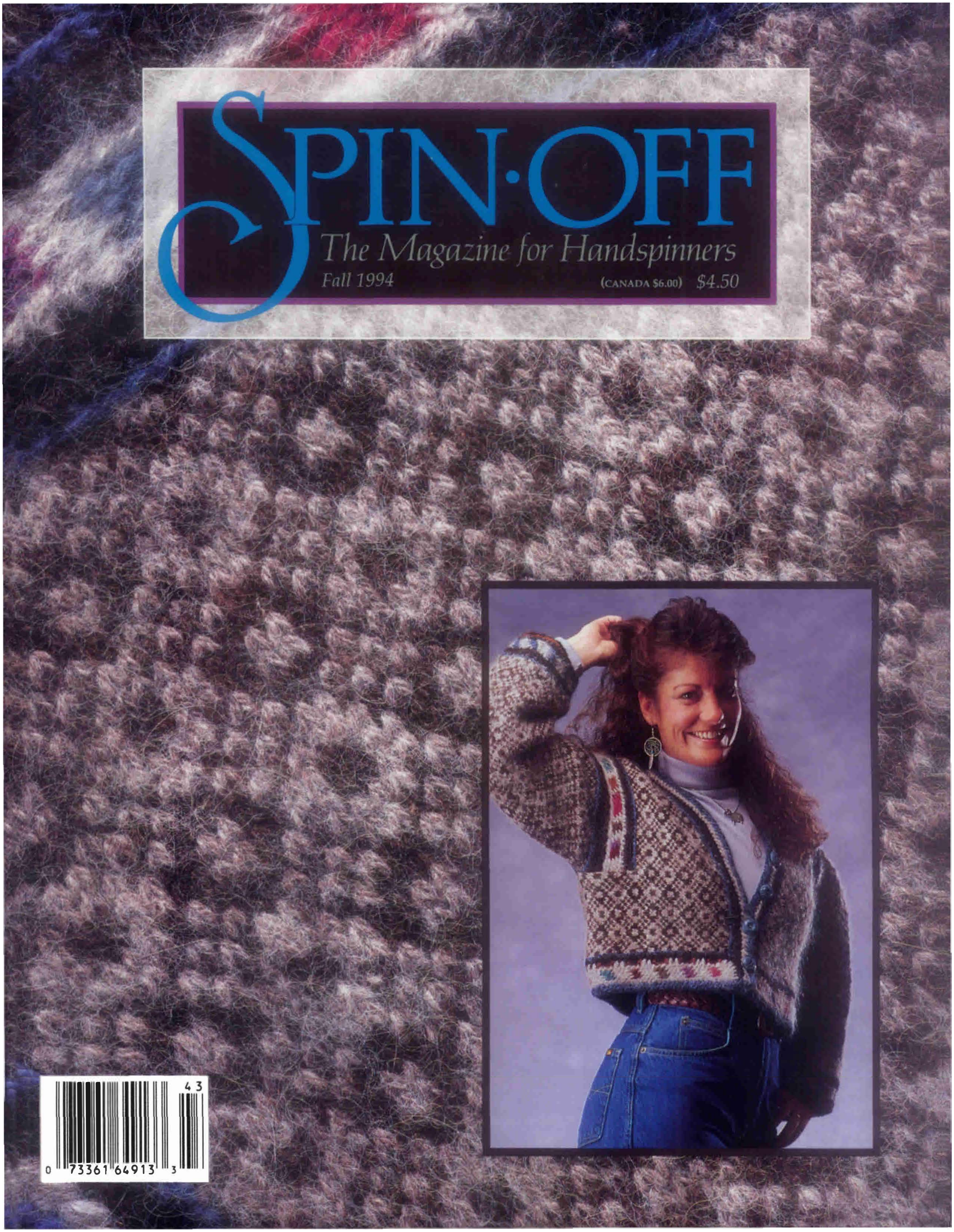
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Investigative Method —a tool for study

by Fred Gerber

"The goal is to teach dyers that there is no need to follow the established recipes exclusively. It is more important for them to establish what in each person's environment can be used for dyeing, and what color palette is available locally."

THE BEGINNING DYER often receives the first impulse which lunges him irresistibly into the world of natural dyeing at a restoration, fair, or demonstration. (Such was our introduction to this craft many years ago.) Questions elicit the first inklings about mordants and the part they play in fixing colors. Charming regional or historical words enter one's vocabulary, such as *saddening* and *blooming*, and one learns new techniques, albeit slowly. If truly smitten, one begins to collect what books may be available and yearns for old and out-of-print materials.

