

Richard Knight and His Production of Malleable Platinum

THE STORY OF A FORGOTTEN CHEMIST

By L. B. Hunt

The Johnson Matthey Group

The outstanding figure in the history of platinum, William Hyde Wollaston, was the first to refine and fabricate the metal on a commercial scale and to develop its uses in industry. His first purchase of native platinum, smuggled from South America to Jamaica and made jointly with his partner Smithson Tennant, was effected on Christmas Eve 1800 and by early in 1805 he had not only isolated and identified palladium and rhodium (Tennant having similarly discovered iridium and osmium in the native platinum) but had perfected his production method and begun to offer chemical apparatus and other products for sale (1).

But almost a year before Wollaston had even bought his initial consignment, on January 9th 1800, a paper was read to the British Mineralogical Society, formed only in the April of the previous year, on "A New and Expeditious Process for Rendering Platina Malleable" (2). This had been prepared by Richard Knight, one of the five founder members of the Society, a man who has so far remained in almost total obscurity apart from being described as "Ironmonger of Foster Lane". This absence of information on his life and work prompted the writer to undertake an investigation of his career and activities, a study in which he was greatly supported by Dr. Peter D. Buchanan whose genealogical researches first established the details of his life story and then succeeded in locating two of his great-great-granddaughters who had in their keeping quite substantial family records. It is now possible, therefore, to give some account of this almost forgotten pioneer in the long struggle to produce platinum in malleable form.

Richard Knight was born on May 26, 1768, the son of William Knight and his wife

Elizabeth, née Martin, at 5 Goldsmith Street, close to Foster Lane in the City of London, where her uncle Edward and her father William Martin, both from a Leicestershire family, carried on an ironmongery business that had been taken over by Edward from his master in 1732. In the year of Richard's birth William Martin's wife died and the family moved to Holloway but on Martin's remarriage in 1772 they moved again to Stoke Newington. It was from here that the young Richard attended school at the dissenting academy in Newington Green.

On leaving school in 1783 Knight was apprenticed to his grandfather who was a member of the Worshipful Company of Skinners, but four years later, and thus three years short of the apprenticeship being completed, William Martin died, leaving instructions in his will for the trade to be carried on by his daughter and son-in-law "until my grandson shall be properly qualified to undertake the same" (3). Richard's apprenticeship was therefore transferred to his father William who, in order to carry on the business had hastily to seek membership of one of the City Livery Companies, in his case the Spectacle Makers (4).

Richard was freed from his apprenticeship in December 1791 but he was not taken into partnership by his father until 1795, and it is during these four years that the family records disclose a most interesting association with Joseph Priestley. While still at school Knight had become acquainted with the great dissenting minister and mathematician Dr. Richard Price (1723-1791), had attended the services he conducted at Newington Green and at the famous Gravel Pit Chapel in Hackney and

Richard Knight
1768–1844

Inheriting an ironmongery business established two generations earlier, Richard Knight was more interested in chemistry and mineralogy and rapidly transformed it into a supply house for chemical reagents, apparatus and instruments. Although well known to many distinguished men of science of his time and a founder member of several scientific societies he has remained in obscurity apart from brief references to a powder metallurgy process he devised to yield malleable platinum before Wollaston had even commenced his researches. In the inktray there may be seen a platinum knife, one of several made by Knight's life long friend W. H. Pepys who presented similar knives to King George III and Queen Charlotte as well as to Sir Joseph Banks

From a miniature painted by his daughter Elizabeth, reproduced by courtesy of Miss Megan Evans and Mrs. Peggy MacKay



became deeply interested in Unitarianism, forsaking the Church of England in which he had been brought up by his parents. As is well known, Price was succeeded in his ministry by Priestley who had found refuge among his many friends in Hackney after the destruction of his home, laboratory and library by the mob in Birmingham. Knight continued to attend the chapel, where he is listed as a subscriber from 1793 onwards (5), and naturally soon discovered that Priestley was the author of a number of scientific books. Now Priestley had been assisted in setting up his new laboratory by Arthur Aikin (1773–1854) the son of his friend John Aikin, until this young man left to enter the ministry in 1793 (6), and it is evident that Knight had either been assisting Priestley in a similar way or that he followed Aikin as laboratory assistant, either living in Priestley's house or spending considerable time there. The

