853 and 1854, the Society faced something of a crisis. Its budget had been eroded by publication costs, and the Horticultural Society, until then the most accommodating of hosts, suddenly proposed a rent increase of £10 a year. The Council attempted to keep the rent at the original figure by discontinuing use of the rooms during the day. But the Horticultural Society proved adamant, so a move was decided upon to the premises of the Chemical Society in Cavendish Square, where what were described as 'very eligible rooms, with light and fire' were offered for the accustomed rent of £20 a year. In 1854, however, the eligible rooms had been found in practice to be inconvenient, and the Society was back in Regent Street again.

It may have been because of problems over accommodation that a major scientific event the subject of which was 'the wonders of the microscope' was held on 11 April 1855, not under the immediate auspices of the Society, but those of the Society of Apothecaries of London, whose Master at that time was Nathaniel Ward. The Council-chamber in Blackfriars was hung with drawings and diagrams from the collections of such Microscopical Society notables as Quekett, and on tables over 100 microscopes were displayed, as well as the Peters machine for microscopic writing [**430**]. Mr Glaisher contributed a special exhibition of his photographs of snow crystals, one of which was eventually chosen as the badge of the Society after the Charter had been granted in 1866. The occasion was enjoyed by a company of over 600, and was reported fully in the *Illustrated London News* of 28 April. The accompanying illustration vividly portrays the 'scientific conversazione' in full swing, the loaded tables, earnest observers, and, in pride of place, the original Wardian Case from Wellclose Square. In all but name, this was a Microscopical Society event – even the floral decorations were supplied by George Loddiges.

The Microscopical Society's requirements in premises had expanded over the years, so the increase in rent by the Horticultural Society was not unreasonable. Monthly meetings were customary, at first on a fixed Wednesday each month, but later, on a Wednesday arranged by the Council to avoid clashes with the meetings of other societies. The months of July, August, and September were regarded as the summer recess, and no meetings were held. From 1844, the meeting-rooms were open during one day a week, when Mr Leonard was to be in attendance 'to assist Gentlemen in microscopic investiga-

11 'Scientific Conversazione at Apothecaries' Hall', from the *Illustrated London News*, 28 April 1855.

tions, and to draw either upon stone or paper for the use of the Society'. In the recess, Mr Leonard was to continue his drawing, and to look after the cabinet, for the sum of £30 a year. Both the cabinet, or collection of slides, and the library grew steadily by gift or purchase, and these had to be given house-room. The Society itself paid for improvements, such as tables for the microscopes, a bookcase, and gas lighting in place of the original Argand lamps. In October 1842, the Council had determined 'that a soirée should be held on the night of the Anniversary Meeting, and that the expense should be borne by the Society, and that the meeting should be the only one held during the month of February'.

The high point of the annual soirées must surely have been reached in 1859, when the lease on the Horticultural Society's premises had expired. An attempt was made by the Council of the Microscopical Society to secure free accommodation in Burlington House, Piccadilly, within the rooms of one or other of the learned societies lucky enough to be granted a home there. But this proved unavailing, and eventually King's College provided the next base for the Society. But before this move was made, 'the extensive rooms of the Museum at South

Kensington' [now the Victoria & Albert Museum] were used for the annual soirée, 'one of the largest meetings of its kind that had ever been seen in the metropolis.' The description of the event by the President, Edwin Lankester, in his 1860 Address, continues:

> About three thousand persons were present, and the display of microscopes and their accessory apparatus was such as had never been got together before. Upwards of three hundred microscopes, exhibiting all the forms and applications of the instrument, were displayed.

And all this, the President announced with justifiable pride, had been managed without any loss to the Society's funds; indeed, a small profit had been made. The move to King's College proved much happier than that to the Chemical Society, and King's provided its great hall for another soirée attended by over 700 people two years later.

These triumphs followed a period in the mid-fifties when the Society was at a low ebb. In 1856, only two papers were offered for publication, and the then President was critical of members in his Address. Since he was William Benjamin Carpenter (1813–1885), already a leading medical man, and about to publish the best-selling *The Microscope and its Revelations* that ran through eight editions between 1856 and 1901, his comments would have been taken seriously. Carpenter studied medicine in his home city of Bristol, and in London, and then moved to Edinburgh Medical School to do research in physiology. He never practised medicine, but achieved a considerable reputation as a lecturer and scientific writer. He was one of the last examples of the universal naturalist, for, as well as his important contribution to physiology – his major work, *The Principles of General and Comparative Physiology* (1839), was considered the first English book to contain a satisfactory conception of the science of biology – he did significant work in zoology, geology, marine physics, and microscopy. He gave up his many lecturerships in 1856 to become Registrar of London University, a post he filled until 1879, when he was awarded a CB for his services in the major development of the university.

George Shadbolt, President for 1856 and 1857, was one of the few to hold the office who had not achieved academic or literary distinction. He was, however, a contributor to the *Transactions*, and an enthusiastic microscopist, well liked by his fellow members. It was during his period of office that a sub-committee was set up to report on the best form of

universal attachment of the object glass to the body of a compound microscope. The report was duly made in November 1857, and the gauges for what came to be called 'the universal screw' were made by Whitworth. The provision of standards designed to make easier the use of the microscope has been an important function of the Society throughout its existence. The first step was the standardization of the size of the glass preparation slide at 3 × 1 inch. This second initiative gradually made it possible to interchange objectives between microscopes made by different makers.

In his second Presidential Address, Shadbolt expressed concern over the comparatively small collection of slides possessed by the Society – only 351 at the time. He recommended that someone should volunteer to be 'an asker-general', prepared to add to the Society's cabinet by direct requests to the members to contribute slides. As is often the case, this appeal provoked a steady increase in donations to the cabinet, the contents of which increased to 663 in 1860, to 882 in 1862, and to 1,100 in 1863. In 1861, the cabinet was put into order, and next year a cabinet committee was set up, the President giving an analysis of the Society's holding of slides, and indicating where additions would be specially welcome.

The Society had always set considerable store by its library, and purchases and gifts are regularly recorded from the first year. Under the Presidency of Edwin Lankester (1814–1874), it was decided that the library needed to be ordered, and its control placed in the care of a library committee. In 1859, it was reported that the sale of back numbers of the *Transactions* had brought in some funds to be used for binding journals and making new purchases. A 20-page *Catalogue of the Books in the Library of the Microscopical Society of London* was produced, which was also distributed with the journal. In 1862, it was reported by the library committee that the library contained 275 volumes, and 'now comprises nearly all the works on the microscope published from 1663 to the present time'.

Edwin Lankester's interest in the library was to be expected, for he was joint editor of the *Quarterly Journal of Microscopical Science* from 1853 to 1871, working first with George Busk, and later with his son, Edwin Ray Lankester. The father was both a medical man and a botanist, secretary for many years of the Ray Society, and editor of the *Correspondence of John Ray*. He made important contributions to the study of public health, and was for twenty years medical officer of health for the parish of St James's, Westminster.

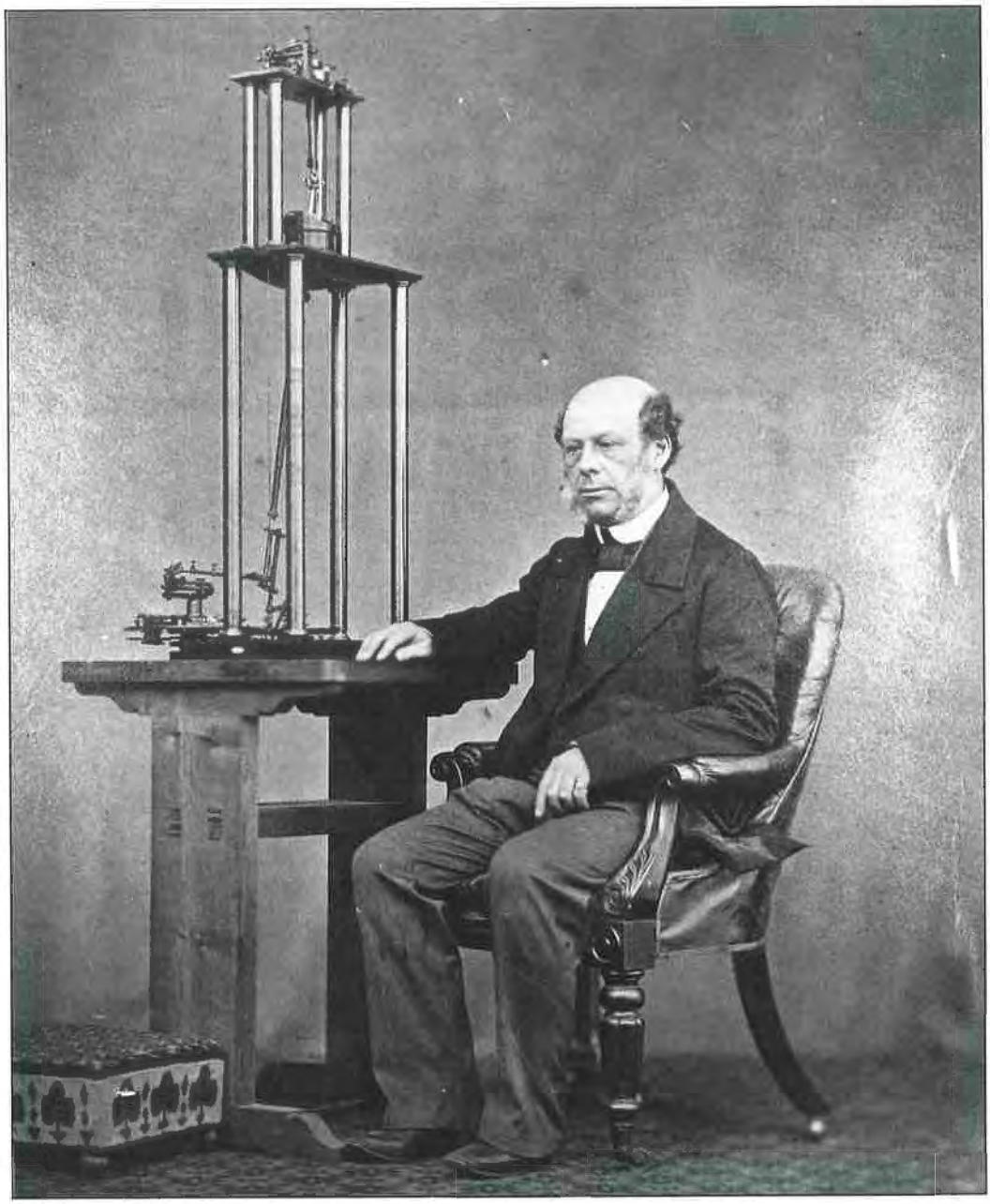
Lankester was succeeded as President by John Quekett, the Society's indefatigable Secretary, who was elected when in such poor health that he was unable to be present at any ordinary meetings, and could only deliver one Presidential Address. After his single year in office, he was followed by Robert James Farrants (1810–1870), a skilled microscopist who also published in the *Transactions* on the remarkable Peters machine for microscopic writing that was given to the Society at the Annual Meeting in 1862 by its inventor, and is still in its possession [**430**]. Farrants commented:

> Here perhaps I may be allowed a short digression, to say a few words on the munificent gift of Mr Peters, presented to the Society this evening – the machine for microscopic writing, and with it Ibbetson's geometrical chuck. The money value of these instruments is considerable, the chuck alone, I am informed, cost fifty guineas, and on the writing machine Mr Peters expended upwards of one hundred guineas, exclusive of the cost of cleaning and embellishing before presenting it to the Society, exclusive also of the handsome stand, mahogany table and glass case, which are now before you.

Farrants also commented that the Society's four microscopes – one the gift of the late Edwin Quekett [**172**], and the other three bought from the leading makers – were in need of modernization, but that this had not been done for lack of funds. The Powell & Lealand microscope [**118**] had, however, been fitted with a Wenham binocular tube, and this was a step in the right direction. He continued:

> Some curious old instruments, valuable as illustrating the history and progress of construction of the microscope, have been purchased. The most important of these is the remarkable instrument made by Benjamin Martin, and so highly prized by the late Professor Quekett.

The Council had authorized the Secretary to bid for the microscope at the 1861 sale of John Quekett's scientific effects, up to the sum of £21 (in the event it cost £15.15*s*. [**28**]), and the library committee to buy books to the value of £20. This was agreed, but it was thought that the Society itself could not afford this expenditure, and so the money was to be raised by private subscription. An extension of this idea was to use private funding to provide a medal, to be called the Quekett Medal, which should be given from time to time to members who had best



12 Robert James Farrants (1810–1870), President 1861–62, with the machine for microscopical writing invented by William Peters. Photograph taken in 1855. The machine was presented in 1862; see Turner, *The Great Age of the Microscope* (1989), **430**.

promoted microscopical science. By 1863, the fund was raised, and a committee was appointed to arrange for a medal to be struck, and for its annual award, though this was no longer to be restricted to members of the Society. A change of plan was proposed in January 1864 by Carpenter, who suggested that the medal should be awarded for the best cheap microscope. This idea was accepted, but in the event no award was made, though three silver medals were struck. The problem arose over the winner in the three classes of compound microscope, who was not prepared to supply microscopes as good as those he entered for the competition at the given price to the public, which led to his disqualification.

The medals were placed in the Society's safe, and nothing further happened until 1874, when the suggestion was made that the Quekett Medal should be given annually to a guest lecturer. The first Quekett Lecture was given in April 1877 by Sir John Lubbock, FRS, MP, with the title 'On Some Points in the Anatomy of Ants', and a bronze medal was presented. But in following years it proved difficult to find suitable lecturers, and the decision was taken to spend part of the fund on books, and to invest the rest for future library purchases. The second (and last) Quekett Lecture was eventually delivered almost a hundred years after the first, on 11 November, 1971, by Gerard L'E. Turner, who was then Hon. Secretary. The title of the Lecture was 'Micrographia historica: The Study of the History of the Microscope' (*ProcRMS*, 7, pt 2, 1972).

In his second Presidential Address, Farrants expressed satisfaction over the steadily rising membership, and remarked:

> It is gratifying to find that the number of members suffers no diminution, notwithstanding the establishment of numerous provincial societies with similar objects to our own. The existence in full activity of the Microscopical Societies of Bradford, Hull, Manchester, Newcastle-on-Tyne, and Southampton, is known to us by their proceedings published in the *Microscopical Journal*.

He was also able to report that Thomas Ross had offered to present to the Society one of his best microscopes, to replace the original instrument made for it by his late father, Andrew Ross.

The new Ross microscope [**152**] was duly delivered the following year, and acknowledged by the next President, Charles Brooke (1804–1879), FRS, who also reported that new objectives had been ordered from Powell & Lealand [**139**], and Smith, Beck & Beck, so that 'the instrumental means at the present disposal of the Society are the best

13 James Glaisher (1809–1903), first President of the Royal Microscopical Society, 1865–68. From a photograph by J. Mayall Jnr.

that can be obtained.' Brooke was a Cambridge graduate, a leading surgeon, and a meteorologist, who invented self-recording instruments adopted for use in the Greenwich and Paris Observatories, for which he received a Council medal at the Great Exhibition of 1851. Charles Brooke had a second term of office as President of the Society, in 1873 and 1874.

Brooke's successor held office for four years, and they proved to be momentous years for the Society. James Glaisher (1809–1903), FRS, was not, as he admitted in his first Presidential Address, primarily a microscopist, but he was a truly remarkable man, and the Society owes him a deep debt for taking it successfully through the petitions to obtain a Royal Charter. Glaisher was born in the East End of London, at Rotherhithe, and received little formal education, but his interest in science was fostered by visits to Greenwich Observatory. In his twenties, he was appointed assistant at Cambridge Observatory by George Airy, moving from there to Greenwich when Airy became Astronomer Royal. When a magnetic and meteorological department was set up at Greenwich in 1838, Glaisher was made its Superintendent, a post he held until retirement in 1874. He was, for this long period, the effective organizer of meteorological observations and climatological statistics in Britain, displaying great energy and persistence. His most spectacular activity was a series of scientific balloon ascents in 1862 with the aeronaut, Henry Coxwell, organized by the British Association for the Advancement of Science. In the course of one ascent on 5 September 1862, at a height of nearly seven miles, Glaisher became unconscious, and his companion had to use his teeth to pull the valve-rope for descent, since his hands were quite numb. Glaisher was deeply involved with the Great Exhibition of 1851, being both a Juryman, and the Reporter for Class X, 'Philosophical Instruments and Processes depending upon their use'. He wrote a most detailed and perceptive Report, and lectured on Class X to the Society of Arts in 1852. One section of the report was on photography, and Glaisher wrote scathingly:

> In closing our remarks on this department of the Exhibition, we may be permitted to record some degree of disappointment at the absence of specimens of the application of photography to any departments of representation, other than such as please the eye or administer to personal feelings. As regards its application to an infinity of useful and instructive purposes, we have literally nothing!

He then goes on to list all the scientific specimens that were missing, and concluded with what is almost certainly the earliest proposal for the microfilming of documentary matter to aid library storage.

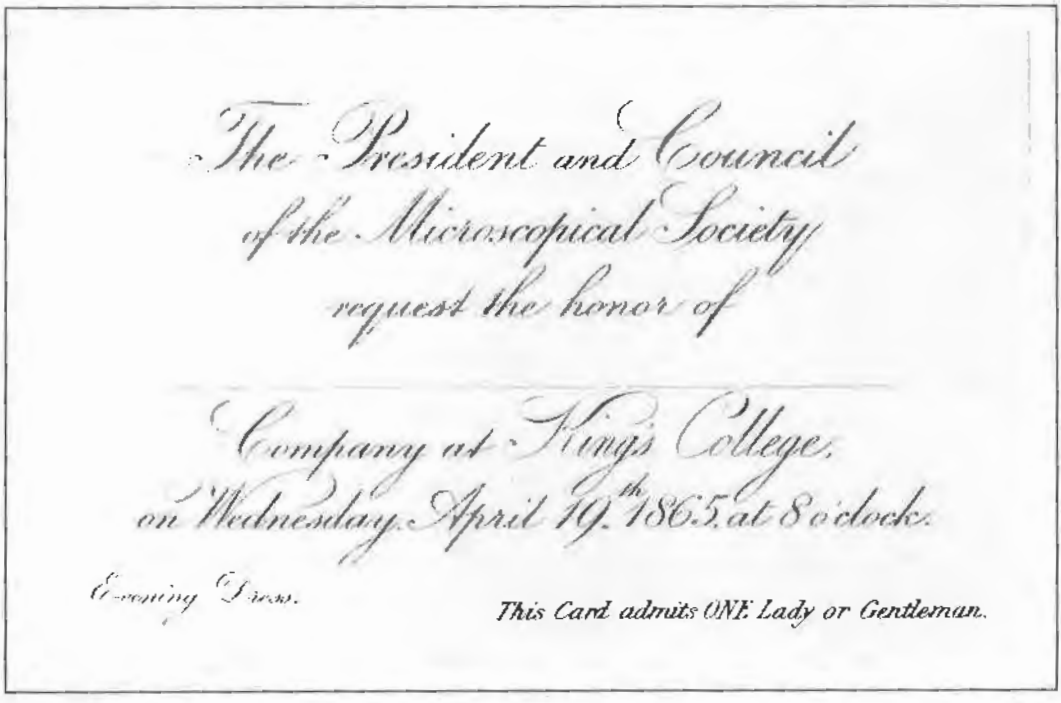
Glaisher's amazing energy also found outlet in involvement with many scientific societies. He helped to found the British Meteorological

Society, was President for over twenty years of the Royal Photographic Society, and was on the council of the Royal Aeronautical Society from its foundation in 1866 until his death. In 1856, he was elected a member of the Microscopical Society of London, probably as a result of his paper on snow crystals. This was read to the Greenwich Natural History Society, and published in the Microscopical Society's *Transactions* in 1855. The subject was the great variety of different forms of crystal produced by the varied and severe weather conditions of that winter. Glaisher examined these under the microscope and made rough sketches of the forms, which were later redrawn by his wife. One of these forms was eventually chosen as the seal of the incorporated Society, as a compliment to the man who had played so large a part in securing the Royal Charter, and a stylized version is still the emblem of the Royal Microscopical Society.

But this is to anticipate. In his Presidential Address of February 1866, Glaisher announced that the Council had been considering making an application for a Royal Charter of Corporation. He enumerated the advantages of such a step. As a corporate body, the Society would be better able to promote research, the members would be closely linked, the contracts and engagements entered into by the Council would be binding on their successors, the legal ownership of the Society's library, collections, and investments would be established, and individual members would no longer be potentially responsible, should the Society fall into debt. It was hoped to raise the necessary fees by subscription. A great deal of work was clearly involved, with redrafting of the By-laws, and other administrative matters. There is no doubt that Glaisher's own reputation, particularly his work for the Great Exhibition that enjoyed such enthusiastic patronage from the Prince Consort, must have helped greatly to achieve the result he proudly announced in February 1867:

> The year 1866–7 will be memorable in the annals of the Microscopical Society, as that in which a Royal Charter was obtained for its incorporation, in which Her Most Gracious Majesty Queen Victoria was pleased to signify her distinguished appreciation of its objects, by commanding it to assume the title 'Royal', and in which H.R.H. the Prince of Wales conferred upon it the honour of becoming its patron.

