

❧ THE FRENCH PORCELAIN SOCIETY ❧

THE CREATION OF HARD-PASTE PORCELAIN
PRODUCTION AT SÈVRES

Antoine d'Albis

XIII
1998

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ISSN 0966-6974

L'auteur tient à exprimer ses remerciements les plus sincères ainsi que sa reconnaissance admirative à Selma Schwartz, Aileen Dawson, Anthony du Boulay et à John Whitehead, qui, d'une très méticuleuse édition à une talentueuse traduction ont rivalisé en maîtrise et en compétence.

Ils sont parvenus, tout en respectant scrupuleusement le texte, à donner vie, dans un anglais vif et enjoué, à un document austère parfois aride qui comportait de surcroît de multiples citations en français ancien.

Ils ont su dominer des disciplines aussi différentes que celles qui ont trait à l'édition, à la technique et à l'histoire des sciences, dans le but de faire connaître une suite d'épisodes, de péripéties et d'incidents, parfois tragiques, parfois burlesques qui, je l'espère, trouvera sa place dans l'histoire de la porcelaine dure de Sèvres.

Les forces et les faiblesses de l'âme humaine sont comme de coutume bien représentées dans cette affaire : le goût du pouvoir de Bertin, la vanité de l'archevêque de Bordeaux et de Millot, la ruse et la dissimulation de Boileau, la cupidité et l'intrigue chez Villaris, la séduction et l'escroquerie chez Camouti, la malhonnêteté chez Parent, l'aveugle inconséquence chez Hannong, mais aussi la bonne volonté chez Deis et le goût de l'intérêt général de Macquer, de Montigny ou même de Dufour.

Tous à leur manière ont contribué par leur qualités mais aussi malgré leurs défauts à transformer une aventure humaine en une réussite à la fois scientifique et artistique.

Antoine d'ALBIS

Antoine d'Albis first delivered an illustrated lecture on the development of hard-paste porcelain at Sèvres to The French Porcelain Society at the St. Stephen's Club, London, on 13 June 1996.

In recognition of his pioneering work, the Society decided to re-publish two earlier articles by the author in a somewhat abridged English version together with his most recent research, which forms the bulk of this volume. It is hoped that in this way the Society's publication will become the most complete edition of research into this subject.

I have tremendous sympathy for the author who has waited patiently an extra year for the publication of his work. The combined efforts of three translators resulted in seemingly endless queries regarding arcane usage, technical terms and biographical references, all of which were answered with wit and grace and when words failed, with diagrams.

Much like the travails experienced in the first firings of hard-paste porcelain, we too suffered from, albeit modern, technological problems. Ultimately I hope we have produced a work which will stand as a testament to the achievements not only of Sèvres porcelain but, more importantly, of Antoine d'Albis.

Selma Schwartz, Editor

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THE VINCENNES-SÈVRES FACTORY AND THE QUEST FOR HARD-PASTE PORCELAIN 1747 – 1768¹

Around 1750, thanks to Jean Louis Henri Orry de Fulvy, minister responsible for the Vincennes factory from 1741 until his death in 1751, the soft-paste porcelain made at Vincennes was comparable in quality to the hard-paste productions of the Meissen factory in Saxony. The ambitions aroused in the breasts of a group of financiers by the factory's success are well known. By entirely legal means they attempted to seize control of the company by secretly trying to buy up its shares from the shareholders, who by this time had tired of incessant calls for capital to shore up the business. The financiers' devious manoeuvres almost succeeded but for the timely intervention of Jean-Baptiste de Machault d'Arnouville, the Minister of Finance, who crushed their schemes. From 1751 the factory was put under state control. In 1753 a new company was set up. To prevent any further depredations, it was protected by its statutes and its virtual monopoly status of porcelain manufacture in France granted by the King. Existing porcelain factories were allowed to continue in production, but no new ones were allowed.²

Precisely during this troubled period, Paul Antoine Hannong of Strasbourg succeeded in making hard-paste porcelain for the first time on French soil. Jean Hellot, technical director of the Vincennes factory, confirms this in a document dating from around 1756: 'In regard to porcelain, Hannong obtained the formula around 1751 or 1752 from a worker from Vienna, who stayed with him for two months and then disappeared without trace, leaving his belongings behind him.'³ Jacques Bastian has identified this itinerant arcanist as the celebrated Joseph Ringler,⁴ who, when he had discovered how to make porcelain at Vienna, passed on the formula first to Höchst and then to Strasbourg before broadcasting it even more widely.⁵ In addition, Rainer Rückert has revealed that Christian Daniel Busch, a porcelain painter working first in Meissen and then in Vienna, went to Strasbourg in 1752.⁶ With the assistance of these two men, Paul Hannong was able to perfect his hard-paste kaolinitic porcelain. In light of the events which had so violently affected the Vincennes factory, leading to the protective measures outlined above, the invention of

hard-paste porcelain at the Strasbourg factory was certain to provoke strong sanctions. The royal factory invoked its privileged status. After abortive negotiations between the two parties, Paul Hannong was obliged to leave France. He set up a porcelain factory under the protection of the Elector Palatine at Frankenthal, about one hundred kilometers from Strasbourg.⁷

The Vincennes factory was now cushioned from financial anxiety and above all from further attempts at a takeover. Its staff, however were fascinated by both German and oriental porcelains. Experiments were carried out on many occasions showing that a piece of soft-paste porcelain could be melted when placed in a dish made of hard-paste porcelain, whilst the dish was scarcely affected by the intense heat to which it had been exposed.

In a report of October 1751 to Machault d'Arnouville, Hellot wrote a remarkably shrewd assessment of a material with which he was unfamiliar:

Some believed, and still believe, that they had discovered the two substances used by the Chinese potters. If they are right, and if they succeed in making good white porcelain of the kind they are attempting to fabricate, then there is no doubt that they will derive great profit from it. The pieces they will make from this porcelain will be capable of being fired without needing to be supported in the kiln, and even the projecting parts of pieces will not collapse in their saggars. However, a much stronger fire will be required than for the Vincennes composition, and it may be difficult at first to find clays for the saggars which will withstand these high temperatures without cracking and splitting.⁸

The assessment made of the new material by this eighteenth-century scientist is surprisingly far-sighted. Outlined below is a summary of the series of experiments which had already been carried out at the factory before 1751, in an attempt to discover the secret of hard-paste porcelain.

Claude-Humbert Gérin, Chanou the Younger and Gilles Dubois 1742-1752

The earliest surviving document to mention these experiments is a contract dated 9 April 1747 binding Claude-Humbert Gérin and François Gravant 'not to reveal the secret of the composition of a porcelain made of two earths on pain of a fine of 10,000 *livres* to be paid to the other party, his wife and heirs, in the case of its disclosure or sale'.⁹ The phrase 'two earths' implies that this was not a frit (or glassy) composition. It was mainly composed of

kaolin and quartz, with the addition of alum, potassium and gypsum, and was a hard-paste porcelain. No example of it has been traced, but the formula must have been successfully tested.¹⁰

Robert Millot, in his well-known memorandum *Origine de la manufacture de porcelaine du Roy en 1740*, described in his particularly vivid style, the arrival of two arcanists at Vincennes:

Two workers arrived from Flanders, who had previously worked at Vincennes, Gilles Dubois and Chanou the Younger. They had come to see M. Boileau saying that they could make a reliable hard-paste and would lay their heads on the block to prove it. M. de Verdun and M. Boileau rented the old château at Sèvres which was there before the present large building was put up, but despite the firm promises made by Dubois and Chanou, they never succeeded in making porcelain, only a type of cream-coloured earthenware.¹¹

The factory accounts for 1752 reveal that these experiments at the Château de Diane before its demolition cost the enormous sum of 1,842 *livres*.¹²

The Christian Daniel Busch Episode

The Vincennes factory's financial report for 1754 shows that the painter Busch and the sculptor Graf, both from the Strasbourg factory, came to Vincennes to try their luck in selling the formula for hard-paste porcelain.¹³ A sample of their paste was entrusted to Hellot for analysis, for which he submitted a bill for 72 *livres*. The sum of 718 *livres* was paid to the arcanists in reimbursement of their expenses. These visits by foreign porcelain-makers may have been spontaneous, but they were certainly encouraged by the factory.¹⁴

On 8 March 1755 Busch, accompanied this time by his wife and children, came by post-chaise from Strasbourg.¹⁵ With them was another worker, who was to assist Busch. This was not Graf, but a certain Stadelmeyer. Busch had left debts in Strasbourg and had borrowed 335 *livres* from Paul Hannong, who had seized Busch's furniture when he failed to get his money back. Hannong seems not to have been at all perturbed by the departure of his former employee for Sèvres, as the royal factory settled this small debt and Hannong sent a receipt for the sum due from 'Sr. Busch, formerly porcelain painter at my factory...'.¹⁶

At this moment the Sèvres factory was under construction. Facilities for workers who were apparently being given red carpet treatment could hardly be set up in the middle of a building site and so a handsome furnished house in the Paris faubourgs, situated in the area known as 'Little Poland', was rented from Sieur Le Roy, an orange merchant, for 166 *livres* a month falling to 100 *livres* after six months.¹⁷ Attached to the property was a stable where the kilns were to be built. A detailed inventory of the house lists several marquetry chests of drawers in the *Régence* style, gilt-bronze wall-lights, beds à l'Indienne with baldachins and mirrors with gilt frames. The dwelling was on two storeys and had nine rooms and eight chimneys, each with a set of andirons.¹⁸

Busch and Stadelmeyer received respectively 144 *livres* and 96 *livres* monthly, and these sums were paid for eleven months.¹⁹ The workshop was soon equipped with kilns, fuel, mortars, clays from Baden and Strasbourg and with seventy moulds from Vincennes. Bougon, the factory mason, was sent to construct five kilns which he repaired on two occasions, when fires damaged the walls and the timber framing.²⁰ During the eleven-month period expenses amounted to 11,354 *livres*.²¹ The results of the experiments were, it would appear, very disappointing. The workshop's occupants were in such a state of despair that several times Caseuille, a surgeon, was called out to administer 'medical compounds' and went on to bleed his patients repeatedly and treat the children for scabies. The medical expenses came to 114 *livres*.²² The factory then stopped paying any salary to the Busch family, who sold their furniture and clothes in order to survive. On 16 March 1756 Busch's wife wrote to Jean François Verdun de Montchiroux, one of the administrators of the Eloi Brichard Company, pleading for his help so that she could leave the city and 'go somewhere else where God will have pity on my children'. Verdun sanctioned the payment to her of a gold *louis* worth twenty-four *livres*.²³

The factory authorities, disappointed with the results of these experiments, were in the throes of moving the factory to Sèvres. From April 1757 Hellot was assisted by a brilliant thirty-eight year-old member of the Academy of Sciences named Pierre Joseph Macquer.²⁴ He had been a member of the Academy for twelve years and had published two important works.

If Millot is to be believed, the Court had not abandoned the idea of making hard-paste porcelain at Sèvres. In his historical memoir he wrote:

In 1759 an experiment was carried out at Madame de Pompadour's house on a

plate made of Hannong's porcelain from Strasbourg. Eggs were fried in butter on it and it did not break, but when the same experiment was made using a Sèvres plate, it soon broke. Some time afterwards the late Louis XV met M. Boileau on the road to Versailles and stopped his carriage to tell him that he had just done an experiment using a plate made at Strasbourg and that the Vincennes company had expelled the maker from the town so that he went to Franquindal [Frankenthal]; M. Boileau was ordered by the Minister and M. de Courteille, the factory commissioner, to go to Strasbourg.²⁵

The Hannong Affair 1759-1763

Whatever the truth of the above story, the fact remains that Jean-Baptiste Bertin, Minister of Finance from 1759 and *commissaire du Roi* responsible for the factory from 1767, was now put in charge of the quest for hard-paste.²⁶ From November 1759 the factory acquired several pieces of Frankenthal porcelain 'painted with hunting scenes with gilt rims and rocaille decoration'.²⁷ Then, on 21 March 1760, Bertin asked Boileau to draw up a questionnaire designed to elicit useful answers which was to be sent to Hannong.

This questionnaire was probably sent to Paul Hannong just two months before his death. Discussions between him and the Sèvres factory must therefore date from 1760 and not from 1753 as previously thought. At the end of his life Paul Hannong realised that his factory at Frankenthal had cost him much more than he had anticipated, and he wondered how his estate would provide for his two sons and five daughters. A letter from Paul Hannong's son, Pierre Antoine, written to the comte d'Angiviller and dated 21 January 1781 (that is, two decades after the events it concerns) supports the above suggestion. It reads: 'Sieur Hannong's porcelain was well known and it was proposed to purchase the formula, for which Hannong demanded the sum of 100,000 *livres* and a yearly payment of 12,000 *livres*. He died before the transaction was completed.'²⁸

In March 1760 the questionnaire was sent to Paul Hannong, who replied on 25 April.²⁹ Bertin wrote his own comments on Hannong's reply and sent the document to Boileau. The latter, anxious not to offend Bertin, drew up a memorandum comparing hard-paste porcelain to soft-paste. He wrote that hard-paste porcelain, and in particular the porcelain made at Frankenthal was 'probably superior to any other in its resistance to heat, and indubitably superior in that respect to Sèvres porcelain. On the other hand, the French porcelain was far whiter'. Sieur Boileau continued prudently 'that it would be very important to acquire the means of making this paste because it could be used for utilitarian pieces and in particular for those which would be frequently exposed to heat, whilst the

present [soft] paste would be used for ornamental pieces such as figures and groups and for biscuit productions.' He added 'that the ground colours used on soft-paste porcelain would not be appropriate for hard-paste, and the paste currently in use would be suitable for artistic creations and for the encouragement of taste'. He drew attention to the possibility of obtaining raw materials from a distance, and the slender likelihood of finding suitable clays on French soil and suggested that, to avoid expense, experiments should be done on porcelain by technicians at the Frankenthal factory, which would avoid the necessity of building kilns. He noted 'small-scale experiments are never conclusive'.³⁰

Obviously, Boileau did not share Bertin's enthusiasm. Paul Hannong died on 31 May 1760, in the midst of negotiations on which he had embarked without having fully informed his family. His two sons were rivals and did not get on.³¹ Paul Hannong's younger son, Pierre Antoine, was familiar with his father's formula and knew that he had held discussions with Sèvres.³² He wanted to conclude the negotiations to his own advantage, but 'not knowing whom to consult',³³ contacted George Joseph Deis, privy counsellor and major domo to Prince Hohenlohe. Deis lived in Haguenau not far from Strasbourg. He informed Courteille and Madame de Pompadour of Pierre Antoine's request for help in the negotiations, and warmly recommended the latter rather than his elder brother, Joseph Hannong.³⁴

By this means the younger of the two Hannong brothers arranged direct access to Bertin.³⁵ Joseph, however, was not completely unaware of his father's dealings with Sèvres, and through his own intermediary, the Widow Lair who was one of his wife's relatives and an important client of the factory, he was able to get in touch with Boileau.³⁶ Madame Lair passed on to Boileau only the most negative information concerning the younger Hannong brother.

Negotiations between the French court and the Strasbourg family of porcelain-makers were only briefly interrupted by Paul Hannong's death. Bertin was now in the advantageous position of merely having to wait until the rivalry between the two mutually hostile brothers allowed him to dominate the situation. He decided to send Boileau to Frankenthal without informing Courteille, the factory's royal representative.³⁷ Courteille shared Boileau's lack of enthusiasm for the idea of developing hard-paste production, and could not see the necessity of introducing additional complications at the factory only a few years after its move to Sèvres, into buildings where only the production of soft paste had been envisaged. When he finally discovered what was going on, he drew up a formal document instructing Boileau to inform him of everything 'so that he [Courteille] could pass it on

personally to the Finance Minister'.³⁸ Boileau, accompanied by Millot, went to Frankenthal where they stayed twelve days with Joseph Hannong, who was in charge of the factory. They brought back with them a small amount of Frankenthal paste and glaze which were both test-fired in a small kiln specially built by Macquer and Millot in '*le pavillon du petit bois*'. The test pieces took only an hour to fire.³⁹ On the very uncomfortable return journey from Frankenthal, Boileau stopped at Strasbourg to hold discussions with Pierre Antoine whom he seems to have preferred to his elder brother.⁴⁰

Once back at Sèvres, Boileau wrote a detailed report for Bertin: Paul Hannong, annoyed at not having been able to reach an agreement with Vincennes, had decided to set himself up in Frankenthal where the Elector Palatine had put at his disposal the site of an old barrack. Hannong had constructed buildings and kilns at considerable expense, and had been obliged to borrow money from the Elector Karl Theodor. The position of the Hannong brothers was particularly complicated, since it was difficult to see how Paul Hannong's estate could be settled under these circumstances. Boileau, who was still sceptical about the whole business, added, in a passage which shows he was prepared to distort the facts for his own purposes, 'the pieces made at this factory are unbelievably mediocre. M. Boileau was unable to find a perfect dish in the entire workshop... It is likely that the pieces we saw here were specially chosen from thousands of less good ones... The workmen are unskilled and are paid a very low wage'.⁴¹ Besides, he commented, the way the colours are applied at Sèvres is perfectly agreeable, whilst at Frankenthal they are applied using oil of aspic which has a nauseating smell... 'It is impossible to embellish these porcelains with gilding...The colours, in particular the greens, flake off and none of the colours used for shading melt properly, which is very noticeable...the ground colours are very poor...'.⁴²

Bertin found the pessimistic tone of Boileau's report almost as agreeable as it was irritating. However, as the Hannong family needed to settle the estate, the hard-paste porcelain formula could be had on very reasonable terms, since neither of the two brothers could afford the expense of running the Frankenthal factory.

Joseph Hannong now proposed selling the Frankenthal factory to France, conditional on the agreement of the Elector.⁴³ The price was 125,275 *livres*. Selling the formula separately was unthinkable, since this would invalidate the factory's right, granted by Karl Theodor, to make porcelain on his territory. It would obviously have been cheaper to purchase the formula alone from Pierre Antoine, who had offered it for sale. Bertin delayed his response so as to obtain the best possible price.⁴⁴

On 21 December 1760 the two Hannong brothers signed a binding agreement not to sell the formula without the other's consent, imposing a penalty of 100,000 *livres* for contravention of the agreement.⁴⁵ This move prevented them from falling into Bertin's trap, but it also meant that they were unlikely to be able to make any progress in sorting out their tangled affairs. Despite the agreement, Pierre Antoine began discreet discussions with Boileau. He suggested that the King should buy the Strasbourg faïence factory. Using his formula, hard-paste porcelain could be made there.⁴⁶

Finally, on 29 July 1761, Boileau and Pierre Antoine Hannong drew up an agreement in the presence of Maître Vivien, a Paris lawyer concerning the formula alone. The Sèvres factory undertook to purchase the formula in its entirety for a lump sum of 6000 *livres* and the payment of a yearly non-taxable pension of 3000 *livres*. In return, Pierre Antoine Hannong was obliged to demonstrate how the paste and colours were made, as well as explaining how the kilns were built. All this was to be recorded by Hellot and Macquer, both members of the Academy of Sciences. Were there to be any subsequent manufacturing problems, Hannong was to be available to solve them. He was also to inform the Sèvres authorities of the location of the clays needed, together with the name and address of a supplier. Lastly, he was forbidden to 'make use of the manufacturing process which he had sold, either on his own account or on behalf of another factory'. Additionally, and this was not the least of the conditions imposed on Hannong, the paste was not to cost more than 6 *sols* for a *livre* in weight.⁴⁷

Once the agreement had been signed, Boileau ordered Pierre Antoine Hannong to go to Oberzell, near Passau, then on Austrian soil, and send him word of the size of the clay pit which was to supply the kaolin. Pierre Antoine left for Strasbourg where he found the family's affairs 'in the greatest confusion'. He waited there for the Sèvres factory to send him money to cover the cost of his trip to Austria.⁴⁸

At the end of August Pierre Antoine was still in Strasbourg. On 26 August Boileau wrote to him that 'it was neither seemly nor honest for him to seem so close to receiving his payment... and that one should never toy with ministers, as it is in one's interest to satisfy them promptly'.⁴⁹ Pierre Antoine was completely penniless. Deis, to stay on the good side of the minister, rashly undertook to pay his protégé's expenses.⁵⁰ Pierre Antoine then set off for Passau, leaving a cousin in charge of the day-to-day running of his affairs.⁵¹ He had prepared several barrels of different clays for the Sèvres factory which were to be sent off as soon as possible. Hannong's co-legates, who suspected, without a shred of proof, that

Pierre Antoine had been in negotiation with Boileau, demanded that the '*ameister gérant*', who carried out the functions of the mayor of Strasbourg, put a lien on the consignment. Then in a fit of rage, they destroyed most of the barrels with an axe.⁵²

In Pierre Antoine's absence his cousin, Charles François, asked Boileau to cancel the lien.⁵³ A number of letters were exchanged which were sent on to the Minister himself. The contents of the barrels were ordered to be valued and on 15 September 1761 the raw materials were ready to be sent to Paris.⁵⁴ In Pierre Antoine Hannong's continued absence, his cousin was beset with problems. The workers chosen to go to Sèvres had run away to Switzerland, probably taking with them the precious formula, and the family had never been more at odds. Pierre Antoine's landlord had ransacked his lodgings as he had received no rent from the destitute porcelain manufacturer. The landlord boasted of having found the formula and mastered it, and to add insult to injury had sealed up the premises. Ninety quintals of clay were, nevertheless, due to be sent to Paris.⁵⁵

M. de Lucé, the Intendant at Strasbourg, confirming the release of the clays by the Hannong co-heirs, 'who had seized them on false information', thought it his duty to inform Courteille that Pierre Antoine Hannong should be put under surveillance. Lucé wrote that he had proof that Pierre Antoine had tried to get in touch with M. de Stanley, a minister of the English Crown, clearly aiming to sell his secrets to a foreign power.⁵⁶ Deis, Pierre Antoine Hannong's protector, was called upon to explain the conduct of his protégé. He played down Lucé's account, putting it down to ill-will on the part of the Hannong family who had worried and intimidated the two cousins to the extent that they had sought shelter with Deis himself.⁵⁷

On 1 October Pierre Antoine returned from Passau. Within the month the workers he had recommended arrived at Sèvres with clay and tools. The group was made up of two throwers, a kiln master, two sculptors and a potter specialising in making and applying handles.⁵⁸

The various consignments of clay sent from Oberzell to Sèvres were analysed so that the factory could calculate how much hard-paste porcelain would cost to make as compared to the soft-paste porcelain supplied in powder form by Gravant. Hard paste was thirteen times less expensive. The clay was dug and purified at Oberzell then sent to Passau. From there it was loaded onto barges which sailed down the Danube to Ulm. It was then taken by wagon to Strasbourg to enter the French customs zone. After being

transported overland to Châlons, it was once more loaded onto a boat and arrived at Sèvres by way of the Marne and the Seine rivers. Almost three tons of kaolin were brought to Sèvres by this route for experimental purposes,⁵⁹ in addition to the ninety quintals which had already been sent.

In the meantime Pierre Antoine had been summoned urgently to Paris by Boileau. There he was kept waiting, perhaps because different messages were coming in from the Intendant of Strasbourg, before his account was settled. Pierre Antoine, who was destitute, 'was very annoyed', and demanded loans from Sèvres, without revealing any of his carefully-guarded secrets.⁶⁰ On 1 February 1762 Hannong's brother, Joseph, sold the Frankenthal factory to the Elector Karl Theodor, with the knowledge of his co-legates, for the sum of 130,000 *livres*.⁶¹

At last on 16 February 1762, in the presence of Boileau, Pierre Antoine Hannong successfully prepared the first mixtures necessary to make hard-paste porcelain.⁶² As no kilns had been specially built, he was obliged to make up four pastes and glazes with different vitrification points, so that they would all be fired to the same state, even though the firing temperatures might vary. Boileau's annoyance at the seeming complexity of the procedure, which he did not fail to comment upon, is understandable given that soft-paste porcelain could be fired in any part of the kiln. Pierre Antoine and his team were lodged in the King's apartments at the Sèvres factory so that they could not communicate with the workshops.⁶³ The first attempts to fire the composition were disastrous. Pierre Antoine maintained that his formula was perfectly viable and that the kiln was too small.⁶⁴ It was no doubt modified, as Pierre Antoine managed to make hard-paste at Sèvres during 1763. Boileau recorded the course of events as follows:

M. Hannong held five firings at the factory. Only a few good pieces were drawn from the first three firings. The last two, that is the ones he carried out after his return from Strasbourg, were much more successful, although this porcelain, by comparison with the pieces M. Boileau had seen [at Frankenthal], seem to be just like that made at Frankenthal.⁶⁵

Pierre Antoine was only twenty-four years old. The series of experiments gives ample proof that porcelain kilns, especially those constructed in the eighteenth century, never give good results when they are new and damp. Several firings are required before these can be achieved.

Pierre Antoine was confident of his success. On 1 September 1763 he sent Boileau a twenty-one page document setting out details of his formula and working method.⁶⁶ He described the location of the clay pits, the names of the clay suppliers, the composition of the paste, glaze and colours, including how to make purple of Cassius, and how to prepare gold by precipitation, etc. The document, with its wealth of detail, is carefully drawn up and easy to understand. It betrays no attempt to deceive the reader. The information it contains was completely new to the authorities at Sèvres, particularly the method of preparing gold and purple of Cassius. Later, when hard-paste porcelain was in production at Sèvres, the factory was to get more than its money's worth from Hannong's document.

Once Hannong handed over the document it was entrusted to Macquer, who reported on it in his usual clear and concise style. He evidently helped Hannong with both his experimental work and his demonstrations. One point made by Macquer is that the kaolinitic clay from Passau, despite having been purified at its place of extraction, was found still to contain thirty five per cent sand, even when carefully washed. This had to be removed. The report also includes a methodical, accurate and extremely full description of the methods used to achieve a reducing atmosphere in the kiln. This is essential to hard-paste porcelain manufacture, but is not required for soft-paste, and is, in fact, one of the main "secrets" for which Hannong had been paid. 'As it burns, the wood almost becomes embers and falls to the bottom of the kiln, where it is consumed by the small amount of air which is allowed in, when necessary, through vents in the lower part of the oven, and new wood is carefully placed in front of the vents so that they are virtually blocked up and there are no gaps' over the hottest embers.⁶⁷

Pierre Antoine Hannong had not only been entirely successful with his own project, but had also given Sèvres enough information for them to use later in their attempts to make hard paste with clay from Saint-Yrieix. Without this they would never have guessed that kaolin occurs in a greyish friable rock, and must be extracted from it by washing and decanting. Nor would they have known that at the end of the firing cycle a strictly controlled reducing atmosphere is essential, especially as this method is exactly opposite to the one used for firing soft paste, which requires an oxygen-rich atmosphere in the kiln.

