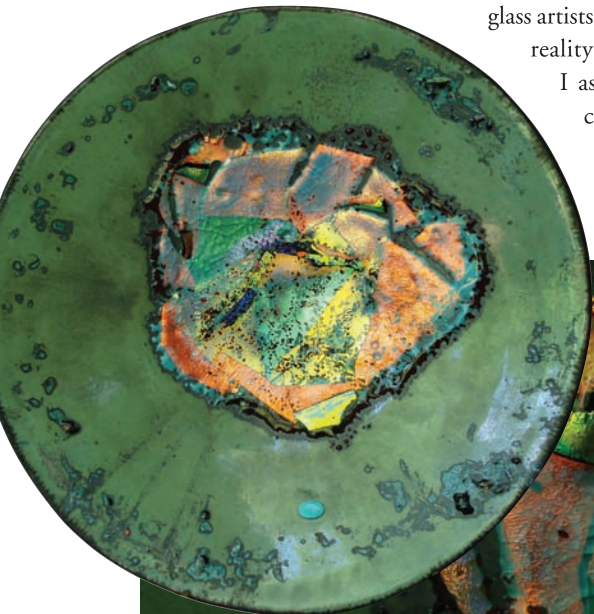
The Fusion of Clay
and Dichroic Glass

by Alfred Spivack

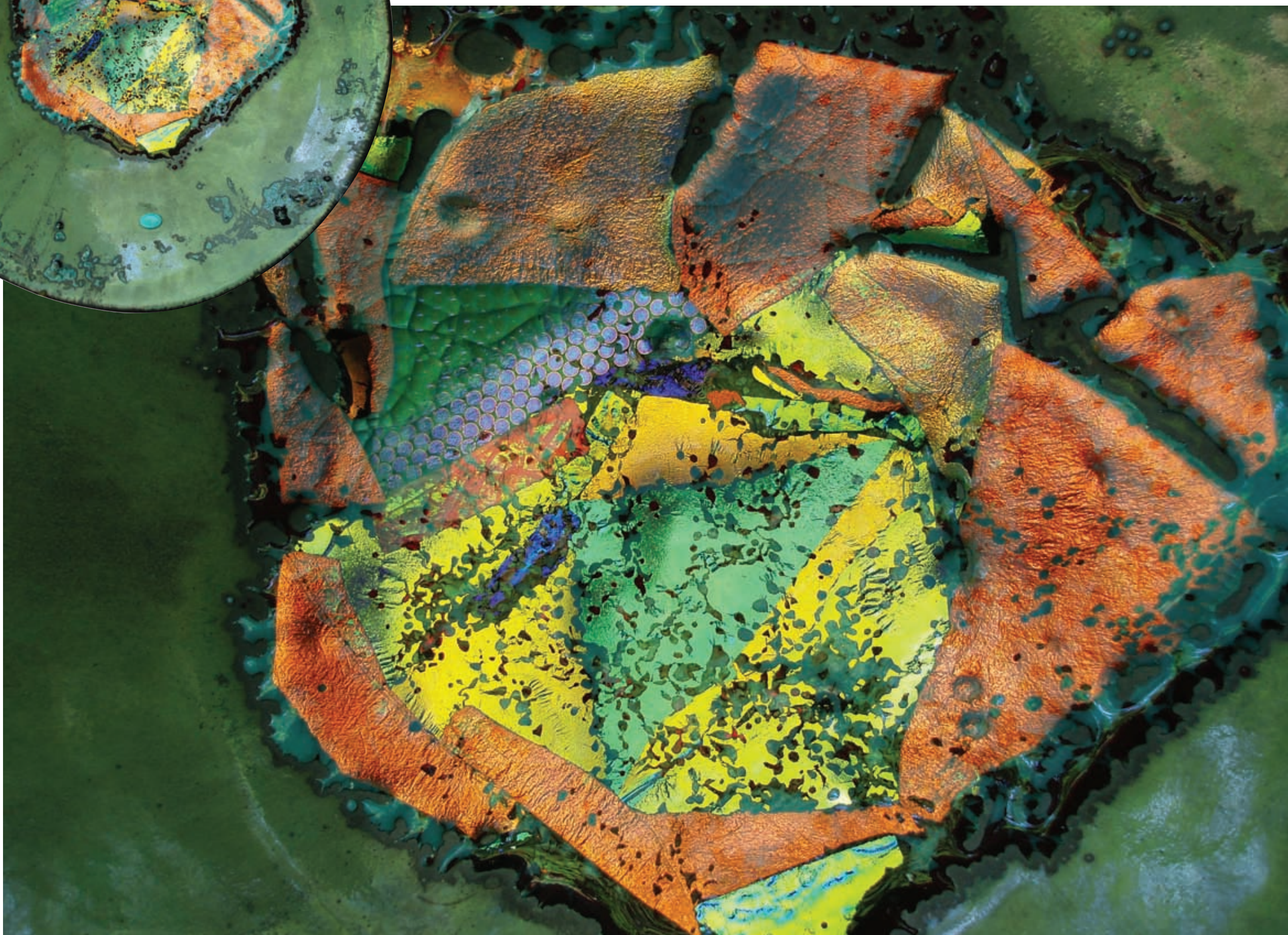
As a youth, I was fascinated by the way light produced a rainbow of colors in kaleidoscopes and when passing through the optical prism. To me the finding and unlocking of colors is magic. It was no surprise that my first exposure to dichroic glass art works drew me in to view them at multiple angles and experience the color changes.

