*Logwood: an Interesting Dye**

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Logwood, formerly known in England as Bluewood and Blackwood, is an interesting dye for several reasons. It was one, and probably the most important, of the new dyes introduced into Europe following the discovery of America. The other great natural dyes indigo, madder and kermes were all found in the eastern world and known not only to medaeval but also to ancient dyers. Of the others new dyes discovered in America the most important were cochineal and fustic, the former was virtually identical to kermes and the second, although a valuable yellow, was hardly as outstanding a discovery. It is certain that neither cochineal or fustic were used to anything like the same extent although it should be pointed out that cochineal was much more expensive.

Until the development of the man made synthetic black dyes logwood was widely used, particularly for producing black on wool. Man made dyes were of course introduced in 1856 with W. H. Perkins's discovery of mauve but it was only with the synthesis of alizarin, the colouring matter in the

* There is no book or pamphlet dealing specifically with the history of Logwood. Rather strangely the Ciba Review which has issued short histories of most natural dyes omitted Logwood. As far as the present writer is aware the best historical account will be found in the English periodical « The Dyer » in the valuable series *Contributions to the History of Dyeing* by CLEMENT BOLTON. Logwood is described in the issues for 13 March 1936, 27 March 1936, 10 April 1936, 24 April 1936 and 8 May 1936. All the older accounts of dyeing have long sections on the application of the dye but except for the obvious value of the contemporary accounts of its application, very little of its earlier history. See also A. M. WILSON: The Logwood Trade in the Seventeenth and Eighteenth Centuries in *Essay in the History of Modern Europe*, ed. D. McKay. 1936.

great natural dye madder, that they became really important and the similar synthesis of indigo at the end of the century meant that most of the ground previously occupied by the natural dyes had been captured. Black remained the special problem. Cotton could be dyed by the specialised Aniline Black process or with the Sulphur Black dye but neither of these methods were applicable to wool. Here Logwood held its place so well that Knecht, Rawson and Loewenthal in the 1909 edition of their *Manual of Dyeing* were still able to say that Logwood was one of the most important of dyes. Shortly after this date, however, the Chrome Blacks quickly took over for most pure blacks although Logwood continued to be used for special purposes and it is in fact the only natural dye that most dyers today have processed.

Today particularly because of the limited amount used in dyeing silk and other special processes Logwood is the only natural dye used to any extent commercially.

Before Logwood was introduced from America the dyeing of black presented a difficult problem. A complicated process using copperas and galls gave the only self black known but it was not a satisfactory method and without much doubt most blacks were obtained by dyeing a deep navy with woad or indigo — the colouring principle in these two dyes are the same — and then topping with weld or madder, which not only did not give a deep black but because of the time taken to obtain the deep navy, was very expensive. This method of obtaining a black involved the combination of a vat dye (woad or indigo), which had to be treated by dipping continually into the dye bath allowing the blue shade to be developed by repeated oxidations in the air with the quite different process of mordanting needed by the weld and/or madder. With mordanting the material is pretreated with a metallic salt at the time usually alum, and then dyed by immersing in a bath containing the dissolved dye. Mordant dyeing although it had problems was much simpler than vat dyeing.

Logwood is a mordant dye which gives a reasonable black when the material has been treated with copperas consequently the process was much simpler. Later it was found that mordanting with chrome was even better. Using alum mordant a blue was obtained and the unsatisfactory nature of this colour was the cause of most of the legislation against the dye. As Bolton stated, « Logwood navy blues are much less fast to light than logwood blacks and as compared with indigo navy blues they are almost worthless ».[1] Here it is worth noting that the main blue dye of the Middle Ages — indigo or woad — was the fastest of blue dyes and amongst the fastests of all dyes known until the twentieth century. It therefore tended to establish almost impossible standards.

[1] Bolton, *op. cit.*, « The Dyer », 13 April 1936.

An account of the various legislations passed relating to Logwood will be given after the interesting history of its introduction has been described; first, however, a little should be said of its chemical nature.

