William Lewis and Platina

BICENTENARY OF THE 'COMMERCIUM PHILOSOPHICO-TECHNICUM'

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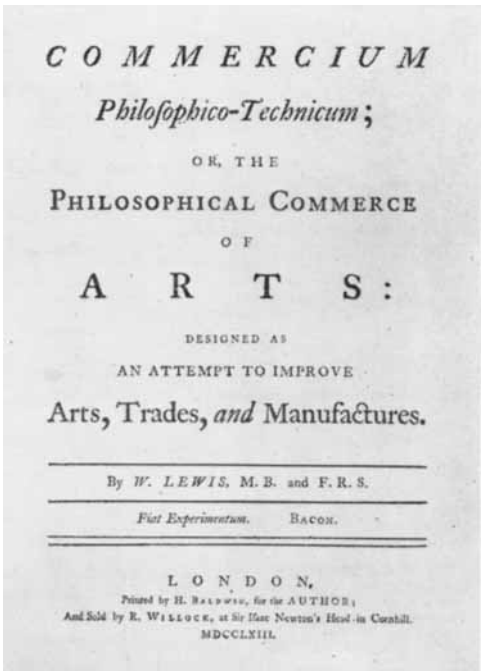
Just two centuries ago Lewis's classic *Attempt to Improve Arts, Trades and Manufactures* began publication. In fact, this was the simple sub-title of a work that is universally known by its grandiose but not so easily understood main title of *Commercium Philosophico-Technicum; or, The Philosophical Commerce of Arts.* In his dedication to King George III, signed on April 7th, 1763, Lewis referred to "the never to be forgotten honour, which Your Majesty was pleased to do me, by Your attention to some lectures and experiments, made by Your command at Kew, for shewing the application of chemistry to the improvement of practical arts as well as of philosophy". This bicentenary anniversary should therefore be of interest to those who take it for granted that awareness of the importance of applying science to industrial needs is a twentieth-century development.

In 1737 William Lewis, M.B., then aged 28, had shown his interest in this subject by arranging "at the Elaboratory in New-street, Fetter-lane" a course of chemistry that had as its object "the Improvement of Pharmacy, Trades, and the Art itself". Probably this was only one of several such courses. By 1745 Lewis was well enough known as a physician, practical chemist and lecturer to be admitted a Fellow of the Royal Society. He had already drawn up an ambitious programme of research and had undertaken several tasks as author and editor of scientific and pharmaceutical works. Among these projects was a unique plan to study ways of applying science to the arts and manufactures, with the help of various patrons and subscribers. For this purpose he moved out of London to Kingston in 1747, renting a spacious house at the Surbiton end of West of Thames (now the High Street), and not far from places associated with two of his patrons—Stephen Hales of Teddington and the Earl (later the first Duke) of Northumberland of Syon House, Brentford. Later Lewis also rented a smaller neighbouring house, presumably for conversion into his research headquarters.

Almost immediately, in January 1748, he



COMMERCIUM

Philoſophico-Technicum;

OR, THE

PHILOSOPHICAL COMMERCE

OF

ARTS:

DESIGNED AS

AN ATTEMPT TO IMPROVE

Arts, Trades, *and* Manufactures.

By *W. LEWIS*, M. B. and F. R. S.

Fiat Experimentum. BACON.

