

# MINERALOGICAL MAGAZINE

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## Dr Max H. Hey

DR MAX HEY, editor of the *Mineralogical Magazine* from 1956 to 1980, died peacefully in his sleep in the early hours of Tuesday 24 January 1984. He is survived by his widow. In his 80th year, he had undergone surgery at Reading in November, and was convalescing at the home of his son in Newcastle upon Tyne.

Max Hutchinson Hey was born on 11 March 1904 at Leyland, Lancashire, the eldest of a family of four sons and a daughter. His father was a departmental head of the firm of John Stanning, 'dyers, bleachers, and finishers', and from him Max and two of his brothers acquired their interest in chemistry. He attended Balshaw's (Leyland) Grammar School from 1912 until 1918, when he went on to Manchester Grammar School. The twice-daily journey between Leyland and MGS took about three-quarters of an hour each way, and Max rapidly learned the knack of putting it to good use by doing his homework on the train, oblivious to distractions. This ability added greatly to his productivity later on in life, when he was commuting to the Natural History Museum.

He had enthusiastic teachers at MGS who gave him a sound grounding in mathematics, physics, languages, and especially in chemistry. In 1921 he gained a 'demyship' (scholarship) to Magdalen College, Oxford, where he read chemistry and crystallography, graduating as a B.A. with first class honours in 1925. His final year's project, on the preparation and crystallography of diphenylacetic acid and related compounds, was the subject of his first publication (in German) and gained him a B.Sc. Of his many practical instructors at Oxford, J. J. Manley and T. V. Barker (a fellow Lancastrian) made the most lasting impact. Max never wore a lab coat, remembering Manley's dictum that anyone sloppy enough to need one would never make a good analyst! The morphological and optical crystallography that he learned under Barker, coupled with his talent for analytical chemistry, provided a formidable basis for his later work in mineralogy.

The middle years of the 1920s were not good for employment, and Max considered himself fortunate to get a job, in November 1926, as a Temporary Assistant Chemist in the Food and Drugs Division of the Government Chemist's Laboratory. In May 1928 he became an Assistant Examiner in the Dyestuffs Section of the Patent Office, and for a few months enjoyed the challenge of using his earlier acquaintance with dyes and making critical searches of the literature. But a much more exciting opportunity soon arose.

G. T. Prior had retired in 1927 as Keeper of Minerals at the British Museum (Natural History), and F. A. Bannister was appointed to set up the apparatus and to apply the new science of X-ray crystallography to minerals. The Department was without a chemical analyst; the post was advertised, Max applied for it, and on 19 November 1928 he was appointed Assistant Keeper (Second Class), with sole responsibility for the running of the chemical laboratory.

He must have settled in rapidly, for within a year he had produced analyses for the new minerals bismutotantalite and scawtite, and published a detailed study of the rhodonite-bustamite series. In the following year, 1930, he published a review of the zeolites, then a poorly understood group, an analysis of the Piedade do Bagre meteorite, and two crystallographic papers. L. J. Spencer, who was then Keeper, had set him the challenging task of examining and cataloguing the many zeolite specimens in the collection. In those days, work on the 'slip catalogue' of the mineral collection was an urgent priority, and all newly appointed Assistant Keepers in the Department were expected to devote part of their time to work on a selected group of species. A new recruit thereby gained invaluable first-hand knowledge of the collection and of the departmental subject. The identification and characterization of species arising from this work had for many years provided material for definitive publications. Max set to work with a will and, with his unique combination of diligence and skills,

aided on the X-ray side by F. A. Bannister, published a now-classic series of nine papers on the zeolites; these earned him an international reputation, and (in 1937) both a D.Sc. and promotion to Assistant Keeper (First Class). But the zeolites, more than enough to have kept any ordinary young mineralogist busy, were by no means his sole preoccupation in these early years. In addition to other investigations of his own, he contributed analyses to studies by his colleagues.

