four great ceramic glazing techniques

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Four Great Ceramic Glazing Techniques

How to Formulate Successful Crystalline Glazes, Add Depth Through Slip Trailing and Color Washes, and Glaze in the Majolica (Maiolica) Style

Trying out new glazing techniques is always exciting because you don't know quite where you'll end up – even a mistake could hold a pleasant surprise! If you'd like to try something new, then one or all of these great glazing techniques may be just what you need.

These three glazing techniques are as varied as their origins. Majolica (also spelled maiolica) originates from the Mediterranean and is the techniques of applying color on top of a glaze; Lisa Bare Culp brings us up to date with contemporary commercial glazing techniques; and crystalline glazes originated in Europe and require specific glazes and firing conditions.

Whether you're looking for a fresh look or looking to see what you can do with a new glazing technique, you'll find your answers in these three great approaches.

The Colorful World of Majolica (Maiolica)
by Linda Arbuckle

Majolica (or maiolica) is a white, opaque, glossy glaze that is very viscous to the point that it doesn't move during firing. This allows the line quality and bright colors applied to the raw glaze surface to be maintained faithfully through the firing. Arbuckle is the authority when it comes to this glazing technique, and she will help you through both the technical aspects as well as the creative approach necessary to gain success with your work.

Layering Pottery Glaze Techniques
by Emily Donahoe

Sarah Jaeger is a fan of color. Here, we share her glazing process and a few of her glaze recipes. It all begins with the pot itself. Making a form that gives you glaze design ideas can jumpstart your creative process. Then comes the surface: from planning a design on the glazed surface of a pot to applying slip trailing designs, wax resist, and washes of color, Jaeger brings it all together in a joyful result.

Adding Depth to Your Glazes by Lisa Bare Culp

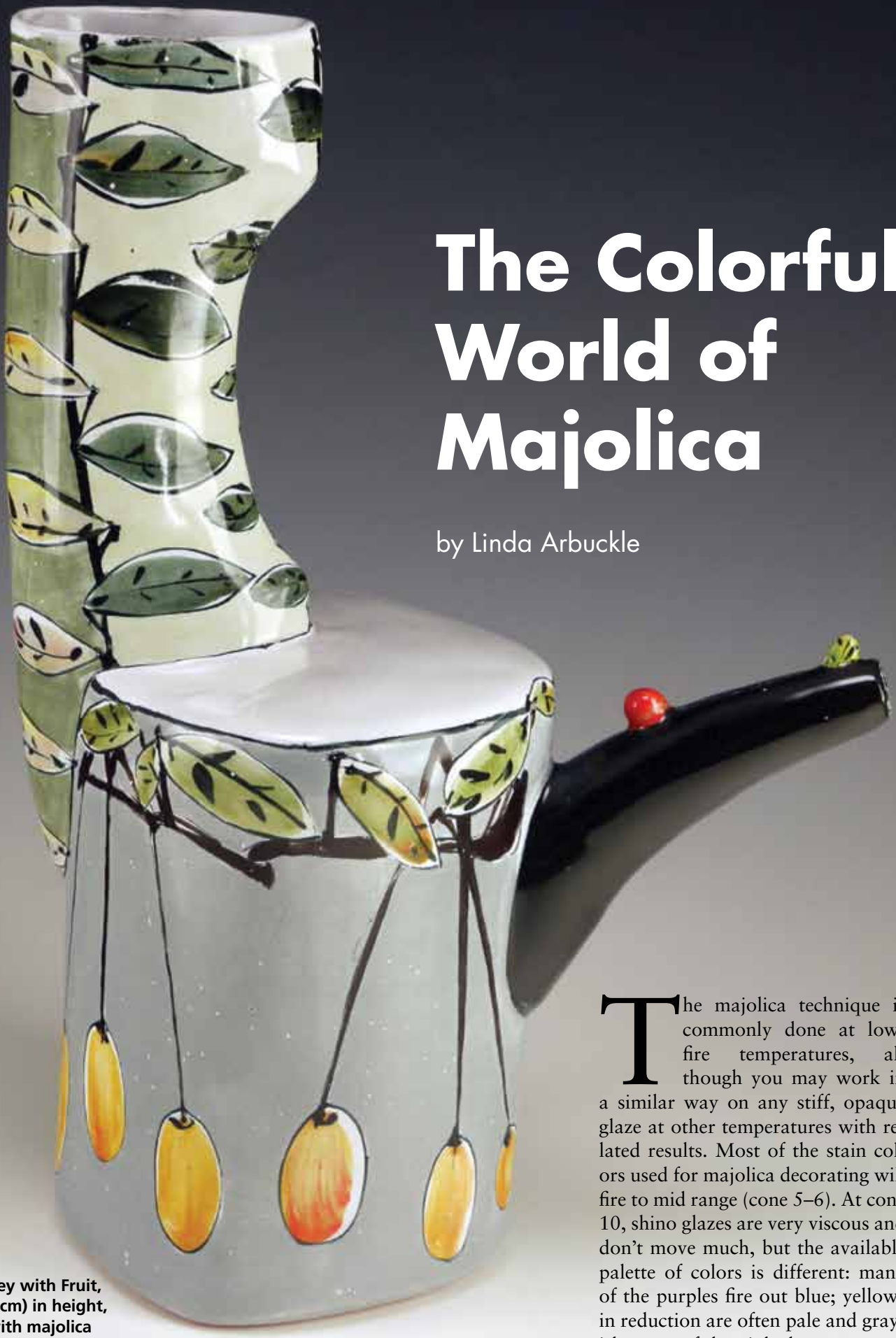
If you're looking for some different glaze techniques, here are three glaze projects you can try out. Lisa Bare Culp learned a lot from her experiments with sgraffito, layering, mixing slip with stoneware glazes and multiple firings. She uses commercial glazes as an artistic tool that she shares with students, and here she demonstrates a pouring technique, a carving technique and a layering technique.

