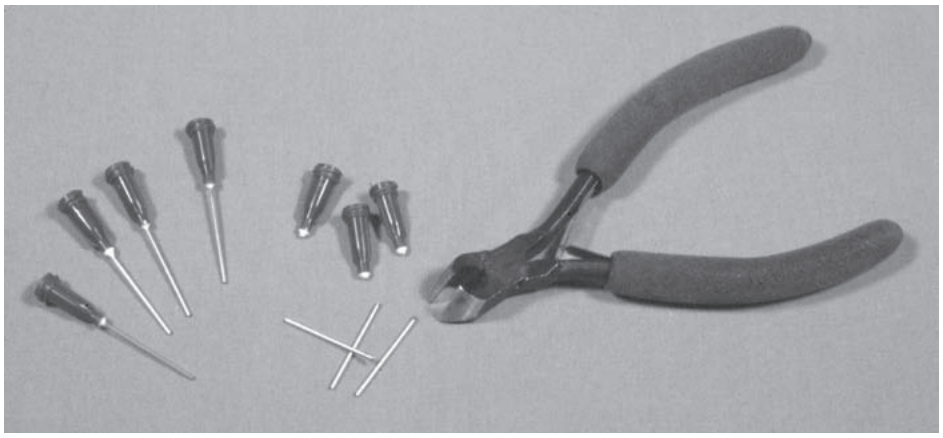

FIG. 1 **Needle snipped off plastic head.**

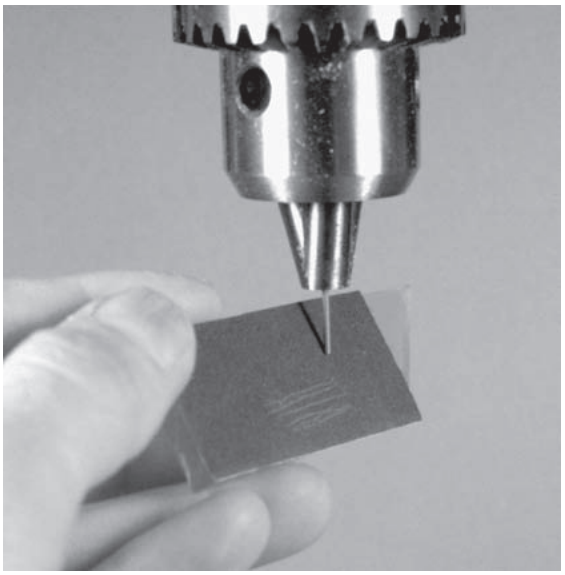

FIG. 2 **Beveling tip on drill press with 400 grit paper.**

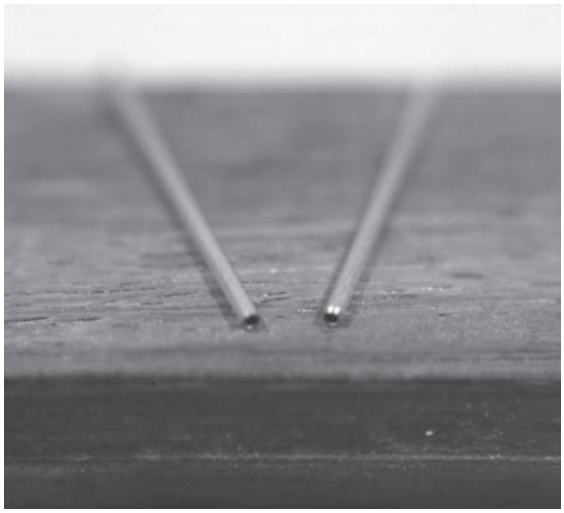

FIG. 3 **Factory tip on left, beveled tip on right.**

Another Method for Taking Cross-sections for Microscopic Finish Analysis

Melissa H. Carr

The problems with taking cross-sections for microscopic finish analysis are that:
• The best places aren't the easiest places from which to take the samples.
• It's difficult to protect the sample until it can be mounted and viewed.
• The client envisions something disfiguring involving large cutting tools.

The following is an alternative we worked out at Robert Mussey Associates during my tenure there. As with most approaches, it has its advantages and its drawbacks and limitations.

The basic idea is to take a core sample from the object using a sharpened hollow tube. We took some commercially available 1″ hollow needles and began by snipping off the plastic end that screws onto the syringe. (fig. 1) This leaves a crimped tip at one end and the flat factory tip on the other end of the needle. Remove the crimp on a grinder. There's no need to worry about the burr—this won't be the business end.

