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Dye-house Notes from the Crutchley Archive, 1716 to 1728: Detailed Descriptions of the Five Stages of ‘Grain’ Dyeing for Red Colours on Woven Wool Fabrics
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Abstract Scarlet red wool cloth is known to have been dyed ‘in grain’ with cochineal and tin in early 18th-century Europe, but the wider colour range and ‘out of grain’ method are less familiar to us today. Dyers’ books from the Crutchley family’s London dyehouses describe their ‘in grain’ and ‘out of grain’ methods for scarlet, crimson, orange, ‘auroras’, pink, rose, orange, cherry, wines, cabob and ‘violat’ with cochineal, madder, brazilwood, logwood, ‘archil’ and turmeric using tin ‘spirits’ and alum mordants. Their practical details to prepare, ‘boil’ (mordant), ‘grain’ (dye), finish (tone) and dry woollen, serge and worsted wool fabrics reveal the everyday labours of controlling pH, selecting the right quality of water and working efficiently. These rare records of colour creation by experienced cloth dyers offer new insight for interpreting, reimagining and preserving the colours of early modern fashionable textiles and for their research by experimental dyeing and dye analysis.

Introduction

Dyers have a long tradition of keeping books to record their dyeing materials and methods, often with dyed samples of fibres, yarns or fabrics that show the resulting colour. The books kept by dyers working in commercial dyehouses were particularly important because these held professional trade secrets about colour creation for clients and competitive markets. For this reason, dyers’ books were kept safe and guarded carefully by owners of textile dyeing businesses. Those that have survived have become an important research resource for dye history studies.

One interesting period in British dyeing history is the 18th century, a time of growth for the global trade of cloth commercially dyed in Europe. A small number of dyers’ books about dyeing practices in Britain in this era have survived with dyed samples alongside brief details for the names and quantities of dyestuffs and dyeing agents and the length of time in the dye bath.1 Until recently, no in-depth first-hand British accounts were known that compared to dyers’ books from other European countries, such as the extensive dyeing memoirs of Paul Gout and Antoine Janot, managers of royal dye-works in and near Bize, Languedoc, France, in the mid-18th century.2 By good fortune, nine dyers’ books from a successful dyeing business operating in early 18th-century London have come to light. These belonged to the Crutchley family of dyers who were owner-managers of two dye-houses in Southwark Borough by London Bridge on the South Bank of the River Thames: one in Clink Street and the other in The Maze.

In 2011, descendants of the Crutchley dyers donated the dye books, plus four books of dyeing calculations and two cash books, to the municipal Southwark Archives (catalogue number SLHLA 2011/5). Our research into this collection, known as the Crutchley Archive, has revealed a rare corpus of dyers’ records with over a thousand dyeing instructions dated between 22 June 1716 and February 1744 and accompanied by samples of wool fabric dyed
in red hues and tones. Moreover, the texts provide rare early 18th-century real-life accounts from dyers in the business of commercial textile dyeing, including knowledge diffusion between dyers literate in Old Dutch or Flemish. Consequently, because of its documentary importance to British textile history, the Crutchley Archive is now inscribed into the UNESCO UK Memory of The World register.

The Crutchley dye books consistently refer to dyeing wool cloth by ‘graining’, a technique that was widely practised across Europe by the early 18th century, the most well-known being ‘in grain’ scarlet created with cochineal and a tin mordant. The Crutchley dyers dyed ‘in grain’ for reds in hues from orange and scarlet to crimson and purple. They also dyed ‘out of grain’ to extend their colour palette range and recycled ‘in grain’ dye baths. ‘Out of grain’ dyeing was significant in the 18th century but is less well known today. In this article, we present and explain the five stages of the Crutchley ‘in grain’ and ‘out of grain’ dyeing methods described in the texts of their three oldest books, dated 1716 to 1728. These detailed accounts offer a rare insight into daily dye-house practices and provide foundational information for the ongoing study of dyeing instructions and dyed patterns in this historically important archive.