The Mystery of Crystals by William Schran

Crystalline glazes are among the most admired in ceramics. The fact that these crystals "grow" in the kiln seems a bit of a mystery to most, but to William Schran it was a mystery he had to figure out. Once achievable only at high-fire temperatures, Bill demonstrates how you can get elegant crystals at cone 6 using a programmable or manual electric kiln. He includes his recipes and his firing programs so you'll achieve success.

The Colorful World of Majolica

by Linda Arbuckle



Tall Ewer: Grey with Fruit, 121/4 in. (31 cm) in height, terra cotta with majolica glazes, fired to cone 04, 2010.

The majolica technique is commonly done at low-fire temperatures, although you may work in a similar way on any stiff, opaque glaze at other temperatures with related results. Most of the stain colors used for majolica decorating will fire to mid range (cone 5–6). At cone 10, shino glazes are very viscous and don't move much, but the available palette of colors is different: many of the purples fire out blue; yellows in reduction are often pale and grayish; most of the pinks burn out; and

Bowl: Fruits of Our Labor in a Time of Envy, 11 in. (28 cm) in diameter, terra cotta with majolica glazes, fired to cone 04, 2010.

body stains (e.g. Mason Stain 6020 Pink) may be too refractory even at cone 10. Nevertheless, it maybe worth an experiment or two.

History and Name

Majolica (or maiolica) in common contemporary parlance is a white, opaque, glossy glaze that is very viscous to the point that it doesn't move during firing. This allows line quality applied to the raw glaze to be maintained faithfully through the firing process.

Historically, Middle Eastern potters developed such glazes for use over an earthenware clay at low temperatures. They used tin oxide to make a white, opaque glaze (usually fluxed with lead) that was a good ground for colored decoration. Work from the Middle East made using this method is identified as tin-glazed earthenware. A raw glaze surface was decorated with copper (green), manganese (plum), and iron or antimony (amber/yellow) over a glaze. Cobalt blues were very popular for decoration, and the blue-on-white echoed Asian high-fire ceramics. Metallic reduced lusterware (done in an additional firing) was also developed in the Middle East, often on a tin glaze.

When the Muslims conquered northern Africa, came north across the Strait of Gibraltar, and created a Moorish influence in Spain from the early 8th century until 1492, they brought their pottery technologies and aesthetics with them. This included tin-glazed pottery methods. Spain exported these wares from Majorca, and Italians began calling this tin-glazed ware *majolica*.

There are contemporary disagreements about the spelling, pronunciation, and terminology of *majolica* vs. *maiolica*. I suspect that the origins of the differences reside in what happens when a Spanish *J* is transliterated into another language, and complicated by casual use of terms for things that are not technically related. For instance, in the 19th century, companies produced molded relief wares with bright, jewel-like, transparent, colored lead glazes. The Minton company in England was well known for the production of these wares (teapots in the shape of pineapples and cauliflower, cheese bells in the form of beehives, etc.). The bright low-fire color reminded people of Italian majolica-decorated pottery, and the term *majolica* was used for both, although they are not technically related. I have seen texts that claim that the Minton–style work is done with techniques similar to Della Robbia techniques, but my eyes tell me it's not so. The tin-glazed work is seen spelled either way. The Minton–style work is usually spelled with a *J*. Some revisionists insist this is the only way, but very reputable sources, such as the Metropolitan Museum, have spelled the tin-glaze with a *J*. It seems to be one of those awkward instances where there are variants in spelling and pronunciation, with no one clear "truth." I pronounce the *Maj* in *Majorca* like *my*, and likewise in *majolica*, and spell both with a *J*, but I allow that other spellings and pronunciations are likewise creditable.

Opacifiers

The use of only tin as an opacifier is often modified in contemporary practice. Tin makes a lovely, buttery, very opaque, white glaze. It also increases surface tension in a glaze and may aggravate crawling problems where the glaze is thick (e.g., in corners). Tin in amounts of 5% or above will also cause a color reaction with small amounts of chrome that will cause the tin glaze to turn pink (chrome fuming). This can be delightful if anticipated, but is often not kind to your color plans as a surprise. Many of the green and teal stain colors and some black stains contain chrome, and some rutiles contain small amounts of chrome impurities that can cause chrome-tin pinking in high-tin glazes. For the above reasons, as well as the expense of tin oxide, many artists today use a zirconium opacifier, or a combination of some tin (for denser whiteness) with some zirconium opacifier. This would keep the amount of tin low (say under 4%), yet allow good opacity. Zirconium is weaker than tin in strength, and the usual rule is 1.5% zirconium to replace 1% tin. If chrome-tin pink fuming is a problem, drop the tin a bit, and add that amount multiplied by 1.5 of zirconium opacifier.

Some artists say they enjoy a bit of the terra cotta showing through a translucent white majolica glaze. For me, it darkens the glaze color, damps color response a bit, and makes any thick-thin areas of glaze application more noticeable than a more opaque white. I have always preferred a very white opaque glaze.

recipes

Arbuckle Majolica

Cone 03

Ferro Frit 3124	65.8 %
F-4 Feldspar (sub Minspar 200)	17.2
Nepheline Syenite	6.2
EPK Kaolin	10.8
	100.0 %
Add: Tin Oxide	4.0%
Zircopax	9.0%
Bentonite	2.0%

Cone 05

Ferro Frit 3124	66.6%
F-4 Feldspar (sub Minspar 200)	23.0
Nepheline Syenite	8.1
EPK Kaolin	2.3
	100.0 %
Add: Tin Oxide	4.0%
Zircopax	9.0%
Bentonite	2.0%

This is a smooth, white, opaque glaze that does not move during firing. It may crawl if thick in corners or pinhole over rough-trimmed surfaces. Add ½–3 tsp. Epsom salts to 5 gallons of glaze to flocculate if needed (for less settling and better application). Colorants with flux are usually applied in a thin wash to the raw glaze surface. Fire with a small 03 cone in the sitter to give a large cone 04 tipped to about 2–3 o'clock in front of the peep hole.

Small Pour: Sunflowers with Black Band, 5 in. (13 cm) in length, terra cotta with majolica glazes, fired to cone 04, 2010.

