cloths, and other substances, whereby their beauty is much improved, and value enhanced.

This art depends chiefly on three things, viz. 1. Dis-polling the surface of the fibres to receive and retain the colours; which is performed by washing them in different 1yes, digesting, beating them, &c. in which human urine putrid, a sharp salt of ashes, divers soaps, and galls of animals, are of principal use; by means whereof the vicious gluten of the silk-worms naturally adhering to their threads, is washed and cleansed from them, and thus they become fitted gradually to imbibe the colours. By these also the greasy foulness adhering to wool and flax is scoured off.

2. To grind the colours, so that they may enter the body duly prepared, and preserve their brightness undiminished.

3. The third consists in having beautiful colours.

According to Sir W. Petty’s account of what is done in particular trades by the art of dyeing, 1. There is a whitening of wax, and several sorts of linen and cotton cloths, by the sun, air, and reciprocal effusions of water. 2. Colouring of wood and leather, by lime, salt and liquors, as in stoves, canes, and marble leathers. 3. Colouring of paper, viz. the marbled paper, by diluting the colours with ox-gall, and applying them upon a stuff gummed liquor. 4. Colouring, or rather discolouring, the colours of silks, taffies, &c. by brimstone. 5. Colouring of several iron and copperworks into black with oil. 6. Colouring of leather into gold-colour, or rather silver-leaves into gold by varnishes, and in other cases by urine and sulphur. 7. Dyeing of marble and alabaster, with heat and coloured oils. 8. Colouring silver into the brass-colour, with brimstone or urine. 9. Colouring the barrels and locks of guns into blue and purple, with the temper of small coal heat. 10. Colouring of glaze (made of sands, flax, &c.) as also of crysals and earthen ware, with the ruffts and solutions of metals. 11. The colouring of live hair, as in Poland, horse and man’s hair; as also the colouring of furs. 12. Enamelling and annealing. 13. Applying colours, as in the printing of books and pictures, and as in making of playing cards, being each of them performed in a different way. 14. Gilding and tinning with mercury, block-tin, sal ammoniac. 15. Colouring of metals, as copper with calamine, into brass, and with zinc or spelter into a golden colour, or into a silver one with arsenic; and of iron into a resemblance of copper with Hungarian vitriol. 16. Making painters colours by preparing of earth, chalk, and slates; as in umber, ochre, cullen-earth, &c. as also out of calcis of lead, as ceruse and minium; by sublimates of mercury and brimstone, as in vermilion; by tinging whole earths variously, as in verdeter, and some of the lakes; by concrete juices, or sectula; as in gambogeum, indigo, pinks, sap green, and lakes; as also by ruffs, as in verdigrise, &c. 17. The applying these colours by the addition of ox-gall, as in the marbled paper aforesaid; or by gum-water, as by limning; or by clammy drying oils, such as the oils of linseed, nuts, &c. 18. The watering of taffies. 19. The colouring of wool, linen, cotton, silk, hair, feathers, horn, leather, and the threads.
DYE threads and webs of them with woods, roots, herbs, seeds, leaves, roots, limes, licorvums, waters, heats, fermentations, macerations, and other great variety of management: an account of all which is a short history of dying.

The materials used in the art of Dyeing, are iron and steel, or what is produced from them in all true blacks, called Spanish blacks, though not in Flanders blacks, viz. they use copperas, steel-flings, and flippe; they also use pewter for Bow-dye scarlet, viz. they dissolve bars of pewter in aquafortis; litharge is also used by some, though acknowledged by few to add weight to dyed silk. Antimony is much used to the same purpose. Arsenic is used in crimson upon pretence of giving lustré, although those who pretend not to be wanting in giving lustre to their silks disown its use. Verdigrise is also used by linen-dyers in their yellow and greenish colours; though, of itself, it strikes no deeper colour than that of a pale flax. Of mineral dyes used in dyeing, the chief is alum; the true use whereof seems to be in regard to the fixation of colours. The next mineral salt is fultropetra, not used by ancient dyers, and but by few of the moderns: nor is it yet used but to brighten colours, by back-boiling of them, for which argol is more commonly used: lime is much used in working blue vats.

Of the animal tribes are used cochineal, urine of labouring men kept till it be flake and flinking, honey, yolks of eggs, and ox gall; the use of the urine is to fust, and help the fermenting and heating of wood; and is used also in blue-vats instead of lime: it discharges the yellow, and therefore is used to spend weld withal.

Dyers use two sorts of water, viz. river and well-water; the last, which is hard, they use in reds and other colours wanting refringency, and in dyeing materials of the flacker contextures, as in calliope, fustian, and the several species of cotton-works; but is not good for blues, and makes yellows and greens look ruly. River-water is more fat and oily, and is therefore used in most cases, and must be had in great quantities for washing and rinsing their cloths after dyeing. Water is called by dyers white liquor, but a mixture of one part bran, and five of river-water, boiled an hour, and put into leaden cistern to fettle, is what they call liquor absolutely.

