Attribution enhanced – a Bovey Tracey porcelain sauceboat

A paper by Nicholas Panes and J Victor Owen, read by Nicholas Panes at Kensington Central Library, Hornton St, London on 15th January 2011

Introduction

This paper provides the evidence for the new attribution of a porcelain sauceboat to Bovey Tracey via a mixture of connoisseurship, documentary evidence, and chemical analysis.

Bovey Tracey's origins as a pottery are first recorded in the 1750 correspondence of Dr Richard Pococke, who wrote:

> I was informed that they were endeavouring to set up such a manufacture as they have in Staffordshire at Bovey Tracey, near the River Tynge, in Devonshire where they have plenty of good pipe clay, and have found a coal that will serve for that purpose.

Later in the 1750s Pococke's cousin, Jeremiah Miles, wrote that the pottery had been:

> . . . burning earthenware, a manufacture of which was set up a few years ago, by some persons, who made it chiefly of the white pipe clay that is found in Bellamarsh Heath. In order to carry on this manufacture they procured some workmen from Staffordshire who attempted to make ye country ware, in which they succeeded tolerably well but soon miscarried, either as the Proprietors said, because the workmen were bribed to destroy it, or as the workmen said, because the Bovey coal, which they made use of in burning it, was not of a heat intense enough to answer the purpose. However, it is proposed to make a second attempt to revive it.

The first attempt at china making was not to begin until 1767. From correspondence between Thomas Pitt and William Cookworthy the experiments by Nicholas Crisp in making porcelain at the Indeo Pottery in Bovey Tracey have been known for some time. Crisp had arrived in Bovey Tracey following the failure of various business ventures including the porcelain works at Vauxhall. Pitt's land in Cornwall was to supply materials for Cookworthy's own attempts at porcelain making. In 1767 through Cookworthy, Pitt also supplied some materials to Crisp. Two papers to the ECC by Roger Massey[1] set out the known history of Crisp's involvement at Bovey Tracey, some of which is summarized here.

It is clear that the attempts at firing porcelain were beset with problems. These problems mainly centred on discoloration of the wares. As Crisp is associated with the manufacture of soapstone (and to a lesser extent bone ash) porcelains at Vauxhall, it is assumed that he would continue making these wares at Bovey Tracey. The following extract is from the Cookworthy/Pitt correspondence in October 1767: 'Crisp is preparing for burning, having recd a pretty large Quantity of Materials from us . . .' It is also noted that Crisp 'will proceed on the high biscuit plan', whilst 'we in Plymouth shall persevere in our Endeavours to perfect our body and glaze on the Chinese Plan . . .'

Thus it is apparent that Crisp was not making a hard paste body, or if he was, he did not intend it to be finished in a single firing. Later, however, a hard paste body was attempted at Bovey, though Cookworthy expressed doubts about the recipe employed. In November 1767 he wrote:

> tis necessary to note that as the Petunse was scarce with them, they had but one fourth part of this ingredient in their body, tis my opinion if the body had been composed of equal parts of Caulin and Petunse we should have a good deal of fine ware from this kiln.

Cookworthy also had doubts about the use by Crisp of wood to fire the kiln, and at first thought this was the reason for discolouration of the wares. However, he soon changed his mind, making this comment in a further letter in December 1767: 'By some Experiments lately made I have fixed to certainty that the tint of yellow or cream colour in the Bovey Pieces is absolutely due to the kiln and not to want of fire.'

Chemical analysis assisted the first firm attribution

Despite the amount of documentary evidence pertaining to the factory, little is known about the porcelain produced at Bovey Tracey. Cookworthy's correspondence referred to figures being made but no example of these wares has yet been identified.

1992 excavations on the Bovey Tracey site resulted in finding a dozen porcelain sherds. Chemical analysis[2] showed that these samples comprised three types of porcelain: phosphatic (bone ash), magnesian-plumbian (soapstone) and silicious-aluminous ("true porcelain").

