James Watt’s philosophical thoughts about chemistry and the nature of heat were dissected thoroughly by David Miller in his recent book *James Watt, chemist* (2009). In contrast, in Watt’s garret workshop, preserved at the Science Museum since 1924, there are four discrete collections of chemicals—the ingredients for practical chemistry. These were probably brought together at various times, for specific purposes, and kept in case of further utility. They are not associated specifically with any known descriptions of Watt’s chemical work; however, by considering containers, names used for contents, and labelling methods, tentative suggestions can be made concerning the dates when the various sets of chemicals may have been assembled, and possibly why.

The collections are as follows: (i) a miscellany of small samples in four drawers of the 38-drawer cabinet against one wall (table 1 and figure 1); (ii) 66 white ceramic jars on the wooden shelves, labelled in most cases with handwritten paper labels stuck to the jars (figure 2); (iii) packets of paper tied with string, mostly mineralogical specimens, also on shelves; and (iv) large pots and barrels on the workshop floor, probably containing raw materials for Watt’s sculpture copying (figures 3 and 4). An inventory of the workshop was conducted in 1885, and again in 1924 when the contents were transferred to the ownership of the Science Museum. The museum treated the workshop as a single iconic object and gave it a single accession number. Identifying numbers for the contents were derived from a sequence following the locations around the room, and for some there is supplementary information from earlier work by conservators, curators and other researchers.

Details recorded for the chemicals include the location of the specimen within the workshop, the type of container or packaging, and a transcription of the label where one existed. A description of the appearance of the contents was also noted, within limits imposed by considerations of health and safety. An essential preliminary was a desktop exercise to identify hazards, of which the work described here forms a part. Some items were easy to recognize as potentially hazardous: liquid mercury in a sealed terracotta pot (item 1487) was fairly straightforward, and ‘Usbestos’ (item 1218) in a packet in one of the drawers led to the drawer’s being promptly sealed until stabilization work had been completed. And of the many white powders, the one labelled ‘W. Arsenic’ leapt out as being one to be handled with particular care.

The labelling produced further questions. Did the pots contain what the labels said they contained, and before that, what exactly did the labels mean? The names noted in the inventory were therefore checked against three sources. The first edition of *Encyclopaedia Britannica* (1768) was written by people that Watt would have known. Second, the
Oxford English Dictionary, both in print and online, gives several alternative definitions and dated examples of usage. Third, a more personal source was a notebook and diary compiled by Watt’s nephew Robert Hamilton, in the Science Museum’s archive collection. Hamilton trained as a potter, at the first pottery in England to buy a Boulton and Watt steam engine for grinding. James Watt’s home at Heathfield was not far away, and, as the diary records, from 1796 young Hamilton spent quite a lot of his free time there. The notebook gives recipes for earthenware and china bodies, glazes, colours and fluxes, and it was invaluable for some of the terms used in the potteries of the day.

Table 1. The labels for the drawers in the 38-drawer cabinet.

<table>
<thead>
<tr>
<th>Engine drills and points</th>
<th>Etching needles and compass needles</th>
<th>Best stocks, taps and dies</th>
<th>Divided scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>iron and steel screws</td>
<td>brass screws</td>
<td>Sand paper and brushes</td>
<td>Decimal small weights</td>
</tr>
<tr>
<td>hones and oil stones</td>
<td>indian ink, pencils and black lead</td>
<td>Optic glasses</td>
<td></td>
</tr>
<tr>
<td>pliers, vices, calipers</td>
<td>flute tools, stocking needles, small hinges</td>
<td>glass blow pipes, spirit levels, pulse glasses</td>
<td>Old wheels, cutters, and sundries</td>
</tr>
<tr>
<td>drills, bradawls</td>
<td>punches</td>
<td>brace bits</td>
<td>putty</td>
</tr>
<tr>
<td>small chisels and gouges</td>
<td>taps, dies and screw plates</td>
<td>Drugs for pottery</td>
<td>Screwdrivers and countersinks</td>
</tr>
<tr>
<td>broaches and small files</td>
<td>turning tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>files</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drugs for drying gums, emery, etc</td>
<td>Fossils</td>
<td></td>
</tr>
</tbody>
</table>
The drawer unit is a small piece of furniture, with 38 drawers containing a miscellany of small tools, accessories and parts for apparatus and machinery, chemicals and samples; as storage it must have been extremely useful to Watt. Its date is unconfirmed, but one drawer is labelled ‘Tools for flutes’, an activity that Watt ceased to pursue from about
and another carries the label ‘Drugs for pottery’, with which Watt was no longer active from 1774, when he moved to Birmingham. This suggests a proxy date for the cabinet of 1774 at the latest.