Boileau was clearly afraid that he would be obliged to manufacture hard paste in his new factory at Sèvres which had been specially designed for the production of soft paste. He reported that between 1 October 1761 and May 1764 the factory had spent 11,165 *livres*

11 *sols* 9 *deniers* on a series of experiments which he thought were disappointing. He reminded the authorities that it had been decided at the outset that the cost of the project would not be borne by the manufactory but by 'a special grant from His Majesty', whose subsidies to the factory barely covered its ordinary running costs. So as not to upset Bertin unduly, he added, 'it does not seem prudent to set up production of this kind in the King's factory without first ascertaining whether the clays which we have obtained from so far away can be found in France'.⁶⁸ However, when other arcanists approached Sèvres with offers to assist in the making of hard paste, the factory's first response was to send them 'porcelain cups made at Sèvres according to Hannong's methods'.⁶⁹ Against this background the decision was taken to search for kaolin in France. Boileau sent a sample to Melchior François Parent, Bertin's commissioner, for use in this quest.⁷⁰

Pierre Antoine Hannong, sure of success, spent money recklessly in his usual spendthrift fashion. On 25 April 1765 he was paid the 'generous' sum of 4000 *livres* to cover his expenses.⁷¹ His contract had stipulated that he would be paid 6000 *livres* in addition to his expenses. Anxious that he might never receive the promised amount, he began to press for payment.

Newly confident after his trials of hard-paste porcelain at Sèvres, Hannong now wanted to set up on his own in the former royal factory premises at Vincennes.⁷² On 20 June 1765 the King granted Pierre Antoine a reduced annual payment of 1,200 *livres*.⁷³ He could no longer expect the agreed sum of 6000 *livres* and lived on credit. On 11 June 1768 his faithful protector Deis reported that he had lent Hannong 18,585 *livres* 2 *sols* 9 *deniers*.⁷⁴ Pierre Antoine had no choice but to settle his debt to Deis and arranged with the King that his annual payment was paid over to Marie-Thérèse Deis, Deis's daughter, 'for life'.⁷⁵ The debt (minus the interest) would be cleared in fifteen years. Every year Deis wrote in an ever more shaky hand 'humbly desiring that Monseigneur would be good enough to pay the pension as agreed' and Marie-Thérèse Deis, who appears to have remained unmarried, sent a statement appended to her father's letter signed by the curate of Hagenau to the effect that that she was still living.

Pierre Antoine Hannong was always short of money. In 1781 he wrote to d'Angiviller. Antoine Regnier, then director of the factory, remarked that Hannong's demands for money were 'dishonest and inappropriate'.⁷⁶ In *Messidor* Year 2 [June/July 1794] Hannong wrote to Citizen Berthillier, *Representant du Peuple*, seeking redress.⁷⁷ His letter was forwarded to Darcet, chemist at the Sèvres factory from 1782 to 1793, who replied in

Thermidor Year 2 [July/August 1794] as follows:

Around 1769 or 1770 Chinese-style porcelain was also made at Sèvres of French raw materials; a Chinese-design kiln was used, just as it is today. It is the same kind of kiln as we ourselves have been using since 1758 on the premises of the former Count Lauraguais, the real inventor of hard-paste porcelain in France. We made it there with kaolin and petuntse from near Alençon. So much for Hannon's [sic] so-called 'discovery'.⁷⁸

Despite these statements, after drying out, modifying and watching over his kiln between February and August 1763, Pierre Antoine Hannong was the one who finally succeeded in making hard-paste porcelain at Sèvres.

Other Experiments 1763-1764

Whilst Hannong was conducting trial firings at Sèvres, Pierre Joseph Macquer was also busy. He had certainly learned much from Hannong's experimental work. Convinced of the difficulty of obtaining clay from Passau, he wrote to Courteille on 28 April 1763 reporting that after 1200 trials he had successfully made hard paste with French raw materials.⁷⁹ One of the ingredients required chemical preparation. The porcelain was 'reasonably white and not unlike Sieur Hanon's (sic) of Strasbourg, without at the moment being superior to it in any way'. Macquer's tone in this letter is quite matter-of-fact. He was now clearly capable of making hard-paste porcelain. We shall return to his activities later.

Research into hard-paste porcelain was being actively pursued at this time. Work was being carried out by the comte de Lauraguais in his laboratory. The earliest known example of his porcelain is incised *oct. 1764*.⁸⁰ This is a medallion ornamented with a drinker after Teniers in relief, now in the Musée Adrien Dubouché, Limoges, made of a yellowish porcelain of hard-paste type, which has been fired in a reducing atmosphere. It bears little comparison in terms of quality to pieces which were being sold on the market in the early 1760s.

Christian Daniel Busch returns, 1764

After burning down the stables and the wooden frame of the house in 'Little Poland' on several occasions, Busch had been obliged to leave the factory in 1756. He went back to

Germany and in 1760 discovered that Paul Hannong, with whose idea of the financial value of the 'secret' of porcelain-making he was familiar, was in discussion with Boileau. On 1 December 1760 he approached Sèvres with a view to selling his own formula 'for a sum less than Hannong was asking'.⁸¹ He received no reply to his letter.

However, it seems likely that by this time he had worked out a satisfactory way of making hard paste, for in 1761 Ludwig VIII of Hesse-Darmstadt appointed him director of the Kelsterbach factory, where he was to manufacture porcelain until 1764 when he left the factory.⁸² Busch imagined that Sèvres would now welcome him with open arms as an experienced porcelain manufacturer. He approached the chevalier d'Aigremont, the French minister at Koblenz. The latter sent a report to the duc de Praslin, the Foreign Minister, which was forwarded to Bertin.⁸³

Busch made out that he had 'experienced discrimination since he had converted to Catholicism'. Bertin agreed to his coming to France, but warned that Busch would only be paid his travelling expenses if he were able to carry out his experiments with demonstrable success.⁸⁴ On 19 July Busch left for France, 'hardly speaking any French, but understanding rather more of the language than before'.⁸⁵ On 2 August he was in Paris and, armed with a letter of recommendation from the chevalier d'Aigremont, tried in vain to arrange a meeting with Bertin. He went to the factory where Boileau immediately recognised him and greeted him in his frostiest manner. Boileau let Busch know that the chevalier d'Aigremont had not been asked to recruit men like him to carry out experiments, and offered him a post as a painter at three *livres* per day. Busch was unable to accept this offer on account of 'his poor sight and his superior talents'. When Bertin found out about Busch's cool reception at Sèvres, he sent orders that Boileau was to receive him properly.⁸⁶

In the meantime Busch and his wife ran up enormous debts in Paris.⁸⁷ Busch turned up at Sèvres with some useless porcelain trials, demanding that clays should be sent to him. Boileau was not inclined to comply with Busch's demands, which seemed likely to be both expensive and unproductive. Bertin was forced once more to display his authority and tact. In a letter which he drafted several times, he ordered Boileau to settle Busch's debts and to send for clay from Koblenz.⁸⁸

Boileau was obliged to obey. He did, however, warn Busch that he would be punished if persisted in trying to take the factory for a ride.⁸⁹ In January 1765 Busch claimed to have

carried out a successful trial and asked Bertin for payment. However, in April that same year Boileau, who could no longer tolerate the situation, asked Bertin to authorise Busch's dismissal. The raw materials he had ordered from Frankfurt were, according to Boileau, clays which could have been found in France. Besides, the chevalier d'Aigremont should have been aware that Busch was 'nothing but a fraud'; aside from this, he added in a barb aimed at Bertin, 'Busch had already been to Sèvres ten years earlier'.⁹⁰

Busch's wife, now even closer to complete destitution, was once more forced to beg for funds to leave France.⁹¹ As Boileau had foreseen, the outcome of the whole affair was that it cost the factory 1327 *livres* 10 *sols* for no return whatsoever.⁹² Busch went back to Germany once more. He was immediately taken on by the Meissen factory where he did extremely well.⁹³ He died a respected figure in 1797.

Boileau emerges from all this as the defender of soft-paste porcelain against the power of the minister himself.

The quarrel between Guettard and the comte de Lauraguais 1765-6

While the events outlined above were taking place, Guettard, piqued by the publicity given to the discovery of hard-paste porcelain by the comte de Lauraguais, presented a paper to the Academy of Sciences on 11 November 1765 in which he claimed to have discovered it.⁹⁴ He had been to a place in a village named Maupertuis near Alençon with a workman called Legué or Le Guay. There he had found kaolin with which he had made trial pieces of porcelain from 1751 onwards. The death of the duc d'Orléans, who had supported his experiments, brought the work to an end. Guettard stated ingenuously that 'the man named Legué is now working with the comte de Lauraguais'.

Lauraguais defended himself aggressively in a meeting of the Academy on 22 and 25 January 1766, challenging Guettard to produce dated trial pieces. He assured his audience 'that his ideas about porcelain were absurd', concluding 'that he did not find lies hateful which had the useful result of showing up the stupidity of many of those whom the world considered clever'.⁹⁵

One piece of evidence suggests that Guettard had indeed made hard-paste porcelain for the duc d'Orléans in 1751. In a letter of 26 October Hendrik van Hulst, artistic director at the Vincennes factory, wrote, 'I also spoke about what I have learned from a man who I can

trust who is a member of the duc d'Orléans's household, about an establishment for his [porcelain] paste set up by this prince'.⁹⁶

Lauraguais's porcelain, as it turned out, was to prove of historical rather than technical interest.⁹⁷ Kaolin from Maupertuis has never been used on a large scale. In the middle of the nineteenth century, according to Alexandre Brongniart, 'a true, but unattractive, porcelain was still being made using this clay'.⁹⁸

To some, there seemed little point in feuding and striving to make a material, which, while technically interesting, was noticeably inferior to the soft-paste porcelains being made in France at this time.

Macquer's proposition 1766

In April 1763 Macquer wrote to Courteille informing him that he had discovered a hard-paste porcelain that was 'of at least as high a quality as the porcelain made by M. Hannong'.⁹⁹ On 10 February 1765 he wrote again to Courteille to remind him of his work and enclosed trial pieces. 'The beauty and whiteness of the material will always be at least as good as the pieces which he is now sending to M. de Courteille'.¹⁰⁰ On 12 July 1766 he deposited several cups made of his hard-paste composition at the Academy of Sciences. With them was a sealed letter describing 'a chemical preparation'. Two centuries later, on 13 March 1967, the seal was broken on this folded sheet of paper.¹⁰¹ The letter described how Macquer had mixed clay from Lyon with quartz, feldspar and a large proportion of calcined alum in the same way as Charles Humbert Gérin had mixed Liège clay, quartz, gypsum and alum twenty years earlier in 1747.¹⁰²

It is worth noting that just as Pierre Antoine Hannong had dated his memorandum 1753, although we know it was sent in 1763, Macquer dated his own memorandum to the Academy 1756 instead of 1766.

The Limprunn Affair 1767-8

Joseph Karl von Limprunn, who was appointed director at the Nymphenburg porcelain factory near Munich in 1763, was remarkably successful in running it. In 1767 his achievement was threatened by a financial crisis in the German-speaking lands.¹⁰³ In April 1767 he contacted the chevalier de Follard, French envoy at the Bavarian Court, to inform

him that he could assist in developing hard-paste porcelain at Sèvres. Follard reported this information to his superior, the duc de Choiseul, who in turn reported the matter to Bertin. Three pieces of Nymphenburg porcelain accompanied the report.¹⁰⁴

The pieces were examined by Macquer. Since Hellot's death in April 1766, Macquer had been assisted by the marquis de Montigny who was also a member of the Academy of Sciences.¹⁰⁵ The two men found the pieces of Nymphenburg porcelain very little different from the Frankenthal porcelains which had been 'precisely investigated' three years before, at the time when Pierre Antoine Hannong was at the factory. In their report they added that the raw materials came from a place 193 leagues from Strasbourg, and that despite several attempts by scientists, no source for these materials had been found. According to them, soft paste 'was better for ground colours, enamel colours and gold'.¹⁰⁶

In June 1767 Montigny, who owed his position partly to the fact that he was the son of an influential minister, wrote a report for Bertin in which he drew particular attention to the fact that Macquer had been able to make porcelain similar to that of Frankenthal. With the report he included 'two porcelain cups made at Sèvres using Hannong's and Macquer's methods'. Montigny also pointed out that 'travellers and patriotic Frenchmen are currently looking for kaolin in France and the nation is about to gather the fruit of their toil'.¹⁰⁷

We may wonder whether Monseigneur d'Audibert de Lusson, Archbishop of Bordeaux, was amongst these 'patriots'. He had invited Macquer to the episcopal palace to present him with a sample of kaolin found in France, which he had had from a man named Villaris.¹⁰⁸ Then, in June 1767, Bertin informed Choiseul that M. de Limprunn's offer to assist in the the manufacture of hard-paste porcelain was now irrelevant. The intention was to send two hard-paste cups with Bertin's letter, one made by Pierre Antoine Hannong, the other by Macquer, but they were never sent.¹⁰⁹

The Gronsfield Affair 1767-9

In 1759 Count Gronsfield-Diepenbroek had purchased the Weesp factory in the Low Countries. Three years later, using a new kiln and Passau clay, he managed to make hard-paste porcelain which he successfully manufactured until he was overwhelmed by financial problems.¹¹⁰ When the count discovered that the Sèvres factory was conducting research

into the very field in which he had experience, he decided to sell his formula. He wrote to Derivaux, the French chargé d'affaires at The Hague, who in turn wrote to Choiseul, who then passed the matter over to Bertin. In June 1767 the Sèvres factory received Gronsfeld's communication.¹¹¹

Once again Montigny was obliged to respond to Bertin and used the same arguments as he had used previously: 'it would be pointless to establish a factory in the kingdom which could not continue to operate in war time, and this would certainly be the case if raw materials had to be purchased abroad'. Alluding to porcelain made by Pierre Antoine Hannong and by Macquer, he added 'it would be worth sending for several cups [of Weesp porcelain] to see how their translucence and durability compared with the new French porcelain'.¹¹²

Bertin and Choiseul ignored this recommendation and invited Sieur Picot, director of the Weesp factory to Sèvres. On 1 September Picot arrived at the factory. Bertin had summoned Boileau to observe the trial firings.¹¹³ Picot had to acknowledge that Sèvres was familiar with the hard-paste porcelain formula. He then offered to construct a kiln, which the factory sorely needed.¹¹⁴

His proposal was apparently taken up and Picot ordered bricks and saggars from Holland. By December they had still not arrived. In the interval Picot occupied himself making a model of the new kiln. In January 1768 he demanded funds from Bertin, although he had been working at the express order of the duc de Choiseul.¹¹⁵ Bertin replied coldly to Picot's demand for money: 'you should blame the delay in receiving the materials you have ordered on the slowness of your suppliers... I do not see that your demand for compensation is justified, as you have never received any orders to carry out the trial firings which you yourself asked to perform.'¹¹⁶

In March 1768 a report by Boileau, Macquer and Montigny was sent to Parent. The futility and probable cost of Picot's stay at Sèvres was underlined. According to the three Sèvres employees, Picot's kiln was very little different from the one built by Christian Daniel Busch at the house in 'Little Poland', and it would make more sense to ask natural and physical scientists to investigate French sources for kaolin.¹¹⁷

Picot's reply to Bertin was in his usual courteous style, but shows his tenacity and down-to-earth approach: 'Every prince in Europe makes porcelain using foreign clay, even in war

time, because then ... prices are low... and good supplies are therefore obtainable...and so, Monseigneur, I am awaiting either the means to carry on my work or at the least payment for what I have already achieved through the generosity of the King.'¹¹⁸

Bertin's response was crushing: 'I have nothing further to add; I thought I had already ordered you to leave when I made it quite clear to you that the factory would no longer entertain any of your proposals.'¹¹⁹ Picot, shocked by his summary dismissal, sought the support of the powerful marquis de Courtenvaux, member of the Academy of Sciences, who wrote an angry letter to Bertin, protesting about the poor treatment accorded to Sieur Picot by the ministry and by the factory.¹²⁰ It was as if a bomb had hit the ministry. Bricks and saggars which had been held up by customs officials were expedited without delay to Sèvres. Courtenvaux was even able to force the factory to bear the entire expense.¹²¹

Whilst all these events were taking place, Count Gronsfeld realised the impossibility of selling his factory to Sèvres. He found a French buyer, however, in the person of a man named Sieur de la Saule. In courteous terms Gronsfeld informed Bertin of the sale and begged him to honour the new establishment with his protection. Bertin agreed to this in his politest manner.¹²²

Unfortunately, Count Gronsfeld now found himself in dire financial straits and was obliged to leave Holland under a false name, calling himself La Vigne. He fled to Bercy.¹²³ To add to his woes he discovered when he reached France that Sieur de la Saule, to whom he had sold his factory, had been found guilty of fraud and arrested in September 1769.¹²⁴ Bertin, who had earlier offered his protection, tried to help Gronsfeld extricate himself from his embarrassment by asking one of his lawyer friends to advise him. The lawyer began by 'calming him down slightly, which seemed to be the first step' and remarked

it is almost impossible to believe that a man whose reputation is so high and whose letters are so well-phrased could have been so easily taken in by these scoundrels. I do not know, Sir, if you are aware of the legal documents which he has signed, the agreements he has entered into and the risks which he has taken... I have only found out all this by reading the proceedings lodged at the *cour des aides*.¹²⁵

Count Gronsfeld returned to Holland where he died a ruined man not long afterwards.

Kaolin from Saint Yrieix, 1767 or 1768

On 25 February 1767 the Archbishop of Bordeaux wrote to Macquer informing him that he had recently received a specimen of French kaolin from Villaris of Bordeaux.¹²⁶ Once again, there are doubts about the date of this letter. Its context, including an earlier letter from the Archbishop and a letter from Bertin to Macquer, both unfortunately undated, indicate that the Archbishop had also made a mistake in dating his letter, which was written, I believe, not in 1767, but on 25 February 1768. If this is correct, Macquer did not carry out his experiments, which, as we know were successful, until early 1768.

Whatever the date of the letter, the fact remains that the discovery of an exceptionally pure kaolin must have caused a stir. News of it had got around, since Villaris, despite strict orders to keep it quiet, had not been in the least discreet. In a letter in his own hand to the Intendant of Bordeaux dated 4 October 1768, that is, after Macquer's departure to look for kaolin, Bertin wrote 'Be warned. Sieur Villaris has been both indiscreet and silly. Immediately after being told to keep his own counsel, he wrote to several people in Paris, one of whom spoke to me of the matter as if it were almost public knowledge.'¹²⁷

The 'matter' was indeed in the public domain. The court's determined, if not obstinate, pursuit of the secret of making hard-paste porcelain and the long series of trials conducted at the royal factory, together with the fact that hard paste was reputed to be cheaper to manufacture than soft paste, had aroused greedy thoughts in various quarters. If German kaolin was so cheap, despite the cost of transporting it, surely French clay would be even cheaper.

One aspect of the production cost of hard-paste porcelain had probably not been taken into consideration by those who were anxious to make it. At today's prices, the cost of the porcelain paste amounts to only ten per cent of the total manufacturing cost. Labour costs, even for the simplest pieces, account for at least sixty per cent of each piece. The same is likely to have been the case in the eighteenth century, and more complex pieces may have incurred proportionally even higher labour charges. The idea that it was possible to make porcelain cheaply, even with cheap raw materials, was almost certainly an illusion.

One last event remains to be catalogued in this account of the discovery of hard-paste porcelain in France. A worker from the Vienna factory sent porcelain samples to Choiseul with a letter dated 17 January 1770, claiming that he could make hard-paste porcelain with

'purified' clays.¹²⁸ This claim was new and interesting, as it opened up the possibility of whitening poorer-quality kaolin. Although Sèvres purchased a clay pit at Saint-Yrieix on 5 May 1769, members of the Academy of Sciences working at Sèvres thought the proposition worth investigating.

These men sent an urgent letter asking for further details of the process, but the reply was vague. It was obvious that the Viennese correspondent had muddled up the Saint-Cloud factory, which by that time had ceased production, with Sèvres, and this elementary mistake cast grave doubts on the rest of the information. The matter was allowed to drop. The Sèvres factory was at the time far too busy with putting its new hard-paste porcelain into production, and coping with all the problems arising from this momentous step.

The author is grateful to Françoise Treppoz, Tamara Préaud and Bernard Dragesco for their kind help in the preparation of this text. He also wishes to thank Catherine Monnier, Guy Sarrauste de Menthère and Martine Beck-Coppola for their unwavering support, cheerfully given.

As this article was going to press [in 1995], M. R. Trouilleux generously brought to my attention an unpublished document which suggests that Pierre Antoine Hannong had closer links with England than he would have liked to admit to his protector. In a letter to the National Convention of 28 July 1793, Pierre Antoine Hannong wrote: "Having given up hope of succeeding, I left for England to make use of my talents there. Hardly had I been away three weeks, when I received a letter from Boileau pressing me to return to Sèvres." (Archives Nationales, F 12, 1456.)

Notes to Chapter 1

1. This chapter first appeared in *Sèvres, Revue de la Société des Amis du Musée National de Céramique* 4 (1995), pp. 48-80. Some alterations have been made to avoid repeating material discussed in other chapters. It has been translated for the French Porcelain Society by Aileen Dawson.

2. Tamara Préaud and Antoine d'Albis, *La Porcelaine de Vincennes* (Paris: Adam Biro, 1991).

3. Archives de la Manufacture Nationale de Sèvres [henceforth referred to as MNS Archives], Y 50.

4. Jacques Bastian, *Les Hannong, étude des décors peints sur faïences et porcelaines de Strasbourg et Hagenau* (1721-1764), doctoral thesis, University of Strasbourg, 1986.

5. Hermann Jedding, *Europäisches Porzellan* (Munich: Keyser, 1971), p. 145.

6. Rainer Rückert, *Biographische Daten der Meissener Manufakturisten des XVIII Jahrhunderts, Kataloge des Bayerischen Nationalmuseums München* (Munich, 1990). Christian Daniel Busch (1723-97), apprentice painter at Meissen (1741-5), then in Vienna (1745-8) and subsequently in Munich, Neudeck, Bayreuth (1749-50), Göttingen and Augsburg. At Strasbourg in 1752, Sèvres in 1755 and 1764. Returned to Meissen from 1765 until his death. He perfected the use of kaolin from Seilitz, which Höroldt and Teichert had both declined to use. In his capacity as factory chemist he perfected a 'royal blue' ground colour in imitation of the *bleu nouveau* developed at Sèvres.

7. Due to an erroneously dated (1753 instead of 1763) document, Alexandre Brongniart (in *Traité des Arts céramiques* [Paris, 1877] vol. II, p. 501) and the comte de Chavagnac and the marquis de Grollier (in *Histoire des Manufactures françaises de Porcelaine* [Paris, 1906] p. 50) thought that Paul Hannong sold his secrets to Sèvres beginning in 1753 and asking for an exorbitant payment of 100,000 *livres* and an annual salary of 12,000 *livres*.

8. MNS Archives, Y 71.

9. Ibid, C 1/14/10. See also Geneviève Le Duc, "Chantilly Un certain regard vers l'Extrême Orient," *The French Porcelain Society*, vol. X, 1993.

10. Antoine d'Albis, "Les premières années de la Manufacture de porcelaine de Vincennes," *Faenza LXX*, fasc. 5/6 (1984), p. 489.

11. MNS Archives, Y 37. This document probably dates from around 1780. Robert Millot, who was called 'a good, faithful and affectionate fellow' by Hellot in 1751, was kiln master at Vincennes and Sèvres. He was intelligent, active and much respected and in the course of time assumed an increasingly important role in the factory, so much so that in his memorandum he took credit for most developments there and, therefore, the document should be used with caution. Jacques-René Boileau de Picardie was the *inspecteur général* and director of the Vincennes-Sèvres factory from 1751 until his death in 1772.

12. Ibid., F 1, *liasse* 7.

13. Ibid., F 2, *liasse* 2.

14. In Hellot's report to Machault d'Arnouville, dated 30 November 1752, he wrote: "The Saxon painter who escaped from Meissen and came to Vincennes last summer hoping to sell his colours found that all those he was shown were better than his own ... I think it is not impossible that we could seduce a worker from inside the factory, or introduce a clever spy there." (Ibid., Y 73.)

15. Ibid., C 3/2/2.

16. Ibid., C 3/1.

17. Ibid. "Little Poland" was a block of small houses in the Faubourg Saint-Honoré situated behind the Madeleine cemetery, between rue de l'Arcade and rue d'Astorg and abutting rue de la Pépinière (near the present-day Saint-Lazare station). Four years later, in 1759, a Sieur Le Roy let a furnished house with a stable and garden to Casanova. (See Jacques Casanova, *Histoire de ma vie*, ed. Francis Lacassin [Paris: Laffont, 1993], p. 147).

18. Ibid., C 3/2/b.

19. Ibid., C 3/2/2.

20. Ibid., F 2, *liasse* 3.

21. Ibid., C 3/1.

22. Ibid., C 3/2/10.

23. Ibid., C 3/2/11.

24. Additional biographical details about Macquer are contained in Chapter 2, note 2.

25. MNS Archives, Y 37. Jacques Dominique de Barberi, marquis de Courteille, was appointed by Louis XV as the royal representative (*commissaire du roi*) to the factory in 1751, a role he held until his death in 1767 when he was succeeded by Bertin.

26. See Chapter 2, note 9 for biographical information on Bertin.

27. MNS Archives, C 1/25.

28. Ibid., C 1/28.

29. Ibid., C 1/20.

30. Ibid.

31. See Bastian, note 4, who records the history of the Hannong family.

32. Régine de Guillebon, "Les Fourberies de Pierre Antoine Hannong à Sèvres, Vincennes, Vaux et Paris," *Bulletin de la société de l'Histoire de Paris et de l'Ile-de-France*, 113-114e année, 1986-7.

