Bertrand Pelletier, Master Pharmacist

HIS REPORT ON JANETY'S PREPARATION OF MALLEABLE PLATINUM

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Bertrand Pelletier (1761–1797) was born in Bayonne, in south-west France, on 31 July 1761. He was apprenticed to his father, a master pharmacist, from 1775 to 1778 and then to a pharmacist in Paris, where he became the protégé of Jean d'Arcet, Professor of Chemistry at the Collège de France. D'Arcet appointed Pelletier as his assistant and encouraged him to do research in the laboratory that was attached to the pharmacy in the Rue Jacob, near the Abbey of Saint-Germain-des-Prés, which Pelletier bought on qualifying as a master pharmacist in 1784 (1, 2).

Pelletier's main interest was in inorganic chemistry, and in 1788 a long investigation of metallic phosphides, few of which had been previously known, led him to discover a new method for the preparation of malleable platinum (3). Native platinum containing base metals was heated strongly with phosphorus pentoxide and charcoal to yield a brittle button and a glassy material, which contained the impurities. The button was considered by Pelletier to be a compound or 'alloy' of platinum and phosphorus. When the button was heated again for several hours phosphorus was expelled, leaving platinum which he assumed to be pure. Marc Étienne Janety (1739–1820) the royal goldsmith who had been producing and working with malleable platinum for two years, made some balance pans from this platinum (4). Pelletier believed that his process might replace Janety's, which involved the use of arsenic and thus not only exposed the workers to dangerous fumes but also might deter the public from buying platinum ware for domestic use. However, Pelletier conceded that his process was more expensive, which is probably why it was not adopted.

For several years Pelletier was registered as a medical student in the prestigious University of Paris, but in 1790 he graduated as a physician at the University of Reims, which he had visited only twice. As his chemical research kept him fully occupied, and he had already installed his brother Charles as manager of the pharmacy, he did not immediately practise medicine, though presumably he hoped to do so later. After 1789, however, the French Revolution changed the direction of his career and led him to become involved in the application of chemistry to various technical problems.

The French Revolution

A shortage of copper coinage led to a suggestion in the National Assembly that copper might be obtained from the bells of churches made redundant by the reorganisation of parishes. The alloy from which bells are made contains copper and tin, so in 1791 several chemists developed methods for removing the more easily oxidised tin. Pelletier's method involved heating molten bell metal with manganese dioxide, a powerful oxidising agent, but as manganese dioxide was not plentiful, a less expensive method was found by Antoine François de Fourcroy (1755–1809) who oxidised the tin in the molten alloy with atmospheric oxygen. Fourcroy also acknowledged that Janety, in collaboration with the chemist M. J. J. Dizé (1764–1852), had independently solved the problem in a similar way (5). Janety had previously worked only with precious metals, but because many of his wealthy clients probably left France early in the Revolution, he may have been seeking an alternative occupation.

In fact, copper was not extracted from bells on a large scale until 1793, when it was required for the manufacture of cannons (6). However, by then, Janety was working in Marseilles, making parts for clocks, and took no part in the operation.

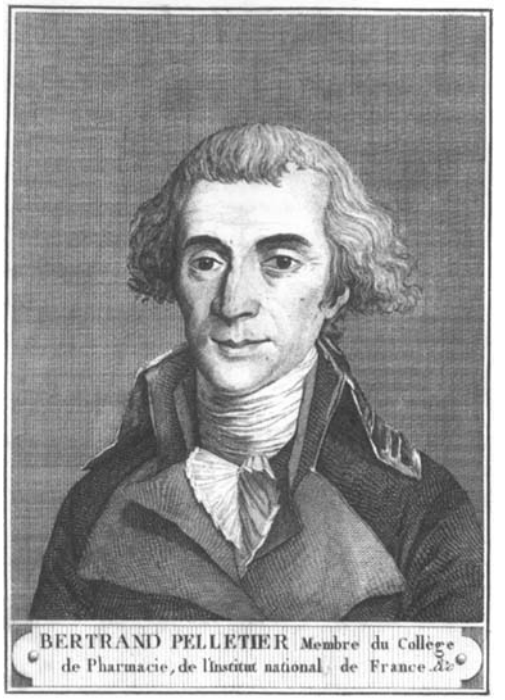
Before the Revolution, royal grants and pensions were given to manufacturers and craftsmen chosen by the King's advisers, often on the recommendation of the Academy of Sciences. This secret procedure was unacceptable in these new democratic times, so in 1791 the National Assembly established the Bureau de Consultation des Arts et Métiers (Consultative Board for Arts and Trades, originally called Bureau de Consultation pour les Arts). This comprised fifteen members of the Academy of Sciences and fifteen representatives of other societies, and was responsible for distributing awards (7). The Bureau had at its disposal 300,000 livres (about £12,500) for the 'useful arts' and 100,000 livres for the 'fine arts'. Pelletier was a member, at first representing the Society for Natural History and later the Academy of Sciences to which he was elected on 17 March 1792.

Janety's Award for Malleable Platinum

When Janety sought an award for his method of making malleable platinum, the Bureau de Consultation appointed Pelletier and Claude Louis Berthollet (1748–1822), a senior chemist in the Academy, to examine his claim. Berthollet's name appears first in their report, but as Pelletier was already acquainted with Janety and his work, and had himself done research on platinum, it can be assumed that his contribution was substantial.