Description of the three books and general content

The Crutchley dyers dyed ‘in grain’ with cochineal and madder, and ‘out of grain’ with the additional use of three dyes with poorer colourfastness properties, namely brazilwood, logwood and archil. The cover of one Crutchley book is titled ‘1726 The In Grain Book’ (SLHLA 2011/5-1) while the opening page of another is headed ‘Direcktions for Dyeing ye Out of Grains’ (SLHLA 2011/5-8). A third book starts with a memorandum for tin ‘spirits’, the key mordant for ‘in grain’ colours (SLHLA 2011/5-13). These three books are very similar in style, content and layout, including numerous neatly cut samples of dyed woven wool fabric averaging 3 × 3 cm attached to the pages by waxy red adhesive or metal pins. The books are now in a fragile state, deteriorated over time from use and by water, dirt, handling and mould, resulting in faded ink, white bloom on textiles and physical loss at the page edges.

The dyers give three types of texts in the books: dyeing instructions, and passages of texts about dyeing titled ‘Direcktions’ and ‘Memorandums’. The dyeing instructions are untitled shorter passages detailing the types and numbers of fabrics dyed, resulting colours, dyeing materials and quantities, and timings and order of dyeing. There are at least 332 instructions (203 in English plus 129 translations of adjacent texts in Old Dutch or Flemish). This number excludes instructions in book 2011/5-1 beyond folio 3 which were inaccessible because of the book’s fragility. There is only one ‘Direcktions for ye Out of Grains’, a single lengthy passage of descriptive narrative over two double-sided pages with in-depth essential information about fabric preparation, dyeing and finishing. The ‘Memorandums’ give practical dyeing advice and there are 49 of these, written as standalone passages and embedded within instructions. Part of the ‘Direcktions’ text and an example of a ‘Memorandum’ are shown in Figure 1. Alongside 150 of the instructions and six of the
‘Memorandums’ are one or more attached samples of different types of woven wool fabrics. Each sample is dyed a red hue or tone and there are a total of 278 samples. An additional 22 unattached dyed samples are found loose between pages. The Crutchley dyers consistently call these plain, single-colour dyed samples ‘patterns’. This is a dyers’ term for a yarn or fabric used as a colour reference to compare and copy when dyeing. As ‘pattern’ is the technically correct historical name for a dyed sample in dyers’ books, it is the term used in this article. Figure 2 shows examples of dyeing instructions with patterns for ‘in grain’ and ‘out of grain’ colours.

{Insert Figs 1 and 2 here}

The Crutchley dyers used archaic English dyeing terms and spellings, frequent examples being ‘scowering’ (scouring), ‘kettle’ (vessel), ‘culler’ (colour), ‘drugs’ (dyes and dyeing agents), ‘flat’ (dye bath), ‘liquor’ (aqueous solution) and ‘charging’ (adding and replenishing solutions). Weights are stated in the dye books to be based on 16 ounces to the pound, which is the Avoirdupois system. A volumetric measure mentioned frequently is the ‘mog’ (mug) which held 2 pints and is synonymous with a quart. These quantifiable measures can be converted to metric units based on 1 ounce = 28.35 g, 1 pound = 0.45 kg and 1 pint = 1.14 L. Other measures given in the books are pails, ‘piggens’ (a small wooden pail), ‘end’ for fabric length, and ladle spoonfuls of unspecified amounts, while timings are whole and fractional hours.

