

## Dyeing Ivory and Antler

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(by Ford Hallam) I seem to remember reading a thread about staining ivory recently and Clive commented that Guy Shaw had told him that he used to use dye to help develop his "aged" patina on ivory. As chance would have it I just stumbled across some notes I made in '96 while spending time with Guy in his studio not far from where I used to live in England.

I've not used this procedure myself but am pretty certain that Guy was accurate in his description of his process. I'm also pretty certain that he would approve of me sharing his technique with you now that he is no longer with us. Those of you who knew Guy will no doubt remember that he was always generous with his time and knowledge.

So here is Guy's approach;

First clean the ivory piece with alcohol. Then etch in a 33% acetic acid solution for 15 seconds. Rinse in clean water and take care to keep the item grease free, so handle with rubber gloves etc. Now make up a solution of Dylon dye of your chosen color and add the specified amount of salt as a mordant. Dip the piece into the boiling solution for 15 seconds at a time. Once the desired depth of color is reached rinse in warm water so as to avoid too much of a thermal shock to the piece. The colouration can at this stage be lightened or relieved by selective polishing. Finally soak the piece in baby oil ( or almond oil ) for 15 min. Wipe off the excess oil and buff to a high sheen with a clean cloth.

I hope this is reasonably clear and should anyone use the process as described it would be great to see the result.

**Question:** what is Dylon dye... a fabric dye, or wood stain dye? We on this side of the pond could use a similar counterpart.

**Answer:** Dylon is an aniline dye for fabric, as far as I'm aware. It's a brand name over there in the UK- not describing a class of dyes. I've used it for paper and fabric. I think the equivalent here in the US would be whatever you find at the fabric store.

**Question:** Would the method Ford described work with carved antler? I have had a piece sitting around for a while but have been unsure how to color it. I have inlaid it with stones and amber eyes so would not be too keen to dip it into a boiling solution, would brushing it on work?

What is the purpose of the acetic acid? Would this cause problems with the stones and amber also?

So many questions!

**Answer:** Coral, being mainly calcium carbonate, is very sensitive to heat, acids and hot solutions so will have to be treated with kid gloves. Turquoise is a copper compound containing basic aluminium phosphate and is thus also similarly sensitive. Interestingly, as it is a relatively porous stone it's color can be improved using aniline dye and copper salts. It would follow that you may inadvertently end up dying the turquoise if you got the dye on it.

**Answer2:** as far as I remember Guy did use this process on antler too. Antler is somewhat less dense than ivory so a much quicker dip in the etchant may be all that needed to open up the pores, so to speak.. The acetic acid will lightly etch the surface making it more porous, this allows the dye to penetrate. It's a very fine surface change and buffing by hand once coloring is completed will restore the lustre. Stones inlaid in your piece should cope with hot ( as opposed to boiling ) but amber is very heat sensitive and will quite likely be affected by the etch also, so perhaps as you suggest, brushing the dye on may be the wiser approach. The stones may be fine in acetic acid and in a hot solution but it really does depend on what you've used, for instance opal, turquoise or malachite will probably be adversely effected. Let me know what you've used and I'll check them out for you.

I reckon a bit of experimenting may be in order. Good luck.

**Answer3:** I use dyes on ivory and antler a lot. Procion fiber reactive dye works well for me. I etch the surface of both ivory and antler with vinegar first, just painting it on. I let the vinegar dry before dyeing, occasionally gently using a little compressed air to speed things up. The vinegar really only needs to sit on the ivory or antler a couple of minutes to dissolve whatever it is dissolving, giving the surface a little "tooth." You only want to paint it on, not soak the ivory or antler. Soaking for long periods (i.e. weeks) will turn bone and antler into "rubber" so that's not good - assuming you didn't want rubber, of course. Oh yes, it will do the same to an egg shell.