Until 2005, when a paper was read to the ECC by Mary White[3], no pieces of extant Bovey Tracey porcelain had been identified. However, chemical analysis was carried out on a porcelain fuddling cup which was found to resemble compositionally some of the magnesian-plumbian sherds from the site. (**1**) In particular, its 'soapstone' body is mildly phosphatic and sulphurous and also contains barium, an element hitherto unknown to occur in substantial concentrations in analysed historical British porcelains. The establishment of the fuddling cup as Bovey Tracey porcelain also brings with it the expectation that a similar fuddling cup, now in the Victoria and Albert Museum, London, is also of Bovey Tracey origin.

1. Bovey Tracey porcelain fuddling cup

2. Vauxhall, Bovey Tracey? and Plymouth sauceboats

The sauceboat

The documentary evidence of the efforts to make porcelain at the Indeo Pottery have been accompanied by tentative attributions of wares to Bovey Tracey based upon connoisseurship. One such attribution referred to two sauceboats, sold as individual lots at auction in 1998.[4] One of these is in Nicholas Panes' collection and is illustrated in the centre of the picture (**2**), alongside a sauceboat from Vauxhall (on the left) and one from Plymouth (on the right).

The first aspect of the argument for a Bovey Tracey attribution is that the appearance of the paste is creamy in texture, the beginning of discolouration consistent with flaws described in the Cookworthy / Crisp correspondence. This discolouration (**3**) is more notable beneath the foot of the piece, leading to the thought (now proved incorrect) that this sauceboat might even be of phosphatic composition.

The second aspect of the argument hinges on the developmental evolution in the design of the piece, which has previously been discussed in Nicholas Panes' book on sauceboats.[5]

The earliest piece, the one from Vauxhall, has a quite small foot which may have lead to instability. The suspected Bovey Trace sauceboat has a handle identical to that on the Vauxhall piece. However, its foot has been enlarged for greater stability. The 'true porcelain' sauceboat from Plymouth retains (slightly enlarging further) the bigger foot but uses a new type of handle. The old type of handle is not known on Plymouth true porcelain wares. For those, including Nicholas Panes, who have advanced a Bovey Tracey attribution for this sauceboat, it has seemed reasonable to suggest that if the sauceboat in the centre was made by neither Vauxhall nor Plymouth, it is likely to have been introduced at some point after the production of the first Vauxhall examples.

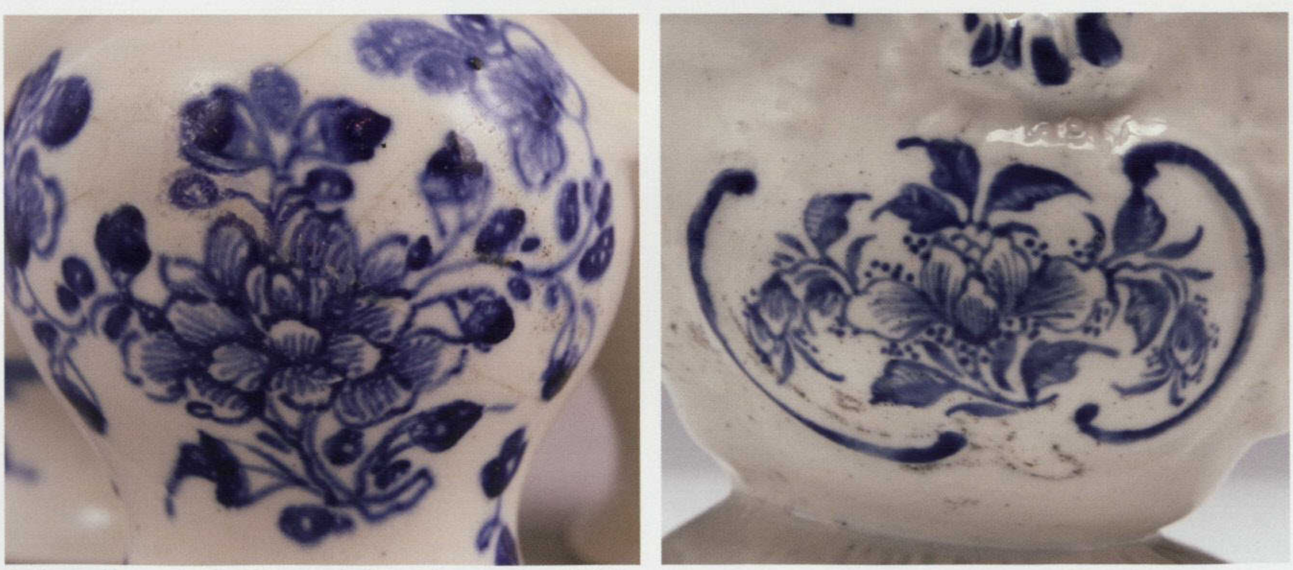
Workmen employed by Crisp at Indeo included at least one modeller, Thomas Hammersley, and moulds from Vauxhall may well have travelled with him to be modified later. On the failure of the venture, the Indeo moulds as well as the workmen again transferred, this time to Plymouth. The progressive design changes of the sauceboat foot and handle support an argument for the chronology of their production being similar to the order of presentation (**2**) from left to right.

