DYEING AS A HANDICRAFT

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PREFACE

THE compilation of this book has afforded the authors considerable pleasure. An attempt has been made to render the style as simple and concise as possible, so that the handicraft worker should experience little difficulty in putting into practice the various methods described.

To compile even so modest a work as this several authorities have had to be consulted. Students desirous of following up the craft in all its many forms are strongly advised to read Mr. Charles E. Pellew's valuable treatise on dyeing. Thanks for suggestions and assistance must also be given to the Dryad Handicrafts, Leicester, from whom all the dyes mentioned in this book may be obtained.

The authors wish to acknowledge their indebtedness to many friends for generous

help in preparing the book for publication. Especially would they tender thanks to Mr. Edward Richardson, B.Sc.(Oxon), A.I.C., for correcting the proofs.

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INTRODUCTION

THERE is no doubt that handicrafts are becoming increasingly popular. This is certainly a step in the right direction. Science and materialism have too long held undisputed sway and treated true creative art with contempt and ridicule. The term amateurish, a once deadly criticism levelled against all non-professional work, has no longer the same venomous sting. The vast art-loving public are growing tired of the sameness and standardized precision of modern industrial products. They desire something different, something which, although crude and unfinished, will reflect beauty and culture. Handicrafts alone can satisfy the new demand for individual work. They fulfil a wonderful mission in enabling even the humblest person to possess articles distinctive and characteristic, and above all, individual. Educational authorities are realizing the great importance of handicrafts, as a help in developing the latent creative instinct present in every child.

Surely there is no greater pleasure in life than something in which it is possible to put a little of one's real self. Happiness inevitably comes to those whose pleasures are found in pursuits whose only rewards are the joy of creating and the satisfaction of contemplating the finished article.

Dyeing is one of the oldest arts and was practised long before the dawn of civilization. We know from ancient records that dyeing was an honoured and prosperous trade in Egypt under the youthful Tut-ankh-Amen, and in Imperial Rome under Numa. Almost every known civilization encouraged the art of dyeing and realized its great importance in contemporary life.

In many of our museums there are examples of the work done by those ancient craftsmen, and in several cases their beauty cannot be equalled by the best of our modern products. It is to the ancients that the handicraft worker with a love for his art has to proffer thanks. From them he may learn much about colouring every kind of material, but far more about the qualities which make a real craftsman—patience, sympathy, humility, wisdom and innate simplicity.

Dyeing as a handicraft is only just becoming popular. There are untold possibilities

about this craft which the industrious and intelligent student may well appreciate. Almost every kind of material used by the handicraft worker can be dyed or stained a wide range of lovely colours. Again, technique, whilst important, can soon be mastered, and in a short time the craftsman will be obtaining really beautiful results.

In the following pages, the authors have attempted to give practical recipes and suggestions for dealing with a large number of materials, including cotton, wool, silk, raffia, cane and leather. It is hoped that the craftsman will find the information of material assistance to him in his work, and enable him to open up new avenues of thought and action.

Dyeing as a Handicraft

CHAPTER I

PREPARATION OF FIBRES AND FABRICS FOR DYEING

Linen and Cotton Goods—Wool—Silk—Apparatus for Dyeing

BEFORE any fabric can be dyed in a satisfactory manner, it must be devoid of dirt and grease.

In many cases a good boiling in soapy water, followed by wringing, proves sufficient. Cheap yellow laundry soaps should not be used, as they frequently contain injurious chemicals which might possibly affect the dyeing. Cotton and woollen goods may be treated as indicated—that is on fairly vigorous lines—but some care must be exercised when dealing with silk, both natural and artificial, and other delicate materials.

Real silk may be boiled in a weak soap solution to which has been added a teaspoonful of olive oil to the gallon of water. This prevents the lustre from diminishing. Artificial silk or rayon is best washed in warm soapy water, wrapped in a cheesecloth and passed through the wringer. As the fibres of this material are not very strong, it is not advisable to hang up the sodden fabric too great a strain being imposed upon the fibres; it is, therefore, the safest plan to dry as much as possible by wringing.

Bleaching Fabrics.– In some instances it may be desired to bleach a coloured fabric prior to dyeing. The following methods when carefully carried out yield satisfactory results.

Linen and Cotton Goods (*Vegetable Fabrics generally*).– Prepare a solution of bleaching powder in the following manner: Mix one part of bleaching powder to a paste with three parts of water, and then dilute with three more parts. Allow to settle for two hours, then pour off the clear liquor. About half a pint of this liquor to a gallon of cold water should prove sufficient.

Immerse the wetted materials in the bleach and agitate well during the bleaching. It

is important that the fabrics should be left in the liquor for the shortest possible time, otherwise the fibres may be weakened.

As soon as the colour has been discharged, take out the material and rinse for ten minutes in a solution made up of three tablespoonfuls of vinegar to the gallon of water. Afterwards wash in cold water under the tap for a quarter of an hour, wring out and hang in the open air to dry.

Bleaching Wool.—A satisfactory way is as follows:

Prepare a solution of two teaspoonfuls of permanganate to the gallon of water and immerse the wetted material in the liquor. Care should be taken that the chemical is all dissolved before putting in the fabric or skeins.

After five minutes, or until the wool has assumed a deep brown colour, it may be taken out and dropped into a solution of sodium bisulphite in one gallon of warm water. Work about in the liquor until all the colour has been discharged and the wool is quite white. When the bleaching finishes, boil the material in a weak soapy solution for ten minutes, and wash well in warm water ready for dyeing.

Bleaching Natural Silk.—Some care has to be exercised when dealing with this costly and

delicate material. Hydrogen or sodium peroxide are probably the best agents to employ.

First of all, boil the silk in soapy water for ten minutes—as mentioned previously, a little olive oil should be added to the water—then treat with a solution of carbonate of ammonia, about two teaspoonfuls to the gallon, for at least ten minutes, rinse in cold water and bleach.

Steep the material in a strong hydrogen peroxide liquor, composed of half a pint of peroxide to a gallon of water containing four or five drops of concentrated ammonia.

Move the fabric about in the solution for ten minutes and then hang up in a warm room to dry. A good percentage of the bleaching takes place during the drying.

Note.—It is not possible to bleach all dyed fabrics as some of the modern colours on cotton are extremely fast.

Apparatus Necessary for Dyeing.—Excellent results may be obtained by the use of simple and inexpensive apparatus. First of all, the vessels for dyeing. Enamel bowls capable of holding from one to three gallons will usually meet all requirements. Two or three of these are necessary. One in which to mordant, another for dyeing, and the last for rinsing with soap and water.

Of course, it is possible to economize in

this direction, but this means that the dye bowl will have to be washed perfectly clean after each operation.

Small enamel saucepans with a capacity of a pint to a quart are excellent for dyeing skeins of wool or silk, and also for boiling up the dye, mordant or chemicals.

As regards heat, the best plan is to make use of a gas-stove or ordinary kitchen range. Paraffin-oil stoves can be utilized for this purpose, providing care is taken when stirring the dye liquor to prevent upsetting the stove.

An important item is the dye-stick. Pieces of thin curtain pole with the ends rounded off will prove very satisfactory for this purpose. These should be two feet in length. After using these sticks, it must not be forgotten to scrub them well with hot water and soda, to avoid staining the next material with which they come in contact.

Rubber gloves are absolutely necessary when dyeing, as the chemicals and dye-stuffs used are injurious to the skin and cause disagreeable and obstinate stains. Gloves with or without fingers may be obtained from any of the handicraft or rubber stores at a very reasonable price. When not in use, it is advisable to soak

them in cold water, or store them in a box containing a little sulphur; this simple treatment prevents the rubber from perishing.

A cheap Fahrenheit thermometer is exceedingly useful, if not absolutely essential, as it enables the worker to repeat results which would otherwise be practically impossible to achieve.

CHAPTER II

DYEING VEGETABLE FABRICS WITH MINERAL SUBSTANCES

Orange to Reddish Brown—Grey to Greyish Blacks—Grey to Greyish Blues—Discharged Greys and Blues—Olive Green to full Blues—Tan Shades to Seal Brown—Discharged Browns—Yellow to Deep Orange

THE ancients made great use of simple mineral substances when dyeing animal and vegetable fibres.

Although the modern professional dyer has little use for these materials, on account of the time and labour which their utilization entails, the handicraft worker will find them of great value on account of the simple beauty of their shades.

For vegetable fibres some excellent results may be obtained by careful use of mineral dyes, but on silk and wool they are not so satisfactory.