The vinegar will destroy any surface polish you have on either ivory or antler. A polished ivory surface will go instantly dull, and antler will go dull to partially dissolved, depending on the area the vinegar is on. The hardest outer surface of the antler will act a lot like the ivory, but the more porous the inner surface becomes, the more the vinegar seems to affect it. It often looks to me like the porous portion has a pronounced "raised grain" similar to soaking wood in water - not just getting it wet, but a prolonged soaking. Once the surfaces are dyed, polishing will remove some of the color, so a practice piece is advisable. Also, the porous areas of antler will soak up a lot more dye

than the more dense parts. This can work to your advantage, or not...

Clive Hallam uses potassium permanganate as a dye for many of his antler pieces - perhaps he'll grace us with a little insight...

Tom Sterling

**Question:** what type of vinegar do you recommend; malt, white wine or something more exotic?

**Answer:** I just use the white vinegar available at the grocery store. I think it is marginally stronger than the others, but have never tested them, although they would all probably work just fine.

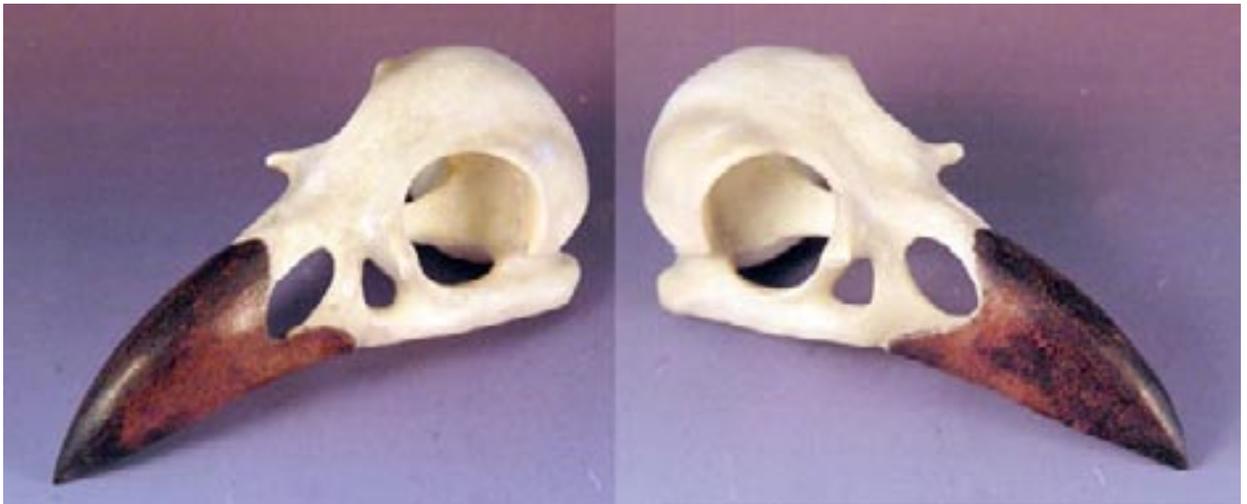
I was carving a raven skull (of moose antler) for a basket lid today, and thought this was a good opportunity to take a few dye process photos.



The image on the left is of the carved and smoothed moose antler, with just a hint of gloss on the beak. The right hand image is after the application of vinegar. I used a cotton swab since the area to be stained is large. Use a tiny brush for detailed areas. You may be able to see that the right hand beak is looking much rougher.



The left image is after a light application of Procion fabric dye (after the vinegar dried). The right image is after several applications. You can see the top areas of the beak are darker (the more porous areas of the antler), and the sides are lighter (the more solid areas). I kind of like this look, so I'm not going to add any more dye.



These are images of the finished beak. I burnished the surface rather than polishing because polishing tends to remove some of the color, especially in the harder areas. The color doesn't penetrate very deeply unless the piece is soaked in the dye for long periods, and that leads to problems if you don't want the entire piece stained.