Majolica Colorant Suggestions

Gerstley borate production has been erratic, and the material is variable in quality. It pushes decorating colors toward pastel through very fine reticulation (break up) of the glaze surface, and although I used it when I began majolica, I now use frit as a flux (with bentonite added) or commercial majolica decorating colors.

Colorants mixed with only frit settle quickly, have limited brushability, and are very powdery once dry, making wax resist over the color smudge easily. Some artists, like Matthias Ostermann, use this powdery quality to work the movable surface like pastels. The addition of bentonite or CMC gum to the frit and colorant mix aids brushing and hardens the dry surface. Bentonite doesn't mix easily with water, so be sure to mix dry bentonite, frit, and colorant first, then add water. Some people find an immersion blender handy. I mix small amounts and generally use a tiny whisk. If something is really lumpy, I will use a small test sieve (60 mesh) and screen the mixture.

I use Ferro frit 3124. Others will work, with color reactions influenced by the specific chemistry of each frit. To aid brushability, you may add a small amount of glycerin (drug store item), or a few drops liquid CMC gum to the liquid mix. Too much glycerin or gum can make a very slippery color mix that moves well but doesn't apply color in an even thickness.

Colors in studio-mixed oxides or stains and commercial majolica decorating colors will generally mix, but some information about ceramic materials helps. I recommend doing line blends of colors to learn more about mixing and relative strength. Copper melts easily, and will color strongly compared to yellow colors. A nice chartreuse may be four parts yellow by volume to one part mixed copper. With paint, yellow + blue = green. In ceramic colors, blue is made with cobalt, a *very* strong colorant, while yellow may be a stain made with praseodymium or vanadium, which are weaker colorants than cobalt. Equal amounts of mixed yellow and blue decorating colors may still be very blue, due to the strength of cobalt.

Non-refractory Colorants

1 part colorant, 1 part frit, ½–1 part bentonite:
copper (blue-green), cobalt (blue), manganese (brown to plum with Ferro frit 3110), iron (brown)

Refractory Colorants

1 part colorant, 3–4 parts frit, ½–1 part bentonite: chrome (grass green), rutile (rusty orange), titanium dioxide (ivory). Most stains are refractory enough to require this ratio. Note that body stains, like Mason 6020 manganese-alumina pink and Mason 6485 titanium yellow are too refractory for use on top of majolica, even with flux added. Refractory colorants that are not adequately fluxed will result in matte surfaces that are bumpy and/or pig-skinned (crinkled). Testing is the only way to really know.

Soluble colorants

Cobalt sulfate (blue), copper sulfate (turquoise), manganese chloride (plummy brown), and chrome chloride (green). All are toxic raw. Do not inhale or ingest. They are also absorption hazards: do not handle these without gloves. Soluble colorants are dissolved, rather than suspended, in water, so they wick into the surface of the ware with the water, making a very uniform ground color with a soft edge. If you want any white areas, or to retain clean edges, areas must be waxed before applying soluble colorants. Over-wetting the glaze when applying solubles may move raw glaze and cause color to migrate through the pot wall and/or cause crawling. Too much water on the raw glaze may also cause crawling in the fired glaze.

Commercial Colorants

Some single-coat commercial underglazes work for decorating on top of a majolica base glaze, while others are too refractory. Testing is the only way to determine which ones work. Several companies now make very

nice pre-mixed majolica decorating colors. These colors are generally a combination of stains, flux, and vehicles, and they brush well. I suspect that, unlike underglaze colors, the clay content is kept low for more supple brushability.

Application Suggestions

Both the best and worst thing about majolica glaze is that it doesn't move when you fire it. Having a decent base glaze coating goes a long way toward being happy with the final product. Additionally, large bumps and voids in the raw glaze will leave evidence of brush strokes on top of them and emphasize your glaze application issues.

Apply glaze in the thinnest coating that will give you opacity, and attempt an even glaze coat. Dampen pieces slightly before dipping to remove any dust and moisten the ware for better glaze pick up. Dipping is my mode of choice, although I do know potters who spray effectively. I want to have a container that will allow me to do one dip of the bisqueware. If I have a piece that will not fit in my glaze bucket, say a long, oval platter, I use a different container for dipping. Garden stores often carry metal or plastic 5-gallon oval tubs. Oil change pans can be useful. I have flexible plastic tubs from a garden store that are wider than my 5-gallon glaze buckets, and will allow me to flex the bucket for longer-than-wide shapes and to form a spout to pour my glaze back into the bucket. In a pinch, I have used cardboard boxes reinforced with duct tape or dresser drawers double-lined with heavy trash bags to hold glaze for dipping.

For errors in glazing (and there are bound to be some) 400-grit wet-dry sandpaper will sand down lumps, or they may be gently scraped down with a sharp knife. When sanding or shaving glaze, do it over a container of water to trap the dust and prevent it from circulating in your studio environment.

Clay Body, Off-Gassing, and Firing Rates

I am still experimenting with firing rates. Several years ago something in clay materials changed and caused gassing in my clay, resulting in many white gas dots in the fired majolica surface, where the base glaze might seal over, but the colorant layer is so thin that it can't seal and leaves a white spot. Many people maintain that firing slowly is the way to go, and it seems logical that any gas release would be more gentle the slower the firing. On the other hand, I fire many pieces in a small, oval, doll-body test kiln, which cools quickly, and these generally turn out less dotted. The same shapes fired about 200°F per hour in my regular kiln may be more dotted. It's been an infuriating problem that I continue to research. If you have dotting, try bisque firing as high as you can without making the work too dense to accept glaze. This may drive off gassy materials before glaze application and firing. Bisque at a slower rate, vent your kiln, and glaze thinner if possible. Thinner glaze is less likely to trap the gas bubbles and cause dotting.

the author Linda Arbuckle is a member of the CM Editorial Advisory Board, and is a professor of art at the University of Florida, Gainesville. For more majolica glaze recipes, including a cone 6 version, and additional resources, see her handouts page on her website at http://lindaarbuckle.com/arbuckle_handouts.html.