When dyeing with mineral salts, the greatest care must be taken to avoid over-

loading and choking the fibres with the colouring matter. If this precaution is not taken the dyed fabric will dry out hard and stiff, and the colour will rub off quite appreciably. Of course, mineral-dyed materials are never so soft as those coloured by means of coal-tar or wood dyes.

Probably the best-known mineral salts which can be used successfully on vegetable fabrics, such as cotton and linen, are copperas or iron sulphate, permanganate of potash, prussiate of potash, lead acetate and bichromate of potash.

Iron Dyeing.—*Shades of Orange to Orange Brown. Shades of Grey to Greyish Black.*

A solution of green vitriol, iron sulphate or copperas, should first of all be prepared. About two tablespoonfuls of this chemical dissolved in two gallons of hot water 150° F. will prove sufficient for most purposes. Immerse the fabric in the dye-bath, take it out for a moment, and then dip it in again. This alternate process should be repeated for at least ten minutes. At the end of that time add two teaspoonfuls of copperas, previously dissolved in a little boiling water, to the dye-liquor. Continue dyeing for a further ten minutes, then take the fabric out and wring it. Some handicraft experts recommend shaking out the material and

hanging up in the open air for a few minutes before placing in the soda bath.

In order to develop the distinctive and beautiful orange or orange-brown colour, the iron-saturated material must be treated with a solution of ordinary washing soda. Two tablespoonfuls of soda crystals in a gallon of warm water will prove quite satisfactory. Dip the fabric in the soda and work as described above for five minutes, or until the full colour is obtained.

Wring out the material, shake, and then hang up in the open air for at least ten minutes before washing in a weak soap solution and drying out.

Precautions.—It is most important that the colour should be formed gradually by dipping the fabric in the two solutions. The iron compound, when formed in thin layers, has a lesser tendency to rub, which is one of the disadvantages of this process. Care must be taken that both the copperas and soda are thoroughly dissolved before the dyeing commences, otherwise the colour will be patchy and unsightly.

Effects Produced by Partially Discharging the Colour.—Some very effective results can be obtained by partially bleaching or discharging the colour produced by means of iron and soda.

If the material is tied with tape and certain parts left uncovered, then, by immersing the tied bundle in a weak acid, the unprotected portions will be bleached white. All manner of interesting modifications of the above simple method will spring to the workman's mind.

The acid-bath may be made up by dissolving one ounce of vitriol or five tablespoonfuls of vinegar in a gallon of water, and treating the fabric with the solution for a few minutes.

On no account should the material be left in the acid for longer than a minute or so. Afterwards rinse the tied bundle in cold water, untie, and wash in hot water and soap, then wring and dry out.

Precautions.—The greatest care must be taken when tying the material. Where the colour is not desired to be bleached, the tape should be pulled tight. String should not be used, as the tannin present may stain the iron-dyed fabric. Watch the acid-discharging process very carefully, and take out immediately the colour has been bleached.

Iron and Tannin.—*Grey to Greyish Blacks. Grey to Bluish Blacks.*

Pleasing but rather dull effects can be obtained by combining iron and natural tannin, as found in gall nuts, acorn cups,

tea-leaves, unripe English walnuts, hazel-nuts, butter-nuts, the green twigs of alders, oak-bark, and many other natural woods and leaves.

First of all make up a solution of copperas, about three teaspoonfuls to the gallon of hot water, and immerse the fabric in the liquid. Boil for ten minutes to a quarter of an hour. Make up an infusion of tannin, using some of the materials mentioned above. If none of these can be obtained, logwood is to be recommended, although it gives a more decisive bluish-grey to navy, according to the amount used.

About a quarter of a pound of twigs or nuts, etc., should be boiled in a quart of water for one hour, then carefully strained through muslin. This infusion must be added to the iron mixture very gradually and the mixture kept boiling.

Particular pains should be made to keep the fabric under the dye-liquor and constantly agitated.

When the desired shade is obtained, the material should be taken out of the bath and hung up in the open air for ten minutes, then wrung out and shaken and washed in warm water to which has been added just a trace of curd soap and a little olive oil. Dry in a warm room.

Precautions.—This is a process where great caution has to be exercised. Make quite sure that the material is well saturated with copperas before adding the tannin. Keep the final dye-bath under constant supervision to ensure that the correct colour is obtained. The shade may be varied by increasing or decreasing the addition of tannin.

Iron and Prussiate of Potash Dyeing.—*Colours ranging from Olive Green to full Blues.*

Fabrics already dyed by means of iron and soda as hitherto described may be treated very successfully with prussiate of potash and vinegar or acetic acid.

About two tablespoonfuls of this salt and the same quantity of acetic acid should be dissolved in two gallons of hot water and the fabric dyed by means of dipping. The temperature of the dye-bath should be 160° F. or thereabouts.

Any shade of green to navy may be obtained, providing the fabric is kept under strict observation during the dyeing, and removed immediately the desired colour has been developed. As soon as the material has taken the colour to the required depth, plunge it into hot water 170° F., and work about with a stick for at least a quarter of an hour. Rinse in cold water, wring out and dry in the open air.

Precautions.—Yellow prussiate of potash is very poisonous and great care should be taken when using it. Rubber gloves must always be worn when applying this method.

It is essential that the material be well washed after dyeing to ensure fastness to rubbing and washing.

Note.—Prussiate of potash may be obtained from any stores, provided that it is known to be required for dyeing purposes.

Permanganate Dyeing.—*Tan to Seal Brown.*

Very pleasant warm shades of brown may be obtained by using permanganate of potash. Two to three teaspoonfuls of permanganate of potash crystals to a gallon of hot water will make a satisfactory solution. The greatest care should be taken that no undissolved crystals are present in the liquor when the fabric is immersed, otherwise objectionable stains will be produced.

Dye by dipping as described for iron dyeing, then hang up in the open air for the colour to develop. It is preferable to add two dessertspoonfuls of treacle to the dye-liquor to prevent intensive oxidization of the fibres and the weakening which accompanies such an action.

As soon as the desired depth of colour

has been produced, the fabric should be washed in warm soapy water and then wrung out and dried. The purple colour in the dye-bath quickly changes to brown in the presence of air.

Precautions.—This dyeing operation should be carried out as quickly as possible, as the material is apt to rot if left in the solution too long. If carried out as described, the method will be quite satisfactory.

Effects Produced by Partially Discharging Permanganate Brown.—The brown colour may be discharged or bleached by treating the fabric with a solution of bisulphite or hydrosulphite of soda. An ounce of this chemical in a gallon of warm water will quickly destroy the colour. By folding, knotting, or other means, many effects in shaded brown and white may be produced. After dyeing, rinse well and then wash in soap and water, wring out, shake, and then dry as quickly as possible in a warm room.

Dyeing with Sugar of Lead and Bichromate of Potash.—*Yellow to Orange.*

Prepare a solution of sugar of lead crystals, four teaspoonfuls to the gallon. Sieve the liquid through fine muslin before use, as all the chemical might not be dissolved.

The liquid should be hot—about 160° F. is a very suitable temperature.

Now dip the material in the liquor and work up and down in the usual manner for a quarter of an hour.

At the end of that time take it out and immerse in a solution consisting of half a teaspoonful of bichromate of potash, and a quarter of an ounce of caustic soda or a tablespoonful of washing soda. Dissolve the above chemicals by boiling, and then allow to cool down a little before use.

Develop the colour by dipping the fabric in the solution until the correct shade is obtained. Immediately afterwards, wash in very weak soapy water, rinse in cold water, and wring out and dry in a warm room.

Precautions.—Great care must be taken to avoid hurrying the process, as if the fabric is heavily loaded with mineral salts it will feel very harsh and rough and will not, moreover, be fast to rubbing. The yellow chrome must not come in contact with cuts or sores, otherwise there is a danger o poisoning. Rubber gloves must be worn.

CHAPTER III

DYEING WOOL WITH VEGETABLE DYES

Yellows—Mole—Safe—Slate—Golden Tan—Black—Purple —Scarlet—Crimson—Reds—Browns—Fawn—Grey—Blue

Mordanting.—Before wool (either in skeins, naturally scoured, or in woven pieces) can be dyed with woods, and other natural products, it must first of all be treated with certain chemicals called mordants. The best known of these that the handicraft worker will require are the following:

Alum
Chrome alum
Copperas
Tin chloride
Cream of tartar or tartar emetic
Bichromate of potash
Copper sulphate or blue stone

These chemicals may be obtained from

any drug store. There is no need to purchase the pure substances, as the ordinary commercial varieties are quite suitable.

It is advisable to purchase half a pound of each mordant and have a useful stock in hand. This will generally prove more useful than buying odd ounces.

The mordanting is generally done before dyeing, but in some cases it may be done with the dyeing.