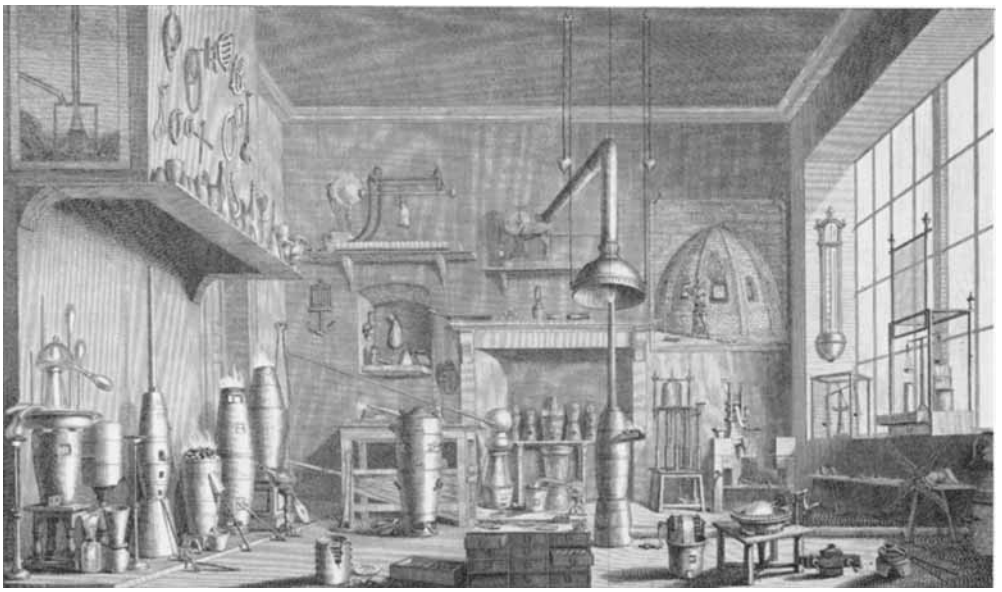
LONDON,

Printed by H. BALDWIN, for the AUTHOR;

And Sold by R. WILLOCK, at Sir Isaac Newton's Head in Cornhill.

MDCCLXIII.

The title page of the Commercium Philosophico-Technicum, *dedicated to George III on April 7th, 1763. The last section of the book, running to 170 pages, constitutes the first authoritative and comprehensive textbook on the properties of platinum.*



The laboratory of an experimentalist as depicted in the frontispiece to the book. Based very closely on his own laboratory at Kingston, this shows the chemical apparatus on the left and centre, and the mechanical and physical instruments to the right. This was one of the first laboratories specifically designed for research in applied chemistry and physics.

issued proposals for a new periodical, to have six parts to the annual volume, with the title *Commercium Philosophico-Technicum*. In the event, fifteen years passed before he had completed his initial series of researches and before he felt assured of sufficient support to launch Part I of his first and only volume, which nevertheless became a classic in the literature of chemical technology.

Lewis soon found that he needed an assistant in his work, to collect all available information on his projects from books and journals, to help carry out his programmes of experiments, and to draft accounts of this research for publication. It was about 1750 when, through the window of a London shop, Lewis spotted a young and apparently impecunious Aberdeen graduate taking the opportunity to read part of a Greek book on display there. This was Alexander Chisolm, whom he forthwith called inside and, after a short interview, took into his employment. Chisolm remained with Lewis at Kingston until the latter's death in 1781, when he joined Josiah Wedgwood at Etruria for similar work.

Lewis's interests covered many aspects of engineering, physics, metallurgy and chemistry, and he gave special attention to the chemical materials and processes used in various manufactures. The topics he dealt with, both theoretically and practically, included several metals, dyes, colours, glass and ceramics, graphite and "lead" pencils, inks, gilding, japanning, papier mâché goods, clock-dials, and a host of things of interest to manufacturers, scientists and men of fashion.

As regards metals, he was chiefly interested in gold, platina, and iron. His account of the many operations in which gold was used was important for many different kinds of tradesmen. His work on the iron industry occupied him for some years, and a final draft was begun for publication in his proposed Volume II. Parts of this are extant and form portions of six volumes of his manuscript collections still to be seen in the Cardiff Central Reference Library. But his most original contribution was an experimental study of the metal then known as "platina", which earned him the highest scientific award of the day—the Copley Medal of the Royal Society. His final

account of all that was known of this substance in 1763 formed a 170-page section of the *Commercium Philosophico-Technicum*. Here we can only outline briefly the way in which this came about.

One of the first British scientists to mention platina was William Brownrigg of Cumberland. Brownrigg's father seems to have been associated with the Lawson family at High Close, Plumbland, where all the estate dues were collected from tenants; and it is perhaps more than coincidence that Isaac Lawson and William Brownrigg, who had common interests in medicine, chemistry and metallurgy, were both awarded the M.D. degree of Leiden University in 1737. On his return to England, Brownrigg practised medicine at Whitehaven, where he became a useful consultant to the mine-owners, such as Sir James Lowther and the sons of William Wood, who had coal and iron interests in the neighbourhood of Whitehaven and Frisington. Coal and iron, the hazards of fire-damp in mines, and Cumberland graphite naturally figured among Brownrigg's interests for many years.