Armed with a few books, assorted pots, and much ignorance, the incipient dyer launches into the world of alchemy, the world of the Colonials, the Middle Ages. Accumulating experience results in a pattern of working habits, a degree of order in procedures, and finally, when enough dye plants have been sampled, mordants tried, and recipes carried to completion, there suddenly injects itself into the mind some small fraction of the older knowledge held by many before the era of aniline and chemical dyestuffs.

This is an initiation into an old and venerable institution. It is exciting. If the bent of the dyer so leads him, he begins to wonder about the historical accuracy of his efforts. Since natural dyeing is a craft of antiquity, there can easily develop in the dyer a real interest in producing the colors of the pre-chemical era, and in knowing "first hand" what some of the colors of the older periods were.

If the dyer is near a major museum which displays old tapestries, he can check his efforts with those remnants of a by-gone age; he can glory in the old colors that have in some form survived the test of time, far exceeding the life of the oldest of today's aniline dyes.

An incredible number of questions accumulate, some of which seem to exist in an undefined state, buried and unspoken. These questions remain unframed because a necessary clue remains unseen—perhaps hidden in an insignificant clause in a cumbersome sentence in an ancient, or even modern, book. Tragically, the "clues" are sometimes missed because the dyer lacks the experience to understand what is being said. Often the methods described are left untried because the reasons behind them were not explained. The result is that what had probably at one time been "known by all" has now joined that incredible limbo which accounts for the losses in many manual activities long since replaced by the industrial aspects of our lives.

Questions

Some of these questions concern the mordant materials: when and how they were discovered, and, just as importantly, how today's dyer should behave in terms of them. When did brass pots, often specified in older recipes, come into being? Is their use truly a method? What of old "coppers"? What did ancient industrial dyers use? Why has the iron or copper cauldron on a tripod of poles over a fire come to symbolize the dyeing of older days?

And what of the oft-encountered contention in today's dye books that natural-dyed colors are one-of-a-kind, fading, and dull? It becomes a paradox that a craft which has left brilliant relics half a millenium old is subject to such disparaging allusions. Are these observations valid? Need natural-dyed colors be dull? Need they fade? Need they be one-of-a-kind?

At least a modicum of the renewed interest in crafts, including natural dyeing, results from a partial rejection of our specialized, industrialized period. It seems to be tied up with the ecology "kick," and with anti-pollution, anti-chemical, back-to-natural attitudes, at least for some new adherents of the craft. When this is the motivation, perhaps some inquiry ought to be made to see if natural and vegetable dyeing really is consistent with this adopted philosophy.

How do present-day methods and recipes compare with those of our own earlier periods? Do we know as much about natural dyeing, and are we as advanced in our technology, as our predecessors two hundred years ago? What are appropriate goals of the natural dyer today? Should he be concerned with every dyestuff ever known or used? Can he be content with the flora that surrounds him? What does he do for colors that were gotten in earlier periods from dyestuffs that have disappeared from use, or that have grown so rare that they are virtually unavailable? Is our natural dyeing just a stunt to amuse and bewitch?

Our weaving revival of the last seventy-five years is not of that latter cast. Our weavers look both ways, making heirlooms for a future period but also dashing down side alleys of the craft, creating things that are both permanent and ephemeral. Can the same adventuresome outlook be applied to dyeing?

From cook to scholar

We wish to address ourselves to some of these points. Often we know too little to do more than make a suggestion. The premises upon which we base our procedures may be shaky, or quite faulty. But much that we offer is based upon trials and errors, accumulated from our own dyepots, fortified with the gleanings of reading and contemplation. It is left to the reader to accept or reject—to be eclectic on his own terms.

In the beginning, we were what we now call "cookbook dyers." We followed recipes, given to us by word of mouth or from books. The expression is not to be construed as being derogatory. After following definite procedures, we soon wrote our own recipes; when we repeat them, we again become cookbook dyers.

Armed with much ignorance, the incipient dyer launches into the world of alchemy.

Editor's note: *Fred Gerber's articles on natural dyes began to appear during the 1970s, when many natural dyers were at the "gee whiz" stage of finding colors in our garden prunings and few were being methodical in their research. Fred's open-minded and open-spirited approach to the quest for color is reflected in his collaboration and dialogue with others of similar interests over the years; see the Summer 1994 issue of* Spin·Off *(pages 8 and 9) for a few comments from his friends following his death earlier this year.*

When we asked Juanita Gerber if we could have permission to reprint some of Fred's thoughts, she responded quickly and generously. This is the Investigative Method, devised to elicit a range of colors from a single dyestuff, whether its potential was known or not. It first appeared in three sections in Shuttle Spindle & Dyepot *in 1974 and 1975, then was included in a self-published collection of articles in 1978.*

The text here has been trimmed slightly, to eliminate the duplications which are not required when it is printed as a single piece and to allow us to present the maximum number of ideas in the available space. The original version can be found in SS&D *or in* The Investigative Method, *both of which are listed in the bibliography on page 118.*

Many people who never met Fred Gerber have already been influenced by his approach to dyeing. We present this material again because its usefulness has not diminished with time, and we suspect that many others will carry these thoughts forward if given the chance.