The granting of a Royal Charter (see Appendix 1) to a comparatively small and young society was a tribute both to the quality and standing


The President and Council
of the Microscopical Society
request the honor of

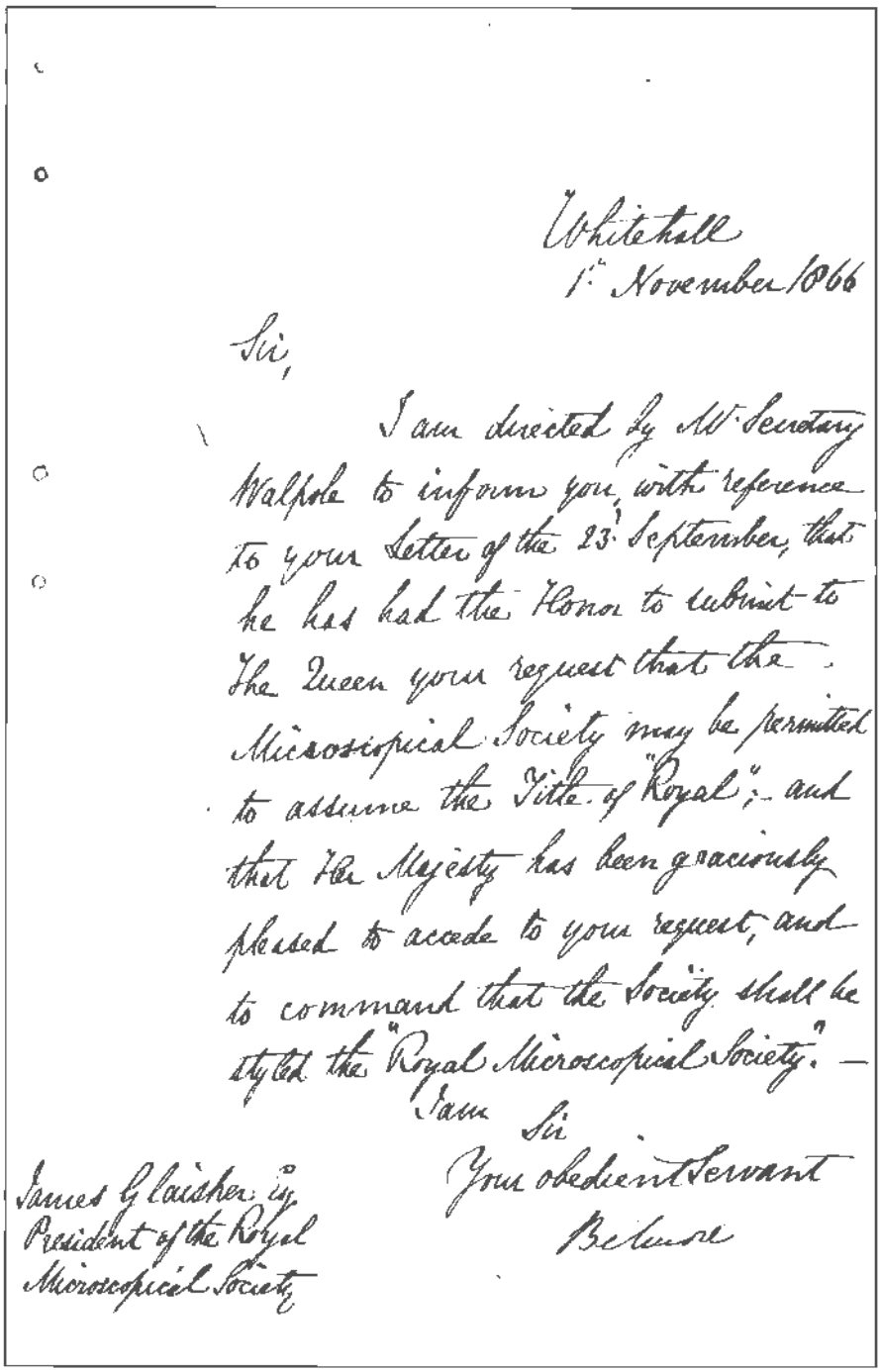
Company at Kings College,
on Wednesday April 19th 1865 at 8 o'clock.

Evening Dress.

This Card admits ONE Lady or Gentleman.

14 Invitation card, 19 April 1865.

of its members, and to the recognition of the importance of the microscope as a tool in so many branches of science. From the first, the Microscopical Society of London had seen itself as part of the international scientific community, and had enrolled as Honorary Members some of the world's leading scientists (see Appendix 3). In 1840, two were elected, Christian Ehrenberg (1795–1876), the German naturalist who pioneered microbiology, and the classification of micro-organisms, and Jan Purkinje (1787–1869) of Prague, one of the first to use the microtome for his fundamental studies under the microscope of human tissue and body cells. In 1846, the Italian, Filippo Pacini, was honoured for his research in histology, while in 1851 the American botanist, Asa Gray (1810–1888) became the fourth Honorary Member for his work as a plant geographer and taxonomist. Thus, the first twenty-five years of the Society reached a most satisfactory end.



Whitehall
1st November 1866

Sir,

I am directed by Mr Secretary Walpole to inform you, with reference to your letter of the 23rd September, that he has had the Honor to submit to The Queen your request that the Microscopical Society may be permitted to assume the Title of "Royal"; and that Her Majesty has been graciously pleased to accede to your request, and to command that the Society shall be styled the "Royal Microscopical Society". —

I am Sir
Your obedient Servant
Belmore

James G Laisher Esq
President of the Royal
Microscopical Society

15 Mr Secretary Walpole's letter of 1 November, 1866, notifying the President that Queen Victoria had allowed the Society to be styled the Royal Microscopical Society.

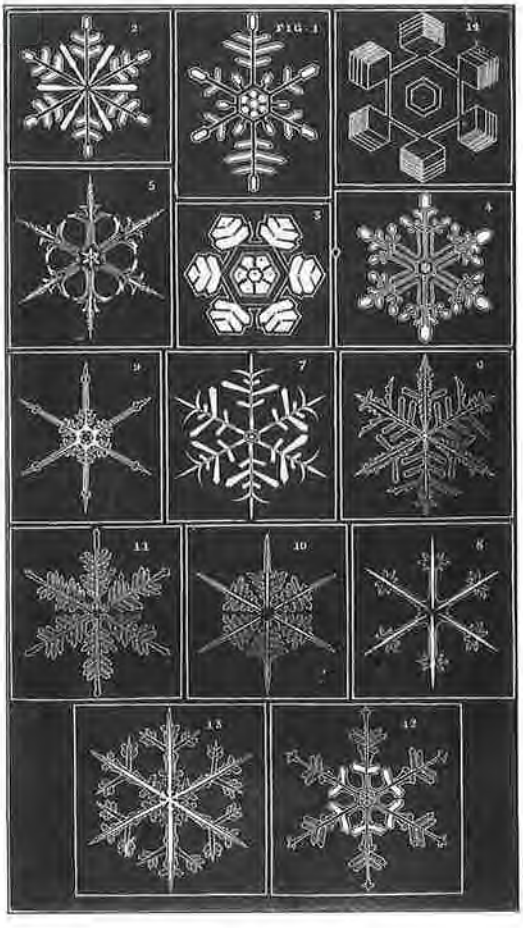
16 The Royal Charter, dated 28 August, 1866 (705 x 590mm). For a transcription, see Appendix 1.

CHAPTER 4

The Charter to 1900

Starting a second term as President, James Glaisher formally announced the granting of the Royal Charter to the Society at the Anniversary Meeting for 1867, as well as the enrolling of 51 new Fellows, as members were now to be styled. Following the now established pattern of giving a brief account of the careers of members who had died during the year, Glaisher spoke at some length of the life and work of Richard Beck (1827–1866), whose father was Joseph Jackson Lister's partner in a firm of wine merchants, and also his brother-in-law. Richard Beck was apprenticed to the instrument-maker, James Smith, who worked closely with Lister on the production of his prototypes. Smith was one of the three leading makers commissioned to provide a top-quality microscope for the newly-founded Microscopical Society of London, and his instrument, which still survives [**171**], is superb. Glaisher said of the gifted young man: '. . . it was mainly through the skill and the exertions of Richard Beck that the well-known firm of Smith and Beck, formed in 1847, took such an important position in the microscopic world'. Beck was specially commended for producing a good range of modestly priced microscopes within the means of students. He died at the early age of thirty-nine, and was buried in the graveyard of the Friends' Meeting House at Stoke Newington, for the Becks, like the Listers, were Quakers. Richard's brother, Joseph, joined the firm of Smith & Beck in 1851, after serving an apprenticeship to Troughton & Simms, and became a partner six years later, at which time the name of the firm changed to Smith, Beck & Beck. When Smith retired in 1864, the firm became R & J.Beck, and Joseph's son, Conrad, born in that year, was made manager of the company in 1883, to retire only in 1944.

The year 1868 was clearly a good one for the Royal Microscopical



17 The Presidential badge of office, in silver and silver gilt, hallmarked London, 1959. Inscribed on the reverse 'PRESENTED BY J. BUNYAN ESQ.'. The central motif is the Society's seal devised after the granting of the Royal Charter in 1866. The microscope is by Thomas Ross, given to the Society in June 1863; see Turner, *The Great Age of the Microscope* (1989), **152**.

18 The microscope presented in 1863 by Thomas Ross [**152**].

19 Drawing of snow crystals by James Glaisher and his wife Celia in the winter of 1855, published in *TransMSL*, 3 (1855). The one on the right of the second row became the Society's emblem. See G.L'E.Turner, 'The Snowflake Emblem of the Royal Microscopical Society', *ProcRMS*, 14 (1979), 175–178.

Society. The Treasurer was able to report the investment of £1000 in Consols, with a further £168 awaiting investment. Membership was the highest ever recorded (452), and the collections and the library were growing steadily by gift and purchase. A report was submitted to the 1868 Anniversary Meeting on the microscopes and cabinet of objects. Eleven microscopes were listed and described, three being antique instruments, while the other eight, including three of the popular Wenham binoculars, were available for the use of Fellows. Also listed as part of the collection was a Browning micro-spectroscope [**417**], just purchased by the Society. The cabinet of slides had received a 'munificent donation' from George Charles Wallich, consisting of a first installment of over 1000 specimens. Wallich was born in Calcutta, and spent a large part of his working life in the Indian Medical Service. His manuscript catalogue of Bengal diatoms is in the British Museum (Natural History). Among the Fellows whose deaths were reported in 1868 was the great pioneer of electro-magnetism and electro-chemistry, Michael Faraday (1791–1867), who had joined the Society in 1842. Yet again, the vexed question of the publication of the Society's *Transactions* was under discussion in 1868. Glaisher reported that the Council had decided to terminate in October of that year the publishing arrangement with the *Quarterly Journal of Microscopical Science*, because 'the mode and form of publication, the quantity of illustrations, and other important particulars' were completely outside the control of the Society's officers.

The basic problem was whether the Society should publish on its own, or in association with an established journal. The first option was obviously to be preferred, but had to be abandoned because the Council was well aware that Fellows greatly valued the inclusion of microscopical information from other societies and other journals, information that could not be handled if the *Transactions* were a Society publication. That accepted, the main requirements were monthly (instead of quarterly) publication, and tighter control over the editorial activity of the chosen journal. The proprietors of the *Quarterly Journal* were asked if they wished to carry on, complying with the new requirements, but they declined. So an agreement was reached with the publisher Robert Hardwicke for publication of the Society's *Transactions* in the *Monthly Microscopical Journal*, starting on 1 January 1869, under the editorship of Dr Henry Lawson. The arrangement thus entered into was to continue for eighteen volumes, two a year, terminating with the death of Lawson in October 1877 (see Appendix 6).

In the summer of 1869, one of the world's most skilful microscopists, the American army surgeon Lieutenant-Colonel Joseph Janvier Woodward (1833–1884), was able to realize the highest potential of the instrument in advance of the theoretician, Ernst Abbe, who published his results in 1873. In the course of his major research into disease, Woodward developed photomicrography, and, because he was a perfectionist, he bought the finest objective lenses from leading manufacturers in Europe and the United States. These he tested and compared, using the remarkable resolution test-plates ruled with a diamond on glass by the German optician, F.A.Nobert. In the summer of 1869, Woodward became the first to resolve the final band of Nobert's nineteen-band test-plate, using a Powell & Lealand 1/16-inch water immersion objective lens. The final band comprised 57 lines ruled by a diamond point on glass at an average separation of 0.225 micron. A set of his photomicrographs was sent to the Royal Microscopical Society, and a paper on the subject published in the *Monthly Microscopical Journal* in October 1869. Woodward was elected an Honorary Fellow of the Society in December 1873.*

Glaisher's long and most important period as President of the Society came to an end in 1869, and he was succeeded by the Rev. J.B. Reade, one of the Society's founders, and now an elder statesman. Reade marked his inauguration with the generous gift of his complete run of the *Philosophical Transactions of the Royal Society* to the Society's library. It also fell to him to announce the death of Joseph Jackson Lister, and the receipt of a letter from Lister's son, giving, in extracts from his father's MSS and letters, a full account of his microscopical research. This letter from Professor (later, Lord) Lister was published in the March 1870 number of the *Journal*. Reade also reported that he and the President of the Quekett Club had been invited to attend the first meeting of the State Microscopical Society of Illinois, an occasion when its President paid tribute to the Royal Microscopical Society's pioneering role as the 'parent' of a host of younger microscopical societies.

It was also in 1869 that the Council began its efforts to secure for the Society permanent accommodation in 'some building appropriated by government for the use of learned societies'. The deputation from the Council was shown the plans for the new buildings at Burlington House, and at first had high hopes of becoming one of the favoured bodies. But encouragement was one thing, a definite official agreement another. Five years later, fading hope was still expressed, but, either for

ROYAL MICROSCOPICAL SOCIETY.

NOTICE TO FELLOWS.

ATTEMPTED FRAUD.

The Fellows are warned against attempts to collect Subscriptions due to the Society by persons making an unauthorized use of the name of the late Collector, Mr. Low. No Receipt is valid unless signed by the Treasurer, Richard Mesiayer, Esq., or the Assistant Secretary, Mr. Walter W. Reeves, who has been appointed the Society's Collector.

HENRY J. SLACK,
JABEZ HOGG, } *Hon. Secs.*

20 Cautionary notice to Fellows, 1869.

lack of sufficient influence in high places, or inadequate exertion by the officers, the Society never achieved grace and favour accommodation.

Reade died before he could give his second Presidential Address, and the speaker in his place was the Secretary, Henry J. Slack, who was the first to address the Anniversary Meeting on a scientific topic, rather than giving an account of the year's activities. This practice was continued by the next President, William Kitchen Parker (1823–1890), both of whose Addresses were on aspects of his research into the cranial morphology of vertebrates. Parker was a farmer's son, apprenticed at the age of fifteen to a chemist; he qualified as a doctor through determination and diligence, and became a specialist in developmental osteology. In 1874, he was appointed one of the Hunterian Professors of Comparative Anatomy, and his Hunterian lectures of 1884 were published under the title: *On Mammalian Descent.*

The year 1872 saw the retirement as Secretary of Jabez Hogg (1817–1899), who had held the office for five years. He retired in order to become President of the new Medical Microscopical Society, which held its inaugural meeting in January 1873, yet another of the large number of microscopical and natural history societies whose activities are recounted in the *Monthly Microscopical Journal.* This particular

society must have represented something of a threat to the Royal Microscopical Society, since it was based in London, and could have been expected to draw on the same pool of medical men involved with microscopy as its older brother. Jabez Hogg was, like so many of the Society's early officers, a well-known and successful doctor, who practised as an ophthalmic surgeon in London for forty-five years. He was born in Chatham and attended the same school in Rochester as Charles Dickens. He began his career on the staff of the *Illustrated London News*, for which he edited a series of very successful educational books, one of which was *The Microscope: Its History, Construction, and Applications* (1854) which went through numerous editions, the last in 1911. Hogg was also a prominent Freemason, and an active member of several learned societies.

At the Society's Annual Meeting in 1873, Joseph Beck had clearly decided that things were not as they used to be. He complained that ordinary meetings were less sociable than in former times: 'Persons now went off directly after the meetings were over, whereas they used to stay when the Society indulged in the good wholesome practice of a cup of tea after the business of the evening was over'. He regretted the formation of another new society (the Medical Microscopical Society), which would be bound to attract young men away. But his chief plaint was that a By-law existed which made it impossible for instrument makers to become members of the Council, and he instanced the case of his late brother, Richard, who had devoted much of his energy to the Quekett Club because he could not become involved in the policy-making of the Society. Joseph instanced the Astronomical Society as an example of a body which made no such discrimination. Whether as a result of Beck's comments, or because of a more enlightened outlook, this situation had been remedied by the 1890s, when Conrad Beck and Thomas Powell, Hugh Powell's son, were both members of the Council of the Royal Microscopical Society.

During the 1870s, it was the Society's practice to hold what were called 'Scientific Evenings' twice a year at which Fellows met, in either the great hall or the library of King's College, 'for inspection of, and for conversation upon, the numerous objects of special interest which were exhibited'. These exhibits could be slides, modifications to instruments, or new microscopes shown by makers. It was reported that numbers were generally around or above 100, except on one occasion when dense fog resulted in a drastic drop in numbers. Fellows were prepared to travel considerable distances to attend these occasions,

which must have provided an opportunity for the sociability that Beck found missing from the ordinary meetings.

In 1873 and 1874, Charles Brooke held office as President for a second term, and in his second Address, delivered in February 1875, he referred to a controversy which had caused tempers to run high in the Society, and indeed outside it. This he described as 'the war of the angle of aperture', and its main protagonist was Francis H. Wenham (1823–1908), twice a Vice-President of the Society, who resigned from it in 1879 because of the dispute. Wenham was described by E.M. Nelson in the Society's obituary of him in 1908 as 'a very expert mechanic', and such he clearly was, witness his inventions of a paraboloid illuminator [**355**], and of the binocular arrangement that bears his name. But the controversy arose over his inability to understand that a medium with a refractive index greater than that of air, for example, water or oil, could, in fact, increase the angle of aperture between the microscope objective and the specimen to what appeared to be more than 180 degrees. The resolution of fine detail depends on both the angle of aperture and the refractive index (n) of the medium between the specimen and the objective:

$$d = \lambda / 2n \sin \theta$$

where θ is half the angle of aperture.

So the greater $n \sin \theta$, the finer the detail that can be resolved. For angles of aperture of nearly 180° (half-angle approaching 90°), an increase in resolution depends on n, which for oil is commonly about 1.5. As sin 80° is 0.985, placing oil between the specimen and the objective can achieve a considerable gain in resolution, and far more simply than striving for that extra few degrees. This was a matter of physics, and Wenham, a pragmatic craftsman, found such a theoretical concept beyond him. He took on all comers in the argument until everyone was weary of the subject, so much so, that in 1879, the Council ruled 'that the Angular Aperture question, having been very exhaustively discussed, no further papers on the subject should be received (with the exception of a paper promised by Prof. Abbe) without the special order of the Council'. Later in the year Wenham tendered his resignation, which was regretfully accepted.

The Society's President for the next three years was Henry Clifton Sorby (1826–1908), the epitome of the self-educated scientist. Coming from a well-to-do family of cutlers in Sheffield, Sorby was privately educated at home, and deliberately rejected a university training

because his declared intention was 'not to pass an examination, but to qualify myself for a career of original investigation'. This aim he literally fulfilled by his application of microscopy to the structure of rocks and metals. He was the originator of metallography and micro-spectrum analysis, and his interpretation of the crystalline structure of metals laid the foundations of modern metallurgy. Sorby lived all his life in Sheffield, working at home, and remaining unmarried. After his mother's death, he entered into public life, becoming a member of the Council of the Royal Society, President of the Geological Society, and founder President of the Mineralogical Society. His Addresses to the Royal Microscopical Society were long and detailed scientific papers, the first devoted to the limit of the powers of the microscope and the size of ultimate molecules. It was praise worth having when such a President commended the papers delivered to the Society during 1876 as of excellent quality and of general significance.

Ever since its foundation, the Society had regarded it as a prime objective to publish its own journal (see Appendix 6). Early attempts at so doing had proved fitful, and expensive, so it had been customary to include the *Transactions* in a general microscopical publication. But even the last and most successful of these joint ventures, with the *Monthly Microscopical Journal*, had not proved trouble-free. In 1875, the President, Charles Brooke, complained of the 'intemperately conducted correspondence' included in the journal. Therefore it was with the greatest satisfaction that the Council was able to launch, in 1878, the Society's own, bi-monthly *Journal*, to be forwarded free of charge to all Fellows. The new journal was to comprise papers, reports of business and discussions, extracts from other English and foreign microscopical journals, and notes on matters of current interest, together with a bibliography of new books and papers relating to the microscope.

The statement about the Society prefaced to the first volume of the *Journal* reveals that certain changes had taken place. The entrance fee and annual subscription had increased to two guineas each, and life membership (described as compounding for future payments) was £21. A new category of Corresponding Fellow had been introduced, and the Society now had two Secretaries and a paid Assistant Secretary to deal with its increased business. Ordinary Meetings were still held monthly on a Wednesday from October to June, but the Society's library at King's College was also open four days a week from 11 am to 4 pm, and each Wednesday evening.

One of the two Honorary Secretaries listed in the 1878 volume of the *Journal* was Frank Crisp (1843–1919), who the following year undertook the editorship as well, with notable success. On 3 April, Crisp read to the Society a paper entitled 'On the Present Condition of Microscopy in England', in which he propounded the argument that in recent years no substantial progress had been made in this country either in the knowledge of the theoretical principles of the microscope itself, or in the systematic investigation of microscopical phenomena. He blamed microscopists in general, and Fellows in particular, for failing to see the wood for the trees, for regarding the microscope merely as a tool of the naturalist or the histologist, and for avoiding the crucial topic of the theory of image formation. Crisp's aim in taking over the running of the *Journal* was to attempt to remedy this deficiency. His success was such that, at the Annual Meeting in 1880, Joseph Beck, in seconding the acceptance of the officers' report, was able to claim that Fellows now enjoyed: 'a Journal which he did not hesitate to say was a model of what a society's Journal should be in every respect'.

