THE INS AND OUTS OF PIERCING

Malcolm Zander

Photo Courtesy of Gordon Pembridge

History

Sometime between 1991 and 1992, Saskatchewan dental therapist and instructor Terence da Silva received a visit from nearby Paddockwood resident Frank Sudol, who brought a collection of dental parts he wanted assembled into a system to pierce holes in wood. Terence did so, and when Sudol tried it out, it worked so well that, as da Silva recalls, "He jumped up and down like a small boy."

Frank Sudol's influence

In June 1993, Sudol showed a pierced chalice form at the AAW's Annual Symposium, and it caused a stir. A similar piece by Sudol, *Goblet*, is now in the AAW Permanent Collection.

Sudol's career took off, and he began to sell the modified dental handpiece kits and to teach. In 1998, he gave a course at Arrowmont School of Arts and Crafts. Binh Pho had seen Dale Nish's wormy vessels, found them very interesting, and was looking for a tool to make something similar; he thought that piercing might be a way. Pho

took Sudol's course, during which he made a bowl where the piercing formed images. Sudol saw it and said, "You SOB—you made something I had never imagined." Pho had used piercing for more than just decoration.

Following this development, Pho, Sudol, Steve Sinner, and several others held a week-long session of discovery at Pho's home. Further week-long sessions were held at six-month intervals, exploring piercing and air-brushing, complemented by a series of commercial courses taken on air-brushing. In 1999, Binh Pho's *Chicago Cityscape* put him on the map.

Others quickly picked up on the use of high-speed air-powered carvers. Arthur Jones's ephemeral, filigree *Soul of the Game* (1997), an ironic redefinition of the game's macho, offensive weapon, predates Pho's *Cityscape*. Jones used a Buffalo air-driven, 250,000-rpm, straight dental handpiece.

Different ways of "piercing"

The term *piercing* is usually associated with fine, small holes created with an air-powered tool, but the semantic line between *piercing* and *carving* is fuzzy. We shall see that the size of the holes and how they are made matter far less than the appeal and impact of the finished piece.

The use of air-powered, high-speed tools has become the standard for fine piercing, but it is not the only way. Most people would call the ▸

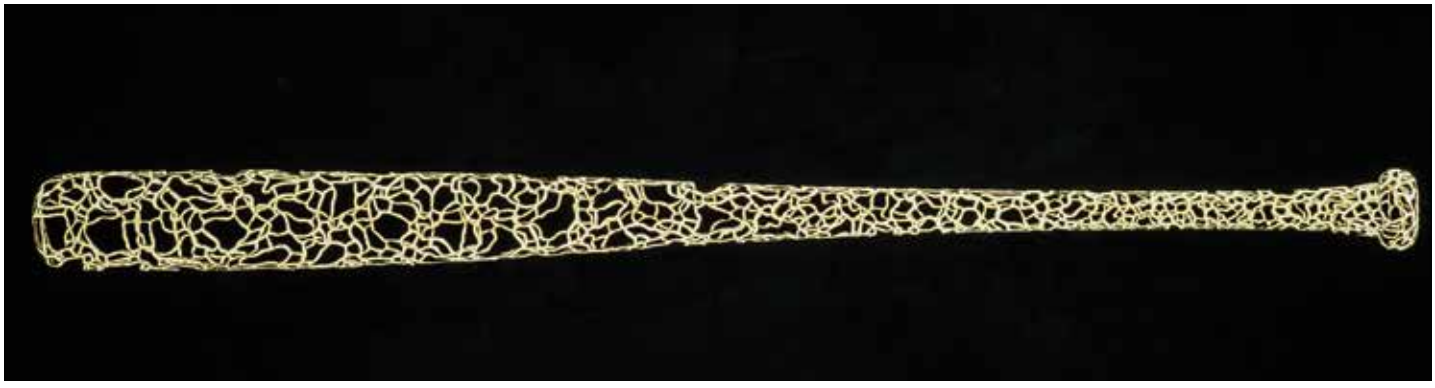
Binh Pho, *Chicago IV,* 1999, Maple, acrylic paint, dye, 12" (30cm) diameter

Photo: Binh Pho, Courtesy of Ruth and David Waterbury

Frank Sudol, *Goblet,* 1994, Birch, paint, 6½" × 3½" (17cm × 9cm)

An early example of the use of a dental drill for piercing.