As I looked at squares of clear-backed dichroic glass directly, I saw brilliant reflections of light, and as the glass was rotated I could see the translucency, transparency and color changes. My response to the beauty of the glass was to consider the possibilities of adding it to ceramics. After all, why should the glass artists have all the fun? The reality check came when I asked experts in both ceramics and glass about combining the dichroic glass with clay. The answer was that it wouldn't work because there are too many variables in the expansion and contraction of differing media. I was also warned that dichroic glass would burn off at clay firing temperatures. Looking back on my years as a cardiologist, however, it occurred to me that I had heard that futility message before and realized that some of the successes in my medical career came from taking the road not taken.

Dichroic glass is glass coated with a thin film of metallic oxides, such as titanium and combinations of other metals, which have been vaporized by an electronic beam. The coatings allow certain wavelengths to be reflected and others to be transmitted. The term dichroic relates to having multiple colors. The technology came from the space industry and subsequently found its way into glass art. For its use in ceramics, I visualized glaze painting on ceramic



Left: Platter, 15 in. (38 cm) in diameter, thrown stoneware fired to Cone 6 then refired with glass following the program outlined in the Monthly Methods sidebar on the opposite page. The glass is composed of multiple colors of glass frits and random pieces of dichroic glass. Below: detail of glass area.



surfaces and fusing the glass over the images in order to create a window of varying images. Once the process was made to work, combinations of sheet glass and dichroic glass could be used. With the use of a ring glass cutter (I use the Taurus 3, which can be found at www.geminisaw.com), the shapes and forms that can be created are endless. I hoped to entice the viewer into walking around the art work in order to view the changing visual effects of the glass-surfaced clay. The only detail to be worked out was how to make the fusion work and preserve the surface and shape of the glass. After all, it is not a problem to melt glass into liquid form and make it stick.

Finding a low-fire program to use for glass fusing on the already-glazed and fired ceramics was the challenge. My plan to attempt fusion was to start at the extremes of high and low temperatures and work toward a satisfactory program. Knowing that glass slumps at 1300°F (704°C) and is liquid at the temperatures of clay vitrification, I determined to first bisque and then glaze and fire the ceramics. Starting with Cone 06 as the highest temperature and working downward, a satisfactory program evolved after many firings. It appears that staying below 1500°F (815°C) preserves the shape and surface of the dichroic and thin sheet art glass. Firing at higher temperatures is more likely to burn off the dichroic surface layer and create bubbles.

A few companies manufacture art and dichroic glass. I have chosen to use Bullseye thin glass (www.bullseyeglass.com) in both the dichroic and colored sheet glass. Compatibility of glasses in multilayered glass fusion is important and necessary for optimal fusion.

At first I used single squares of dichroic glass applied to the ceramics with commercial GlasTac, a glue used in glass kiln forming that holds pieces in place prior to firing. The previously glazed and fired ceramics were fired again at the lower temperatures. As I became more confident with the process, I used multiple layers of glass and began to cut forms and designs. With dichroic glass, the coating is only on one surface. In order to determine top and bottom, hold the glass to light and look at the edge. On the top, the film extends to the edge, while the undersurface shows a clear edge from the thickness of the glass.