It is easy to buy a ton of alum. . . .

A cookbook dyer soon accumulates paraphernalia. He has a brass pot, an iron pot, and enameled pots of assorted sizes. He has bottles and jars of crockery and glass, plastic bags of various collections. He has a hot-water thermometer, gram scales, and a growing collection of chemicals that includes potassium alum, potassium bichromate, copper sulfate, iron sulfate, white vinegar, clear non-detergent household ammonia, and soft soap; and he has wool—lots of wool.

The kitchen supplies scouring powders, bleaches, ragged towels, and gobs of potholders that seem always to be damp. He has stripped the grocery store of cream of tartar, and has acquired from his pharmacist (by implorings and imprecations) a pound of stannous chloride and a small stock of oxalic acid, to use until he can locate a benevolent chemical house that will bother with the dibs and dabs that he needs. It is easy to buy a ton of alum, but sometimes impossible to purchase five pounds!

His library has grown to include all the dye books on the market, assorted floras and botany books, and, if curiosity grows strong enough, maybe some organic chemistry tomes. The real purist of the craft will have secreted at one time or another, hopefully inoffensively, a jug of "chamber lye" to try the old indigo recipes. The proficient aspirant will have garnered some cochineal, madder, natural indigo, yellow oak bark, logwood, fustic, and osage orange wood or chips. (We leave unmentioned the ubiquitous, almost unidentifiable, lichens, but they will be there, too.)

His road maps, tucked over the car's sun shade, will have notations of where plants grow. His garden may sport *Anthemis, Coreopsis verticillata,* and other likely prospects. It takes a lot to follow a dyer's cookbook—one recipe calls for mordanting with alum, another for "blooming" with tin and tartar, while yet another specifies "saddening" with copperas in an iron pot.

By now the novice dyer's samples have been stuffed into a corner because no records were kept. "I'll never forget that color!" has given way to a calmer, "I'd better keep some records." Notebooks, labels, and card files join the system, along with waterproof pens, clothespins, drying lines, and resolutions "to do better."

Unlike the user of a food-preparing cookbook, which one consults for a specific purpose, the beginning dyer frequently attempts to go through his recipe book cover-to-cover. He discovers that the plants in dye books are usually seasonal, and the season is wrong. The plants described may be hundreds of miles away, and unavailable. They may be on conservation lists.

Then the incipient dyer locates a large batch of a likely looking plant, but can find no recipe for its use. Uncertainly, he applies first one dye method, then another, and yet another. There are drawbacks to this random attack. If a gorgeous result turns up on the first try, he may conclude that he has achieved all. If the first efforts produce mawkish, grayish buff, he may decide there is nothing more worth searching for. Both conclusions may be sadly misleading.

The investigative method

Out of our own faltering trials, we have developed a composite approach to testing any likely, and many unlikely, plants. We call this method of studying a prospective dye plant the *investigative method.* We developed it in part because we live in an area not covered by most dye books, and if we had to content ourselves with only those things in print, we would be mostly out of luck.

It is essential that the plant to be studied be available in enough quantity to dye a pound of wool; there should ideally be enough to dye a second pound if the colors from the tests are good. It should be reasonable to assume that the same plant will be available another year, and that its use will not jeopardize the flora of the area where it grows.[1]

Our method is a composite of many techniques of dyeing. It is based on *alum* and *chrome,* which seem to be the two most important mordants in most of today's dye literature. Alum has been used throughout time as a dye agent, while chrome seems to have appeared on the dye scene in Europe about 1815, entering the

[1]As dyers, we deplore even the suggested use of our native bloodroot, for the dyed product does not equal in aesthetic value the raw material. A cup of violets is a foolish approach for a pound of wool.

American dye repertory about 1830. We call these the *prime mordants.* Each acts as a *base mordant* for a series of trials.

Tin and *tartar* date back before dye records existed. Tin mines have been active in Cornwall, England, since the time of the Phoenicians, and trade routes have been traced between the Levant and Cornwall. Tartar, a byproduct of the wine industry, is just as old. *Copper* and *iron* both make similar claims of antiquity.