Advantages and Disadvantages of Majolica-type Glazes

Advantages	Disadvantages
The viscous glaze does not move when fired. The brushwork stays crisp, with no runny glaze to chip off shelves. Dry-footed areas need less margin on pot bottoms or lid seats.	The viscous glaze does not move when fired, which means any lumps, drips, or pinholes from application remain and do not heal over or smooth out in firing. Thick glaze may crawl.
Because the raw glaze absorbs the color from the brush readily and does not move in the firing, the direction of brush marks, speed of the brush, and loading of the brush show in the fired decoration, adding painterly, expressive qualities to the marks.	Because the raw glaze absorbs the color from the brush readily and does not move in firing, direction of brush marks, speed of the brush, and loading of the brush show in the fired decoration, and may reveal hesitancies, touch-ups, and direction of background when painting around motifs, etc., which may distract from the aesthetic impact.
Thick glaze blankets the piece, which may forgive small handling errors like finger smudges in the surface.	Thick glaze blankets the piece, which may cover small details in clay handling. like carving or incised decoration.
The kiln is a passive tool, resulting in more predictable results from firing to firing. Someone else could fire your work and achieve the same results (easier to share kilns).	The kiln is a passive tool, resulting in uniform color that may look flat or does not describe the form. There are no gifts from the kiln gods.
A bright palette of commercial stains gives easy access to a range of pinks, oranges, yellows, and purples that work well with the blue, green, and rust that are available with oxides.	The bright color may look garish, or the entire palette may look too pastel and therefore lose impact.
Inexpensive color, because it takes less colorant to put a thin wash on the glaze surface than to color a slip or a glaze.	

Sarah Jaeger's simple, well designed serving bowl brings both food and cheer to the dinner table.

Adding Joy to Your Pots

by Emily Donahoe

Geometric patterns and forms combine with organic, plant-inspired lines in artist Sarah Jaeger's inviting functional pots. In her hands, a modest, wheel-thrown serving bowl becomes something special with some easy alterations and a layered, wax-resist glazing technique.

The alterations developed over years of playing around with simple geometric forms—dividing up the space, making rounds into squares, and just seeing where things went.

"A lot of the evolution just comes from working on the wheel and doing something and then thinking, well, what would happen if I tried this?" she explains. "So it doesn't start out as high concept all the time."

Sarah says that the alterations are "both visual and tactile—and both of those things come into play with functional pots." Add to that Sarah's love of decoration and the surface of the bowl becomes a space where pattern and irregularity meet. She says her goal is to make a bowl that functions well, that's also beautiful and adds some joy and a sense of festivity to someone's meal. For her, it's about making things more joyful.

Throwing and Altering

Sarah's small but well-appointed backyard studio looks out onto a sunlit garden. Her dogs, Archie and Oona, laze nearby as she goes about her work.

"This is, in many respects, a very simple pot," says Sarah as she centers a 4½-pound lump of clay on the wheel in preparation for making a serving bowl. She is working with porcelain, which she prefers because of its translucent quality. "With porcelain, even when the pot is unglazed or even if it is a monochrome glaze, you get a lot of interesting play of light and shadow that I think is very beautiful," she explains.

Throwing the bowl starts out normally, the clay is centered, opened to the desired depth and diameter. When making the initial center hole, Sarah purposefully leaves more clay in the floor of the pot. By not pressing down as far when creating this hole, she leaves room for trimming a taller foot on the pot. Then, she starts to pull up the walls. To create the flange on the exterior of the bowl, she pulls up the wall of the pot halfway and then skips a vertical space of about an inch and a half, resuming the pull just above it. This leaves a thicker area that can be trimmed to shape later. She then splits the rim using the back of her thumb pressed lightly into the middle (*figure 1*).

Next, she goes back to refine the shape of the bowl. As she works, she explains the process. "I did about two or three pulls with a sponge in my outside hand and then I go to using ribs (*figure 2*). I use the curve of the rib to help me get the inside curve of the bowl; but also the ribs really help to compress the clay and make it stronger. After a few pulls with your hands, if you go and use the rib, it strengthens it, recompresses it. It also gets rid of all the throwing lines. Sometimes (the marks are) something you want to use visually and sometimes they're just distracting."

The split rim is further refined using a wooden knife (*figure 3*). Using a sponge, Sarah cleans up the slurry from the inside of the bowl, then uses a thin piece of plastic to smooth out the rim.

The bowl is ready to be altered. Sarah drops a small circle divider into the bottom of the bowl as a guide and uses a chopstick to divide the rim into six sections. Next, at each mark or divot, she presses the chopstick into the wall from the flange to the top, creating six lobes (*figure 4*). Finally, Sarah cuts the bowl from the wheel.

Trimming

When the bowl is leather-hard, Sarah centers and secures it with lugs of clay on the wheel for trimming. For heavier pieces, or pieces with very uneven rims, she uses a foam covered bat.

"I intentionally leave quite a depth of clay here, just because I want this pot to have a really nice, elevated foot. I want to be able to work with the proportions of the lip element and the volume element and then the foot, so a little extra clay leaves me some leeway to play with."

Using a trimming tool, Sarah removes excess clay from the bowl. As she trims, first creating the outer diameter of the foot and then the inside diameter, she taps the area she's working on every once in a while to gauge its thickness. She then trims another flange to echo the one she's thrown into the bowl. After she's achieved the shape she wants, Sarah continues to remove excess clay until the bowl is of the right heft.

"I'm pretty fussy about the weight of the pots," says Sarah. "There's something about the way a pot looks that sets up an expectation for what it's going to weigh. With a bowl that I intend to be a functional pot, my goal is not to mess with people's expectations about what it is or how it functions."

After trimming, she goes over the surface with a rubber rib to smooth out any lines from the tool, and to refine the transition between the rounded bottom and the outer flange (*figure 5*).

Decorating

Sarah works atop the *New York Times* Arts and Travel sections—after she's read the articles, of course. She wears latex gloves to protect her hands from the abrasive glaze. After waxing the foot of the bisque-fired bowl with paraffin, she uses tongs to dip the bowl into a clear glaze, allowing it to dry for a bit before beginning the first step in decorating.