33. MNS Archives, C 1/25. Letter from Pierre Antoine Hannong dated 31 May 1760.

34. Ibid. Memorandum written by Deis (1768); and letter from Deis to Boileau dated 23 September 1761.

35. Ibid. Letter from Pierre Antoine Hannong to Bertin dated 13 July 1760. In this letter Pierre Antoine complains that his brother, Joseph, told lies about him to Boileau, though the intermediary of the Widow Lair.

36. Ibid. The connection is referred to in a note made by Bertin on the letter.

37. Préaud and Albis, *passim*.

38. MNS Archives, C 1/25. Letter from Courteille to Boileau dated 27 October 1760, and letter from M. de Nuit, Courteille's secretary, who wrote 'as for M. de Courteille's health, he is well, I would only like him to show a little more moderation at table, which he never will, and this causes real alarm on his account'.

39. Ibid., Y 37. Memorandum written by Millot.

40. Ibid. Letter from Pierre Antoine Hannong to Boileau dated 16 December 1760.

41. Ibid., C 1/21.

42. Ibid., C 1/23. There are numerous pieces of finely painted and gilded Frankenthal porcelain dating from this period.

43. Ibid., C 1/21. Letter from Joseph Hannong to Bertin dated 25 December (1760?).

44. Ibid. Bertin's comments on the above letter.

45. Ibid., C/17.

46. Ibid., C 1/16/b.

47. Ibid., C 1/18 and C 1/19.

48. Ibid.

49. Ibid., C 1/25. Letter from Boileau to Pierre Antoine Hannong dated 26 August 1761.

50. Ibid., C 1/26. Letter from Deis dated 17 June 1768.

51. Ibid., C 1/25. Letter signed 'Hannong' dated 27 August 1761. Jacques Bastian has suggested that this mysterious cousin may be Charles François Hannong (1734-88) who may have sided with Pierre Antoine in the family dispute.

52. Ibid., C 1/24. Letter from M. de Lucé, Intendant at Strasbourg, to Courteille dated 19 September 1761, explaining earlier events.

53. Ibid., letter signed 'Hannong' to Boileau dated 2 September 1761.

54. Ibid.

55. Ibid., C 1/25. Letter from the cousin who signed himself 'Hannong' to Boileau dated 19 September 1761.

56. Ibid., C 1/24. Letter from Lucé to Courteille dated 19 September 1761.

57. Ibid., Letter from Deis to Boileau dated 23 September 1761.

58. Ibid., C 1/16/A. Document entitled "Etat des dépenses faites à l'occasion des expériences du S^r Hannong commencées à la manufacture royale de porcelaine de Sèvres du 1^{er} octobre 1761 au mois de mai 1764".

59. Ibid. Detail of the expenses incurred by Sieur Luger, haulier.

60. Ibid., C 1/25. Letter from Pierre Antoine Hannong to Boileau dated 28 October 1761.

61. Bastian, p. 87.

62. MNS Archives, C 1/25. Sheet in Boileau's hand.

63. Ibid., Y 37. Memorandum written by Millot.

64. Ibid., C 1/25. Letter from Pierre Antoine Hannong to Boileau dated 8 December 1762.

65. Ibid., C 1/23. Letter from Boileau to (?) Bertin, undated, probably 1763. Boileau means that Hannong's porcelain was no better than Frankenthal's.

66. Ibid., C 2/13. "Secret de la porcelaine de Frankenthal donné par le Sr Pierre Antoine Hannong de Strasbourg." Erroneously dated 1 September 1753 instead of 1763. This mistake probably confused both Brongniart and Chavagnac and Grollier.

67. Ibid., C 2/23. Macquer's commentary on Hannong's document.

68. Ibid., C 1/16/A.

69. Ibid., C 3/5/b, June 1767, and C 2/16, Macquer to Montigny on 8 October 1767: "we have a good (porcelain) paste".

70. Ibid., C 1/25. Letter from Boileau to Parent dated 4 February 1765.

71. Ibid., C 1/17. Legal document dated 27 April 1765, copy dated 1 March 1776.

72. de Guillebon, p. 185. [MNS Archives, C 1/25. Letter from Courteille to Bertin dated 18 June 1765.]

73. MNS Archives, C 1/26. Document dated 20 June 1765 granting an annual pension to Sieur Pierre Antoine Hannong.

74. Ibid.

75. Ibid. Memorandum dated 28 August 1768.

76. Ibid., C 1/28. Memorandum from Hannong to d'Angiviller dated 21 January 1781. Although written by Hannong himself, this memorandum provides valuable evidence, which apparently is reliable, for the chronology of the tribulations he experienced in his dealings with the factory.

77. Paris, Archives Nationale, F¹² 1456.

78. Ibid. Information kindly communicated by Tamara Préaud. Darcet was in fact involved in the work carried out by Lauraguais. There is some doubt that 1758 is the correct date.

79. MNS Archives, C 2/14. Letter from Macquer to Courteille dated 28 April 1763.

80. Jean d'Albis and Céleste Romanet, *La porcelaine de Limoges* (Paris: Sous le Vent, 1980), p. 23.

81. MNS Archives, C 3/3. Letter from Busch to Boileau dated 1 December 1760.

82. Jedding, p. 85.

83. MNS Archives, C 3/4. Letter from the chevalier d'Aigremont to the duc de Praslin dated 10 June 1764; and letter from the duc de Praslin to Bertin.

84. Ibid. Letter from the chevalier d'Aigremont to Bertin dated 17 July 1764.

85. Ibid. Letter from the chevalier d'Aigremont to Bertin dated 19 July 1764.

86. Ibid. Petition from Busch to Bertin dated August 1764.

87. Ibid. Letter from Boileau to Bertin dated 23 November 1764.

88. Ibid. Letter from Bertin to Boileau dated October 1764.

89. Ibid. Letter from Boileau to Courteille dated 12 November 1764.

90. Ibid. Letter from Boileau to Bertin dated 8 April 1765.

91. Ibid., C 1/4. Letter from the Busch family dated 25 April 1765.

92. Ibid., F 15. Factory accounts for 1765.

93. See note 6.

94. Guettard, *Histoire de la découverte faite en France des matières semblables à celles dont la porcelaine de la Chine est composée* (Paris: Imprimerie Royale, 1765). Jean Etienne Guettard (1715 - 1786), member of the Academy of Sciences from 1743 and Keeper of the duc d'Orléans's collection.

95. comte de Lauraguais, *Observations sur le mémoire de Guettard concernant la porcelaine* (Paris, 1766).

96. MNS Archives, H 1. Letter from Hulst to Boileau dated 26 October 1751.

97. On September 19, 1765, Horace Walpole wrote that he had seen "some medals made in china, so hard that they would strike fire, they were made in the manufacture of porcelain of Count Lauraguais". (*Horace Walpole Correspondence*, Yale Edition, ed. W. S. Lewis, vol. 7, p. 262.) Information kindly supplied by Clare Le Corbeiller.

98. Alexandre Brongniart, *Traité des Arts Céramiques* (1844; reprint, Paris: Dessain et Tolra, 1977), vol. II, p. 503.

99. See note 76.

100. MNS Archives, C 2/14. Letter from Macquer to Courteille dated 10 February 1765.

101. Willem Constantine Ahlers, *Un chimiste du XVIIIe siècle, Pierre Joseph Macquer 1717-1784*, doctoral thesis, Ecole pratique des Hautes Etudes, VII section, 1969.

102. See notes 9 and 10.

103. Jedding, p. 126.

104. MNS Archives, C 3/5/b. Letter from Bertin to Courteille dated 19 April 1767.

105. Ibid., F 8. Factory accounts for 1766.

106. Ibid., C 3/5/b. Report by Macquer and Montigny on Nymphenburg porcelain.

107. Ibid. Letter from Montigny to Bertin dated 2 June 1767.

108. A. Fray-Fournier, "Document pour servir à l'histoire de l'industrie et des manufactures de Limousin. Lettre de l'Archevêque de Bordeaux à Macquer du 25 février 1767," *Bulletin de la Société Archéologique et Historique du Limousin* XXXVIII (Limoges, 1893). This letter was perhaps written in 1768.

109. MNS Archives, C 3/5/b. Letter from Bertin to Choiseul. Recorded in Bertin's office on 12 June 1767 it reads: "The minister has not signed this because a letter from Sieur Limprunn made it unnecessary".

110. Jedding, p. 182.

111. MNS Archives, C 3/6/A.

112. Ibid. Report from Montigny to Bertin dated 19 June 1767.

113. Ibid. Letter from Bertin to Boileau dated 1 September 1767.

114. Ibid., C 2/16. Letter from Macquer to Montigny dated 8 and 16 October 1767.
115. Ibid., C 3/6/b. Letter from Picot to Bertin dated 5 January 1768.
116. Ibid. Letter from Bertin to Picot dated 8 January 1768.
117. Ibid. Letter from Boileau, Macquer and Montigny to Bertin dated 19 March 1768.
118. Ibid. Letter from Picot to Bertin dated 22 March 1768.
119. Ibid. Letter from Bertin to Picot dated 28 March 1768.
120. Ibid. Letter from the marquis de Courtenvaux to Bertin.
121. Ibid., C 3/6/C. Letter from the marquis de Courtnevaux to Bertin, marked "urgent" in Bertin's hand in the margin.
122. Ibid. Letter from Gronsfeld to Bertin dated 10 July 1768 and Bertin's reply dated 19 August 1768.
123. Ibid., C 3/6/D. Letter from Gronsfeld to Bertin dated 10 April 1769.
124. Ibid. Letter from Bertin to Gronsfeld dated 2 September 1769.
125. Ibid. Letter from a lawyer to Parent dated 23 April 1770.
126. See note 108.
127. Fray-Fournier, letter from Bertin to the Intendant of Bordeaux dated 4 October 1768.
128. MNS Archives, C 3/9.

Chapter 2

THE DISCOVERY OF KAOLIN AT SAINT-YRIEIX¹

Hard-paste porcelain imported from China fascinated the West, which tried in vain for years to imitate it. At Meissen in Saxony the chemist Böttger was the first to understand the secret by discovering and using kaolin in 1708. France had to wait until 1767 when a chemist in Limoges identified this precious clay and hard-paste porcelain production began, ultimately supplanting that of soft paste.

In April 1757 Pierre-Joseph Macquer was engaged by the Sèvres factory.² His job, judging from his books of experiments, was to discover the secret of hard-paste porcelain. At the time it was thought that if kaolin existed in the natural state it would be enough to extract it directly from the clay pits in order to obtain a cheaper paste than that of soft-paste porcelain which required a long and costly preparation.³ In order to discover a formula for hard-paste porcelain Macquer had already conducted 1045 experiments by December 1760.⁴ He believed he had discovered first one process, then another.

In the meantime Jean-Baptiste Darnet, a surgeon from Saint-Yrieix, discovered an unusually fine white clay in the region, which he thought could be useful as fuller's earth for whitening laundry. He also found it very intriguing in other ways. He mentioned his discovery to an apothecary in Bordeaux named Villaris,⁵ an acquaintance of long standing. The latter recognised the nature of this mineral, identifying it as kaolin, but misled Darnet as to its importance: telling him that it was possible to extract '*l'eau forte*'⁶ from the mineral. He advised Darnet to keep the matter completely secret. In order to obtain some form of remuneration, Villaris informed his Archbishop who, in February 1767, sent a sample weighing 15 kilograms to Macquer.⁷ Macquer immediately made the necessary experiments and produced a small figure of an infant Bacchus in glazed hard-paste porcelain which he kept as a souvenir under a glass dome in his laboratory.⁸

A Phantom Seam

The factory expressed a desire to acquire the clay pit. Villaris asked for a reward which, in his judgment, was absolutely legitimate. Bertin, Secretary of State in charge of the

factory,⁹ agreed on the condition that a scientist from the factory should first check the importance of the seam in person. Fearing that he would never receive his reward if he revealed the whereabouts of the clay, Villaris retracted and let it be known that, under such conditions, he would not disclose the location of the mineral. Abruptly breaking off all talks, Bertin sent Macquer to Bordeaux with the task of ferreting out, in total secrecy, the seam which he believed to be in the neighbourhood.¹⁰

Macquer bought maps of the Guyenne area, a coach timetable, and hired a two-horse post-chaise. He left Paris on 23 August 1768 and arrived at Bordeaux on the 28th, accompanied by his servant Albin and his kiln-master Robert Millot. There he was able to confirm that negotiations with Villaris had been broken off. He visited all the mineralogical cabinets of the area and continued his journey towards Dax. He stayed there a month and, with the help of Millot, tested all the different white clays of the region, firing them in the kiln of a local locksmith. On his way he made friends with a fellow doctor named Camouti. This meeting was of considerable importance.

On 18 September Macquer informed Bertin that he had found a clay-bearing mineral close to the quality of the one discovered by Villaris, and on 10 October returned to Bordeaux. At the same time as Macquer presented the positive result of his researches to the Archbishop, Villaris, whom chance seemed to have guided to this area, made his own announcement. Seeing the specimens shown by Macquer, he was disturbed, became most conciliatory, and immediately offered to reveal his secret. On 24 October they all left for Saint-Yrieix arriving on the 28th. Guided by Villaris, they made their way, as Macquer wrote in his diary 'to ... discover ... in the narrow path which leads from this place to the town of La Roche l'Abeille, opposite the church, in the churchyard and cemetery of the parochial church of Notre-Damme [*sic*] de Noailles.'¹¹

They began to dig but the owner of the land, Gentil de la Faye, son of Madame de Montet, tried to stop them. Macquer then had to intervene and went to see the town mayor to inform him of the Minister's orders. He was able to extract two barrels containing 800 *livres* of clay, which he sent to Sèvres. On 4 November 1768 he wrote to his brother: 'The new clay is so white and so beautiful that one could kneel in adoration before it.'¹²

The discovery is made official

Returning to Paris, Macquer set to work and on 17 June 1769 was able to announce to the

Academy of Sciences a new hard-paste porcelain which was in no way inferior to Meissen. During his ninety-day journey, Macquer had changed horses no fewer than 212 times. The hire of his coach and coachmen cost 501 *livres*. [At this time one English pound was approximately equal to 24 French *livres*.] The total cost of his expedition amounted to 3,105 *livres*, for which he was reimbursed on 31 December 1768.¹³

Villaris received a fee of 15,000 *livres* and 3,172 *livres* in expenses. Montet's widow and her son were given 3,000 *livres* for rights of extraction of the kaolin. Parent received an annual salary of 1,500 *livres*, while the establishment's accountant, Sieur Deleviston, received a gift of 40,000 *livres* from the King on the occasion of his marriage with Miss Briaïs, the sister-in-law of Boileau, the factory's director. This sum being paid late, he had the gall to claim 1,860 *livres* in interest.¹⁴ Macquer and Millot received nothing; as for Darnet, who was the first to discover kaolin at Saint-Yrieix, he was nominated inspector of the quarry with the meagre salary of 600 *livres* per annum. However, for a number of years in the factory's account books he was called 'Monsieur le Chevalier Darnet de Saint-Yrieix.'¹⁵

The Sèvres factory deceived

One point remains obscure. When Villaris spontaneously offered to show where the kaolin was to be found, making it known that the king would give him what he wanted for his generosity, the other partners of this expedition were in Bordeaux. Macquer renewed his acquaintance with an old friend, Sieur Camouti, a doctor at the Court of Parma, whom he had met in Bayonne on the way to Dax. The latter, returning to Bordeaux, wished, or so he said, to return to Paris. Macquer, who had had two months of travelling and sixty evenings with Millot and must have exhausted every topic of conversation, proposed that Camouti should join them. Thus it was that Camouti, together with Villaris, went to Saint-Yrieix and gained knowledge of where the clay pit was to be found.

Shortly afterwards two young men went to visit Madame du Montet and offered to purchase her land. They left with a cargo of kaolin and then, on 13 August 1769 the Sieur de Laborde asked Bertin for support in his application for the privilege of establishing a hard-paste porcelain factory at Vaux.¹⁶ Macquer and the Sèvres factory had been overtaken at speed. What had happened?

One suggestion is that Villaris, who could already have known Camouti long before the discovery of kaolin at Saint-Yrieix, had remained in contact with him. Seeing his

negotiations with Bertin take a bad turn, and very alarmed at Macquer's arrival in Bordeaux, he could have warned his accomplice Camouti, who was also looking for kaolin. To follow a post-chaise at that time must have been very easy and so it is that Camouti could have set out in Macquer's footsteps.

He could have engineered a chance meeting with the scientist, sympathised with him in order to obtain his secrets, and warned Villaris that Macquer had discovered, or believed he had discovered, kaolin near Dax. This is one explanation as to why Villaris went to the archbishop at the precise moment that Macquer was showing the prelate the result of his researches.

Frightened that he would lose his reward from the King, Villaris could also then have envisaged selling his secret to Camouti. The best alibi would be that Macquer himself should invite him to share his carriage to Saint-Yrieix. Thus Villaris would never have been suspected. It seems that the stratagem worked as Macquer was strongly blamed for inviting Camouti to accompany him to the Limousin.¹⁷

Villaris might well have received a second reward from the partners in the Vaux manufactory, in addition to the 18,000 *livres* given him by the King. It is possible because, having already disgracefully cheated Darnet, another lie would make very little difference.

The Vaux manufactory in the Yvelines

The question of the Vaux manufactory deserves some attention. As a result of Régine de Plinval de Guillebon's researches we know that Pierre-Antoine Hannong built a porcelain kiln at Vaux in 1768 and that he worked in the establishment founded in the previous year by Jean-François Hocquart, son and brother of the *fermiers généraux*.¹⁹ The Hocquart brothers knew how to interest Jean Benjamin de la Borde, Louis XV's *premier valet de chambre*, in their project²⁰. He was the same de la Borde who in August 1769 had asked Bertin for the privilege of establishing a manufactory at Vaux.²¹ As a measure of his importance it is significant that de la Borde and Champlost, also a *premier valet de chambre*, were the only ones to accompany Louis XV to the funeral service for the marquise de Pompadour.²² de la Borde was also part of the very opportunist du Barry clan. Such a person, with an important following, very close to the centre of power and interested in porcelain²³ must have been aware of the discovery of kaolin in France and Macquer's mission, secret though it was. Through Pierre Antoine Hannong, was he behind

the idea of sending Camouti, a friend it seems of Villaris, to the area? Possibly. Did he simply think of profiting from the situation for his own manufactory, or was it a matter of court rivalry between him and Bertin? Whatever it was, it seemed that Villaris well knew how to profit from the situation and that Macquer was the innocent victim of a cleverly worked-out intrigue for which he had to bear all responsibility.

Notes to Chapter 2

1. This chapter first appeared *Dossier de l'Art* no. 12, *Porcelaine de Limoges du XVIIIe siècle à l'Art Nouveau*, May-June 1993, pp. 4-9. Some alterations have been made to avoid repeating material discussed in other chapters. It has been translated for the French Porcelain Society by Anthony du Boulay.

2. Pierre-Joseph Macquer, 1718-1784. Received *Docteur régent* at the faculty of medicine in Paris in 1742. *Associé ordinaire* of the Royal Society of Medicine. Lived in Paris, rue Saint Sauveur, with his brother Philippe, a lawyer, of whom he was very fond. Presented a paper to the Academy of Sciences, in chemistry, in 1744 at the age of 25. Elected *adjoint chimiste* to the Academy of Sciences on 5 April 1745. In 1748 he published *Les éléments de chimie théorique*, in 1751 *Les éléments de chimie pratique* and in 1756 his celebrated *Dictionnaire de chimie*.

Elected *associé chimiste* to the Academy in 1766 and *pensionnaire chimiste* in 1772. He became deputy director of the Academy in 1773 and director in 1774. He died the year before the commotion caused by Lavoisier about the theories of combustion and was not able to be among those scientists who abandoned "*La Phlogistique*", of which he was one of the last defenders.

Macquer cannot, therefore, be historically classed among "modern" scientists. According to his master, Le Beau, he had "an active spirit whose course was pure and exact, a wise inquisitiveness and a method which was applicable to everything." (Ahlers, *Un chimiste du XVIIIe siècle J.P. Macquer 1718-1784*)

3. In a report to the Minister of Finance, dated 7 October 1751, Jean Hellot, director of the Academy of Sciences, furnished some interesting information about Chinese porcelain manufacture: "The base price of the materials, and the low wages of the workmen, mean that Chinese porcelain will always have a very good market in the country, and I recently saw a cabaret of 38 large pieces, painted with the arms of the person who ordered it, which only cost 40 *livres*. While it was of much better quality than all those ceramics shipped by the European East India Companies, Vincennes porcelain is infinitely superior, both for its perfect whiteness and for the precision and taste of its painting and shapes." (MNS Archives, Y 71. Information kindly supplied by comte de la Panouse.) In comparison, on 24 July 1752 the marquise de Pompadour purchased "two cups and saucers of Vincennes [porcelain] painted with landscapes and birds" from the *marchand-mercier* Lazare Duvaux for 48 *livres*. Study of the factory's annual accounts shows that these pieces were sold at cost, their retail price would have been double that amount.

4. MNS Archives, Y 58.

5. Marc-Hillaire Villaris, Bordeaux 1719-1792. Sent to Paris at the age of 18 to continue his studies under Professor Rouelle at the *Jardin du Roi*. Having finished his studies, he joined the Hannover military campaign as an apothicaire aide-major. It was then that he formed his friendship with Darnet, surgeon to the prince de Conti's lifeguards.

He was received *Maître-apothicaire* on 30 August 1748 and elected to the Academy of Sciences, Bordeaux on 23 April 1752. He tried to participate in the creation of a botanical garden, opposed a process for the desalination of sea water and proposed a method for drying meat. He was supported in the latter by Mgr. de Lussan, archbishop of Bordeaux. He possessed a mineral cabinet. (Odile Cazaylus-Claverie, *L'apothicaire bordelais Marc-Hillaire Villaris (1719-1792)*, doctoral thesis, Bordeaux University II, 1990.)

6. The term "*eau forte*" should be understood as the alkaline soda used in the manufacture of soap and not the nitric acid used for engraving.

7. Fray-Fournier, vol. 2, p. 7. Letter from the archbishop of Bordeaux to Macquer dated 8 April 1769.

8. MNS Archives, Y 59. Report by Millot, undated.

This figure, now in the Musée national de céramique, Sèvres (MNC 1830) was partially destroyed during the Second World War; only the head remains. A photograph of the complete figure is illustrated in Emil Hannover, *Pottery and Porcelain, III, European Porcelain* (New York: Charles Scribner's Sons, 1925), fig. 480.

The figure was acquired by the museum in 1835 and is described as follows: "Small Bacchus pressing a grape in a cup of 0.075 mm [sic] in height glazed, made with the first French kaolin found by Darnet, surgeon at Saint-Yrieix La Perche, near Limoges in 1765." (A. Brongniart and D. Riocreux, *Description méthodique du Musée céramique de la manufacture Royale de Sèvres* [Paris, 1845], p. 314.) It cannot have been made before February 1767 when Macquer received the first shipment of kaolin.

9. Henry Léonard Jean-Baptiste Bertin, born circa 1719 in Périgord, died circa 1792. Lieutenant-general of police in 1757. Replaced Etienne de Silhouette as Minister of Finance in October 1759, a post he retained until 1763. In 1767 he succeeded Jacques Dominique Barberi de Courteille as the *commissaire du Roi* in charge of the Sèvres factory, the former having held the post since August 1751. In 1772 he appointed his clerk, Melchior François Parent, as Director of the factory, replacing Jacques René Boileau who had held the post since 1745 at Vincennes.

He was Secretary of State of the Council until Louis XV's death in 1774 and his department was in charge of, among other things, the King's personal finances. He contributed to the establishment of a number of agricultural societies and founded the veterinary schools of Lyons and Maisons-Alfort. He was an honorary member of the Academy of Sciences as well as the *Académie des Inscriptions et Belles Lettres*. As a collector he was interested in books and Chinese drawings. His correspondence with Père Amiot, a Jesuit in Peking, was published in 1776. In 1780 he was replaced by the comte d'Angiviller.



Plate I

Chocolate cup, Vienna porcelain

Inscribed on the rear: 'Vienna the 9th of November 1746. Fired three times.'

The painting, comprising thirteen colours, uses the palette of colours developed by C. D. Busch.

From Wilhelm Mrazek and Waltraud Neuwirth, *Wiener Porzellan 1718 - 1864*, Vienna: Museum für Angewandte Kunst, 1970



Plate II

Cup and saucer, Sèvres hard-paste porcelain, date letter N for 1766. It was probably made using the recipe of P. A. Hannong with kaolin imported from Passau or Lyons clay and calcined alum. The production of hard-paste porcelain using kaolin from Saint-Yrieix did not begin until 1769.

Sèvres, Musée National de Céramique, no. 22598.

Photography: Martine Beck-Coppola



Plate III

Detail of plate III

Both red and yellow coloured gold are evident.

The gold was probably of the type used for soft-paste porcelain as precipitated gold only began to be used in 1770.

Photography: Martine Beck-Coppola



Plate IV
View of the quarry of Beauvoir kaolin in Allier.
The Saint-Yrieix site must have had a similar appearance in the late 18th century which is why it is possible to site the 'Clos de Barre' excavations with some accuracy.

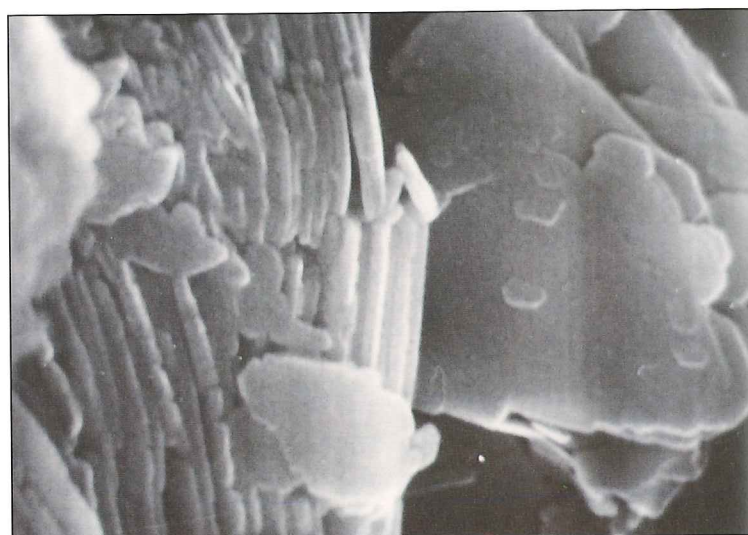


Plate V
A sample of kaolin magnified 30,000 times.
The distinct structure of thin plates gives the material its plasticity when combined with water.