**Dyeing materials, fabrics and resulting colours**

The dyestuffs madder, cochineal, ‘brazeil’ (brazilwood), logwood, ‘archil’ (orchil), and occasionally turmeric were used by the Crutchley dyers with tin ‘spirits’ (a tin alloy dissolved in nitric acid, referred to in the books as ‘aqua fortis’ or ‘acquafortice’) and ‘allom’ (impure and pseudo alums), argol (crude tartar residues from wine barrels), potash (water-soluble potassium carbonates extracted from wood ash), bran liquor (bran steeped in water), gin (distilled alcohol) and starch from an unknown source. These were common materials for dyeing wool red in early 18th-century western Europe. The dyers combined these materials to create colours named in the instructions as scarlet, orange, ‘aurora’ (orange-pink), pink, cherry, crimson, rose, wine, cabob (possibly red-brown, but the patterns are missing) and ‘violat’ (violet). The Crutchley dyers produced colourfast ‘in grain’ scarlet, cherry, crimson and wine colours from cochineal, madder and tin ‘spirits’. The dyers also dyed less colourfast imitations of the ‘in grain’ colours with brazilwood, logwood, archil and turmeric. These four poorer quality dyes were also used to create orange, ‘aurora’, pink, rose and ‘violat’ colours with recycled leftover ‘flats’ (dye baths) from ‘in-grain’ scarlet dyeing, and by overdyeing the ‘in-grain’ colours. The dye instructions show that the dyers worked methodically and carefully to fine tune the combinations and amounts of these materials, as described and discussed later in this article.

The Crutchley dye-houses specialised in dyeing woven wool fabrics and had the capacity to batch dye two at a time, depending on the type. Thirty-one distinct kinds of fabric are
mentioned in the instructions, representing well-known 18th-century textile-making centres across England that produced medium to good quality cloth. Table 1 lists the fabrics by the names and spellings in English and Flemish/Old Dutch in the texts. The dyers refer to individual lengths of cloth as a ‘piece’ and in some cases the weight of cloth ‘per piece’ is given. The weight of cloth is important to dyers for calculating the amount of dyestuff and dyeing agents needed for the dye bath as well as for experimental dyeing using historical recipes.

Regarding the types of fabrics dyed in the Crutchley dye-houses, the finest and best quality fabrics referred to in the texts were ‘long Cloths’, ‘broad Cloths’ (broadcloth) and ‘drabs’ from ‘Salsberry’ (Salisbury), Worcester and Gloucester in southwest England and Colchester in Essex. These were soft, hardwearing cloths with a napped or teased surface, with the drabs typically thicker.9 Also mentioned were lightweight serges that were a speciality of Devon, namely ‘drougets’ (druggets) and ‘salloons’ (shalloons), as well as ‘Bocking bays’ from Essex and ‘long bocking bays’ that might have been made in Bocking or perhaps equivalents from other renowned bays production centres such as East Anglia, and also worsteds, a famed product of Norwich.10 Our initial examinations of selected samples have so far identified woollens (cloth woven from spun yarns of short wool fibres or blends of different fibre lengths and fulled by beating to interlock the fibres), worsteds (cloth woven with spun yarns of longer wool fibres and usually not fulled) and serges (cloth woven from yarns of wool and of silk). These agree with the fabrics named in the instructions, but technical analysis of the patterns needs to be completed to confirm the types and variations of fibres and yarns.

In the early 18th century, English wool cloth makers sent their textiles to London to be dyed, or had them dyed locally as exemplified by Norwich shawl pattern books and the Exeter Dispatch Book, a rare compendium of exports by local cloth merchant Claude Passavant in 1763–1765.11 The Crutchley books state that their fabrics were received undyed except those that they dyed ‘violat allamode’ which were first ‘blew’d at London’, meaning pre-dyed with woad and indigo in the City across London Bridge. A few fabrics were dyed for the East Indies Company (two aurora ‘long Cloths’ and 12 ‘long Ells’ (two aurora, 10 scarlet)), South Seas Company (10 scarlet ‘ten hundreds’) and ‘for Turkey’ (12 aurora ‘long Ells’) and six ‘Salsberrys’ (three wine, three cherry).