Sarah's Joyful Process

Define the split rim using the back of a thumb pressed down in the middle.

Use ribs on the inside and outside to compress the walls and remove throwing lines.

Refine the split rim using a wooden knife or rib while supporting the rim on both sides as you work.

Divide the rim of the bowl using a circle divider and marking tool. Press in at each mark, creating six lobes.

Refining and smoothing the trimmed surface using a rubber rib to remove any lines or marks.

Draw a design on the inside of the freshly glazed pot using a pencil.

After painting in the leaf forms using a colored wash, trail on green glaze line decorations.

Additional red glaze decorations are trailed on next. The trailed glaze should be thicker so it does not run.

PHOTOS : TOM FERRIS

Use a tinted wax resist to protect the painted and trailed patterns and shapes.

After the wax dries, paint a layer of wash, here cobalt sulfate, over the surface to create another layer.

The finished, glazed, and waxed pot is ready to be glaze fired.

"Her goal is to make a bowl that functions well, that's also beautiful and adds some joy and a sense of festivity to someone's meal. For her, it's about making things more joyful."

"This is another one of my secret tools: it's a no. 2 pencil," Sarah explains as she draws a simple leaf pattern inside the bowl (*figure 6*), and then uses a paintbrush to fill in the patterns with a wash of rutile and Gerstley borate. She applies a thin layer for a translucent, cloudy effect (see *figure 7*).

As she works, Sarah explains that her decorations have evolved out of hand repetition and "responding to the curve of the pot."

"A lot of my glaze decorations started out as very geometric patterns and over the years evolved into more botanical patterns. The longer I did it . . . the more organic the lines and the forms and those decorative motifs became," says Sarah. "I like patterns that are pretty organized and symmetrical but then, when the pot gets fired everything softens and relaxes. There's a kind of nice contradiction there."

The next two glazes are applied in thick, dense lines. The first is Reeve Green, mixed very thick to give the bowl some texture (*figure 7*). Sarah applies the glaze using Clairol color applicator bottles, which she gets at a beauty supply store. She then uses the same technique with an orange-red glaze, which is made from the same base glaze as Reeve Green, but with red inclusion stain added (*figure 8*). On the outside of the bowl, Sarah uses the same elements in a different arrangement; she decorates the bowl all the way down to the underside of the foot, filling in the spots between leaves with simple waves and crosshatches.

"It's a three-dimensional pot," says Sarah. "I think it matters to pay attention to all of it." Plus," she adds, "when people wash dishes, they love that the undersides are decorated. One time this guy in California emailed me a photo of bowls in the dishwasher."

Glaze Recipes

Reeve Base

Cone 10 (oxidation or reduction)

Custer Feldspar	75%
Whiting	15
EPK Kaolin	5
Silica	5
	100 %
Add: Bentonite	2 %
Green: Chrome Oxide	4%
Red: Cerdec Intensive Red	10%

Used as the trailing overglaze colors. When trailing this glaze, it needs to be thick so that it does not run.

Limestone Clear

Cone 10 (oxidation or reduction)

Custer Feldspar	27.0%
Ball Clay (OM 4)	14.0
EPK Kaolin	7.0
Whiting	20.5
Silica	31.5
	100.0 %

This glaze is not an absolute clear. On its own in reduction, it's a little greenish.

Wax and Wash

Wax resist is an old technique, but Sarah finds that she uses it a little bit differently than most potters.

"One thing that caused me to keep playing with this technique is that I really love surfaces that have a sense of depth," says Sarah. "It confuses that figure-ground relationship—and for some reason that confusion really interests me."

Sarah uses a color-tinted Aftosa wax to go over the decorations on the bowl with a Japanese-style brush (*figure 9*). This type of wax helps her to see what she's done and also brushes on more easily than paraffin wax.

"The wax will repel anything that goes on over it. Some other waxes that flow and brush well don't seem to resist the cobalt sulfate as well as Aftosa," explains Sarah. "So I will paint with wax on all the parts of this that I want to remain what they are now."

Sarah's final step is to brush a cobalt sulfate wash over the entire bowl (*figure 10*). She mixes the colorant with water by eye, testing it on newsprint to see that it is the right concentration before applying it to her work. Sarah explains, "The form of cobalt sulfate that I use, because it's water-soluble, you get a really soft line. Just like when a watercolor goes on paper and it bleeds into the paper, as the water of the cobalt sulfate wash evaporates, the cobalt bleeds into the glaze, so the line quality is really soft." **Note:** Cobalt sulfate, like all soluble salts is easily absorbed into the skin. It is important to wear latex gloves when working with this, or any other soluble salt colorant. It is not recommended to use this material in group studio situations.

As she finishes up the pot (*figure 11*), Sarah reflects on the paradox of spending so much time discussing technique—and so much time decorating a single pot.

"At the end, you don't want the person who is using the pot to think about technique at all. You don't want it to look like it was a lot of work; you just want it to look like itself."■

Sarah Jaeger lives and works in Helena, Montana. To see more of her work, visit www.sarahjaeger.com.

Emily Donahoe is a freelance writer living in Bozeman, Montana. She has written for Ceramics Monthly, *and other publications.*

Adding Depth to Your Glazes

by Lisa Bare Culp

***Fish Bowl*, matt white glaze over commercial glazes, fired to cone 6.**

As a potter and in-home instructor for many years, I've always mixed my own glazes, or relied on other professionals who mix dry glazes to my specifications. Recently, an idea for a single pot challenged me to experiment with commercially-made glazes. The outcome has been succesful with vibrant new color selections, time savings and the convenience of readily available glazes screened for toxicity—all this without compromising my workspace or my standards.

What changed my thinking on commercially prepared glazes was my desire to introduce bold new colors into my work. I envisioned a piece with contrasting matt black-and-white slip surfaces offset against a single area glazed in vibrant red. My local supplier recommended a food-safe, non-toxic red glaze, Mayco's Stroke & Coat Cone 06.