Plate VI
Details of two pieces of the Marie-Antoinette service, Sèvres porcelain, 1784
The serving platter (background) is made of hard paste, while the plate (in the foreground) is made of soft paste. The platter and most of the serving pieces were made in hard-paste porcelain because of the better heat-resistant properties of the material.
Photography: Sotheby's, New York



Plate VII
Cup and saucer, Sèvres hard-paste porcelain, date letter AA for 1778
Marked in cobalt underneath: 286. 1. Δ (saucer) and 189. 1. Δ m (cup)
The ground colour is 'noisette' (hazlenut), one of the high-fired hard-paste ground colours. The decoration is in gold and silver (or possibly red or green gold which has oxidised). After firing, the silver was easily polished to a high sheen, but has tarnished over time.
Sèvres, Musée de Céramique, no. 23261
Photography: Martine Beck-Coppola

Plate VIII
Plate, Sèvres hard-paste porcelain
An example of the brown tortoiseshell ground colour. The appearance of the ground colour is light and somewhat greenish after firing and only gains its warm tones after enamel firing. The difference in colour can be seen on two large *Cordelier* vases in the Louvre, only one of which was re-fired at the lower temperature.
Sèvres, Musée National de Céramique, no. 12829
Photography: Martine Beck-Coppola



Plate IX
Cup and saucer, Sèvres hard-paste porcelain
Black ground colour which also needed re-firing at lower temperatures to achieve depth and opacity of colour.
Sèvres, Musée National de Céramique, no. 22952
Photography: Martine Beck-Coppola



Plate X
Garniture of three vases, Sèvres hard-paste porcelain, 1779
Decorated by Dieu, Schradre and Vincent
The lapis ground colour was achieved by applying the ground colour in an irregular fashion and combining it with white lines resembling veins.
Geneva, Musée de l'Ariana

Plate XI
Tea pot, Sèvres hard-paste porcelain
Agate-blue ground colour which, according to Regnier, was achieved by reducing the proportion of blue colour to the glaze which necessitated a much finer grinding of the coloured powder than with the *Bleu du Roi*. It is likely that the colour was dabbed on with a brush, rather than sieved onto the mordant.
Sèvres, Musée National de Céramique, no. 13212
Photography: Martine Beck-Coppola



Plate XII
Figure of Juno, coloured hard paste
Adding a colour to the paste changes its fusibility, causing different degrees of expansion and shrinkage in the two pastes, as well as deformation in the kiln and cracks upon cooling. Sèvres was not able to rival Wedgwood's technique until 1778.
Sèvres, Musée National de Céramique, no. 1839
Photography: Martine Beck-Coppola

10. J. d'Albis and Romanet, pp. 24-9.

11. MNS Archives, Y 59. Monsieur Bournazel, an inhabitant of Saint-Yrieix and historian of the town, confirms that this description corresponds to the spot called "Le clos de Barre", which can still be indentified. On 27 May 1769, Villariz stated before Maître de Valette, a royal notary, that the land belonging to the widow Gentil du Montet and her son Gentil de la Faye, situated at a spot called "Close de Barre" had been purchased on behalf of Louis XV. The site is further confirmed on 28 January 1770 by deed before Maître de Valette, by the Sieur Darnet concerning the discovery of kaolin on "Claud [sic] de Barre". The author thanks M. Bournazel for having communicated this information. (See: Dr. Escorne in the account of the 5th Congress of the Société Gay-Lussac which appeared in *L'arbre et l'eau*, Limoges, 1911.)

12. Fray-Fournier, vol. 2, p. 5.

13. MNS Archives, F 10.

14. Ibid, Vf 21, accounts for 1772.

15. Ibid, Vf 20, accounts for 1772, f. 27 (outgoings). Mr le chevalier Darnet is recorded from 1 July 1770.

16. J. d'Albis' and C. Romanet, p. 28.

17. Fray-Fournier, vol. 2, p. 7.

18. Now the commune of Vaux sur Seine, Canton de Meulan, département des Yvelines.

19. In his letter to Macquer, dated 29 September 1769, the archbishop of Bordeaux confirmed that the two young people who, alerted by Camouti, visited Madame du Montet in order to purchase her land were in fact the Hocquart brothers. In another letter, however, written nearly six months earlier and dated 8 April 1769, he suggested that the two young men could have been sent by the comte de Lauraguais.

20. Plinval de Guillebon, pp. 190, 191, and 209-213.

21. Jean Benjamin de la Borde (1734-1794). *Fermier général* from 1757 to 1762 and from 1775 or 1781 to 1791. Governor of the Louvre and *receveur général des Finances*, member of the Lodge of Fidelity of the Grand Orient of Paris. He was the author of historical essays and of a number of songs. He composed music for operas and comedies by Marmontel. When Louis XVI came to the throne he was dismissed from his post as *premier valet de chambre* to the King for siding with the du Barry clan. His wife was adept at ingratiating herself with Marie-Antoinette, for which she was reinstated as a *Dame du Lit*. In his *memoires* Dufort de Cheverny describes him as follows: "A well-informed man, a great musician, happy and noble in his dealings, friendly company and of a pleasant and delightful appearance." (Jean Pierre Guicciardi, *Mémoires de Dufort de Cheverny* [Paris: Perrin, 1990], p. 89.) A collector, he owned works by Fragonard, Hubert Robert, Greuze

and Teniers. He had more than 25,000 volumes in his library, which were destroyed when his house burned down during the troubles of 10 August 1792. Rameau was his music teacher and he was a friend of Voltaire. During the Revolution he took refuge in Rouen but was found out and guillotined on 22 July 1794. (Yves Durand, *Les Fermiers Généraux au XVIIIe siècle* [Paris: P.U.F., 1971], pp. 521-2.)

22. Michel Antoine, *Louis XV* (Paris: Fayard, 1990), p. 824.

23. On the death of Boileau, de la Borde put himself forward as director of the Sèvres factory, but Bertin was able to install his clerk, François Parent.

Chapter 3

THE BEGINNING OF HARD-PASTE PORCELAIN PRODUCTION AT SÈVRES¹

More than two months after he had left Sèvres, on 23 August 1768, Pierre-Joseph Macquer set out from the Auberge Sainte-Catherine at Limoges and, after four days journey, reached Paris, where he shared an apartment with his brother in the rue Saint-Sauveur. Macquer was very pleased with himself. Thanks to an innocent and probably unwitting trick he had managed to force Villaris to take him to the Saint-Yrieix site. At Pouillon, near Dax, Macquer discovered a white kaolinic clay² which, with Millot's assistance, he fired in the forge of a locksmith named Sainte-Marie, at a cost of 18 *livres*.³ These trials appeared conclusive and on 4 October Macquer wrote from Dax to Bertin to announce, somewhat prematurely, that he had found a quarry containing clay 'of sufficient quantity for the use of the manufactory'.⁴ After Villaris agreed to show him the Saint-Yrieix site, Macquer sent off some 800 *livres* of the kaolin, which proved to be the finest in Europe and was to be the glory of the French porcelain industry for the next 150 years.

Absorbed as he was by his scientific quest, Macquer was unaware of the machiavellian machinations between Camouti and Villaris. His only aim was to develop hard paste for the royal manufactory and present an historic paper to the Academy of Sciences. With the benefit of hindsight, we can now examine the reasons which motivated so many important figures of the period to become excited about hard-paste porcelain.

Motivations

By 1752 Vincennes soft-paste porcelain had succeeded in surpassing all its hard-paste rivals. This was due not only to its chemical formula but also to the factory's ability to call upon the finest artistic talents, whatever the cost. Despite this, there existed a movement for change, both at court and at the ministry, which intensified in 1754.

The characteristic sinking of the painted decoration into the lead glaze of soft-paste porcelain was aesthetically pleasing, the alkaline ground colours were striking in their

brightness and the gilding was superb, but decorated and gilded soft-paste porcelain was, and remains, fragile. It can be easily scratched, the gilding can wear, and it does not withstand sudden changes of temperature.⁵ Hard-paste porcelain is undeniably more resistant to scratching.⁶ It expands less as it heats up and is, thus, better able to withstand thermal shock. It has to be admitted, however, that elaborate gilding and hand-painted decoration is, nevertheless, fragile on eighteenth-century hard-paste porcelain.

Another factor plays an important role. Preparation of the paste for soft-paste porcelain is much more expensive. As already discussed, the materials for hard paste, including transportation charges, cost one tenth of the price of materials for the same quantity of soft paste. It was, therefore, supposed that hard-paste porcelain could be produced more cheaply, although that proved to underestimate the higher cost of modelling.

The scientific aspect is also far from negligible. If this mysterious porcelain could be made in the Far East, Germany, Italy and Holland, then why not also in France? That this was a major consideration is confirmed by the public incidents caused by the comte de Lauraguais.

Furthermore, painted decoration on hard-paste porcelain often appears matt as it shines somewhat less than decoration on soft paste. This was considered a fashionable feature with the emergence of the neo-classical style as it resembled the surfaces of archaeological objects.

Perhaps the most significant factor was that soft-paste porcelain was judged to be false and artificial, in contrast to hard-paste porcelain which was deemed to be natural as it was taken directly from the ground; in keeping with ideas advanced by Rousseau. On 15 April 1769 the Archbishop of Bordeaux wrote to Macquer:

All our fine antique porcelain will fall from grace as I can see that the fine colours and grounds do not look so well on good [hard-paste] porcelain as on the one made at Sèvres [soft paste]. This porcelain is comparable to stucco imitating marble. One may make pieces which shine brighter than marble, jasper and porphyry but the fact remains that nature is preferable to artifice. I know that for myself I am of this opinion and that I would prefer simple fine white porcelain to the most beautiful examples of frit [soft paste].⁷

It seems extraordinary that an archbishop should be so forgetful of his spiritual mission as to describe nature as 'good' so as to get on at court and with Bertin. All Macquer needed

to do was to perfect hard-paste porcelain because it was made of 'earth' rather than 'salts' and it would, therefore, be 'good' and 'natural'. This mission was to take some time as he was starting from scratch and had to develop the paste, the glaze, the colours, the gilding, the kilns, the firing and the kiln supports.

Kaolin

The 1769 contract giving Louis XV the right to extract kaolin from the site called 'Le clos de Barre' also specified that the king promised to refill the excavations after extraction. The kaolin lay under more than 2.5 metres of topsoil which had to be removed carefully before the white mineral was unearthed. One wonders by what chance Madame Darnet, if indeed it was she as tradition will have it, came to dig such a deep hole.⁸

Darnet was full of righteous indignation at having been defrauded by Villaris of 18,000 *livres* for a discovery that he had made. Five months after Macquer's arrival, he still believed what Villaris had told him, namely that this earth was to be used to make potash.⁹ It was a humiliated and embarrassed Darnet who came to Paris to see Boileau and demand justice.¹⁰ Boileau reassured him that he would not be forgotten and wrote to Bertin explaining the situation in diplomatic terms.¹¹ As a result Darnet was put in charge of the 'excavation, washing and transportation of the kaolin for the Sèvres manufactory.' As early as May 1770, 24 *milliers* of clay, approximately 12 tonnes of untreated mineral, were sent in 36 crates of more than 300 kilograms each to Montignac. From there they travelled by ship on the Vézère and Dordogne rivers, then by sea from Bordeaux to Le Havre, and finally via the Seine from Rouen to Sèvres, an operation which cost 1,000 *livres*.¹²

In a detailed report Boileau explained to Bertin that it was vital to wash the kaolin at the excavation site to avoid incurring unnecessary transport costs: '... this is essential as half of the last shipment of 30 *milliers* is useless...'.¹³ Boileau, recalling his promise to Darnet, also recommended that '... this operation should be entrusted to someone living at the site...'.¹⁴ At Boileau's suggestion, Bertin sent Millot to the Limousin to initiate the operation. Millot undertook the journey in early July 1770 and was well received by Darnet, in whose house he stayed.¹⁵

In his customary manner, Millot took control of the situation with competence and authority. He did not plump for the house suggested by Darnet, but for another, which could more easily be transformed into a workshop. It consisted of a large storeroom where

the washing took place and of a well-ventilated and sunny upper floor where racks were installed to dry the purified clay.

Kaolin is made up of small, flat, translucent crystals which slide on each other when wet. This causes the plasticity that is an essential element in the modelling of a porcelain paste. When the water content is dried off, the pieces become sufficiently solid for final treatment such as retouching and turning.

Kaolin is naturally formed by decaying granite, as is the case at Saint-Yrieix. As a result of millenia of damp conditions and variations in temperature, granite breaks up and decomposes into kaolin particles which remain in place, mixed with fine gravel. It needs to be soaked in water to separate it from the gravel. The kaolin goes into suspension, creating a creamy solution while the gravel sinks to the bottom. The resulting liquid, or slip, is poured off into a separate container. The kaolin particles slowly settle to the bottom and the water is then drained off and the mineral dried.

Millot installed three large washing-tubs in the workshop. Water was piped in from a well in the garden thirteen metres away. He ordered a new pit, five metres in diameter, to be dug. Under two and a half metres of brown topsoil lay the kaolin. Millot wrote that 'this clay is very white but extremely sandy in places and problematic. I nevertheless believe that it will produce about half its mass. I already have in our store nearly 40 milliers of clay which we are vigorously washing.'¹⁶

After having taught Darnet every detail of the operation, Millot returned to Paris. His journey had cost 1,200 *livres*.¹⁷ As a result, the surgeon from Saint-Yrieix was placed in charge of the extraction, washing and dispatching of kaolin. He performed his duties well and his first batch of kaolin was sent off in 1772. From then on the kaolin was sent not by water but overland, and the carriers were responsible for the various customs duties which had to be paid along the way.

In 1778 complaints were received from Sèvres that the kaolin had not been sufficiently refined. The chemist Dufour, who had just started working at Sèvres, noted that two workmen were constantly employed in washing the kaolin from which they discarded a quarter of the mass which was made up of fine sand.¹⁸ In the margin of Dufour's letter Bertin noted: 'A good point made by the Sieur Dufour'. Also in 1778, Darnet's involvement ceased; he either retired or was sacked.¹⁹ In his place the factory employed

the Sieur Saint-Martin and, from 1781, the Sieur Bordas.²⁰ In 1787 François Alluaud took over and continued to supply the factory for many years.²¹

The factory's account books show a continuous increase in the quantities of kaolin being processed between 1768 and 1788, with a sharp rise from 1780.²² It is difficult to cite precise figures as the official in charge paid for the purchase and transport of kaolin in quantities that are difficult to define, such as cases or barrels. Nevertheless the following sums were spent on salaries, excavation, washing or refining and transport: 2,900 *livres* in 1772, 2,000 *livres* in 1774, 3,600 *livres* in 1776, 4,048 *livres* in 1781 and 3,862 *livres* in 1784. These may represent quantities of between 7 and 15 tonnes per year. In 1787 there seems to have been a sharp rise in the kaolin supplied as 7,900 *livres* were paid for transport alone and nearly 10,000 *livres* were paid to Alluaud, who appears to have been a businessman of uncommon ability. Perhaps strategic reserves were made in that year as the kaolin was of exceptional quality.

The quality of kaolin seems to have varied greatly. On 2 June 1781 Antoine Regnier, the factory's director from 1778, noted in a letter that: 'One can vary the tone of the whiteness and of the beauty of the hard paste by the choice of kaolin from Saint-Yrieix. The whitest and the purest makes a porcelain of an excellent whiteness and beauty.'²³ In reference to an experiment, he wrote: '... the white clay used for process 128 is extremely rare and is found only in small quantities in the quarries at St Hirier'.²⁴ Differences of this sort in the quality of the raw material are visible today in Sèvres eighteenth-century hard-paste pieces, which vary in whiteness and translucence according to the quality of the kaolin itself.

The Kiln and firing problems

From 1757 to 1761 Macquer conducted over 1,000 experiments with hard paste. These were carried out in a kiln described by Millot: 'Mr. Macquer, named by the King to succeed Mr. Hellotte [sic] of the *académie des sciences* has instructed me and Toussaint the mason to build a kiln in the pavilion of the *petit bois*; in this kiln we fire hard-paste porcelain samples very well in less than an hour ...'²⁵

One of the major differences between hard and soft paste is that the latter needs to be maintained at its maximum firing temperature for several hours in the biscuit firing stage, while hard paste must not, under any circumstances, be left for more than a few minutes at its firing temperature, otherwise the quality of the glaze is irremediably damaged.

Macquer and Millot fired hard paste for an hour, which is the norm in today's industrial kilns, while soft paste was maintained at a high temperature, necessary to enable the chemical reactions between the different components of the frit to take place.²⁶ The resulting biscuit is then of an homogeneous structure, ready to receive the lead glaze which is fused onto it in a subsequent firing.

In 1751 Hellot noted that the biscuit firing of soft paste lasted between three and a half and five days, depending on the weather.²⁷ This meant that in a primitive rectangular kiln, with one source of heat, an even firing could be achieved whether a piece was near the source of heat or not.²⁸ It would have been out of the question to fire hard paste in this manner.

The Germans had solved this problem, first at Meissen and then at other factories, in an ingenious manner. Different compositions of pastes and glazes were made respective to their proximity to the source of heat within the kiln.²⁹

Macquer conducted his first experiments, in December 1768 or January 1769, in a kiln which was probably rectangular or square, with the source of heat on one side and the flue on the other. Six months later, on 17 June 1769, he was delighted to be able to read a *mémoire* to the Academy of Sciences on: 'a new kind of porcelain which combines the most desirable qualittes, those of strength and beauty.'³⁰ In support of his claims Macquer presented, 'jointly with Mr. de Montigny', several vases of a new porcelain made at the royal factory. After having explained that soft paste was a porcelain of very inferior quality to that from Japan, China, India, Saxony and the other German states, or rather that it was merely a material which imitated the exterior beauty of true porcelain but which was nowhere near it in strength, Macquer recounted the history of the discovery of kaolin, paid the appropriate compliments to the King, to Bertin, Boileau, Montigny, the Archbishop of Bordeaux, Millot and even to Villaris. Without divulging technical details, he stressed the facts that the porcelain contained no frit, that it was made exclusively from ingredients found in France, that it was worked easily, that once fired it was of the same hardness as stone, that it could be used for crucibles to vitrify any frit porcelain and that it was resistant to sudden changes in temperature. Furthermore, '... its whiteness and semi-transparence were at least the equal in beauty to porcelain from Japan, Saxony and of all the finest made hitherto...'. He also stressed that it was now necessary to build a kiln suitable for the firing of hard-paste porcelain, so that 'the King's factory should be able to produce this porcelain in commercial quantities'.

His colleagues at the Academy, Jussieu and Duhamel du Monceau, were placed in charge of conducting experiments on some samples in order to verify Macquer's claims. On 1 July, they delivered their conclusions.³¹ They confirmed the exceptional resistance of the new porcelain to thermal shocks. They had poured boiling water into cups without breaking them. They boiled water in another cup by placing it among red-hot coals, after which they threw it into cold water without it breaking. 'One may conclude,' said the scientists, 'that this new porcelain will be resistant to the highest heat of coffee, chocolate and soup, which is all that one can legitimately expect.'

They placed a cup into a forge; when it was red hot (and undamaged) they removed it and threw it into cold water. As it was floating, small cracks appeared on the edge. They, therefore, brought a saucer to red heat and, when plunged into boiling water, it suffered no damage whatsoever. In the same saucer, they melted butter and fried an egg, then poured on cold vinegar, causing a small crack to appear.

Jussieu and Duhamel du Monceau subjected a cup to a severe test. They used it as a crucible to fuse lead glaze. Once again, 'good' porcelain emerged unscathed. Their conclusions were extrememly positive. The scientists concluded '... the work done on this porcelain will enable it to be manufactured at a reasonable cost.'

In the meantime Bertin's clerk, the ambitious Parent, had seen a plan designed by Guettard for a circular kiln with four sources of heat. Parent wrote a memorandum which justifiably sang the praises of the circular kiln when compared to the rectangular kiln with a single source of heat.³² The firing problems of hard paste were solved by this kiln: in a restricted space fed by four sources of heat, the firing proceeded in a stable and uniform manner. It was no longer necessary to raise the temperature in prolonged stages which resulted in damage to the hard-paste glaze. Parent, who was hoping to become director of the factory after Boileau, sent his memorandum to Bertin who immediately passed it on to the factory.

So as to be certain of maximum publicity for his ambitions, Parent entrusted his report and his plan to the comte de Milly, who published it in his book, entitled *L'Art de porcelaine*, in 1771, just one year before Boileau's death. In the preface to his book, the comte de Milly makes reference to Parent's report, commenting that it was: 'written by a talented man, connected to the Sèvres factory, who is concerned with encouraging the successful progress of the arts.'

Construction of the circular kiln proceeded at Sèvres simultaneously with experiments carried out in the square kiln. On 2 October 1769 Boileau wrote to Macquer to confirm the uneven temperatures in the old kiln:

Always the same operation, Sir, and the same result; except that our kiln is less hot above than below. The case of samples was the only one to begin fusing; the flatware is never as beautiful and is always covered with small blemishes. We are only failing on account of the quality of the refractory clays; the porcelain is fine, beautiful and I believe it to be successful ... I have fired a cup with gilt lines to see if there are still black stains. It has come out well. Consequently, I will fire two large ones this afternoon along with a sugar bowl for the Archbishop of Bordeaux.³³

In late October Macquer announced that the new kiln was ready:

I have seen the results of the firing in the circular kiln with three sources of heat, and I have compiled an inventory of all the pieces, so as to be able to give you a precise account. This kiln has performed well, the temperature has been even and sufficiently high to produce a fine whiteness, a good translucency and a shine to all the pieces with the new glaze; there were 47 pieces in all: 3 teapots, two water jugs, three sugar bowls, a sauceboat, a large plate (in the Saxon style), three small plates (in the Chinese style), an *ecuelle* and its tray, a saucepan, 12 cups of the same shape with handles, 20 saucers, a figure of Bacchus. The firing lasted 28 hours in all, but here is the chapter of the accidents which, as you well know, never fail to occur. One support has sagged and this has affected not just one pile but also the neighbouring ones. Overall although the firing itself was perfect more than half the pieces are faulty ... Thursday ... I will see the outcome of a firing consisting of 3 coffeepots, a water jug, 2 teapots, a covered *ecuelle*, 2 very large bowls, 2 small plates *modele des Indes*, 3 sugar bowls, a saucepan, 15 cups with handles and 15 saucers, a total of 45 pieces.³⁴

In early November 1769 Macquer wrote again to Montigny:

We have now decided to dispense with the square kiln and replace it with a second circular kiln on the same principles as the preceding but which will be 6 pieds [2 metres] in diameter if possible, and which will accomodate five or six hundred pieces. This new porcelain is so good that despite the accident of the square kiln, of about 45 pieces in the last firing 35 are fine ... The second and last firing of which I saw the outcome yesterday took place in our good circular kiln. It is marvellous; of 40 pieces, 36 came out perfect ... Mr. Boileau seems to be happier about our new porcelain; upon seeing the success of this firing he kissed Millot on both cheeks in front of me.³⁵

The circular kiln appeared most satisfactory. Parent, to further his own career, publicised this event as much as possible. The porcelain factory founded in Limoges in 1771 by Grellet, Massier and Fournierat asked Turgot, who at the time was the Intendant of the Limousin but who was shortly to become Minister of Finance, to try to obtain the plans of the kiln. Bertin responded in an evasive manner to the request, claiming that the kiln was still in the experimental stage and was continually being substantially altered. He did not fail, however, to inform Turgot that the plans of the kiln had been supplied by '... a talented person in his employment'.³⁷ Turgot must already have been an influential person for Bertin to feel the need to prepare the ground with him for naming Parent director of the Sèvres factory. Bertin took Macquer into his confidence and must have authorised him to communicate the plans, since on 1 June 1771 he gave Turgot a positive answer.³⁸ When Boileau died in 1772, Parent seemed the natural choice to succeed him, on account of Guettard's kiln. His tenure as director, however, was to be short-lived as a result of his unscrupulous handling of the factory's finances.

By the end of 1769 at least two hundred pieces of hard paste had been successfully produced at Sèvres and Macquer had triumphed. On 29 December, the feast of Saint-Thomas, he accompanied Montigny to present his discovery at Versailles during the annual exhibition of Sèvres held at the château. It was to be a long and memorable day for him. He spoke to the king for more than two hours.

... On a special table was the new porcelain all white and gold; about sixty pieces all very beautiful; while we were looking at them, the King came in alone ... three coffeepots of our porcelain filled with water were placed on a fire and brought to the boil without damage. There was also a saucepan of our new porcelain which was on a spirit lamp and which broke as the water was coming to the boil, at which point His Majesty burst out laughing and stepped backward two paces, looked at both of us and said, 'Messieurs, Messieurs'. After that he left to go to Mass, which we attended as well ... I very much wanted to have the opportunity to see the King once more to explain to him the reason for the accident and repeat the experiment with a handleless saucepan ... We showed him another saucepan boiling away on the same spirit lamp, the King examined it for a while and seemed satisfied ... Madame du Barry and everyone else appeared appreciative.³⁹

Dufour's twelve notebooks

Twelve notebooks of experiments, some of which describe more than 200 trials, are preserved in the Sèvres factory archives.⁴⁰ These are seldom dated but appear to record a considerable

amount of work, probably dating from 1773 to 1778. These notebooks, the titles listed below, will be referred to in connection with each of the subjects discussed subsequently.

1. Trials for the paste of hard-paste porcelain (203 trials)
2. Hard-paste glazes (76 trials)
3. Coloured hard pastes (242 trials)
4. Coloured glazes for hard paste (65 trials)
5. missing
6. Porcelain imitating lapis lazuli (82 trials)
7. Blue grounds (126 trials)
8. Materials (42 trials)
9. Colours (96 trials)
10. Vitrification and flux (60 trials)
11. Whites and repairs (66 trials)
12. Experiments (10 trials)
13. Feldspathic stone (9 trials)

The manner in which these notebooks were kept bears witness to the sort of inventive, methodical and perservering mind necessary for such research. They are countersigned by Macquer and another hand, probably Montigny's. Unfortunately, however, they do not provide any clues for the dating of such important discoveries as the technique of cameos on a coloured ground or the elaboration of ground colours.