Logwood [2] — the name is derived from the form in which it is imported — contains two natural colouring matters Haematoxylin and Haematin, two substances which are very similar, having nearly the same chemical formulae.

Logwood was also known as Campeachy Wood, Haematin paste and Haematin crystals [3] and is the wood of the Haematoxylin Campeachianum of the family Casealpiniaceae, a tree growing in Mexico, Haite, San Domingo, Cuba, Honduras, Jamaica and elsewhere. Of recent years the finest wood of all is considered to come from Yucatan. The interior of the wood is yellow immediately after cutting but changes rapidly to a dark brown on exposure to light.[4] The most common commercial form of the dye is now Logwood Extract, which is obtained by boiling fresh Logwood with water in what is knows as the French process or with steam under 50-80 lbs. pressure in the American process. The material is then concentrated to 15° TW for Logwood liquor or 51° TW for Logwood Extract or evaporated to dryness for Haematin Crystals. The wood imported in large, irregular shaped blocks weighing an average of almost 400 lbs. It is very hard and capable of taking a good polish. The tree reaches a height of up to forty feet and is ready for felling when ten years old. After 1715 a considerable proportion of the weight used in England was grown in Jamaica where a Dr. Barker planted seeds obtained in Honduras.

The importance of the Logwood trade, especially during the eighteenth and nineteenth century is not always realised. Even more fascinating is its early history during the seventeenth century. The British colony of Honduras owed both its origin and its retention to the trade.[5]

The history of the struggle for the early trade centred around the age old fight between England and Spain in the New World. The Spanish government was determined to keep control for itself, stating on one occasion that « as it is unlawful to take wine out of a cellar in Malaga by force, so it is unlawful to cut Logwood in the Bay of Campeachy ». The early history of the Logwood

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[2] Although the historical literature on Logwood is small the chemical is large and the great seventeenth century French dye chemists worked on it. W. H. PERKINS further elucidated the structure and published his results in the Journal of the Chemical Society in 1908 and 1909; and more recently there have been important papers in the « Journal of the Society of Dyers and Colourists » by BIRD and NEWSOME, August 1950, Arshid et al September 1954 and Lalor and Martin November 1959.

[3] Also bois de Campeche, bois bleu and blauholz.

[4] There is a good account of Logwood growing in *Timbers of Tropical America* (Yale University Press 1924).

[5] *The Archives of British Honduras*, ed. J. A. BURDON, vol. I, p. 5.

trade in Honduras reads much like the story of the sheep farmers or squatters in Australia. As the official history of the country clearly shows the logwood cutters established their own rules « When a person finds a spot unoccupied and builds his hut, that spot shall be deemed his property and no person shall presume to cut or fell a tree or grub a stump within less than one thousand paces or yards of his hut ».[6]

The British government, again reminding one of the position of the Australian squatters, was uncertain what attitude to take. They realised that legally the position of the Logwood cutters was insecure, and under pressure from Spain were often inclined to wipe their hands of them. On the other hand the knowledge that the trade was important and the awareness of the long traditional antagonism of the British towards the Spanish claims in the New World, led them in the last resort always to come to their rescue. In the end with the increase in the economic power of Britain and the falling power of Spain, the Logwood cutters established themselves in the colony and Honduras was accepted, still somewhat reluctantly, by the British government as part of the Empire.