Finally, the painting style on the reverse of the fuddling cup is fairly similar to that on the sauceboat. (**4**)

Results of analysis

Analysis of the sauceboat shows that it is a distinctive type of magnesian-plumbian porcelain. A Bovey Tracey origin for this sauceboat is supported by its composition, which in terms of the presence of barium and virtual absence of phosphorous and sulphur, is intermediate between the two types of magnesian-plumbian sherds recovered from the Bovey Tracey factory site.[6] Based

3. Discolouration on sauceboat



4. Decoration on the fuddling cup (left) and the sauceboat (right)

on the available analytical data for 18th century British porcelain, substantial concentrations of barium have thus far only been reported for the `Type A` Bovey Tracey sherds.[6] It is possible that further analysis of other magnesian-plumbian British porcelains will also detect this component, particularly since barium is known in other types of 18th century wares (e.g. Wedgwood`s jasperware).

One group of sherds from the Bovey Tracey site (A), represented by four samples, has a barian (3% BaO), sulphurous (1% SO_3) and mildly phosphatic (2% P_2O_5) composition. These three components are at (or below) analytical detection limits (i.e. $\leq$0.1%) in the other grouping (B), represented by a single sample. These two types of wares are also distinguished by the concentrations of other components that they share. Group A samples have higher magnesium (7.9% vs 5.7% MgO) and lime (8.3 vs 4.4% CaO), and lower silica (64.7 vs 75.4% SiO_2) and alkali (Na_2O+K_2O = 2.9% vs 5.1%) contents than the single group B sherd. Both groups, however, have similar lead contents (~6% PbO). The first intact piece of Bovey Tracey porcelain identified on compositional grounds, the fuddling cup described by Mary White[7] is Group A.

The results of analysis of the paste of the sauceboat described here are set out and compared. (**5**) As already noted, the sauceboat described here is compositionally intermediate between group A and B wares. It resembles the group B sample in terms of its elevated silica content (75.1% SiO_2) and alkali content (3.4%). Like group A, it contains barium (3% BaO), but it lacks sulphate, and contains only a trace of phosphate. The sauceboat contains higher amounts of magnesian (9.8% MgO) and lower lime (1.8% CaO) and lead (2.2% PbO) than previously analysed Bovey Tracey magnesian-plumbian porcelains. All three variants of these wares have low alumina contents, since soapstone (steatite [talc]) evidently partly replaced clay as the plastic ingredient in the ceramic paste.

	Sherds 7-10 Bovey Site	**Fuddling Cup**	**Sherd 12 Bovey Site**	**Sauceboat**
	Group A	**Group A**	**Group B**	
SiO_2	64.7%	65.9%	75.4%	75.1%
TiO_2	-	0.2%	-	0.1%
Al_2O_3	3.2%	2.7%	3.1%	4.3%
FeO	0.4%	0.5%	0.3%	0.5%
MgO	7.9%	6.8%	5.7%	9.8%
CaO	8.3%	8.4%	4.4%	1.8%
BaO	3.0%	3.6%	-	2.5%
PbO	6.2%	6.2%	5.9%	2.2%
SO_3	1.3%	0.7%	-	-
Na_2O	0.4%	0.3%	1.4%	0.9%
K_2O	2.5%	2.2%	3.7%	2.5%
P_2O_5	2.3%	2.1%	-	0.1%