Upon Parent's dismissal and Regnier's appointment as director in 1778, the comte d'Angiviller ordered that official records be made of the chemical processes employed at Sèvres. These were produced from March to July 1781.⁴¹ The intention was to prevent important manufacturing procedures from becoming the personal property of individuals. The records are not as precise or detailed as the ones for which Hellot had been responsible in 1751-52,⁴² nevertheless they are dated and specific. The following pages are based on these reports, as well as on the twelve notebooks and other documents in the C series of the Sèvres archives.

The Paste

On 2 June 1781, in accordance with d'Angiviller's instructions, Regnier, in collaboration with Millot and his assistant Dufour, consigned to paper the various processes and recipes

for hard-paste porcelain in use at the Sèvres factory.⁴³ The paste was made of the following ingredients:

washed clay from Saint-Yrieix	24 parts,
sand from Aumont near Senlis	7 parts,
washed chalk from Bougival	3 parts,
and fine feldspathic sand precipitated in the refining of the clay from Saint-Yrieix	3 parts.

This composition is recorded as trial number 110 in the notebook number 1. The formula is closely related to that supplied by Pierre Antoine Hannong on 1 September 1763. Half of each of the three pages in which these trials are recorded have been torn out by what was probably a spiteful and vindictive hand. One can, however, still read in the margins next to trial number 91: 'this process makes a very fine porcelain, it seems to need a little more vitrification', for trial number 101: 'very fine but a little harsh', and for number 110 simply: 'very fine'. Unfortunately it is difficult to date these experiments but it is probable that the final formula (number 110) was achieved in 1778, as paste number 107 mentions the use of an experimental glaze from that year (notebook 2).

From 1774 a special paste was developed for sculpture,⁴⁴ as confirmed by a note in the archives.⁴⁵ It seems likely that soft-paste sculpture was not made after this date, possibly because it would have been of a different whiteness.⁴⁶ Earlier trials with hard-paste sculpture are also recorded. The account of the removal of pieces from the kiln on 24 December 1772 states that: 'The figures in this hard-paste trial have been much appreciated by the public, the whole Court and even the King who was enthusiastic about it when he was shown it on St. Thomas's day. Today M. Parent has ordered that from now on all figures are to be of hard paste.'⁴⁷ In the same register Millot recorded the results of the firing which ended on 15 October 1772: 'The Pygmalion is perfect, but the Castor and Pollux is rather red. We have tried to put a very light glaze on the biscuit figures, they have been particularly successful and the glaze has not harmed the crispness of the features.' He added this surprising statement: 'A lilac flower among others is covered with such a light glaze that one can apply any colour on it.' This would indicate that Sèvres produced hard-paste flowers in the eighteenth century. The flowers modelled by Joseph Humbert after 1780 may, therefore, have been of hard paste.

The formula for hard-paste sculpture, as recorded in the June 1781 report, was composed of:

washed Saint-Yrieix clay	23.1 parts,
sand from Aumont	7.0 parts,
washed chalk	2.3 parts,
and fine feldspathic sand	4.6 parts.

This mixture may have been softer than the paste used for other products. The paste consumption register confirms this: 'sculpture, including biscuit, was made of the same paste which was employed for ordinary wares, but the biscuit made with this paste was not sufficiently pleasing to the eye, not fine or shiny enough and became dirty easily, so we have conducted experiments to find a more perfect paste.'⁴⁸

In 1777 and 1778, and then in small quantities in 1781, a new paste was employed known as *pâte girasol*.⁴⁹ The paste consumption register defines it in the following manner: 'The paste known as garesole [*sic*] because of its resemblance to this material and because it becomes extremely vitrified in the hard paste kiln. This paste has only been sparingly used to date because of its low fusibility and all we have made with it are medallions.'⁵⁰ This paste is similar to the Parian ware produced by Copeland some fifty years later. The June 1781 report records its composition:

washed Saint-Yrieix clay	23 parts,
sand from Aumont	5.8 parts,
washed chalk	2.4 parts,
and fine feldspathic sand	5.8 parts.

The three different hard-paste formulas were crushed in water in a mill for ten days. Particles of sand or feldspath which had not been reduced to a fine enough consistency were crushed again and added to the remainder. After settling the slip was hardened in plaster moulds.⁵¹ In his 1781 report Regnier records that when the paste was dry enough it was possible

to knead it and work it until the mixture is absolutely homogenous. The more it is kneaded and worked and kept the better. This paste is very pliable and can be shaped on the lathe and in moulds without any further additions ... this porcelain is fired in two stages, it has a first low temperature firing which renders the pieces firm enough to receive the glaze. This is known as *dégourdi*.

The first *dégourdi* firing for hard paste, at 900 degrees centigrade, was a low- temperature one. In this state it was sufficiently solid and porous to be steeped in a glaze bath. Paste and glaze were then refired at a high temperature between 1,350 and 1,400 degrees. Soft-paste porcelain, in contrast, had its first firing at a high temperature (about 1,200 degrees centigrade). It emerged with its final qualities, whiteness and translucence, and was then covered in glaze for a simple fusion firing at 900 to 1,000 degrees centigrade.

The Glaze

The register of glaze trials (notebook 2) notes 76 experiments which are all methodically undertaken variations. Macquer's clear mind may perhaps be recognized in this method, but that is not to say that he was its author.⁵² Like the paste formulas, those for the first hard-paste glazes used at Sèvres were heavily inspired by those supplied by Pierre Antoine Hannong in 1763:⁵³

	<u>Trial no. 18 (Sèvres)</u> ⁵⁴	<u>Hannong formula</u>
crushed hard-paste sherds	49%	44%
sand	41%	44%
chalk or whiting	10%	12%

This formula was used until 1778, with only minor modifications:

crushed hard-paste sherds	48%,
sand from Fontainebleau	40%,
washed clay from Bougival	12%. ⁵⁵

Regnier's official account of 2 June 1781 describes the process as follows: 'the components are mixed and crushed in a mill; when one wants to apply it to pieces it is dissolved in enough water so that a piece of porcelain which has had a *dégourdi* firing, when dipped in it, emerges with a coating no thicker than a sheet of paper. When the liquid is of this consistency all the pieces are dipped into it one after the other.'

From trial number 41 a new and strange experiment was attempted. To this day, it has been responsible for the enduring quality of Sèvres hard paste. In a complete break with Meissen-inspired recipes brought to Sèvres by Hannong, which consisted of hard-paste

sherds crushed with quartz and chalk, trial number 41 attempted to use pegmatite, a naturally occurring mixture of feldspar and quartz, found in the sand washed out of kaolin.⁵⁶ Thus, for trial number 43, the notebook states that 'no. 43 is very fine, at every temperature, the glaze becomes and remains shiny, this was checked once more after a firing in which there were a large number of pieces with this glaze on 25 June 1778.' The process was improved by the use of pegmatite from Saint-Yrieix, which was sent specially by Darnet.⁵⁷

This material combines perfectly with eighteenth-century hard paste. It is still employed today and is one of the cornerstones of the exceptional quality of Sèvres hard paste as it has the advantage of reacting very little with the paste in the firing; this allows it to be applied very thinly and, therefore, transparently, and without obscuring even the most finely modelled work.⁵⁸ In his official account of 1781 Regnier notes that: 'this finely ground feldspar makes a very fine glaze for hard paste on its own. It is applied to this porcelain in the same manner as the old glaze.' The factory accounts record its use: '20 November 1780. 397 *livres 5 sous* for six barrels of a stone named Petung-tsé [*sic*] from Limoges.'⁵⁹

The Kilns

Regnier's official account of 2 June 1781 is so explicit that it is best to cite it almost in its entirety:

... the kilns in which this porcelain is fired are cylindrical, with two vaulted compartments one above the other, the floors pierced by flues so that the heat may be evenly distributed. These are built of fine Burgundy brick. Around the base of the lower compartment are four hearths in which wood is placed. It is in this first compartment below that porcelain is fired. Very high temperatures are required to fire this porcelain; the interior of the kiln must become so brightly white-hot that one can no longer distinguish the supports.

The firing lasts from 26 to 30 hours according to the dampness of the weather. One starts with the low-heat firing, during which the burning logs are not covered with more wood. This lasts from 10 to 12 hours.

A kiln of this type is 8 pieds [2.64 metres] in diameter with two chambers of about 6 pieds [1.98 metres] in height. This consumes approximately 6 to 7 voies of wood [12 to 14 cubic metres] for each firing.

In a kiln of this size one can fire up to 3,000 small pieces of porcelain such as cups and saucers.

The heat required to give the paste its hardness, its whiteness and its translucency is the same which fuses the glaze so that when one sees that the glaze has fused on the samples, that it is clear and shiny, one knows that the porcelain has been sufficiently fired and one can put out the fire.

... the *dégourdi* firing takes place in the upper part of the hard-paste kiln and is the equivalent of the biscuit firing of soft paste, minor variations in temperature in this firing are without importance. The pieces of porcelain after this first firing are nowhere near being fired; they are not transparent and are very porous.

So, in 1781, the factory had two or possibly three circular kilns. The first had been built in 1769, another larger one perhaps in 1770, and finally the one described here which must have been built shortly thereafter.

Nowhere does Regnier mention an important phase of firing, which is that with a reducing atmosphere. He only alludes to it by saying that the burning logs are not covered with wood. It is precisely when the burning wood is covered with further small pieces that a reducing atmosphere is achieved. This happens when the kiln is forced to absorb more incandescent fuel than air through the natural draught of the flue.⁶⁰

At this stage the combustion gases are only partly burnt; carbon oxide is present and this reacts with the iron oxide in the paste, turning it into a colourless oxide, which results in a white and translucent porcelain. If this reducing phase has not been correctly accomplished the porcelain emerges yellow and as opaque as cardboard.

Kiln furniture

Kiln furniture has caused problems for porcelain factories right up until the middle of the twentieth century. The difficulties must have been immense at Sèvres in the early stages. The piles of supports weigh down heavily on their bases. At high temperatures they are liable to collapse and whole piles can lean over; equally precariously balanced neighbouring ones can be dragged down too.

On 25 October 1769 Macquer described a disaster caused by the supports:

... the firing had lasted 28 hours in all, when the samples were found to be fine enough to stop. All the supports were of unwashed Moret clay. Everything had gone well so far, but here we come to the chapter of accidents which as you know never pass us by. One support sagged so that not only its pile leaned to

one side, but it affected the neighbouring ones also. Millot appeared sad and discouraged and complained about the additional work.⁶¹

The problem was to find a substance based on clay which could be worked easily when raw and yet also be resistant to collapse at high temperatures. Until the development of press-moulded fireproof materials in the twentieth century, it was necessary to use various types of clay which were turned or moulded. It was equally difficult to make trays which would stand changes in temperature without breaking. Furthermore, the breakage of a support during a firing was liable to cause particles of fireproof material to fall onto the molten glaze and become fixed there.⁶²

Kiln furniture for soft paste was made of clay from Fécamp, but this was found unsuitable for hard paste, as it was not sufficiently fireproof. An alternative, therefore, was sought. The first clay to be employed came from 'near the tower at Moret.'⁶³ The still meddling Archbishop of Bordeaux sent some 'white earth used for glassware jars from the banks of the Garonne river.'⁶⁴ The factory inventory of 1 January 1771 describes '15 barrels of clay from Dreux and half a barrel of clay from Lyon'.⁶⁵ In 1772 Parent sent Dufour to Picardy to try to obtain clay used in the glass works at Saint-Gobain. He produced a detailed report on this subject.⁶⁶ Finally, clay from Dreux was found to be the best and, from 1772, increasing quantities were purchased every year. In 1788, for example, 28 deliveries were received, for a total of 208 barrels of this clay, at a cost of 4,380 *livres*.⁶⁷

In his official report of 2 June 1781 Regnier describes the paste formula for the supports. It varied according to the quantity of paste to be made but contained Dreux clay mixed with further quantities of the same already calcined and crushed. This mixture was known as the *ciment*. By 1772 this problem was as well resolved as it was ever going to be.

Repairs to hard-paste pieces

Vincennes and Sèvres soft-paste figures often have cracks, particularly in the bases. These frequently developed before firing but were not highly visible. During firing the crack would expand. It would then have to be filled with a mixture of ground biscuit and glaze, and refired. When hard paste was developed a solution was sought to this problem. A frit was produced from Aumont sand, borax and minium. It appears that this mixture was used to fill cracks in other types of products as well, as Regnier's account states that 'Pieces mended in this way are fired with their colours.'

Soft paste did not become deformed during the glaze firing as this took place at a lower temperature than the biscuit firing. When a soft-paste piece is misshapen, the deformation occurred in the biscuit firing, and it was decided to glaze it anyway. This is not the case with hard paste. Pieces become deformed not in the first (*dégourdi*) firing but in the glaze firing. Some pieces, such as cups, must be fired upside down on supports which can only be used once as they shrink at the same rate as the piece being fired. Their role is to maintain the circularity of each piece. If cups are fired upright, without a support, the weight of the handle is likely to bend the cup into an oval shape during the vitrification process.

When fired upside down on a support, the cup's rim could not be glazed as the glaze would bond permanently to the support as it became molten and then dried. The rim, therefore, had the glaze removed before firing and remained in biscuit, which resulted in an unacceptable rough edge. Instead of polishing the edges, a low-fired colourless lead glaze, made of hard-paste glaze with added minium and borax, was developed for the rims. 'It is applied with a fine brush on the parts which lack glaze, then fired in an enamel kiln where this kind of glaze fuses' wrote Regnier in his report. It must have been apparent early on, probably in 1770-1772, that small pieces such as cups could be refired at a high temperature without losing their shape because, as we know today, the crystalline skeleton formed within hard paste prevents misshaping. The rims of cups were, therefore, covered with hard-paste glaze before being refired.⁶⁸

Coloured grounds

At Vincennes-Sèvres there was a marked difference between enamel colours and ground colours for soft paste. Apart from *bleu lapis*, ground colours were transparent and were of an alkaline composition. These innovative ground colours played a major role in the factory's fame. They were fired at a temperature which was hardly higher than that for enamel colours. These coloured grounds were incompatible with hard paste because of the reactive properties inherent in their chemical composition. When they were applied to hard paste they cracked during the firing, then flaked off.

With hard paste, colours are classed according to their firing temperature rather than whether they are for painted decoration or grounds. All the painting colours could be used as ground colours, to produce quite varied and subtle tones, but they tended to be opaque rather than shiny. Sèvres gave them picturesque names such as '*Boue de Paris*' ('Paris

mud') and others. Earlier in the century Meissen had produced ground colours of a similar delicacy.

To obtain shiny and translucent grounds on hard paste it was necessary to develop a palette of high-fired colours. They were normally fired onto the glaze during a second passage through the glaze kiln. In Regnier's 1781 report he listed five high-fire ground colours. They are all based on the new glaze developed in 1778, but it is likely that they were already in use with the old glaze:

- | | |
|---|--|
| 1. brown ground | 1 part iron oxide, 5 parts hard-paste glaze; |
| 2. black ground | 3 parts cobalt oxide, 6 parts umber, 27 parts hard-paste glaze; |
| 3. hazel ground | 1 part nickel oxide, 15 parts hard-paste glaze; |
| 4. brown ground in imitation of tortoiseshell | 1 part manganese from Piedmont, 2 parts umber, 9 parts hard-paste glaze; |
| 5. Bleu du Roy ground | (see below). |

Colours were prepared by a thorough mixing of the ingredients which were then melted in crucibles placed in the glaze firing. After this the crucibles were broken and the blocks of coloured glass finely ground. They were applied onto the pieces in the same manner as on soft paste: using a sieve, the coloured powder was shaken onto the mordant- (adhesive) covered piece, once the mordant was partially dried. The mordant held the colour and the pieces were then fired. This process was perfected fairly rapidly as only 65 trials are listed in the coloured hard-paste glaze notebook (notebook number 4).

Blue ground or *Bleu du Roy*

Perfecting this colour must have been laborious as 126 trials are listed (notebook number 7), with a variety of different experiments which bear witness to the problems encountered. It would seem, however, that this very diversity of experiments may have led the factory's chemists to the discovery of the new hard-paste glaze adopted in 1778. Only at the end of the notebook do we find the formula finally adopted by the factory and transcribed by Regnier in 1781.

Before this, different formulas appear to have produced a satisfactory colour but the coloured powder had to be applied onto the *dégourdi* (unglazed) surface. This often

resulted in an uncontrolled spread of colour, causing problems with creating a reserved white area. A note in the margin of trial number 8 states that 'this process can only be used as a ground when applied to *dégourdi* porcelain which is then glazed. This kind of blue is called lapis as it imitates this material perfectly.' Perhaps this is what Millot was referring to when he described a firing which ended on 26 October 1772: 'the *bleu royal* pieces were perfectly successful.'⁶⁹

The comment '*bon*' was first applied to trial number 18, which consisted of cobalt oxide and fusible feldspar, that is, the new glaze. Trials continued because the colour was too strong, but it appears to have been applied over the glaze. Trials number 20, 26, 36 and 37 relate to colours applied directly to *dégourdi* porcelain, but more trials were required in order to succeed in applying colours over the glaze.

Success finally came with trial number 90. It was similar to number 18, but the proportions of the ingredients were reversed: two parts cobalt oxide to three parts fusible feldspar. This trial is annotated 'fine' and 'very fine'. It was applied with a mordant onto the fired glaze and was the formula which was ultimately adopted.

In his 1781 report, Regnier describes the preparation procedure which is the same as for the other ground colours. The factory name for the colour was *Bleu du Roi*. Regnier adds that 'a variety of shades of this ground colour can be made, from the dark blue we have just described, to the lightest blue which is called agate grey, by reducing the proportion of blue to the glaze.' This overglaze colour may date from around 1776-7, but as we have seen it appears to have been employed previously as an underglaze colour.⁷⁰ A manuscript dating from 1778 bears witness to the difficulties encountered: 'In 1774 the *beau bleu* made from Swedish cobalt gave us much trouble to perfect.'⁷¹

Gold, coloured gold and silver on hard-paste porcelain

In the late 1760s it was apparent that gilding on German hard-paste porcelain was much more thinly applied than on soft paste. Additional gold was needed for soft-paste porcelain because the glaze had a tendency to dissolve and absorb the metal during the firing. It was not until 1748 that Frère Hippolyte discovered a gilding method appropriate for this paste. Gold consumption was considerable. In 1770, the factory spent 59,860 *livres* on 450 onces of powdered gold, which is the equivalent of nearly 14 kilograms of the metal.⁷²

It was rightly considered that hard-paste production would enable substantial savings to be made in the factory's use of gold. Already in 1769 Macquer wrote that: 'M. Boileau and M. Marmet have informed me of two advantageous features of our new porcelain, which are that it can be gilded as well as the old one, and with only half the gold.'⁷³

Gold for soft paste was bought in leaf form, at a cost of 101 *livres* an *once*.⁷⁴ The beating process to turn it into leaf cost 20 *livres*. The gold leaf was then entrusted to Frère Hippolyte who turned it into a powder employing a laborious crushing process, lasting eight to twelve hours, for which he received 12 *livres* an *once*. By avoiding the beating and crushing processes the cost could be reduced by 32 *livres* an *once*, or thirty percent, even before taking into account the fact that it would be applied more thinly onto hard paste.

The process for obtaining gold in powder form, without crushing, had been known for some time. Pierre Antoine Hannong had provided Boileau with the detailed formula in his document on the production of Frankenthal porcelain in September 1763. It was the method used at Meissen from 1719, as well as for uses other than gilding on porcelain. The metal was dissolved in aqua regia,⁷⁵ resulting in a yellow solution of gold chloride. By dripping a weak solution of iron sulphate into this liquid, the gold was 'resuscitated' in the form of an extremely fine powder called '*or précipité*' or '*or à la couperose*'. This method was not appropriate for soft paste because the resulting powder was too fine for the soft-paste glaze.

Jean-Jacques Bailly, head of the colour workshop, took it upon himself to develop a satisfactory method. This resulted in a quarrel between him and Macquer, with each claiming to have been the first to work on this problem. Macquer and Montigny stated their case in a report dated 4 May 1771: 'At our request and following the methods already known to chemists, the Sr. Bailly has divided gold and silver, using solvents, and produced extremely fine precipitated powders which may be used for gilding on porcelain.'⁷⁶ A contradictory note was added in the margin: 'M. Bailly states that these gentlemen have taught him nothing, that he knew about dissolving and precipitating gold before they informed him of it.'

Bailly was remarkably skilled in preparing colours. He was undoubtedly also looking for a reward, especially as Frère Hippolyte had received the large sum of 5,400 *livres* for the preparation of 450 *onces* of gold in 1770.⁷⁷ This reward was three times the salary of the

factory's best painter. Although he passed most of it on to his monastery, the size of the reward cannot have failed to incite jealousy and complaints.

A deal was struck with Bailly. Boileau suggested to Bertin that Bailly should be offered 1 *livre* 10 *sols* per *once* for the chemical preparation of gold.⁷⁸ This proposition was made as the result of an experiment which had taken place in late 1770. Nine *onces* of gold in ribbon form were purchased from the Sr. Aubert, at 101 *livres* an *once*.⁷⁹ The experiment was successful and on 11 May 1771 Bailly was placed in charge of the preparation of gold both by crushing and by precipitation for which he received 30 *sols* per *once* in either case.⁸⁰ The actual work was done by one of the two salaried employees in his workshop.⁸¹ Frère Hippolyte was given an annual pension of 300 *livres* on account of his twenty-three years of good and loyal service.⁸²

Annual purchase costs for beaten gold (for use on soft-paste porcelain) and for ribbon, or laminated, gold (for use on hard-paste porcelain) enable comparisons to be made between the production of the two pastes. In their report of 4 May 1771 Macquer and Montigny stated that Bailly was successful in applying precipitated gold onto soft paste, although very few examples exist.⁸³ The use of silver is also mentioned at this early date.

A hard-paste *écuelle* with military scenes in the Musée national de Céramique, Sèvres, which was painted by Rosset in 1770, has reserves bordered with red and green coloured gilding.⁸⁴ This must be one of the earliest pieces gilded with gold precipitated by Bailly. The fineness of this gilding bears witness to the ease with which it could be applied, compared to beaten and crushed gold. Not only was it just as pure, but it was more easily applied and at least three times as thin as soft-paste gilding.

On 27 March and 9 April 1781, Regnier, Montigny, Macquer, Fontelliau and Bailly collaborated in the production of a detailed official account of the various processes for the preparation, colouring and application of precious metals on both types of porcelain.⁸⁵ Methods had not changed since the days of Vincennes: the gilt motif was sometimes painted with mordant onto which the gold was then sprinkled, but it seems that generally the gold was mixed with a turpentine solution and painted directly onto the piece. On soft paste it was the fusion of the glaze which made the gold adhere, while on hard paste a flux had to be added. This was a frit made of lead oxide, sand and diaphoretic antimony.

Coloured golds were made in the following ways:

- steel-coloured gold: gold mixed with its flux (4 gros), manganese (4 gros), powdered silver (3 gros), rocaille flux (2 gros);
- red gold: copper oxide (1 grain), powdered copper (1 grain), gold mixed with its flux (1 gros);
- green gold: gold mixed with its flux (6 gros), powdered silver (2 gros). When a very bright finish was desired, more silver was added to the mixture.

The account does not give the formulas for vari-coloured golds on soft paste, although we know they were used; one of the best-known examples being the monogram on the Rohan service.

Powdered silver was made by dissolving the metal in hydrochloric acid, then rinsing the resulting chloride powder in boiling water. When dry, the flux was added to the powder and the mixture was applied, suspended in a turpentine solution. The chloride turned silver in the firing.

Some low- and high-fired ground colours were applied with a pattern of gilt specks in a haphazard manner. This process took place as follows: 'to make aventurine on a white, brown, carmine or purple ground, take a fine bristle brush and dip its tip into gold prepared for painting; by raking the bristles of this brush with a little stick, droplets will sprinkle themselves onto the piece which is being aventurined.' A note in the margin about burnishing is worth mentioning: 'Matt gilding with gold made from crushed leaf is much finer than that made with precipitated gold and, by contrast, the burnished surface of precipitated gold is finer than that of crushed gold.'⁸⁶ Crushed gold for soft paste was occasionally used on hard paste according to a document in the archives.⁸⁷

Enamel colours

Low-fired colours are made of coloured powders combined with a colourless flux. Soft-paste colours contained little colour and much flux. To obtain a dark shade they were applied more thickly. This was possible on the lead glaze used for soft paste and, indeed, is one of the aesthetic qualities of the paste. Low-fired colours for soft paste are chemically incompatible with hard paste. They either failed to adhere or they had to be applied so

thinly that they were too pale. As a result, they needed to contain more colour and less colourless flux and be applied thinly.

Bailly set to work on a solution. The factory archives contain a photocopy of his notebook of experiments.⁸⁸ This document is of limited use as it is often difficult to differentiate between trials and the formulas which were finally adopted. The official account produced on 12 March 1781 by Regnier, Bailly and Fontelliau, with Macquer and Montigny as witnesses, notes the various formulas for hard-paste colours, which number about thirty.⁸⁹ Visually they resemble the soft-paste colours. The differences principally lie in the fact that as they are more concentrated than soft-paste colours, smaller quantities are needed to obtain the same effect and they are less shiny.

Some new colours were developed such as platinum grey,⁹⁰ the formula for which is described in detail in 1781.⁹¹ This was made by dissolving the metal in aqua regia. The colour was spread either with a brush or sieved on as a ground colour. According to the authors of the report, the colour was extremely beautiful.

On 16 May 1771 Bailly supplied the factory with another novelty, precipitated *pourpre de Cassius*, which was used for carmine, purple and mauve.⁹² This formula was once again closely related to that supplied by Pierre Antoine Hannong in 1763. Thanks to Taunay, Vincennes had possessed these colours since 1744, but they were prepared in a completely different manner.⁹³

A few low-fired ground colours are mentioned: grey (*gris*), lilac (*lilas*), green (*vert*) and carmine (*carmin*). Grounds to which picturesque names were given were certainly combinations of other ground colours. There is, furthermore, an enamel colour called *Bleu du Roi* which is a version of the Vincennes *beau bleu* modified for application on hard paste and using cobalt oxide from Sweden.