Various papers printed in the Archives of British Honduras give some indication of the importance of the trade, for example in 1751 a private letter reports: « There was cut last year in the Bay of Honduras above 8,000 tons of logwood, sold at an average in England and elsewhere for at least £20 per ton. Total £160,000 a valuable sum especially when it is considered that Logwood is the fundamental fixing dye to almost every other colour and therefore absolutely essential to our Woollen Manufacturers — the consumption of all Europe by what I can learn does not exceed 4,000 tons a year, but the Baymen cut more or less every year as they are more or less interrupted and in proportion to the demand from the merchants that store it, who are now stocked I am told in England for two or three years, but as this irregular way of proceeding makes either a Feast or a Famine among the Logwood Cutters it is to be wished the Bay were taken under Protection ».[7]

Another interesting memorial from the settlers about the Treaty of 1783, which recognised the settlement as being part of the Spanish Empire but officially gave the English settlers permission to cut the wood, gives additional statistics:

« The Memorialist beg leave to state: firstly that British subjects were the first to cut Logwood in that Bay; secondly, that their special rights were recognised by Spain in the Treaty of 1763; thirdly, that the Logwood trade is too valuable to surrender. Logwood is chiefly used in dyeing Colours, such as Black, Blues and Purples; Wherefore its consumption is very great in all the Woollen, Linen, Cotton and Hat Manufacturies. From being possessed

6 *Archives*, op. cit., vol. I, p. 107.
7 *Archives*, ibid., p. 77.

of this commodity we not only Supplied all our home Manufacturies, but exported large Quantities of it to Italy, Portugal, France, Holland, Germany and Russia.

Prior to the settlement of His Majesty's Subjects in the Bay of Honduras, the price of Logwood in this Kingdom was from £50 to £60 per Ton. From that time the prices continued decreasing until 1749 when it was reduced to £25 per ton. From 1749 the quantity continued increasing, and the price, of course, diminishing until 1756 when they exported from Honduras 18,000 Tons per Annum at £11 per Ton. Lastly from their re-establishment in the Bay in 1763 their exportations of this article became immense in so much that there were from forty to seventy-five sail of ship loading continually in the Bay all the year round until about 1770 during which time the price continued lowering till it came to about £6 and £5 per Ton... ... the Memorialists point out that the value of the trade to Great Britain by the cheapness and plentifulness of Logwood, the duty of twenty shillings per ton to the Revenue and the number of men employed in shipping it and Mahogany, estimated at 7,700 seamen. They ask that all their privileges in cutting and shipping Logwood and Mahogany should be restored by the Treaty, without any limitations or boundaries whatever to the Bay Settlements ».[8]

Many of the early Logwood cutters had been privateers and the new trade gave them good opportunities. William Dampier was one of the most famous of them and he himself for some years cut Logwood in Honduras and has left an excellent account of his experiences in his travels of how the the privateers discovered the value of the trade:

« After the English had taken Jamaica and began to cruise in the Bay they found many barks laden with Logwood but not knowing its value they either set it adrift or burned them, saving only the nails in the ironwork; taking no notice at all of the cargo until Captain James having taken a great ship laden with it and brought her home to England to fit her for a Privateer, beyond his expectation he sold his wood at a great rate; though before he valued it so little that he burned it all during his passage home. After his return to Jamaica, the English visiting the bay found out the place where it grew and if they met no prize at sea they would go to Champeton River where they were certain to find large piles cut to their hand and brought to the seaside ready to be shipped off. This was the common practice till at last the Spaniards sent soldiers to prevent their depredations ».[9]

Dampier's Voyages should certainly be read by all interested in the history of dyeing. He made three journeys to Central America as a youth before he became famous for his account of his voyage round the world.

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[8] *Archives*, ibid., p. 134.

[9] Mr. Dampier's, *Voyage to the Bay of Campeachy* quoted Bolton, *op. cit.*, 27 March 1936.

