

# Stained Glass

The highly developed art of creating pictorial windows from small pieces of colored glass reached its peak in the churches of the Middle Ages. Colored glass was made by adding various metallic oxides to the molten glass mix; the glass was formed into sheets, and then pieces of this glass were cut into appropriate shapes. The components were finally assembled in soldered lead frames to form a decorative mosaic of colored light. Religious themes dominated virtually all stained glass production until after the Renaissance, when secular buildings also began to make use of the art.

The use of decorative glass in windows dates from ancient times. Throughout the Roman Empire, clear window glass was used in the *caldaria*, or "hot rooms" of the Roman baths, as a means of confining the heated air while admitting light. The Romans knew how to make colored glass and manufactured many colored glass vessels, but no windows made of colored glass have been found to date. In early Christian times, writings by the Byzantine court usher and poet Paulus Silentiarius describe colored glass pieces set into stone or stucco to create the "pierced screens" of Byzantine churches; some of these screens have survived to the present day in Moslem mosques.

The practice of assembling small pieces of colored glass in metal frames to form artistic patterns did not appear until about the 10th century. The earliest reference to a true stained glass window appears in a contemporary manuscript that describes the building of the French royal coronation church in Reims, which was completed in 988.

By the 12th century, Gothic architectural innovations allowed major development of stained glass as an important art. Gothic churches incorporated larger windows, providing larger expanses for stained glass mosaics and greater illumination in the formerly dim cathedrals. In fact, stained glass church images provided a means for the mainly illiterate population to learn stories from the Bible.

Since stained glass was so expensive, few secular buildings could afford to incorporate it into their designs. Thus, stained glass windows were used almost exclusively in churches until about the 16th century. Even many churches received insufficient donations for more than one or two stained glass windows, leaving all other windows to be made of clear glass.

Medieval stained glass is usually called "pot metal" glass because the coloring, usually from metal oxides, was added directly to the molten glass in the melting

pot. Cobalt oxide gave a blue color, manganese oxide gave purple, antimony oxide yielded yellow, iron oxide yielded red, and copper oxide produced ruby red. The ruby glass was so deeply red, however, that it was nearly opaque. In order to obtain sufficient transparency, medieval glassmakers "flashed" small pieces for stained glass windows—i.e., they dipped still-pliant clear glass into the molten ruby glass, coating the outside with a thin layer of red. Flashed ruby glass allowed stained glass artists to create unusual detail effects by grinding away parts of the ruby outer coating to the clear glass underneath. Today, this technique is done primarily by etching with acid.

Glassmakers and stained glass artists were usually two different craftspeople. Glassmakers set up their shops near a forest, with the plentiful firewood, ash, and sand necessary for manufacturing glass. The glassmaker would blow a bubble of glass, manipulate it into a tubular shape, then cut off the ends to form a cylinder of red-hot glass; he then slit the cylinder lengthwise and unrolled it into a thin rectangular sheet of glass, usually about 10 by 12 inches (25 by 30 cm). These sheets of colored glass were then shipped to the waiting stained glass artists.

Stained glass artists had to travel and work at the construction sites of various churches. An artist made a small colored sketch of the window design to act as the guide during assembly. Then, on a board

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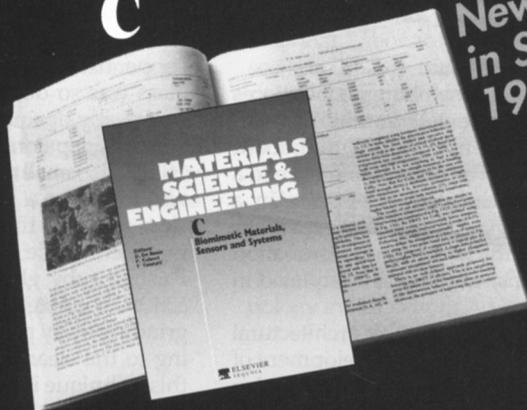
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## HISTORICAL NOTE

whitened with chalk, an actual-size drawing of the window—called a cartoon—would show the exact shapes and placements of the pieces of each color of glass.

To cut the sheets of colored glass to the required shapes, the stained glass artist would lay the glass on the cartoon and trace the outline of each segment with black paint. Then, dampening the area with water, he cut (or cracked) into the painted trace line with a red-hot iron point. Applying the red-hot point to the edge of the glass sheet, the cutter could start a crack that would more or less follow the direction of the hot point—but much glass was wasted this way. The glasscutter could then shape the rough piece more accurately by cracking away small pieces from the edge with a tool called the “grozing iron.” By the 16th century, a much more effective diamond tool had been invented for cutting small glass pieces.

Once the pieces had been cut and shaped properly, the window was assembled. Grooved strips of lead (with a cross section shaped like an H) held the pieces in place. The joints between each lead strip were soldered. A weatherproofing putty was rubbed under the lead strips—then the entire window could be installed in the cathedral. Since the lead strips were so flexible, large windows had to be segmented in iron frames, which were then put together. Some windows reached gigantic size—the stained glass window at Chartres Cathedral covers over 250 square feet (23.2 square meters).

After the 13th century, the art of stained glass began to decline. Due to the cost and complexity of manufacturing potmetal glasses, many new churches settled for illustrative windows that were simply painted with glazes or stains of various colors. This technique is primarily found in Italy and Germany (especially Cologne). Also, artistic styles shifted to more realistic portrayals of figures, a task for which actual stained glass was not well-suited. Stained glass suffered further during the 16th and 17th centuries as Protestantism discouraged “iconography” and the depiction of religious figures.

After the Renaissance, stained glass found some uses in secular buildings as well as in churches, though its importance steadily declined until the brief Gothic revival in the 1800s. Today stained glass is occasionally used in modern buildings in conjunction with concrete, but it is rare to see a true stained glass window made by the technique that was so popular during the Middle Ages.

KEVIN J. ANDERSON

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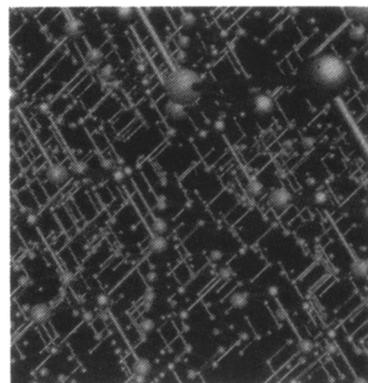


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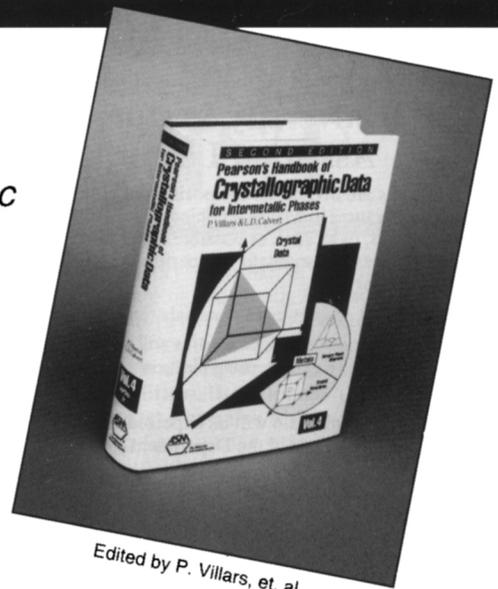
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