Mordants impregnate the pores of the wool fibre with chemicals, which form insoluble coloured lakes when acted upon with various natural dyes, such as wood extracts, nuts, mosses, lichens, berries and various other products.

The usual procedure when mordanting before dyeing, is first of all to dissolve the mordant in the requisite quantity of boiling water. Sieve the solution through fine muslin to ensure that no undissolved particles are present and then put the material in the liquor. Raise almost to the boil and continue at this temperature until the wool has absorbed the maximum amount of the chemical, which may take from half an hour to an hour. In the case of chrome and ordinary alum, leave the material in the liquor for at least twelve hours —that is, raise the solution nearly to boiling for one

hour, then remove the vessel from the source of heat and allow to cool.

The Sources of Vegetable Dyestuffs.—It is always interesting to know something about the more important materials used for dyeing. In addition to the personal satisfaction obtained by knowing their history, the knowledge may be of great benefit to teachers of handicraft work in art schools and other institutions.

Many of the more important woods and vegetable dyes were introduced into this country during the Elizabethan age, when the maritime adventurers visited the South American ports in search of Spanish gold and plunder.

When these woods were placed upon the English market they met with considerable criticism from the Dyers Company. Logwood in particular, one of the most valuable dyestuffs for producing blues and blacks, was vetoed by the Government, as the colour obtained by its use was said to be fugitive and generally unsatisfactory. In consequence, logwood was not used for dyeing until nearly eighty years had elapsed since its introduction into this country.

The craftsman of to-day would be astonished if he were aware of the attitude of the old-time dyers towards new ideas. They

shrouded their trade in a mysticism of secrecy which seems almost incredible to us of the twentieth century. Methods of dyeing in the Middle Ages were extremely long and costly, and the recipes for colours were handed down as heirlooms from father to son, and not changed one iota from one generation to another. It took many years for all the following vegetable dyestuffs to achieve popularity in the industry.

Fustic.—This wood comes from South America where it is known as Yellow Wood. The extract is still extensively employed as a mordant, but seldom as a dye.

To the handicraft worker fustic is particularly useful, as, when mordanted with alum or tin salts, some very beautiful shades of yellow may be obtained.

Both the fustic chips and the solid extract are on the market; the latter is preferable on account of the economy which may be practised when using it.

Cutch.—The Indian tree *A. Catechu* yields cutch. The trees are found principally in Burma, and also certain parts of tropical East Africa. This dyestuff and mordant comes into commerce in the form of an extract, obtained by boiling the wood in earthen jars over a mud fire-place. The best cutch contains about sixty per cent. of tannic

acid, together with other similar bodies. It is principally used for obtaining rich shades of brown on cotton and woollen goods, after mordanting with copper or chromium salts.

Gambier.—This important tanning agent, mordant and dye-stuff, is obtained from the East Indies. The source of gambier is a climbing shrub. When the plant is three years old the leaves and twigs are clipped off the main stem and boiled in an earthenware copper. Eventually an extract or paste is obtained, and this is moulded into small cubes or blocks.

Like cutch, it is used on cotton and woollen materials to dye rich browns, after the former have been mordanted with copper or chromium salts.

Sumach.—This plant is extensively cultivated in Sicily and the United States. The Sicilian variety is certainly the most popular and undoubtedly the best.

Sumach comes into commerce in the form of a very fine powder which consists of the ground leaves and twigs of the plant. It is used principally in the tanning of sheepskins. With the aid of sumach, the handicraft dyer may obtain some fascinating and useful shades.

Thus, with ferrous sulphate or copperas, it

yields a grey to slate colour, whilst with copperas and chrome it gives a lovely golden tan.

Quebracho.—This is a wood from the South American Republics, particularly the Argentine Republic.

The wood is extremely heavy and hard; in fact, the Spanish word "quebracho," means "axe-breaker."

Extracts or pastes consisting of concentrated infusions of quebracho are familiar in commerce. The solid extract is perhaps the best-known form of this material and is a dark-coloured brittle mass. Some good colours may be obtained by combining this agent with certain mordants. Thus, with alum it gives a good yellow, with copperas a mole, and with blue stone or copper sulphate a sage.

The use of quebracho is, however, rather limited, as it is a very dark-coloured material.

Logwood.—The tree is native to Central America and the West Indies. Logwood is one of the best-known vegetable dyestuffs and mordants. The process of extracting the important colouring matter from the wood is by no means simple, and many of the large dye firms have put on the market various extracts, such as "Hematine," which

can be used very simply and efficiently. If the extract crystals are not employed, then the logwood chips are sold ready for boiling. Excellent blacks may be obtained on wool and cotton by first mordanting the material with chrome, copperas and blue stone, and then developing the full shade with logwood; using either the crystals or wood chips, and a little fustic. A very beautiful purple results from combining alum mordant with logwood and cudbear.

Cochineal.—This was one of the first, and easily the most popular dyestuff sent over from South and Central America.

The dye is of animal origin, and consists of the dried bodies of small insects, which live upon a variety of cactus common in those parts of the world. For obtaining scarlets and crimsons, practically no other dyestuff was employed on fabrics until the end of the nineteenth century.

If wool or cotton are mordanted with tin salts, very beautiful scarlets may be obtained, although the colours are not particularly fast to light and washing.

Indigo.- The indigo plant is extensively cultivated in India, Japan, Java, South and Central America, and several other countries. The blue metallic indigo with which we are familiar does not occur as such in the

natural plant. When the juices of these specialized plants are exposed to the atmosphere for any length of time, or fermented, the blue indigo of commerce is formed. Indigo will give permanent and beautiful blues and a host of different colours when blended with other dye-stuffs. In the old process of indigo dyeing, the indigo has first to be rendered soluble and changed by reduction into "Indigo White," then developed on the fibres of the material into blue indigo. This latter change takes place by oxidation or exposure of the material to the air.

Dyeing with Fustic.— *Bright Crocus Yellow.* 1 lb. of wool.

Make up a mordant solution with a teaspoonful of bichromate of potash crystals to two gallons. Boil the wool for half an hour and pour away a quarter of the liquor. It is important that the light should be kept away from freshly mordanted wool, as it tends to affect the colour.

Prepare the fustic by boiling a quarter of a pound of fustic chips in one quart of water for at least half an hour. Strain the solution through muslin, and then add the clear liquid to the mordant bath, together with a teaspoonful of Turkey-Red oil. To obtain full shades it is advisable to boil for

half an hour, rinse the dyed wool in cold water, and then wring out and dry.

Dyeing with Fustic.—*Lemon Yellow.* 1 lb. of wool.

Dissolve three teaspoonfuls of powdered alum in boiling water. Now immerse the wool in the solution and continue boiling for one hour. When sufficiently mordanted, add one quart of fustic liquor prepared in the above manner, to the alum solution. If at the end of half an hour's boiling the colour is not dark or decisive enough, add another pint of fustic liquor and continue dyeing until the desired shade is obtained. A small scrap of white curd soap may be added to the dye-liquor previous to taking out the fabric. Rinse well in cold water, wring out and dry.

Dyeing with Fustic. *Green.* 1 lb. of wool.

Mordant with a teaspoonful of bichromate crystals and a teaspoonful of tartar emetic dissolved in two gallons of water. Boil for half an hour, then add one quart of the boiled fustic mixture, which is prepared as follows: Four ounces of fustic chips and two ounces of logwood chips boiled in a quart of water for an hour, and the solution well strained.

Dye by boiling the wool for half an hour in the mixture, then add one teaspoonful

of Turkey-Red oil and boil for another ten minutes. Rinse in running water, wring out and dry in a warm room.

Dyeing with Quebracho.—*Mole.* 1 lb. of wool.

Mordant with three teaspoonfuls of copperas to two gallons of boiling water. Boil the wool for at least half an hour. Now pour away half of the iron liquor and add the following:

1 teaspoonful of ground quebracho extract
1 teaspoonful of Turkey-Red oil
½ gallon of boiling water

Some trouble may be experienced in dissolving the quebracho, but no pains should be spared to ensure complete solution. Boil the wool gently for half an hour, then rinse in cold water, wring out and dry in a warm room.

Note.—The shade of mole may be graduated light or dark, by increasing or decreasing the time devoted to dyeing or developing the full colour.

Dyeing with Quebracho.—*Sage.* 1 lb. of wool.

Mordant with blue stone or copper sulphate, about one teaspoonful to two gallons of boiling water. Boil the wool for half an hour. Dissolve the quebracho extract in one quart of boiling water, add the freshly

prepared solution to the mordant and boil the fabric for at least forty minutes. At the end of that time add one teaspoonful of Turkey-Red oil and boil for another ten minutes. Rinse in cold water, wring out and dry.