5. Comparison of paste compositions

The composition of the glaze on the sauceboat (**6**) resembles that on the fuddling cup. Both contain a moderate amount of lead (~28% PbO) and are tin-bearing, and in these respects differ from the glaze on the type B sherd, which is relatively lead rich (45% PbO).[2] and lacks tin. None of the other magnesium-plumbian sherds found on the site were glazed. The sauceboat glaze, however, contains about twice the amount of lead as the glazes (8-16% PbO) on the phosphatic sherds from the Bovey Tracey site. True porcelain sherds from Bovey Tracey have a lead-free glaze.

	Fuddling Cup	**Sauceboat**
SiO_2	52.30%	53.58%
TiO_2	0.30%	0.18%
SnO_2	4.70%	7.50%
Al_2O_3	1.10%	1.01%
FeO	0.40%	0.43%
MnO	-	0.01%
MgO	1.10%	1.96%
CaO	2.00%	1.82%
BaO	0.90%	0.67%
PbO	28.90%	27.68%
SO_3	-	0.03%
Na_2O	1.90%	2.15%
K_2O	6.10%	2.91%
P_2O_5	0.10%	0.08%

6. Comparison of glaze compositions

These data suggest that Nicholas Crisp experimented both with the paste and glaze of the magnesian-plumbian wares he produced at Bovey Tracey. This is consistent with Crisp's penchant for experimentation at Vauxhall, since an equally wide range of wares (high-Ca and low-Ca magnesium-plumbian, and phosphatic porcelain) and glazes (17-38% PbO) is represented by sherds from that London factory site.[2] If this sauceboat is indeed a Bovey Tracey ware, it represents a third variant of the magnesian-plumbian porcelains thus far identified from this factory.

Despite the lack of sulphate in the sauceboat sample, barite (barium sulphate, a mineral) could nonetheless be the source of Ba, since the sauceboat apparently also lacks bone ash (note its very low phosphate [P_2O_5] content (**6**), a phase known to partition sulphur during kiln firing.[8] However, the possibility that a barium carbonate mineral (witherite) was used instead cannot be excluded. Nevertheless this seems a less likely scenario given the expense of bringing this material from the Cumbria area or Wales, where it occurs.

Although the presence of barium has been noted in Bovey Tracey porcelains, the reason for its use has not previously been considered. Barite was first identified in 1774 by Swedish chemist Carl Wilhelm Scheele (1742-86). However, barium itself was not isolated until Humphrey Davey's work in 1808. Considerably before this, however, the material was known by various names, including Gypsum Irregulare (Wallerius, J G (1747) Mineralogia), Calk, and 'heavy spar'. In the late 17[th] century Europe some such rocks were known of as 'Bologna stone' named after the city where they occurred, Bologna, Italy. The Bologna stone glowed in the dark, and scientific interest in such materials began at that time.

Uses for this mineral today are quite diverse. They include applications in the oil drilling industry, electronics, and the manufacture of paints, glass and ceramics. Barium sulphate has a high density (4.4g/cm^3), and unlike the pure element it is non-toxic. Although colour may vary, barite can be white and can have a very high reflectivity. These properties contribute to the use of barite as a pigment in white paint and in the manufacture of paper. In addition, barite is used as a fluxing agent in some modern ceramics. Given its density, it is highly unlikely that barite would be mistaken for other non-metallic minerals. Its use in some early British ceramics therefore must have been deliberate.

Use of Barium in 18th century ceramics

Although traces of barium rich glass have been found in Pomona porcelain sherds, only one other instance of the use of barium is known in the 18th century, this being the experiments in the 1770s by Wedgwood who used it in 'white bodies' including those subsequently coloured (i.e. Jasperware). Wedgwood appears to have been excited, if not obsessed with these experiments, and correspondence with Thomas Bentley in the Wedgwood archives does seem to infer that the idea for this material may have come from Bovey Tracey. He referred to barite as 'Cauk', and gave a catalogue number, 74. He was also experimenting with number 19, which he referred to as '*spath fusible*', the French name for fluorite which is associated with barite found near the historic lead mines at Matlock, Derbyshire.