With Bannister, Max was a pioneer in recognizing the importance of relating chemical composition to the unit cell and density of a crystal. The continuing success of this collaboration led to their being jointly awarded the Lyell Fund of the Geological Society of London in 1943, each receiving 'a moiety'.

The analysis of small amounts of material was an early challenge, and for qualitative work he enjoyed using reactions that produced characteristic products on a microscope slide. Quantitative analyses were also required for such minerals as gemstones or the individual grains in a platinum concentrate from the Transvaal. Mineral analyses had previously been made on about 0.1 g, rarely less, and the purchase of the Department's first micro-balance enabled him to get down to the 10 mg scale; he considered his first true microchemical analyses to have been those on Mg-Zn spinels, in 1937. He was also innovative, devising methods for the analysis of the metallic phases of meteorites by chlorination (for the Suwahib meteorite, 1932) and for the direct determination of ferrous iron in resistant silicates (for kornerupine, 1941). Visitors to the laboratory would often find him reading a novel, perhaps a detective story or thriller, and making readings of the swings of the balance whenever a timer 'pinged'; modern instrumentation has removed many of the early demands on an analyst's patience. He had great respect for the work of many early nineteenth century analysts, whose published methods made it possible to identify errors and to convert their results into modern terms for purposes of comparison. Fortunately, he recorded some of his experience in his Hallimond Lecture for 1973, 'Mineral analysis and analysts'.

Familiarity with meteorites, resulting from his many chemical analyses and preparation of the meteorite collection for its wartime evacuation, led to his publication of a (second) appendix to Prior's *Catalogue of Meteorites* in 1940. He completely revised the full Catalogue twice, producing a second edition in 1953 and a third edition in 1966. He was the natural successor to Campbell Smith as curator of the meteorite collection when the latter retired in 1952. The high point of this part of his

career was the successful series of negotiations, starting in 1956, leading to the purchase in 1959 of a large part of the extensive Nininger Collection with the aid of a Nuffield Foundation grant of £50 000. This notable acquisition added specimens of over 200 falls and finds not previously represented in the Museum collection.

His keen interest in morphological crystallography continued throughout his long career, in part because of the intriguing mathematical problems involved, and his last paper on the subject was on the computation of crystal angles from photographs or accurate drawings (1978). Barker had died in 1931, leaving unfinished his systematic method of using crystal measurements for purposes of non-destructive identification. Max was one of a small group of crystallographers who met soon afterwards, deciding to assess the method. A year of tests proved the method to be practicable, and for the next thirty-two years he remained closely associated with the daunting task of bringing *The Barker Index of Crystals* to press; he made many of the recalculations required, especially those for monoclinic crystals after R. C. Spiller died in 1954, devised an ingenious 'atlas of configurations' for the anorthic system, and wrote the introductory sections on the use of the method for each of the three volumes (1951, 1956, and 1963).

He loved computation, progressing over the years from logarithmic tables to the Otis King helical slide-rule, to the Marchant desktop and the Curta hand-held mechanical calculators, through the trials resulting from changes of programming languages and operating systems on the Oxford and London University computers, and finally spending hundreds of hours with a hand-held Texas Instruments programmable calculator. The statistical problems associated with errors in physical measurements and chemical analyses, and the need to correlate the properties of minerals, were a lasting preoccupation. Convinced that many of the techniques developed for population and related studies, particularly those of linear regression, are inappropriate for the physical sciences, he developed better methods. He was co-author with his son, a paediatrician, in two papers arising from the statistical interpretation of some medical research results. In the last few years he went back to the works of Gauss, helped by a classicist friend in translations from the Latin, and was writing a textbook on statistics; sadly, only a few chapters were written and in typescript at the time of his death.