Dyeing with Sumach.—*Golden Tan.* 1 lb. of wool.

Mordant the wool with a solution made up of:

1 teaspoonful of copperas

½ teaspoonful of bichromate of potash

2 gallons of boiling water

See that all the chemicals have thoroughly dissolved before putting in the wool. Keep the liquor on the boil during the mordanting and allow about twenty minutes.

Now make up an infusion of sumach in the following manner:

Take two tablespoonfuls of ground sumach and boil in a quart of water for fifteen minutes. Sieve the solution through fine muslin into a clean vessel.

For the actual dyeing, pour off about a quarter of the mordant solution and add the sumach liquor, boil the mixture gently for half an hour or until the correct shade is obtained. The colour may, of course, be varied by altering the proportions of mordant and sumach. The authors advise the addi-

tion of a little Turkey-Red oil to the dye-liquor as it improves the appearance of the wool. About a teaspoonful to the gallon is quite sufficient. After dyeing, rinse the fabric in cold running water, wring thoroughly and then dry out in a warm room.

Precautions.—Take particular pains to see that no free particles of sumach are in the solution, otherwise considerable difficulty will be experienced in removing them from the wool fibres.

Dyeing with Sumach.—*Slate.* 1 lb. of wool.

Mordant the fabric with half a teaspoonful of copperas in two gallons of water. Dissolve the iron salt thoroughly before immersing the wool.

Now make up an infusion of sumach, as already described for golden tan, only use three tablespoonfuls of ground sumach and dissolve in one quart of boiling water.

Pour off one quarter of the mordant liquor and add the sumach solution, taking care that no free particles of the latter are present. To dye, boil for half an hour, or until the correct shade is obtained. Rinse the wool in cold water, wring out and dry. Turkey-Red oil may be added to the dye-liquor if desired; the authors consider it advisable.

Precautions.—See that all the copperas is thoroughly dissolved before the wool enters the solution. Allow the mordant and dye-liquors to boil slowly and give the process plenty of time.

Dyeing with Logwood.—*Black.* 1 lb. of wool.

Mordant the fabric with a solution made up as follows:

½ tablespoonful of bichromate of potash
1 tablespoonful of copperas
½ tablespoonful of blue stone
2 gallons of boiling water

Boil the wool for half an hour in the above solution, then add the following strained mixture:

6 ounces of logwood
1 ounce of fustic
1 quart of boiling water

It is very important that the logwood and fustic solution should be sieved or strained before it is added to the mordant liquor. Always add one teaspoonful of Turkey-Red oil to the dye-bath when the full colour has developed, and continue boiling for ten more minutes. If an intense black is not desired, then the copperas may be omitted from the mordant mixture.

Dyeing with Logwood.—*Purple.* 1 lb. of wool.

Mordant the wool with ordinary alum and tartar. About three teaspoonfuls of powdered alum crystals, and a tablespoonful of tartar emetic should be dissolved in two gallons of water. Immerse the wool and stir fairly vigorously. Now add the logwood mixture consisting of four ounces of logwood and one ounce of cudbear. Needless to say, the mixture should be well sieved to demonstrate the fullest shades.

Dyeing with Cochineal.—*Scarlet.* 1 lb. of wool.

Mordant with three teaspoonfuls of tin crystals, one teaspoonful of tartar, and one or two crystals of alum to two gallons of boiling water. Boil the wool for half an hour, then pour off a quarter of the liquor and add the cochineal.

To prepare the dye solution, the following procedure is recommended:

Boil four ounces of cochineal in one quart of water for a quarter of an hour, then strain the liquor through muslin and pour it into the mordant bath.

Excellent full shades of scarlet may be obtained by boiling the material half an hour, then adding one tablespoonful of Turkey-Red oil and continuing the boiling for a further ten minutes. Rinse in cold

running water, wring out and dry in the open air.

Dyeing with Cochineal.—*Crimson.* 1 lb. of wool.

Mordant with two tablespoonfuls of powdered alum and one tablespoonful of tartar dissolved in two gallons of boiling water. Work the material in the mordant for half an hour, then add the infusion of cochineal. About four ounces of the dye dissolved in a quart of boiling water should be strained through muslin into the mordant bath. Boil for half an hour, then add a few tin crystals and a teaspoonful of Turkey-Red oil and continue the boiling for a further ten minutes. Rinse in cold running water, wring out and dry in a warm room.

Dyeing with Madder. —*Reds.* 1 lb. of wool.

Mordant with a mixture of alum and tartar. The best proportions are four teaspoonfuls of powdered alum and one teaspoonful of tartar to two gallons of boiling water. Boil the wool in the mordant solution for one hour, then allow it to remain in the cooling bath for at least eight hours.

Make up the dye mixture as follows:

Boil five ounces of madder root in a quart of water for two hours, then sieve the liquor through fine muslin ready for use. Add half a teaspoonful of tin crystals to

the madder infusion and then pour it into the mordant bath.

For satisfactory dyeing, raise the liquor to the boil very slowly and allow to simmer for at least one hour. Add one teaspoonful of olive oil and a few soap flakes, and continue boiling for a further ten minutes. Wash in cold running water, wring out and dry in the open air.

Dyeing with Cutch.—*Tan Brown to Seal Brown.* 1 lb. of wool.

Mordant the material with copper sulphate or blue stone, about three teaspoonfuls to two gallons should prove sufficient. Boil the fabric or wool in the mordant liquor for half an hour, then pour off one quarter of the solution and add the cutch infusion. For full shades of brown, four ounces of cutch to the gallon should prove sufficient. Dissolve the vegetable dye in a quart of boiling water and sieve the solution through fine muslin into the mordant bath. Develop the full shade by boiling for half an hour, then add a few soap flakes and a teaspoonful of olive oil, and boil for another ten minutes. Rinse in cold water, wring out and dry.

The colour may be darkened by continuing the boiling for an hour instead of half an hour.

Dyeing with Gambier.—*Browns.* 1 lb. of wool.

Mordant the wool with a mixture of:

2 teaspoonfuls of copper sulphate

½ teaspoonful of bichromate of potash

2 gallons of boiling water

Mordant for half an hour, then add two ounces of gambier previously dissolved in a quart of boiling water. Always sieve the vegetable dye before adding, or whilst adding to the mordant. Boil for three quarters of an hour, then add soap and olive oil as mentioned above and continue boiling for another ten minutes. Rinse in cold water, and wring out and dry in the open air. The colour may be brightened by adding a few tin crystals to the dye-bath.

Dyeing with Crotal without Mordants.—*Autumn Brown.* 1 lb. of wool.

Boil about a pound of the grey and black lichen in half a gallon of water for at least two hours. Strain the liquor through fine muslin into a clean vessel, and add one and-a-half gallons of boiling water. Immerse the wool in the fresh dye-bath and boil for an hour. Then add a teaspoonful of olive oil and a few soap flakes, and continue boiling for ten more minutes. Rinse thoroughly in cold running water, wring out and dry in the open air.

The colour may be deepened by adding a teaspoonful of tartar emetic to the dye-liquor.

A number of beautiful variations of colour, ranging from the lightest straw to a deep maroon, may be obtained by the use of more or less crotal.

Dyeing with Kermes.—*Red.* 1 lb. of wool.

Mordant with three teaspoonfuls of powdered alum and one tablespoonful of tartar dissolved in two gallons of boiling water. The wool should be boiled for half an hour, then left in the cooling liquor for eight hours.

Afterwards take the wool out of the mordant and put it into the dye-bath. About a quarter of a pound of kermes is sufficient for two gallons of water. First boil the dye in a quart of water for an hour, sieve through muslin and dilute to a gallon. Boil the material in the dye solution for an hour or until the requisite shade is obtained. Now add one tablespoonful of Turkey-Red oil and continue ebullition for a further ten minutes. Rinse in running water until no more colour tints the water, wring out and dry in a warm room.

Dyeing with Citron Bark or Extract.—*Fawn, Grey.* 1 lb. of wool.

An excellent fawn may be obtained by

boiling the wool in a solution of this vegetable dye. Mordanting is not necessary. About four ounces of citron to two gallons of water is sufficient. The bark should be cut up into small pieces and boiled for an hour or more, then the liquor strained and the wool added. It is preferable to boil the citron in a quart of water and then dilute according to desire. The requisite shade of fawn may be obtained by boiling the material in the dye solution for half an hour. Rinse in running water and dry in the open air.

To obtain a grey, all that is necessary is to add a crystal of copperas and half an ounce of fustic and boil for an hour.