Looking back over forty years from the vantage point of the 1879 Annual Meeting, there was considerable satisfaction. Membership was holding up, though still below 500, and over £2000 was invested on the Society's behalf. One reason for the failure to increase substantially the number of members was that there were so many other societies with very closely similar interests and activity. On the principle that co-operation with rivals is good policy, the decision was made to invite the presidents of similar societies to become ex-officio members, receiving the *Journal* and able to attend meetings, but without voting powers (for a list, see Appendix 5). The fortieth anniversary year was also seen as an appropriate occasion for creating new Honorary Fellows. In the 1850s and 1860s only three were elected, with a further nine in the early 1870s, but 1879 was marked by the election of no fewer than thirty-nine Honorary Fellows, and eighty-eight ex-officio Fellows. The majority of the former were distinguished foreign scientists whose work involved the use of the microscope (see Appendix 3). Such elections were clearly seen as a means of extending the influence and increasing the status of the Society, and so of the microscope. In 1885, a more far-reaching step was taken with the decision to elect women Fellows under a new By-law. In future years this was to lead to controversy, but the first four ladies, one the joint-editor of a microscopical journal, seem to have been welcomed with perfect complaisance.

The Society's President in its fortieth year was Lionel Smith Beale (1828–1906), who was, for almost his entire career, associated with King's College, where the microscopists had found such a satisfactory base. The son of a surgeon and medical author, he attended King's College School, and then its medical department. Apart from a couple of years working at Oxford with Acland, he was a member of the teaching staff at King's College Hospital until his retirement, holding professorships in pathology, anatomy, and the principles and practice of medicine. He also ran his own private laboratory, where he pioneered the teaching of pathological anatomy with the aid of the microscope. Beale was a prolific writer, illustrating his books and papers with plates made by himself, and he engaged in controversy with gusto, mounting a vigorous attack on T.H.Huxley. His successor as President, holding office for three years, was Peter Martin Duncan (1824–1891), another King's-trained medical man, who, after a period in general practice, abandoned medicine for geology, and became professor of that subject at King's until his death. He specialized in the study of corals, and was Secretary of the Geological Society from 1864 to 1870.

Throughout the 1880s, the *Journal* was edited, and in large part financed, by Frank Crisp, with the assistance of a small committee. The publication was carefully ordered, to comprise the Transactions, that is, the papers given before meetings of the Society; a summary of current research in a broad field, arranged under the headings of: Zoology; Botany; Microscopy; Instruments; and Collecting, Mounting and Examining Objects; the Society's Proceedings; and a Bibliography. Also included was an author index, and each volume was fully illustrated. It was the summaries of research that almost got out of hand, for fatter and fatter volumes were published, until the Council was obliged to rule that no more than 1000 pages could be printed (the maximum achieved was 1181 in 1885; the volume is 10cm thick!). However, there seems to be no doubt that Fellows appreciated both the quantity and the quality provided by the editor, for membership climbed steadily, rising to over 650 during the decade, without the inclusion in the total of the ex-officio Fellows. Crisp had agreed to help the Society pay for the *Journal* on a sliding scale, with the intention that it should become self-supporting within ten years, and this goal was achieved. He retired from the editorship in 1889, handing over what he believed to be 'recognized as an indispensable guide to the ever-increasing mass of periodical literature relating to Biology and

21 Spy's cartoon of Frank Crisp, 31 May 1890. Crisp, later Sir Frank, was editor of the *Journal of the Royal Microscopical Society* from volume 2, 1879, to 1889. He was also an Honorary Secretary and Treasurer at various times.

Microscopy'. But the Society continued to benefit from his energy and enthusiasm as Treasurer.

Frank Crisp was one of the most versatile of the many gifted men associated with the Society in its earlier years, and an important biographical article on him has been published by Jane Insley (*JQMC*, 35, pt 1, 1984). Crisp was a distinguished lawyer, who was knighted in 1907 for his work on the revision of company legislation, and became a baronet in 1913 for acting as legal advisor to the Liberal Party. The grandson of a successful Norwich printer, and professionally successful himself, he owned a London house in Holland Park, and the country estate of Friar Park near Henley, where his landscaped gardens were often open to the public, and where he entertained royalty during Regatta week. His huge energy and enthusiasm produced at Friar Park a range of different gardens, of which the most extraordinary was the Alpine, with a twenty foot high model of the Matterhorn. There were also caves, one of which was equipped with optical illusions, and another with model gnomes.

Crisp was a member of the Linnean Society from 1870 until his death, and its Treasurer for twenty-four years, giving it generous patronage. In 1903, he chaired the meeting of the Linnean at which the vote to admit women was carried, and his own wife was one of the first fifteen women to be elected as Fellows. Crisp joined the Royal Microscopical Society in the same year as the Linnean, was elected to the Council in 1874, and became one of the Honorary Secretaries in 1878. During his membership, he donated over 100 books to the Library, three chairs for officers at meetings, two cabinets for the collection of instruments, and four microscopes. To bring about the greater understanding of optical principles that he had declared to be lacking in English microscopists, he was largely responsible (with help from John Mayall) for translating from the German the standard textbook on optics, *Das Mikroskop, Theorie und Anwendung desselben* (2nd edn, 1877) by C.Naegeli and S.Schwendener. Crisp's own interest was not in the subjects to which the microscope is applied, but in the instrument itself, as is amply witnessed by the collection of instruments and accessories that he amassed, estimated to have consisted of nearly 3000 microscopes and over 1000 accessories. Sadly, his draft catalogue was never completed, and the collection was dispersed after his death at five sales. Some of it was acquired by R.T.Gunther for the Museum of the History of Science at Oxford, and he wrote to the magazine, *Nature*, on the occasion of the last sale in 1925:

> The fact that many of the parts of the instruments have got mixed, that historic examples have been divorced from their history, that the collection has been distributed without having been properly catalogued, is an international calamity.

It was not possible to reassemble all of the Crisp collection, but parts of it are now in public museums, and stand as a memorial to a remarkable man. While the collection was being amassed, the Royal Microscopical Society had the benefit of having more than 200 items exhibited by Crisp at its meetings.

Another man who had great influence on the Society at this period was Crisp's successor as one of the Secretaries, John Mayall Jnr (1842–1891). The two men were close friends, for Mayall shared Crisp's interest in the microscope and its history, and helped in the amassing and cataloguing of the Crisp collection. It was Mayall who, in 1890, superintended the Society's move from King's College to its new rooms, leased for 21 years at an annual rent of £130, at 20 Hanover Square. The property belonged to the Royal Medical and Chirurgical Society, and the accommodation comprised two rooms on the second floor for the exclusive use of the Royal Microscopical Society, and the right of meeting in a ground-floor hall. The rapid increase in membership over the past five years – there were now 659 ordinary Fellows – enabled the Society to accept such a rent with equanimity. Sadly, the move and its attendant business was the last service John Mayall gave to the Society, for he died of pneumonia in July 1891, at the age of forty-nine.

Mayall was the son of an American photographer, John Jabez Edwin Mayall (1810–1901), who settled in London in 1846, and opened a studio in the Strand called the American Daguerrotype Institution. In 1852, he moved to 224 Regent Street, the address used by John Mayall Jnr, and began the mass-production of cartes-de-visite, from which he made a fortune, producing as many as half a million a year. Mayall Jnr was educated in Paris and became a complete European, speaking fluent French and German. Having family money at his disposal, he made a particular study of mathematical optics, and acted as a link between the Society, which he joined in 1867, and the most important research being carried out in Jena by Professor Ernst Abbe, as well as other developments in microscopy on the Continent. Mayall's main contribution to his chosen subject was made in the two series of Cantor Lectures that he delivered before the Society of Arts. These concerned

22 The meeting room of the Society in King's College, London, from 1859 to 1890. In addition to lectures, the room provided space for the Collection of instruments and slides, as well as the Library. Colotype frontispiece to the *Journal of the Royal Microscopical Society* (1898).

both the history and early development of the microscope and the current state of microscopy.

Mayall, like Crisp, was characterized by strong personality and remarkable energy. Accounts of the Society's ordinary meetings contain examples of his capacity for ruthless criticism, for he was, as the writer of his Obituary remarked, 'no respecter of persons'. His energy manifested itself in physical as well as mental activity, for he was both a fencer and a chess-player of skill, and was the first man to ride a bicycle from London to Brighton. Mayall's early death left his widow with nine children to support, the youngest being only seven. Though Mayall Senior was still living at this date, he was in his eighties, and the business may well have declined. Whatever the truth of this, it is certain that Mrs Mayall's situation was thought to be difficult. Therefore, a group of microscopists, most of them members of the Royal Microscop-

ical Society's Council, launched, on 31 October 1891, an appeal for a Mayall Fund directed at members of London and provincial microscopical societies. In the same month, Mayall's microscopes and apparatus were put up for sale, the advertisement being placed, free of charge by the Council's express order, in the Society's *Journal*.

Though the Society in the 1880s was to such a large extent dominated by Crisp and Mayall, the President for the four years 1884 to 1887, the Rev. William Henry Dallinger (1842–1909) was also a figure of some repute in the microscopical world. After study at Trinity College, Dublin, and Durham University, he entered the Methodist ministry, and eventually became the head of Wesley College in Sheffield. After the death of Carpenter, he produced a seventh (1891), revised edition of W.B.Carpenter's standard work on the microscope, with the first seven chapters entirely re-written. According to A.A.C. Eliot Merlin, in his Obituary of Nelson published in the *Journal* for 1938, 'Dr Dallinger was indebted to Nelson for its first six chapters, for the fine photomicrographs reproduced therein, and for 150 diagrams; although this is not clearly stated in the work, it is a fact'. Dallinger was also President of the Quekett Club (1890–93), and was elected a Fellow of the Royal Society in 1880.

Dallinger's successors in the Presidency were Charles Thomas Hudson (1828–1903), a public school master, and an expert on Rotifera, who held office for three years, and Robert Braithwaite (1824–1917), a physician by profession, and a keen botanist. Albert D.Michael (1836–1927), who was President between 1893 and 1896, is chiefly memorable for having given, as one of his four Presidential Addresses (1895), an excellent and detailed account of the founding and early history of the Society, to which subsequent historians are indebted.

The 1890s were a difficult time for the Society. The burst of energy under Crisp had fallen off; recruitment of new Fellows failed to keep pace with deaths and resignations, and publishing the *Journal* and the rent of the rooms proved a heavy burden. In 1897, it was reported that the *Journal* was costing £900 a year to print, and that Fellows were £500 in arrears with subscriptions. The cost of the *Journal* to non-Fellows was raised from 5*s*. to 6*s*., but even this failed to relieve financial worries. Yet for the last three years of the century the Society had as its President one of the most skilled and devoted microscopists of any period, Edward Milles Nelson (1851–1938), described in his Obituary as 'the pioneer of modern microscopical observation'.

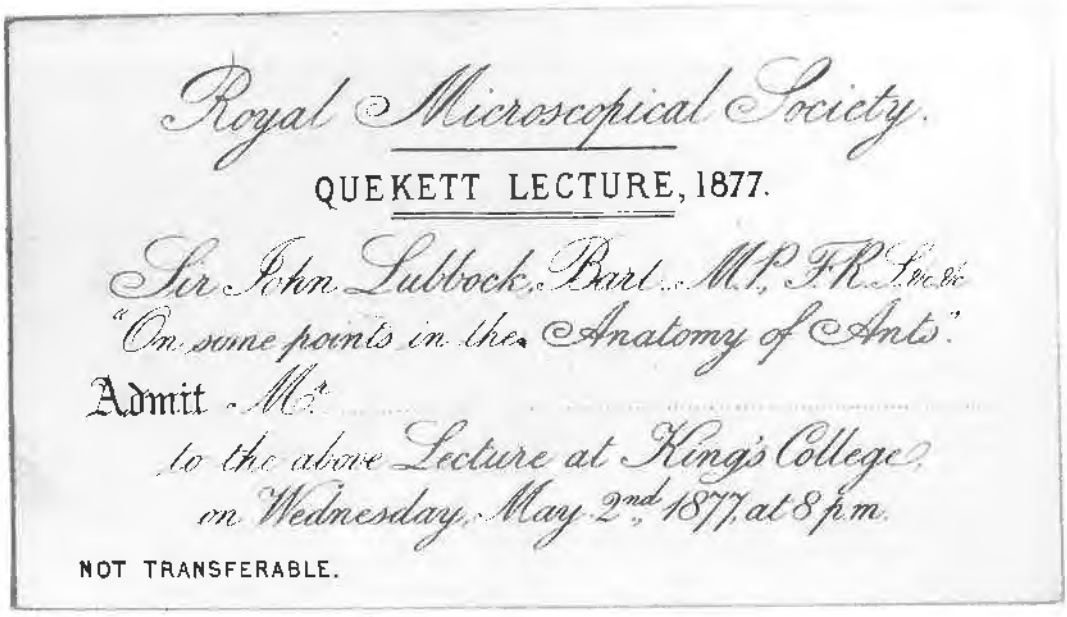
23 William Henry Dallinger (1842–1909), President 1884–87, using a large Ross microscope. An illustration from Dallinger's edition of W.B.Carpenter, *The Microscope*, 7th edn (1891), p.346

A man of private means, Nelson spent his life working with the microscope, striving always to achieve ever more perfect results. To every meeting of the Society he brought his famous No. 1 Powell microscope and the paraffin lamp designed by himself. In 1882 he exhibited to the Society the resolution of Nobert's 19th test band, the first occasion that this had been achieved in England. Nelson was involved in controversy over his disagreement with Abbe's insistence on the need for a pin-hole stop in the substage condenser in order to achieve the best performance from an apochromatic objective of large numerical aperture. Nelson maintained that a large aplanatic illuminating cone was essential. It is clear that this was a dispute between the theorist and the practical observer, and Nelson's achievements in resolving unknown structures, and his magnificent photomicrographs, prove that, theory or no theory, his methods worked. By way of variety,

24 Edward Milles Nelson (1851–1938), President 1897–99. Photographed with his Powell & Lealand No 1 by A A C Eliot Merlin in 1910. (Courtesy of the Museum of the History of Science, Oxford)

Nelson's mathematical bent also directed his interest to the survey of prehistoric stone circles, and to short-focus objectives for the telescope. But it was as the advisor and friend of innumerable practical microscopists that Nelson was deeply respected and warmly remembered.

The start of a new century nearly coincided with the death of Queen Victoria on 22 January 1901. She had reigned for well over half the previous hundred years, and her character had indelibly stamped the period generally known as Victorian. Her eldest son, as Prince of Wales the Patron of the Royal Microscopical Society from its incorporation, now became King Edward VII, and the Society, like the rest of England, prepared itself to face the challenge of a new era.



Royal Microscopical Society.

QUEKETT LECTURE, 1877.

Sir John Lubbock, Bart., M.P., F.R.S. &c. &c.

"On some points in the Anatomy of Ants."

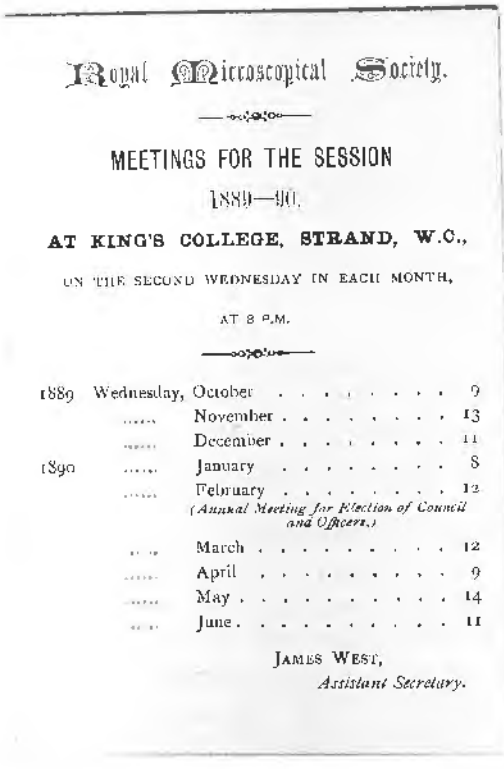
Admit Mr.

to the above Lecture at King's College,

on Wednesday, May 2nd 1877, at 8 p.m.

NOT TRANSFERABLE.

25 Invitation to the Quekett Lecture, 2 May 1877.



Royal Microscopical Society.

MEETINGS FOR THE SESSION

1889—90,

AT KING'S COLLEGE, STRAND, W.C.,

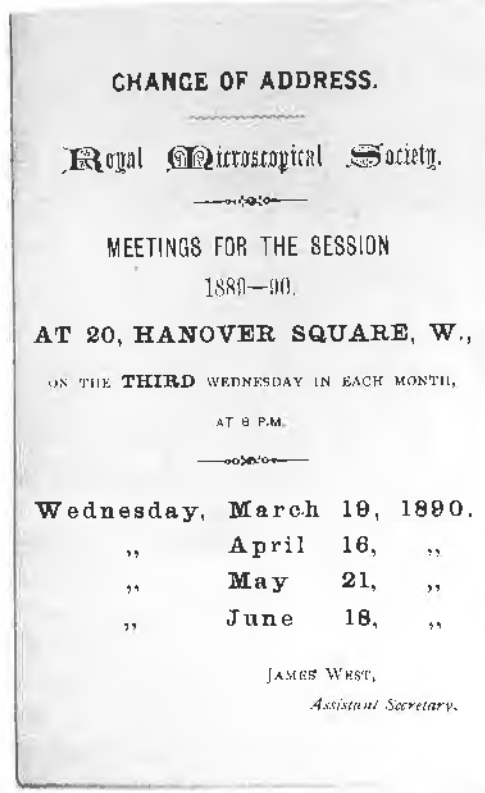
ON THE SECOND WEDNESDAY IN EACH MONTH,

AT 8 P.M.

1889	Wednesday,	October	9
	.....	November	13
	.....	December	11
1890	.....	January	8
	.....	February	12
		(Annual Meeting for Election of Council and Officers.)	
	.....	March	12
	.....	April	9
	.....	May	14
	.....	June	11

JAMES WEST,
Assistant Secretary.

26 Meeting card for 1889–90, when still at King's College.



CHANGE OF ADDRESS.

Royal Microscopical Society.

MEETINGS FOR THE SESSION

1889—90,

AT 20, HANOVER SQUARE, W.,

ON THE **THIRD** WEDNESDAY IN EACH MONTH,

AT 8 P.M.

Wednesday,	March	19,	1890.
,,	April	16,	,,
,,	May	21,	,,
,,	June	18,	,,

JAMES WEST,
Assistant Secretary.

27 Meeting card for 1889–90, showing the change of address in 1890 to 20 Hanover Square.

CHAPTER 5

Through Two World Wars

The Annual Meeting in 1900 saw the end of E.M.Nelson's extended Presidency, and, appropriately because of his lifelong preoccupation with the microscope, he was able to report the completion of a process of standardization of certain parts of the instrument that had begun eighteen years before. In December 1899, the Council adopted a number of resolutions that withdrew the standards adopted in 1882, and substituted new standard sizings for the inside diameter of the substage, and for the internal diameters, four in number, of draw-tubes. The Council also ordered that a set of plug and ring gauges in the given sizes should be kept in the Society's rooms, and be available for inspection by the public for a small fee. Nelson warmly acknowledged the help received from the manufacturers in determining the standards, mentioning Conrad Beck by name. Examples of these standard dies, gauges, chasers, and threads are still to be found in the Society's Collection [**439–443**].

The Society's growing interest in adding antique instruments to its collection is also apparent, for Nelson described, with obvious enthusiasm, the gift of eighteenth-century microscopes made by Martin and Adams, and of an early Ross, and reported that the catalogue of instruments and apparatus was progressing under the curator, C.F.Rousselet. One area, however, where the new century was unlikely to reproduce the triumphs of the Victorian era was in the organization of soirées and conversaziones. Nelson announced that the state of the funds did not justify holding a special exhibition, and expressed doubts as to whether such large, general events were of real value to the Society, though he referred a trifle wistfully to the grand soirée at South Kensington in 1859.

Nelson's successor as President for the first two years of the 1900s

was William Carruthers (1830–1922), who was described in his Obituary as 'the doyen of the botanical world'. From 1871 to 1895, he was Keeper of the Botanical Department of the British Museum (Natural History), and superintended its move to South Kensington. His two Presidential Addresses to the Royal Microscopical Society were accounts of two early botanists, John Ellis and Nehemiah Grew. His other great interest was in the Presbyterian Church of England, into whose ministry he had originally wished to enter, and whose *Children's Messenger* he edited for forty years. Carruthers' successor was another British Museum Keeper, but this time a geologist, Henry Woodward (1832–1921), whose main study was the fossil forms of Crustacea, but whose particular contribution was in popularizing paleontology through books and articles, and through his work for the British Association.