**Question:** What do you do next, to keep the water soluble dye on the antler or hard material, to keep the dye from being rubbed off by handling, or in the case of netsuke from rubbing onto clothing?

**Answer:** I haven't found that the Procion brand of dye rubs off. On the hard spots, or ivory, it will wear off as the material wears away, but doesn't stain clothing. My wife (who is a basketmaker) says that the common brand of fabric dye you can find in most grocery stores does rub off, at least when basket reed is dyed with it, so basketmakers tend to use Procion. Since Procion has done everything I've asked of it, I haven't tried other brands.

For a final finish I'll either apply a thinned coat of nitrocellulose lacquer over the dyed areas (I like the Deft semigloss brand), or lately I've been using Don Fogg's description of "poor man's stabilization." I completely submerge the carving in a linseed oil finish (I like Watco), place the oil/carving in a vacuum chamber, use a brake line vacuum pump (hand powered) and remove the air, let it sit for 6 to 8 hours in the vacuum, then remove the vacuum (carving still submerged) and let it sit in the oil overnight. By then the oil has really penetrated most of the surface to a fair extent. Remove the carving from the oil, dry it off, then wait for it to dry - long time. Don't try to glue anything until the oil is completely dry, however. This is for patient carvers - don't do this the night before your big show. You get interesting translucent-sort of looks to antler using this method.

**Question:** when you say you burnished it rather than polishing, how is that done?

We have Dylon dye down here in NZ but I haven't seen procion dye, how much different are these?

**Answer:** I used a smooth, polished antler tip to rub the surface of the dyed beak. A polished steel rod would do even better on antler. Maybe grind a blunt point on the end of a drill bit and smooth and polish it really well. For really large areas the back of a spoon bowl is a quick expedient.

Polishing removes a layer of material and color. Burnishing simply presses the "raised grain" back down, so unless you are overzealous the color remains. Fine sanding and polishing can be useful if you want variations in the colored antler surface. Burnishing works well for wood and the raised grain sections of antler, but does nothing on ivory.

As for the Dylon dye question, I have no idea, never heard of it here in the US. Try the Dylon dye, if it is bad about rubbing off, just seal the surface with thinned lacquer. The idea is for the thinned lacquer to penetrate into the dyed areas, not just sit on the surface.

I use four colors only; blue, yellow, red and brown. Any other colors I need I just mix from these.

## **Yashabushi Dye**

**Question:** Yashabushi is used to color ivory, and perhaps wood and fabric. There is a little written about the dye in the book about Masatoshi and his work. I would like this Forum Topic to explore

what we know about yashabushi, what plant source with common and scientific names, collection/time of year, preparation of the dye solution, preparation of the materials prior to dying, and relating any experiences you are willing to share.

Well, I use alder cones from a local alder tree (Aldus).

[http://www-saps.plantsci.cam.ac.uk/fscfrui...r\\_cone\\_seed.gif](http://www-saps.plantsci.cam.ac.uk/fscfrui...r_cone_seed.gif)

[http://www.uwgb.edu/biodiversity/herbarium...rug\\_fruit01.jpg](http://www.uwgb.edu/biodiversity/herbarium...rug_fruit01.jpg)

**Answer:** (by Doug Sanders) In nature, I've read these trees generally like damp soil conditions, but I've seen them planted on residential city streets (dating from 1910 or so) as well. I'm no botanist, but I think alder produces cones throughout the year, which is an asset for us carvers who work all twelve months. At any rate, there always seem to be cones on the tree and some on the ground when I go collecting. I've read too, that the bark can be used as well but I don't want to rob the trees of that. One web site refers to a Siberian hazelnut, when talking about yashabushi! I'm not sure that's correct- although hazelnut skins will give you a dye.

For preparation, I just bring a handful of cones and about 750ml of water to a boil, then turn it down to a simmer. You see the color begin to come out almost immediately. I suppose I simmer for an hour or so. Nothing too scientific. I put some iron (steel wool) in once and it improved the darkness/intensity of color. Keep it in the fridge. I think maybe it works better after it sours a bit.

