Gathering Summary: Using Natural Dyes for Fibers, by Joan Goldstein, September 22, 2010

Summary by Catherine Haug;
Basket photos by Joan Goldstein; other photos as noted.

Colors!

Joan brought baskets of dyed yarn samples to show off the gorgeous colors:

- **Madder, etc.** basket of golds and oranges (shown in photo, right);
- **Lichen, etc.** basket of tans, yellows and mossy greens (by dying yellow on grey wool). See page 2 for photo;
- **Japanese indigo** basket of blues (see page 4 for photo); and
- **Cochineal** basket of reds and purples (see page 4 for photo).

She notes that “natural dye” is a relative term, because some unnatural materials are used in natural dying.

Pigment vs Dye

Pigments don’t attach to the fiber without the use of an agent; whereas a dye bonds with the fiber, according to Joan. A good example of his difference is beet: it produces a gorgeous red-purple liquid, but will only dye fibers grey.

[NOTE: Wikipedia contends that a pigment is insoluble in the vehicle whereas a dye is either itself a liquid or is soluble in the vehicle. Either can be used as a colorant. (9)]

Getting the dye to ‘stick’: Using Mordants

Mordants are chemicals used to pretreat the fiber to accept and hold onto the dye. Most are metals, like alum (aluminum), copper sulfate, tin, chrome (which is extremely toxic) and iron. And all are harsh on the fiber, with iron being extremely so. Because of this, many people prefer to use dyes that don’t require a mordant, and so choose direct (or substantive) dyes that don’t need a mordant to get the dye to stick to the fiber.

See Premordanting and Dying Methods, below, for more details.

From the Kitchen

- **Coffee and tea** are direct dyes that produce ivory and tan colors without a mordant. [Quilters often use a tea bath to make new fabrics appear old, for an heirloom look.]
- **Onion skin** is a direct dye (no mordant required); gives a reddish brown, golds and oranges. It takes a lot of onion skins, so save them all year long (or more). All members of the onion family can be used. See Onion Skin Dye (14) for more.

Dying with Lichens

A perfect example of a direct dye is lichen; it contains its own mordant (aluminum), which is the least harsh. Lichens are a symbiotic community of a fungus and a photosynthetic partner, typically an algae. (9)

Joan prefers the following local lichens:

- *Letharia vulpina* (wolf lichen, or wolf bane) is a day-glow yellow colored lichen, shown in photo, right (9), and give a prime yellow dye. It grows on old growth trees. If you find it on the ground, it is nearing the end of its life, so is the best to pick for use.

•*Parmelia* is a blue-grey lichen shown in photo, left (9). It is best to gather it just after a rain because that's when it's easiest to peel it off the wood upon which is grows.

•*Usnea,* pictured right (9), may give a light purple dye if you let it work a while.

How to dye with lichens

NOTE: Once you use pots and utensils for dying, you can never again use them with food.

Your pot should be stainless steel, enamel, or glass that won't break, because they won't interact with the dye. Chipped pots can introduce iron, which can be harsh on your fiber, so should be avoided.

Lichens are most potent when they come into contact with the fiber. Joan works with skeins of wool, but un-spun fiber, or fabrics can also be dyed.

1. Make a layer of lichen at the bottom of a pot.
2. Add spun wool or fabric, then more lichen, etc. in layers, ending with lichen on top.
3. Pour water down the side of the pan until you can just see it at the top.
4. Cook at a simmer for 3 hours.
5. Lichens are 'yukky,' so remove fiber and shake it over the pot, so the lichen flies off and disappears.
6. Wash/rinse fiber clean.

See also Dying with Mushrooms and Lichen (2).

Orchil

Some lichens can be fermented to produce orchil, which yields different colors such as purples. Orchil is also the name of a specific lichen used to make fermented dye; it grows on a rock and is very thin. It is very slow growing, so take it only if it has fallen off.

Ferment with clear ammonia to produce a magenta dye. Use about ½ cup ammonia, chop up the lichen, add equivalent amount of water and stir the mixture once each day until the ammonia smell stops. Keep it out of the light.

See "Orchil, the poor person's purple" by Chris Laning for more. (11)

From the Garden & Landscape

Amaranth

This is a beautiful plant (pictured left (9)), related to spinach, with red seedy spikes. The seeds have been used like grain in Central and South America for centuries, and the red 'flower' yields an orange dye, even though the dye bath is red-purple. See 'madder, etc.' basket on page 1 for yarn colors.

Cosmos

Cosmos flowers (pictured right (9)) produce a nice yellow dye; the leaves will give yellow or tan colors. Golden yellow colors can be obtained with a premordant. See 'madder, etc.' basket on page 1 for yarn colors.

Cottonwood

This produces a nice bright yellow, but Joan didn't indicate which part of the cottonwood tree you use (bark, leaf, or cottony seed). One source (12) indicates Native Americans used the leaf buds for a yellow dye. See also "Plants of the Plains: 101 Ways to Get Yellow".