Therefore, tin, tartar, copper, and iron—all with claims of long use and frequent application—have been incorporated into the series of treatments. With the noted exception of chrome, the use of each of our chemicals predates the American Colonial period, and probably predates the written history of Western culture.

One further addition to this study series was derived from a variety of sources: old recipes using iron, observations of the "litmus effect" of alkali on orchil colors, the effect of lime with madder dyes, and an old-fashioned hunch. This addition was the alkali, *ammonia.* Most natural dyestuffs are mildly acid in character, and will clean pans in much the same way as spaghetti sauce shines aluminum pots. We observed that a small addition of clear, non-detergent, household ammonia intensified the dyebath color, and that this effect was carried over into the wool. So the addition of ammonia frequently intensifies the color dramatically; with some mordants, it effects a complete color change.

Whether ammonia will influence the final colors can be tested early by dipping out a small portion of dyebath and pouring in a few drops of ammonia. Any ammonia effect will be visible as an abrupt color change in the dyebath.[2]

All of these studies are assumed to be carried out in a chemically inert pot, such as agate or enameled ware. The contribution of metal containers to the dye process is another field of study. The mildly acid nature of most natural dyestuffs dissolves at least a small amount of metallic ions from the container surface which, more likely than not, will contribute some mordant influence.

[2]This apparently does not hold for boiling-water lichen dyes. Although in this case the bath darkens with ammonia, the dyed color remains constant or may even weaken.

In summary, the investigative method is based on using alum for one prime mordant and chrome for the other, with additions of tin, tartar, copper, and iron—each in turn being given a shift from acidity to alkalinity with ammonia.

Record keeping

Record-keeping may seem tedious, but good records, and the resultant ability to retrace one's steps, is anything but tedious—it is security. It is also good, reliable dyeing. The individual dyer may conjure up his own methods for keeping records, but it is imperative that the system be easy, require a minimum of writing, establish reliable labels for dyed skeins of yarn, and eliminate the need for a key to permit subsequent translation. There is nothing as frustrating as a file system that no one understands, including the dyer.

We make up a 5" × 7" (13 × 18 cm) **sample card** for each series of treatments. At the top of the card, we enter the name of the plant and the prime mordant, followed by numbers which record the date of dyeing and the sequential number of the test in relation to all testing done on that date.

For example, *Goldenrod alum series 973-14-1* means *Goldenrod of an undetermined species was dyed, in a series with a base mordant of alum, in September 1973 on the 14th day; this was the first set of studies on that day.* If a second set of studies using chrome as the base mordant was made on the same day, the identifying tag would be *Goldenrod chrome series 973-14-2.*

The prime mordant is indicated by the word *alum* or *chrome.* The final number in the label indicates the position of the study in the day's dyeing.[3]

A column of letters **a** through **h,** down the left side of the card, indicates the sequence of treatments; opposite each, the appropriate sample is attached (stapled, or knotted through a punched hole). Our alphabetic key consists of the following:

a. *base mordant only* (alum alone, or chrome alone)

[3]The final number simply separates one group of studies from another. If the chrome series is done on another day, the final number varies in relation to the sequence of studies done on that particular day.

With the exception of chrome, the use of each of our chemicals probably predates the written history of Western culture.

The procedures are simple but require a regard for system.

b. base mordant + *ammonia*
c. base mordant + *tin and tartar*
d. base mordant + *tin, tartar, and ammonia*
e. base mordant + *copper*
f. base mordant + *alternate prime mordant, copper, and ammonia* (alum-base wool is treated with chrome, copper, and ammonia; chrome-base wool is treated with alum, copper, and ammonia)
g. base mordant + *iron*
h. base mordant + *iron and ammonia*

Each sample card is cross-referred to a **record card** which explains collection data, any irregularities, special treatments, and so forth; record cards are either filed by number in a catalog box or kept in a notebook.

Duplicate dyed samples are frequently labeled for quick identification with similar notations, i.e., *973-14-2d*. In this case, the letter *d* indicates that the mordant was modified with additions of tin and tartar, followed by an ammonia rinse or addition.

Procedures

The procedures are simple but require a regard for system. This is a premordant approach; therefore the wool is mordanted before it is dyed.[4] These two operations, mordanting and dyeing, are followed by subjecting portions of the dyed wool to a variety of post-mordanting treatments, called *color modifications.*[5]

Pound lots of wool are ideal, but for great numbers of tests, using pound lots involves large, expensive quantities of wool. If smaller amounts are used, all quantities (chemicals, pot capacity, and so forth) must be carefully and proportionately reduced. Yarns for each set of tests should be put up in eight equal skeins (when working with pound lots, these will be 2-ounce skeins), individually tied to prevent tangling but not so tightly as to impede even dyeing.