The file concerning Janety's application has survived and its contents have been published (8). On 16 March 1792, Janety wrote to the local government of Paris, asking how to claim an award and on 5 April, presumably following the advice given, he applied to the Minister of the Interior, enclosing a certificate showing that he had lived in the Rue de l'Arbre Sec in Paris for fifteen years, a memoir of about 2000 words on 'Platinum and the means of obtaining it in a massive and malleable form' and another certificate from the local government confirming that there were no objections to his application.

Berthollet and Pelletier submitted their report to the Bureau de Consultation on 18 April 1792. They noted that Janety was not the first to purify



Bertrand Pelletier
1761–1797

Frontispiece of "Mémoires et observations de chimie de Bertrand Pelletier", volume 1, see Ref. 11

platinum by heating with arsenic, but that his predecessors had only worked on a small scale, while he had produced very large objects for the Academy of Sciences. These included a ball weighing 8 marcs (2 kg), two bars of length 19 feet (6.2 m) and a concave mirror weighing 12 marcs (3 kg). He had also made small objects, such as snuff boxes, crucibles and a coffee pot. They showed some of Janety's products to the Bureau and recommended that Janety should receive the maximum permitted award of 6,000 livres (about £250). The other members agreed to this and pointed out that his work opened up a new branch of commerce of the greatest utility to society. Janety received the payment a few days later, four months before the overthrow of the monarchy led to a financial crisis.

Most reports to the Bureau de Consultation were seen only by its members, but Berthollet and Pelletier published their report in July 1792 in the monthly journal *Annales de Chimie*; both

were members of its editorial board (9). After summarising earlier attempts to prepare malleable platinum, they described Janety's process using his words from his submission to the Bureau de Consultation, only altering his idiosyncratic spelling. According to his account, Janety melted 24 ounces (730 g) of native platinum with 48 ounces (1460 g) of arsenious oxide and 16 ounces (490 g) of potassium carbonate in a crucible and, after cooling, removed a metallic button from beneath the slag. The button was magnetic, showing that some iron had remained, so the procedure was repeated a second and sometimes a third time until all the iron was removed. The platinum now contained metallic arsenic, which was expelled as vapour by heating under controlled conditions for twelve hours, leaving a spongy metal, considered by Janety to be pure platinum, which he hardened by repeated heating and hammering. The reactions leading to the formation of metallic arsenic have been discussed previously (10).

Although Berthollet and Pelletier published in full Janety's account of his procedure, they omitted the first half of his manuscript in which he speculated at some length about the reason why native platinum was not malleable. His experience with silver alloys had convinced him that the brittleness of an alloy was related to the differences in expansion and fusibility of its constituents, and since platinum differed so much from other metals in these properties, it had to be completely freed of impurities if it was to become malleable. Janety provided no experimental evidence in support of his theory, and Berthollet and Pelletier may have served him well by not publishing it.

Pelletier's Wartime Reports

Pelletier wrote other reports for the Bureau de Consultation, but in 1793 he began to contribute to other reports, concerning processes that were important to a country at war, cut off from its traditional sources of essential materials. The reports were requested by the government, which published them as pamphlets, Pelletier was a co-author of reports on instructions for preparing soda from sea salt, manufacturing soap, rapidly tanning leather, repulping waste paper and extracting copper from bells (11).

A shortage of engineers, urgently required by the army and navy, led to the foundation in 1794 of a new college, the École Polytechnique, to which Pelletier was appointed as a professor of chemistry. In 1795 he became a member of the Institut National, the successor to the Academy of Sciences. He served on a committee of the Institut which was examining methods of improving gunpowder production, but he had already contracted pulmonary tuberculosis and died on 21 July 1797, before the task was completed. His son, Pierre Joseph Pelletier (1788–1842), also became a pharmacist and professor and achieved fame by isolating quinine and other alkaloids in collaboration with J. B. Caventou (1795–1877). The pharmacy remained in his possession until 1836, on the site of the present building at 45 Rue Jacob. A later proprietor moved it to 48 Rue Jacob, where it is still named 'Pharmacie Pelletier' (12).

References

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4 For an account of Janety see D. McDonald and L. B. Hunt, "A History of Platinum and its Allied Metals", Johnson Matthey, London, 1982, pp. 78–86 and 180–181

5 A. F. Fourcroy, *Ann. Chim.*, 1791, **9**, 305–352

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8 *Op. cit.*, (Ref. 7), pp. 169–176

9 C. L. Berthollet and B. Pelletier, *Ann. Chim.*, 1792, **14**, 20–33

10 *Op. cit.*, (Ref. 4), p. 85 (where it is erroneously stated that Berthollet and Pelletier submitted their report to the Academy of Sciences)

11 These reports were reprinted with Pelletier's other publications and some unpublished works, in "Mémoires et observations de chimie de Bertrand Pelletier", eds. C. Pelletier and J. Sedillot, Croullebois, Paris, 2 vols., 1798

12 C. Warolin, "Les variations du numérotage de la pharmacie de Joseph Pelletier, rue Jacob", *Rev. Hist. Pharm.*, 1989, **36**, 196–201