I think there are many species of alder, so those that grow in Eastern Europe may not be the same as the North American ones. I saw some Japanese cones once and they were bigger and slightly different looking than the local variety.

As far as how to color wood- that's something I'm not entirely happy with yet. People just have to experiment. We've got a few threads on that already.

The ivory colored much more quickly than wood (perhaps because the white 'ground' showed the color change more readily). I had it in a cold solution for about 10 minutes. Most of it I polished off- it just sits in the recesses to deepen the shadows and accentuate the relief.

If to be frankly, reading the book about Masatoshi, I thought that Yashabushi was done from pine cone.... I didn't know that it is alder cone! Ha, ha what would I do???

When I was living on Chukotka (opposite Alaska) I saw this plant many times, but here.... this week-end we are going to the nearest forest, where I'll be looking for these alder cones!

**Answer:** (by Natasha) Doug, thank You very much for so detailed description of this process! It is almost the same for walnut dye, also with pieces of iron ( I use drawing-pin). I use this dye more for mammoth tusk, on the box-wood it looks almost black, too dark-brown color. This dye musty very fast, even on mammoth! I add some crystals of alum ( it is against mustly process

**Editor's note: anti-mold).** So, about my experiment with yashibushi I'll get to know after this weekend. For mammoth, once I used henna, it was light-orange color. I also tested some hair-dyes, the same problem, there was no intensive color as I wanted. Only light color, permanent. I also tested  $\text{KMnO}_4$  (**Editor's note: potassium permanganate**), first time it looks very well, about for two or three months, then it disappeared from mammoth.

I gathered some pine cones yesterday, but I couldn't find no alder cone! I walked two hours in the forest, no result. This morning I tested those pine cones, the color of water became very light brown, too light. It didn't colored the piece of mammoth. Now I tested the tea-dye. Probably it would be interesting, how I use the walnut dye.

I often use dye which I do with walnut nuts. I gathered them when they were green and their nutshells were not hard, I could cut it with a knife. 1 or 2 kg would be more than enough for year. I put them into refrigerator, -18, at once. When I need to color something I take 2 or 3 nuts, defrost them and press their juice. The juice has green-grey color the first time, it doesn't look nice on the bone or wood. I put some pieces of iron with rust and watch when the color become darker. Usually, in an hour it become chocolate color! I add some crystals of alum, it fights against the mould. If the alum couldn't be find, at once after coloring and dyeing the walnut dye must be covered with a lacquer, it also helps! Tested by me! An advice: don't wash the walnut dye with water. If You need to wash a piece of bone or mammoth, better to wash it with alcohol! Alcohol doesn't wash away the walnut dye. You can touch the stained bone with your wet fingers, nothing happens! I often use the burning needle, the color of burning process and the color of walnut dye are the same! I use both very often.



For example, the staff and the hat of this netsuke was covered with walnut dye, others were burnt with needle:



Once I used some dyes: henna, walnut dye, burning needle and hair-dye (it takes very much time)

(by Janel) The concept of opening the surface of the polished ivory, antler or perhaps even bone, to assist the material in accepting a degree of dye or stain is one to consider and experiment with. Acetic acid (I found mine in a photography supply store), around 32% strength, requires fresh air, and you should avoid splashing it on your skin or in your eyes. Experiment with a test piece of material, try submersion of a portion of a piece for 3-5 seconds, 10-more seconds, and upwards from there. The shortest times will open delicate pores in the gloss, the longer times will open larger pores in the gloss of the material. The stains will be accepted by the material by degrees relative to the length of time in the acid. It is strong stuff, so the minimum use for effect...