The next step is to bevel the flat factory end (without the burr) so that it will cut sharply through the finish. We've tried using a Dremel tool held at an angle against 400x paper, but this isn't ideal because of run-out in the rotation of the Dremel that results in an uneven bevel. More recently I've been using my new drill press that has virtually no run-out. I chuck the ground-off end of the needle in the drill press, tape some 400x paper to a piece of Plexiglass, and press it gently at a 45° angle against the factory end (fig. 2). This produces the beveled tip seen on the right in figure 3, in contrast with the un-beveled tip on the left. Any grinding debris in the tube should be cleared out with a reaming wire corresponding to the interior diameter of the needle.

I've tried polishing at higher grits and even with jeweler's rouge to improve the cutting action of the tip, but haven't noticed any particular improvement in the end result. As a further disincentive, the jeweler's rouge tends to contaminate the view unless you want to spend a lot of time cleaning it out of the needles before you use them.

The next step is to punch a polyethylene plug into the needle. The plug protects the sample if you need to eject it later from the needle. Tap the needle through some sheet polyethylene set over 6# Etha-foam (fig. 4). If you don't succeed after two or three tries, that means the bevel is bad on the needle and

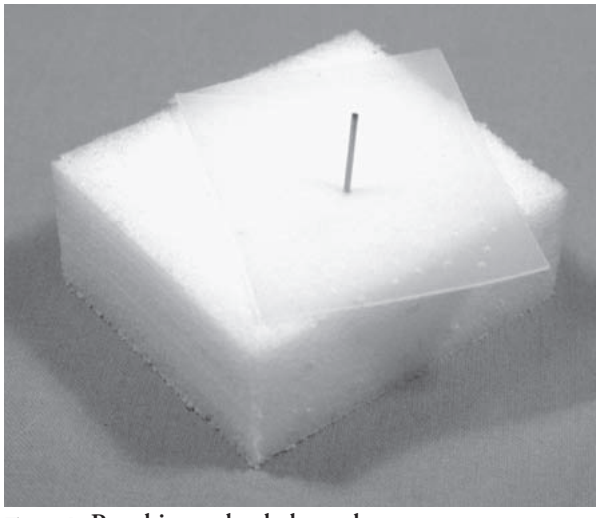

Fig. 4 **Punching polyethylene plug.**

FIG. 5 **Taking a sample.**

the needle should be discarded. Finally, wrap a "return address" size label around the non-beveled end. It gives you something to hold, and something to label. Now the needle is ready to use.

To take the sample, place the beveled tip against the surface in question and give it a firm tap with a small hammer (fig. 5). The idea is to cut through all of the finish layers and go at least a bit into the underlying substrate (wood in this case). It takes some practice to tap it just right, and of course, "just right" varies with the hardness of the substrate. Once you've taken the sample and labeled the paper tag, you can put it in an envelope if you're on the road, or mount it in polyester if you're in the lab.

There are two choices for mounting the sample; it can be mounted while still in the tube, or ejected with the same reamer used to clean out the grinding debris. Unless there's a particular reason to remove it from the tube (*e.g.*, the metal will contaminate other analysis), I don't recommend it. The tube is a little distracting to look at under magnification, but you'll get used to it.

If the sample is to be left in the tube, snip off the end of the needle that contains it (being careful not to cut so close to the sample that you crimp the section holding it). Place the section on a shallow bed of cured polyester (we used the small ice cube trays), and then pour a bit more polyester on top to seal the needle in the cube. After the polyester cures, grind it back using a standing sander and Micromesh until one side of the needle is gone and the face is polished—up to 3600x usually produces a good image for viewing under the microscope.

Sometimes the sample is lost in the grinding process when the upper layer of the needle is removed—remember, it's the needle that's secured in the polyester, not the sample. If that's a problem, I've had some success in consolidating the sample in the needle by submerging the end in a resin solution before I mount it in the polyester—it's a good idea to test a few different solvents so that the sample isn't dissolved into a soup.

Figure 6 shows a sample of a verte antique finish, left in the needle, viewed under UV light. The wall of the needle is visible on the left side of the sample. Figure 7 shows a finish sample from a piece with questions about whether it was originally mahoganized. It illustrates one of the drawbacks of this technique—notice that the left side of the sample is smashed down—that's a distortion caused by the impact of the needle in the process of taking the sample. Sometimes the impact seems to crush the entire sample, and the layers are com-