Grain dyeing from start to finish

The Crutchley directions describe five distinct dyeing stages – fabric preparation, ‘boiling’, ‘graining’, ‘finishing’ and drying – and all are identifiable in the ‘in grain’ and ‘out of grain’ dyeing instructions. This sequence was followed by other wool dyers in western Europe before and throughout the 18th century.12

Fabric preparation
First, undyed fabrics were scoured clean ‘up at the mill’, probably with fuller’s earth, a material that is mentioned elsewhere in the memorandums. Scouring is included in most instructions, indicating that the mill was accessibly close. All fabrics, except heavy drabs, were ‘listed’ there too. ‘Lists’ were one or more blue lines (indigo-dyed threads in France) woven or sewn into selvedges to identify fabrics. The Crutchley dyers ‘ript off’ the lists immediately after graining to prevent colour spoilage.

Fabrics for ‘in grain’ and ‘out of grain’ colours were then ‘white boiled’ for half an hour in a kettle containing water and a pail of the required amount of potash mixed with some liquor from the previous boiling. Two cloths were normally batched together, although the kettle could take 10 smaller, lighter ‘long Ells’ weighing 14 lbs or 15 lbs each, but only one larger ‘long bocking bays’ of unspecified weight. After boiling, all were ‘exceedingly well washed upon a bridge’ in river water to rinse out the potash, with a cautionary note to avoid cross-contamination with finished fabrics also washed there because potash caused ‘white spots’ that spoiled the final colour. Fabrics for cherry colours, some ‘in grain’ scarlets and those pre-dyed blue for ‘violat’ were treated differently, being boiled with bran liquor instead of potash in a designated kettle for half an hour and not rinsed before the next stage.

Potash and bran boilings continued throughout the working day with the liquid level topped up with fresh water. These boilings could be reused for two days to save time cleaning the kettles, but no fabrics were left in them overnight because completing the dyeing and finishing quickly, ideally in one day, gave ‘beautiful and not fading colours’.

**Boiling**

Next came the ‘boiling’ for dyeing, which was the mordanting stage although this word is not used in the books. Fabrics for ‘out of grain’ crimson, scarlet and wine colours were boiled two at a time in river water with alum, argol, bran liquor and sometimes potash, for a mandatory half hour in a designated kettle. When done, the mordanted fabrics were beaten clean in river water on the finishing bridge. The alum liquor was reused for the whole working day, being replenished between batches with six pails of bran liquor boiled with the required additives for a quarter of an hour. Scum was left on the alum liquor surface, possibly to suspend particulates and simply to save time. Each night this alum boiling kettle was cleaned and filled with water ready for ‘charging’ with bran liquor the next day.

‘In grain’ boilings had two key differences: they always involved tin ‘spirits’ and reduced amounts of alum, and they often had additions of cochineal, madder, turmeric (for auroras) and ‘archil’ (for cherry colours and crimsons). Tin spirits were pre-made, and a memorandum describes their preparation in a wide-mouthed stone pot. This involved eight pints of river water to which was added (in the order given): 24 ounces of ground and sieved ‘bay’ (sea) salt, 8 pints of ‘acquafortice’ and 44 ounces of shavings of pewter (a lead-tin alloy with 80–90% tin). Sticks laid on the pewter helped to submerge it. The pot was covered while the pewter reacted, which took one to two hours. The resulting spirits had to be a clear yellow and were ‘no use if white’. When the spirits lost effectiveness ‘after a good while’, signalled
by poor dye colours, a fresh batch of spirits was made with the depleted solution to recycle it. Tin spirits are discussed in more detail below.

‘Out of grain’ cherry and ‘violat’ fabrics had a special boiling in a kettle of leftover dye bath from ‘in grain’ wine-coloured dyeing, charged with alum, argol and sometimes madder for the cherry colours.

‘Graining’

For both ‘in grain’ and ‘out of grain’ colours, ‘graining’ described the coloration step. Each working day started with making fresh ‘flats’ or recycling ones from the previous day to use up expensive cochineal and tin spirits. Both types of dye bath were used all day, replenished with fresh ‘drugs’ and more water for each fabric batch. Recycled ‘flats’ were mainly for ‘in grain’ scarlets and crimson and for ‘out of grain’ cherry and ‘violats’. Most dyeings took about one hour.