Woodward was followed by three distinguished men whose interest in the microscope was the only common factor in very different careers. Dukinfield Henry Scott (1854–1934) was a pioneer of scientific botany, whose comparative anatomical studies of fossil and living plants, undertaken in relation to plant physiology and genetics, anticipated modern botanical research. He was the son of George Gilbert Scott, the architect, and, with private means, was able to pursue his research in Germany, and maintain close links with continental scholars, as well as working at Kew Gardens. Lord Avebury (1834–1913), PC, FRS, was President of the Society in 1907 and 1908. As Sir John Lubbock he became head of the family banking firm and also a Liberal Member of Parliment, and was, in 1900, created the first Baron Avebury for his public services. He began a long career in Parliament by sponsoring the Bank Holidays Act of 1871 (the new holidays were popularly known at the time as St Lubbock's Days), and Acts requiring the limitation of shop hours, and the preservation of public open space, and of ancient monuments. In science, he was a convinced Darwinian, and gained an international reputation for providing an evolutionary framework for archaeological finds relating to prehistoric man. He also carried out important research on insects, particularly ants (the subject he chose for his Quekett Lecture in 1877 to the Society). He was a popularizer and educator, with twenty-five books and many papers to his credit, and much in demand as a lecturer. As president of the Working Men's College, he helped to widen educational opportunities and the spread of scientific literacy. The third of this remarkable triumvirate of Presidents was Edwin Ray Lankester (1847–1929), whose father had

held the office in 1858–9. Ray Lankester, as he was always called, was a brilliant student at Oxford, and became a Fellow of Exeter College in 1872. Two years later, he was appointed Professor of Zoology at University College, London, and was elected a Fellow of the Royal Society in 1875. He became Director of the British Museum (Natural History) and Keeper of Zoology in 1892, positions he held until his retirement in 1907, when he was created a KCB. His explosive temper made enemies, and seriously impeded his career, for he failed to become President of the Royal Society, and was compulsorily retired from the British Museum (Natural History). It was because of the problems of this crisis that he only held office for one year (1909) with the Royal Microscopical Society.

An important question for the new century, the status of women in the world of affairs, began to affect the Society in 1899. A report in *The Queen* on the International Congress of Women in July of that year raised the problem of 'the action of certain of the learned societies in excluding scientific persons from the advantages offered by their societies merely on the score of the womanhood of the candidates'. The 'temperate protest' was made by Mrs Marian Farquharson, a botanist and microscopist, who had been a Fellow since 1885. Her criticism was directed against the Royal, Linnean, and Royal Microscopical Societies. The first two had refused to admit women to fellowship, but the Royal Microscopical Society had compounded the offence by allowing women to stand for and achieve election, but barring them from meetings. Mrs Farquharson did not expect 'centres of advanced science to open their doors to all women', but pleaded for the privilege to be extended to graduates and authoresses. The Linnean Society, as already refered to in Chapter 4, elected women for the first time in 1903, and apparently all went smoothly from then on. But the Royal Microscopical Society made heavy weather of the business.

It was not until December 1908 that a Special Meeting was called by eleven Fellows to consider a resolution for the amendment of the By-laws 'to remove any restriction of privileges due to distinction of sex'. In the preceding years, printed announcements of ordinary meetings had carried a note at the bottom: 'Ladies do not attend the Meetings of the Society'. The manifest unfairness of this in view of the fact that women Fellows were admitted and charged the same entrance fee and subscription as men, was stressed by D.J.Scourfield, the proposer of the resolution. He considered that the long delay in putting right this injustice was bringing the Society into disrepute. He also

28 Ernst Abbe (1840–1905). Photograph printed in carbon on porcelain (135 × 105mm), and presented to the Society in July 1879. Abbe was elected an Honorary Fellow in 1878.

pointed out that similar leading scientific societies, such as the Linnean and the Zoological, now gave women Fellows full equality, and he believed that for the Royal Microscopical Society to join them could not fail to increase membership. The leader of the opposition was one of the Society's Secretaries, J.W. Gordon. He raised practical problems: cloak-room accommodation was not adequate for both sexes; if ladies attended the meetings, everyone would start having to wear evening dress. This he saw as a real difficulty because he was 'generally too busy, or, as some friend had put it, too indolent, to get into evening dress for the purpose, and then get back into working dress when he got home to resume an interrupted task at the lathe or bench'. But his main contention was that there was no evidence that many ladies would wish to join the Society if the resolution were implemented, while a good number of male Fellows were likely to resign.

After much discussion, it was decided to leave the matter for a short period in the hands of a sub-committee, which reported to another special meeting in June 1909. The committee was irretrievably divided.

The main report concluded that it was 'inexpedient to proceed further at the present time with the proposed alteration of the By-laws', and then handed the entire problem neatly back to the Council. A supplementary report, however, signed by three members of the sub-committee, went for a compromise. The existing women Fellows must have their legitimate complaint removed, and women should be allowed to attend ordinary meetings of the Society, but 'it would be wise and expedient' to respect the views of Fellows who did not want women to have the possibility of election to the Council and Committees. The supplementary report won the day; its adoption was moved by Edward Heron-Allen and seconded by Frederic Cheshire, and carried by twenty-two votes to seven. The immediate result was that the main opponent of admitting women to full Fellowship, J.W. Gordon, resigned as Secretary in October 1909, while 1910 saw the election of five new women Fellows. In fairness to Mr Gordon, it has to be said that the Society was having considerable problems with its accommodation in 1909, and that cloakroom provision was not convenient.

The connections between the Society and Ernst Abbe (1840–1905), 'to whom, more than any other man, the perfection of the modern Microscope is due', were long and close. He was elected an Honorary Fellow in 1878, addressed a meeting of the Society in 1879, and published nine papers and three notes in its *Transactions*. As a young lecturer at Jena University in Germany, Abbe was approached by Carl Zeiss, and persuaded to enter his firm as scientific adviser, in an endeavour to achieve a theoretical basis for the construction of microscope objectives. Zeiss chose well, for Abbe evolved, within a few years, his theory of microscopic vision, based on his discovery of the modifications produced in the image by the diffractive action of the object itself on the light by which it is illuminated – what is generally called the diffraction theory. This research was published in 1873 in a German journal, and the first English translation was printed in full in the *Proceedings of the Bristol Naturalists' Society* for 1875, with extensive extracts in the *Monthly Microscopical Journal*(14, 1875). When Abbe died in 1905, a detailed Obituary by Julius Rheinberg appeared in the Society's *Journal*.

Like all new theories, however, Abbe's was not without its opponents. On 16 November 1904, A.E. Conrady (1866–1944) delivered a paper to one of the Society's ordinary meetings entitled: 'Theories of Microscopic Vision. (A Vindication of the Abbe Theory)'. Alexander

Royal Microscopical Society.

VISIT TO THE MUSEUM OF THE

Hon. WALTER ROTHSCHILD, at TRING,

ON SATURDAY, JUNE 21ST, 1902.

Card of Invitation issued to

For particulars of Trains, &c., see Back of Card.

The Train will leave Euston Station at 11.5 a.m., from No. 5 Platform.

Return Tickets, to be obtained at the East Booking Office, price 3/8 Second Class, on presentation of Invitation Card.

By the kindness of the Hon. WALTER ROTHSCHILD Brakes will convey the Fellows (free) from the Tring Station to the Museum and back.

Luncheon (Cold at 2/6 per head, exclusive of liquors) will be served to Fellows at the Hotel after the visit to the Museum.

Walk in Lord ROTHSCHILD's Park.

Fellows will return by the Train leaving Tring at 5.50 p.m., arriving at Euston at 7.15 p.m.

29 a, b Invitation card for a visit to the Rothschild natural history museum at Tring, 21 June 1902.

Eugen Conrady was educated at Bonn University, and took British nationality in 1902. At this time he was a scientific adviser and lens designer to W. Watson & Sons. In 1917 he was appointed Professor of Optical Design in the new Technical Optics Department at Imperial College. In his lecture, Conrady pointed out the 'the Abbe theory has never been presented in a form which would appeal to practical microscopists', and so he set out the physical basis for the theory. He had to counter some alleged objections to it enunciated by J.W. Gordon, who had given a long paper to the Society with what Conrady called 'several curious objections, each of which was put forward as fatal to the Abbe theory'. Gordon replied, and had to be silenced by still further exegesis of Abbe's theory by Conrady.

The Society's Collection of antique microscopes – as opposed to those acquired for practical use – dates effectively from the purchase in 1861 of Quekett's Benjamin Martin instrument [**28**]. The value of such a Collection as showing the progress of the microscope's development was clearly recognized at the end of the nineteenth century by such powerful advocates as Crisp, Mayall, and Nelson. Moreover, with such rapid and far-reaching improvements being constantly made to the optics, stands, and accessories, microscopes bought or given for use as the latest models soon became of historic interest. Throughout the first decade of the twentieth century, the Society had a meticulous curator of what was now described as its 'Collection of Old Microscopes' in the person of Charles Rousselet, and in the Annual Report for 1904, the situation with regard to the Collection was assessed as follows:

> The numerous additions of late years to the . . . Collection . . . have completely filled the available space in the Cabinets; and owing to overcrowding none are suitably or worthily displayed. Moreover, the Cabinets do not contain by any means the whole of the Society's Collection, for a number of instruments still remain packed away in cases, and are therefore never on view.

Clearly, the Collection was in need of attention, but what was it best to do? The state of the funds was not such that the purchase of additional cabinets, or the printing of a catalogue of the instruments, could be contemplated as a charge on the Society. The printed library catalogue had not sold well to Fellows on the last occasion, so the Council's decision was that a new cabinet for instruments and a catalogue would have to be a matter for 'private generosity' by the Fellows. The state of the Collection as described above continued for

several years, with regular additions in the form of gifts. Worthy of special mention, if only because of its size, was the Ross binocular of 1888, donated to the Society in 1909 by Lord Edward Spencer Churchill [**156**]. In accepting the gift with thanks, E.J.Spitta, a Vice-President, in the chair at the meeting of 21 April 1909, commented:

> A considerable change has come over the manufacture of microscopes since this one was made. At that time a man did not consider himself at all well treated unless he had something very large for his money . . . . All this has changed in recent years, and portability as well as efficiency are combined.

But even such a magnificent addition failed to produce from Fellows the hoped-for donations towards proper housing for the Collection. At the beginning of 1911, a fly-sheet went to Fellows with the *Journal*, asking for subscriptions for a new show-case, but it was reported that this produced only one guinea as an immediate response.

Charles Frederic Rousselet (1854–1922) took over as honorary Curator of the instrument Collection in 1898; his task was actually defined in 1901 as to make and keep up a catalogue of all the objects in his charge, and deliver an annual report to the Council on their condition. Rousselet worked fast after his appointment, for by 1901 he was able to report that the manuscript catalogue was complete. The problems over proper storage of the instruments took ten more years to sort out. In 1910, a further effort was made to persuade Fellows to contribute the money necessary for new show-cases – £50 was the target. The Council report for 1913 refers to a new show-case, and for the first time clearly forecasts the publication of 'an illustrated descriptive catalogue of the unique collection of Microscopes' in the Society's possession. Again, there was a long delay before this intention could be actualized. There can be no doubt, however, that the Society was proud of its Collection, and secured welcome publicity from it. The Annual Report for 1909 records that 28 instruments had been lent on request to the British Science Section of the Franco-British Exhibition. A similar group of instruments to illustrate 'the Evolution of the British Microscope' was exhibited, with accompanying demonstrations, at the British Scientific Products Exhibition in 1918 at King's College. Rousselet retired from the curatorship in 1916 because of ill health, but it is in his elegant and legible handwriting that the first 119 entries in the manuscript Inventory are made. All the items in this group – the

first 84 being microscopes, the rest accessories – were also engraved with the Inventory number.

Rousselet came of an old Huguenot family that had settled in Germany during the persecution of Protestants. He came to London in 1873, and became naturalized before joining the Royal Microscopical Society in 1888. He made a special study of Rotifera, and pioneered methods of preserving and mounting specimens. The year before his retirement, he presented to the Society's library about a thousand papers and reprints from correspondents all over the world on his chosen subject.

Towards the end of the nineteenth century, there had been some half-hearted attempts to provide for specialized groups within the Society by means of sections. This idea was revived in 1909, with provision for informal discussion meetings on certain Wednesdays for three sections: 'Brass and Glass; Bacteriology and Protozoology; and Pond-life'. The first of these, the section concerned with the instrument itself, was 'to consider and study . . . the history of the Microscope, more particularly as illustrated by the collection of the Society . . . . It is proposed to collect and classify the material which it is hoped will eventually be utilized for the cataloguing and description of that collection.' By 1911, there was also a Biological Section that announced a special meeting, and the Annual Report for 1912 reported that 'the Sectional Meetings have now fully justified their institution', the Biological Section having held eight meetings with an average attendance of seventeen, and the Brass and Glass Section six meetings, with an average attendance of eight. In 1915, there is no mention of the Brass and Glass Section, but the Biological Section had added excursions to laboratories and scientific institutions to its activities; indeed, this Section alone kept going throughout World War I.

The Society had, according to the robust account of its activity given by the President, Edward Heron-Allen, in his Address read on 16 January 1918, a good war record. Apart from the achievements of individual Fellows in the fields of medicine and science, the Society's corporate efforts were directed to providing lectures and demonstrations in military camps. The subjects of the courses provided were 'lectures on natural and physical science and on the medical and hygienic problems which confront the soldier'. The organizer was James Wilson Ogilvie, a Fellow, who ran the Microscopical Section of the Young Men's Christian Association, and who had, in 1916, seventy-nine microscopists working with him. Between October 1916

Royal Microscopical Society.

A PAPER entitled

"Theories of Microscopic Vision"

(A VINDICATION OF THE ABBE THEORY)

WILL BE READ BY

A. E. CONRADY, Esq., F.R.M.S.,

AT THE MEETING OF THE SOCIETY,

On Wednesday Evening, November 16th, 1904,

At 8 o'clock.

20, Hanover Square.

Invitations may be had within.

Ladies do not attend the Meetings of the Society.

30 Announcement card, 16 November 1904

SEVENTH

International Congress of Applied Chemistry

EXHIBITION

BY FELLOWS OF THE

ROYAL MICROSCOPICAL SOCIETY

At the Reception of Members of the Congress

IN

THE NATURAL HISTORY MUSEUM

SOUTH KENSINGTON

ON THE EVENING OF

TUESDAY, JUNE 1, 1909

METALLURGICAL MICROSCOPES
OBJECT-HOLDERS AND MOUNTING DEVICES
VERTICAL AND OTHER ILLUMINATORS
PHOTOMICROGRAPHIC APPLIANCES
PHOTOGRAPHS, etc., etc.

31 Announcement card, 1 June 1909.

32 Low's cartoon, *The Star*, 28 July 1925, referring to the discovery of 'the organism which causes cancer' by Dr W.E.Gye and J.E.Barnard. See page 73.

33 Lee's cartoon, *Evening News*, 17 June 1935, on the Society's move to BMA House.

and May 1917, this team arranged 188 exhibitions, and delivered 89 lectures. Of the lecturers, 23 were Fellows of the Society, and their war effort consisted of 354 lectures and demonstrations in the four years.

Edward Heron-Allen (1861–1943), President of the Society in 1916 and 1917, was a Fellow from the age of thirty, and an active member of the Council. He was a solicitor in his family firm until he retired at fifty to devote himself to his study of Foraminifera, on which he published extensively, and for which he was elected a Fellow of the Royal Society in 1919. His legal expertise, business ability, and energy were of great service to the Society, particularly in the war years. Among many functions undertaken on the Society's behalf, Heron-Allen was its representative on the Conjoint Board of Scientific Societies, set up in 1917 by the Royal Society to co-ordinate the activities of British societies, and prevent undue overlap.

During the 1920s, the Biological Section continued to meet each month, and a new Leather Industries Section was formed in November 1920, to 'deal with Physiology, Mycology and Bacteriology in relation to the Leather Industries'. The hope was expressed in the Annual Report for 1921 that this would be the first of a number of similar links between the Society and industry. Sections for Metallurgy and the Paper Industries were set up in 1922, and, for convenience amalgamated into a single Industrial Applications Section in 1923. But by the thirties this had faded out, and only the Biological Section survived.

Co-operation with other scientific societies flourished in the post-war years. In January 1920, a joint symposium on The Microscope: its Design, Construction and Applications was organized at the Royal Society's Rooms by the Faraday Society, the Royal Microscopical Society, the Optical Society and the Photomicrographic Society; this proved so successful that further sessions were held in Sheffield in February and in London in April. Also in 1920, the Institute of Physics was founded, with the Royal Microscopical Society as one of a number of 'Participating Societies'. Fellows were urged to take advantage of the reduced fees available to join the new Institute.

The Society became involved at this time with the the national effort to re-establish manufacturing industry following the war. On 2 March 1921, a Special Meeting of the Council resolved that a deputation be sent from the Society to the Board of Trade in reference to the Key Industries Bill, about to be introduced in Parliament. The case that the deputation was to present was in effect a free trade one, for it was feared that 'if any prohibitive legislation were passed which would prevent the

free use of the most efficient types of instrument, irrespective of its country of origin', this might prejudice the advance of microscopical science. Specifically, the anxiety was that supplies of high quality optical glass might fail if only British manufacturers were producing it; the leading source of supply was the Zeiss works at Jena in Germany. The Society suggested that the Government should provide subsidies over a period of years to promote the British optical glass industry.

In 1925, the Society broke new ground by holding a residential Conference, combined with a Trade Exhibition, at Sheffield University. With receptions by the Vice-Chancellor and the civic authorities, the mornings devoted to scientific papers and the afternoons to visits to local firms, this was clearly an ambitious venture, attended not only by Fellows, but by delegates from fifty other societies and associations. Two years later, in March 1927, a similar conference was held in Liverpool that succeeded in achieving national Press coverage. This was on the strength of a paper about the microscopical examination of the clothing from Tutankhamun's tomb, which established beyond doubt that the superstition of the 'curse' that afflicted with strange diseases those who entered the tomb had no foundation in the continued existence of bacteria in the ancient linen.

But the excitement of 'Tut's Tomb', as the *Daily Courier* headlined it, was as nothing to the publicity achieved by a man who was President of the Society for three separate terms, Joseph Edwin Barnard (1870–1949). He was elected to Fellowship in 1895, and held office as President 1918–1919, 1928–1929, and 1938–45, receiving an Honorary Fellowship of the Society the year before his death. Barnard was described as the last of the great amateurs, but this is a misleading term because it suggests the dilettante. He, and many of the other leading microscopists of the Victorian and Edwardian periods, did not earn their living as professional scientists, but their expertise and their achievements were in the highest degree professional. Barnard took over the firm of hatters in Jermyn Street, London, founded by his father, and ran it with great success, so that he had both the time and the money to devote to his microscopical work. He was a technologist of the highest order, working with ultra-violet light at the ultimate resolution point of the light microscope. In July 1925, the *Daily Express* carried the headline: 'British Science Triumphs: Mystery Organism Found'. This was described as the organism which produces cancer, and its discovery was attributed to the biologist, W.E. Gye, and to the microscopist, J.E. Barnard, then Secretary of the Society. No claim was

made that a cure had been found, but this research was regarded as very much at the sharp end of medical science, and was widely reported.

The first mention of a printed catalogue of the Society's Collection was made in 1913, but the war intervened, and work recommenced in the 1920s. The editor of the catalogue was Alfred Norman Disney (1855–1929), and, as his Obituary reports, he spent seven years working on the publication, meeting weekly with his two assistants, C.F.Hill and W.E.Watson Baker. It had been determined to preface that catalogue with a history of the development of the microscope, and this added greatly to the labour involved. Watson Baker, who wrote Disney's Obituary, says that their collaboration started in 1921, before which Hill and Watson Baker

> . . . had been accumulating material for a book upon ambitious lines, dealing with the microscopes and books relating thereto in the collection of the Society. References needed verification, the whole material required digestion and coherence; a vast field of inquiry was open, but only one with a profound knowledge of Latin and Greek could explore it.

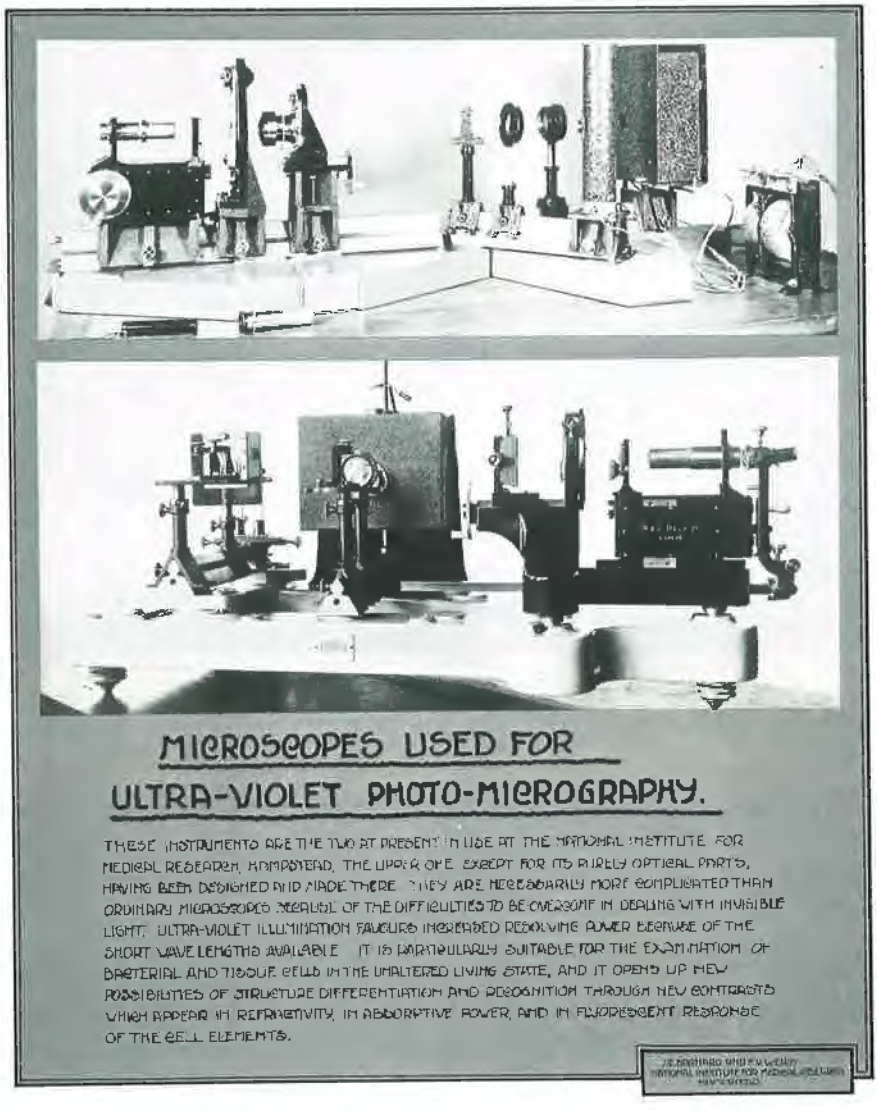
This refers to the classical works on the history of optics, and indeed Disney was well-equipped to tackle the task, for he was a graduate in both classics and physics, and a school master by profession. The *Origin and Development of the Microscope, As Illustrated by Catalogues of the Instruments and Accessories, in the Collections of the Royal Microscopical Society, together with Bibliographies of Original Authorities . . . Preceded by An Historical Survey on the Early Progress of Optical Science by the Editor* was published in May 1928, price 17*s* 6*d* to the public, and 15*s* to Fellows, and was indeed, despite some vagaries of classification, a remarkable piece of work for its period, and one reflecting great credit on Alfred Disney.