Wedgwood's efforts were in full swing in 1775 when he wrote to Bentley as follows:

> 15th January 1775
> . . . I will give you a full description of the substance I want, for I have not a single piece un-pounded. It is generally a white chalky looking substance in form generally flat, above an inch or from one to two inches thick and often enclosing a small lump of lead ore. We found it in great quantity in the first mines we visited short of Middleton going from Matlock where my father called a ? here to us and asked him if he knew what we wanted. He called it 'Cauk', but we were then in search of Spath Fusible (fluorite) or no. 19 which he afterwards found for us on Middleton Moore and called it Wheat Stone. I inclose a little of this Cauk provided in a paper A.

Wedgwood went on to explain where to find this mineral and how it should be separated from any lead ore before pounding. He was unsure as to whether number 19 was as good, and specified that no. 74 (the barite) should be given priority. He was concerned lest others should become aware of the material: ' . . . it will be next to impossible, we are such notorius and suspected folks, to come at 74 unnoticed, and we must be cautious in our first steps, not to appear in it if at all possible.

Such were these security concerns that in a letter dated 17th July 1775, Wedgood went as far as to garble the word 'Matlock' so nobody would know where it was:

> I went to Mafedgk on Friday to inquire about the subject I told you was not as it should be, and found that he had got it at a different place to that which you directed him. I told him you wished to have it whiter, which he seemed to think could not be – however I settled with him to sort it out and send you the white by itself and that which is not white my serve some other purpose.

The letter of 6th August 1775 is also of great interest:

> . . . Mr Trecize's white <u>something</u> for I can hardly call it a clay does not acquire the hardness of a clay in burning unless mixed with other matters but with 74 & c it makes a body of the most delicate pearly blue and may be a valuable raw material, but I have so many of these raw materials & different compositions under my immediate care and in which nobody can assist me that I am almost crazed with them . . .
>
> . . . I shall send you some specimens of this substance with other things particularly the chalky body made waxen and its whiteness preserv'd. [This is the Barite body]
>
> This white body is much the best I have made and as I have near 2 cwt of it ground and mixed and prepared all alike, & all together in one vessel I hope to send you some fine things soon – but I have too much experience of the delicacy and unaccountable uncertainty of these fine things to be very sanguine in my expectations – and Crisp, poor Crisp, haunts my imagination continually, ever pursuing, just upon the point of overtaking, but never in possession of his favourite object ! There are many good lessons in that poor man's life labours and catastrophe if we schemers could profit by example, but that wisdom, alas, is denied us. Fate, I suppose, has decreed that we must go on – we must have our Hobby Horse & mount him, & mount him again if he throws us, ten times a day.

Whilst Wedgwood's comments on Crisp have been published before, it does not appear that the context has been previously commented on. Wedgwood's comments on the use of barium in the correspondence are embedded with his comments about Crisp, providing implicit documentary support for the use of barium already identified at Bovey Tracey through chemical analysis. Wedgwood did visit Bovey Tracey in June 1775 (after Crisp's death) but his interest in barite predates that. It may be that his fixation with barite, and indeed his visit to Bovey, all stemmed from earlier knowledge of Crisp's experiments, perhaps relayed by a potter who left Bovey Tracey to return to Staffordshire.

Properties of barite when fired

One mineral containing barium, witherite, is sometimes used as a means of introducing barium oxide into glazes[9]. It is known to influence the sintering behaviour of "soapstone" porcelains as it generates highly reactive BaO particles that react both with metakaolinite derived from kaolinite and with silica derived from talc at temperatures well below (~122° C lower than) the eutectic[10]. This causes an increase in the density and hence influences the microstructure of the wares, with the potential to improve the aging behaviour.