Irrespective of a fresh or recycled ‘flat’, and with the exception when producing wine colours, it was essential to start with bran liquor to soften and clarify the fresh or recycled water. Two pails of bran liquor sufficed for a fresh ‘flat’, six if recycled. The importance of doing this is revealed by the dyer, who divulges that at night, when the clean kettles were filled with fresh water in readiness for the next day, they would ‘warm up the kettle and put in two pails of bran liquor. This is a secret. I never let the men know that I put liquors in overnight, doing it always when by myself’; either it made a difference or they believed it did.

Wide-ranging quantities of dyes and additives in the instructions reflect the dyers’ experience in dyeing different fabric types and weights to colour-match patterns. This was remarkably accurate, as colorimetric analysis of the Crutchleys’ scarlet ‘broad Cloths’ proves. The memorandums describe how to use ‘brazeil’ to intensify and brighten reds, logwoods to make reds bluer, and ‘archil’ to deepen and ‘dull’ crimsons and cherry colours. Table 2 summarises the combinations and resulting colours. The pattern colours for ‘out of grain’ scarlets from ‘brazeil’ and gin, crimsons from ‘brazeil’, gin and ‘archil’, and cherry colours from cochineal, logwood and ‘brazeil’ without tin spirits visually resemble those from ‘in grain’ dyeing and are a noteworthy achievement.

Dyeing ‘out of grain’ scarlets, wines and crimsons with ‘brazeil’ was complex, requiring control and attention for good even colours in light, deep and medium tones. The dyeing followed a sequence, starting with a fresh ‘flat’ for scarlet, then recycling the scarlet ‘flat’ for wine colours and followed by recycling the wine ‘flat’ for crimson colours. To prepare the dye bath, the ‘brazeil’ was placed in fine mesh bags that were weighted over the kettle rim to prevent them sinking, ‘whilst a man at each bag beats out ye colour with a stick’. Bran liquor gave the best scarlets and crimsons but spoiled the wine colours, so before dyeing wines a ‘3
foot to 4 foot’ depth (approximately 1–1.3 m) of the recycled scarlet ‘flat’ was ‘shifted’ (replaced) with alkaline spring water. This would have diluted and neutralised the mildly acidic bran. This ‘flat’ was charged with potash, ‘archil’ and gin and the fabrics fast-boiled for half an hour with continuous scumming. The recycled wine ‘flat’ was in turn shifted with bran liquor for the crimson ‘flat’ and ‘archil’ added to dye ‘a blew cast’, taking care not to boil it otherwise the colour spoiled. This whole process needed to be completed in one day ‘for ye quicker these out of grain worke is done, the better it is for the colour’. It was labour-intensive, requiring ‘more hands than ye in grain work’. To submerge fabrics for even colours, they were sewn together along their ends or ‘crowfooted’ (tacked together along selvedges) and put on a winch for winding back and forth through the dye baths as fast as possible.

Logwood for dyeing cherry and ‘violat’ colours also needed careful handling. The dyestuff was placed in bags and lowered into the boiling liquor in the kettle and the bags then shaken to release the dye. The winch constantly turned the fabric through the liquor while at least one person ‘opened up’ the fabrics with sticks for even colour.

All the Crutchley ‘grain’ dyeing methods carried risks. Patchy colour formed if fabrics were insufficiently opened during dyeing, or not cooled or washed quickly enough post-dyeing. ‘In grain’ scarlets and wines with tin spirits were susceptible to white spots during dyeing, a blight for other ‘grain’ dyers besides the Crutchleys’. Tin spirits contamination would dull cherry dyeings, so scouring the kettles between scarlet dyeings and at the end of the day was an important daily activity. A page of itemised and costed ‘Utensils for the Dye House’ (SLHLA 2011/5-8) specifies two long scoops and mops to clean the kettles and sieves for scumming, besides sticks, iron ladles, handled bowls, pails and hour glasses.