Engraved gems from antiquity

On 24 December 1777, in Bertin's presence, the Sèvres factory showed Louis XVI a series of small hard-paste cameos imitating agate originals. The king, 'having seen and carefully examined the stones', was assured that 'the factory was capable of copying 1,200 carved gemstones after the Antique.' To encourage this initiative, the king agreed to 'lend some of the engraved gems from the royal collection, the finest in Europe.'⁹⁴

The trial notebook (notebook number 4 : MNS Archives, C 2/33/2) for coloured pastes appears to have been started in 1776, as experiment number 4 used the *girasole* paste first employed in that year. Trial number 210 describes a brown paste which was in fact unrefined and unwashed kaolin from Saint-Yrieix, from which the larger particles had been removed by sieving. The paste derived its colours from the impurities in the sand, and the feldspathic sand was sufficient to ensure vitrification.

To engrave these small artificial stones, which were made of a layer of brown paste and a layer of white paste, a lathe for polishing cameos was purchased and installed in a workshop called the '*lapidairerie*'.⁹⁵ These small hard-paste cameos were produced from 1778 to ornament some of the pieces of the soft-paste *bleu céleste* service ordered by the Empress Catherine.⁹⁶ The factory archives still contain a large collection of cameos, some of which are glazed. It seems they were not used for any purpose other than the Empress's service.

Coloured pastes

The question remains as to why the Sèvres factory tried to make coloured pastes, and why these trials took place only with hard paste and not earlier with soft paste. Did this initiative come spontaneously from within the factory, or was it inspired by English examples?

The first records of coloured paste trials date to May 1771.⁹⁷ The documents are all probably in Macquer's handwriting. Various ingredients were randomly added to the hard paste: red earth, enamel blue, silver ore, manganese and salts of copper, iron or zinc. In June the trials continued with mercury salts, precipitated copper and dissolved gold. Commentaries in the margins record the results: 'bluish grey, bubbly, white, yellowish white.' At the end of June, enamel blue was again added. The result was a 'well-fused pale blue'. When copper salts were added, the colour was a pale olive, 'more or less well fused'. A trial using bone ash received no comment. The trials continued in May 1772. A commentary for a mixture of hard paste with cobalt ore notes: 'greenish-purple where covered with the glaze, greenish-blue in unglazed areas'.

There is no further trace of these trials until 1776, when Dufour set about them in a methodical manner. Two notebooks were started, one called 'coloured hard paste' (notebook number 3 : MNS Archives C 2/30), the other 'porcelain imitating lapis lazuli'

(notebook number 6 : MNS Archives C 2/33/2). The coloured hard paste notebook begins with an anecdote. Millot had apparently used a special kind of kaolin from Saint-Yrieix to make a paste which was 'pale blue ... which gave Millot the idea of making a paste out of which he made a small vase, which was appreciated as a novelty.' The idea of colouring paste with cobalt oxide was to have further success. It appears that already in 1776-77 white porcelain vases were covered with a blue paste in the same manner as the process which was later to be known as *pâte-sur-pâte*. The process is recorded in the coloured hard paste notebook:

Into a given quantity of ordinary hard paste mix cobalt clay or lime according to whether one wants a darker or lighter shade of blue or agate grey [the name often given to this shade] ... This paste will be soaked in water until it is a light creamy consistency... Then one can dip white *dégourdi* vases into it; you will need to block off the inside with a sponge so that no blue goes in ... you then work on the places where it is too thick, and cut out a reserve or other decoration as desired, then they are subjected to a *dégourdi* firing again and then glazed in the normal manner.

The fact that a note describes the name of the colour as being the usual one implies that this sort of production was not uncommon at this date.

Trial number 96 of the coloured paste notebooks refers to a bronze paste. It was made of hard paste with added nickel oxide. A note states that in 1777 this process was used to make vases and a small putto after Van Loo which, after firing, was rubbed all over with gold to produce an effect imitating bronze.⁹⁸

Trial number 97, a black paste trial using cobalt and iron oxide, bears the note that 'these sort of black pastes are destined for small plaques onto which white paste heads can be applied'. This probably denotes an intention rather than a fact as it is not until trial 242 that 'this process is fine' is noted.

Regnier's official account of 2 June 1781 lists the following four coloured pastes: agate grey, a paste imitating lapis lazuli, black and *bleu céleste*. Agate grey paste was achieved by mixing between one and ten per cent of cobalt blue into the white paste according to the shade desired.⁹⁹ Regnier commented: 'By this means one can make blue pastes of any hue from a bluish-grey to a bright blue. But the lightest shades are the finest and most pleasing.'

Paste imitating lapis lazuli required four parts Saint-Yrieix clay, one part calcined Aumont sand and one part cobalt lime. Regnier stated that 'the cobalt lime used in this mixture acts as the flux. This makes a fine porcelain of an even blue.'

Bleu céleste paste consisted of sixty-six parts Saint-Yrieix clay, eighteen parts feldspar from the glaze, twelve parts nickel lime and one part Swedish cobalt lime. Regnier noted that 'the surface is always grey and dirty so that to reveal the fine blue one has to polish it with a grindstone. The problem is that the glaze applied to this paste, even after the outer layer has been abraded, is dull and produces a dirty olive-green hue.'

Regnier also recorded that the *bleu céleste* paste could be used to make a paste resembling veined lapis lazuli: 'To imitate veined lapis lazuli, take small rolls of white paste and of *bleu céleste* paste, knead them together, and you will get a paste with the irregular veins of natural stone.' Taking into account Regnier's comments on the production of *bleu céleste* paste, this combined paste would also have to be abraded and polished. No such examples, however, are known to exist.

Black paste was made of a special hard-paste mixture to which iron and cobalt oxide was added. Regnier noted that 'this paste needs to be fired to a precise temperature which has to be determined by samples. If overfired it becomes less black and more lead-like, if underfired it is reddish.'

Medallions and plaques in two colours of paste

From 1775 Josiah Wedgwood had been making medallions by adhering two coloured pastes.¹⁰⁰ The main problem with medallions of two different pastes is that each paste vitrifies at a different temperature. To avoid breakages or warping in the kiln, the relief decoration (a person's profile, for example), made of a fine layer of white paste, is laid into the bottom of a mould. Before it dries, it is covered with a layer of coloured paste to form the background. A further layer of white paste is then applied creating, in effect, a sandwich which prevents warping. This process is not mentioned in Regnier's 1781 account. Had it already been in production it is unlikely that he would not have mentioned it.

The 1781 account shows that the processes for coloured pastes had been perfected, but it cannot be determined whether they were used for glazed pieces or small

monochrome biscuit pieces. The engraved gems, being small, had suffered no technical problems. Had they warped, the polisher making the cameos could correct them easily. This was not the case with medallions five or six centimeters in diameter, or of the large decorative plaques. The process of sandwiching layers, traditionally used by enamellers to prevent their metal plaques from warping, must have been adopted soon after 1781.¹⁰¹

Comparison of hard- and soft-paste production

Kaolin consumption, based on calculations of transport expenses, grew in a regular manner until 1778. After this date, the kaolin being of a very high quality, one notes a sharp increase until 1788. Furthermore, a register of hard paste consumption, kept by Dufour from 1773 to 1781, produces the following figures (the weights are in *livres*, with 489 grammes equal to one livre):¹⁰²

	1773	1774	1775	1776	1777	1778	1779	1780	1781
service paste	22,161	24,500	25,150	26,150	35,650	28,050	29,040	26,040	25,300
sculpture paste	—	4,040	8,200	7,750	9,350	8,500	3,940	8,670	4,200
girasole paste	—	—	—	—	2,626	450	—	—	166
Totals	22,161	28,540	33,350	33,900	47,626	37,000	32,980	35,070	29,666

The lower paste consumption for 1778 is explained by a note in the margin:

The manufacture and the consumption are lower than last year for two reasons: First, when the mill was rebuilt it was not possible to make paste during the building works. The previous mill only drove 10 grinders and their pestles. We now have 20 grinders with pestles, and another sieve. Secondly the Empress of Russia's soft-paste service has diverted many workmen from the hard-paste workshops.

A comparison can be made between the production of the hard-paste and soft-paste workshops using the pay sheets of the factory's employees. From 1778 the painters were no longer recorded separately according to the paste with which they worked. There were approximately seventy painters in all. The figures refer to numbers of workmen:¹⁰³

	<i>Porcelaine royale</i> (hard paste)				<i>Porcelaine de France</i> (soft paste)			
	Painters	Turners	Modellers	Sculptors	Painters	Turners	Modellers	Sculptors
1773	39	8		35	43	10		69
1774	30		49		54		46	
1775	30		51		45		48	
1776	25	15		40	35	8		40
1777	23	10		41	34	10		41
1779			54				64	
1780			52				37	
1782			47				32	
1784			54				44	
1785			62				45	
	Head of workshop: Bolvry				Head of workshop: Deparis			
1786			62				44	
1787			59				44	
1788			58				51	

According to these figures it seems that the quantities produced from each paste were similar, with a slight predominance of hard paste after 1779. It is curious, therefore, that hard-paste pieces are comparatively rare given that so many employees were involved in their production, the factory having invested heavily in terms of both money and human resources.

From 1770, when a different kind of gold was employed on hard paste, the accounts enable us to check on the proportions of soft-paste to hard-paste gilding.¹⁰⁴ The figures are recorded in *onces*, with one *once* equal to 30.59 grammes.

	Beaten gold (soft paste)	Laminated gold (hard paste)		Beaten gold (soft paste)	Laminated gold (hard paste)
1770	450	9	1780	270	25
1771	82	120	1781	186	120 (?)
1772	180	—	1782	402	?
1773	240	96	1783	234	76 (?)
1774	168	180	1784	294	77
1775	192	180	1785	270	15
1776	262	156	1786	282	6
1777	324	60	1787	276	6
1778	270	?	1788	314	2
1779	?	?			

These figures shed a new and surprising light on the production of 'royal paste' as compared to soft paste. It is difficult to explain the sharp decrease in hard-paste gilding, especially as the production of hard paste increased after 1785, despite the following factors: less gold was used on hard paste, a small number of pieces were gilded with soft-paste gold, the Rambouillet dairy service pieces had no gilding,¹⁰⁵ and the Arabesque service had very little.

It may be that, as hard paste is tougher than soft paste, a new type of production was decided upon in 1781, of utilitarian objects with little decoration and gilding, with the aim of creating a commercially viable market. A letter written from Versailles by Montucla to Regnier on 4 October 1781 may shed some light on this.

M. le comte d'Angiviller, Sir, a few days before the illness from which he is currently convalescing, dined in a house where he was served with very pleasing porcelain, which his host informed him was not expensive. He borrowed a plate which he gave me a few days ago so that I might send it to you. Please find it enclosed herewith. He wishes to know what you think of this porcelain and for what cost the Sèvres factory could make plates decorated as simply and as elegantly, because M. le comte d'Angiviller is struck by a very simple idea, which seems to me very worthwhile, that a factory which only produces lavish pieces will always be in difficulty, and that to give it stability and profit it must produce objects which can be afforded by a large number of consumers. He found the blue of this plate very fine, but in that respect it seems to me that our factory can easily equal and even surpass it.¹⁰⁶

You know porcelain too well not to be able to recognise this plate as a product of the Tournay factory. I believe it to be of hard paste. It is certain that if one could make them for a reasonable price one could easily sell them as any customer even of modest means would prefer this porcelain to the finest faience which has so many defects and which cracks and chips very quickly. [signed] Montucla

So the Sèvres factory, in the face of all its policies and traditions including the recruitment of talented artists and craftsmen, was considering making objects for everyday use in a vain attempt to finance its prestige production. It seems extraordinary that d'Angiviller could condone such a possibility, considering that every aspect of the factory's activity was geared to luxurious and artistic pieces. Not only would production costs have been far too high, but it would have been a waste of resources, both human and material. Despite this, it is certain that hard-paste production could be of excellent quality; the Arabesque service and the Rambouillet dairy pieces are evidence of this.

Conclusion

It was not until Alexandre Brongniart's arrival that hard-paste production was to achieve the fame that the comte d'Angiviller had failed to give it more than twenty years previously, despite the fact that all the technical difficulties had already been resolved by 1778.¹⁰⁷

Guettard had solved the kiln problems as early as 1769. A year later Bailly perfected the gilding processes, including coloured golds and the *pourpre de Cassius*. Hannong's secrets had been used as a starting point for long and careful experiments.

In 1772 kiln furniture problems had finally been ironed out and in 1774 special sculpture paste had been developed, followed by *girasole* paste two years later. 1777 was the year of the engraved gems which, although little used, constitute a remarkable invention.

Dufour's new glaze and the high-quality paste employing new kaolin, make 1778 a particularly important year. Pieces bearing the date letter 'AA' exemplify this quality. Coloured grounds probably reached their peak at about this time. In the early 1780s coloured pastes were developed for medallions and bas-reliefs in two colours.

In the space of ten years Sèvres had reached the first rank of European factories in this field, much as it had previously done with soft paste. The three men responsible for this achievement were Macquer, Bailly and particularly Dufour, although he was only assistant kiln master. Parent had undoubtedly come to Sèvres with dishonest intentions, and his irregular behaviour shocked many people. His son, who had replaced him as Bertin's assistant, acted as a protective screen. This was reinforced by the appointment of a young man named Roger to take charge of the factory's accounts.

Nevertheless, Macquer and especially Montigny were on to Parent on account of his misdemeanours. Dufour may have been Parent's unwitting accomplice. The 1775 accounts bear the comment: 'Apart from payments properly noted, petty cash expenses of 2437 *livres* 15 *sous* have been paid to a chemist for his expenses, fees and travel expenses, without receipts being produced.'¹⁰⁸ If this refers to Dufour it could be that Parent was using him to hide his embezzlement. Be that as it may, Dufour certainly possessed extraordinary qualities, and his involvement with Parent pales into insignificance when compared to his achievements.

Notes to Chapter 3

1. This chapter, previously unpublished, has been translated by John Whitehead.
2. Kaolinic clay should not be confused with kaolin. Kaolin is used to produce white and translucent porcelain, which is not the case with kaolinic clay with which one can make white earthenware, crucibles and kiln furniture. Had Macquer been able to fire the Pouillon clay under normal conditions, he would have realised the difference.
3. MNS Archives, Y 59 (Macquer's notebook) and Y 37 (Millot's report).
4. Fray-Fournier, pp. 736-765. Letter from Macquer to Bertin dated 4 October 1768.
5. Sprig decoration such as that on Chantilly or in underglaze blue at Tournai is resistant to regular and repeated use, including dishwasher use, but these pieces do not have any delicate decoration on the glaze. Their glaze does, however, easily scratch.
6. A law of physics links hardness with resistance to fire. The more fire-resistant a ceramic, the more it will be impervious to wear and, consequently, to scratching. For this reason, grinding wheels used for machining hard metals are made of fire-resistant materials similar to those used for kiln furniture.
7. Fray-Fournier, p. 751.
8. The purchase contract dated 5 May 1769 refers to "...the white earth which is found in the spot called the graveyard". Kaolin may have been discovered by a gravedigger. The dead of Saint-Yrieix were perhaps buried in kaolin. This is a less romantic notion than Madame Darnet doing her washing.
9. Fray-Fournier, p. 717. Letter from Darnet to Villaris dated 3 April 1769.
10. Ibid., pp. 754-5. Letter from Millot to Macquer dated 19 August 1770.
11. MNS Archives, C 2/12. Letter from Boileau to Bertin, undated (probably May-June 1770).
12. Ibid., F 12. Accounts for 1770: "*Détail des frais d'exploitation de la terre destinée à la Manufacture de Seve [sic] et son transport*".
13. Ibid., C 2/12. Letter from Boileau to Bertin, undated (probably May-July 1770).
14. Ibid. In his letter Boileau mentioned Darnet as the person in question, then diplomatically crossed out the paragraph, thinking that Bertin would prefer to have the impression of choosing the person himself.
15. Fray-Fournier, pp. 755-6. Letter from Millot to Macquer dated 19 August 1770.
16. Ibid.

17. MNS Archives, Vf 19 *bis*. Accounts dated 10 December 1770, Millot's acknowledgement of receipt dated 6 July 1770.
18. Ibid., C 2/12. Letter from Dufour to Bertin and letter from Dufour to Monsieur le Président Parent, rue du Mail in Paris, dated 13 May 1778.
19. Darnet died three years later, in 1781. J. d'Albis and Romanet, p. 24.
20. Bordas owned a plot of land at Saint-Yrieix. He had supplied the Hocquart bothers for the manufactory at Vaux and had met Macquer during his stay (MNS Archives, Y 59, Macquer's travel journal).
21. MNS Archives, Vf 20 to Vf 38. On Alluau, see J. d'Albis and Romanet, pp. 70-1.
22. Ibid., Vf 20 (1771) to Vf 38 (1788).
23. Ibid., C 2/29.
24. Ibid., C 2/28.
25. Ibid., Y 38. Document by Millot entitled "*Origine de la manufacture des porcelaines du Roy en 1740*".
26. The current practice of firing hard-paste porcelain at Sèvres takes twenty-four hours for the kilns to reach the full firing temperature of 1,400 degrees centigrade. It then takes a further forty-eight hours for the kilns to cool down.
27. Antoine d'Albis, "Procédés de fabrication de la porcelaine tendre de Vincennes d'après les livres de Hellot," *Faenza* 3/4 (1983), pp. 208-9.
28. No description has been found of the kiln used for biscuit and glaze firings for soft paste. Only the colour of eighteenth-century soft-paste biscuit wares varies. These were probably placed at the rear of the kiln, near the flue. Despite the length of time during which the high temperature was maintained, uneven results were produced resulting in some yellowish, rather than purely white, pieces. This difference in colour occurs rarely with service wares.
29. It is for this reason that some pieces of German porcelain bear *pressmarken* with numbers from 1 to 5 which identify the degree of fire resistance of the paste. After the *dégourdi* firing, the pieces were covered with the appropriate glaze, through which the number was still visible, so that they might be placed in the correct part of the kiln for the next firing.
30. Ahlers, pp. 211-226. Ahlers reproduces the complete text of Macquer's communication to the Academy of Sciences.
31. Ibid.

32. MNS Archives, C 2/31. Parent's report dated 2 February 1769.
33. Ibid., C 2/16. Letter from Boileau to Macquer dated 2 October 1769. During the firing a container with small samples of porcelain was placed near an opening so that it could be removed with a long handle in order to test how the firing was progressing. The small blemishes on the flatware were a result of the reduction phase occurring too late in the firing process.
34. Ibid. Letter from Macquer to Montigny dated 25 October 1769.
35. Ibid. Letter from Macquer to Montigny (undated, but includes the phrase: "Saint Martin's day is near"; this fell on 11 November according to the *Almanach Royal*).
36. J. d'Albis and C. Romanet, p. 35.
37. Fray-Fournier, pp. 761-3. Letter from Bertin to Turgot dated 31 May 1771.
38. Ibid., pp. 763-4. Letter from Macquer to Turgot dated 1 July 1771. One month later, the plan for this kiln was published by the comte de Milly.
39. *Moniteur des Arts*, 2 February 1864, quoted by Ahlers, pp. 211-26. Letter from Macquer to his brother, undated. The full text of the letter is appended to this article. In light of the progress achieved at Sèvres, it seems probable that the events recounted by Macquer took place on 29 December 1769.
40. MNS Archives, notebook 1: C 2/28, notebook 2: C 2/33/1, notebook 3: C 2/30, notebook 4: C 2/33/2, notebook 6: C 2/33/3, notebook 7: C2/23, notebook 8: C 2/33/4, notebook 9: C 2/24, notebook 10: C 2/24, notebook 11: C 2/35/5, notebook 12: C 2/32 and notebook 13: C 2/15/2.
A document in the Sèvres Archives (C 1/15/2) provides a firm attribution of these notebooks to Dufour. The present author had long considered that these were the work of Macquer, on account of the high quality of the research. In the nineteenth century Denis Désiré Riocreux indicated that they had belonged to Dufour.
41. Ibid., C 2/29 and C 2/18/3.
42. Préaud and A. d'Albis, *passim*.
43. MNS Archives, C 2/29. It is not certain that this Dufour is the same one who is mentioned in note 16.
44. Ibid., C 2/27. Annual register of hard-paste consumption.
45. Ibid., C 2/15/1.
46. See note 26.
47. MNS Archives, C 2/26.

48. Ibid., C 2/27.

49. Girasol: a kind of bluish and milky opal. In the workshops at Sèvres the paste was erroneously referred to as '*garesole*'.

50. MNS Archives, C 2/27.

51. This method of drying can result in the fired biscuit paste having a shiny surface. This has often been noted on antique pieces and on Brancas-Lauraguais medallions.

52. Riocreux, who was the first curator of the factory's collections, attributes the twelve notebooks to Dufour.

53. MNS Archives, C 2/13.

54. Ibid., C 2/33/1 (notebook 2).

55. Ibid., C 2/29. Regnier's report of June 1781.

56. Pegmatite was called by a variety of names in the eighteenth century: cailloux (stone), feldspar or even *Pe-tung-tsé* (petuntse).

57. MNS Archives, C 2/15/2.

58. The author has tried for years, without much success, to synthesize this extraordinary material. It will only work on hard-paste Sèvres porcelain, the recipe for which has not varied since the days of Dufour. The combination of this glaze with the Sèvres paste creates a particularly pleasing combination.

59. MNS Archives, Vf 30, accounts for 1780.

60. Some older specialists still refer to the reducing atmosphere phase of the firing as the *couvreage* (covering of the logs), even when the firing takes place in a gas-fired kiln.

61. MNS Archives, C 2/16. Letter from Macquer to Montigny dated 25 October 1769.

62. These particles could only be removed with a grinding wheel. From 1806 pieces were entrusted to numerous members of the guild of *useurs de grains* (abraders). Traces of these abrasions were hidden with painting (Brongniart, vol. II, p. 373).

63. MNS Archives, F 12, accounts for 1770: "Transport to Paris of 140 *livres* weight of clay from Moret and from the farm at Froidefontaine for trials for M. de Montigny, 20 August 1769."

64. Ibid., C 2/16. Letter from Macquer to Montigny dated 10 October 1769.

65. Ibid., I 8.

66. Ibid., C 2/26.

67. Ibid., Vf 38.

68. The author has tried, without success, to find a cup edge with a lead flux by using an ultra-violet light. A number of sugar bowls where the covers were used as supports, and some important vases as well, bear visible traces of the lead flux described by Regnier.

69. MNS Archives, C 2/26. Document written by Millot, which he modestly entitled: "*Atelier du Sr Millot, chef des fours et leur construction, direction du feu, recherches sur les terres et couvertes, directeur des travaux de la porcelaine de pâte dure comme celle du Japon et de la Saxe*". This was far removed from the early days at Vincennes in 1751 when he was referred to simply as "faithful and friendly".

70. The problem with obtaining a fine overglaze blue is that the cobalt oxide component is deceptively unstable within the colour. At the low temperature firing required for gilding, excess cobalt oxide can be rejected and form a matt black surface. The problem can be avoided if the ground colour is applied under the glaze, but the colour tends to seep into the reserved areas.

71. MNS Archives, C 2/26.

72. Ibid., C 1/1. Memorandum sent by Boileau to Bertin. Objectively it is undeniable that soft-paste gilding is much more beautiful than that on hard paste.

73. Ibid., C 2/16. Letter from Macquer to Montigny dated November 1769. Marmet was the deputy director and factory accountant from 1760 to 1771.

74. Ibid., Vf 17, accounts for 1769.

75. A mixture of nitric and hydrochloric acids, so called because it can dissolve the "noble" metal, gold.

76. MNS Archives, C 1/1. Letter from Macquer and Montigny to Bertin dated 4 May 1771.

77. Ibid., Vf 19 *bis*.

78. Ibid., C 1/1.

79. Ibid., Vf 19 *bis*.

80. Ibid., Vf 19 *bis* and C 1/1. Letter from Bertin to Boileau dated 11 May 1771.

81. Ibid., C 1/1. A letter from Bertin to Boileau dated 11 May 1771 includes the statement: "I approve the payment to the Sr. Bailly of 30 *s.* for each *once* of gold which he prepares according to the new method he has invented. This *douceur* is a well-deserved reward for his activity, his zeal and his diligence."

82. Ibid. Letter from Boileau (?) to Bertin (?) dated 19 June 1771, on the subject of a complaint from Frère Hippolyte: "What can he have done with the 40 or 50 thousand *livres*

he has received from the factory?" And in another letter between the two, dated 21 August 1771: "It would be in keeping with the King's benevolence to look with pity upon this monk who has become decrepit and infirm and accord him an annual pension of 300 livres for the remainder of his days, 200 *livres* to be paid directly to him, and 100 *livres* to his monastery to encourage it to keep him in Paris."

83. Ibid. One example is a pair of vases marked CC for 1780, decorated with jewellery by Coteau, now in the Louvre (OA 10 945-10 946), formerly in the collection of Baron Gustave de Rothschild.

84. Musée national de Céramique, Sèvres, inventory number 4992.

85. MNS Archives, C1/1, f. 23 - f. 30. Antoine Louis Fontelliau worked as a painter at the factory from 1753 to 1789.

86. Ibid., C 2/18/3. Copy of an official report of 13 March 1781, signed by Rosset, "A Sèvres ce 21 Ventose an 5 de la République française une et indivisible".

87. Ibid., C 1/1. Letter from Macquer and Montigny to Bertin dated 4 May 1771.

88. Ibid., Y 74. The original belongs to the comte de la Crouée.

89. Ibid., C 2/18/3.

90. Ibid., undated.

91. Ibid. There is no evidence of platinum being used to decorate porcelain in the manner of gold or silver, that is as 'gilded' decoration, at this date (1781).

92. Ibid. "Préparation du pourpre qu'on employe sur la porcelaine dure. Copie conforme a l'original collationné par Rosset le 11 pluviôse an V de la République une et indivisible".

93. Antoine d'Albis, "Les débuts des pourpres en France, de Chantilly à Vincennes: Salomon Taunay et son fils Pierre Henry Antoine," *Sèvres, revue de la Société des Amis du Musée national de Céramique*, no. 3 (1994).

94. MNS Archives, C 2/36.

95. Ibid., F 20. "... 647 *livres* for the setting up of a lapidary's workshop"; and Vf 19: 16 January 1780 "paid 10 *livres* to the Sr. Henry for supplies for the lathe used to polish cameos".

96. Rosalind Savill, *The Wallace Collection, Catalogue of Sèvres Porcelain* (London, 1988) vol. II, pp. 762-783.

97. MNS Archives, C 2/17.

98. Brongniart records exactly the same formula in his *Traité des arts céramiques*, vol. II,

p. 623.