At the end of 1928 a bizarre episode again brought the Society into the news. Mr Charles Lock, who had been a paid secretary of the Society for nine years, was given notice, and made a claim against his former employers for wrongful dismissal. The court found, however, that there was no case to answer, and the judge (as reported in *The Star*, 23 November 1928) commented: 'These small incidents seem appropriate to the fact that defendants are a microscopical society. Life would not go on if men magnified these microscopical things!'

It will be remembered that the Society had moved from King's

34 Joseph Edwin Barnard (1870–1949), Honorary Secretary 1920–27, President 1918–19, 1928–29, 1938–45. Photograph dated 1923.

College in 1890 to rooms at 20 Hanover Square, leased for 21 years from the Royal Medical and Chirurgical Society. When the time for renewing the lease approached in 1909, the Medical Society made it clear that it was going to drive a hard bargain. A £20 per annum increase in rent was insisted upon, together with the requirement to undertake repairs at the end of the lease. More unreasonably, the Royal Microscopical Society was obliged to accept the right of the landlords to cancel the lease and require vacant possession of the rooms at seven or at fourteen years into the lease, with six months' notice. The Society, with no other alternative accommodation in view, accepted these adverse arrangements, and signed, but this was not the end of the matter. The first aggravation was a peremptory request to give up the use of the lavatory adjacent to the rooms (hence the justification for Mr Gordon's argument against ladies attending meetings). Then new landlords took over, and a programme of building work was started that necessitated the Society moving to a different part of the building. Meanwhile, the increased rent was biting, and the Council decided that refreshments at meetings could no longer be afforded. Attempts were made in 1911 to secure rooms in the building being altered for the use of the Royal Geographical Society in Kensington Gore, but this came to



35 Display card, *c.* 1936, prepared by J.E. Barnard and F.V. Welch, National Institute for Medical Research, Hampstead.

nothing. So the Society had no real choice but to continue at Hanover Square, which it did until the expiry of the second lease in 1931.

At a Special General Meeting called in May 1930, it was announced that the Society was about to move house. The lease at 20 Hanover Square, renewed with such problems in 1910, was to expire fully the following year. With great difficulty, alternative premises had been found in the British Medical Association's house in Tavistock Square.

This accommodation was described by the President as 'palatial quarters', designed to increase the Society's status, and provide for extended activities, even though rent would still be payable at Hanover Square for more than six months. The President at the time of the move was Reginald Ruggles Gates (1882–1962), a Canadian by birth, and a leading biologist and geneticist. He came to London in 1912, and in 1921 was appointed head of the botany department at King's College. In the latter part of his life, he turned to the study of eugenics, travelling widely to continue his studies of race.

In its new home, the Society's membership increased, and the *Journal* flourished. It was noted with satisfaction that moving costs and new furnishing expenses had been met out of income. The Biological Section, the only one to hold regular meetings over an extended period, remained in existence and produced an Annual Report. The Collection, well displayed in the spacious new rooms, continued to attract interest that must have been stimulated by the publication, in 1932, of *The History of the Microscope Compiled from Original Instruments and Documents up to the Introduction of the Achromatic Microscope* by R.S. Clay and T.H. Court. Dr Reginald Stanley Clay (1869–1954) joined the Society in 1924, was elected President for 1936 and 1937, and an Honorary Fellow in 1950. He was a school master who moved into higher education, and became Principal of the Northern Polytechnic. His subject was physics, and his lifelong interest and study was optics and the early microscope. He amassed a considerable collection of antique microscopes, acquiring many at the sale of the Crisp collection, and he worked closely with Thomas H. Court, an antique dealer, who also possessed a large private collection of microscopes. The Clay collection was eventually acquired by the Museum of the History of Science at Oxford, and the Court instruments went to the Science Museum in London. The two men collaborated to write *The History of the Microscope* whose short title is misleading, since the major period of the development of the microscope is not dealt with. In addition, neither author was an historian, and their account of the London instrument trade is inaccurate and now largely superceded. Nevertheless, the book was a stimulus to interest in the history of the instrument, and to collecting old microscopes.

The great event that the Society began to look forward to during the decade was the 1939 Centenary of the foundation. The Annual Report for 1937 contained plans for the event, which was to consist of a two-day meeting in October. There was to be 'an exhibition of historical

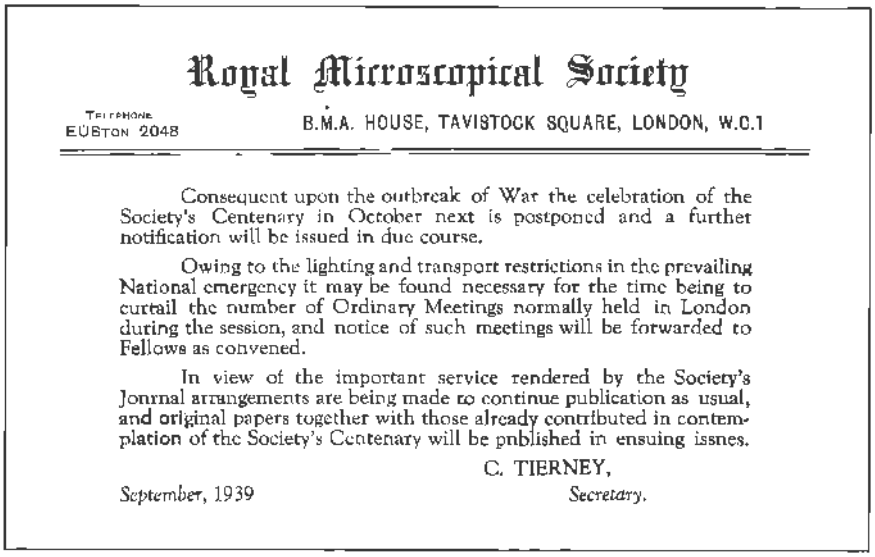
instruments (as many as possible set up to show the successive improvement in performance), together with Fellows' exhibits'. The December issue of the *Journal* was to be a Centenary Number, containing the President's historical address, and a description of the Centenary Meeting and its exhibits. British and foreign institutions were to be invited to send delegates. Funding was discussed, and it was agreed that the additional cost of the Centenary number of the *Journal* could be met from funds, while a guarantee fund should be raised for contingencies.

But it was not to be. In the September 1939 issue of the *Journal*, the following announcement was published:

> Consequent upon the outbreak of War, the celebration of the Society's Centenary in October, 1939, is postponed, and a further notification will be issued in due course.

It was also announced that ordinary meetings might have to be curtailed because of lighting and transport restrictions in London, but that the *Journal* would be published as usual. In 1940, only one ordinary meeting was held, and the Council sought permission from the Privy Council to suspend its Annual Meeting for 1941 because of the war. The offices and the library, however, remained open, and both were busy dealing with technical queries. One major problem confronted the Society: should steps be taken to move the Collection to some place or places of greater safety during the bombing of London? It was decided that some at least of the microscopes should be moved, and the Secretary produced a 'Memorandum and Register', bearing a seal, recording where parts of the Collection had been deposited 'for safe custody on behalf of the Society during the period of National emergency'. Those accepting the items were stated to have no liability for them for loss or damage due to enemy action. The President and the Secretary both took charge of some items, as did Messrs Kodak at their Harrow works. The Peters machine [**430**] went to a strong room at the Westminster Bank in Tavistock Square, while the rest was packed away in various parts of the BMA building.

Following its meeting in 1941 at which these arrangements were finalized, the Council met only twice more during the war years, once in 1942 and once in 1943, while no meeting was held in 1944. The second World War hit the Society much harder than the first. Meetings were discontinued, and the publication of the *Journal* was much disrupted. For instance, volume 62 for 1942 was issued in two parts totalling 150



Royal Microscopical Society

TELEPHONE EUSTON 2048

B.M.A. HOUSE, TAVISTOCK SQUARE, LONDON, W.C.1

Consequent upon the outbreak of War the celebration of the Society's Centenary in October next is postponed and a further notification will be issued in due course.

Owing to the lighting and transport restrictions in the prevailing National emergency it may be found necessary for the time being to curtail the number of Ordinary Meetings normally held in London during the session, and notice of such meetings will be forwarded to Fellows as convened.

In view of the important service rendered by the Society's Journal arrangements are being made to continue publication as usual, and original papers together with those already contributed in contemplation of the Society's Centenary will be published in ensuing issues.

C. TIERNEY,

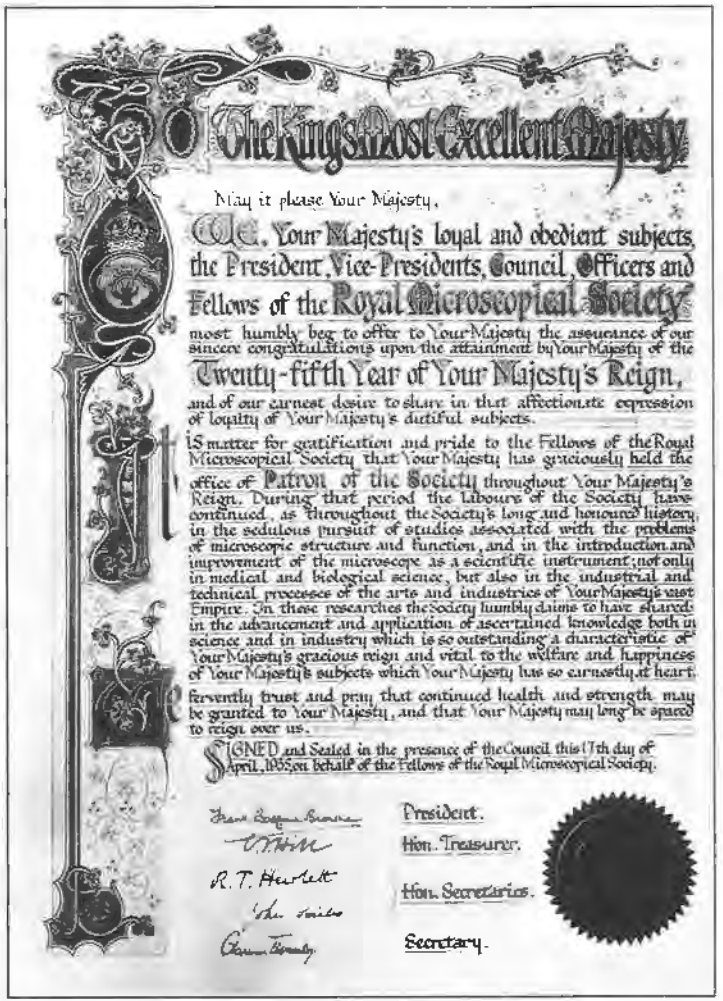
September, 1939 *Secretary.*

36 The circular of September 1939 announcing the cancellation of the Centenary celebrations.

pages in all. In the Treasurer's Report printed in that volume, C.F.Hill commented:

> . . . the audit has been effected under exceptionally difficult and hazardous conditions, during which the premises of the auditors were completely destroyed by enemy action, involving the total loss of the Society's books of accounts and records covering a period of several years.

There was also much delay in publishing the *Journal*. Volume 65, which bears the date 1945, was published with the four parts together in November 1947; it amounted to only 54 pages. The next volume was two years late, and the following one a year late. It was not until the publication in November 1948 that the schedule returned to normal. The finances of the *Journal* were naturally affected by the temporary loss of a large part of the world-wide circulation, coupled with increasingly heavy printing costs. Fortunately, however, the Treasurer was able to report that the shortfall in funds had been made good by voluntary donors. The Annual Report for 1946 was printed in that volume, and recorded that the Society had returned to normal activity, with nine meetings of the Council and eight Ordinary Meetings. The Honorary Editor had returned from the services, but paper was still in short supply for printing the *Journal*. On the credit side, however, the number of Fellows was sustained, and even modestly increased during the war.



To The King's Most Excellent Majesty

May it please Your Majesty,

We, Your Majesty's loyal and obedient subjects, the President, Vice-Presidents, Council, Officers and Fellows of the Royal Microscopical Society most humbly beg to offer to Your Majesty the assurance of our sincere congratulations upon the attainment by Your Majesty of the Twenty-fifth Year of Your Majesty's Reign, and of our earnest desire to share in that affectionate expression of loyalty of Your Majesty's dutiful subjects.

It is matter for gratification and pride to the Fellows of the Royal Microscopical Society that Your Majesty has graciously held the office of Patron of the Society throughout Your Majesty's Reign. During that period the labours of the Society have continued, as throughout the Society's long and honoured history, in the sedulous pursuit of studies associated with the problems of microscopic structure and function, and in the introduction and improvement of the microscope as a scientific instrument; not only in medical and biological science, but also in the industrial and technical processes of the arts and industries of Your Majesty's vast Empire. In these researches the Society humbly claims to have shared in the advancement and application of ascertained knowledge both in science and in industry which is so outstanding a characteristic of Your Majesty's gracious reign and vital to the welfare and happiness of Your Majesty's subjects which Your Majesty has so earnestly at heart.

We fervently trust and pray that continued health and strength may be granted to Your Majesty, and that Your Majesty may long be spared to reign over us.

SIGNED and Sealed in the presence of the Council this 17th day of April, 1935 on behalf of the Fellows of the Royal Microscopical Society.

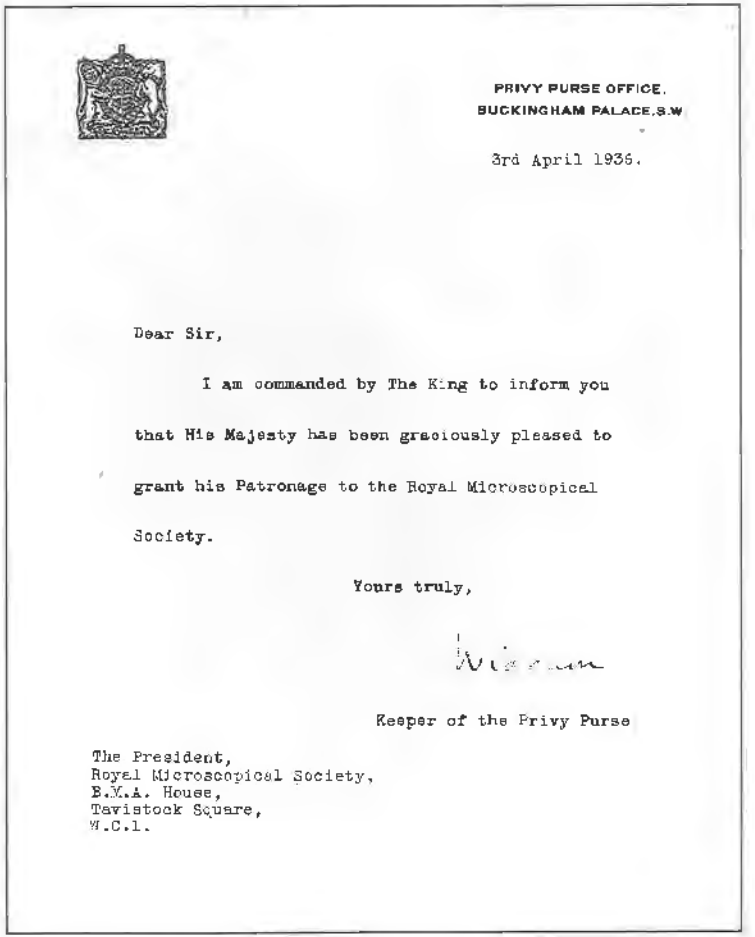
President.

Hon. Treasurer.

Hon. Secretaries.

Secretary.

37 The illuminated Address presented by Council to King George V, Patron of the Society, on their Majesties' Silver Jubilee, 1935.



PRIVY PURSE OFFICE,
BUCKINGHAM PALACE, S.W.

3rd April 1936.

Dear Sir,

I am commanded by The King to inform you that His Majesty has been graciously pleased to grant his Patronage to the Royal Microscopical Society.

Yours truly,

Keeper of the Privy Purse

The President,
Royal Microscopical Society,
E.M.A. House,
Tavistock Square,
W.C.1.

38 The acceptance of the Patronage to the Society by King Edward VIII, 3 April 1936. The King ruled for less than one year, from 20 January to 11 December 1936.

CHAPTER 6

A New Beginning: Forty Years to 1989

The 1950s were a period of transition for the Royal Microscopical Society, which was later described by Dr V.E. Cosslett (in his John Innes Lecture at Micro 78) as in the process at that time of 'slowly emerging from the brass-and-glass era'. What the Society had to come to terms with was, quite simply, the triumphant appearance on the scene of the electron microscope in the immediate post-war years. With hindsight, what should have happened was a successful take-over of electron microscopy by the Society, but instead, the Institute of Physics took the initiative with its EM Group, started in 1946. Dr Cosslett himself ran Summer Schools on electron microscopy at the Cavendish Laboratory in Cambridge for several years, and was closely involved in International EM Conferences at Delft in 1949, and Paris in 1950. Meanwhile, all that the Society could do was to include abstracts on electron microscopy in the *Journal* from 1949, until it was persuaded to help in the organization of the third International EM Conference in London in 1954, and to publish, two years later, a fat volume of the *Proceedings* of that Conference, which continued to sell for many years. By 1961, Cosslett was President of the Society, holding office for three years, and in July 1962, the first Symposium devoted to electron microscopy and organized exclusively by and for the Society was held in Oxford. Dr Cosslett remarked in his opening address that the Symposium on Cytochemical Progress in Electron Microscopy was 'symptomatic of the efforts of the Society to detach itself from its Victorian origins and catch up with modern microscopy'. The *Proceedings* of this conference were published and sold separately by the Society. The following year, a second Symposium, this time on Botanical Applications of Electron Microscopy was organized, again at Oxford. The Society continued, as with light microscopy, to lay

emphasis on the techniques of using the instrument rather than simply on its applications. The process of coming to terms with the electron microscope was fostered by the support of such a pioneer of electron microscopy as Dr Cosslett, and culminated with the establishment of an Electron Microscopy Section within the Society in 1965.

Meanwhile, at a more domestic level, the Society was busy getting under way again after the disruption of the war. Another move was accomplished in 1950, to the British Medical Association's new building, Tavistock House South, which was admirably commodious, but required a much higher rent. The result was an increase in the annual subscription from 2 guineas to 3 guineas. The Society's style in those shoestring days is caught by Gilbert Hartley in one of his 'Cyclops' Cave' contributions to the *Proceedings* (24, pt 1, 1989):

> The move [to Tavistock House South] was a picnic. We could not afford professional removers, and a volunteer squad of Fellows manhandled all our collections. There was a lift most of the time. The job took two days, and I remember standing in the lift entirely submerged in the funerary pyramidal boxes of Culpeper microscopes and wondering whether Dr Ludford might be exercising his impish sense of humour by organizing a return flow of them while I was stowing the current consignment. In the prevailing condition of cheerful mutual support which pervaded the Fellowship, it would have been quite possible.

Everyone apparently felt the need to indulge in social activity as part of the return to peacetime normality. Soirées and conversaziones were resumed, and 1948 saw no fewer than five different exhibitions mounted, most of them on historical themes. The Coronation in 1953 – Queen Elizabeth II had consented to become the Society's Patron – was celebrated by a special two-day reception and exhibition in June, followed by two afternoons of demonstrations, open to the public. In the same year, the first Scourfield Memorial Lecture was held, thanks to a bequest to the Society by David Joseph Scourfield (1866–1949), who had served for long periods on the Council, as a Vice-President, and as Honorary Secretary during World War I. Scourfield was a civil servant by profession, and a keen microbiologist, whose great achievement was to establish the Freshwater Biological Association (later to be taken over by the Ministry of Agriculture), with laboratories on Lake Windermere.

The post-war period, when science became for the first time fully

professionalized, saw the Society's Sections come into their own. The Biological Section had been the only steady success story from the inter-war years, and to this were added in the 1950s a Film Section, under which a considerable film library was built up for loan and hire; and an Industrial Section, which the Council was clearly keen to encourage because of the membership potential in industrial laboratories, but which had little success in arranging meetings. The first of the modern Sections to be founded was the Histochemical and Cytochemical Section, which still occupies a unique position as the only British Society for histochemistry. A proposal for such a Section was put in a letter to Council by Dr A.J. Hale of St Thomas's Hospital Medical School, Department of Pathology. Council met Dr Hale on 20 February 1963, and was sympathetic to his proposal, appointing there and then a 'Formation and Drafting Committee' composed of Dr Hale as Convenor, with Dr S.Bradbury and Dr G.A. Meek as members. At a Special General Meeting on 20 November, 1963, the By-laws were amended to allow for the formation of Sections with rules for the election of Section Members, who were not required to be Fellows, and who paid a fifth of a Fellow's subscription (one guinea instead of five). In later years, however, it became expedient to drop this category of member. The inaugural meeting was held on 23 April, 1964, and the first business meeting in September 1965: Professor A.G.E.Pearse was elected Chairman.