He was in his early twenties at the time, straight from his home in Somerset. Dampier is an excellent writer of good simple English prose. He is concerned to tell the story of his trips without any unnecessary embellishments. Occasionally one regrets this and it would be interesting to have more details of his early life. His first voyage was to Newfoundland where he suffered so much from the cold that he made a resolution that in future he would go only to warmer areas. This decision did have an unfortunate effect for later when in the Pacific he turned north away from the cold; if he had gone south he would have been the real discoverer of Australia. His career really begins with the first of his voyages to Campeachy Bay in 1675 when he was 24. There he met the Logwood cutters with whom he worked for several months. At the time that Dampier went there this Logwood cutting trade was prosperous. The Treaty of Madrid made in 1670 between England and Spain had recognised the right of Englishmen to stay anywhere in America where they were already established, but the trade still remained of a somewhat doubtful legality. In any case, whatever the new treaty said, the Spanish officials on the spot continued to do what was in their power to prevent the Logwood cutters pursuing their business. They treated them as outlaws and if any of the sailors on the ships coming to collect wood were caught they were liable to be imprisoned. Many of the Logwood cutters had been ex-buccaneers, some of them had served the famous Morgan, and all bitterly resented the treatment they received from the Spaniards and did everything that they could to get their revenge. It is not too much to say that a state of war existed in Campeachy Bay at the time that Dampier arrived.

The Logwood cutters were tough in every sense of the word. If their relations with the Spaniards had not made this necessary, the job they were doing would have done so. They worked all day in a tropical heat, up to the knees in water, and they slept at night in miserable huts with loaded pistols at their sides. Dampier gives his first taste of his skill as a writer in the vivid description he gives of the habits of this group of men. They lived on the half-cooked flesh of wild cattle and Dampier makes the interesting remark that it was because the Spaniards when they first discovered America had so well stocked that part of the world that the Logwood cutters were able to exist and pursue their business.

When Dampier decided to become a Logwood cutter himself, he went to the same area he had visited during his first voyage. He fitted himself out in Jamaica with the usual cutter's equipment of axes, saws, tents and guns, and arrived in the Bay in 1676 with the intention of staying there until he had made his fortune. He might well have managed to do this, for when compared with most of the other cutters he was a model of industry. As he said, he did « ever abhor drunkeness ». However, he had only been

there four months when disaster came, not from the Spaniards as he might have expected, but in the shape of one of those great hurricanes that have always ravaged the area. The countryside was completely flooded, the trees were blown down and some of the ships were driven out to sea whilst others were hurled into the forest where their masts could be seen standing among the tree tops. Dampier had lost all his possessions as he had not yet had time to turn the Logwood he had cut into money. All were gone in one night. At this point he decided to give up Logwood cutting and he joined the buccaneers. However, he was never very proud of this change of occupation and after a while returned to Logwood cutting. The second period was more successful than the first and finally, after an absence of four and a half years he returned to England.

There is no record of the manner in which the Spaniards discovered the dyeing properties of logwood. In England from 1581 to 1662 its use was prohibited by law on account of the inferior colour which at first was produced by its employment. The statute in question, 23 of Elizabeth, 1581, could not have been entirely successful and it was supplemented by another — 39 Elizabeth (1597-8) which begins: « An Act for the better Execution of the Statute made in the three and twentieth year of the Queen's Majesties reign for the abolishing of Logwood alias Blackwood in the dyeing of Cloth, Wool or Yarn ». There were certainly prosecutions under the act and H. Heaton in his history of the Yorkshire wool textile trade comments « such legislation was enforced occasionally, as for instance in 1598 when Thomas Cumming of Holbeck (Leeds) was indicted for dyeing wool and woollen cloth with logwood or blackwood.[10] How far the Elizabethan prohibition was due to prejudice and not to the fact that some of the earlier dyeings were badly done and were not fast is difficult to decide. Similarly we do not know how far the repeal by Charles II was due to the realisation that the dye was better than any other known for certain purposes or to improvements in techniques. Most of the early trouble may have been due to it being used for blue in which form it compared very badly for fastness properties both with itself as a black and even more noticeably with indigo, the traditional blue. It dyed a very pleasant shade, which was reasonably fast to washing but not to light. The early dyers were anxious to find an alternative blue for woad and indigo which although excellent when dyed were troublesome during the process. A paragraph in the famous Instructions that Hayluyt gave makes this clear: « There is a wood called Logwood or Palo Campeach — it is cheap and yieldeth a glorious blue but our workmen cannot make it sure. This wood you must take with you and see whether the silk dyers or wool dyers of Turkey can do it. With this you may

[10] H. Heaton, *History of the Yorkshire Woollen and Worsted Industries*, p. 221.

enrich yourself very much and therefore it is to be endeavoured very earnestly of you. It may bring down the price of woad or perse ».