Then drop in a teaspoonful of soap-flakes and continue boiling for a further ten minutes. Rinse in cold running water and dry out in a warm room.

Indigo Dyeing. *Extract Method.*

The simplest way to use this famous Eastern dye is the following:

Take half an ounce of the best ground indigo and shake it into about four ounces of concentrated vitriol in a porcelain bowl or glass jar. Metal must not be used, as corrosion will take place and the receptacle will be ruined. Allow the indigo to stand for twenty-four hours.

To obtain the best results, the wool must be carefully mordanted before use. For one pound of wool use two ounces of alum crystals and a few crystals of tin chloride. Dissolve the chemicals in boiling water and then pour the solution into the mordant bath which should be full of warm water.

After putting in the wool, heat up the liquor until just under boiling-point and keep at this temperature for three quarters of an hour. It is advisable to avoid boiling the wool which is usually dyed in skeins, as these soon become ravelled and coarsely matted; again, excessive temperature gives the wool a sombre and dull appearance. After mordanting, rinse the wool in cold water and wring out. The authors consider it advisable to leave the wool for an hour or so before entering it into the indigo, as it allows the mordant to set in the pores of the fibres.

Add half the indigo extract to the dye-bath full of warm water, and after stirring for a few minutes put in the wool. Move the wool about very gently so as to avoid "matting." Increase the temperature of the liquor until boiling-point is approached, then keep under 100° C. until the desired colour is obtained. If the shade is not deep enough add more of the indigo extract and con-

tinue dyeing. After dyeing, which may take anything up to an hour for really fast results, the wool should be taken out of the indigo and rinsed in cold water and then hung out in the open air for the colour to set. At the end of an hour or so the dyed wool should be washed in soapy water containing a little olive oil. About a quarter of an ounce of good flake soap and a teaspoonful of olive oil should be boiled in a pint of water and stirred with a stick until an emulsion is formed. The liquor may then be poured into a bath of hot water and the wool entered. After thorough washing and rinsing, the wool may be wrung out and dried.

A stock of indigo extract may be prepared ready for use. This solution will keep indefinitely if placed in a glass bottle provided with a glass stopper.

Indigo lends itself to various effects which can be very simply achieved by the use of knots.

Dyeing with Indigo.—*Vat Method.*

Dyeing with indigo according to the old fermentation process is a tedious, and indeed, a hazardous undertaking. The same principle can, however, be applied if modern chemical methods are used, with the additional advantages of simplicity of working and reliability of results. The following recipe

is one of the many vat processes now in regular use by professional dyers.

The wool must be thoroughly scoured before dyeing and then wrung out. It is a mistake to enter the material into the dye-bath unless it is in a moist and absorbent condition.

For one pound of wool mix half an ounce of the best natural indigo with a pint of boiling water and stir thoroughly. Now dissolve a quarter of an ounce of stick caustic soda in the water and mix well with a glass rod. Fill up the dye-bath with two gallons of boiling water and add the indigo mixture. After a few minutes stirring add crystals of sodium hydrosulphite until the colour of the solution changes from blue to a greenish yellow. Possibly some adjustment will be found necessary before the desired shade is obtained. If the solution is not yellow enough then a little extra caustic soda should be added, or if too dark a green, a little more hydrosulphite.

To test the dyeing properties of the indigo mixture, it is advisable to treat a few strands of wool with the solution for a few minutes, and afterwards hang them out in the open air to dry. If a deep blue colour does not develop very quickly, a further amount of hydrosulphite must be added.

It is necessary to exercise some considerable care in using the caustic soda, as an excess of this chemical will seriously damage the wool fibres.

The hanks of wool or cotton should be entered into the hot indigo liquor and moved up and down the bath for half an hour. It is recommended to preserve a temperature of about 85° C. and not boiling-point. After dyeing, the wool should be wrung out very lightly and hung in the open air for the colour to develop. When the full depth of blue has been obtained, the wool should be rinsed in several changes of cold water and then boiled for ten minutes in a soap bath, containing a little flake soap and a teaspoonful of olive oil to two gallons of water.

After washing, the wool should be wrung out and dried in the open air.

Any particular shade of blue may be obtained by leaving the material in the liquor for a longer or shorter period of time.

The indigo bath can be used repeatedly, providing small portions of fresh indigo, soda and hydrosulphite are added from time to time to replenish the solution. Before dyeing, the light-greenish colour must be obtained.

Indigo blue is one of the fastest known colours to both light and washing, and although this method is more troublesome than the indigo extract process, the results make good compensation for any extra trouble and expense involved.

There are on the market a number of special indigo pastes made up ready for dyeing. These contain the indigo already mixed with caustic soda and hydrosulphite. Their use saves some time and trouble, but the interest and pleasure of preparing the dye oneself is of course sacrificed.

Excellent fast greens may be obtained by first dyeing the wool or fabric with fustic and mordants to develop a full yellow bottom, then finishing the colour effect in an indigo bath. It should be remembered that indigo is probably the fastest known vegetable dye, and consequently any process of dyeing which embraces the use of this substance, gives a product very fast to light and washing.

Various other colours may result from combining indigo blue and red or yellow in different proportions.

Thus, if you bottom with red, and then top with indigo, a very beautiful violet may be obtained.

The following are possible combinations:

Indigo + Red orange = Soft red
Indigo + Yellow orange = Soft yellow
Indigo + Red green = Soft blue
Indigo + Red yellow = Grey
Indigo + Orange = Grey

CHAPTER IV

THE HISTORY OF COAL-TAR DYES

Until the middle of the nineteenth century, natural wood dyes were almost solely employed by professional dyers. A few mineral substances such as Prussian blue, iron buff, chromate and permanganate were used for colouring vegetable fibres, but the dyeing industry depended chiefly upon supplies of woods and extracts from South and Central America and from the East.

The process of dyeing was an expensive and laborious operation, as before any material could be dyed with vegetable dyestuffs it had first to be mordanted. Generally speaking, the mordanting, as in the case of the old Turkey-Red, was far more complicated and lengthy than the actual colouring.

The whole industry was revolutionized in 1856 by an accidental discovery of a young chemical student, William Henry Perkin. Whilst experimenting with a substance known as aniline, a derivative of ordinary coal- or

gas-tar, Perkin isolated a powerful mauve colouring matter which would dye animal fibres without any previous mordanting. This brilliant young student at once realized the great possibilities of his discovery, and with the help of his father and brother started in business in Manchester as the first aniline dye manufacturer.

Very soon the scientific world was acquainted with the full history of Mauveine, Perkin's famous dye, and chemists in almost every civilized country became absorbed in research work, with the object of finding more of these coal-tar dyes. The German scientists, following Perkin's lines of work, quickly discovered many more dyes of a similar nature to Mauveine.

The early dyes of the Mauveine class were rather crude and harsh when used individually, but if blended with a trace of a similar colour they became considerably softened and mellow. Unfortunately, many of these pioneer dyes were fugitive to light and washing, but these properties were soon improved by the colour chemist.

Naturally, these dyes met with fierce opposition from the intellectuals and artists, and Ruskin in particular, was very bitter in his attacks on these "worthless imitations of the good old-fashioned vegetable colour-

ing matters." But not even the criticism and contempt of Ruskin and his artistic contemporaries could stem the tide of progress. Increasing numbers of artificial dyes, some useless, and others fast and valuable, were put on the market by first one large colour house and then another, until the range of colours became exceedingly wide.

All of the early dyes were however, only suitable for animal fibres. They had practically no effect upon cotton or linen unless these materials had been well mordanted with the tannic acid contained in natural barks or woods like gambier, sumach, cutch, gall nuts, etc.

Eventually, the direct, or salt colours appeared, and these were found invaluable for cotton, linen and vegetable fibres generally. Mordants were not required, and the material could be dyed in a very simple and satisfactory manner. Later on, other groups of dye-stuffs appeared on the market to satisfy the demands made for extra fastness to light and washing. At the present time, there are several thousands of coal-tar colours, the majority being faster to light and washing than the average vegetable dye-stuffs. Again, the best known of the artificial dyes can be used in a very simple manner, and it is possible for the

merest amateur to obtain beautiful results by adhering to the few directions supplied with the dyes.

Everyone is now acquainted with the fact that the first colour chemist and manufacturer was an Englishman, and yet it is strange to relate that the industry did not take root in this country, but migrated to Germany and the Continent. In Germany, along the Rhine, huge factories were erected for the manufacture of coal-tar dye-stuffs on a very large scale. German dyes were exported to almost every country in the world.