exact location of the house has recently been identified by Mr. Michael Gray of University College, London, after much research in local records, at the southern corner of Lower Clapton Road and Clapton Passage (7). In this way Knight learnt something of chemistry from Priestley, and would have had the use of the library that Priestley had been able to re-assemble with gifts from his many friends, while the older man befriended him and, in fact, left in his care a number of possessions when he left for America in April 1794. Among these was a sun dial that is still in the keeping of Knight's descendants. Other relics were later handed over by a member of the Knight family to the Priestley Museum in Northumberland, Pennsylvania.

Clearly Knight continued his studies and in 1798 he was elected a member of the Guy's Hospital Physical Society, then one of the



The house in Hackney occupied by Joseph Priestley from September 1791 until his departure for America in April 1794, recently identified by Mr. Michael Gray, but no longer in existence. Richard Knight spent considerable time here in working with Priestley who both introduced him to chemistry and converted him to Unitarianism. On Priestley's departure he left with Knight a number of his possessions, one of which, a sundial, still survives in the family. Later, after his marriage in 1803, Knight took a large house just round the corner in Clapton Passage

Photograph by courtesy of the London Borough of Hackney Library Services Archives Department and Mr. Michael Gray

leading scientific associations in London in which William Babington, William Allen, George Pearson and Astley Cooper were prominent (8). He was never a member of the Askesian Society founded by William Allen in 1796, but at a meeting held in their rooms at Plough Court in Lombard Street in April 1799 he was one of the five founder members of the British Mineralogical Society together with William Allen, William Hasledine Pepys an instrument maker, Alexander Tilloch who had just established the *Philosophical Magazine*, and the geologist and engraver William Lowry. The rules of the new group stipulated that membership should not exceed twenty and that:

“none to be admitted as members but such as are able and willing to undertake a chemical analysis of a mineral substance” (9).

It was felt that the absence in England of any school or college teaching scientific mineralogy such as the *École des Mines* that had been set up in Paris in 1783 might be remedied by the

collective activities of the members in applying a little science to mining and metallurgy. Before the end of the year the five founders had been joined by William Phillips, the two Aikin brothers Arthur and Charles, with the former becoming president of the society. Other members included Babington, Richard Phillips, Robert Bingley the Assay Master at the Royal Mint and Theodore and Robert Albion Cox of the gold and silver refining firm of Cox and Merle in Little Britain. Meetings were held fortnightly at Plough Court, reports being read on the analyses of minerals, and on three occasions Richard Knight reported analyses of lead and iron ores.

The Platinum Process

It may be wondered why Knight should then turn his mind to the problem of producing the hitherto intractable metal platinum in malleable form, but the potential value of the metal had formed the subject of a number of papers