Photo: Tib Shaw/AAW



Arthur Jones, *Soul of the Game,* 1997, Maple, 35" × 2½" (89cm × 6cm)

four works below by Frank Cummings, Arthur Jones, Richard Kennedy, and Ed Kelle "pierced." Yet they were not made with high-speed air tools, and the holes are not always small.

For his early 1988 platter, Cummings used a jeweler's fretsaw and rasps. Jones's early 1995 *Sylvan Autumn* was done with a Bosch jigsaw and finished with a knife and microgrinder. The 1980s-era *Citrus-Citrine* by Cummings and *The Seed* by Hughes in the accompanying article on negative space (page 30) were also made by fretwork. High-speed air tools were not available at the time, but the pieces certainly appear as if they could have been made this way. More recently, Ed Kelle and Richard Kennedy have both used slower micromotor tools. The conclusion from these examples is that defining *piercing* by tool or by hole size is arbitrary.

Equipment/methods

High-speed, air-powered handpieces

Dentist Lew Jensen initially created a hobbyist market for ultra-high-speed tools (250,000 to 400,00 rpm) driven by compressed air, of which the dental drill is an example. The advantage, compared to slower tools, is that at this speed the cutter (known as a bur) does not follow the wood grain—it slices effortlessly wherever directed.

Pho initially used both a dental drill and another oil-requiring handpiece. Shortly afterwards, he switched to the oil-free NSK Presto, turning at 320,000 rpm at 35 psi, which has become the tool of choice for many wood artists. Ceramic bearings floating on an air cushion eliminate the need for oil lubrication.

The Presto and other such power carvers found on the Internet typically draw only 1 to 2 cubic feet/minute (CFM) at 35 to 40 psi, so the air compressor need not be large. Turbines are expensive, but with care they last a long time. Bearings can be damaged by water or particles in the incoming air supply, so a good 5-micron ceramic filter and water trap in the line are essential, as is a pressure regulator to avoid turbine damage from excess air pressure. Damage also occurs if too much lateral pressure is put on the handpiece from trying to cut wood that is thicker than the tool will handle, or from engaging the shaft of the bur against the wood instead of using the cutter flutes (a common cause of bur breakage for beginners).

Regulators, traps, and fittings can be found in the compressed-air section of any hardware store. A good setup illustration is shown in Glynn Cox's useful article listed in the *Resources* sidebar at the end of this article.

Burs used in air-powered handpieces such as the Presto or dental drill are

(Clockwise from top left)
Frank Cummings III, *Platter,* 1988, Macassar ebony, mother of pearl, 18K gold, onyx inlays, 3" × 16" (8cm × 41cm)

Arthur Jones, *Sylvan Autumn,* 1995, Camphor, 5" × 18" (13cm × 46cm)
Photo: Randall Smith

Ed Kelle, *The Weight of Expectations,* 2009, Scorched cherry (bases), bleached maple (sphere), steel rod, sphere is 2" (5cm) diameter

Richard Kennedy, *Black-Anatir* series, 2012, Lime wood, 3" × 8½" (8cm × 22cm)

Different types of piercing using different types of tools.

Air-powered tools: dental drill (top) and NSK tool.
Photo: Malcolm Zander

made of carbide, have a 1/16"-diameter × ¾"-long (1.6mm × 19mm) shank, and are identified by the prefix FG (Friction Grip). Most commonly used are the FG 699L and the FG169L. The 699L has radial chip breaker grooves and removes stock faster than the 169L, which lacks these grooves but leaves a cleaner cut. Also used are the FG700L and FG170L, which have a slightly larger-diameter cutter.

Cutting at this high speed burns the wood, the more so the thicker the wood. A fan to blow the smoke away or an exhaust hookup to your dust collector to remove the smoke is a good idea. Resinous woods produce more burning. The residual carbon on the cut wood edge can be partially removed by taking a rapid, lighter, second pass along the wood, in a left-to-right direction. Buffing with 400-grit 3M radial bristle discs™ is also useful. Further cleanup can be done by sanding or by the use of needle files (techniques illustrated in my short video listed in the *Resources* sidebar). If the wood is to be painted, then the burning is hidden, but if it is to be left natural, then good cleanup is essential.