Early Experiments

Early tests resulted in pieces with dramatic and beautiful contrasts between my porcelain slips and the red glaze. In one test, I used Stroke & Coat SC-73 Candy Apple Red, to highlight areas of bisqueware. In another, I used SC-74 Hot Tamale. Sometimes I applied the glaze with a big brush in a single, expressive stroke. Other times, I squeezed the colors from a slip trailer and a turkey baster.

After these loose applications, I dipped the entire piece in my usual cone 6 glazes. Because of their gum content, the commercial glazes resisted my glazes slightly, making the bold strokes of color come through vividly. Stroke edges were blended and their colors softly striking against the cone 6 palette. The outcome was as satisfying technically as it was aesthetically; I was satisfied with the melt (Stroke & Coat is a glaze, not an underglaze), the color and

the absence of pinholing or other major flaws at cone 6.

A New Tool

Further experiments with sgraffito, layering, mixing with slip and stoneware glazes, and multiple firings have opened up commercial glazes as a new artistic tool—albeit an unexpected one—to share with students. They have learned the importance of experimenting with new surfaces, new materials, combining techniques and achieving balance with different kinds of material.

If you'd like to experiment with commercially prepared glazes, I've included three of my projects for you to try. Mixing my own recipes will always be an important part of understanding the science behind the art of pottery making. But successfully integrating commercial glazes in the mix is just one more way to pursue the function and beauty of ceramics.

Asparagus Tray

Pouring

Squeeze a large amount of Stroke & Coat SC-73 Candy Apple Red across the interior of a bisque-fired bowl. Use a 2-inch brush to apply a thin coat of Mayco's Elements Chunkies EL 203 Coal Dust (this is a low-fire effect glaze with crystals) over the Candy Apple Red.

A nice feathered edge is created when the piece is dipped into a cone 6 black glossy glaze.

Carving

Apply a thick coat of Mayco Stroke & Coat SC-71 Purple-Licious and SC-74 Hot Tamale with a large brush to the interior surface of a leather-hard bowl. Once the colors are slightly dry, the design is carved through the glaze with a loop tool, then bisque fired to cone 08. Dip the entire piece twice in a cone 6 matt white glaze and fire to cone 6 in oxidation. The commercial colors show well through the white matt.

Note: If the carved lines are too fine they may fill in when the glaze melts.

Fish Bowl

Gear Dish

***Gear Dish*, slab-built stoneware.**

Layering

On a heavily textured, bisque-fired piece, apply a cone 6 porcelain black slip as a stain, wiping off the high spots with a damp sponge.

Use a 2-inch brush to apply Stroke & Coat SC-71 Purple-Licious to the high spots with a dry brush technique. Next, dry brush Mayco's Stroke & Coat Red SC-74 Hot Tamale and SC-27 Sour Apple onto the interior. Apply a thick coat of the red glaze in isolated areas to obtain a bright color.

Apply wax resist to the interior surface of the piece and allow to dry. Dip the entire piece in a cone 6 blue glaze.

The Mystery of Crystals

by William Schran

Four vessels, to 8 inches in height, thrown B-Mix clay. Glazes are as follows. Left to right: Fa's Cone 6 Base (Revised) glaze with 3% manganese dioxide and .5% cobalt carbonate; MFE (Dan Turnidge Revised) glaze with 3% manganese dioxide and 1% cobalt carbonate; Fa's Cone 6 Base glaze revised with 3% manganese dioxide and .5% cobalt carbonate; and MFE (Dan Turnidge Revised) glaze with 3% manganese dioxide and 1% cobalt carbonate.

My fascination with macrocrystalline glazes began as a graduate student. While visiting a local exhibition of an individual's collection, I discovered two small porcelain bottles by Herbert Sanders. The glazes appeared to have blue colored snowflakes frozen on a transparent sky of orange. From that initial encounter, macrocrystalline glazing has become a process that I've revisited many times over the years.

Sanders had published *Glazes for Special Effects* in 1974, which contained recipes for crystalline glazes. In 1976, I began experimenting with several recipes listed in the book, but since it was difficult to fire our electric kilns to the required cone 9–10 temperature range, I had little success. An article by David Snair in *Ceramics Monthly* provided additional glaze recipes and techniques for preparing the pots for firing. Though all the recipes were for cone 9, a comment in the article stated that firing to cone 6 would also produce crystals. I had some limited success with these glazes, but that comment stuck in my head.

Fast forward to 1994. Discussions of glazes with a group of my students lead to a question about crystalline glazes. This one question resulted in a semester-long series of glaze tests that resulted in few successes. It was the problem I had encountered years before, our electric kilns only reached cone 9–10 with much difficulty. The lack of success producing crystals by my students only strengthened my resolve to find a solution. It was then, that I recalled the Snair article and the comment about cone 6.

With additional information gathered through Internet searches and interlibrary loans, I discovered some artists experimenting with crystalline glazes at lower temperatures. Since we conducted our glaze firings to cone 6 at school, I decided to target this temperature for my testing. My initial

experiments involved firing cone 10 glaze recipes only to cone 6. These tests resulted in the discovery that crystalline glazes could be produced in this lower temperature range by simply introducing additional fluxes. The flux that seemed to produce the best results was lithium carbonate. Other materials that would function as a powerful flux were either soluble or contained additional silica and alumina, which are not desirable in crystalline glazes.

All of my experiments with crystalline glaze firings, up until fall 2006, have been done in a manually operated electric kiln. The kiln has infinite controls, so with careful monitoring, I was able to control the firing schedule fairly accurately. A digital pyrometer is an essential tool to closely track temperature changes, especially during long holding cycles. Acquisition of my first kiln with a programmable controller has allowed for more complicated, repeatable firing schedules. The ability to be able to alter temperature ramp speeds and specific temperature hold times have opened up new avenues of experimentation. I have also found that, for both types of kilns, a direct vent system is important for rapid cooling cycles and maintaining an oxidizing atmosphere.