After ‘graining’, the lists were cut off and fabrics inspected for white threads which were ‘burled’, meaning picked out with large tweezers. The final line of the ‘Direcktions’ states that ‘tis proper to keep List a purpos for ye out [of] Grains’ but it is not clear why.

**Finishing**

A final dyeing step for ‘in grain’ orange, aurora, cherry, rose, pink and scarlet colours was to heighten their tones in a finishing kettle with madder, cochineal, tin spirits, argol and sometimes logwood and ‘archil’. The effort was worthwhile and wine colours were ‘especially beautiful when finished’.

**Drying**

The final step involved beating fabrics clean with sticks and river water, except the thick drabs which were scoured at the mill then ‘set upon the tenters’ to dry quickly. ‘Tenters’ were hooked metal pegs fixed to a two-rail wooden frame. Fabrics were attached by the hooks to the top and bottom rails, and the rails’ spacing adjusted to stretch and reshape the fabrics whilst drying. Tenter grounds were common in villages, towns and cities across Britain, and
two sizeable ones were within 100 m of the Crutchleys’ dye-houses at Snow’s Fields by The Maze, and off Maiden Lane and Dead Man’s Place adjoining Clink Street. Several memorandums reminded dyers to work carefully and swiftly with ‘out of grain’ crimsons, scarlets, wines, cherry colours, ‘violat’ and pinks in bright, hot sunshine because ‘brazeil’ faded, logwood darkened and wines blackened. Stained fabrics were ‘mended’ at the mill by scouring with fuller’s earth, then re-boiled and re-grained. Drying completed the dyeing process, but the dye books do not indicate if the fabrics were calendered or hot-pressed after the final clean before being sent to customers.

Discussion

The merits and qualities of three influential chemicals in the Crutchley dyers’ grain methods – tin spirits, water sources and bran liquor – are worth further brief discussion.

Tin spirits

The Crutchley dyers’ use of tin spirits with cochineal was equivalent to Dutch scarlet discovered by Cornelis Drebbel between 1624 and 1627 and commercialised by his son-in-law, Johannes Sibertus Kuffler. From 1657 to 1677, Johannes managed the dye-works Drebbel had established in Stratford-at-Bow in the east end of London in 1607. This colour became popular in western Europe with the dyers in Stratford-at-Bow becoming ‘Bow scarlet’ specialists. However, white spots were reported to be a serious issue for producing scarlet with tin spirits. The spotting was tolerated to some extent in Britain, Germany and the Netherlands where the dyeing method was practised, but France did not allow its dyers to use the method because of the spotting problem. Interestingly the Crutchley dyers experienced problems with white spots on finished cloths which they attributed to potash contamination.

There are two interesting aspects to the use of tin spirits by the Crutchley dyers, one being that it was a pre-made liquor which is similar to Kuffler’s method. This differs to the Dutch scarlet method described in The Whole Art of Dying, translated from German into English and published in London in 1705, and Partridge’s later description from 1847, of putting ‘acquafortice’ and pewter metal directly into the kettle with the fabric and the cochineal, alum and argol. This Dutch method was also documented on a Scottish Highland country estate in 1783. The other intriguing aspect is that the Crutchley dyers conceivably developed their method with the Bow scarlet dyers. This hypothesis is based on the instructions in Old Dutch/Flemish and English dated 22 October and 25 October 1716 and 11 September 1717 for patterns ‘diett’ (dyed) at the ‘house’ of Mr Hodttson and Mr Hudson, and 14 instructions dated 9 February 1722 for ‘in grain’ scarlet, ‘violat’, crimson, rose and wines colours on ‘drabs’, ‘bays’ and ‘long Cloths’ ‘diett att madan houdtsson’. A notable Bow scarlet dyer was Phillip Hudson who had a dye-house and calendering machine from at least 1665 and was an advocate of the use of fine bay salt (from evaporated seawater), which is also emphasised in the Crutchleys’ preparation. With Southwark within 5 miles of Stratford-at-Bow across old London Bridge, it is feasible that John Crutchley knew Hudson through mutual acquaintances or during his apprenticeship, and if Hudson’s dye-house was
successful, it may well have still been operating 50 or more years later in the hands of his
family. The connection remains speculative but is an intriguing one.