When first at the Museum, he lived in digs at no. 4, Wharfedale Street, Earls Court—and, incidentally, continued to keep his bank account in the area for the next fifty years. He married Miss Gertrude

Neville, a qualified pharmacist from Oxford, and they moved to Headstone Lane, near Harrow. Their son, Edmund, was born in 1934, and shortly afterwards they moved again, to no. 1025, Oxford Road, Tilehurst, near Reading. Max and his wife were to live in this new home for nearly fifty years, and it had many advantages. It was near Mrs Hey's relatives at Newbury, and it was a mere couple of hundred yards from Tilehurst station, with fast trains through to Paddington (no inconvenient changes halfway, as there had been from Harrow). Disdaining the Circle Line, Max walked across Hyde Park between Paddington and the Museum in all weathers.



But, best of all, no. 1025 had a large garden, occupying both the area behind the house and the adjacent plot, which had not been built upon. Love of growing things started early in Max's life, with all the family helping to run the garden at Leyland. Only someone as fit and methodical as he was could have combined a busy professional life with many years of active scouting and the demands of the

garden. The garage served as a garden shed and apple store, for Max and his wife neither owned a car nor felt the need to learn to drive. Fruit bottling, and making pickles, chutney, jam, and marmalade, were related activities, and he carried them out with the same attention to details of weighing and temperature control as with any laboratory preparation. And, of course, there were the roses, so very characteristic of Max's buttonhole at most times of the year. He cultivated dozens of varieties, and his knowledge of them was encyclopaedic; a non-smoker, he could recognize most of them by scent alone. It is no wonder that he and his wife never had time to get a television set!

During the war years, he remained at the Museum, taking his turns of duty in the team of fire-watchers and first-aiders. Much of the time he worked on chemical problems for various Government Departments, especially on explosives. One of these he found more than usually satisfying, since he was able to solve it easily by using crystal shape and optical properties to identify unstable impurities in TNT. Between these official, external problems, and with most of the mineral and meteorite specimens inaccessible in safe storage, he spent some of the time working with Miss Sweet, devising a systematic ordering for the mineral display in anticipation of its restoration to the gallery after the war. Extended as new species arrived in the collection, only now is this ordering in need of revision.

Outside enquiries of the Museum are often interesting, and sometimes lead to unexpected results. In 1942, Max was asked what silicates of magnesium were known in nature. Since there was no single reference to which he would turn, he had to make a complete listing; and after the immediate question had been answered, the resulting card catalogue continued to grow as a departmental work of reference. It proved so useful that it was published in 1950, as *An Index of Mineral Species & Varieties Arranged Chemically, With an Alphabetical Index of accepted Mineral Names and Synonyms*. Priced at thirty shillings, it was an immediate success; and a second edition followed in 1955. A best seller among the Museum's publications, a second and corrected printing was made in 1962; and two appendices followed, in 1963 and 1974. Better known by its short title, the 'Chemical Index of Minerals', or more familiarly as 'The Hey Index', it is based on qualitative chemical composition and was intended primarily for determinative purposes. More of its users, however, consult the alphabetical glossary first, as a comprehensive and authoritative guide to nomenclature; and, with this in mind, Max planned the third edition (referring to it as the 'Index Mineralium') with most of the

information under the names in the alphabetical section. Moreover, having found many erroneous citations in secondary sources, he was engaged until October 1983 in the enormous task of checking all the original references that he could find. The work remains for others to complete.

In 1946 he became a Principal Scientific Officer in the post-war reconstruction of the Government Service and the conversion of BM(NH) museum grades to scientific grades. In July 1952, his achievements gained him an 'individual merit' promotion to Senior Principal Scientific Officer. Shortly afterwards, following Bannister's early retirement through ill-health, he became acting Keeper for a few months until G. F. Claringbull's appointment in 1954. Max did the job well, but greatly preferred his science to the managerial routine which he regarded as a necessary evil. In 1969 he retired from nearly 41 years of full-time service, but he remained as busy as before, working at home and going to the Museum as often as the demands of the garden would permit.