Figure 4. Inventory from 1885. Page 3 shows the contents of drawers 18 and 19. (Online version in colour.)
Alternatively, it may even have been acquired when the Watt family moved into Heathfield in 1792, although I have not found any particular evidence supporting this. R. L. Hills has suggested a date of 1801, when Watt sold his house in Scotland. However, some of the contents have an intermediate date, indicating an earlier period of regular use. Indeed, one, a packet labelled ‘Fine Gold 4/6’ (item 1062) can be tentatively associated with a purchase recorded in Watt’s cash book of 1797, from a visit to London.

The contents of the drawers no longer necessarily match the labels on the front, but the type of tape and the way it has been cut are quite distinctive. The same patterns appear on the labels of the jars. Because of these similarities, I suggest this gives a proxy date for the pots also of about 1774.

Until now, the pots have routinely been described as being Wedgwood wares. They are certainly cream ware, for which Wedgwood was renowned, but none are signed, and some were evidently misfired. One of Watt’s known chemical interests was to assist the Delftfield Pottery in making comparable ware, and as he lived near the pottery and must have been surrounded by the wares, I further suggest that the pots are examples of his own production.

**SUBSTANCES IN POTS**

Forty-two pots have identifiable labels, for which three—blue stone, gum ammi and admirabulans—still lack definitions and two others, marked only with numbers (1514 and 1534), can be tentatively linked to experiments with plaster of Paris. A further 14 pots have been used as containers for unidentified matter, mostly powders, and white, red, brown or black in colour. It is tempting to suggest that the white powders (items 1419, 1529, 1533 and 1503) are likely to be associated with the plaster experiments; the others may be colourants for attempts at making artificial stone, or related to pottery glazes, where the colour changes in firing.

Twenty pots have labels that imply a purpose for pottery, either as ingredients for the base, as fluxes to assist the colours to attach to the pots in the firing, or as components of glazes.

Given Watt’s interest in making tools and instruments, there is no surprise in finding chemicals for grinding, gilding and varnishing. His production of sculpture, whether from plaster-of-Paris moulds or using the sculpture-copying machines, would have required emery to smooth off the insides of the moulds and the finished products.

**SUBSTANCES IN DRAWERS**

The substances in the drawer unit are in very small packages, implying that they are special samples kept as reference. The packages are individually wrapped, or in small deal boxes (figure 5).

Of the ninety-seven substances found in drawers 18, 19, 25 and 26, thirty have uses in pottery. They are spread fairly evenly throughout the drawers—nine, seven, eleven and three, respectively. Drawer 25 is labelled as containing pottery drugs, but only eleven of twenty-three match that function. Under the category of dyeing, there are twenty-three, mostly in drawers 18 and 19. Five items have a use in foodstuffs, including rather strangely a sample of coculus indicus (item 933), a known adulterant for beer, but also
poisonous. There are twenty-three paint colourings, twelve in drawer 18, but predominantly in association with other potential purposes. Only four are polishers—more could have been expected from drawer 19, which is labelled for emery in particular. Four relate to ink and two to tanning. Sixteen are for medical purposes, but these, although interesting, may be irrelevant, because they were not readily to hand for someone wishing to self-medicate.

SUBSTANCES IN PACKETS

The names on the packets were nearly all untraceable, even in *Encyclopaedia Britannica*, implying that they were either particularly specialized or particularly general. Several did have known connections with aspects of James Watt’s interests: composition mouldings (item 1699) and aurum musivum (item 1700), being used in forms of artificial stone, would fit with sculpture copying, as would Parker’s cement, patented in 1796 (item 1704). The samples of china clay (item 1701), grain tin (item 1703), animal charcoal (item 1707) and bone powder (item 1710) all have connections to pottery; shining sand (item 1711) would be for polishing; and parchment shavings (item 1713) would be used in papermaking and for glue or size, useful at the time of the invention of the letter-copying machine. Red saunders (another name for sandalwood) (item 1708) had uses as either a colouring in dyeing or as a medicine; ‘suppd tin stuff’ (item 1705) is possibly for pottery along with the grain tin.

Several are still either puzzling or unspecific: mica (item 1697), white powder (item 1698), Eiseuman (item 1702), resin (item 1709) and Water of Ayr stone (item 1712).