99. The term 'cobalt blue' is somewhat imprecise; it may refer to blue glaze.

100. Aileen Dawson, "Copiers or competitors? Wedgwood and the French porcelain factories," *Handbook of the Grosvenor House Antique Fair*, 1983. Wedgwood worked with stoneware, not porcelain.

101. A curious document is preserved in the Sèvres Archives (MNS C 2/12/2). It is a letter concerning coloured pastes, written by Dufour to Bertin and dated 4 January 1779. Bertin noted in the margin, in a handwriting which expresses excitement: "If this succeeds and if we can discover a seam(?) with which to make a beautiful coloured paste of pure or mixed colour, then we really could call it *Porcelaine de France*." Perhaps this is an allusion to jasperware from England.

102. MNS Archives, C 2/27.

103. Ibid., F series.

104. Ibid., Vf and F series.

105. It should be noted that the *bols sein* of this service were made in soft paste.

106. MNS Archives, H 2. Cited by Mireille Jottrand, "De Vincennes à Tournai et de Tournai à Sèvres ou la porcelaine de France vue dans un miroir," *The French Porcelain Society*, vol. V, 1989.

107. Alexandre Brongniart has often been credited with refining and finalising the formula for hard paste.

108. MNS Archives, F 25, accounts for 1775.

APPENDIX I

Transcripts of letters from Macquer to de Montigny, relating to experiments conducted for the production of hard-paste porcelain and, in particular, the construction of the kilns necessary for firing this material

Source: Archives of the Manufacture Nationale de Sèvres: C 2/16

[Macquer to de Montigny]

A Monsieur

*Monsieur de Montigny Tresorier de
france, commissaire du conseil, de l'academie
royale des Sciences, de celle de Berlin, etc.
chez Monsieur de Trudaine
conseiller d'état intendant des finances etc.
au chateau de Montigny.*

A Montigny

A Paris ce 8 octobre 1767

J'ai été charmé Monsieur et très honoré confrère, de recevoir de vos nouvelles et je suis on ne peut plus flatté de l'intérêt que je vois que vous continués à prendre a nos travaux communs. depuis votre depart je n'avois reçu aucunes nouvelles de Seve, et esperant que vous pourriez revenir a Paris vers le dix de ce mois, j'avois été m'informer chez vous du tems de votre retour dans l'intention de vous proposer d'y aller ensemble pour voir par nous mêmes l'état des choses; mais depuis votre lettre craignant de faire tout seul un voyage inutile j'ai pris le parti d'écrire a Mr. Boileau; il m'a repondu qu'il n'a plus entendu parler du hollandois, quil présume que d'apres ce quil a vu a la manufacture il ne croit pas pouvoir lui être d'une grande utilité ou quil a peutêtre changé de sentiment, dautant que Monsieur Bertin lui a dit a lui même que nous avions une bonne pâte et que

nous ne périssions que par la connoissance d'un four qu'au reste, il passera chez lui pour savoir sil est encore dans ce païs cy.

A l'égard de nos experiences de four M. Boileau me mande que le Sr. Millot a été retardé par la maladie de l'homme chargé de la conduite des fours de biscuit et de couverte dont il a été obligé de faire l'ouvrage, que cependant, il a réparé le petit four et quil sera en etat de faire une nouvelle fournée d'essai un des jours de la semaine prochaine. sur cet avis, j'irai a la manufacture un de ces jours, et je vous rendrai, Monsieur, un compte exact de ce qui s'y sera passé, je puis vous assurer avec la plus grande sincérité que je ressens une satisfaction entiere de ces liaisons de travail qui sont entre vous et moi, il me semble que je suis plus fort d'être associé avec un homme très éclairé, de bon conseil, et dont lhonêteté et les bons sentimens me sont connus par experience. la seule chose que je desire actuellement c'est de trouver quelque occasion importante et décisive de vous prouver toute la pureté des miens ainsi que la reconnoissance et le dévouement parfait avec lesquels je suis Monsieur

*Votre très humble et très
obéissant serviteur*

Macquer

P.S. Mr de Lubersac m'a envoyé redemander il y a environ quinze jours le memoire que je vous avois communiqué; j'ai été le voir a cette occasion la; je l'ai trouvé sur une chaise longue ayant la goutte; il ma semblé que les notes que javois mises en marge de ce memoire n'entroient pas entierement dans ses vues du moins il me l'a fait entendre et m'a ajouté de vive voix des choses beaucoup plus fortes encore que ce qui etoit dans le mémoire. j'ignore quels pouvoient être ses desseins, mais les voila bien renversés car je viens d'apprendre ce que peut être vous savés deja, c'est quil est mort subitement il y a trois jours.

[Macquer to de Montigny]

A Monsieur

*Monsieur de Montigny tresorier de
france, commissaire du conseil, des academies
des Sciences de Paris et de Berlin, etc. et present
chez Monsieur Trudaine conseiller d'état
intendant des finances etc.*

A Montigny

A Paris ce 16 octobre 1767

*Mr. Fouquet Thuillier à Montereau envoie des argiles de paris a raison de par
tombereau.*

*Depuis que j'ai eu lhonneur de vous écrire Monsieur et très honoré confrère j'ai été a
Seve; je ni ai pas trouvé M. Boileau, mais j'ai sçu par Millot qu'il n'a pas encore de
nouvelles du hollandois. Millot doit faire demain une fournée dans notre four d'essai; je
vous en manderai le résultat la semaine prochaine; mais quoique ce four soit arrangé de
manière qu'on pourra le régler suivant l'effet qu'on lui verra produire, je prévois quil aura
toujours les inconveniens que nous avons remarqué jusqu'a présent; je pense en
réfléchissant sur tout ce qui est arrivé a ce four depuis que nous nous en servons, qu'il a
un vice essentiel qui le rendra toujours fumant, c'est de n'avoir point un dessous vouté
comme il y en a aux grands fours de la manufacture, cet espace ou la flamme se développe
et circule librement avant dentrer dans les carnaux me paroît très propre a consumer la
fumée qu'elle entraine avec elle de dessus le bois, et il est certain qu'elle ne peut avoir le
même avantage en passant dans les canaux serrés de notre petit four; j'ai fait part de cette
idée a Millot qui la trouve très bonne, et en consequence je suis convenu avec lui que la
fournée que nous allons faire sera la dernière de ce four si nous y trouvons encore ses
deffauts ordinaires comme je l'apprehende bien. nous nous retournerons ensuite du côté
d'un four a dessous voûté, mais il y a lieu de croire que vous serés alors de retour et que
vous partagerer avec nous ces nouvelles recherches. En attendant comme vous êtes
actuellement dans le voisinage de Montereau, et qu'ils ne savent comment faire a la
manufacture pour avoir des argilles de ce país, qui sont absolument necessaires, surtout*

*pour les étuis des porcelaines solides, je crois que vous feriez, Monsieur, une chose très
utile, si vous pouviés découvrir dans le país quelqu'un qui fut maitre d'une fouille et
auquel on put s'adresser pour faire venir la quantité de cette terre dont on pourroit avoir
besoin; cela ferra certainement grand plaisir a M. Boileau qui est toujours dans lembarras
quand il s'agit de faire venir de la terre de montereau et qui ne l'a preciairement par le
moyen de l'entrepreneur de la Poterie du pont aux choux façon d'angleterre.*

je suis avec l'attachement le plus fort et la plus grande consideration

Monsieur

Votre très humble et très obéissant serviteur

Macquer

[Boileau to Macquer]

A Monsieur

*Monsieur Macquer de
Laccadémie des Sciences Rüe
St Sauveur*

A Paris

Sevres ce 2 octobre 1769

*Toujours même opération, Monsieur, le même résultat; a lexception cependant, que notre
four a eu moins de feu dans le haut que dans le bas. il n'y a eu que l'étuy des montres qui
a voulu commencer a fondre nos soucoupes, c'est a dire la platterie qui n'est jamais aussy
belle et qui se trouve remplie de petit pustules. nous ne périlitions a ce que j'imagine que
par la qualité des terres; car certainement, la porcelaine est belle bonne et je la crois de
réussite. Millot mettra demain le feu pour une seconde fournée dans le four et de jeudy
prochain en huit vous trouverez le feu au four quaré quand vous arriverez. J'ay fait passer
un gobelet en filets d'or, pour essayer s'il y auroit encore des taches noires. il est sorty beau
et en bon etat. en conséq. ce j'en fais passer deux grands cette après midy avec un pot a sucre
pour M. Larchevêque de Bordeaux. voila, Monsieur, le résultat de nos petites opérations.*

J'ay l'honneur d'etre avec un très parfait et sincere attachement

Monsieur

*Votre très humble et très
obéissant serviteur*

Boileau

[Macquer to de Montigny, 10 October 1769]

J'allai chez vous ces jours passés, Monsieur et très cher confrère pour vous communiquer une lettre de M. Boileau que je vous envoie, et pour savoir si vous pourriés venir jeudi prochain à Sèvres; je vois par la lettre que vous avez eu l'attention de mécrire de Montigny, que je ne pourrai pas avoir l'avantage de votre compagnie dans ce prochain voyage, mais je suivrai votre conseil, et j'irai seul pour suivre et presser les essais des terres a étuis et a briquet qui sont ce que nous avons de plus important et de plus urgent a constater pour le présent. je porterai avec moi une caisse de terre blanche que vient de m'envoyer M. l'archevêque de Bordeaux, laquelle est employée pour les pots d'une verrerie sur les bords de la garonne et qui, par conséquent pourroit venir ici tout par eau et a très peu de frais.

Vous lisés on ne peut pas mieux dans la pensée de M. Boileau; c'est un homme que vous savés par coeur et que vous avés eu bien tôt appris. je n'avois pas reflechi comme vous sur l'espece des pieces au travail des quélles les ouvriers de la nouvelle pâte paroissent en effet uniquement occupés mais d'après votre remarque qui me paroît très juste, je crois que vous avés parfaitement bien deviné; je ferai mon profit de ces ouvertures et j'inisterai en conséquence sur des tasses assorties, mais vous comprenés bien que M. Boileau n'en fera toujours que ce qu'il voudra.

M. Vilaris est veni me voir ces jours passés, il revenoit de la manufacture de Vaux, ou il s'etoit présenté comme commissionnaire d'un négociant de Toulouse qui desiroit tirer de grosses parties de la porcelaine de cette manufacture; on l'a payé de belles paroles et de grandes pompes; mais on lui a avoué que pour le présent, on nétoit pas encore en etat de rien fournir; il n'a obtenu qu'avec grande peine une seule tasse avec la soucoupe peintes en pourpre qu'on lui a vendues trois livres; il me les a fait voir; elles sont très gauches et toutes pleines de déffauts. je ne conterai pas cette histoire à Sevres pour les raisons que vous savés.

Si je savois ou vous faire tenir une lettre, je vous écrirois vendredi prochain pour vous fair part de ce que j'aurrai vu jeudi à Sevres : en tout cas je vous en informerai toujours dès que j'aurai l'honneur de vous voir après votre retour.

Je suis avec l'estime la plus parfaite et l'attachement le plus inviolable

Monsieur

*Votre très humble et
très obéissant serviteur*

Macquer

A Paris ce 10 octobre 1769

[Macquer to de Montigny, 25 October 1769]

Je présume que vous avez reçu une lettre que je vous ai adressée à Montigni sous l'enveloppe de Mr. Trudaine; elle contenoit le detail que m'avoit envoyé M. Boileau des opérations qui avoient été faites jusqu'alors; je vais continuer dans celle ci a vous rendre compte de ce que j'ai vu par moi même, il y a eu jeudi dernier huit jours, jour au quel j'ai été seul a la manufacture. j'y ai vu le résultat d'une journée qui venoit d'être faite dans le four rond a trois bouches, et j'ai fait par écrit linventaire de toutes les pieces, afin d'être en état de vous en rendre un compte exact ... Ce four a tres bien fait son devoir; le degré de feu a été égal partout et assés fort pour donner le beau blanc, la belle transparence, et le brillant a toutes les pieces qui etoient toutes en nouvelle couverte et au nombre de 47 comme vous allés le voir par le detail suivant.

<i>3 théyeres</i>	<i>deux pots a l'eau</i>	<i>3 pots a sucre</i>
<i>une saussiere ...</i>	<i>une grande assiette</i>	<i>3 petites assiettes</i>
<i>une écuelle et son plateau,</i>	<i>un poëlon</i>	<i>12 gobelets pareils ansés</i>
<i>20 soucoupes</i>	<i>une figure de Bacchus ..</i>	

le feu avoit duré en tout 28 heures; les montres estoient belles quand on l'a cessé. tous les étuis de cette journée estoient de terre de Moret non lavée. Tout cela est bien jusqu'à présent, mais voici le chapitre des accidens, qui, comme vous savés ne nous manque jamais.

Primò vous savés que dans les precedentes fournées il y a eu plusieurs pieces couvertes dont les couvercles se sont soudés a la piece; cet accident a été général dans cette dernière journée les couvercles des theyeres, des pots a l'eau, de l'écuelle couverte se sont trouvés soudés de facon qu'il a été impossible de les détacher sans casser les pieces. Millot a qui j'ai demandé la cause de cet accident, m'a dit, que cela venoit de la couverte dont il reste toujours une petite portion dans l'interieur du biscuit, malgré le soin qu'il prend de bien ratisser les endroits du contact des couvercles. Nous sommes convenus ensemble de plusieurs expediens et précautions a prendre pour éviter cet inconvenient dans la prochaine journée, et il est a présumer qu'on y remedira.

Secundò, il y a eu un étui qui s'est affaissé et qui a fait pencher non seulement sa pile, mais des piles voisines; de la il est arrivé que plusieurs pieces se sont touchées et ont eu leur couverte gâtée dans l'endroit du contact et que d'autres ont été déformées entre autres, la figure de Bacchus qui n'est plus droite et deux des petites assiettes plates, facon de la chine, la troisième a très bien conservé sa forme, ainsi que la grande qui étoit facon de Saxe. En tout, quoi que le feu ait été admirable dans cette journée, il se trouve plus de la moitié des pieces défectueuses par les deux accidens dont je viens d'avoir l'honneur de vous parler ... j'ai profité de cette occasion pour presser vivement Millot sur la nécessité d'essayer toutes les terres et de les employer lavées, comme vous l'aviés conseillé avec grande raison; il m'a paru triste et découragé s'est plaint de l'excès de travail dont il étoit accablé par cette nouvelle porcelaine; je l'ai ranimé par l'esperance d'une récompense, mais en lui faisant entendre qu'il ne l'auroit qu'après la réussite complete. il m'a répondu que le lavage des terres pour les étuis étoit une operation tres longue, tres embarrassante et tres laborieuse, qu'il étoit sur d'ailleurs de réussir, sans ce lavage avec de bonne terre de Moret, ou de celle de la verrerie de Seve, ou de toute autre d'aussi bonne qualité mais seulement bien choisie et bien épluchée; il m'a ajouté qu'il attendoit d'un jour à l'autre une voiture d'une terre de l'aigle, dont il connoit la qualité; Enfin il va essayer la terre de Montreau dont le lavage est bien avancé; la terre de la verrerie de Bazat don M. l'archevêque de Bordeaux m'a envoyé une petite caisse que j'ai porté avec moi, et qui nous a paru assés bonne au simple coup d'oeil, pour me déterminer à prier M. l'archevêque de Bordeaux a nous en envoyer deux tonneaux. cette terre etant sur les bords de la Garonne, pourroit venir tout par eau et par consequent, couteroit peu... M. de Senosan vient de m'envoyer une autre terre qui me paroît

bonne, et que je porterai jeudi a Seve pour la faire essayer. je verrai enmême tems le résultat de la journée qui a du être faite et du contenu de laquelle j'ai pris la note; elle consiste en trois caffetieres, un pot a l'eau, 2 theyeres, une écuelle couverte, 2 très grandes jattes, 2 assiettes, petit model des indes 3 pots a sucre, un poëlon 15 tasses ansées et 15 soucoupes. en total 45 pieces ... je porterai aussi avec moi la lettre que vous m'avez fait l'amitié de m'ecrire de fontainebleau en date du 23, que je viens de recevoir et qui m'a fait grand plaisir; comme elle est ostensible j'en ferai la lecture a M. Boileau et a Millot. l'idée de faire l'essai d'un étui de la terre même de la porcelaine est très bonne et mérite assurément d'être effectuée, ainsi que toutes les bonnes intentions de notre sage ministre; elles doivent être des ordres pour M. Boileau auquel j'en ferai part. j'attens votre retour avec la plus grande impatience et suis avec la plus parfaite estime et l'attachement le plus fort

Monsieur et cher confrere

Votre très humble
et très obéissant
serviteur

A Paris ce 25 octobre 1769

Macquer

[Macquer to de Montigny, November 1769]

J'ai fait hier un voyage a Seve et j'y ai vu le résultat de deux nouvelles fournées d'environ 50 pièces chacune. la première avoit été faite dans le four carré a plancher et a une seule bouche : le feu a été bien; mais il est arrivé l'accident ordinaire de ce four, c'est a dire que les piliers qui soutenoient son plancher ont tous flechi, même celui qui étoit de la terre d'élite de la verrerie laquelle est assurément une des plus capables de soutenir la violence du feu. Nous avons décidé d'après cette dernière épreuve, qu'il falloit abandonner ce four, et nous nous en consolons d'autant mieux que le four a trois bouches fait tout aussi bien sans avoir le même inconvenient. nous avons donc fait le procès de ce four carré; on le démolit a présent pour construire a sa place un second four rond sur les mêmes principes que le premier, mais qui sera de 6 pieds de diametre, s'il y a moyen, et qui contiendra cinq ou six cens pieces. cette nouvelle porcelaine est si bonne que malgré l'accident de ce four carré, d'environ 45 pieces que contenoit la dernière journée qu'on y a faite, il y en a 35 de bonnes.

La seconde et dernière journée dont j'ai vu hier aussi le résultat avoit été faite dans notre bon four ron; elle est admirable; de 40 pieces, il s'en est trouvé 36 de parfaites qui ont été défournées devant moi; M. Boileau m'a semblé s'affectionner davantage a la nouvelle porcelaine, car en voyant la réussite de cette journée, il a baisé Millot sur les deux joues en ma présence, comme un homme transporté de joie; il ma dit qu'il alloit écrire a M. Bertin, et comme sans doute sa lettre vous sera communiquée, je ne vous parlerai pas dans celle ci de ce que je présume qu'il doit mander au ministre, je vous dirai seulement que M. Boileau et M. Marmet, m'ont appris deux circonstances qui sont encore bien a l'avantage de notre nouvelle porcelaine, c'est qu'elle se dore tout aussi bien que l'ancienne, en y employant moitié moins d'or, et que pour raison de la peinture, elle se peint du premier coup, sans avoir besoin d'être retouchée et repassée trois ou quatre fois au feu comme l'ancienne. Quelle economie de main d'oeuvre ou de matière première précieuse!

Nous n'avons plus qu'une seule chose a faire c'est de nous procurer une bonne terre a étuis et qui soit abondante. Millot m'a montré les épreuves de trois étuis faits dans les dernières journées le premier étoit de la terre du fond de la carrière d'arcueil que vous lui aviez procurée cet étui est devenu très bien et a moitié fondu; la porcelaine qui étoit dedans, n'y est pas devenue belle. le second étoit de la terre de montreau que vous lui aviez aussi donnée pour l'essayer; il avoit lavé cette terre et l'avoit mêlée avec du sable quartzeux tiré de notre bonne terre a porcelaine. cet étui ainsi préparé s'est comporté on ne peut pas mieux, la porcelaine y est devenue tres belle. Le troisième lui étoit de la terre de Moret du rebut du Sr. Serrurier, mais lavée et préparée, comme celle de l'étui précédent; ce troisième étui a eu aussi le même succès ainsi voila toujours un expedient pour avoir de bons étuis jusqu'a ce que nous ayons une bonne terre bien abondante qui exige moins de main d'oeuvre pour sa préparation; j'en ai porté une nouvelle hier avec moi pour la faire essayer; j'en ai assez bonne opinion; c'est M. de Senozan qui me l'a envoyée; il me mande qu'il en a beaucoup dans sa terre de Rhône et que les entrepreneurs de la manufacture de Vaux qui l'ont essayée lui en demandent pour faire leurs cazettes et en paroissent tres avides ...

j'ai lu votre lettre a M. Boileau et la lui ai même laissée, parce qu'il se propose d'écrire a M. Bertin et de lui parler de plusieurs choses qu'elle contient. j'ai dit a Millot de faire une cassette de terre a porcelaine pour éprouver si la porcelaine qu'on fera cuire dedans deviendra plus blanche; il le fera, mais il m'a fait une observation qui me paroît assez bone, c'est qu'il est a craindre que cette lettre quoique suffisamment réfractaire pour la

porcelaine ne le soit point asses pour servir d'étui, et quelle ne s'affaisse. d'ailleurs il m'a montré qu'il avoit déjà fait a peu pres cette experience, ayant fait cuire une piece de la nouvelle porcelaine posée sur un rondeau de la même porcelaine et recouverte par un pot a sucre renversé aussi de la même porcelaine, et cette piece ne nous a pas paru differer de celles qui n'ont point été cuites de même.

Comme voici la St Martin qui approche, j'espere avoir l'avantage de votre Compagnie au premier voyage de Seve; je le differerai même de quelques jours, si cela est necessaire pour que nous puissions y aller ensemble; agréés je vous prie en attendant les assurances de la parfaite estime et du tres sincere attachement avec lesquels j'ai l'honneur detre Monsieur et tres cher confrere. Votre très humble et t. ob. serviteur

Macquer

APPENDIX II

Transcript of Macquer's notebook recording the expenses incurred on his journey in 1768 to Bordeaux, and other locations in southern France, in search of kaolin

Source: Archives of the Manufacture Nationale de Sèvres, C. Y 49

*Etat des dépenses que j'ai faites pour les voyages
et expériences chimiques pour la manufacture
Royale de Porcelaine établie à Seves*

Hotel de Richelieu à Bordeaux

Lundi 10 octobre ... Soupé et couché ...	3 sols
mardi ... diné et soupé ...	3 sols
mercredi... soupé ...	3 sols
jeudi ... diné et soupé...	3 sols
vendredi diné albin, soupé ...	3 sols
samedi diné diné et soupé ... plus albin	1 sol
dimanche donné a diné	
4 a table / et soupé 2 à l'ordinaire.	
lundi... diné 1. soupé 2 et albin.	
mardi ... diné 1. soupé 2 et albin.	
mercredi ... soupé 2 et albin.	
jeudi soupé 2 et albin.	
vendredi. diné et soupé tous.	
samedi. diné1. soupé 2	
dimanche ... soupé.	

*Voyage à Bordeaux
Aoust 1768*

Faux frais

Fouet ...	2 £
Culotte a courir la poste pour le domestique ...	18 £
Malle ...	15 £
Bottes pour le domestique ...	18 £
Livre de poste ...	2 £ 10 s.
Carte de poste ...	6 £
Cartes de Guienne ...	8 £
	62 [sic] £ 10 s.

frais

Acompte sur la chaise au Sr. Alleton Sellier ...	48 £
Pour un exprès envoyé à Seves a Mr. Millot ...	3 £
Partis le mardi 23 a une heure apres midi couché à Monerville filles garçons graissage des roues ...	7 £ 4 s.
Le 24 diné à orleans au Dauphin B...	5 £
Couché à Blois aus trois marchans ...	9 £
Le 25 diné a tours au Sauvage ...	5 £ 16 s.
Couché aux ormes ...	7 £ 10 s.
Le 26 diné à Vivonne...	6 £
Soupé a Rufec ...	7 £ 10 s.
Le 27 diné au faux bourg de l'hommeau a angoulême ...	6 £ 10 s.
Soupé à la grole ...	7 £ 4 s.
	62 £10 s.

Le 28 aoust 1768

Passage de la Dordogne et de la Garonne ...	8 £ 12 s.
A Bordeaux a l'hotel de Richelieu depuis le 28 aoust apres midi jusqu'au diné du 4 septembre ...	112 £
Pour deux voyages par eau ...	6 £

4 Septembre

Couché a Belin ...	6 £ 10 s.
Couché à Castets ...	6 £
Diné a la harie ...	5 £ 10 s.
Diné a St Vincent ...	6 £
Couché a Bayonne et séjourné jusqu'au mardi 13 à l'hotel de St Etienne	78 £

Le mardi 13 septembre

Diné à St Vincent ...	6 £
Traverse de St Vincent a Dax ...	20 £ 12 s.
Passage de l'Adour à Dax a la balance	1 £ 16 s.
Pour des terres qui nous ont été apportées ...	6 £
Pour essais à la forge ...	12 £
Autres essais à la forge ...	6 £

Pour loyer de chevaux pour les recherches de terres ...	18 £
Pour dépenses dans nos courses de recherches ...	24 £
Pour ports de terres depuis Pouillon et Ballus jusqu'à Dax...	9 £
	371 £ 2 s.

Pour la cuite de nouveaux essais ...	6 £
autre cuite ...	6 £
Pour épluchage de la terre ...	3 £
Pour une caisse ...	5 £ 12 s.
Au Sr. Pomaret pour déboursés à Dax pour séjour jusqu'au 8 septembre...	207 £
Pour domestiques et commissions...	12 £

Partis de Dax le 8 septembre a midi

Samedi 8 septembre

Passage de l'adour	1 £ 16 s.
Traverse de Dax à Castets 4 chev. sur la chaise et 2 postillons.2 postes 1/2...	18 £ 12 s.
Couché à la harrie...	6 £ 6 s.
Diné à Belin...	5 £
Couché au la cubate	7 £

Lundi 10 septembre

Arrivé a Bordeaux a l'hotel de Richelieu a Albin pour mémoire depuis Dax...	18 £
	688 £ 16 s.

Lundi 24 septembre

Partis de Bordeaux et payé a l'hotel de Richelieu...	220 £
passages de la Garonne de la Dordogne et de l'île...	6 £ 18 s.
Couché à Libourne hotel de Richelieu	6 £

Mardi 25 septembre

Diné a Mucidon ...	5 £
Couché à Grignol...	6 £ 12 s.