Guards have been used by dyers about silk, viz. gum arabic, tragacanth, mastic, dragon’s blood. These tend little to the tincture, any more than gum in writing-ink, which only gives it a confluence; so gum may give the silk a glisting: and lastly, to increase the weight.

The three peculiar ingredients for black are copperas, fluxings of steel, and flippe: the refrigent binding materials are alder-bark, pomegranate-peels, walnut-roots and roots, oaknapping bark, and saw-dust of the same, crab-tree bark, galls, and fumac.

The flacks are alum, salt-petre, salt armoniac, potash, and stone-lime; among which urine may be enumerated as a liquid flack.

The liquors are well and river water, urine, aquavi.

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ter, vinegar, lemon juice, aquafortis, honey, and muskces.

Ingredients of another class are bran, whiten-dowel, yokes of eggs, leaves, cummin seed, fenugreek seeds, aganic, and lenna.

The first, or absterfies, are fuller’s earth, soap, linseed oil, and ox gall.

The metals and minerals are pewter, verdigrease, antimony, litharge, and arsenic.

The colectionings are of three sorts, viz. blue, yellow, and red; of which logwood, old suffice, indigo, and madder, are the chief.

General observations upon Dyeing.

1. All materials which of themselves do give colour are either red, yellow, or blue; so far from them, and the primitive fundamental colour white, all that great variety which we see in dyed stuffs doth arise.

2. That few of the colouring materials, as cochineal, foot, wood-wax, woad, &c. are of that outward and first appearance of the same colour, which by the flight of dippers and solutions in the weakest menstrua, they dye upon cloth, fresh, &c.

3. That many of them will not yield their colours without much grinding, steeping, boiling and fermenting, or corroboration by powerful menstrua, as redwood, woad, arbutus, &c.

4. That many of them will of themselves give no colouring at all, as copperas or gallic, or with much disadvantage, unless the cloth or other fluff to be dyed be as it were first covered, or incrusted with some other matter, though colourless moreover, as madder, woad, brazil, with alum.

5. That some of them, by the help of other colourless ingredients, do strike different colours from what they would of themselves, as cochineal, brazil, &c.

6. That some colours, as madder, indigo, and woad, by reiterated tinctures, will at last become black.

7. That although green be the most frequent and the most common of natural colours, yet there is no simple ingredient now used alone to dye green with upon any material; sap-green being the nearest, which is used by country people.

8. There is no black thing in urch which dye black, though both the coal and foot of molten things burnt or scorched be of that colour, and the blacker, by how much the matter before being burnt was whiter, as in ivory black.

9. The tincture of some dyeing fluffs will fade even with lying, or with the air, or will stain with water only, but very much with urine, vinegar, &c.

10. Some of the dyeing materials are used to bind and strengthen a colour; some to brighten; some to give luster to the fluff; some to disperse and take off the colour, either in whole or in part; and some out of fraud, to make the material dyed, if costly, heavier.

11. That some dyeing ingredients, or drugs, by the coarseness of their bodies, make the thread of the dyed stuff seem coarser; and some, by thinning them, smaller; and some, by smoothing them, finer.
12. Many of the same colours are dyed upon several fluffs with several materials, as red-wood is used in cloth, not in silk; azurro in silk, not in cloth, and may be dyed at several prices.

13. That fleuring and walking of fluffs to be dyed, is done with special materials, as sometimes with ox-galls, sometimes with fuller’s-earth, and sometimes soap; this latter being, in some cafes, pernicious, where pot-alkes will tan, or alter the colour.

14. Where great quantities of fluffs are to be dyed together, or where they are to be done with any speed, and where the pieces are very long, broad, thick, or otherwise, they are to be differently handled, both in respect to the vessels and ingredients.

15. In some cafes and fluffs the tinging liquor must be boiling, in other cafes blood-warm, and in some it may be cold.

16. Some tinging liquors are fitted for use by long keeping, and in some the virtues wear away by the keeping.

17. Some colours or fluffs are best dyed by reiterated dippings in the same liquor, some by continuing longer, and others a lesser time therein.

18. In some cafes, the matter of the vessel wherein the liquors are heated, and the tincture prepared, must be regarded, as the kettles must be pewter for Borrow dye.

19. There is little reckoning made how much liquor is used in proportion to the dyes/drugs, it being rather adjusted to the bulk of the fluffs, as the vessels are to their breadth; the quantity of dyes/drugs being proportioned both to the colour, higher or lower, and to the fluffs; as likewise the salts are to the dyeing drugs. Concerning the weight that colours give to silk, (in which it is most taken notice of, being held by weight, and a commodity of great price) it is observed, that one pound of raw silk loatheth four ounces by walking out the gains and the natural forces; that the same colored may be raised to above thirty ounces from the remaining twelve, if it be dyed black with some materials.