Both barite (barium sulphate) and witherite (barium carbonate) generate BaO as they de-volatilize. Unless these minerals are preserved or the volatiles they generate are taken up by other phases in the ceramic, the volatiles will escape during the firing process, leaving the modern-day researcher with insufficient data to determine the source mineral of this component. Although we did not detect barite during microprobe analysis of the sauceboat sample, it seems likely that Crisp used barite (rather than witherite) in the preparation of his "soapstone" pastes since particles of this mineral are preserved in sherds of Group A magnesium-plumbian wares from the Bovey Tracey factory site[11].

It is not possible to invoke arguments centred on what is now known about the properties of particular compounds used in ceramic pastes and glazes in trying to decide how or why historical ceramics were made. However, in Crisp we have an experienced porcelain manufacturer who collaborated with Cookworthy, himself a well read, scientifically trained and knowledgeable chemist. Given the wide ranging paste trials which characterized the factory, the use of barite, available nearby, seems a reasonable experiment to improve the porcelain, perhaps utilising its more obvious features in the hope of improving whiteness.

Sources of barite

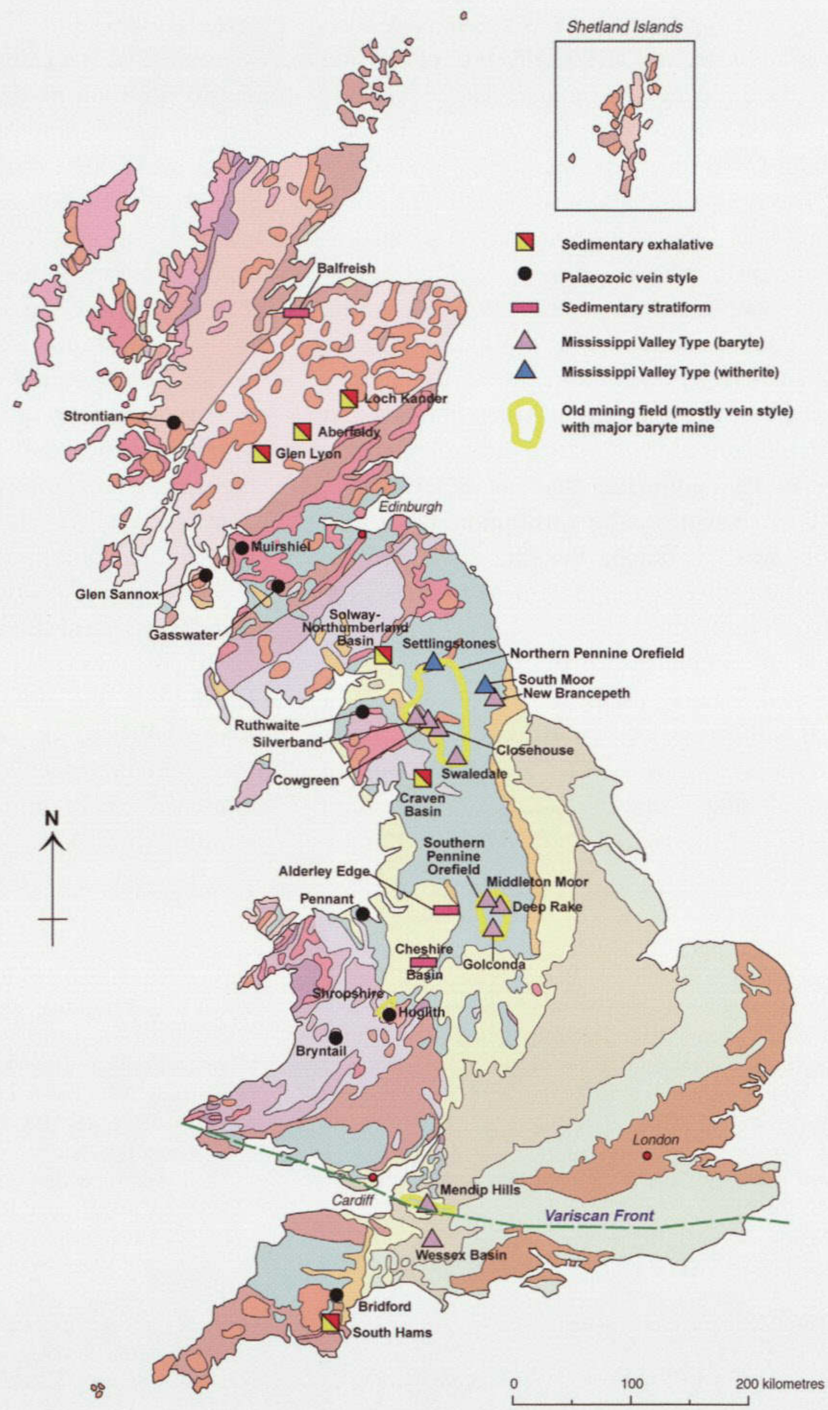
As to where such supplies were obtained, Mary White identified the probable source from mining activity, some eight miles north of Bovey Tracey. However, whilst this may certainly have been the source, commercial activity of any sizeable scale did not commence there until the 1840s, and then the search for lead, discontinued in 1853, caused the barite to be largely ignored. After some 32 years in abeyance, the mine at Bridford was reopened to mine the barite in 1875.