Generally a plant is cut up for making the dyebath, added to the water in the dyepot, and simmered. Enough dye liquid is prepared for both the alum and the chrome series, if both are to be run. At the same time, if premordanted wool is not on hand, and it seldom is in our house, the wool is prepared; the mordant bath is put on to heat; and the chemicals are weighed out.

For mordanting and dyeing, it is important to have the wool well cleaned and absolutely wet throughout. Washed wool unused during a previous session should be rewashed with soap and thoroughly wetted. (The soap aids in the wetting process.) After the wool is washed and rinsed, it is kept submerged in a pan of water until it is squeezed out and added to the mordant bath.

The usual alum and chrome mordanting recipes are followed. For one pound of dry wool to four gallons of water, dissolve 3 ounces (84 grams) of alum for fine wools, 4 ounces (112 grams) of alum for coarse wools, or 1/2 ounce (14 grams) of chrome (potassium bichromate) for either fine or coarse wools.

Keep a low simmer for both mordant and dyebath preparations. A rolling boil will make the wool float in the mordant bath, with consequent uneven mordanting, and will also cause it to felt during agitation. Neither should the dyebath boil violently while extracting dyes. In fact, some materials—such as soft flowers and tender foliages—will profit from heats lower than a simmer.

Since both baths need casual but regular supervision, this is an ideal time to prepare labels and data cards. If these are ready, each sample can be tagged and hung out to dry as soon as it is finished, and preparations can be made for the other treatments. It helps to have a drying rack or line ready outdoors.

Waterproof pens are indispensable for writing tags, since other types of ink or pencil marks are inclined to smear. It is necessary to use strings for the tags because this is a wet craft. The sample cards should be hole-punched, or the stapler checked for staples.

[4]Proper techniques for mordanting and dyebath preparation depend upon yarns, quality of fleece, nature and kind of dyestuff, and other variables that are adequately covered in many of the currently available dye books, so will not be discussed here.

[5]Tin, copper, and iron—the color modifiers—are actually mordants applied at the end of dyeing, as a finishing process; although we refer to them as modifiers, keep in mind that they are mordants.

Each label and sample card should carry the identifying number for the series being undertaken. For example, if the dyeing day is September 15, 1974, and the series is the first of the day, based on alum, the sample card might read *Solidago macrocephala—The Flat Topped Goldenrod—alum series 974-15-1,* with the letters **a** through **h** down the left margin. Corresponding skein labels would read *974-15-1;* the letters **a** through **h** are added as the skeins are removed from the dyepots.

The amounts of tin and tartar, copper sulfate, and iron sulfate should be weighed out; it helps if these are dissolved in a small amount of hot water.

If your timing is satisfactory, the reference cards, individual sample labels, and master file cards will all be completed by the time the dyebath is ready for straining and the mordant bath ready to be turned off.

While the mordant bath is cooling enough to remove the wool, the dyebath is strained, and the volume of the dyebath is increased to at least four gallons by adding water. As soon as the mordanted wool is cool enough to squeeze out, it is quickly and lightly rinsed in clear water and then entered into the dyebath, which should be approximately the same temperature as the wool (again, to avoid felting). The wool is weighted with a plate to keep it below the surface of the dyebath, and the temperature is slowly brought up to simmer.

Virtually *all* old recipes dye at a temperature low enough to be tolerated by the hands, and the wool is periodically "worked" (lifted and turned) in the bath to promote even dyeing. (The simmer or boil temperature is generally not obtained until the last few minutes of the dyeing process.) It is unavoidable that the bottom of the dyebath will be hotter than the top because the convection flows within the pot are impeded by the wool. Because the dye adsorption rate is proportional to the heat, uneven dyeing will result from neglect of this working and turning.

If the weight is not too great, it is recommended that the entire mass of wool be lifted clear of the dyebath at some time during the process. One can appraise the colors being developed, and lifting causes a complete change of dyebath throughout the wool mass. It is also interesting to note that virtually all old recipes recommend a thorough airing at least once during dyeing.

The dyeing period may vary according to the dyestuff and the whim of the dyer, from a half hour to one hour (forty-five minutes is suitable for most herbaceous plant materials).

After dyeing, the wool is removed and set aside without rinsing. One of the eight skeins is washed until no color is released; it is labeled **a** (for base mordant only). Each skein is hung out to dry as soon as it has been labeled.