Crystalline Technique

I've developed techniques through years of experimentation, adopting processes that worked, eliminating those that produced only limited success. Web searches and recent publications provide a variety of approaches to this very involved process, and each individual needs to conduct tests to find the process that makes the most sense for his or her particular circumstances.

Crystalline glazes produce the best results when applied to a smooth white clay body. Many artisans work with a porcelain clay body. Porcelain comes with its own set of issues and I have found a cone 10 porcelaneous stoneware clay—B-Mix or Bee-Mix—that works very well with my glazes. I chose to use a cone 10 clay to reduce the amount of alumina that might be picked up by the glaze.

A normal glaze has a mix of silica/flux/alumina in a ratio that provides a glassy surface and remains in place when melted on a vertical surface. A crystalline glaze contains little or no alumina, which would inhibit crystal growth. The glaze is comprised of silica, flux and a saturation of zinc oxide. This highly fluxed mix of materials leads to a very fluid glaze and steps must be taken to avoid destroying kiln shelves or the kiln.

Catch Basins and Pedestals

Every pot must have its own catch plate/basin to contain the glaze that runs off the pot. The catch plate need not be made from the same clay as the pot. The plate can be wheel thrown or hand built. Each pot must also have some type of pedestal device to facilitate re-

Crystalline glazes run off the pot so you need to raise the piece on a pedestal that sits in a catch basin. It's important to select a pedestal that closely matches the diameter of the foot. Preparing several sizes allows you to select one with the correct fit.

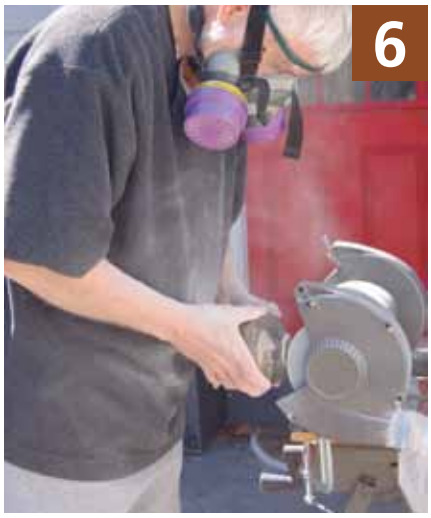
Apply three to four coats of glaze to achieve the desired thickness, brushing each layer in a different direction to ensure that brush strokes aren't visible and you have an even coating.

Pieces ready to load in the kiln. Each glazed pot is positioned on a pedestal that is placed in a catch basin.

After the firing, the fluid glaze will have run down over the pedestal and into the catch basin.

moval of the pot after firing. Some potters use insulating firebrick to create the pedestal. The brick must be at least a 2600K-type and coated with kiln wash. Another technique involves throwing the pedestal from the same clay body as the pot. After bisque firing, the pedestal is attached to the pot with a mix of white glue, which holds the pedestal in place before firing, and kaolin, which acts as a separating agent after firing. Striking with a sharp chisel or heating with a small torch just below the joint with the pot removes the pedestal. After encountering a number of problems with each of these

The pedestal and catch basin are removed by tapping with a small chisel along the line where the pedestal joins the pot.



Excess pedestal material and glaze are ground off the bottom using a bench grinder fitted with a silicon carbide grinding wheel.

methods, such as pots falling over or broken foot rings, I sought another solution. Ellie Blair, a fellow crystalline artist, provided this process to me—the pedestals are a mix of equal parts by volume: alumina, kaolin and sawdust. Add just enough water to bind the materials and form the mix into ¾-inch thick "biscuits" cut to the foot diameter of the bisque fired pot using round cookie cutters. I've found this material to stand up well to the melting glaze and soft enough to be easily knocked off with a chisel. Any remaining pedestal is easily ground away from the pot.

Glaze Application

Crystalline glazes may be applied like most other glaze, but since I don't have spray equipment or room in my studio to store large

I use a portable flat lap machine fitted with diamond grinding and smoothing disks to even out and smooth the bottom of the foot with 100 and 260 grit disks. Since water is used in this process, I do this in the studio, but still wear eye protection. Self-adhesive diamond disks or silicon carbide disks can be attached to plastic bats and the potters wheel used to grind and smooth the bottoms.

WARNING

Proper eye and respiratory protection must be worn during this process. Do all grinding outside the studio, if possible.

buckets of glaze, I apply crystalline glazes by brush. Most of the time I mix a few hundred grams at a time, which is sufficient to glaze two or three small pots. Since the crystalline glaze contains no added clay to keep the glaze in suspension, you don't want to add just water to wet the glaze. To wet the glaze, I use a CMC gum solution by adding about two heaping tablespoons of CMC powder to one quart of hot water. I let the powder soak into the water for at least 24 hours. The soaked gum is then stirred, resulting in a thin honey consistency. I add this to the dry glaze, stir and pass through 40 mesh, then 80 mesh sieves. The wetted glaze should have the consistency of thick honey.

Apply the glaze fairly thick. I apply one coat by brush horizontally around the pot. When that dries, I apply a second coat vertically, then a third coat in a diagonal direction to the upper ⅔ of the pot. Sometimes I'll apply a fourth coat to the top.

On the interior of vase/bottle forms and on the exterior of bowls, I use a cone 6 stoneware glaze. I selected a glaze that fits my clay body to create a watertight seal. With a crystalline glaze on just the interiors of bowls, I don't have be concerned with pedestals or catch plates.

Firing

Pots, with their pedestals and catch plates, are loosely loaded in the kiln. In my 4 cubic-foot-kiln, I will have at the most a dozen pots. Avoid using too much kiln furniture. It takes more energy and time to heat and cool kiln furniture than it does the pots. Always use witness cones in every firing. Even if you fire with a programmable kiln and don't look at the cones during the firing, they will be the best record of the firing. Keep meticulous notes of every firing. Keep a logbook of your firings and cross-reference each glaze to its firing. Fara Shimbo and Jon Singer gave the best advice during a presentation at the Lattice Structures Crystalline Glaze Symposium in fall 2005: When you're testing, change only one thing at a time. If you alter the glaze in any way, change only one amount or material at a time. Do not change anything else. If you alter the firing schedule, do not change the glaze until you see what change the firing has made.