Dental drill vs. pen-type handpieces

The primary difference here is that pen-type handpieces have more torque; hence they can comfortably pierce wood thicknesses up to about ⅛" (3mm), with variability according to the hardness of the wood. A dental drill handpiece copes with a maximum of half this thickness. Pushing the tool beyond these limits is liable to damage the turbine. Replacement turbines for the dental drill are significantly cheaper than those for the NSK.

In addition, the dental drill turbine has steel bearings that require oil. This I apply about every half hour of run time, and it takes only a couple of minutes to do. The drill is then run at speed briefly before being applied to the wood in order to blow out any excess oil, which might stain the wood.

I prefer the dental drill for fine work on small pieces. The 90-degree angle of the bur to the handpiece often makes it easier to pierce perpendicular to the plane of the curved wood. The Presto is held like a pen; the dental drill I prefer to cradle, as seen in my video listed below. In both cases, you need a stable base from which to manipulate the tool. For the Presto, you can rest your wrist or fingers on the body of the wood and with hand and arm now steady, operate the tool with the fine motor muscles of your fingers and thumb (as shown on page 22). Alternatively, you can pivot off a single third or fourth finger as a base, as seen clearly in Andi Wolfe's video (see *Resources* sidebar) of her carving *Acer Embrace*. A strong light and head-mounted magnifier are essential.

Micromotor detail carvers

Micromotor detail carvers are also high-speed tools but operate at a maximum of 30,000 to 50,000 rpm, a tenth the speed of the air tools. Their cost ranges from $200 to $2,000, and unlike air tools, which are run at top speed only, micromotor tools offer variable speed from zero rpm up to the maximum. An Internet search for "micromotor detail carver" will turn up many different models. A good online video showing some of the features is listed below (though this is not an endorsement of the product shown). All are driven by a small electric motor in the handpiece, which in turn is linked to the control box by a fine electrical cord, giving complete freedom of movement.

Micromotors have significantly more torque than compressed-air tools. However, even at the high end of their speed range, the cutter bur will usually track the wood grain. For piercing, they are preferable to the older and slower flex-shaft tools, which have yet more torque but are awkward and slow to pierce with. Another advantage of micromotors over higher-speed air tools is that there is less scorching of the wood. Micromotor tools are more appropriate for heavier work than air-powered handpieces. A good example is the work of J. Paul Fennell, whose pieces are sculpted in thicker areas with a micromotor and in thinner areas with the NSK Presto. ▸

Micromotor handpiece with blue 400-grit abrasive 3M Bristledisc™ in the collet. Tool length is 6½" (17cm)
Photo: Malcolm Zander

J. Paul Fennell, *De la Mer,* 2012, Carob, 8½" × 8" (22cm × 20cm)

Pascal Oudet, Diabolo 41, 2017, Oak, 17¼" × 8½" × 7⅞" (44cm × 22cm × 20cm)

Lace textures achieved by sandblasting.

Robert Jones and Stephen Hughes, Potpourri bowl (Jones) with laser-cut insert (Hughes), 2017, Native pear, silky oak veneer plywood, 2" × 6" (5cm × 15cm)

Laser-pierced inserts can be made in a range of patterns, but thus far only on flat work.

Photo: Robert Jones

Burs for micromotor carvers are larger and heavier than the FG burs; the shaft is 3⁄32" or ⅛" (2mm or 3mm). They come in a range of shapes and coatings.

Laser carving

A laser can also be used to make fine piercings. Stephen Hughes has created inexpensive laser-cut inserts, which have been used in fellow-Australian Robert Jones's potpourri bowls, as seen above.

A major drawback to the laser method is that the wood must be flat. If someone can create a system to laser-cut vessels in three dimensions, that would be a remarkable breakthrough.

Sandblasting

Pascal Oudet uses sandblasting to generate a fine-pierced texture in his work. Oudet and Bill Luce have developed this technique through many hours of experimentation, and the effect is unique.

Design considerations

In his Summer 2000 *AW* article, Binh Pho describes his piercing philosophy, involving two types of piercing: negative dominant and positive dominant. This article, with accompanying diagram, is invaluable reading for all those learning to pierce. Positive dominant piercing leaves much wood and little air. Richard Kennedy's *Anatir* is an example. Negative dominant piercing has much air and little wood. Binh Pho's *Balance* (shown on page 35 of this issue) is an example. The way in which light interacts with these two pieces is very different.