**Water**

The Crutchley dye books provide a realistic sense of the copious amounts of clean water a
commercial dye-house needed to charge, refill and clean boiling and graining kettles, make
liquors, and wash fabrics quickly and several times per day. Their dye-houses in Clink Street
and The Maze, within Southwark’s industrial quarter, were well placed for river and spring
water.\(^{25}\) The water was good quality by 18th-century standards and fresh water was abundant
from the fast-flowing, tidal River Thames, which was relatively clean at that time.\(^ {26}\) Spring
water from underground sources rose up through chalk and limestone into wells and purpose-
built channels, and the methods of the Crutchley dyers show that they favoured it to enhance
blue hues for some ‘in grain’ pink, rose, wine and crimson colours.

References in the books to washing fabrics in ‘river water’ did not necessarily mean literally
in the Thames. Although maps from 1720 show stairs leading to the Thames either side of
Clink Street, this would have been a dirty route as it was used for offloading coal and not
therefore conducive to a dyer’s needs.\(^ {27}\) In addition, the Thames to the west of the bridge was
turbid with suspended soil and debris. There was, however, an inland water source called The
Maze Pond fed by a Thames tributary at the south end of The Maze, its level falling and
rising with tidal fresh intake.\(^ {28}\) It was popular with felt hat makers who had businesses
nearby, though, so again its water quality may not have been clean enough for the
Crutchleys’ needs.\(^ {29}\)

Water reached Southwark’s bankside in other ways. At London Bridge, it was siphoned from
the river into pipes laid along Tooley Street that crossed the north end of The Maze.\(^ {30}\) There
was also a network of open conduits carrying spring and river water through the streets of
Southwark. Indeed, Rocque’s 1738 map of Clink Street shows the dye-house with a sizeable
water course alongside it.\(^ {31}\) One or more bridges to ‘washt and beat well’ the fabrics perhaps
spanned this channel, and the running water in the channel was possibly used for sluicing the
fabrics. The fabrics may have been rinsed with water from it in pails, or maybe even pipes, if
the bridges were ‘washed with several jets of River water’. This control over bridge
cleanliness and seemingly ready access to the bridge when needed suggests a location on
Crutchley property.

**Bran liquor**

Bran liquor features in most Crutchley instructions and was important to other dyers of red
wool.\(^ {32}\) Bran contains 2.1–7.3% (w/w) of phytic acid, a water-soluble natural chelating agent
that readily binds to calcium and magnesium, two common alkaline minerals in London’s
water.\(^ {33}\) This would explain why the dyers found bran water a necessary treatment for the
graining kettle at the start of the working day. The liquor preparation memorandums record
that constant stirring was very important during boiling and cooling, and that stirring had to
continue every half hour the following day and regularly thereafter. In this way the liquor lasted days, maybe even weeks, before it reached an undesirable state that the dyers described as ‘ropey’, possibly a thickening effect from bacterial growth or fermentation. Why the dyers kept the liquor this long is not obvious, but it may relate to fermented wheat bran being mildly acidic, around pH 5.5, which benefits dyeing wool with anthraquinone dyes by allowing protonation of amide groups in the amphoteric wool proteins that improves take-up of the dye.34 There seems to be more to the making and using of bran liquor for dyeing than appears at first sight and this warrants experimental investigation to be better understood.