Mercredi 26 septembre

diné et couché à Périgueux vis à vis la poste...	13 £
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Jeudi 27 septembre

diné et couché à Tivier a l'image N. Dame jusqu'au 29 septembre...	36 £
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Vendredi 28

Arrivé à xxx... a l'image notre dame jusqu'au 1er novembre...	72 £
Pour le loyer des chevaux qui nous y ont conduit...	20 £
Pour fouilles...	18 £
Pour tonneaux pour mettre la terre...	6 £
Pour port de la terre jusqu'à Limoges...	24 £

Mercredi 2 octobre

Diné à la coquille...	6 £
Soupé et couché à Aix...	7 £ 4 s.

Jeudi 3 et vendredi 4

Couché et soupé à limoges a Ste Catherine...	18 £
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1124 £ 18 s.

Pour raccomodage de la chaise...	15 £
Port de la terre par un roulier jusqu'a Paris ...	53 £

samedi 5

Soupé et couché à Mortroles...	8 £
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Dimanche 6

Soupé et couché à chateauroux...	7 £ 4 s.
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Lundi 7

Soupé et couché a Salbris...	6 £ 12 s.
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Mardi 8

Diné a orleans à la poste au Dauphin...	7 £ 4 s.
Soupé a Touri a la poste au grand cerf...	8 £

mercredi 9

Arrivé a Paris	
Nettoyage de la chaise	3 £
Payé à Albin pour raccomodage des harnois croupiere, bottes etc...	13 £ 9 s.
Pour glace cassée...	15 £
Pour port de la terre de la douanne rue St Sauveur et garde a la douanne...	2 £ 10 s.

1263 £ 7 s.

Frais des postes pour tout le voyage non comprises les deux traverses employées 212 1/2 postes a 5 £ 12 s. par poste ...	1190 £
17 postes a 4 chevaux sur la chaise...	21 £
prix de la chaise et sa conduite ...	501 £ 4 s.

*A Dax le mardi 13 septembre 1768
donné à la blanchisseuse*

1	paire de draps
7	chemises en effilé
3	chemises de nuit
9	mouchoirs de couleur
6	cols
4	coeffes de nuit
11	paires de bas de dessous à pied
1	a etriers
3	paires de chaussons
1	bonnet de coton

Mémoire total du linge

1	paire de draps
2	camisoles de bazin
1	têt d'oreiller
13	chemises de jour efilé
6	chemises de nuit
13	cols
11	coeffes de nuit
1	a etriers
22	mouchoirs
12	paires de chaussons
8	paires de bas a pied
5	a étriers
1	bonnet de coton
1	piece d'estomac
5	serviettes

APPENDIX III

Presentation of the first hard-paste porcelain produced by Sèvres
at the court of Louis XV

Excerpted from Willem Constantyn Ahlers, *Un chimiste du XVIIIème siècle*,
Pierre-Joseph Macquer (1718 - 1784), doctoral thesis,
Ecole Pratique des Hautes Etudes, 1969.

This account appeared in the *Moniteur des Arts* on 2 February 1864. A copy of the account, by an unknown hand, is in the Bibliothèque Nationale (f fr 9135, fts 182 to 187). A section of text on folio 187 recto is crossed out by the transcriber with a note in the margin: 'Effacé par l'auteur sur le manuscrit'. This section was not published in the *Moniteur des Arts*, but is included here within brackets.

Un chimiste à la Cour de Louis XV

Le jour de Saint-Thomas, à huit heures du matin, je suis parti avec M. de Montigny pour Versailles; nous y sommes arrivés à dix heures et demie, chez M. Bertin qui devait nous présenter au roi. M. de Montigny s'était mis en perruque carrée, en rabat et en petit manteau de maître des requêtes. A onze heures et demie, M. Bertin, qui était allé chez le roi, nous a envoyé chercher pour nous conduire dans les appartements où l'on avait exposé la porcelaine de Sèvres à l'ordinaire; et sur une table particulière était la nouvelle porcelaine, tout en blanc et or; il y en avait environ soixante pièces, toutes très belles, comme nous étions à les examiner, le roi est entré seul, M. Bertin nous a présentés l'un et l'autre; il nous a reçus très gracieusement, et, sans regarder l'ancienne porcelaine, il a été tout de suite à la nouvelle, dont il a paru fort content; on avait mis devant un grand feu trois cafetières de notre porcelaine pleine d'eau qui bouillait à gros bouillons et qui soutenaient très bien cette épreuve; le roi nous faisait pendant ce temps-là plusieurs questions sur cette porcelaine et nous comptait comme quoi il avait fait l'épreuve, depuis peu, d'une casserole de la porcelaine de M. de la Borde, sur un réchaud à l'esprit de vin, pour y bouillir de l'eau, et que cette casserole s'était cassée; il en concluait que le feu de l'esprit de vin était plus dangereux pour la porcelaine que le feu de charbon. Il y avait aussi une casserole de notre nouvelle porcelaine qui était sur un réchaud à l'esprit de vin, et dans laquelle l'eau commençait à bouillir; mais elle s'est cassée un instant après en

présence de Sa Majesté, qui s'était mis à faire un éclat de rire en reculant deux pas en arrière et en nous regardant tous les deux et nous disant : Messieurs, messieurs ... Après quoi, il est sorti pour aller à sa messe, à laquelle nous avons assisté.

Voilà la première partie de notre histoire. Je m'interromps pour vous la faire lire, après quoi je la continuerai, car elle a une longue suite.

L'histoire de la casserole cassée nous avait un peu interloqués, quoique le roi fût de fort bonne humeur et l'eût prise en bonne part; néanmoins, faisant réflexion que cette casserole était très mal faite et qu'elle avait un gros manche de porcelaine massif qui l'avait empêché de s'échauffer uniformément et avait contribué à la faire casser, je désirais beaucoup d'avoir occasion de revoir le roi pour lui expliquer la cause de l'accident, et refaire une autre expérience avec une autre casserole sans manche.

Dans cette espérance, nous sommes retournés aussitôt après la messe dans la salle aux porcelaines, et en effet, un instant après, le roi y est entré avec Mme du Barry; M. Bertin n'était plus pour lors avec nous; le roi ayant entamé la conversation avec nous, je lui ai demandé la permission de prendre notre revanche avec une autre casserole mieux faite; le roi m'a souri de l'air du monde le plus obligeant et le plus gracieux, et m'a même donné un petit coup caressant sur la main en signe d'approbation. En conséquence, nous avons fait paraître devant lui une autre casserole bouillant à gros bouillons sur le même réchaud à l'esprit de vin, le roi l'a considéré longtemps avec satisfaction; pendant ce temps-là, est entré M. le duc de Noailles, qui m'a fort accueilli, et avec lequel j'ai renouvelé connaissance, M. le prince de Soubise et M. le prince de Condé, auxquels nous avons montré les porcelaines, ainsi qu'à Mme du Barry; tout le monde a paru fort satisfait. Le roi s'est retiré; il était alors deux heures après midi; comme il ne dîne point, ses carrosses l'attendaient pour le mener à Bellevue faire une promenade. Nous nous sommes retirés aussi pour retourner chez M. Bertin, chez lequel nous devons dîner.

Faisons encore une pause.

Le dîner chez M. Bertin s'est très bien passé; nous nous proposons de repartir pour Paris vers les cinq heures, lorsque Mme de Mollette, nièce de M. de Montigny, qui avait dîné avec nous, nous a prié de la mener dans la salles des porcelaines pour les lui faire voir; comme cela était possible, attendu que cette pièce est en quelque sorte publique pour tous les gens de la cour pendant cette exposition, et que même toutes les porcelaines exposées

étant en vente, beaucoup de personnes en achètent, nous y avons conduit Mme de Mollette. Nous comptons bien après lui avoir tout montré nous en retourner, et que nous ne reverrions plus le roi, lorsque, tout d'un coup, la porte par laquelle il avait coutume d'entrer s'est ouverte et qu'il a paru avec Mmes de France et une cour très nombreuse, qui a rempli la salle, dans laquelle il y avait déjà beaucoup de monde.

Il faut observer que les cafetières qui avaient été mises devant le feu le matin en présence du roi, ainsi que la casserole à l'esprit de vin qui bouillait sur le réchaud lorsque le roi s'était retiré pour aller à Bellevue, y étaient restés depuis ce temps-là, et bouillaient toujours à gros bouillons. A peine le roi était-il entré que, m'apercevant à l'autre extrémité de la salle, il m'appelle tout haut par mon nom, et est venu à moi en me demandant de l'air du monde le plus obligeant si la casserole avait résisté et si nous avions pris notre revanche. Je la lui ai montrée aussitôt en l'assurant, comme cela était vrai, qu'elle n'avait cessé de bouillir sur l'esprit de vin depuis le matin; il a souri très gracieusement en signe de contentement, il s'est mis ensuite à entamer la conversation avec moi sur la porcelaine, en faisant mille questions d'un homme en vérité intelligent et fort instruit, sur lesquelles je lui ai satisfait de mon mieux; il m'est impossible, cher frère, de me rappeler tout le détail de cette conversation; je sais seulement que je lui ai bien expliqué toute la manoeuvre et les qualités de la nouvelle porcelaine, sa différence avec l'ancienne, les longs travaux qu'elle avait exigés pour être perfectionnée, l'histoire du larcin qui nous avait été fait de la nouvelle par MM. Hocquart, Couberon, de la Borde, enfin tout ce que j'ai cru propre à intéresser le roi et à faire valoir la nouvelle découverte. Je ne puis assez vous exprimer avec quelle familiarité, avec quelle bonté, avec quel air de satisfaction le roi s'entretenait ainsi avec moi en présence de toute la cour, qui était debout à l'autre extrémité de la salle; il me quittait de temps en temps pour faire la ronde autour des tables sur lesquelles étaient exposés les beaux morceaux de l'ancienne porcelaine faits pendant l'année, mais il revenait toujours à moi, pour causer non-seulement sur la porcelaine, mais sur plusieurs objets de chimie et de physique. Il est revenu causer ainsi avec moi à quatre ou cinq reprises différentes, et ces conversations duraient des quarts d'heure, des demi-heure entières. En un mot, j'ai tout lieu de croire qu'il prenait plaisir à m'entretenir et qu'il était satisfait de tout ce que je lui disais. Bien des petits détails de ces conversations me reviendront et je vous en ferai part de temps à autre à mesure que je m'en souviendrai.

[Vous êtes peut être étonné de ce qu'il ne soit presque plus question de Mr de Montigny dans la suite de ma naration, mais c'est qu'en effet, c'était presque toujours à moi que le Roi adressai la parole je crois qu'il me donnoit la préférence parce que Mr de Montigny

qu'il connaît pourtant très bien et qu'il paroît estimer a comme vous savez un air froid et embarrassé que sa vois est faible et basse qu'enfin comme j'ai les objets de Chymie plus présan(?) plus familière que lui, j'avois les réponses plus promptes et plus étendues d'ailleurs.]

J'avais eu la présence d'esprit de prendre le matin une grande tasse de café à l'eau qui m'animait, et quoique j'eusse assisté chez M. Bertin à un dîner des plus exquis et des plus splendides, j'avais si peu mangé, qu'en vérité je puis dire que j'étais à jeun avec ma tasse de café dans l'estomac, ce qui me laissait une activité et une présence d'esprit bien nécessaires en pareille occasion. Enfin, le roi me parlait avec une bonté et une familiarité si grandes, que j'étais réellement plus à mon aise avec lui qu'avec le premier venu un peu important que je n'aurais pas connu. Cette dernière entrevue a duré ainsi depuis cinq heures jusqu'à sept heures du soir.

APPENDIX IV

Excerpt from the general inventory of porcelain stock at the Sèvres manufactory

1 January 1774

Magazin de Porcelain dure

A

52	Assiettes à soucoupe...	6	312. £	"	"
24	Assiettes unies 1ère gr...	6	144.	"	"
6	assiettes unies 2è gr...	6	36.	"	"
2	id. à Gaudrons 1ère gr...	6	12.	"	"
30	id. à couronnes...	6	180.	"	"
60	id. à palmes...	6	360.	"	"
9	id. ancienne forme à palme enlassée...	6	54.	"	"

B

3	Batteaux...	18	54.	"	"
6	Beurriers ...	21	126.	"	"
4	Bougeoirs à colonnes coupées...	15	60.	"	"
4	id. à colonnes terminées...	18	72.	"	"
8	id. petits à colonnes et baze carrée	18	144.	"	"
8	Böete à savonnette de 2 gr. chaque...	18	144.	"	"
9	id. à éponge de 2 g. chaque...	18	162.	"	"
2	Bassins à Barbe...	30	60.	"	"
7	Burettes cannelées...	12	84.	"	"
4	Brocs 1ère grand. pour garde-robbe...	48	192.	"	"

C

10	Compotier quarré 1ère gr...	18	180.	"	"
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2366. [sic] " "

De l'autre part...

2366. " "

10	Compotier quarré 2è gr...	18	180.	"	"
6	id. à coquille	21	126.	"	"
1	id. rond uni ...		18.	"	"

9	id. ovale 2è gr...	18	162.	"	"
43	Coquetier à jour	6	258.	"	"
1	Cuillère à caffè...		3.	"	"
14	Coquille sur petit pied quarré pour salière	6	84.	"	"
16	Caffetière à 3 pieds et anse 1è g.	18	288.	"	"
31	id. ... id. ... id. ... 2è gr...	18	558.	"	"
2	id. à manche ... 3ème gr...	15	30.	"	"
4	Chocolatières...	18	72.	"	"

D

3	Déjeuner Courteille 1ère gr. a anse...	48	144.	"	"
1	id. Duplessis 1ère gr. a anse		72.	"	"
1	id. G[sic]ebert a anse		72.	"	"
4	id. forme corbeille à anse	72.	288.	"	"
7	id. Losange à anse	72	504.	"	"
1	id. à baguette et ruban sans anse...		96.	"	"
3	id. du Roy. 2è gr...	48	144.	"	"
5	id. tiroir ... 1ère gr...	24	120.	"	"
7	id.... id. 2ème gr...	24	168.	"	"
7	id.... quarré 1ère gr. ...	72	504.	"	"
4	id. ... id. ... 2ème gr...	60	240.	"	"
			6497.	"	"

Cy contre...

6497. " "

E

4	Ecritoire...	30	120.	"	"
19	Pot pour led. 1è gr...	6	114.	"	"
19	id. pour led. 2è gr...	6	114.	"	"
4	Ecuelle 1ère g. avec anse, à feuilles de roseaux...	12	48.	"	"
3	id. 2è gr...	12	36.	"	"
3	id. nouvelle à ruban...	21	63.	"	"
2	id. ... id.... unie...	18	36.	"	"
11	id.... ordinaire 1ère gr. ...	18	198.	"	"
63	Platteau ovale 1ère gr. pour lesd. ...	9	567.	"	"
35	Ecuelle ordinaire 2è. gr. ...	10	350.	"	"
8	Platteau ovale 3è gr. pour lesd. ...	10	80.	"	"
2	id. rond. ... 2è. gr. pour lesd. ...	10	20.	"	"

31	Ecuelle 3è. gr. ...	12	372.	"	"
13	Platteau ovale 3è. gr. pour lesd. ...	9	117.	"	"
64	Platteau ovale pour les ecuelles 4è gr. ...	6	384.	"	"
3	Ecuelle de veilleuse ...	4	12.	"	"
2	Enfant bougeoir sans pied...	12	24.	"	"
4	id. led. Saison...	12	48.	"	"
5	id. à bougeoir et corne d'abondance...	24	120.	"	"

G

646	Goblet Bouillard...	4	2584.	"	"
49	Soucoupes pour lesd. ...	3	147.	"	"
			12051.	"	"

De l'autre part ...

12051. " "

2	Goblet Calabre 1ère gr. ...	6	12.	"	"
4	Soucoupe à bord renversé pour lesd.	4	16.	"	"
2	id. à sorte pied pour lesd. ...	18	36.	"	"
42	Goblets Calabre 2ème gr. ...	4	168.	"	"
2	id. à gaine, avec anse, ornement, nouvelle forme...	18	36.	"	"
1	Soucoupe enfoncée 1è. gr. sans goblet		4.	"	"
60	Goblets Bouret 1ère gr. ...	4	240.	"	"
21	Soucoupes pour lesd. ...	3	63.	"	"
31	Goblet Bouret 2è grand. à anse et sans anse...	3	93.	"	"
1	Goblet Bouret 3è. grand. sans anse...		3.	"	"
8	Soucoupe servant aux 2è et 3è gr...	2	16.	"	"
14	Goblet à fleur d'orange	2	28.	"	"
1	Soucoupe pour lesd. ...		2.	"	"
5	Goblet à thé 1ère gr. ...	3	15.	"	"
29	Goblet à thé 2ème gr. ...	2	58.	"	"
8	Soucoupe pour lesd. 2è. gr. ...	2	16.	"	"
11	Petit goblet	4	44.	"	"
69	Goblet Litron 1ère gr. ...	4	276.	"	"
115	Soucoupe pour lesd. ...	2	230.	"	"
86	Goblet Litron 2è. grand. dont 2 couvertes	3	258.	"	"
43	Soucoupes pour lesd. ...	2	86.	"	"
116	Goblets Litron 3è. grand. dont 11 couverts	4	464.	"	"
24	Soucoupes pour lesd. ...	2	48.	"	"
			14263.	"	"

Cy contre		14263.	"	"
79	Goblet Litron 4è. grandeur ...	3 257.	"	"
72	Soucoupes pour lesd. ...	2 144.	"	"
12	Soucoupe pour Goblet à lait 2è. gr.	3 36.	"	"

J

1	Jatte à punche ...	30.	"	"
4	Mortier pour lad. ...	30 120.	"	"
1	Grande jatte à lait couverte	24.	"	"
9	Jatte à lait 1ère gr. ...	12 108.	"	"
11	id. ... 2è. grandeur...	9 99.	"	"
2	Jatte et fontaine ...	18 36.	"	"
3	Jatte anglaise 1ère gr. ...	9 27.	"	"
5	id. ... 2ème gr. ...	9 45.	"	"
4	Jatte quarrée à raincer la bouche...	6 24.	"	"
4	id. ovale...	9 36.	"	"

M

12	Moutardier...	6 72.	"	"
7	Platteau pour lesd. ...	4 28.	"	"
15	Marmitte...	6 90.	"	"

P

3	Pot à oeil à ornement 2è gr. ...	60 180.	"	"
9	id. ... unie 2ème gr. ...	50 450.	"	"
12	Platteaux pour les deux objets ci-dessus	50 600.	"	"
4	Platteaux de pots à oeil 3è. gr. ...	36 144.	"	"

16813. " "

De l'autre part ... 16813. " "

13	Petit pot à oeil pour purée...	24 312.	"	"
7	Plat d'entrée uni servant aussi aux pots à oeil pour purée...	15 105.	"	"
12	Plat d'entrée à ornement...	12 144.	"	"
8	Plat à laver ...	9 72.	"	"
5	Porte huillier avec carcasse...	18 90.	"	"
12	Platteaux Bouret uni...	9 108.	"	"

1	id. triangle...	9.	"	"
1	id. pour fromage de Brie...	18.	"	"
3	id. Lozanges servant aux saucières...	18 54.	"	"
92	Pots à jus uni...	4 368.	"	"
18	id. à coste...	4 72.	"	"
1	Pot à fleur pointé 1ère gr. ...	30.	"	"
2	Pot à lait à 3 pieds 1ère gr. ...	12 24.	"	"
45	id. ... id. ... 2ème gr. ...	9 405.	"	"
28	id. ... id. ... 3ème gr. ...	6 168.	"	"
2	id. ... id. ... nouvelle forme	6 12.	"	"
34	Pot à lait à anses 1ère gr. ...	9 306.	"	"
38	id. ... id. ... 2è gr. ...	9 342.	"	"
22	id. ... id. ... 3è. gr. ...	6 132.	"	"
1	Pot à lait à manche ... 3è. gr. ...	9.	"	"
10	id. id. 2ème. gr. ...	6 60.	"	"
21	id. id. 3ème gr. ...	6 126.	"	"

19779. " "

Cy contre ...

19779. " "

11	Pot à lait à manche 4ème gr. ...	6 66.	"	"
56	Pot à sucre 1ère gr. ...	9 504.	"	"
87	id. 2ème gr. ...	9 783.	"	"
58	id. 3ème gr. ...	6 348.	"	"
10	id. 4ème gr. ...	6 60.	"	"
20	id. 5ème gr. ...	5 100.	"	"
1	Poëlon 1ère gr. ...	9.	"	"
2	id. 2ème gr. ...	9 18.	"	"
3	id. 3ème gr. ...	6 18.	"	"
41	id. 4ème gr. ...	6 246.	"	"
21	id. couvert 5ème gr.	6 126.	"	"
11	Pot à l'eau 1ère gr.	18 198.	"	"
8	Jatte pour lesd.	12 96.	"	"
3	Pot à l'eau 2ème gr.	15 45.	"	"
14	Jatte pour lesdt.	12 168.	"	"
3	Pot à l'eau 3ème gr.	15 45.	"	"
3	Jatte pour lesd.	12 36.	"	"
8	Pot à l'eau à la romaine	21 168.	"	"
7	Jatte pour lesd.	15 105.	"	"

3	Pot à tabac quarré...	18	54.	"	"
2	Plaque ...	12	24.	"	"
1	Platteau à deux pots à confiture		12.	"	"
7	Pot à pommade...	5	35.	"	"
			23043.	"	"

De l'autre part . . .

9	Pot à opiat ...	3	27.	"	"
6	Pieds d'estaux à colonne 1ère gr.	24	144.	"	"
9	id. ... id. ... 2ème gr.	24	216.	"	"
19	id. ... id. ... 3ème gr.	18	342.	"	"
1	Platteau d'huillier uni...		9.	"	"
			23043.	"	"

S

4	Saladier uni à bords découpés 1ère g.	30	120.	"	"
5	id. ... id. ... id. ... 2ème gr.	30	150.	"	"
8	Sceaux à bouteille ...	30	240.	"	"
10	id. à demie bouteille...	24	240.	"	"
3	id. à topette...	18	54.	"	"
14	id. ronds à liqueur...	18	252.	"	"
7	id. ovale à liqueur...	36	252.	"	"
29	sceaux ordinaire à verre...	18	522.	"	"
3	id. du Roy échancré...	21	63.	"	"
6	Sceaux à glace...	60	360.	"	"
7	id. creveté [sic] ...	60	420.	"	"
15	Saucière	12	180.	"	"
18	Salière simple ancienne forme...	4	72.	"	"
6	id. simple nouvelle forme...	6	36.	"	"
12	id. double ancienne forme...	8	96.	"	"
4	id. double nouvelle forme...	15	60.	"	"
22	Salière à ozier plein et en panier...	9	198.	"	"
			27096.	"	"

Cy contre . . .

13	Salière à 3 parties...	12	156.	"	"
12	Sucrier M. le Premier...	24	288.	"	"
4	id. ancienne forme...	18	72.	"	"
5	Platteaux id. pour lesd.	9	45.	"	"
2	Sucrier forme de Saxe...	24	48.	"	"

T

7	Terrine ovale à ornement...	72	504.	"	"
4	Platteaux pour lesd.	60	240.	"	"
31	Tasse à glace	3	93.	"	"
3	Teyere 1ère gr. ...	18	54.	"	"
7	id. 2ème gr. ...	18	136.	"	"
45	id. 3ème gr. ...	12	540.	"	"
12	id. 4ème gr. ...	9	108.	"	"
32	id. 5ème gr. ...	6	192.	"	"
3	id. en canne de rozeaux ...	24	72.	"	"
6	id. en bas relief ...	30	180.	"	"
7	Tableaux...	18	126.	"	"

V

8	Vase hollandois 2ème gr.	48	384.	"	"
2	id. Chantilly 1ère gr.	48	96.	"	"
3	id. à oreille 3ème gr.	24	72.	"	"
1	id. forme d'oeuf 1ère gr.		72.	"	"
2	id. a tête de poisson...	24	48.	"	"
			30622.	"	"

De l'autre part

			30622.	"	"
1	Vase de Nesle 1ère gr. ...	24.	"	"	"
1	id. Carage...	24.	"	"	"
1	id. en colonne couverte...	24.	"	"	"
2	id. à gorge 1ère gr. ...	36	72.	"	"
1	id. id. ... 2ème gr. ...	30.	"	"	"
1	Vaze royal à médaillon sur fond bleu 1ère gr. ...	36.	"	"	"
5	id. 2ème gr.	120.	"	"	"
4	id. 3ème gr.	96.	"	"	"
3	id. 4ème gr.	72.	"	"	"
2	id. 5ème gr.	60.	"	"	"
2	id. à tête de Bouc 5ème gr.	60.	"	"	"

Pièces en fond de gris d'agate

D

2	Déjeuners du Roy 2ème gr.	36	72.	"	"
1	id. G [sic] ebert à anses...		48.	"	"
1	id. forme corbeille à anse...		48.	"	"

E

3	Ecuelle et Platteaux 2ème gr.	30	90.	"	"
5	id. et 4 Platteaux 3ème gr.	30	150.	"	"

G

2	Goblet Litron 1ère gr.	6	12.	"	"
4	Soucoupe pour led. ...	4	16.	"	"
			31676.	"	"

Cy contre . . .

			31676.	"	"
5	Soucoupe pour goblet Litron 2è gr.	4	20.	"	"
13	Goblet Litron 3ème gr.	4	52.	"	"
12	Soucoupe pour led. ...	3	36.	"	"
17	Gobelet Litron 4ème gr. ...	4	68.	"	"
17	Soucoupe pour led. ...	3	51.	"	"
9	Goblet Bouillard ...	6	54.	"	"
8	Soucoupe pour led. ...	4	32.	"	"
1	Goblet Bouret 3ème gr.		6.	"	"
4	Soucoupe pour led. ...	4	16.	"	"

P

2 [sic]	Pot à lait à pied 1ère gr.		18.	"	"
15	id. 2ème gr.	18	270.	"	"
11	idem 3ème gr.	15	165.	"	"
3	Pot à sucre 2ème gr.	9	27.	"	"
2	id. 3ème gr.	9	18.	"	"
7	id. 4ème gr.	7	49.	"	"
9	id. 5ème gr.	6	54.	"	"

T

2	Teyere ... 2ème gr.	12	24.	"	"
4	id. 3ème gr.	12	48.	"	"
32	Goblets Bouillard...	12	384.	"	"
21	Soucoupe pour lesd. ...	6	126.	"	"
Total			33194.	"	"