The map (**7**) shows the main barite deposits throughout Britain. As will be seen, over much of the country only those on the western side of England have easy access to these minerals. Poor and limited road access to some of the inland sites may have constrained the exploitation of these minerals although for the coastal areas sea transportation was an option. One further site in Devon exists where barite can be found. Although this site, at South Hams is nearly 30 miles from Bovey Tracey, it is only a mile or two from Kingsbridge, the birth place of William Cookworthy, so might well have been known to him, and thus, in turn, to Nicholas Crisp. The use of barite in porcelain was an experiment, and one for which the absolute purpose is unclear. However, it is likely that Cookworthy more than anyone in Devon would have been aware of the scientific interest in this mineral, and would also have had the wherewithal to find it.

Discussion and conclusions

The distinctive composition of the sauceboat, coupled with a study of the piece using traditional connoisseurship, enable us propose that it (and another sold by Phillips

7. Barite deposits in Britain



in 1998) be added to the population of Bovey Tracy porcelains. As set out in Mary White's paper on the fuddling cup, it remains unclear why Crisp made such a technically difficult and stylistically unsophisticated product as the fuddling cup in porcelain. However, perhaps we should remember that some of the local potters whom Crisp may have recruited were used to making '*ye country ware*' and that workers at the Lambeth Delft manufactory, who Crisp may have recruited at Vauxhall, also made fuddling cups.

With the sauceboats there are no such stylistic questions. The repeating of a product at Bovey Tracey which Crisp previously made at Vauxhall is understandable. Moreover the transfer of workmen and moulds explains how ultimately the same product was made in Plymouth after the failure of Crisp's venture. The cement in the attribution process is the scientific analysis linking the sauceboat and the fuddling cup together and linking them to the sherds on the Bovey Tracey site.

Although quantitative chemical analysis is a well developed science, its use in the attribution of ceramics is still regarded with suspicion in some quarters, especially those who were raised on the not inconsiderable powers of connoisseurship demonstrated by experts the field of antique ceramics. This suspicion in part arises from the fact that similar recipes were used by different concerns over long periods of time.[12]

Analytical data has demonstrated that not every piece of porcelain made by a factory has the same recipe. Indeed, many porcelain manufacturers – Nicholas Crisp is but one example – produced different types of ware as they struggled with kiln wastage and other technical concerns. Furthermore, it is unreasonable to expect that the analysis of a handful of sherds can be representative of the composition of the tens or even hundreds of thousands[13] of porcelain objects created at any given commercially successful pot works over the course of its production history. Thus, a dogged faith in analytical data by a collector or a scientist may lead him or her to a wrong attribution and chemical analysis should not be expected to deliver definitive answers to all questions posed by enthusiasts.

With these cautionary notes in mind, it is nevertheless clear that chemical analysis can be an extremely powerful tool when used intelligently in determining the origin of unprovenanced ceramic objects. When, as in this case, analytical data, documentary evidence, and connoisseurship can be combined to help substantiate an attribution, this is the best of both worlds.

NOTES

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