Before the acid, clean the piece with finger nail polish (lacquer) remover (I am drawing a blank on the universal name of the stuff) to remove oils from your hands. Immerse the piece in the acid, count and remove, I use chop sticks (hashi). Rinse in water or even a baking soda (sodium bicarbonate) and then water. One may also use a brush to limit the location of the acid application.

Use caution, and experiment on samples prepared to a finish gloss before committing a completed piece to the acid.

(by Bradford Blakely) Yashabushi is new for me, but I have used Yashadama stain. It is made from fermenting the seed cones of the mulberry tree. These seed cones are from Japanese mulberry trees. I was sent about two pounds of the cones by Kangyoku Risshisai, the famous Tokyo carver. I boiled the seed cones for an hour until the resulting dark liquid condensed slightly. Leave the seed

cones in the brew for a few days, then remove. The resulting brew becomes very dark brown and will stain wood or ivory equally well. The Japanese carvers say it is good to let mold grow on the surface of the brew, so store in glass jar and keep in the refrigerator. Periodically reboil the solution and add some water and a few more seed cones. Maybe go to the local nursery and see if the seed cones are available, one mulberry tree can't be too different from the other. Do some experimenting and see if these seed cones work. The gardenia stain is a yellow powder made from gardenia seeds. It is good for ivory. Make inquiries in Japan by contacting Yamato Brothers of Tokyo, owned by the sons of Hirokazu Nakayama, now deceased. They can advise you how to find these raw materials. Ground antler powder is also a good polishing powder for ivory, use sharpened chopsticks dipped in water and apply a small amount of the powder to end. It is good for getting into crevices. Also you can use a linen cloth dipped in water with the powder. Sometimes multiple stainings are required, once before final polishing and then again afterward. It all depends on how you want the highlights of the carving to show through the stain. Personally, I use leather dyes for wood or aniline powdered dyes mixed with water. These are not fugitive colors and hold up well to UV. Some of the colored inks made by Penguin are useful for ivory coloring and oil based inks are good for picking up detail work to accent features.etc.

(by Doug Sanders) Brad, are you sure what you use are mulberry cones? I always thought mulberries dispersed their seeds in fruit, not cones. I think it is alder cones you are describing. The process you state is pretty much verbatim of what is found in the Masatoshi book, describing alder cones.

I looked on several web glossaries of Japanese art terms and yashadama doesn't come up. I'm certainly not fluent in Japanese, so I don't know what -bushi means as a suffix, but -tama or -dama can refer to jewels, beads, or other round items, i.e.. cones.



Here is a picture of alder cones

I've had some experience dyeing tagua nut with alder cone dye. I only wanted a light stain, to sit in the recesses of the carving. No preparation work was done; I just soaked it in warm dye solution until the color was where I wanted it.

<http://www.dougsanders.net/netsuke/goldfish.html>

This will get you to my web page photo. Sorry about the quality- This was my first batch of photos years ago and the quality is poor.

Tagua isn't something I'll be carving much of anymore- I still use it for inlay detail on other carvings, but I've had a number of problems that crop up after the piece was finished. I've had inlays and onlays pop off after about a year. I think that as the nut continues to dry, oils migrate to the surface causing glued inlays to loosen. It seems to go through dimensional change over time.

Also, the himotoshi I carved cracked right between the two holes (months after carving), making the piece unsalable.

Like all nuts, tagua is oily. If we look at old netsuke carved from tagua nut (I think there's also another sort called corozo nut?) they have darkened considerably to a deep honey color. This needs to be kept in mind when conceiving the subject you wish to carve.

If you soak the nut for several hours in warm water, it becomes easier to carve. Once dry and cooled, it is hard again and can be more finely carved and polished.

I've thought that the warm water used for the dye may have caused the nut to swell and crack later on. Maybe, maybe not. My problems seem to crop up down the road, time-wise, so I think any dimensional change from water-induced problems would have subsided. I do think that as the nut ages, the oils go through a chemical change and do migrate to the surface. Oxidation I suppose. Most nut and seed oils are classified as drying oils so they will harden over time.