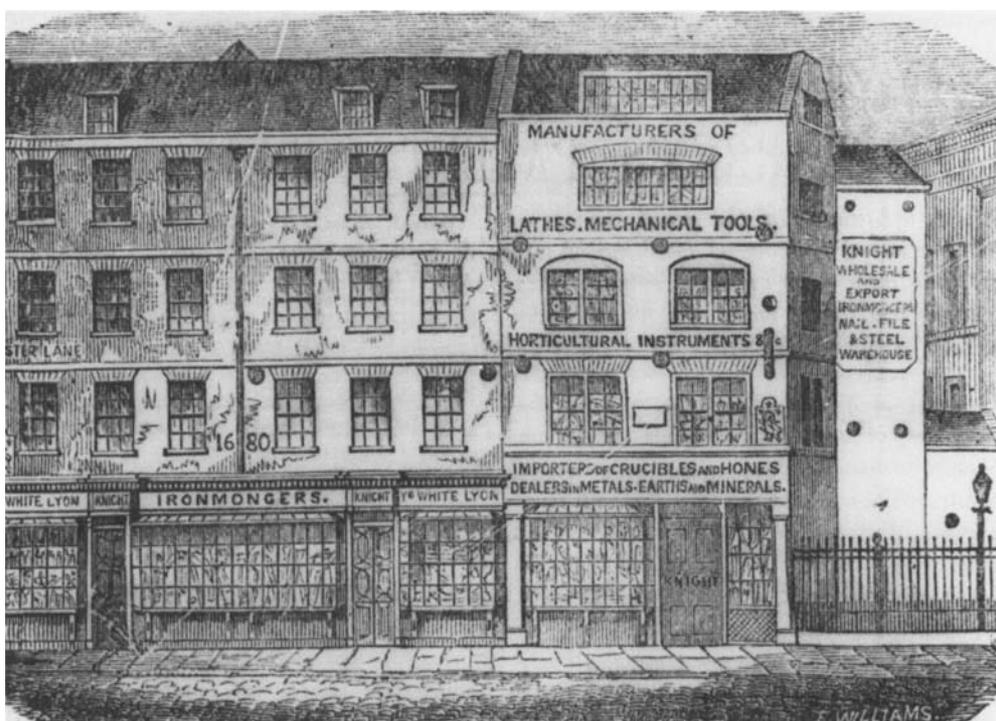
and articles in the scientific periodicals that had now begun to be published in London, these following upon several reports of but indifferent progress made by workers in Sweden, Germany, France and Spain (10). *The Repertory of Arts and Manufactures*, for example, founded in 1794, reproduced in 1797 the classic paper, "Observations on Platina", read by Lavoisier to the Académie des Sciences some seven years earlier in which he described Janety's process using arsenic (11) while John Aikin's newly established *Monthly Magazine* reprinted in March 1798 an account of the researches of the Russian metallurgist Count Mussin-Pushkin in compressing a mixture of platinum and mercury and forging it at a white heat (12). In the October and November of the same year Tilloch's *Philosophical Magazine* carried a translation of the paper by the Abbé Rochon, "Observations on Platinum and its Utility in the Arts", from the *Journal de Physique* (13). Earlier sources of information available to Knight would have included William Lewis' "Commercium Philosophico-Technicum" published in parts between 1763 and 1765 and including some 170 pages on platinum, as well of course as Macquer's "Dictionnaire de Chymie" that had been translated into English by James Keir in 1777, while Priestley's own "Heads of Lectures on a Course of Experimental Philosophy", published just prior to his departure for America in 1794, also included two pages on platinum. (Priestley was also sufficiently interested in platinum to purchase a modest amount; his claim for compensation after the destruction of his house and laboratory on July 14, 1791 includes the item "Half a pound of platinum £2.8.0").

Thus the problem of the infusibility of platinum and the numerous attempts to overcome this was much in the air at this time, there was considerable interest in finding a reliable method of rendering it workable, and it was clearly the prospect of commercial success that motivated Knight. His paper opens:

"The many peculiar advantages which platina in a malleable state possesses over every other metal for the fabrication of a variety of instru-

ments and utensils particularly useful for the purposes of chemistry, together with the extreme difficulty of procuring it, being hitherto only to be obtained from Paris, of a very indifferent quality, and at a price equal to that of gold, first induced me to turn my attention to the subject. After having repeated a variety of experiments, from the different writers on this substance, without effect, I at length completed a process, the success of which has fully answered my expectations. By the process, which I follow I am able to reduce any quantity of crude platina to a perfectly malleable state, entirely free from impurity, and capable of being wrought into any form whatever. As this is a circumstance of considerable importance to the chemical world, and the advantages which may result from it to society in general are perhaps incalculable, I would consider myself deserving of censure could I allow any motive whatever to induce me to withhold it from the public".