The Crutchleys’ business of colour making

The methodical work of early 18th-century grain dyeing is evident in the Crutchley Archive dye books. Profitable commercial-scale dye-houses clearly required good management for efficient, economical operation by recycling liquors and planning sequential dyeing to minimise waste of costly cochineal and tin spirits and to save time. Ultimately, saleable end products depended on skilled dyeing. The Crutchley dyers’ abilities to select and ratio dyes and additives to pattern-match colours for apparently 31 different wool fabrics, and to control pH and mineral content with potash, bran water and water sources from start to finish, are undoubtedly the hallmarks of experienced dyers being in charge, while instructions in English and Old Dutch/Flemish signal knowledge diffusion with others. John Crutchley, a master dyer, undoubtedly had a guiding or active role as co-manager with two other dyers, one being his son Thomas. From the descriptions of labour to prepare, dye, clean and finish cloths, the workforce needed several people and almost certainly involving another two of John’s sons, also dyers who were important successors following John’s death in May 1727.35

Light-sensitive brazilwood, logwood and ‘archil’ dyes prevailed in the Crutchley ‘out of grain’ dyeings for quality wool fabrics, particularly high-end woollen cloths. This challenges the present-day assumption that these sensitive dyes meant poor quality products because businesses such as the Crutchleys’ would not have succeeded had fastness been a major issue for customers. There were other reasons for the acceptance of these dyes. The first half of the 18th century saw increased economic growth for Britain’s textile trade, bringing global competition and the evolution of fashion colours. Although these three dyes had poor colourfastness, they were permitted in Britain, enabling the Crutchley dyers and their counterparts to dye scarlets and crimsons ‘out of grain’ and extend their colour range. ‘Brazeil’ also brightened ‘in grains’ colours from cochineal and madder. The Crutchley dyers deliberately used ‘brazeil’ with careful pH control and occasionally used turmeric, while other dyers used yellow dyes such as weld and fustics. This suggests that acceptable colourfastness could be achieved with the Crutchley method, with a possible incentive of reduced costs for them and their customers if ‘brazeil’ was cheaper.

The Crutchley dyers’ methods are typical of those used in western Europe in the early 18th century, a period when dyed fabrics were increasingly produced in quantity in Britain. This suggests that quality wool textiles dyed red in Britain during this period may have been
produced using similar dyeing combinations to the Crutchley methods. If so, this would make dyewood and lichen dyes more widespread than is generally perceived today, particularly in fashionable clothing. This is important for interpreting dye analysis of 18th-century red wool textiles if these dyes are detected, and especially significant if such dyes are prevalent in textile merchant books, which represent the next link in the commercial chain.

**Conclusion**

The earliest of the Crutchley Archive dye books with entries from 1716 to 1728 provide invaluable first-hand practical insights for commercial ‘grain-dyeing’ of wool fabrics to produce red colours in early 18th-century London. From the writings of the dyers about daily activities and necessary practices, a clear picture emerges for five stages of graining in the Crutchley dye-houses. Key points for colour success were controlled conditions concerning pH and water quality to dye with temperamental dyewoods, and for efficient dyeing with cochineal, tin spirits, madder and alum to colour-match patterns. There was also an astute business understanding about profitable colours for wool fabrics beyond scarlet and crimson, including hues from deep wines to bright pinks and dazzling oranges.

The Crutchley practices validate modern understanding and perceptions of dyeing in the pre-industrial era, but highlight an underappreciation of light-sensitive dyes in fashionable colours of British wool fabrics in this period. These elusive aspects of 18th-century fashion colours enhance the interpretation, re-imagination and research of dyed early modern British textiles. This also raises the need for more uniting of dye analysis with fabric analysis in historical textile studies. Material research of merchant sample books to investigate the extent of fabrics ‘finished’ with light-sensitive dyes will also aid conservation strategies for colour preservation of these precious artefacts.

**Editor’s note and authors’ addresses**

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Notes and references


17. Partridge 1847 (see note 13 above).
21. The Whole Art of Dying 1705 (see note 8 above).
22. Tierie 1932 (see note 20 above); De Keijzer et al. (see note 20 above).


31. Roque and Hyde 1982 (see note 18 above).


35. Quye et al. 2020 (see note 3 above).