**Sumi Ink:** (by Doug Sanders) I've got several reasons for using sumi. In my work, I like to keep things simple. It's easy to have a stick of sumi and a stone to grind it on to produce ink whenever I need it- without having to worry about spills or a bottle drying out. - that said, there is a liquid sumi on the market which is a very good product. I'm not sure what additives it may have over the dry stick type.

Sumi, as you stated is made up of very small particles of carbon, which can be classified as a pigment. Most modern black writing inks are a cocktail of dyes- they have been developed to flow from pens with very little clogging, and are liquid through and through. It is my understanding that a black dye is very difficult to make, so most of these modern inks are a mixture of blues, purples and even reds. Before the modern petroleum-based dye and color industries, a black dye was

achieved with an iron compound (the same chemical Japanese women blackened their teeth with) used in writing inks and dyeing leather. It is really a very dark brown though.

You can see this 'cocktail' by taking a black felt-tip pen, writing on a piece of paper, and then getting the spot wet with alcohol or acetone or some other solvent. As the paper soaks up the solvent, the ink bleeds into its composite colors. This process is utilized in the science of Chromatography- generally speaking.

Sumi also works well across a range of dilutions, so that intensity of black can be built up in layers- without going too far at the start.

Will modern inks give a different effect? I don't know. They may bleed into the wood fibers, giving a more feathered appearance than with a pigment-based black.

Modern black watercolors will give a similar effect as sumi. India ink traditionally has shellac added to the mix to give a shiny appearance and make it water insoluble when dry. Dr. Martens brand of writing inks are known to be very good quality. Black shoe polish will stain and create a wax finish in one application

Finally, with black pigments, there is a whole range available, from cool bluish blacks, to warm brown blacks. It all depends on the source- combustion of oil, various vegetable matter, and/or bone- and the particle size. For woodcarving, this is probably too fine a point to worry about, but next time you see a sumi painting, have a look at the range of colors 'black' can achieve.

(by Janel) I use sumi at times for darkening the area behind an amber eye inlay. When I have tried to put the sumi right on the amber, it more often than not, will release from the amber during the glue stage. Consequently, I no longer use that technique with sumi.

**Question:** Is there something else that I should be doing to help the sumi to remain where placed?

**Answer:** (by Doug Sanders) well, if you're not adverse to modern paints, acrylic will form a better film on the amber. Once dry, it should be resistant to the solvent action of the glue.

Maybe paint the inlay pocket with sumi, then inlay the amber. Of course the glue might distort the blackness.

There's also a technique where you could fix the sumi on to the amber by painting a layer of clear nail polish on top of the ink layer. This will be soluble in acetone, so probably won't withstand the cyanoacrylate glues (Super Glue), but should be fine with epoxies and maybe model cement. Kinda gets complicated and not a very purist approach.

I'm really interested in all sorts of artist materials and traditional techniques and methods of artists. In order to conserve artwork, we've got to know what things are made of and how to manipulate them. I've got a shelf at home of all sorts of artist tracts and kitchen chemistry handbooks. Consequently, there are so many things I want to attempt with carvings, but not enough time. My wife thinks I'm a mad scientist.

Oh- one more thing- Amber is soluble in alcohols- you may have noticed this. A quick brushing of alcohol (rubbing, isopropyl, methylated spirits, etc) on the back side of the inlay will frost it just enough to maybe give the sumi something to grip on to.

Question: (by Janel) I am carving walrus tooth for the first time and am wondering about its ability to take on coloration. Does anyone have experience with this material? I have one more tooth and will test it with various techniques to see if is stainable.



The cicada netsuke is 1.5 inches and is incomplete.

**Answer:** (by Tom Sterling) I've never stained walrus ivory, but I don't think it will be different from other types I've stained. My best successes have been with Procion fiber reactive dyes (available at <http://www.dharmatrading.com/html/eng/3796-AA.shtml>). These are basically high quality cloth dyes. That said, there is a certain procedure I go through to make them work.