Wall thickness

Given the importance of transmitted light for the visual effect of pierced pieces, care must be given to hole size relative to wall thickness. If the holes are very small and if the walls are thick, then the holes will close off when viewed from the side, and the desired effect of transmitted light is lost. In this case, the walls must be made thin. Steve Sinner's *Goblets* are an extreme example—the walls are 0.5mm (1⁄50") thick and the hole diameter is about 0.7mm. For a thicker piece of say ⅛", one can get good light transmission only if the holes are significantly larger. An example is my *Leaves in a Golden Wind* (wall thickness ~2mm); another is Fennell's *De la Mer.*

Most turners prefer to make thin-wall vessels from green wood and monitor the wall thickness using a light source behind the wall. Wet wood transmits light well. The disadvantage of this method is that as the piece dries out during turning, it will warp, even more so after completion. Sanding can be done only when the piece is dry. If instead the piece is pre-turned, allowed to dry and move, then re-turned to the final thickness, these issues do not arise. However, the use of light to track wall thickness is now harder because dry wood transmits light poorly. One solution is a fiber optic system giving an intense light next to the piece but with the undesirable lamp heat at a distance. With this system, I find that even dense exotic woods such as pink ivory will transmit light when dry, at wall thicknesses approaching 1⁄25" (1mm). (African blackwood will not transmit light at any thickness). Good calipers are essential. A sparkplug feeler gauge with leaves of different thicknesses is useful

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For more on design considerations, see Binh Pho's Summer 2000 *AW* article, "My Philosophy in Piercing Design" (vol 15, no 2, page 13).

for monitoring; apply the calipers across the wall of the piece and then check it against a leaf of the desired wall thickness. I aim for 0.8mm on my small pieces.

Color

Piercing may be complemented with airbrushed color, used most notably by Binh Pho, Frank Sudol, and Gordon Pembridge. Pho used it for storytelling; Sudol and Pembridge used it to depict and honor wildlife. Pembridge's and Pho's work may be seen on their respective websites: gordonpembridge.com and binhpho.com.

Summary

Piercing is a way of creating negative space, which depends on light for its effect. It is a decorative design element and can give a feeling of fragility and lace-like delicacy, as in the filigree background of Pembridge and Sudol's work. The patterns produced by piercing are textures, both visual and tactile, and can be dramatic. Richard Kennedy notes that the light creates its own artwork through the shadows cast. Sinner and Kennedy both find that piercing gives a wow factor to a piece.

Piercing can also be used to convey different meanings. J. Paul Fennell uses it to mimic the patterns of sunlight on an ocean floor. For Binh Pho, it was all about negative space as a metaphor for past or dream events in his storytelling.

There are different ways to pierce wood, and there are different styles. Try it, and find a style of your own. Listed at right are several resources to get you started. Have fun. ■

Photos courtesy of the artists, unless otherwise noted.

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Frank Sudol, *Wolf,* c. 2000, Birch, about 30" (76cm) tall

Photo Courtesy of Barbara Sudol and Kevan Leycraft

Gordon Pembridge, *The Red Elephants of Tsavo,* 2014, Macrocarpa, acrylic paint, 5¾" × 6¾" (15cm × 17cm)

Wildlife, pierced and airbrushed.

Malcolm Zander, *Leaves in a Golden Wind,* 2008, Walnut, 23K gold leaf, 9½" × 15½" × 11½" (24cm × 39cm × 29cm)

Steve Sinner, *Goblets,* 2005, Sugar maple, heights are 2½" to 4" (6cm to 10cm), diameters are 1" to 2" (25mm to 5cm)

Different hole sizes for different wall thicknesses.

Resources

- Article with setup illustration, by Glynn Cox: tiny.cc/GlynnCox
- Andi Wolfe carving video: *Acer Embrace:* tiny.cc/AndiWolfeCarving
- Malcolm Zander piercing video: *Dressed for Dinner:* tiny.cc/ZanderPiercing
- Video explaining micromotor features to look for: tiny.cc/Micromotor
- Source of micromotor and FG burs: bursforcarving.com
- Source of optional supplementary filter for compressed-air system: tiny.cc/MotorGuard