After a proposal to Council on 6 January 1965 by Dr Cosslett, and an exploratory meeting on 3 February, it was decided to launch an Electron Microscopy Section to be concerned with biological research and its instrumentation. The inaugural meeting was held on 1 October 1965, and Dr Audrey Glauert was elected Chairman. There followed in 1967 the Materials Section (founder Chairman Dr B.Ralph), and in 1978, the Light Microscopy Section (founder Chairman P.C.Robinson). In 1988 fission occurred, from which came the Histochemistry Section and the Cytometry Section (founder Chairman Dr M. Ormerod). In effect, the Sections are small societies that alone would not be viable, but with a central organization provided by the RMS headquarters they are enabled to flourish, and, indeed, find mutual benefit. From the Sections have come some of the Society's recent officers. Audrey Glauert was its first woman President in 1970 and 1971, Tony Pearse succeeded her, and Brian Ralph was also President from 1978 to 1979, while Phil Robinson has held office as Honorary Secretary.

39 On the way to open Micro 66 at Imperial College: HRH Prince Philip, Duke of Edinburgh, President; John Bunyan, Vice President (President 1958–60); Professor P.M.S. Blackett, President of the Royal Society, CH, Nobel Laureate; Dr Savile Bradbury, Honorary Secretary.

40 HRH The Duke of Edinburgh, President 1966, presents the Honorary Fellowship Diploma to Professor M.G. Lozinski, Laboratory of High-Temperature Metallography, Institute for the Study of Machines, Moscow, at the opening of the Conference 'The Role of the Microscope in Scientific Investigation', 18 July 1966.

Conferences of more than one day's duration, and held in a variety of locations, are an important part of the organization of modern science – and one that the Society could not ignore. Appropriately, in view of the link the Society provides between light and electron microscopy, a two-day meeting was held in 1960 in Leeds on the co-ordination of the two instruments, and the *Proceedings* were published as Part 3 of the *Journal* in October of that year. Accommodation was provided at Leeds University, and the conference was jointly sponsored by the Society and the Institute of Physics EM Group. The next event was even more ambitious, being nothing less than the first American meeting of the Society, held at Bethesda, Maryland, 7–9 April 1963. This was to mark the Tercentenary of the Microscope in Living Biology, referring to the pioneering research of Antoni van Leeuwenhoek (1632–1723) with his simple microscope. The organization was in the hands of John Bunyan, member of Council and Secretary of the Biological Section, and the conference was chaired by the Society's President, Dr Cosslett. The *Proceedings* were published in the *Journal*, and also issued separately.

Then it was time to prepare for an event that would compensate for the opportunity missed in 1939 because of the outbreak of war to celebrate the centenary of the Society's founding. The centenary of the granting of the Society's Royal Charter fell in 1966, and this was to be marked in a style of which the Victorian founding fathers would have approved. In the course of the year there were to be three symposiums and two international conferences. The first meeting was on Historical Aspects of Microscopy, which was held in Oxford in March, and organized by Savile Bradbury and Gerard Turner. The two Sections were each responsible for a two-day meeting, the first in Birmingham at the end of March, on Electron Microscope Studies on the Biosynthesis and Assembly of Fibrous Proteins, and the second in Sheffield in mid-April on Fluorescence Methods in Histochemistry. The main event of the Centenary year was an International Conference held in London 18 to 22 July 1966, opened by HRH The Duke of Edinburgh, who had also consented to be President for the year, and who had been elected an Honorary Fellow. The subject of the conference was The Role of the Microscope in Scientific Investigation, and linked with it was a large trade exhibition, as well as a display of historical microscopes and apparatus from the collection. The scientific meeting was attended by some 700 Fellows, Section Members, and visitors, and over 5,000 attended the trade exhibition. In the Annual Report, the year was assessed thus:

> . . . the Royal Charter Centenary Celebrations have been almost an unqualified success. They have certainly confirmed the Society as a leading international forum for the presentation and discussion of discoveries and developments in the field of microscopy.

The 'almost' referred to the failure to complete all the planned arrangements for the year. Attempts to organize a transatlantic conference to mark the Centenary, though vigorously pursued, were finally vetoed by the Council as a dangerous overstretching of the Society's resources.

The surge in the Society's activity that culminated in the Bethesda Conference and the Centenary celebrations was largely due to the energy of John Bunyan, President 1958 to 1960. An engaging portrait of the man is supplied by Gilbert Hartley (*ProcRMS*, 24, pt 1, 1989):

> He was a large extrovert, fairly radiating bonhomie; he had served in the navy as a dental Commander but was best known for the Bunyan Bag, a device for treating severely burned limbs. He collected microscopes, and had great ideas for enhancing the role of the Royal Microscopical Society, which was plainly becoming comatose, by developing an Institute of Microscopy with teaching facilities and collections; his constant but fallacious claim was that money was available if the right sources were tapped, and that he knew how to do it. He had strong connections in the United States, and arranged the first RMS meeting jointly with the US Public Health Department at Bethesda . . . . His gift for public relations may be seen from the list of people involved, from President Kennedy down; for the Charter Centenary he involved the Royal Family.

The year 1966 also saw the first publication of the *Proceedings of the Royal Microscopical Society*, under the joint editorship of S. Bradbury and R. Ross. This was to be, in effect, a house journal, to appear quarterly, carrying information about meetings, and other matters of interest to the Fellowship, articles of general and historical content, and the Annual Report. Volume 2 Part 1 (1967) contained all the papers read at the Oxford conference, and these subsequently appeared in book form under the title *Historical Aspects of Microscopy*, edited by Savile Bradbury and Gerard Turner, and distributed by Heffers of Cambridge. In the Annual Report for 1968, it was reported that the

Proceedings was to have an Editorial Board, consisting of the Editor, the Honorary Secretary, the secretaries of the Sections, and an editor for New Equipment (a special section describing microscopes and accessories presently on the market). The role of the *Proceedings* was seen as of great importance in maintaining links between the Council, the administration, and the Fellowship, especially those overseas or not attending meetings regularly. It was produced in house from 1970, and printed by offset litho, but with a steadily improved appearance.

The combination in the Centenary year of scientific conference and trade exhibition proved so successful in terms both of prestige and hard cash, that it was decided to organize another such event in 1970, and this inaugurated a series held at two-year intervals throughout the seventies and eighties. All these were given the name 'Micro', a convenient and memorable omnibus word for the combined event. The name was, however, first used by the Society in 1958 for an exhibition (which had no trade content) of photography with the microscope that ran for a week in July at the Regent Street Polytechnic in London. This early Micro did, however, anticipate the later ones by using publicity to attract as many visitors as possible. The ever-increasing level of organization needed for the Micro series could only be managed if the Society had a well-established office, and the problem of achieving such a state of affairs became a pressing one from the mid-sixties.

As has been referred to in earlier chapters, the Society was never fortunate enough to be granted grace-and-favour accommodation as had a number of the scientific societies founded in the Victorian period. This meant that the Royal Microscopical Society faced regular problems of increased rent and moves. In the post-war period, inflation, and soaring rents in London forced the Council to face two major changes in the Society's organization: the possibility of buying premises, and the possibility of moving out of London. These two suggestions were put to the Fellowship in the form of a ballot, the results of which were disclosed in October 1966. There was a strong vote in favour of raising a mortgage to acquire freehold premises; a much closer vote in favour of moving the office, library, and collections out of London, provided all meetings were still held in the metropolis. One idea considered was to reduce the burden of rent by reducing the amount of space required, and this could be achieved by finding an alternative home for the collections. Negotiations were opened with the Museum of the History of Science at Oxford, and an agreement to place the Collection of microscopes there on loan was reached at the

beginning of 1967. In the spring of that year, two different sets of offices owned by the British Optical Association in London were considered, and compared with spacious premises in Oxford. The London alternatives were either cramped, or, at £1500 per annum, very expensive. The rooms at Canterbury House, Cowley Road, Oxford, were large enough to accommodate office, library, and collections, for a rent of £1000 a year. The move was decided upon, and accomplished in the autumn of 1967.

The move brought all sorts of attendant changes in its wake. Though Council meetings continued to be held in London, the regular monthly meetings gradually declined in attendance in favour of one-day meetings held in various academic centres. Perhaps inevitably, the library and the collections were little used in Oxford by Fellows. In April 1970, the Collection of historic microscopes and accessories was transferred on loan to the Museum of the History of Science at Oxford, thereby creating the largest combined group of antique microscopes in the world. In the same year, it was decided 'to negotiate the transfer of the books to a historical institution where they can be kept together'. The Annual Report for 1971 reported that 'the Library was sold as a unit to the University of Oxford, thus avoiding both its dispersal and its removal from Oxford'. The library and the Collection are both housed in the Museum of the History of Science, which occupies the magnificent building in Broad Street, Oxford, opened in 1683 for the Ashmolean Museum. Disposing of the library made possible another move, this time to much more compact and central offices at Clarendon House, Cornmarket Street, Oxford. Immediately following this move, the Executive Secretary, who had come with the Society to Oxford, was dismissed for neglect of duties, and in August 1971, Lt. Col. P.G. Fleming, was appointed Administrator, a post which he held until 1988. In December 1974 came the Society's most momentous move, to its first freehold premises in a large, Edwardian house in St Clements, just east of Magdalen Bridge, popularly known as Snowflake House.

The reorganization which followed the move to Oxford also brought changes to the *Journal*. From January 1969, Blackwell's Scientific Publications took over the publication of the *Journal*, which was re-named the *Journal of Microscopy*. The new *Journal* substituted six parts a year for the previous quarterly publication, but numbering followed sequentially from the old *Journal* (see Appendix 6). An Editorial Board was also formed, whose members took over much of the responsibility for refereeing papers, with the aim of raising standards. Quick

41 The Charter Centennial presentation shield from the New York Microscopical Society, 1966.

42 Audrey M. Glauert, President 1970–71.

publication, within four to six months, was offered to contributors, with the additional facility to have short accounts of work not meriting a full paper published in a new section entitled 'Short Technical Notes'. At this time, the Society agreed with the International Society for Stereology that the *Journal* would offer a vehicle for publication of papers by stereologists, whose work has always been of interest to microscopists. This link, together with a flush of papers resulting from Micro 70, enabled the *Journal* to survive with minimum disruption the sudden increase in the number of parts issued, which, of course, required a marked increase in material available for publication. In 1972, Brian Ralph and Patrick Echlin succeeded Geoffrey Meek and Bob Ross as Editors. The latter's retirement marked the end of a particularly long period of service to the Society's publications, for Ross had first become a joint Editor in 1952. From 1973, the *Journal* went, as Pat Echlin later put it, 'from strength to strength'. In that year it was decided that three volumes of three issues each should be published in a year, of which not more than one issue in any volume was to be specialized. From the beginning of 1981 the *Journal* was published in monthly parts with four volumes a year. This increased the number of pages published in a year, which soon exceeded the number published in the 1880s – but now not packed with abstracts. In the most recent

43 Dr V.E. Cosslett is awarded the Duddell Medal (jointly with Dr K.C.A. Smith), in recognition of outstanding achievement in designing and constructing the Cavendish 750kV electron microscope, at the 1971 Annual Dinner of the Institute of Physics. Mr G.L'E. Turner, Honorary Secretary (President 1974–75), Dr V.E. Cosslett (President 1961–63), Dr A.M. Glauert, President.

44 The presentation of the first Glauert Medal to Dr Gillian Bullock, CIBA Laboratories, awarded at the Micrographic Competition held in conjunction with Micro 72, 10–14 April 1972. Mr G.L'E. Turner, Honorary Secretary, Dr A.M. Glauert, Vice President, Dr F.J. Aumonier, Judge, Dr G.R. Bullock (President 1988–89).

year, 1988, the total of printed pages is 1644; with colour plates and the 'rapid publication' section, the grand total is 1711 pages.

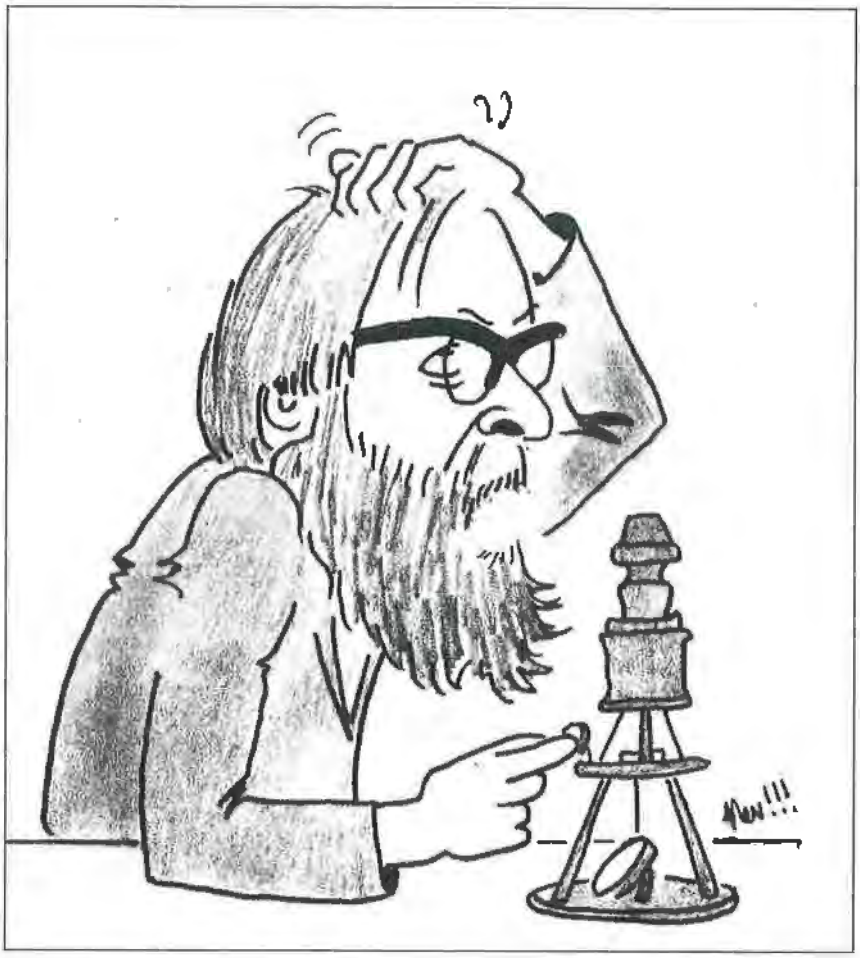
Any problems that arose were in the publishing and distribution, not in the supply of high-quality material. In 1985, it was decided to change from letterpress printing to the offset lithographic process, a change resisted for several years because of fears that the quality of reproduction, particularly of illustrations, would deteriorate. Once it was clear that standards could be maintained, the change could, and did, lead to greater efficiency with economy. Gerard Turner's comment, made in his Presidential Address of 1976, is still as true thirteen years later: 'The RMS *Journal* is by far the most important one of its type in the world, and reflects great credit on the Society and on the editors'.

The success of the *Journal* was only a part, though a very important one, of the Society's regeneration in the late sixties and early seventies. A leading architect of this recovery was Peter J.Stoward, Treasurer from 1967 to 1972, and thereafter a Vice President. At the time of his retirement as Treasurer, the following tribute was paid to his work: 'His business acumen, untiring energy, and meticulous attention to detail have resulted in a remarkable improvement in the financial health of the Society'. With the help of an advisory committee, Peter Stoward completely revised the Society's investments, negotiated the contract to publish the *Journal* with Blackwell's Scientific Publications, and reorganized the staffing and operation of the office. With the support of Audrey Glauert as President and Gerard Turner as Honorary Secretary, he also coped successfully with the problems resulting from the dishonesty of the Executive Secretary, and the hiatus before Peter Fleming took over as Administrator in 1971. All this was achieved while he continued to occupy his university post at Dundee, and to edit the *Histochemical Journal*.

From its earliest days, the Society has regarded education as one of its main functions. This was achieved informally when Fellows met each month to compare notes on their work, and such regular meetings only ceased after World War II. Now Fellows were widely scattered and employed in universities, colleges, and industrial laboratories, making meetings of one or more days' duration, in a variety of locations, the best means of exchanging knowledge and of teaching. From the mid-sixties onwards, a growing number of courses have been organized by the Society's office, many related to the special interests of the Sections. The Society has also given its attention to providing more formalized education in microscopy, from school to post-graduate

level. Perhaps the most successful of the general educational courses run by the Society have been the annual light microscopy courses run from 1972, first at Brunel University, and more recently at Oxford. It was then thought that for the Society to award its own diplomas would both encourage and suitably reward attendance at courses. In 1973, the Diploma of the Royal Microscopical Society – DipRMS – was instituted. To qualify, it was necessary to be a Fellow of the Society, and either to hold a medical or science degree, or have seven years' experience of microscopy. The standard requirement then was to attend three of the Society's courses, including two that were advanced or specialized, over up to three years; to submit a thesis; and to undergo a *viva voce* examination. The success of this post-graduate qualification turned the Council's attention to the possibility of a similar Diploma for technicians, which the Society had been asked to implement by the British Joint Committee for Electron Microscopy as the result of a survey in 1971 by Dr Jan Sikorski of Leeds University. The TechRMS finally received approval from the Department of Education in 1975, the first course being held at Southall Technical College and Brunel University. This example of collaboration between institutions owed a great deal to Barry Fookes of Brunel. Those attending the course were day-release students, and its duration was two years, with the first year devoted to general microscopy, and the second to specialization in either biology or material science. Another important aspect of education not neglected by the Society has been the publication of textbooks. A series of *Microscopy Handbooks* was proposed in the 1970s, but with all the potential authors heavily committed, it was not until 1984 that the first of the series appeared: *An Introduction to the Optical Microscope* by Savile Bradbury. Now, under the Editorship of Christopher Hammond, the list of *Handbooks* totals seventeen (at March 1989), and they are published for the Society by Oxford University Press.

The Society's recovery in the early seventies has been steadily consolidated. To this end, the acquisition of its own freehold premises has largely contributed, since this has made possible the gradual growth of a well-staffed and electronically equipped office, from which large events can be run successfully. Eight Micros have been organized from Snowflake House, St Clements, increasing both the scientific standing and the financial resources of the Society. More recently, conferences have been organized on behalf of international organizations. In 1980, the Society ran the International Histochemistry



45 Nev's cartoon of Gerard Turner published in the *Proceedings*, July 1978, with the caption: 'Now then! where *was* I before the RMS came along?'

Congress, as well as the 13th Meeting of the International Metallographical Society, while in 1988, it provided the administration for the 9th European Electron Microscopy Congress at York. All this has been achieved at the expense of devoted hard work, not only by the paid staff, but by Fellows working in an honorary capacity. Tribute has been paid to the Editors of the *Journal*, and to some of the officers. One Honorary Treasurer has been singled out, and Peter Stoward's successor in this office has also given long and devoted service. Clive Cowen took over this essential and demanding post in 1972, and has held it, with one year's gap, to the present. Fortunately resident near Oxford, he has

46 Peter Fleming, Administrator, with staff, at Micro 84.

paid meticulous attention to all the Society's financial and administrative activities, as well as giving much time to improving the content and appearance of the *Proceedings*. The 'New Equipment' section, his particular care, is generally reckoned to rival the trade magazines. The roll-call of the Society's Presidents has continued to include leading scientists, but now from a wider range of disciplines, and very much still in the full flood of their achievement. In 1986, the Society elected its first President from Europe, Professor J.S. Ploem of Leiden University in The Netherlands. Bas Ploem is a pioneer in computer-assisted image cytometry with biomedical applications, internationally known for his research.

Through much effort and hard work, combined with some good luck, the Royal Microscopical Society has weathered changes that have killed off, or reduced simply to social clubs, many of the long-standing learned societies. Some still-remembered aspects of the earlier days of the Society have had to go, but its vitality remains, as does its capacity to secure devoted voluntary work. It has an accepted scientific role to play in the modern world, just as it had in 1839 when the optical microscope was coming to its maturity, and the electron microscope undreamt of. To have retained such a position through a century and a half of massive and rapid change is no mean achievement.

CONCLUSION

The foregoing chapters are a simple chronicle of the life of the Microscopical Society of London, and then the Royal Microscopical Society, over 150 years. They describe how the Society was run, who were the main actors on its stage, how it adapted its activity to changing times. The story has been told in what historians would describe as an externalist style, that is, concentrating on practical, administrative matters, and on the Society's interaction with the world at large. An internalist approach would have concentrated on the papers read to the Society and published in the *Journal*, and on the way in which the Society, through its members, influenced the development of microscopical science. To carry out the latter task properly would have required a serious, academic study less appropriate to the anniversary occasion of this popular history. But it is to be hoped that at some future time the appropriate research may be carried out for such a study. The discerning reader, however, should be able to draw from this factual account some conclusions about the Society's influence on the progress of science.

It is possible to pick out certain crucial turning points in the Society's history. It was founded at the time when J.J. Lister's research on the lens system of the microscope turned what was simply a philosophical or recreational instrument into a fully scientific one. Forty years on, the optics of the microscopical image were for the first time fully explained by the physicist, Ernst Abbe, and the Society's membership surged, as its *Journal* became fully established. The Edwardian period and the inter-war years were a time of dogged survival rather than achievement, but with the growth of the specialist Sections from 1964, the move to Oxford in 1967, and the acquisition of freehold premises in 1974, the Society managed to make the fundamental transformation

from a Victorian London-based club to an international scientific association.