Should the pot come out of the firing with few or no crystals, take heart and give it another chance. If the glaze has not filled the catch plate, simply apply another coat of the same glaze or a different glaze and fire it again. Should the catch plate be filled with glaze, it will be necessary to remove the pot from the pedestal, grind the foot even and create another pedestal and catch plate. I have refired some pots up to five times before I achieved results that were to my satisfaction.

Cleanup

After the firing, knock the pedestal loose with a small chisel or screwdriver. Strike the pedestal material, not the joint between the pots and pedestal. I use a bench grinder

fitted with a silicon carbide grinding wheel to remove any remaining pedestal material and glaze. I do all of my grinding outside and I always wear proper eye and respiratory protection. After coarse grinding, I use a portable flat lap fitted with diamond disks to even out and smooth the foot. Silicon carbide disks and diamond disks with self adhesive backing can be attached to plastic bats and used on the wheel to grind and smooth pot bottoms. Squirting or spraying with water while grinding will help keep down the dust.

Firing Schedule

Use one of the following firing schedules for cone 6 crystalline glazes. You will need to experiment to determine the best firing schedule for your kiln. The ability of the kiln to respond to rapid heating and cooling ramps is a critical factor in successful crystalline glazes. Kilns should be loaded loose, using as little kiln furniture as possible. Older, well-used elements may not be able to keep up with programmed demands of the kiln. I've found heavy duty elements begin to be unable to keep up with the programmed firing schedule after about forty crystalline firings.

Bottle, 7 inches in height, thrown B-Mix clay, with Fa's #5 (Revised) glaze with additions of 4% manganese dioxide and 1% cobalt carbonate.

For Manual Kilns with Infinite Control

- Low – ½ hour
- Medium – ½ hour
- High – cone 6 over
- Turn off kiln, cool to holding temperature (1850°F–1880°F)
- Turn on kiln to a medium setting and monitor closely.
- Try to maintain the holding temperature for 3–4 hours.

Each section of the kiln may need to have a different setting to maintain a constant temperature. For my kiln, a setting of #3 on the top and middle section, and "M" setting on the bottom section provided a fairly consistent reading.

For Programmable Kilns

Note: My kiln uses an "S" type platinum thermocouple with the thermocouple offset turned off. Each kiln may indicate a different temperature when cone 6 bends over. Use witness cones and closely monitor them until the correct peak temperature is determined.

- Increase temperature 350°F per hour to 700°F
- Increase temperature 750°F per hour to 2000°F
- Increase temperature 150°F per hour to 2210°F (this puts cone 6 over, cone 7 at 1 o'clock position)
- Hold at 2210ºF for 10 minutes
- Cool down 750°F per hour to 2000°F, hold for 1 hour
- Cool down 750°F per hour to 1900°F, hold for 3 hours
- Kiln off, vent off, total firing 9–9½ hours

Higher holding temperatures results in fewer but larger crystals with more ground (areas without crystals) exposed.

Crystalline Base Glazes

MFE (Dan Turnidge Revised)

Cone 6

Ferro Frit 3110	50.0	%
Silica (325 mesh)	22.5	
Zinc Oxide	22.5	
	95.0	%
Add: Lithium Carbonate	1–5.0	%

Fa's Base (Revised)

Cone 6

Zinc Oxide	25.0	%
Dolomite	5.0	
Ferro Frit 3110	51.0	
Silica (325 mesh)	19.0	
	100.0	%
Add: Lithium Carbonate	2–4.0	%

Fa's #5 (Revised)

Cone 6

Zinc Oxide	27.0	%
Talc	5.0	
Ferro Frit 3110	50.0	
Spodumene	4.0	
Silica (325 mesh)	14.0	
	100.0	%
Add: Titanium Dioxide	2.0	%

Colorants

Add the following colorants individually or in combination:

Cobalt Carbonate	0.25–3.0	%
Copper Carbonate	0.5–6.0	%
Manganese Dioxide	0.5–3.0	%
Iron Oxide	0.5–3.0	%
Rutile	0.5–3.0	%
Nickel Oxide	0.25–3.0	%

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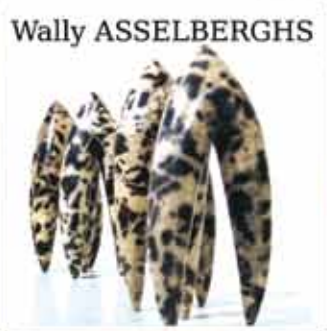

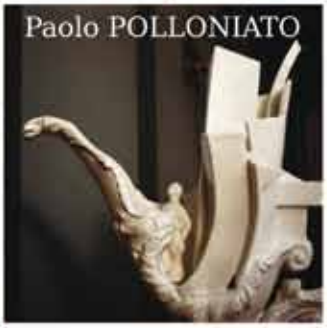

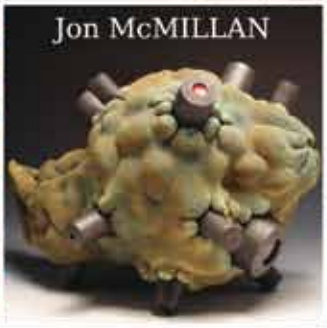

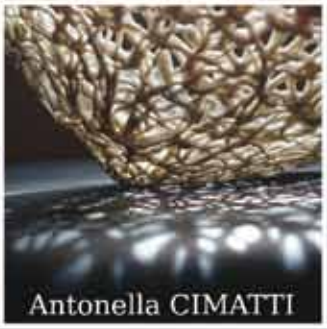

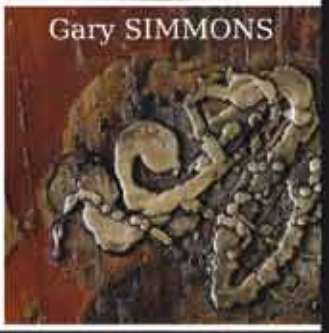

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