Dividing the substances by their packaging does not give a steer towards Watt’s research, except that if one considers the research stories first, then supporting examples can be found. For instance, Watt had an interest in the manufacture of Turkey Red dye from as early as 1769, and his elder son James was apprenticed to the dyer Charles Taylor in Manchester and wrote home with details of the processes. Fragments of cloth in the
workshop remain from experiments in the 1780s. Colours could have been ingredients for dyes as well as pottery, or indeed for mixing paints (figure 6). Watt’s younger son, Gregory, was a keen watercolourist.\textsuperscript{16} Watt had invented a perspective sketching device for survey views in the 1760s,\textsuperscript{17} and may well have sold paints in his hardware shop in Glasgow.

Black was a necessary colour for ink, and Watt’s letter-copying press of 1780 depended for its commercial success on the quality and other properties of the inks. Elsewhere in the workshop there are several packets of oak galls, definitely an ink ingredient, and test papers from his experiments.\textsuperscript{18}

\textbf{The rest}

The miscellany of barrels, boxes and so on contains mainly unnamed material. Watt would of course have been completely familiar with them. Without formal chemical analysis, it will be difficult to take this much further. However, they are few in number, and greater chemical interest lies with the other three categories.

Watt’s interest in creating copies of sculpture from moulds pre-dates the sculpture-copying machines by some 14 years.\textsuperscript{19} The workshop contains what may be the largest collection of eighteenth-century plaster-of-Paris moulds known to exist in the UK, a matter of some excitement to art historians. Detailed discussion of these is beyond the scope of this paper,\textsuperscript{20} but further research may reveal what sculpture he was attempting to copy. One piece much quoted from his correspondence was a bust of Sappho; Watt recorded the time required to trace it on the machine.\textsuperscript{21}

The work continues.

\textbf{Acknowledgement}

Images are reproduced Courtesy of the Science Museum, London.
NOTES

2 H. W. Dickinson, *The garret workshop of James Watt* (HMSO, London, 1929; reprinted in 1958). The workshop is entered on the museum’s inventory as 1924-793, with the contents (all of them) under 1924-792.
3 The 38-drawer cabinet does not have an individual item number but contains items numbered from 471 to 1258. Drawer 18 contains specimens 918–946, drawer 19 specimens 947–978, drawer 25 specimens 1045–1067, and drawer 26 specimens 1068–1082.
4 The white pots can be found at racking division 1, shelves 1, 2, 3 and 4.
5 The packets are on shelf 2, divisions 3 and 4, mostly.
6 The barrels and other large containers are described where they appear as one pans clockwise around the workshop.
7 The first listing was performed in 1885 by N. Collins, the estate manager with responsibility for Heathfield at the time. Most subsequent inventory work has been based on this; two copies of a typed version made in 1924 at the time of acquisition were bound and preserved in the Technical File for the workshop, held in the Documentation Centre at South Kensington, and the current work relies on a spreadsheet from this listing. Minor changes have been made by curators at various times.
8 ‘W Arsenic’, item 921, red arsenic item 929, and arsenic as ingredient, in item 1047.
9 The first volume of *Encyclopaedia Britannica* was authored by ‘A Society of Gentlemen of Scotland’ and published in Edinburgh.
10 Hamilton’s notebook and diary have inventory number 1997-32.
12 Fine gold—item 1062, drawer 25: see receipt noted in JWP/MI/2/15, 30 January 1797. This reference is in the old style, as used in the microfilm holdings of the Science Museum Library; the papers in Birmingham have been recatalogued, and their references will be different.
13 John Chaldecott *et al.*, *Josiah Wedgwood: the arts and sciences united*, catalogue of the Science Museum exhibition, March to September 1978. Display items 2 (on p. 28) and 28 (on pp. 32–33) are possibly misdescribed.
16 Gregory’s watercolours (items 2453–2481) are in his trunk, item 2382, preserved in the workshop from his school days.
17 For the perspective drawing apparatus see items 1268–1309, completely reworked by Michael T. Wright; see also Hills, *op. cit.* (note 14), pp. 109–111.
18 Galls have numbers 944, 964 and 2004; experimental papers are item 12.
19 Item 2163 is a receipt from John Pierotti dated 1790 for the purchase of moulds.
20 The 27 moulds were conserved in 1987–89, and a section of the Technical File T1924-792 reports that work.