Japanese Indigo

This is different from regular indigo, but like regular indigo, produces blue colors (see basket, left(. Use the leaves of this plant.

It can be grown here but, like basil, it is tender to frost (13). Don't harvest until ready to use it, and use right away. Dying with indigo is a bit different than other dyes because it does not achieve the right color until it reacts with oxygen in the air.

1. Add leaves to water in a pot and boil for awhile; you will get a dark green color. Pour the dye bath back and forth between buckets to add oxygen.
2. Then remove oxygen using Rit color remover (or the old way was to use urine from a baby); this turns it a mustard yellow.
3. Add washed and wet yarn, dipping slowly to avoid adding more oxygen. Don't stir, but jiggle a bit below the surface, for 35 minutes. The yarn will be a German mustard color.
4. Remove yarn from bath; it will turn to green and then blue, as it reacts with the air.

Madder

Madder produces orange and rust colors. Use the root. Watch temperature of the dye bath; temps above 140° F gives browns. Photo, right (9) shows the madder plant. See basket on page 1 for yarn colors.

In Europe can get more red colors, but generally hard to get reds with vegetable matter.

Cochineal

This is not a plant, but a tiny insect that lives on (parasitic to) a cactus of the genus *Opuntia, and produces crimson reds*. In the photo below, the whitish spots on the cactus leaves are cochineals (9).

It is a direct dye (no mordant required), but you can affect the color of the dye by adding vinegar or other acids to get redder colors, or ammonia or other bases to go toward purple.

Joan was fascinated by a book that tells the history of cochineal dye: *A Perfect Red*, by Amy Butler Greenfield (3). Conquistadors found natives in Central and South America using a beetle-like insect to make reds.

Cat noted that The Winter 2010 issue of The Metropolitan of Art Bulletin: *Cochineal Red, The Art History of a Color*, by Elena Phipps was exclusively about cochineal dyes.

To use cochineal, boil the bugs in water, then strain. After use, save the bugs in the freezer for reuse.

The Affect of pH, and Dying Plant vs Animal Fibers

pH is a measure of acidity of a solution: pH of 7 is neutral; below 7 is acidic; above 7 is alkaline.

Animal fibers (wool, silk, hair) are made of protein and will hold the dye better if the bath is slightly acid (pH below 7). Vinegar, citric acid, tannic acid and oxalic acid (from rhubarb) are all acids that can be added.

Plant fibers (cotton, linen, flax) prefer a more alkaline bath (pH above 7).

Joan did an experiment to illustrate the affect of pH, using a glass of cochineal water, which was red in color. Adding lime juice turned the solution toward red-orange; adding baking soda (slightly alkaline) turned the solution toward purple (bluer).

Union dye will dye both wool and cotton. The dye intended for one type of fiber is used and the dye for the other type goes down the drain. Rit is an example.

Premordanting

Refer to Joan's handout, The EssentiaList: Dying Fibers with Natural Materials, by Joan Goldstein for an overview of the process.

1. First, weigh your dry goods (yarn, fabric, fiber) to determine 'weight of goods' (WOG). This weight will be used to determine the amount of mordant and dye needed.
2. The amount of mordant needed is determined by a percent of weight of goods. For example, alum is 10% weight of goods. If your goods weight 1 pound (16 oz), you would need 1.6 oz alum.
3. Weigh desired amount of mordant. Weight is more accurate than cup or spoon measures. Wear mask when you use powders such as alum.

   You can buy alum through the University of Montana art department; Village Spinning and Weaving Shop in California. Pickling alum can also be used (find at health food stores in bulk), but it is more expensive.
4. Add cream of tartar (tartaric acid), at rate of 5% weight of goods, to the mordant.
5. Mix powders with the hot water (or warm if using wool, to avoid felting). **Caution:** Add water first, then the powder.
6. After mordanting, spin dry or squeeze to get most of the chemical out, then rinse and dry.

You can also mordant after dying. See page 2 of the handout: copper moves toward green on the color wheel; ammonia moves toward blue.

Overview of Dying Process

Joan went through this quite quickly, as we were running out of time. See also her handout, The EssentiaList: Dying Fibers with Natural Materials, by Joan Goldstein.

The amount of water in the dye bath doesn't affect the intensity of the color. The ratio of amount of dye to amount of fiber is what affects the intensity.

1. Prepare fiber: Soak in hot water (not too hot if wool, because it will felt). If wool, add a bit of white vinegar (acidic) to the hot water soak. If cotton or linen, add washing soda, aka sal soda (alkaline), 1/3 cup to each 8 oz fiber.
2. Put dye in nylon stocking to hold it when heating in the pot of water.
3. Simmer fiber in dye bath at 180° F for 1 hour. Then let it sit in the bath until it cools.
4. Remove fiber; rinse, wash and rinse again.
5. You can re-dye if you don't like the color.

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