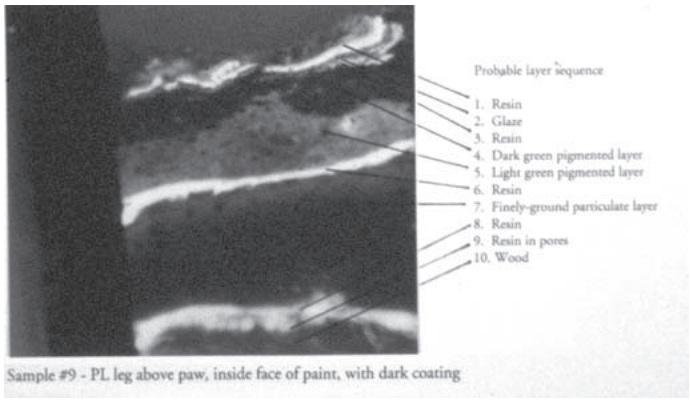

FIG. 6 **Sample mounted in tube, UV light, 125X.**

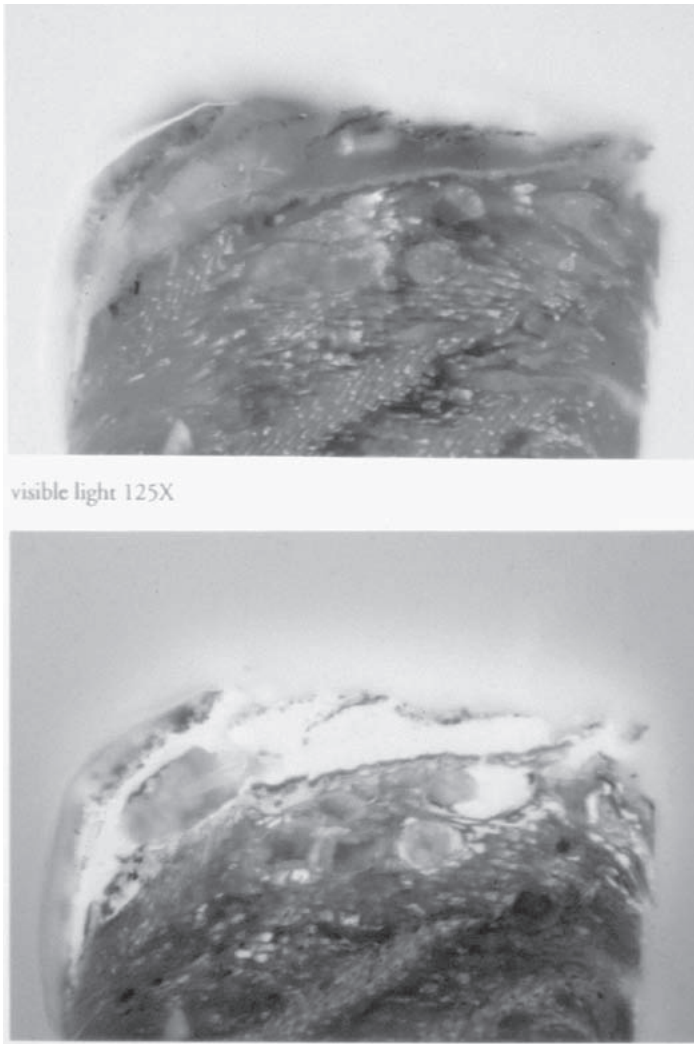

FIG. 7 **Sample ejected and mounted, visible and UV light, 125X.**

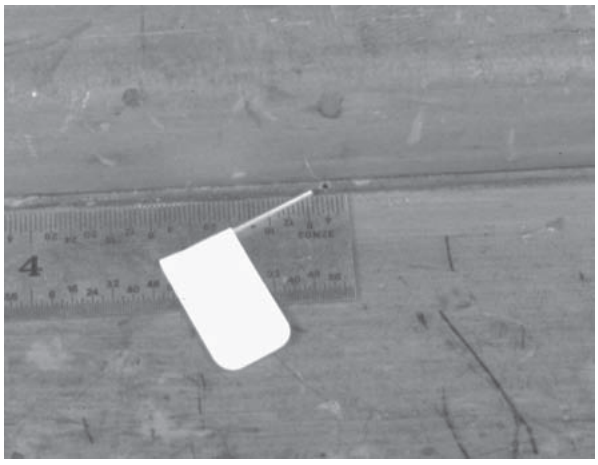

FIG. 8 **Scaled illustration of sample hole in object.**

pletely jumbled when you view it under the microscope.

Figure 8 illustrates the size of the sample taken. Most clients tend to relax when they see the size of the hole.

Materials Sources

There's nothing sacred about the needle size. In my experience, anything smaller than 19 gauge won't work, but a larger needle would be just fine—it's a question of controlling the sample size for your client's anxiety level and your own conscience. Available from Technitool by special order (www.techni-tool.com, 800-832-8846. Item # 606TI189, Manuf. # KDS191P, 19g, 1″).

About the Author

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