When the Great War commenced in 1914, supplies of foreign dyes stopped, and our own dyers were faced with a great shortage. It was then that English chemical manufacturers turned their attention to the production of coal-tar dye-stuffs on a really large scale. Encouraged by the Government, the British Dye-stuff Corporation gained enormous ground, and in a comparatively short time was producing practically all the dyes once only obtainable from the German colour houses. It is not an exaggeration to state that eighty per cent. of the dyes used in this country at the present time are made in England.

A word about the various groups of coal-

tar dyes. The first important series belonging to the classical Mauveine family were known as basic dyes. The name was given because the dyes displayed certain base-like characteristics, that is, they combined with acids to form salts.

Another group of dyes which quickly followed the basic was the acid group. Acid dyes were found to be of an acid nature and, quite opposite to the basic dyes, they combined with alkalies.

These two extremely valuable classes of colours have a great attraction for animal fibres such as wool and silk, also leather, but hardly any for cotton or linen.

They are of great importance to the handicraftsman who is particularly interested in wool and silk dyeing and not so much in the dyeing of cotton and linen.

The salt colours, a later range of dyestuffs, were known as direct dyes on account of their unique property of dyeing cotton and linen without any mordanting or previous preliminary treatment. A little salt is usually added to the dye-bath to increase the fastness to washing, hence the name—salt dyes. There are several other varieties of dyes which followed the above discoveries, but the most significant are the vat and sulphur colours. The first named are similar

to indigo, and like that substance, require sodium hydrosulphite in the dyeing. They are exceedingly fast to light and washing, but being rather expensive, are only used on the first-class material. The sulphur dyes are used in the presence of sodium sulphide and are particularly useful for vegetable fabrics required to be very fast to washing and fairly fast to light.

It should be remembered that the individual members of the above groups of dyes are manufactured under a confusing number of fancy trade-names, and in many cases different manufacturers produce identical dyes under altered names.

THE GENERAL USES OF COAL-TAR DYES

BASIC DYES	Particularly useful for leather, raffia, cane and basketry in general
ACID DYES	Wool and silk. Leather and basketry to a limited extent
MIXED COLOURS	Cotton and vegetable fibres generally
SULPHUR DYES	Vegetable fibres
VAT DYES	Vegetable fibres

CHAPTER V

DYEING WOOL WITH ACID DYES

Before dyeing, the wool must be thoroughly scoured as previously described. After cleansing, always wring out the wool and immerse it in the dye-bath in a moist condition so that it will absorb the dye evenly.

For full shades use about a quarter of an ounce of dye to the pound of wool. Two gallons of water may be reckoned as sufficient for the same quantity of wool.

Dissolve the dye in a pint of boiling water and stir the solution for a few minutes to ensure that all the dye has dissolved. The dye-bath should be filled up with hot—not boiling water, and the strong dye-liquor poured in and well mixed. Now enter the wool and keep it on the move. The solution should be maintained at an even temperature, just under boiling-point, by placing the bath over a small gas-ring or stove. When the dyeing has continued for a quarter of an hour, add half an ounce of sulphuric

acid previously dissolved in some warm water. The acid must be added very slowly, and well mixed with the dye. Now add half an ounce of Glauber salts also dissolved in water. Continue the dyeing for a further quarter of an hour, then take out the wool, rinse in warm water and several changes of cold water until the water shows no trace of colour. After wringing out, the wool may be dried in the open air.

It is important that the following points should be borne in mind:

(1) Keep the temperature under boiling-point.
(2) Use the maximum quantity of acid.
(3) Keep the wool on the move during dyeing, but do not ravel or felt the fibres by violent agitation.

In some cases, it is advisable to add at first only half of the strong dye-liquor, and then to use the remainder later if the colour is not full enough. This procedure is to be recommended when dyeing the wool to any particular shade of colour. Thus, if dyeing a shade of green, the second portion should be toned with a little yellow, or blue, according to requirements.

It should be remembered that the acid dyes are not fast to washing, but reasonably fast to light. Thus the handicraft worker

must not expect the dyed wool to withstand the action of laundry soap or washing powders. If fastness to washing is desired, then the wool will have to be dyed with wood dyes, or the salt colours under special conditions.

The simplest method of dyeing wool fast to washing, is to make use of a bath containing half an ounce of salt colour to the pound of wool. First of all, prepare the wool and then make up the dye solution. Dissolve the dye in a quart of boiling water and strain it into the dyeing vessel containing two gallons of boiling water. Now add an ounce of sodium phosphate and half an ounce of Castile soap, boil the mixture and stir vigorously. Enter the wool and continue boiling for half an hour or more according to the penetration depth of colour desired. After dyeing, rinse the wool in several changes of cold water, then boil in a weak soap-bath (half an ounce to the gallon) and finally wash and wring ready for drying.

CHAPTER VI

DYEING SILK WITH ACID DYES

Dyeing skein, or woven silk, requires some considerable care if a success is to be made of the process. It is well known that silk contains a considerable amount of gum adulterants, and it is necessary to remove these before dyeing. The best and simplest way to achieve this, according to Pellew, is by means of a mixture of soap and oil prepared in the following manner:

Take an ounce of the finest olive-oil soap (Castile soap) and boil it in a quart of water containing a teaspoonful of olive oil. After boiling for ten minutes or so, dilute to one gallon with hot water and stir the solution. Now enter the silk into the solution and keep it gently on the move for a quarter of an hour. Throw away half of the liquor and add half an ounce of soap previously dissolved in boiling water; work the silk for a further twenty minutes, then take it out.

The dyeing is best performed in a strong soap-bath. It is advisable to utilize the old liquor used to cleanse the silk. Make up the dye solution with a quarter of an ounce of dye to a quart of boiling water, and strain half of this into the dye-bath. The liquor in the dye-bath should be made up with half soap solution and half boiling water.

Before putting in the silk, add half an ounce of sulphuric acid previously dissolved in cold water and stir it into the soap solution. Commence dyeing the silk by moving it up and down in the liquor for a quarter of an hour, then add the remainder of the dye and continue dyeing until the requisite shade is obtained.

After dyeing, rinse the silk in cold water until no more colour washes out, then pass it through a soap-suds solution and finally through a weak acid-bath made up with two tablespoonfuls of acetic acid to two gallons of cold water. Dry by hanging on a rod suspended over two chairs in a warm room

this refers to skeins; ordinary pieces may be hung up on a line in the usual manner.

Care should be taken to keep the temperature of the dye-bath constant by means of a small gas-ring or oil-jet. The temperature should never reach boiling-point, but should

be maintained round about 180° F. On no account must the process be hurried, this is fatal to good results. If the colour is not deep enough add a little more dye and increase the temperature a few degrees higher.

The best of the acid dyes are quite fast to light but will not stand the action of strong alkaline soap-baths. For most purposes, however, they will be found quite satisfactory.

If shades fast to washing are desired, then the salt colours must be used. The method is quite simple.

Treat the silk in exactly the same way as described above, then make up the dye-bath in the following manner:

Dissolve half an ounce of dye in a quart of boiling water and sieve this into the dye-bath made up with two gallons of boiling water, containing one ounce of sodium phosphate and half an ounce of Castile soap. Boil the mixture for a few minutes and then enter the silk and continue ebullition.

Full shades will probably be obtained after three quarters of an hour's boiling. Rinse the silk in several changes of cold water, then boil in a weak soap-bath for ten minutes, half an ounce of soap to the gallon. Finish off by rinsing in weak acetic

acid, one ounce to two gallons, and drying out slowly in the open air.

The colours obtained by using direct dyes are not so brilliant as the acid dyes, but of course they are infinitely faster to washing.

CHAPTER VII

DYEING VEGETABLE FIBRES WITH GENERAL COAL-TAR DYES

Direct or Salt Colours —Sulphur Colours— Vat Dyes

Dyeing with Direct or Salt Colours.—The cotton or linen should be well scoured and cleansed before dyeing and should preferably be in a moist condition.

About half an ounce of dye to two gallons of water may be regarded as useful proportions. Enough material should be dyed in a vessel so as to allow plenty of room for complete immersion and agitation.

It is advisable to dissolve the dye in a quart of boiling water and, after well stirring the solution, to strain it into the dye-bath. Add one ounce of ordinary table salt and then enter the cotton or linen. Boil for half an hour, then add half an ounce of salt and continue boiling for a further quarter of an hour. Take out of the dye-bath and

rinse in several changes of cold water before boiling in soap-suds and wringing out ready for drying.

The method is quite simple and providing it is carefully carried out, the colours should be even and fast to washing, which is pre-eminently desirable.