I begin with the ivory at a polished stage that is suitable for final presentation. Any tiny scratches will attract the dye and be very visible, almost like a difficult to eradicate scrimshaw mark. In fact, if you're at all doubtful as to the quality of your polishing, I might try using ink first to look for scratches, since it won't sink into the ivory surface and require deep exploration to get rid of.

Once the surface is smooth and polished, I apply white vinegar to etch the surface. This will be apparent because the shiny surface will become dull where the vinegar was. I let that dry, then am ready for the dye. I use little medicine cups with a knife tip's worth of dye and a few drops of distilled water. I wouldn't use tap water since you may get some unpredictable and unwanted adverse

reactions. Some folks have recommended a little TSP (Trisodium Phosphate) with it (a really small knife tip. We're making less than half a milliliter of dye, so don't go crazy. With the amounts of powder the dye comes in, at this rate one bottle of color will last a lifetime.

Add dye if you want more saturated color, distilled water if it's too concentrated. I like to have a scrap of the same ivory I'm carving to test the dye on. You never know... When all is satisfactory, I use a tiny paint brush to apply the dye with. Staining is instantaneous. Alternate vinegar etch with more dye applications to get the color saturation (by this, I mean the strength of the color, not the depth of penetration into the surface). The penetration is deep enough that you won't be able to easily polish it away, although scraping will remove the color if things just aren't pleasing. You can even paint wet in wet like watercolors if you paint into the wet vinegar.

This procedure works on the solid sections of antler too. I haven't tried bone, but think that some bone may have problems with the Haversian canals (little tubes in the hard sections) that cause color running.

Incidentally, since we're on the subject, this works on wood as well. Don't use the vinegar, since you don't need to etch the wood. You will need to either carve a little ditch around the area to be dyed to keep the dye from seeping into unwanted areas. I very often use a woodburner like the bird carvers use to make the ditch. The burner will carve a nice little groove, easily controlled, and will melt the waxy lignins that glue the wood cells together, making a waterproof barrier. At high heat settings you'll get dark grooves, and at low heat settings the grooves can be almost undarkened. Just be sure to stay a little distance away from the ditch and let the color soak out to the edges. If you paint too close, a blob of color can bridge the ditch and get color outside the area. Also, in porous woods, I've seen the color submerge below the surface and show up many inches away. Had that happen on a yellow cedar carving, with color showing up six inches away, with no visible track in between. Weird.





Here are a few examples. The spider has yellow and a salmon color on the body (boar tusk ivory). The Spanish dancer sea slug has red on the top surface (hippo tooth). The little hatching alligator has baby alligator color (mixed several colors, carved of deer antler). The salmon are dyed red, with a slight greenish color on the heads (boxwood).

**Question:** (by Janel) I am familiar with Procion, and have a number of little jars of it. Long ago I chose to not use them on wood after experimenting with it. It will be interesting to see what it will do with the non wood materials. I am also familiar with vinegar or higher strength acetic acid. I noticed that you did not mention rinsing off the vinegar. Would leaving it on the surface make a color change with the dye? (like a mordant?)

**Answer:** (by Tom Sterling) I usually let the vinegar dry, so rinse isn't needed. Once it's dry, I conclude all the organic molecules in the vinegar/acid have reacted and been altered to decomposition products no longer harmful to the surface or the dye. I've never noticed any dye color change from the vinegar, even when I've painted wet in wet. Also, once you've polished the dyed area back to gloss, that is when the major color alteration occurs. The colors tend to become more muted, I think because you are removing some color in the polishing process and also because you are making the surface more reflective. Consider the color change that occurs on a wet road surface to the normally highly visible line markings.

Undiluted acetic acid is a lot stronger than vinegar and may actually etch the surface too deeply making it difficult to polish. Don't know for sure.