The earlier chemical part of his process, dissolution in aqua regia and precipitation with sal ammoniac, was not new, but his important innovation was the much more forcible hot compression of his precipitate in a hollow inverted refractory cone to a compact mass that could then be forged into an ingot of malleable metal. This process had the principal advantage of avoiding contact between the platinum and red hot iron that had readily introduced contamination in the hands of other workers, but rather curiously there is no indication that he made much practical use of his process or that he made more than one or two articles from his platinum. In fact, in February 1801, scarcely more than a year after his paper was presented, he disposed of the considerable quantity of 800 ounces of native platinum to Wollaston at four shillings an ounce, half of the cost being met by Smithson Tennant (14). His acquaintance with Wollaston undoubtedly arose from the close proximity of the Foster Lane premises to the Church of St. Vedast, exactly opposite and only a few feet away across this narrow lane, where the rector, from 1779 until his death in 1815, was the Rev. Francis Wollaston—father of the scientist—and where members of Knight's family had attended and had been buried. Why Knight abandoned his platinum work we shall never know, but possibly he foresaw that greater success might be achieved in the hands



The premises known as Ye White Lyon in Foster Lane, built in 1680 and occupied from 1732 first by Richard Knight's great uncle and then jointly with his grandfather, Edward and William Martin, as an ironmongery business. When Knight succeeded to the business he rapidly converted it to a supply house for chemicals and apparatus, designing a number of pieces of equipment himself

Photograph by courtesy of the Guildhall Library

of a more professional scientist. This purchase was only the second of many such transactions made by Wollaston in the early days of his extensive researches.

Although Knight claimed a high degree of purity for his product it must be remembered that the other five members of the platinum group were then unknown. A recent study by Professor M. C. Usselman and his colleagues, who reproduced Knight's process starting with native platinum from Colombia provided by Johnson Matthey Inc., has shown that the product would have contained only 94 per cent of platinum with 2 per cent of iron, 2 per cent iridium and small amounts of palladium, rhodium and lead (15). These impurities could have caused problems for Knight in the fabrication of his few products.

In the meantime Richard's father William Knight had died in January 1799 and he became the sole owner of the business, being

joined two years later by his younger brother George, the firm then becoming known as R. and G. Knight and continuing in this style until 1838. It was now that, with a secure basis for expansion, Richard turned from ironmongery to the devising of apparatus and equipment, an activity in which he progressed and prospered for the remainder of his life, serving his fellow scientists with their needs in the rapidly developing technology of the period.

The isolation of sodium and potassium by Humphry Davy in 1807, employing a rather crude assembly of a platinum spoon to hold the caustic soda and caustic potash and bringing them into contact with a platinum wire connected to the negative pole of a battery, aroused of course, considerable excitement in scientific circles, and this classic experiment was repeated on numerous occasions, first before the Askesian Society and the British Mineralogical Society by William Allen and William

Hasledine Pepys using a more sophisticated platinum apparatus designed by Pepys and made in several versions by Knight (16).

A little earlier Humphry Davy, in one of his lectures for the Board of Agriculture on the analysis of soils, recommended a chemical chest supplied by Knight (17).

By 1811 Knight was able to publish an extensive catalogue of "Apparatus and Instruments for Philosophical, Experimental and Commercial Chemistry" this including furnaces, retorts, stills, blow pipes, electric batteries, thermometers and a range of platinum apparatus.

The British Mineralogical Society was discontinued in 1805, most of the members including Knight then becoming proprietors of the new London Institution, while in 1807 he was one of the eleven founder members of the Geological Society, being chosen as a member of their Committee for Chemical Analysis.

Richard Knight retired in 1838 at the age of seventy, the business being carried on by his brother George and later by the latter's two sons George and Richard. He had moved from

Clapton in 1830 to a house in Tavistock Square where he died on February 21, 1844, leaving a thriving business and the very considerable sum of £35,000 to his five daughters, his wife having pre-deceased him by eight months (18). He was buried in the grounds of the New Gravel Pit Chapel in Hackney where he had been for so long a leading member and for some years a trustee.

An obituary notice written by his life long friend William Hasledine Pepys appeared in the journal associated with the Unitarian movement (19), but otherwise this industrious chemist, mineralogist and instrument designer, despite his friendship with so many scientists of his time, seems to have left but little record of his achievements other than a brief account of an early method of producing platinum in usable form.

Acknowledgements

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A more detailed account of the career of Richard Knight by Dr. L. B. Hunt and Dr. P. D. Buchanan was published in the July 1984 issue of Ambix, the Journal of the Society for the History of Alchemy and Chemistry.

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