Enough dyebath is now added to a small pan to cover a second 2-ounce skein of wool. A scant tablespoonful of clear, non-detergent household ammonia is mixed in. The skein is immersed, and this pan is heated for five to ten minutes to "set" the ammonia color. This sample is rinsed, then labeled **b** (for base mordant-ammonia).[6]

The remaining dyebath is now divided into three pots. Five grams each of dissolved tin and tartar are added to one pot; 5 grams dissolved copper sulfate is added to the second; and 5 grams dissolved iron sulfate is added to the third. The baths are heated. The remaining six skeins are entered into the three baths, two skeins per pot, and held for approximately fifteen minutes at a simmer. The skeins are removed, and one from each pot is washed with soap, rinsed, and labeled **c** (base mordant-tin-tartar), **e** (base mordant-copper), or **g** (base mordant-iron).

Now a small amount of ammonia is added to each of the three modified dyebaths. Each of the three unrinsed skeins is re-entered in the pan where it was just processed, heated for five to ten minutes in the ammonia-modified solution, then washed, rinsed, and labeled **d** (base mordant-tin-tartar-ammonia), **f** (base mordant-copper-ammonia), or **h** (base mordant-iron-ammonia).

Eight samples of alum-mordanted colors are now available.

Chrome. While a chrome series is in progress, the procedures vary only in that the mordant bath should be covered and as little light allowed to contact the wool or mordant bath as possible until the conclusion of the first dyeing. Chrome reacts

[6]There is no evidence that the heating makes any appreciable difference, as a rinse in ammonia water seems as effective, but we do it anyway. We follow an "instinct" in this process, suspecting that heat makes the penetration of the ammonia-modified bath more thorough.

Virtually *all* old recipes dye at a temperature low enough to be tolerated by the hands.

adversely and irregularly when exposed to light in these initial steps. If the chrome series were completed the same day, its sample numbers would be 974-15-2a through 974-15-2h.

Results and refinements

If both alum and chrome series are completed, the dyer has a total of sixteen color samples produced from one raw material. These samples may be dramatically different from one another, and all might be of interest. The dyer may consider some colors poor and others superb. There may be unusual greens, dark browns, brilliant yellows and oranges.

The dye material may often be exploited beyond all expectations.

The common garden marigold makes a dramatic test case, as all the colors are different and all are good—the only disadvantage being that the beginning dyer may expect such results all the time, which is regrettably far from the case. However, it is the rare plant that doesn't yield up something worthy.

Exhaust bath. A dyebath can be re-used for a second, and usually more dilute, color; some plants produce such a strong dyebath that the second use equals the first. These second, third, and even fourth uses of a dyebath are called the "exhaust" colors.

Some dyestuffs, such as logwood and cochineal, contain so much pigment that they may be used many times; our own orchils developed with ammonia from indigenous lichens exhibit similar properties. Quercitron is able to dye incredible amounts of wool in the same bath, without additions of dyestuff. When using strong dyestuffs, the dye material may often be exploited beyond all expectations by adding small amounts of mordants to subsequent baths, especially when the dyestuff and mordant are present together.[7]

To label yarns processed in exhaust baths, identify the skein with the color, then note that it is the "First (or second, or third) exhaust of . . . ," using the sample number from which the color was derived.

Developing colors. Colors that are developed to an interesting degree toward oranges and reds, even unusual intense yellows, may be further approached without alum by using only tin, or tin-and-tartar. Tin is recognized for its favorable development of the red range of colors. By the same token, colors that seem desirable with iron as a color modifier can be explored by using an iron pot for the preparation of the dyebath as well as for the dyeing, in order to intensify the final color.

Shifting alum's yellows. Alum for the most part produces yellows from our native herbaceous plants. These yellows can be shifted through the use of additional chemicals. They are generally "lightened and brightened"—made clearer—by tin and tartar. Copper is inclined to shift the yellows to greenish-yellows or greens, and iron produces a shift to greens, tans, or browns. Ammonia shifts the alum to a brighter yellow, and tin-and-tartar move color toward orange if the plant dye has that potential.

Any dyestuff which shows a strong shift toward orange when treated with alum, tin, and tartar should be studied with a tin or a tin-and-tartar mordant (without alum), as tin brings out a shift toward red. Ammonia generally converts copper-greenish colors to tans; iron greens to tans or browns; browns to dark brown/blacks.