From his student days at Leiden, Brownrigg remembered that the physics professor, W. J. s'Gravesande, had shown him a specimen of a metal that had a greater density than gold—something that an alchemist would have considered impossible. The origin of the metal was not known, but it was believed to have been brought from China by the Dutch East India Company. It was thought to be very rare and valuable, but s'Gravesande did not know what uses it had. After this, Gaubius, the chemistry professor, often showed it at his public lectures. Brownrigg recalled this when he was shown specimens of a similar material which Charles Wood had come across some years before when he was Assay Master at Jamaica, and which had been brought there from Cartagena (Colombia). Brownrigg was told that plenty of it could be obtained from the Spanish West Indies, since sword hilts, buckles, and trinkets of various kinds were made from it. The metal could be bought for less than its weight of silver, and formerly it had been cheaper still. The Spaniards had a way of casting it in alloy form for making such "toys". In 1750 Wood asked Brownrigg to present his specimens of platina to the Royal Society.

Lewis had begun his investigation on a "quantity of a white metallic substance in grains, scarcely known before in Europe", which had come into the country from Jamaica, early in 1749. The metal could be alloyed with gold, and the name "white gold" was suggestive of certain abuses that had been known to occur in gold imported in 1742. Lewis was able to reconcile the inconsistencies in the accounts given by various writers by examining Wood's specimens. The piece of a sword pummel, for instance, was made from a cast alloy, and he was able to study this material after an ingot of the same metal was sent to him by the Earl of Macclesfield, a past President of the Royal Society. As so many specimens of platina were in fact alloys of the substance with other metals, the properties of true platina were still not known with any certainty, and it was to establish these that Lewis's first series of experiments were undertaken.

But it was not until the beginning of 1754 that Lewis obtained a large enough supply of genuine platina to carry out a full chemical and physical examination. This supply, 100 oz, he obtained from General Richard Wall, then ambassador from Spain. Further specimens were sent to Lewis by other interested people. Unknown to him, Scheffer in Sweden had already examined some platina that he obtained when he was in Spain in 1745, and his work was later published by the Swedish Academy of Sciences. Lewis's work, which was entirely independent, was described in four papers communicated to the Royal Society by the Earl of Northumberland and Dr. William Watson, the well-known physician and "electrician", who acted as an intermediary between Brownrigg and Lewis. These papers, neatly prepared in Chisolm's

Distinguished chemists of the eighteenth century often had a laboratory building close to their homes. Brownrigg's laboratory, on the right of the illustration, still exists at his family home, Ormathwaite Hall in Cumberland. (*Photograph by N. Wood*)

handwriting, are still preserved by the Society. They were read in May, June and July 1754, and were widely applauded. Many names were put forward for the award of the Copley Medal that year, but it was unanimously agreed that Lewis's work was the most outstanding. In making the award on November 30th, 1754, the President outlined the nature and importance of this work, but the industrious and somewhat elusive winner of the medal was not present.

In December 1754, Brownrigg, no doubt pleased that his observations had been followed up so successfully, wrote again to Watson and made suggestions that led Lewis to make further inquiries into the nature of the cast metal and other alloys of platina in the hope of preventing fraudulent practices. Brownrigg also mentioned some experiments carried out by Wood and himself, and thought it might be useful to obtain specimens of the metal from Holland. Lewis found that the results from Whitehaven were incorrect, and wrote two further papers for the Royal Society, outlining ways in which abuses could be prevented and detected. Lewis was again absent when they were read, but Chisolm was present as the guest of Thomas Birch. Lewis's platina was still not pure, as he reported an average density of about 17, whereas that of an alloy of equal parts of gold and platina was about $16\frac{1}{2}$. Thus density measurements were not of very great help.

In Number VII of the *Commercium Philosophico-Technicum*, entitled "History of Platina", Lewis said that "Nothing now is so much wanted, as a regular history of what has already been done, or a connected view of the experiments that have been made upon it". This he set out to supply. It was a faithful record of all that was then known about platina, and included his own work as well as that of other leading men of science in Sweden, Germany and France. It was so good that for several years little further progress was possible. Not until the early years of the nineteenth century, chiefly through Wollaston and Smithson Tennant, was any notable progress made in what was to prove one of the knottiest chemical problems of the period.

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