Dyeing with Sulphur Dyes.—This is slightly more complicated than any of the methods yet described. The dyes have to be used in the presence of a chemical known as sodium sulphide. The writers recommend the following method:

Dissolve half an ounce of the dye in one quart of boiling water containing one ounce of sodium sulphide and half an ounce of common washing soda. Stir the three chemicals until complete solution is obtained, then strain the liquor into the dye-bath containing hot water. Enter the cotton or linen goods and move up and down the liquor, taking care to keep them well under the surface. When the boiling-point has almost been reached take out the fabrics and add two ounces of table salt, then re-enter the cotton and continue dyeing until the desired shade is obtained. Take them out of the solution and wring by means of a small mangle, and immediately hang them in the open air for the colour to develop.

This is most important, and should on no account be omitted. After ten minutes in the air the cotton or linen should be boiled in a soap-bath, half an ounce to the gallon, then rinsed in cold water ready for drying.

There is always the danger of streaky results being obtained, and some considerable care must be taken to keep the cotton or linen under the surface of the liquor.

Dyeing with Vat Dyes.—These are used in the same way as indigo, that is, in the presence of caustic soda and sodium hydrosulphite. The modern Vat or Indigo Dyes are sold in the form of pastes containing about twenty per cent. of actual dye.

It is difficult to say how much dye-stuff to use, but for an experiment the writers recommend using half an ounce to two gallons of water. If this proves too concentrated, the solution may be thinned down with water, or vice versa. Pour the dye into a small vessel containing a quart of boiling water and mix thoroughly. Now fill up the dye-bath with hot water and add one ounce of caustic soda. Add the dye to the alkaline solution and stir. Crystals of sodium hydrosulphite should now be added until the colour of the solution changes. This means to say that the dye-stuff has become reduced and rendered soluble. Test

the dyeing property of the liquor with a small piece of cotton. If the dye has not all dissolved, then a further quantity of sodium hydrosulphite should be added; the same applies if the colour does not develop readily, in this case a little more caustic may be added.

Allow the solution to cool down to lukewarm and then put in the cotton or linen. Keep under the surface of the solution and move up and down for at least ten minutes. Now wring out and hang in the open air for the colour to develop, which may take about five or ten minutes; always, however, allow twenty minutes. Boil in a soap-bath, with half an ounce of curd soap to the gallon, and then rinse, wring out and dry.

Dyeing with Vat Colours is by no means an easy task, and some practice is necessary before the various difficulties are overcome and success crowns the amateur's efforts. Fabrics dyed with the above dyes are extremely fast to washing and light, although the colours are not so brilliant as those obtained by the use of the Acid and Basic Dyes.

CHAPTER VIII

TIED AND DYED EFFECTS

It has already been mentioned in several places that it is possible to obtain some very original and beautiful effects by tying and knotting the fabric or skeins before dyeing. The writers now propose to enter into further details concerning these novel and interesting applications and adaptations.

Knotted Effects. If a strip of silk or other fabric suitable for a scarf or wrap is knotted on itself with a simple loose knot and then dyed with a brilliant dye, a very striking rainbow effect will be produced. The colour will vary from the full shade on the outside of the knot to the merest tint, and even white, in the interior. The most effective pattern is obtained by knotting the centre of the strip of material; this produces a well-balanced effect.

It should be emphasized that the dyeing must be carried out as quickly as possible

and the most brilliant colours employed. After dyeing, the fabric should be rinsed in cold water, wrung out and dried.

There are hundreds of different ways of making patterns by knotting; each one is quite unique and can seldom be repeated. The tighter the knot is tied the sharper the effect, as in the tightest part of the knot very little dye will have penetrated.

Tied Effects.—Rising-sun effects may be obtained by binding the fabric with tape or twine in such a way that only a very little dye can penetrate. Take a square piece of silk and fold it so that a triangle is formed. now take a piece of tape and starting an inch from the apex of the triangle, commence binding in an irregular manner so that a thin margin of material is always left between the layers of tape. Continue this until about four or five inches have been covered, finish off the binding with a slip-knot and dye the fabric according to one of the methods previously described. After dyeing, when the tape has been undone, a very beautiful circular pattern will be seen, the centre of the circle will be the full shade and this will vary in the lightest tones to the circumference.

Modifications of this method will at once appeal to the imaginative craftsman. Thus,

if the fabric is dyed orange to start with, and then tied and dyed a deep red, a very striking effect will be produced. This may be made more pronounced by binding the apex and again dyeing in a violet.

In all these methods the pattern has been bold and large, it may, however, be desired to obtain a more complicated and decisive effect. Serrated bands may be produced by rolling the fabric in a long roll and tying it in set places with one or two widths of tape, according to the depth of the band desired. This is very effective for the ends of scarves and similar decorative articles. The lightness of the tape or twine is shown in the lightness or sharpness of the bands. Circles may also be obtained in a very simple manner. Thus, if marbles or stones are tied in the fabric by means of string or cotton, the effect will be small circles showing quite clearly against the dyed background. The circumference of the circle depends upon how the marble was tied and the amount of string used for the tying.

By the aid of the above two methods some very effective and unmistakably hand-made designs may be achieved.

Discharged Effects.—This is more skilful but by no means so tedious as the above methods. The principle is very simple and

depends upon the bleaching action of sodium hydrosulphite. Thus, if a piece of silk is dyed and then part of it is dipped in a weak solution of hydrosulphite, the colour will be discharged. By tying the dyed fabric so that only certain portions come into contact with the bleach, some very effective results may be obtained.

One ounce of hydrosulphite should be dissolved in one and a half gallons of water. After bleaching, the fabric should be washed in several changes of cold water and then wrung out and dyed. The process is very quick and admits of beautiful effects in the hands of a skilled craftsman.

Care must be taken not to leave the material in the bleach too long, otherwise all the colour will be discharged—a few minutes should prove sufficient.

CHAPTER IX

DYEING, STAINING AND FINISHING LEATHER

The Dyeing of Leather.—Dyeing leather on a commercial scale is a highly skilled task, and the practical dyer is generally a man who has served many years of arduous apprenticeship to the trade. Previous to the introduction of the modern coal-tar colours, dyeing was a far more complicated and mysterious procedure than it is at the present time. Nowadays the methods of colouring a great variety of leathers do not differ very appreciably one from another. They are all comparatively simple in practice and economical in time and labour. The most difficult thing about the process is dyeing to pattern, which does not, of course, interest the average handicraft worker. There is no reason why the craftsman should not dye leather very successfully, even if he has only a superficial knowledge of the trade. Providing the following instructions

are carried out the results will be quite satisfactory.

Before vegetable tanned leathers, such as bark tanned calf, roans, basils, goad and skivers, are ready for dyeing they should be cleansed so that the dye will be absorbed evenly. In order to remove any grease, excess of tanning materials or dirt, it is necessary to work the leather in a small solution of borax or other weak alkali. About one ounce of borax dissolved in two gallons of warm (not hot) water should prove sufficient for two pounds of leather. The latter must be moved about in the solution for a quarter of an hour. It should then be taken out and put into a weak acid liquor, made up with two ounces of acetic acid to two gallons of warm water. The acid clears or bleaches the leather and removes all traces of the borax. After rinsing in cold water the leather is ready for dyeing. Stains can frequently be removed by working the leather in the above manner.

The dyeing of vegetable tanned leathers is best done with Acid Dyes in the presence of a little mineral or organic acid, such as sulphuric or acetic acids. Formic acid is preferable to acetic, but it cannot be procured so easily. The dyeing may be conducted in a large bath or bucket for small

amounts of leather. As regards the quantity of water, this depends solely on the bulk of leather and the proportion of dye used. For two pounds of leather a quarter of an ounce of good Acid Dye should prove sufficient. First of all weigh out the dye and dissolve it in about a pint of boiling water. Now have the dye-bath full of warm water (about 110° F.). Pour in half the dye solution and stir the liquor. For about two pounds of leather three gallons of water should be enough. Now put the prepared leather in the dye-bath and keep moving it up and down in the dye solution for ten minutes. At the end of that time add the remainder of the dye and work as before for five minutes. The acid should be poured in at this stage. About two ounces of acetic acid, or one ounce of sulphuric, should prove ample to develop and fasten the colour. Care should be taken not to pour the acid over the leather, but to take the latter out for a moment during the addition and subsequent mixing. Work the leather until the desired shade of colour is obtained. Take out and rinse in cold water. After dyeing, it is advisable to place the leather flat on a clean, level board or piece of plate glass and press out the surplus moisture with a ruler, working the edge

over the grain of the leather. This simple action helps the leather to dry out quite flat and uncreased. Afterwards tack the leather on a large board and leave to dry. The dyeing should not be hurried, but may be carried out in a warm room.