He gave freely of his time and ability to outside organisations, especially to the Mineralogical Society which he joined in 1929; an ordinary member of its Council 1936-9, 1945-8, and again in 1955, he was appointed editor of the *Mineralogical Magazine* in 1956. The post was designated Principal Editor in 1971, and he relinquished it at the end of 1980. An *ex officio* member of Editerra, the European Association of Earth Science Editors, he wrote the section on mineralogical nomenclature for its Editors' Handbook. Concurrently with his editorship, he was Vice-President of the Mineralogical Society from 1963-5, and concluded his Presidency (1970-2) by giving the Hallimond Lecture. Elected a Fellow of the Mineralogical Society of America in 1961, he was awarded its highest honour, the Roebling Medal in 1966. The British delegate to the Commission on New Minerals and Mineral Names from its inception in 1960, he contributed greatly to its rapid acceptance as an arbitrating body by the mineralogical community and published progress reports; he was its Vice-Chairman at the time of his death. The new species heyite, a Pb-Fe vanadate from Nevada, was named in his honour in 1973.

It would be easy to picture a man of such outstanding achievement as being much too busy and preoccupied for human contact; but nothing could be further from the reality. He was always approachable, even by the most junior assistant, for help and friendly advice. He had a lively, sometimes dry, wit and sense of the ridiculous, often to be heard at its best in discussions over morning coffee (strong and black, with two spoons of sugar). His tastes in non-scientific reading were mainly on the

light side, the 'heaviest' authors being Charles Dickens and Harrison Ainsworth, *The Lancashire Witches*. He was always ready with quotations, usually in verse, from the works of Lewis Carroll, W. S. Gilbert, Edward Lear, Ernest Bramah, *The Wallet of Kai Lung*, and especially Richard Barham, *The Ingoldsby Legends*. He was never at a loss for improvising doggerel, but few examples remain; among them are a reference to the famous Ashcroft Swiss Collection

If you're thinking of visiting Switz  
The cost needn't drive you to fits  
For Ashcroft has bought it  
To South Ken has brought it  
And it's now in the BM, in bits!

and his chemical analyst's version of the fisherman's prayer

Lord, though my little balance swing  
From left to right like anything  
Pray, let the pointer indicate  
Precisely the expected weight.

The second edition of the *Chemical Index* (1955) provided an unlikely occasion for amusement. Max had introduced a new feature, a guide to the pronunciation of mineral names based on the Royal Geographical Society's phonetic system; L. J. Spencer didn't care for it at all, referring to it as 'Heyspeak', and they conducted a short but lively exchange of views (lost, alas!) written in this strange language.

He enjoyed foreign travel, often taking his wife with him on the excursions associated with international congresses. They would also go on walking holidays in Austria, Max making the arrangements and only telling her the exact destination at the last moment. Evening visits to London for concerts, or performances of Gilbert and Sullivan or Lehar's light operas, were an occasional pleasure. But, for all this, Max remained a very shy, undemonstrative, and private person, even with his family.

It is impossible, in a short space, to do justice to his output of over one hundred and fifty publications,\* since he was master of an amazing range of subjects in both theory and practice: chemistry in its various aspects; crystallography and crystal optics; systematic, topographic, curatorial, and nomenclatural mineralogy; meteoritics; computational and statistical mathematics; and to all of these he made significant and lasting contributions. Yet this is by no means the sum of his professional achievement, since he was never too busy to help others, both in the Museum and in his capacity as editor of the *Mineralogical Magazine*. Such was the

\* A bibliography of Max Hey is available from the mineral library at the British Museum (Natural History).

growth of the subject, that in twenty-five years, from 1956 to 1980, he edited more papers than the redoubtable L. J. Spencer had in fifty-five; there can have been few of their authors who did not benefit from his advice. There is no secret to his success, which was founded in a unique blend of native genius, sound teaching, an ever-enquiring mind and retentive memory, hard work, and above all the ability to keep several problems

progressing simultaneously and commit them to paper.

We miss him, and shall not see his like again.

PETER G. EMBREY

[A number of papers in this issue of *Mineralogical Magazine* have been contributed by friends and colleagues of Max Hey as a mark of respect following news of his death.]