However, there are some surprises. Many of the Bidens-Coreopsis group (which are distinguished botanically only on technical characteristics) produce oranges, yellow-oranges, rust-reds, and rich, almost black, browns. The entire group of goldenrods produces from poor yellows to superb yellows of great clarity, and some may produce blacks of intense quality with chrome, iron, and ammonia.

The woody or shrubby materials tend to produce much the same range, but the colors are generally subdued with gray. These are the colors usually called *drabs* in the old dye literature, which seems to imply mordanting at some stage with iron to darken colors and, more importantly, to make them more permanent.[8]

[7]Using dyebaths for exhaust colors is not entirely foreign to some of the old processes. The strongest blues, for instance, resulted from the first uses of the indigo vats. For lighter colors it was the second and third uses of the vats that came into the plan, until the vats were eventually refortified with proportionate parts of the original recipe to re-establish the dye strength.

[8]This fastness is a relative value; in old fabrics, the iron colors have been the first to wear out—iron is ultimately corrosive on wool and silk.

Advantages of the investigative method

There are many advantages to this method of exploring the potential of a dyestuff.

Reproducing colors. The investigative method provides a guide to achieving desired colors. Large-lot dyeings may vary from the test samples, but are often only slightly less intense. This might be compensated for through adding more dye solution, rather than water, when increasing the volume of the dyebath. Once the minor variables are resolved, duplication of colors is no problem. This procedure enables the dyer to match colors to a degree which seems impossible in the majority of commercially dyed yarns.

When "translating" a color from a sample into a large dye-lot quantity, procedures must be followed exactly. For example, in no case should an alum-mordanted wool be added to a dyebath that has been prematurely modified with copper and ammonia; the steps should be followed in correct sequence. At each stage, the colors are equated by diluting or intensifying the base dyebath proportionately.

New dye plants, and new colors from old plants. This approach will reveal to the dyer the potential of his flora, whether or not the plant has ever been presented in a formal literary effort. Colors show up which are not revealed in the usual methods of confining one's dyeing to the base mordants of alum and chrome; the old standby plants, well represented in dye literature, are shown to have unrevealed possibilities, many of which surpass the listed colors so greatly as to make the original, published hues relatively unimportant; and no longer are we confined to the yellows and brasses from alum and chrome which most books suggest are the limits—we can have all sorts of unanticipated browns and greens—and occasionally an orange of unexpected clarity, or a green of incredible brilliance, leaps out.

The investigative approach is seldom applied to the imported, or as we call them, "classical," dyestuffs, but offers similar benefits when it is. Indigo responds to changes in acidity rather than mordants. Cochineal responds to mordants and acidity, producing grayed purples with chrome, roses with alum, reds with tin, and corals with alum and tartar. There are others, but cochineal is a subject unto itself.

Compatible colors. Another worthy aspect of this method concerns the compatibility of colors produced. For example, all the ammonia colors have a harmonious relationship, even though there may be a wide divergence in hue. The non-ammonia colors have among them an equal compatibility. Such color relationships cannot be duplicated by chemical dyes.[9]

More often than not, a dye series can produce a color palette for needlepoint or canvas work that cannot be matched in the marts of trade. Commercial dyers cannot afford to produce the number of small intergrades available to the home dyer. These investigative colors are ideal for Florentine and Hungarian point canvas work.

What have we learned?

Just as no two cooks come up with the same angel food cake, even when using the same cookbook, human variability enters into dyeing. Perhaps the dullness often attributed to the colors from natural materials has to do with the weaknesses of the cook, rather than the potential of the ingredients—an egg fried for two hours is a shadow of its former self. The selection of dyepots, the care and cleanliness of preparation, the length of time a-cooking are all factors. Endless cooking seems an advantage only in the preparation of squid and conch, and even here we have found both less tough and more digestible when handled gently.

What of the colors produced by the investigative method? Are they dull? Do they fade? Our dyepots yield reds and oranges, yellows, greens, blues, and violets as garish as we could want, and prolonged exposure to the Florida sun does not daunt them. Our dyepots also produce gradations and intensities that vie with each season's style selections. For example, this year's favored fashion hue might be the color of a wrinkled prune. We've got it. A recent walk through one of our better dress shops didn't thrill us at all—we have it all at home. ❖

Perhaps the dullness often attributed to the colors from natural materials has to do with the weaknesses of the cook, rather than the potential of the ingredients.

[9]Granted, this appraisal is subjective, but few craftsmen or commercial suppliers evaluate their products without at least a degree of subjectivity.

Partial bibliography of Fred Gerber's work

Articles

"Alkanet." *Interweave* 5, no. 3 (Summer 1980): pp. 66, 68–69.