When dry, the leather is ready for softening and finishing. In some cases it may not be necessary to soften, which may be accomplished by gently rolling the leather on a table or working it over the back of a chair. The next process is finishing, and will be dealt with after we have discussed staining.

Staining Leather.—This is the most popular and generally convenient manner of colouring leather for handicraft purposes, although it finds no great favour with the manufacturer. Spirit stains are the dyes in most demand, and by their careful use some very beautiful and artistic results may be obtained.

It should be remembered that before commencing to stain any leather all the dirt and grease must be removed. In the majority of cases the leather is purchased ready for dyeing, but sometimes it may happen that it requires cleansing. In that case the above borax and acid method should be practised and the leather dried

out before staining; it should be tacked on a board to dry so that it will lie flat.

The stain solution should be made up of a quarter of an ounce of dye to half a pint of methylated spirits. Mix the stain and solvent together in a bottle and shake until the latter is saturated. Keep this solution until ready for use, then strain a little through fine muslin into a saucer.

Some dyes dissolve more readily than others, and it will generally be found advisable to keep stock solutions and add more or less spirits from time to time, so as to get a saturated liquor.

Before staining, moisten the surface of the leather with a damp sponge so as to render the absorption of dye as regular and uniform as possible. If the dye is applied to the dry leather, then patchy and unpleasant shadings are inevitably obtained. The stain should be applied by means of a soft pad or brush. Circular movements are the most satisfactory, especially if finished off with straight strokes.

After colouring, the leather should be dried out slowly and then polished.

If desired, the ground work may be done with Acid Dyes, using a solution consisting of a quarter of an ounce of dye and half an ounce of acetic acid to half a pint of boiling

water. The mixture should be well stirred, then cooled down and strained before use.

It may be applied in exactly the same manner as described above.

The writers recommend the handicraft worker to use a diluted solution of dye in preference to a concentrated one. The advantage of adopting this procedure is that the resultant colour looks softer and deeper than when the dye has been "plastered on."

Finishing and Polishing Leathers.—The ordinary methods of finishing trade leathers are of little interest to the handicraft worker who desires a soft full polish rather than a definite finish.

The writers recommend an application of milk and water, half and half. This simple mixture gives the colour a rich, full appearance and helps the grain to take a good polish. After applying the milk the leather should be allowed to dry; then polished with a piece of soft velvet. A very small quantity of milk will achieve the desired effect; if too much is given there is a danger of the leather becoming dark and greasy.

Just a little beeswax made into a cream with turpentine will give that high lustrous polish desired for particular work.

In place of wax a good white shoe-cream may be used.

CHAPTER X

DYEING AND STAINING RAFFIA, SEA-GRASS AND CANE

Dyeing Raffia. At the present time a large amount of raffia is used for general handicraft purposes. Bags, baskets, table runners and mats are now woven with this cheap and attractive material. There is a wide scope for handicraft dyes in colouring raffia, as the more striking and artistic the results, the better they are appreciated. The methods of dyeing this grass are very simple and economical.

First of all the raffia must be shaken out and soaked for twenty-four hours in cold water containing a little soda. About an ounce of washing soda to a bucket of water will prove sufficient to soften the fibres. After soaking the desired time, the raffia should be rinsed in clean water and then placed in the dye-bath.

The best colour results are obtained by the use of Basic dyes, which can be pur-

chased from any of the stores catering for handicraft workers. A small quantity of dye—say, half an ounce—should be weighed out and dissolved in a little boiling water containing a tablespoonful of acetic acid or three tablespoonfuls of vinegar. This weak organic acid helps to keep the dye in solution and ensures better penetration and more even colour results.

For the actual dyeing, prepare a large galvanized iron bath full of hot water, and pour in the dye liquor through a fine muslin sieve. Now immerse the raffia and heat the solution over a gas-ring or fire until nearly boiling. The heat should be continued until the desired depth of colour is obtained. It is advisable to make the raffia up into bundles provided with a loop so that free movement in the dye-bath may be effected without staining the fingers. Care must be taken not to tie the bundles too tightly, otherwise a shaded effect will be produced. After the raffia has been dyed it should be well rinsed in warm water and then in cold, until all the loose colour has been removed. Drying in the open air always gives better results than quick drying before a fire.

Some workers recommend dyeing raffia in two or three different dyes to obtain

secondary or tertiary colours. Thus, if a green were desired, a more artistic shade could be obtained by bottoming with yellow and then developing with blue, than by the use of a direct green dye in the first instance. There are a large number of other colour combinations which give pleasing and attractive results.

To produce novel mottled effects, the bundles may be tied in two or three places to make a kind of rough pattern. If, for example, the raffia is first dyed yellow and then knots tied and the bundle dyed green, there will be obtained a green fibre with yellow rings or patches occurring at regular intervals.

Basic dyes certainly give very beautiful results which are reasonably fast to both light and washing. It is, however, necessary on occasions to obtain coloured raffia which will withstand the action of the sunlight to a far greater extent than is usually expected. In this case Basic dyes are unsuitable, and Acid dyes must be employed. The method of using these latter agents is similar to that already described, except that the dye-bath must be kept at the boil and about two tablespoonfuls of strong acetic acid added to the liquor during the dyeing. There is no need to add the acid

to the dye when first dissolving it in boiling water. A very thorough rinsing is necessary to ensure a fibre which will prove fast to rubbing.

Dyeing Sea-grass, Cane and Willow.—Sea-grass is a very popular material for bottoming chairs and stools. It is strong and comparatively cheap.

The dyeing of this vegetable product is, however, by no means so simple as raffia dyeing. There is a tendency for the strands to become unwoven. This must be prevented, otherwise the material will be quite useless for weaving. Before dyeing, the ends of the sea-grass should be tied with string so that the strands do not unwind. If this simple precaution is taken much time and trouble will be saved. Basic dyes are better suited for this material than Acid colours, as they give more even results.

Before dyeing, the sea-grass must be soaked in water for twenty-four hours to open up the pores and render it in a suitably receptive or absorbent condition. It is advisable to use warm water containing a little washing soda, about half an ounce to two gallons of water. If the material is not wet down sufficiently in a day, it is advisable to heat up the bath and leave the grass a few hours longer in the water.

For the actual dyeing dissolve the Basic dye in boiling water containing a little acetic acid. For two gallons of water use about half an ounce of dye and three tablespoonfuls of acetic acid. Dissolve the dye in a pint of boiling water to which the acid has been added, and then strain this strong liquor into the dye-bath.

Immerse the sea-grass in the solution and move up and down until the desired colour is obtained. It is recommended to keep the dye-bath at boiling to ensure complete penetration. After dyeing, rinse the grass in cold running water and then hang up in the open air to dry. Various fancy shades may be obtained by suitable manipulation of the material. Thus, if the sea-grass is only half immersed in the dye-bath to obtain a yellow and then reversed in blue dye, very striking effects may be produced. The best results are obtained by working loose bundles of sea-grass rather than coils.

As mentioned when discussing raffia, colours obtained by the use of Basic dyes are not so fast to light as the ones dyed by means of Acid dyes. Therefore, if shades are necessary which will be fast to light, the last-named dyes should be employed, taking the same precautions as described under "Raffia Dyeing."

Cane and willow may be dyed in the above manner, but great care should be taken to soak the wood before dyeing. A little more soda may be used in this case, but the cane must be well rinsed before being put in the dye-bath.

Staining Sea-grass, Raffia, Cane and Willow.—It sometimes happens that it is inconvenient to dye bundles of raffia or other material before weaving, and the craftsman is forced to colour the finished article, whether a basket, chair-bottom or bag. In this case, staining is the only satisfactory method, especially if used in conjunction with lacquering.

Spirit dyes are usually employed for colouring baskets, etc. They are selected Basic dyes and are dissolved in methylated spirits, about a quarter of an ounce to the pint of spirit. The dye should be well shaken up with the solvent in a bottle and then sieved through fine muslin into a clean jar ready for immediate use. Before dyeing, it is advisable to cleanse the raffia or sea-grass and render it more absorbent. First of all brush the material with very hot water until quite damp. Now rub over the surface a little acetic acid (diluted one in five) or ordinary vinegar. Allow the raffia or cane to dry for an hour or so, then proceed to stain.

Two or three applications of stain will generally be found necessary before the requisite depth of colour is obtained. It is advisable to let the fibres dry a little after each application, as by this means the evenness of the colour may be observed and any patchiness corrected. It is a good plan to apply the dye with a brush rather than a pad.

After staining and drying, varnishing or lacquering will usually be found necessary in order to give the article the desired finished appearance. There are many excellent preparations on the market which can be recommended for the purpose, and if the instructions accompanying such products are followed, success is assured.

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