Of all the famous dyes of history Logwood was one of the easiest to apply and this might perhaps account for some of the suspicion. In addition to the many prohibitions already mentioned, Frederick the Great in Germany in 1758 issued an edict forbidding its use, while in France under Colbert's administration it was officially classed as a loose colour.

However, once these original prejudices were overcome, and capperas was introduced as the best known mordant Logwood made great strides and by the middle of the nineteenth century was as stated the most widely used of all dyes, surpassing in weight if not in real importance both indigo and madder.

Meanwhile researches made by the French chemist Chevreul in 1810 established the colouring matter Haematoxylin, which he was the first to obtain in a crystalline state. In 1826, the closely similar Haematin was isolated from blood which has given rise to some nomenclature confusion.

Although other colours could be obtained and are of some historical interest, in the long run the great interest of Logwood rests in its use for black on wool and silk and to a limited extent on cotton. The usual method of obtaining a Logwood black on cotton consisted of mordanting with an iron and then dyeing. There were a number of variations of this basically simple method but the principle was always the same. However, the dyeing of cotton with logwood declined long before its use for wool and silk, partly because of the difficulty experienced in mordanting vegetable fibres and also because alternative methods were discovered early in the development period of new dyeing techniques. Indeed the Aniline Black process was introduced by John Lightfoot of Accrington about 1860. He used it for the printing of calico at the Broad Oak Print Works. The process is in fact a unique dyeing technique and consists of oxidising aniline on the cotton fibre and some people would hardly regard it as a dyeing process at all. There has been a considerable technical literature on the application of Aniline Black with many of the leading dye chemists of the second half of the nineteenth and early twentieth century contributing. The c. 1893 an excellent synthetic black Vidal Black was introduced and the use of logwood for obtaining black on cotton who at an end.[11]

Turning next to the historically important dyeing of black with logwood on wool, by the end of the nineteenth century when Hummel stated: « Log-

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11 All the standard books on dyeing devote considerable space to Logwood and of course to Aniline Black and the Sulphur Blacks. I have found J. J. HUMMEL, *The Dyeing of Textile Fabrics* (1885) and R. S. HORSFALL and L. G. LAWRIE, *The Dyeing of Textile Fibres* (1927) particularly valuable.

wood is the essential basis of all good blacks on wool »,[12] several distinct techniques had been evolved; three, the so called chrome black, the copperas black and the woaded black were the most important. The first of these, the chrome black, represented the culminating point of the traditional mordanting method. The mordant had originally been copperas but had been replaced by chrome, which gave better dyeing value and did less harm to the wool. The chrome blacks were produced by first mordanting the wool with 3% bichromate of potash and 1% of sulphuric acid, then washing, and dyeing in a separate bath with 35-50% of Logwood. This gave the simplest form of dyeing a chrome black with Logwood and yielded a good if blueish black. By the addition of a suitable amount of one of the natural yellow colouring matters to the dyebath, 5% of Old Fustic was common, a dead black was obtained. This black was in fact an excellent neutral shade possessing no decided tint of blue, green or violet and many old wool dyers would still maintain that it was the best black ever dyed.

The copperas or ferrous sulphate black was widely used prior to the discovery of the advantages of chrome as a mordant. The wool was mordanted for 1½-2 hours with 4-6% ferrous sulphate, 2% copper sulphate, 2% alum and 8-12% Argol; then taken out, left overnight and dyed the next day with 40-50% Logwood.

Woaded Blacks were obtained by first dyeing the wool in an indigo vat to a medium shade of blue and then after washing dyeing as for a chrome or ferrous sulphate black. It is difficult to believe that this method really produced a better black than the others and was probably practised because 'woading' was traditionally regarded with such reverence.