This change affected all aspects of its activity, scientific, social, and organizational. Scientifically, it had to take account of the way science works in the second half of the twentieth century: highly institutionalized, multi-disciplinary, international. It also had to accommodate the new instruments, and new applications of old ones: the electron microscope, and fluorescence microscopy, to give two examples. Socially, regular evenings meetings in London were replaced by conferences and courses, with emphasis on the Sections that were societies within the Society. It has been through its publications that the Society has kept itself visible for the past thirty years: the *Journal* which reaches an international readership with the very latest developments in science, and the *Proceedings*, intended to keep all the Fellows in touch with the affairs of the Society. A growing administrative staff is needed to organize conferences, and produce and distribute the publications, and this is a trend likely to intensify, with the possibility of in-house publication. Such administrative growth was only possible once the Society had acquired its own premises.

Of the problems that have retarded the Society's growth or tarnished its image at certain periods in its history, the most serious has been the lack of a permanent home. Had it been possible to win the prize of grace-and-favour accommodation in London after the granting of the Royal Charter, the story of the RMS might have been very different. It would certainly have gained in status and stability, but it might have sacrificed something in initiative, and in the voluntary effort of Fellows.

A fundamental crisis was narrowly averted after World War II, when the Society only just managed to climb on to the electron microscopy bandwagon. Had it failed to do so, it would have had little chance of attracting professional scientists to the Fellowship. Its multi-disciplinary role could well have become a disadvantage as science divided into an increasing number of self-contained branches, each with its specialized professional institution. But the Society met this by organizing national and international meetings on specialist topics. There was also the creation of a policy on education. Courses were offered leading to recognized qualifications, the DipRMS and the TechRMS. *Microscopy Handbooks* were launched in 1984 in conjunction with Oxford University Press, and a *Dictionary* of terms used in microscopy in English, German, and French was published in March 1989 by the Nomenclature Committee.

On balance, however, the advantages of the Society's wide-ranging scientific interests have greatly outweighed its drawbacks. Science has always been a group activity, and from the very beginning the Microscopical Society of London brought together scientists from different disciplines that had in common the need to make use of the microscope. This has always led to a diversity of membership which is socially as well as professionally advantageous. As science has become more and more compartmentalized, the value of the Society's cross-disciplinary role has increased.

Another very positive gain from the Society's commitment to an instrument has been its links with the makers of instruments, the trade. From its foundation, the leading London makers were prominent in the Society, and throughout its life, the maker and user have interacted most profitably at its meetings and through its publications. For a century and a half, the Society has provided consumer input into the microscope trade. The most remarkable manifestation of this is in the standardization of parts of the instrument, the impetus towards which was modestly initiated by the Society, and which has now achieved world-wide results.

The Society's greatest advantage has undoubtedly been its *raison d'etre*, the microscope itself, whose innumerable practical uses, and perennial appeal to human curiosity, have never abated since its first appearance. Modern man experiences just the same delight as the natural philosophers of the seventeenth and eighteenth centuries, when introduced to the amazing new world of the very small. If the wonders of the microscope rate second to those of the telescope, the former's practical applications are more numerous, and constantly on the increase. This is borne out by the fact that, when libraries are forced to institute a weeding out process among the growing number of scientific journals, the *Journal of Microscopy* has proved to be remarkably safe, because it contains material of such wide appeal. As there can be no science without instruments, and the microscope, in all its guises, is so valuable and ubiquitous, the prognosis for the Society's future cannot but be hopeful.

APPENDIX 1

The Royal Charter of 1866

VICTORIA, BY THE GRACE OF GOD of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith, TO ALL TO WHOM THESE PRESENTS SHALL COME GREETING: WHEREAS James Scott Bowerbank, Doctor of Laws, Fellow of the Royal Society; The Reverend Joseph Bancroft Reade, Master of Arts, Fellow of the Royal Society; Nathaniel Bagshaw Ward, Fellow of the Royal Society; and others of our loving subjects, did, in the year 1839, establish a Society by the name of THE MICROSCOPICAL SOCIETY OF LONDON, for the advancement of Microscopical Science:

AND WHEREAS it has been represented to us that the same Society has, since its establishment, sedulously pursued such its proposed object, by the researches of its members, and the collection and discussion of observations, and by the publication of its transactions from time to time, which have contributed to the progress of Microscopical knowledge:

AND WHEREAS distinguished individuals in Foreign Countries, as well as British Subjects, have availed themselves of the facilities offered by the same Society for communicating important discoveries, greatly extending Microscopical knowledge; and the great and general interest now felt in those branches of Science, whereof the Microscope is an important instrument of investigation, has been greatly promoted and fostered by this Society:

AND WHEREAS the same Society has, in aid of its objects, acquired a considerable and important Library of Scientific Works, and a large collection of Microscopic objects, and several valuable Microscopes, to which fresh accessions are constantly being made; and the said Society has hitherto been supported by donations and annual and other subscriptions and contributions to its funds, and has therefrom purchased and is possessed of a considerable stock in the public funds:

AND WHEREAS, in order to secure the property of the said Society, to extend its operations, and to give it a more permanent establishment among the Scientific Institutions of our Kingdom, we have been besought to grant to

James Glaisher, Fellow of the Royal Society, the present President of the said Society, and to those who now are or shall hereafter become Members of the said Society, our Royal Charter of Incorporation for the purposes aforesaid:

NOW KNOW YE that we, being desirous of encouraging a design so laudable and salutary, of our especial grace, certain knowledge, and, mere motion, have willed, granted, and declared, and do by these presents, for us, our heirs and successors, will, grant and declare that the said James Glaisher, and such other of our loving subjects as now are members of the said Society, or shall from time to time be elected Fellows thereof, according to such regulations or by-laws as shall be hereafter framed or enacted, and their successors shall for ever hereafter be by virtue of these presents one Body politic and corporate, by the name of 'The Microscopical Society of London';* and for the purposes aforesaid, and by the name aforesaid, shall have perpetual succession and a common Seal,with full power and authority to alter, vary, break, and renew the same at their discretion, and by the same name to sue and be sued, implead and be impleaded, answer and be answered, unto and in every Court of us, our heirs and successors, and be for ever able and capable in the Law to purchase, receive, possess, hold and enjoy, to them and their successors, any goods and chattels whatsoever, and also be able and capable in the Law (notwithstanding the Statute of Mortmain) to take, purchase, hold, and enjoy to them and their successors a hall or house, and any such messuages, lands, tenements, or hereditaments whatsoever as may be necessary or expedient for carrying out the purposes of the Society, the yearly value of which, including the site of the said hall or house, shall not exceed in the whole sum of one thousand pounds computing the same respectively at the time of the purchase or acquisition thereof, and to act in all the concerns of the said body politic and corporate as effectually, to all intents and purposes, as any other of our liege subjects, or any other body politic or corporate in our said Kingdom, nor being under any disability, might do in their respective concerns.

AND we do hereby grant our special licence and authority unto all and every person and persons, bodies politic and corporate (otherwise competent), to grant, sell, alien and convey in mortmain unto and to use of the said body politic and corporate and their successors and messuages, lands, tenements, or hereditaments not exceeding such annual value as aforesaid.

AND our will and pleasure is, and we further grant and declare, that there shall be a General Meeting or General Meetings of the Fellows of the said Society to be held from time to time as hereinafter mentioned, and that there shall be a Council to direct and manage the concerns of the said body politic and corporate, and that the General Meetings and the Council shall have the

* On the 1st November, 1866, Mr Secretary Walpole notified to the President that Her Majesty had been graciously pleased 'to command that the Society shall be styled the Royal Microscopical Society'.

entire direction and management of the same in the manner and subject to the regulations hereinafter mentioned.

AND we do hereby also will, grant, and declare that there shall be a President, Vice Presidents, a Treasurer, and Secretaries of the said body politic and corporate, and that the Council shall consist of the President, Vice Presidents, Treasurer, Secretaries, and not more that twelve nor less that eight other Fellows of the said Society.

AND we do hereby further will and declare that the said James Glaisher shall be the first President of the said body politic and corporate, and the other persons now being the Vice Presidents, Treasurer, Secretaries, and Members of the Council, and shall continue such until the election of officers shall be made in pursuance of these presents.

AND we do hereby further will and declare that it shall be lawful for the Fellows of the said body politic and corporate hereby established to hold a General Meeting once in the year of oftener, for the purposes hereinafter mentioned; namely, that the President, Vice Presidents, the Treasurer, the Secretaries, and other Members of the Council, shall be chosen at such General Meeting, and that the General Meetings shall from time to time make and establish such by-laws, and vary and alter or revoke the same as they shall deem to be useful and necessary for the regulation of the said body politic and corporate, for the admission of Fellows and of Honorary and Foreign Members, and for the fixing the number of the Vice Presidents and Officers, and for the management of the proceedings, and the estates, goods, and business of the said body politic and corporate, so that such by-laws be not repugnant to these presents, or to the Laws and Statutes of this our realm, and shall and may also enter into any resolution and make any regulation respecting the affairs of the said body politic and corporate that may be necessary and proper:

AND we do further will and declare that the General Meetings shall take place at such time as may be fixed by the said Council, and that the present regulations of the said Society, so far as they are not inconsistent with these presents, shall continue in force until the same shall be altered by a General Meetiug.

AND we further will, grant, and declare that the Council shall have the sole management of the income and funds of the said body politic and corporate, and the appointment of the Librarian, Curator, and such other officers, attendants, and servants as the Council shall think necessary or useful, as also the entire management and superintendence of all the other affairs of the said Society, and shall and may, but not inconsistently with or contrary to the provisions of this our Charter, or any existing by-law, or the laws and statutes of this our realm, do all such acts and deeds as shall appear to them necessary for carrying into effect the objects and views of the said body politic and corporate.

PROVIDED ALWAYS, and we do will and declare that the Council shall, from time to time, render to a General Meeting a full account of their proceedings, and that every Fellow of the Society may at all reasonable times, to be fixed by the said Council, see and examine the accounts of the receipts and payments of the said body politic and corporate.

AND we further will, grant, and declare that the whole property of the said body politic and corporate shall be vested, and we do hereby vest the same, solely and absolutely in the Fellowship thereof, and that they shall have full power and authority to sell, alienate, charge, and otherwise dispose of the same as they shall think proper, but that no sale, mortgage, incumbrance, or other disposition of any messuages, lands, tenements, or hereditaments belongings to the said body politic and corporate shall be made, except with the approbation and concurrence of a General Meeting.

AND we do lastly declare it to be our Royal will and pleasure that no resolution of by-law shall, on any account or pretence whatsoever, be made by the said body politic and corporate, in opposition to the general scope, true intent, and meaning of this our Charter, or the Laws or Statutes of our realm: And that if any such rule or by-law shall be made, the same shall be absolutely null and void to all intents, effects, constructions and purposes whatsoever.

IN WITNESS whereof we have caused these our Letters to be made Patent.

WITNESS ourself, at our Palace at Westminster, this twenty eighth day of August in the thirtieth year of our reign.

BY HER MAJESTY'S COMMAND.

(Signed) CARDEW.

APPENDIX 2

Presidents 1840–1989

	Elected
Sir Richard Owen, KCB, DCL, MD, LLD, FRS	1840–1
John Lindley, PhD, FRS	1842–3
Thomas Bell, FRS	1844–5
James Scott Bowerbank, LLD, FRS	1846–7
George Busk, FRS	1848–9
Arthur Farre, MD, FRS	1850–1
George Jackson, MRCS	1852–3
William Benjamin Carpenter, CB, MD, LLD, FRS	1854–5
George Shadbolt	1856–7
Edwin Lankester, MD, LLD, FRS	1858–9
John Thomas Quekett, FRS	1860
Robert James Farrants, FRCS	1861–2
Charles Brooke, MA, FRS	1863–4
James Glaisher, FRS	1865–6–7–8
Rev. Joseph Bancroft Reade, MA, FRS	1869–70
William Kitchen Parker, FRS	1871–2
Charles Brooke, MA, FRS	1873–4
Henry Clifton Sorby, LLD, FRS	1875–6–7
Henry James Slack, FGS	1878
Lionel S.Beale, MB, FRCP, FRS	1879–80
Peter Martin Duncan, MB, FRS	1881–2–3
Rev. William Henry Dallinger, MA, LLD, FRS	1884–5–6–7
Charles Thomas Hudson, MA, LLD, FRS	1888–9–90
Robert Braithwaite, MD, MRCS	1891–2
Albert D.Michael, FLS	1893–4–5
Edward Milles Nelson	1897–8–9
William Carruthers, FLS, FGS, FRS	1900–1
Henry Woodward, LLD, FGS, FZS, FRS	1902–3
Dukinfield Henry Scott, MA, PhD, LLD, FLS, FRS	1904–5–6
The Rt Hon. Lord Avebury, PC, DCL, LLD, FRS	1907–8
Sir Edwin Ray Lankester, KCB, MA, LLD, FLS, FRS	1909
Sir J.Arthur Thomson, MA, FRSE	1910–11

Henry George Plimmer, FLS, FZS, FRS	1911–12
Sir German Sims Woodhead, MA, MD, LLD, FRSE	1913–14–15
Edward Heron-Allen, FLS, FGS, FRS	1916–17
Joseph E.Barnard, FInstP, FRS	1918–19
John H.Eyre, MD, MS, FRSE	1920–1
Frederic J.Cheshire, CBE, FInstP	1922–3
A.Chaston Chapman, FIC, FCS, FRS	1924–5
James A.Murray, MD, BSc, FRS	1926–7
Joseph E.Barnard, FInstP, FRS	1928–9
R.Ruggles Gates, MA, PhD, LLD, FLS, FRS	1930–1
Conrad Beck, CBE	1932–3
W.A.F. Balfour-Brown, MA, FZS, FRES, FRSE	1934–5
Reginald S.Clay, BA, DSc, FInstP,	1936–7
Joseph E.Barnard, FInstP, FRS	1938–45
James A.Murray, MD, BSc, FRS	1946
R.J. Ludford, PhD, DSc,	1947–8–9
G.M.Findlay, CBE, MD, DSc, FRCP	1950–1
H.G.Smith, CB, OBE, MC, TD, DL	1952–3
T.E. Wallis, DSc, FRIC, FPS, ACP	1954–5
J. Smiles, OBE, ARCS	1956–7
John Bunyan, LDS, RCS,	1958–9–60
V.E. Cosslett, MA, PhD, ScD, FInstP, FRS	1961–2–3
John R. Baker, MA, DPhil, DSc, FRS	1964–5
HRH Prince Philip, Duke of Edinburgh	1966
B.Barer, MC, MA, DPhil	1967–8–9
Audrey M. Glauert, MA, MSc, ScD	1970–1
A.G.E. Pearse, MD, FRCP, FRCPath, DCP	1972–3
G.L'E. Turner, MA, MSc, DSc, FInstP, FRHistS, FSA	1974–5
Duncan G. Murchison, BSc, PhD, FGS, FRSE	1976–7
Brian Ralph, MA, PhD, ScD	1978–9
John R. Garrett, BSc, MB, BS, PhD, MD, FRCPath, LDS, RCS	1980–1
A.W. Robards, PhD, DSc, FIBiol	1982–3
Archie Howie, MA, PhD, FRS	1984–5
J.S. Ploem, MD	1986–7
Gillian R. Bullock, MSc, PhD	1988–9

APPENDIX 3

Honorary Fellows

1840	Christian Gottfried Ehrenberg, Berlin
1840	Jan E.Purkinje, Vienna
1846	Filippo Pacini, Pistoia
1851	Asa Gray, Cambridge, Massachusetts
1867	John Williams, London
1869	George Busk, London
1870	James Hankey, New York, N.Y.
1870	M. Mouchet, Rochefort-sur-Mer
1871	Richard L. Maddox, London
1872	George C. Wallich, London
1875	J.J. Woodward, Washington, D.C.
1876	Conte Ab. F. Castracane, Fano, Italy
1876	Frederick Kitton, Norwich
1877	A.Renard, Louvain
1878	Ernst Abbe, Jena
1879	A. Agassiz, Cambridge, Massachusetts
1879	W. Archer, Dublin
1879	E.G. Balbiani, Paris
1879	A. de Bary, Strasburg
1879	P.J. van Beneden, Louvain
1879	Rev. M.J. Berkeley, Market Harborough
1879	O. Bütschli, Heidelberg
1879	L. Cienkowski, Kharkov
1879	P.T. Cleve, Uppsala
1879	F. Cohen, Breslau
1879	Maxime Cornu, Paris
1879	A. Dodel-Port, Zürich
1879	T.W. Engelmann, Utrecht
1879	H. Frey, Zürich
1879	A. Grunow, Vienna
1879	P. Harting, Utrecht
1879	A. von Kölliker, Würzburg
1879	J. Leidy, Philadelphia, Pennsylvania
1879	E. Metschnikoff, Odessa
1879	C. Nägeli, Munich
1879	W. Nylander, Paris
1879	C.A.J.A. Oudemans, Amsterdam
1879	Louis Pasteur, Paris
1879	L. Ranvier, Paris
1879	G.O. Sars, Christiana
1879	M.J. Schleiden, Wiesbaden
1879	F.E. Schultze, Graz
1879	T. Schwann, Liège
1879	S. Schwendener, Berlin
1879	Hamilton L. Smith, Geneva, New York
1879	J.J.S. Steenstrup, Copenhagen
1879	F. Ritter von Stein, Prague
1879	E. Strasburger, Jena
1879	F. de Thümen, Klosterneuburg, Austria
1879	P. van Tieghem, Paris
1879	E. Warming, Copenhagen
1879	G.R. Waterhouse, London
1879	A. Weismann, Freiburg im Breisgau
1879	K.A. Zittel, Munich
1882	L. Dippel, Darmstadt
1883	Henri van Heurck, Antwerp
1884	W.K. Parker, London
1885	J.H.L. Flögel, Bramstedt, Holstein
1885	H. de Lacaze-Duthiers, Paris
1886	W.A. Rogers, Cambridge, Massachusetts
1887	P.H. Gosse, Torquay
1888	G.J. Allman, Parkstone

1888 G. Govi, Naples
1888 S. Lovén, Stockholm
1888 R. Virchow, Berlin
1889 J. Ralfs, Penzance
1890 F. Leydig, Würzburg
1890 W.C. Williamson, Manchester
1891 E. Bornet, Paris
1891 H. Fol, Nice
1891 T.H. Huxley, London
1891 Sir Joseph Lister, London
1893 O. Hertwig, Berlin
1894 E. van Beneden, Liège
1895 Anton Dohrn, Naples
1895 C. Golgi, Padua
1895 Hermann Grafzu Solms-Laubach, Strasburg
1896 G. Retzius, Stockholm
1897 A.B. Lee, Nyon, Switzerlaud
1897 G.B. de Toni, Padua
1901 C.T. Hudson, Shanklin, I.o.W.
1902 Rt Hon. Lord Rayleigh, London
1904 G. Bonnier, Paris
1904 Y. Delage, Paris
1904 S. Ramón y Cajal, Madrid
1904 J.J.H. Teal, London
1904 Silvanus P. Thompson, London
1904 M. Treub, Java
1905 W.G. Farlow, Cambridge, Massachusetts
1905 H.S. Jennings, Baltimore, Maryland
1905 E.B. Wilson, New York, N.Y.
1905 R.W. Wood, Baltimore, Maryland
1908 J.W. Judd, Kew
1912 Eugene Penard, Geneva
1918 Lady Mary Elizabeth Bruce, London
1919 Albert D. Michael, Swanage
1923 Alfred B. Rendle, London
1925 Marshall D. Ewell, Memphis, Tennessee
1929 Frederick Chapman, Melbourne, Australia
1929 Ludwig Rhumbler, Münden
1929 Hans de Winiwarter, Liège
1930 Sir John Bretland Farmer, London
1931 V. Gregoire, Louvain
1931 K. Krujii, Tokyo
1931 Otto Rosenberg, Stockholm
1933 Sir Robert Hadfield, London
1933 Sir Herbert Jackson, London
1934 E. Küster, Giessen
1938 J.A. Cushman, Sharon, Massachusetts
1946 C.F. Hill, Warrington
1947 J.E. Barnard, Oxhey, Hertfordshire
1948 J.A. Murray, London
1950 Cecil R. Burch, Bristol
1950 R. Chambers, New York, N.Y.
1950 Reginald S. Clay, London
1950 E.V. Cowdry, St Louis, Missouri
1950 Warren H. Lewis, Philadelphia, Pennsylvania
1950 Adrianus Pijper, Pretoria, South Africa
1950 Edmund Vincent, Philadelphia, Pennsylvania
1950 Ralph W.G. Wyckoff, Tucson, Arizona
1950 Frits Zernike, Groningen
1951 William A.F. Balfour-Browne, Dumfries
1951 H.G. Cannon, Manchester
1951 Arthur Earland, Dundee
1951 R. Ruggles Gates, Cambridge, Massachusetts
1951 Ernst Leitz, Wetzlar
1951 T.E. Wallis, London
1952 Lord Adrian, OM, Cambridge
1952 Sir Henry H. Dale, OM, London
1953 J. Brontë Gatenby, Dublin
1954 F.M. Duncan, London
1955 C. Tierney, Coulsdon
1956 G.U. Gey, Baltimore, Maryland
1956 Professor Pomerat, Galveston, Texas
1957 E.W. Taylor, York
1958 D.W. Fawcett, Boston, Massachusetts
1958 E.H. Land, Cambridge, Massachusetts
1958 R.J. Ludford, London
1958 E.K. Maxwell, Shinfield
1958 Maria Rooseboom, Leiden
1959 T. Caspersson, Stockholm
1959 B.K. Johnson, London
1959 Dorothy Russell, London
1959 J. Smiles, London
1960 Irene Crespin, Canberra, Australia
1960 Sir Wilfred Fish, London