"Chaos in the Kitchen, Part 1" (with Willi Gerber). *Shuttle Spindle & Dyepot* 5, no. 3 (Issue 19, Summer 1974): pp. 70–72.*

"Chaos in the Kitchen, Part 2." (with Willi Gerber). *Shuttle Spindle & Dyepot* 5, no. 4 (Issue 20, Fall 1974): p. 92–94.* *The "Chaos" articles present some systematic experimentation with tie-dyeing on warps and wefts (ikat and double ikat); combined use of types of dyes and application methods; and a series of stoles examining these ideas, colored with orchils and indigo.*

"Cochineal as a Domestic Dyestuff" (with Willi Gerber). *Handweaver and Craftsman* 23, no. 6 (November/December 1972): pp. 16–21, 39.*

"Dyeing with Lichens: They Yield Choice Colors" (with Willi Gerber). *Handweaver and Craftsman* 20, no. 2 (Spring 1969): pp. 13–14, 34–36.*

"Dye Plants of the Deep South." *Brooklyn Botanic Garden Record* 29, no. 2 (Handbook 72, 1973): pp. 17-22.*

"Indigo: Discovery of Plants and Experiments in Dyeing" (with Willi Gerber). *Handweaver and Craftsman* 19, no. 4 (Fall 1968): pp. 4–5, 36–37. Reprinted in *Handweaver and Craftsman* 26, no. 3 (May/June 1975): pp. 11–13.*

"Insect Dyes." *Interweave* 3, no. 3 (Spring 1978): pp. 23–25, 46–47.

"Investigative Method—A Tool for Study, Part 1." *Shuttle Spindle & Dyepot* 6, no. 1 (Issue 21, Winter 1974): pp. 62–64.*

"Investigative Method—A Tool for Study, Part 2." *Shuttle Spindle & Dyepot* 6, no. 2 (Issue 22, Spring 1975): pp. 53–55.*

"Investigative Method—A Tool for Study, Part 3" (with Juanita Gerber). *Shuttle Spindle & Dyepot* 6, no. 4 (Issue 24, Fall 1975): pp. 69–70.*

"Milkweed and Balduinea in the Dyepot" (with Willi Gerber). *Handweaver and Craftsman* 22, no. 3 (Summer 1971): pp. 23–24, 40. Reprinted in *Handweaver and Craftsman* 26, no. 1 (January/February 1975): pp. 19–20, 39.*

"Note on Vegetable Dyeing" (with Willi Gerber). *Handweaver and Craftsman* 23, no. 3 (May/June 1972): pp. 28–30, 32.* *Explores the use of* Opuntia *(prickly pear) and* Phytolacca *(pokeberry), in conjunction with cold dyeing processes and fermentation.*

"Quercitron: The Forgotten Dyestuff, Producer of Clear, Bright Colors" (with Willi Gerber). *Shuttle Spindle & Dyepot* 5, no. 1 (Issue 17, Winter 1973): pp. 25–27.*

"Quercitron: The Forgotten Dyestuff, Producer of Clear, Bright Colors, Part 2" (with Willi Gerber). *Shuttle Spindle & Dyepot* 5, no. 2 (Issue 18, Spring 1974): pp. 87–90.*

Books

Cochineal and the Insect Dyes. Ormond Beach, Florida: Frederick H. Gerber, 1978. *Seventy pages of information on cochineal, and the copy we located has actual dyed yarn samples on a card in back! Reviewed in* Interweave *3, no. 4 (Summer 1978): p. 46;* Shuttle Spindle & Dyepot *10, no. 1 (Issue 37, Winter 1978): p. 78; and* Weaver's Journal *3, no. 2 (Issue 10, October 1978): p. 46.*

Indigo and the Antiquity of Dyeing. Ormond Beach, Florida: Frederick H. Gerber, 1977. *The history, botany, and chemistry of indigo dyeing—and a wonderfully comprehensive view of the dyestuff in 59 well-filled pages. Reviewed in* Shuttle Spindle & Dyepot *9, no. 1 (Issue 33, Winter 1977): p. 40;* Interweave *3, no. 2 (Winter 1978): p. 43; and* Weaver's Journal *2, no. 2 (Issue 6, October 1977): p. 34.*

**The Investigative Method of Natural Dyeing and Other Dye Articles.* Ormond Beach, Florida: Frederick H. Gerber, 1978. *A 74-page collection including the articles marked with asterisks in the article list above. Reviewed in* Interweave *3, no. 4 (Summer 1978): p. 45; and* Weaver's Journal *3, no. 3 (Issue 11, January 1979): p. 42.*