Several other uses of Logwood on wool deserve a mention. Bonsor's Black, for example, invented by P. Watinne-Delespierre of Lille was a 'direct' dye, that is no mordanting was needed. A black paste was obtained by precipitating a decoction of logwood with a mixture of ferrous and copper sulphate. 25% to 30% of this was added to the dyebath with 2-3% oxalic acid and the dyebath was brought to the boil and the dyeing then took 1-2 hours.

Logwood according to Hummel continued at the end of the nineteenth century to be used for dyeing blues in imitation of indigo blue and here the mordanting was still done on alum, and for purples when mordanted with tin crystals.[13]

The use of logwood for other than blacks died out as satisfactory synthetic dyes were introduced and even for black itself the coming of the afterchrome blacks — Diamond Black P.V. and Solochrome Black P.V.S. for example —

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[12] HUMMEL, *op. cit.*, p. 323.

[13] HUMMEL, *op. cit.*, p. 331.

largely replaced it partly because of greater cleanness and slightly better all-round fastness and even more because these dyes could be mordanted after the actual dyeing in the same bath thereby saving much time and money.

As already mentioned the application of Logwood to silk was important and this method was really more than a dyeing being a complete finishing process. Hummel in his well known text book first published nearly a hundred years ago stated that the method of dyeing black with logwood on silk had increased to an enormous extent and some very large dyehouses were exclusively devoted to it.[14] From the technical standpoint it was, he admitted, a branch of the trade that had reached a very high standard of excellence, but taken as a whole the process was to be regretted as the practise of so called weighting the silk whilst dyeing black was used to increase the weight of the original raw material by as much as 400%. From a hundred pounds of raw silk the dyer produced five hundred pounds of black silk. The object, of course, was to increase the volume of the silk fibre which swelled considerably during the dyeing process. Naturally a great deal of strength was lost and many other valuable properties of the silk fibre either disappeared or were greatly reduced. The gain to the buyer was therefore illusory although it appeared that he was paying less for one and the same surface of silk material. Hummel concluded that it was not his job to combat the arguments brought forward by the manufacturers in favour of weighted silk but it could, he thought, be fairly maintained that the advantages gained were bought too dearly and that the real value of silk was greatly diminished by the process.

It is interesting to notice that when one looks at a modern book on dyeing the main mention of Logwood remains this type of silk dyeing. The authors Horsfall and Lawrie are not so critical of the ethics of the process as were their predecessors. They thought that this method of dyeing black on silk was a very ancient art and so intimately connected with the appearance and feel of some type of silk materials that is could fairly be regarded as a combined dyeing and finishing process. It will be clear from what has been said that it was necessary to be rather careful when buying a black silk dress so as to be certain that one was buying silk and not material which had been put in for weighting purposes. The process, although to a limited extent permissable, was certainly liable to mis-use and the amount of weighting used by different dyers varied. It could be less than the amount lost in the original degumming of the raw material or it might be equal to the weight of the silk or perhaps much greater. The dyer controlled the amount of iron salts and tannin containing substances which the silk was allowed to absorb over and above that actually needed for dyeing by the number of dips into the dyebath. The silk went into the dyebath a number of times usually from three to ten, according to what degree of weighting was required.

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[14] HUMMEL, *op. cit.*, p. 332.

Logwood continued to be used for black on wool until the 1920s but has now been almost entirely replaced by the chrome blacks. Many wool dyers, however, will have used it. One advantage that it has over the chrome blacks is that it covers vegetable matter and if one is dyeing material likely to contain other matter than wool, which can well be the case with mills today using such a wide variety of fibres, Logwood can still be useful. Indeed it is perhaps true to say that its replacement by the chrome blacks was a little unjustified as the chrome blacks as a group have certain weaknesses notably in their solubility and in their fastness to alkali.

Recently Logwood has found another use in dyeing black on nylon, and also for biological stains.