1960 A. Frey-Weyssling, Zurich
1961 R. Barer, MC, Oxford
1961 M.E. Haine, Aldermaston
1961 Irene Manton, Leeds
1962 G. Dupouy, Toulouse
1962 Oscar W. Richards, Stamford, Connecticut
1963 M.G. Brown, Chicago, Illinois
1963 A. Castellani, Italy
1963 Sir Howard Florey, Oxford
1963 Maurice Francon, Paris
1963 M.G. Lozinsky, Moscow
1963 Ernst Ruska, Berlin
1964 Lord Fleck, London
1964 A.G.E. Pearse, London
1965 V.E. Cosslett, Cambridge
1965 F.H. Smith, York
1966 HRH Prince Philip, The Duke of Edinburgh
1967 W. Bernhard, Villejuif
1967 R.D. Preston, Leeds
1968 J.R. Baker, Oxford
1968 F. Gabler, Vienna
1968 G. Palade, New York
1968 S.C. Palay, Boston, Massachusetts
1968 K.R. Porter, Philadelphia, Pennsylvania
1969 Professor Brumberg, Leningrad
1969 A.C. van Dorsten, Amsterdam
1969 J. Dyson, Teddington
1970 Alan W. Agar, Harlow
1970 R.W. Horne, Norwich
1970 Sir Charles Oatley, Cambridge
1970 S.H.C. Tolansky, Englefield Green
1972 M. Plnta, Warsaw
1973 O. Eränkö, Helsinki
1973 Audrey M. Glauert, Cambridge
1973 H. Pillar, Oberkochen
1974 Sir James Menter, London
1974 G. Nomarski, Orsay, France
1974 J.H. Scharf, Halle
1975 J. Sikorski, Leeds
1976 J.S. Ploem, Leiden
1977 Sir Peter Hirsch, Oxford
1978 A. Howie, Cambridge
1978 Z. Lojda, Prague
1978 E. Weibel, Bern
1979 W.G. Hartley, Seaford
1981 J.V.P. Long, Cambridge
1981 D.G. Murchison, Newcastle upon Tyne
1981 D.W. Pashley, London
1982 R. Castaing, Paris
1982 H.Haselmann, Tübingen
1982 M. Karnovsky, Boston, Massachusetts
1983 H. Hashimoto, Osaka
1983 A.Thaer, Wetzlar
1984 A.V. Crewe, Chicago, Illinois
1984 T. Mulvey, Birmingham
1984 C.F. Quate, Stanford, California
1984 K.C.A. Smith, Cambridge
1985 A. Klug, Cambridge
1987 E. Ash, London
1987 D. McMullan, Cambridge
1988 G. Binnig, Munich
1988 S. Inoné, Woods Hole, Massachusetts
1988 C.P. Leblond, Quebec
1988 J.N. McArthnr, Cambridge
1988 H. Rohrer, Ruschlikon, Switzerland

APPENDIX 4

Membership

The curve of the number of ordinary members over 150 years gives an impression of the changes in the fortunes of the Society. The figures plotted are of ordinary members only as this gives a true record of the willingness of people to support the Society. Other categories were introduced or removed at various times. Honorary Members, or Honorary Fellows, is a class of membership that began in 1840 with two, and which continues uninterrupted to the present. Associates were present from 1840, but never numbered more that two, and were eliminated by 1880. The same applied to the short-lived category of Corresponding Fellow, added in 1874 and ended in 1880. The efforts made in 1879 to increase membership and influence added 39 new Honorary Fellows (see Appendix 3) and 88 in the new category of ex-officio Fellows (see Appendix 5).

Membership figures were customarily made up to the end of December and then reported to the Annual Meeting held in the following January. Numbers joining, resigning, or dying during the year were noted, and it is surprising how many times the simple arithmetic is in error. Then there was always the problem of when to remove a Fellow for non-payment of dues. Do you count someone who is one, two, or three years overdue? Usually the situation was allowed to deteriorate, and so inflate the true figures of membership, until a treasurer was forced to remove a batch of bad payers, and so reduce the membership total with a jerk. This accounts for some of the jogs in the chart.

At the beginning of 1890 the membership was 659 ordinary Fellows, 50 Honorary Fellows, and 88 ex-officio Fellows, so reaching a high not to be attained again until the 1950s. At a Special Meeting held on 17 April 1918, it was decided to remove all enemy aliens from the roll. This decision removed 12 Honorary Fellows, 12 ex-officio, and a number of ordinary Fellows.

In 1925 the ex-officio category was abandoned. At 31 December 1938, the membership was 444 ordinary Fellows and 14 Honorary. Thirty years on (figures for 1 September 1968) there were recorded 1275 ordinary Fellows and 44 Honorary. But a couple of years later, the Secretary said that the earlier figures could not be confirmed, so one must suppose that there were too many non-payers still on the books.

In 1972 the new category of Corporate Member was introduced, and in 1972 that of Student Member (later renamed Junior Member). The figures totalled at 31 December 1988 are:

Ordinary Fellows	2083
Honorary Fellows	52
Junior Members	94
Corporate Members	93

47 Changes in numbers of Members/Fellows from 1840 to 1988.

APPENDIX 5

The List made in 1879 of the 'Societies whose Presidents for the time being are ex-officio Fellows of the Royal Microscopical Society'

UNITED KINGDOM

London

- Quekett Microscopical Club
- South London Microscopical and Natural History Club

Provinces

- Birmingham Natural History and Microscopical Society
- Brighton and Sussex Natural History Society
- Bristol Microscopical Society
- Bristol Naturalists' Society
- East Kent Natural History Society
- Cardiff Naturalists' Society
- Croyden Microscopical and Natural History Club
- Eastbourne Natural History Society
- Philosophical and Literary Society of Leeds
- Literary and Philosophical Society of Liverpool
- Microscopical Society of Liverpool
- Manchester Microscopical Society
- Norfolk and Norwich Naturalists' Society
- North of England Microscopical Society, Newcastle upon Tyne
- Plymouth Institution and Devon and Cornwall Natural History Society
- Hertfordshire Natural History Society and Field Club

Scotland

- Natural History Society, Glasgow
- Cryptogamic Society of Scotland, Perth
- Perthshire Society of Natural Science, Perth

Ireland

- Dublin Microscopical Club
- Belfast Natural History and Philosophical Society

COLONIES

India

- Asiatic Society of Bengal, Calcutta

Australasia
Linnean Society of New South Wales
Royal Society of New South Wales, Sydney
Royal Society of South Australia, Adelaide
Royal Society of Tasmania
Royal Society of Victoria
Microscopical Society of Victoria
Wellington Philosophical Society, New Zealand

Canada
Nova Scotian Institute of Natural Science, Halifax
Natural History Society, Montreal
Canadian Institute, Toronto

UNITED STATES
American Academy of Arts and Sciences, Boston
Boston Society of Natural History
State Microscopical Society of Illinois, Chicago
New York Academy of Sciences, New York
New York Microscopical Society, New York
Academy of Natural Sciences, Philadelphia
Academy of Sciences, St Louis
San Francisco Microscopical Society
Troy Scientific Association, Troy, N.Y.

GERMANY
K. Preussische Akademie der Wissenschaften, Berlin
Gesellschaft Naturforschender Freude, Berlin
K. Leopoldinisch-Carolinische Deutsche Akademie der Naturforscher, Halle
Senckenbergische Naturforschende Gesellschaft, Frankfurt a. M.
Deutsche Malakozoologische Gesellschaft, Frankfurt a. M.
K. Gesellschaft der Wissenschaften, Göttingen
Jenaische Gesellschaft für Medicin und Naturwissenschaft, Jena
K. Sächsische Gesellschaft der Wissenschaft, Leipzig
K. Bayerische Akademie der Wissenschaft, Munich

AUSTRIA-HUNGARY
K. Akademie der Wissenschaften, Vienna
K.K. Zoologisch-botanische Gesellschaft, Vienna
K. Böhmische Gesellschaft der Wissenschaft, Prague
Hungarian Academy, Budapest

HOLLAND
K. Akademie van Wetenschappen, Amsterdam
Hollandsche Maatschappij der Wetenschappen, Haarlem

DENMARK
K. Danske Videnskabernes Selskab, Copenhagen

SWEDEN
K. Svenska Vetenskaps Akademien, Stockholm

RUSSIA
Société Impériale des Naturalistes, Moscow
Société des Naturalistes de la Nouvelle Russie, Odessa
Académie Impériale des Sciences, St Petersburg

SWITZERLAND
Naturforschende Gesellschaft, Basel
Société de Physique et d'Histoire Naturelle, Geneva
Société Vaudoise des Sciences Naturelles, Lausanne
Allgemeine Schweizerische Gesellschaft für die Gesammten Naturwissenschaften, Zurich

FRANCE
Société Linnéenne du Nord de la France, Amiens
Société des Sciences Physiques et Naturelles, Bordeaux
Société Linnéenne de Lyon
Académie des Sciences, Belles-Lettres et Arts, Marseille
Académie des Sciences et Lettres, Montpellier
Académie des Sciences, Paris
Société Botanique de France, Paris
Société Cryptogamique de France, Paris

BELGIUM
Académie Royale des Sciences, des Lettres et des Beaux Arts de Belgique, Brussels
Société Belge de Microscopie, Brussels
Société Malacologique de Belgique, Brussels
Société Royale de Botanique de Belgique, Brussels

ITALY
Società Malacologica Italiana, Florence
Istituto Lombardo di Scienza e Lettere, Milan
Società Crittogamologica Italiana, Milan
Società Toscana di Scienza Naturali, Pisa
R. Accademia delle Scienza, Turin
R. Istituto Veneto di Scienza, Lettere, ed Arti, Venice
R. Accademia dei Lincei, Rome

SPAIN
Sociedad Española de Historia Natural, Madrid

PORTUGAL
Academia Real das Sciencias, Lisbon

APPENDIX 6

Journal Publication History

The journals associated with or published by the Microscopical Society of London, from 1866 the Royal Microscopical Society.

(a) The Society allowed reports of its proceedings to be printed in: *The Microscopic Journal, and Structural Record for 1841*, edited by Daniel Cooper, and published for the proprietors by John van Voorst, Paternoster Row, London; printer H.W. Martin, Holborn, London. Only two volumes were produced, for 1841 and 1842.

(b) To begin with, the transactions were published occasionally: *The Transactions of the Microscopical Society of London*, publisher John van Voorst; printer E. Newman, Bishopsgate, London. Volume 1, 1844; 2, 1849; 3, 1852.

(c) After this, arrangements were made to print the transactions as separately paginated parts of the *Quarterly Journal of Microscopical Science*, edited by Edwin Lankester and George Busk: *Transactions of the Microscopical Society of London*, new series, volume 1, 1853- volume 16, 1868. The publisher was Samuel Highley, 32, Fleet Street, London, and the printer W. Clowes and Sons, Stamford Street, London, for volumes 1–4. The remainder of the series was published by John Churchill, New Burlington Street, London, and printed by J.E. Adlard, Bartholomew Close, London.

(d) Subsequent to the granting of the Royal Charter in 1866, the Society wished to have greater control over the publication of its proceedings and transactions, with the responsibility for the appointment of the editor. Monthly parts were issued, comprising two volumes per year, the publisher being Robert Hardwicke, 192, Piccadilly, London, and the printer once again W.Clowes and Sons, Stamford Street and Charing Cross, London: *The Monthly Microscopical Journal: Transactions of the Royal Microscopical Society*, and *Record of Histological Research at Home and Abroad*, edited by Henry Lawson; volume 1, 1869- volume 18, 1877.

(e) Following Lawson's death in 1877, several changes were made, including bi-monthly publication with one volume per year: *Journal of the Royal Microscopical Society: Containing its Transactions & Proceedings, with other Microscopical Information*, published for the Society by Williams & Norgate, London and Edinburgh; printed by W.Clowes and Sons. This firm continued

to print the *Journal* until the end of 1975, after which printing was by Adlard & Son, Ltd, Bartholomew Press, Dorking, who ceased trading in June 1988. The three volumes 1878–80 constitute the first series; a second series started in 1881 with another volume 1. Annual volumes were produced until volume 78, 1958; although a series three was named in 1927 (with a larger format), it did not involve a change in the numbering. Volume 79 was dated 1959–60, but annual volumes continued once again to 1965 with volume 84. Since 1918 a volume had consisted of four parts, but now it was decided to publish six parts a year, although keeping a four-part volume. Thus: 85, 1966; 86, 1966–67; 87, 1967. After a four-part volume 88 in 1968, the name was changed, but not the volume number sequence.

(f) *Journal of Microscopy*, published for the Society by Blackwell Scientific Publications, Oxford, commenced with volume 89 in 1969, and was issued in three parts per volume, two volumes per year. In 1973 this was increased to three volumes each year. So the 100th volume in the sequence that began in 1881 appeared in 1974, and was duly commemorated. From the beginning of 1981 the *Journal* was issued monthly, with three parts forming a volume, and consequently four volumes appearing in a year. The total number of pages published in the twelve issues for 1988 was 1711.

(g) A second journal was launched by the Society in 1966, which was named: *Proceedings of the Royal Microscopical Society*. Originally in four parts to a yearly volume, a change was made with volume 5, 1970, to six parts per year.

LECTURE "ENCORED."

MR. J. E. BARNARD TELLS STORY OF GERM SEARCH.

Mr. J. E. Barnard, F.R.S.—Dr. Gye's colleague in cancer research—had to repeat his lecture on his search for ultra-microscopic organisms, so large was the crowd that attended to hear him at the Imperial College of Science, Kensington.

The largest theatre in the college was packed and three times an appeal was made for the gangways to be cleared, as the lecturer declared he was willing to go through his lecture again, but it had no effect. The room remained crowded.

The audience rose and cheered at its conclusion, and Mr. Barnard then repeated his address.

This is the first time that a detailed description of what is believed to be the organism associated with malignant growth has been given by the discoverers to a lay audience.

48 The *Evening Standard*, 6 January 1926, reports the 'encore' of a lecture by J.E.Barnard at Imperial College. See page 73.

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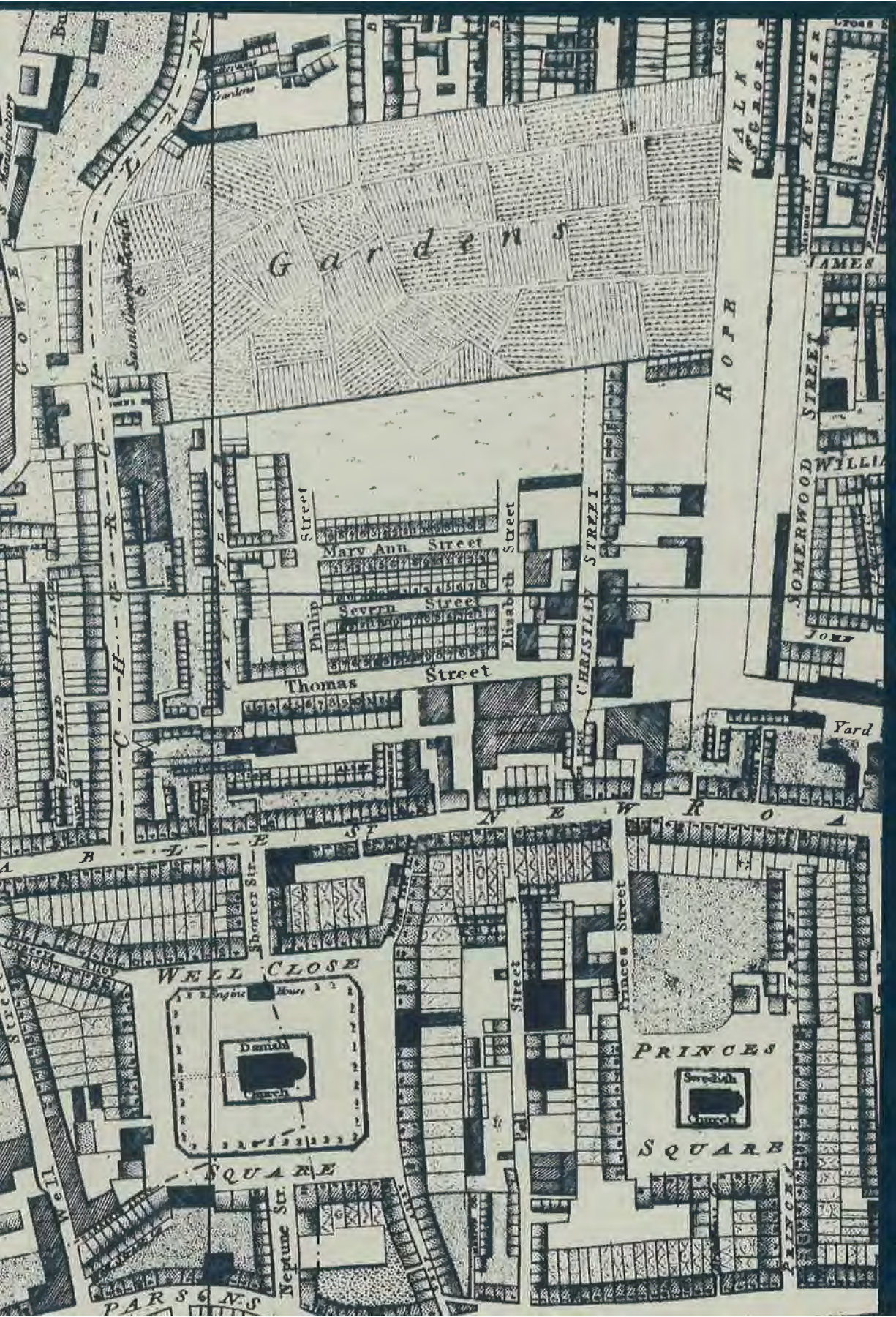
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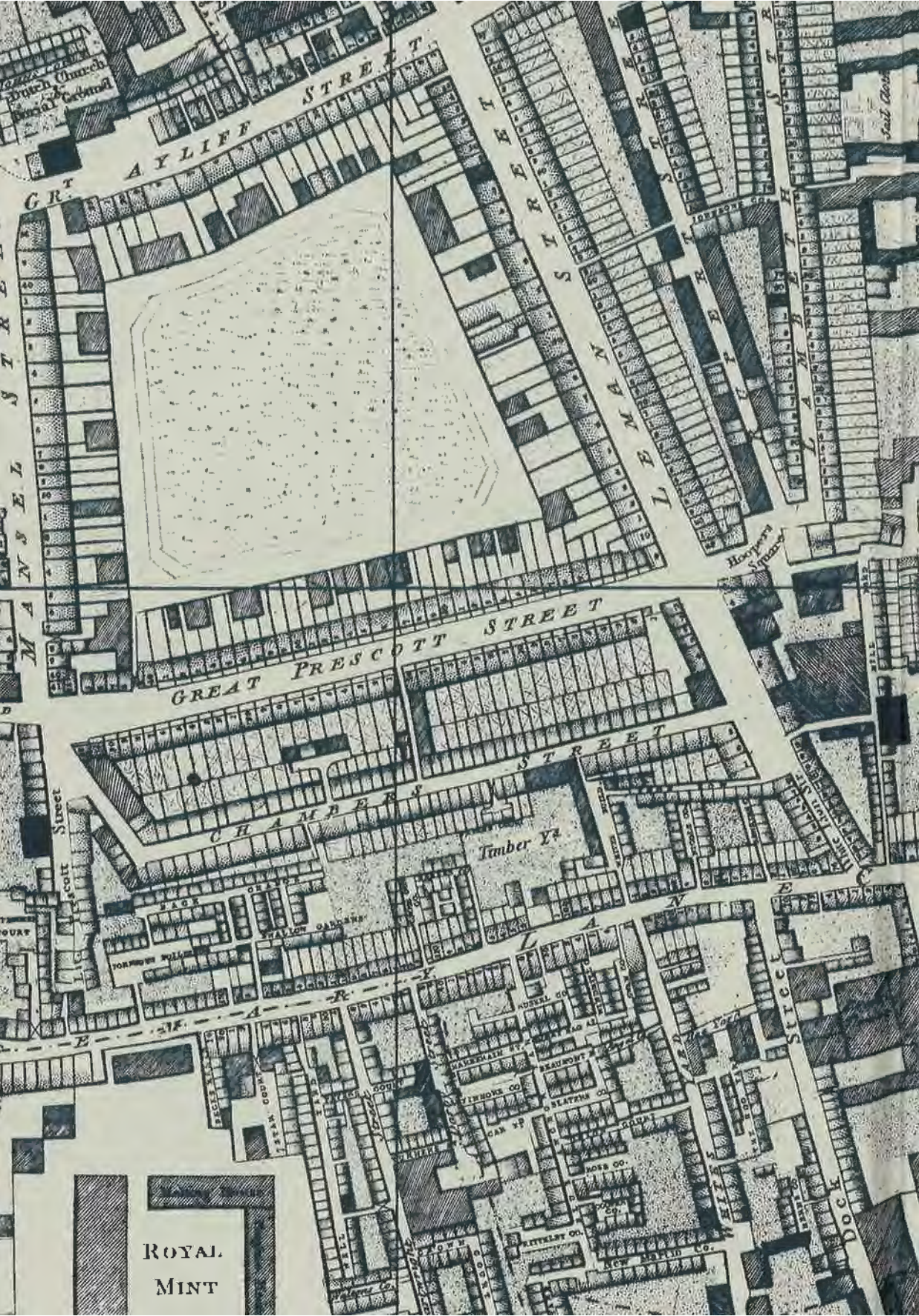
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