I have found that the larger the individual piece of glass and the more heat that is applied (determined by both temperature and duration of heat) the more likely the result will show bubbles in the glass. The bubbles are probably the result of thin spots created in the glass from excess heat and trapping of air when the glass cools. Initially I used low-fire glazes on the clay, thinking that the lower-firing glazes would help with better fusion, I now use a variety of low- and high-fire glazes and have even fused glass to unglazed clay. If I am not satisfied with the resultant design or bubbles have occurred, I refire with additional glass, glass frit or a combination. In the five years in which I have been fusing glass to clay, I have not had glass pop off, which is what I was told would happen.

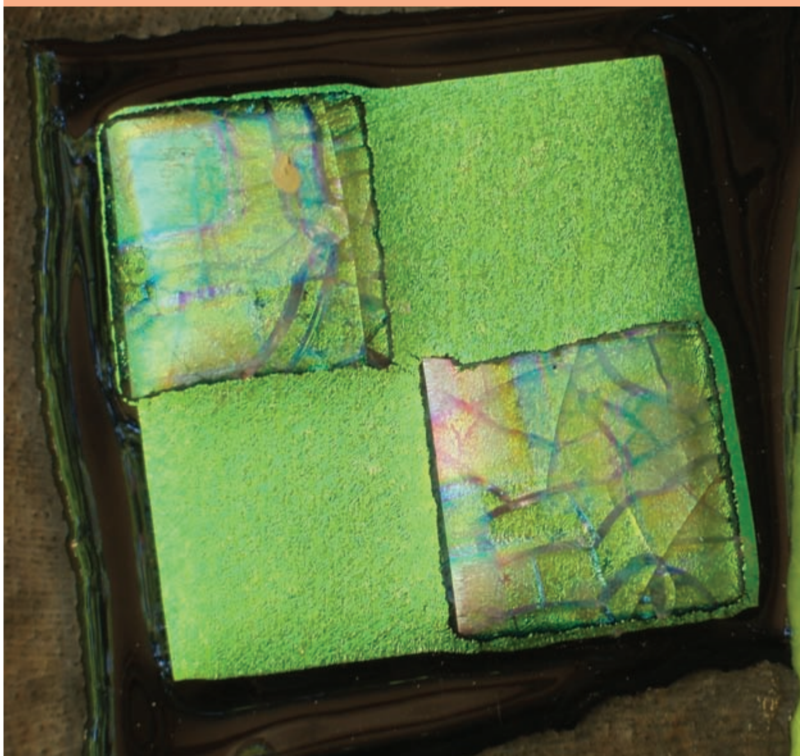
Once the techniques of fusion are shown to be reliable, there are endless possibilities of composition. Using a ring cutter makes it remarkably easy to cut complex forms of glass and, if used properly, seems to have a good degree of safety. The possibilities then are those of the skill and imagination of the artist.

FIRING FOR FUSION

The program that follows should be viewed as a starting point. Each kiln will have its own properties and, depending on the complexity and size of the glass pieces used, the slumping, annealing and fusion times may need to be adjusted. Having a kiln with a computer allows the stages of the program to be preset on the ramp-hold portion of the kiln computer. The highest temperature that I currently use is 1450°F (787°C) with a hold period of 15–30 minutes. This level preserves the shapes and surfaces of the glasses and allows the layers of glass to fuse to the clay surface and to each other and lessens the problem of bubble formation. I currently do the annealing of the glass during the cooling phase at 950°F (510°C) and hold for 30–45 minutes. CAUTION: Do not open the kiln for a peek. I wait a day after the firing is finished and let the kiln cool to room temperature.

I currently use a five-segment ramp-hold program, which is set on the computer control of my kiln:

Segment 1: 150°/hour to 750°F
Segment 2: 200°/hour to 1150°F
Segment 3: 250°/hour to 1450°F, hold 15–30 minutes
Segment 4: 300°/hour to 950°F, hold 30–45 minutes
Segment 5: 300°/hour to 150°F
Then let the kiln cool until the contents are at room temperature.



Detail of thrown stoneware platter with bronze glaze, fired to Cone 8, then refired with glass following the program provided above. Three layers of glass were simultaneously fired to create this effect.