Of a thing very useful in dyeing, especially of black, nothing increaseth weight so much as galls, by which black folks are restored to as much weight as they lost by walking out their gum: nor is it counted extraordinary that blacks should gain about four or five ounces in the dyeing upon each pound. Next to the galls, old fullic encroaches the weight about 14 in 127, madder, about one ounce; woad, half an ounce. The blue vats in deep blues of the fifth fluff, give no considerable weight, neither doth logwood, cochineal, nor even copperas, where galls are not; flipple adds much to the weight, and gives a deeper black than copperas itself, which is a good excuse for the dyers that use it.

Dyeing of wool and woollen manufactures.

For black in woollen manufactures, it is begun with a strong decoction of wood and indigo, that communicate a deep blue; after which the fluffs being boiled with alum and tartar, or pot-alk, are to be maddened with common madder, then dyed black with Aleppo galls, copperas, and a muff, and finisht by back-boiling in wold. Woolens for tapisry are only to be woaded, and then put in black. For fluffs, wool and woollen manufactures are dyed with blues and cochineal, with which may also be used apric and arsene. Crimson scarlet is dyed with colored, muflic, aquafortis, sul ammoniac, sublimate, and spirit of wine. Violet scarlet, purple, amaranth, and purple scarlets, are given with woad, cochineal, indigo, brazilatto, brazil, and orach. Common reds are given with pure madder, without any other ingredient. Crimson reds, carminations, flame and peach-colour, are given, according to their several hues, with cochineal, muflic, without madder, or the like. Crimson red is prepared with Roman alun, with cochineal. Orange aurora, brick-colour, and onion-peek color, are dyed with wood and madder, mixed according to their several shades. For blues, dark are dyed with a strong tincture of wood; the brighter with the same liquor, as it weakens in working. Dark brown, miniums, and tan colours, are given with wood, weaker in decoction than for black, with alun and pot-alkes, after which they are madder-ed higher than black: for tan-colours, a little cochineal is added. Pearl-colours are given with galls and copperas; some are begun with walnut tree roots, and finisht with the former; though to make them more useful, they generally dip them in a weak tincture of cochineal. Greens are begun with wood, and finisht with wold. Pale-yellows, lemon-colour, and sulphur colour, are given with wold alone. Olive colours of all degree are first put in green, and taken down with foot, moss or lefs, according to the shade that is required. Fellement, hair-colour, mulk, and cinnamon colour, are dyed with wold and madder. Naraceet, or bright orange, is given with wold and goats-hair boiled with pot-alkes.

Dyeing of fluffs, is begun by boiling them in soap, &c. then scouring and washing them in water, and steeping them in cold alun-water. For crimson, they are scoured a second time, before they are put into the cochineal vat. Red crimson is given with pure cochineal, muflic, adding galls, turmeric, arsene, and tartar, all mixed in a copper of fair water, almost boiling: with thefe the fluff is to be boiled an hour and a half, after which it is allowed to stand in the liquor til next day. Violet crimson is given with pure cochineal, arsene, tartar, and galls; but the galls in less proportion than in the former: when taken out, it is washed and put in a vat of indigo. Cinnamon crimson is begun like the violet, but finisht by back-boiling if too bright, with copperas; and if dark, with a dib of indigo. Light blues are given in a back of indigo. Sky-blues are begun with ochre, and finisht with indigo. For citron colours, the fluff is first alunmed, the wold-leaved with indigo. Pale yellows, after aluming, or dyed in wold alone. Pale and brown aurora’s, all aluming are welded strongly, then taken down with room and dissolved with pot-alkes. Flame-colour is begun with rosen, then alummed, and afterwards dip-
ped in a vat or two of brazil. Cinnamon and rose
colours are first alummed, then dyed in brazil. Cinn-
ammon colour, after alumming, is dyed in brazil and brazi-
letto. Lead colour is given with fulfirc, or with weld, 
braziletto, galls and copperas. Black silks of the 
corner fort, are begun by scouring them with soap, as 
for other colours; after which they are washed out, 
wrung, and boiled an hour in old galls, where they are 
suffered to stand a day or two: then they are washed 
again with fair water, wrung, and put into another 
vat of new galls: afterwards washed again, and wrung, 
and finished in a vat of black. Fine black silks are 
only put once into galls of the new and fine fort, that 
has only boiled an hour: then the silks are washed, 
wrung out, and dipped thrice in black, and afterwards 
taken down by back-boiling with soap.

The dyeing of thread is begun by scouring it in a 
lye of good alices: afterwards it is wrung, rinsed out 
in river water, and wrung again. A bright blue is 
given with braziletto and indigo: bright green is first 
dyed blue, then back-boiled with braziletto and verde-
ter, and lastly woaded. A dark green is given like 
the former, only darkening more before woading. 
Lemon and pale yellow is given with weld mixed with 
rocou. Orange isabella, with fulfirc, weld, and rocou. 
Red, both bright and dark, with flame-colour, &c. 
are given with brazil, either alone, or with a mixture 
of rocou. Violet, dry-rofe, and amaranth, are given 
with brazil, taken down with indigo. Peulemot and 
olive colour are given with galls and copperas, taken 
down with weld, rocou, or fulfirc. Black is given with 
galls and copperas, taken down and finished with bra-
ziletto wood.