Interpretations of the natural world in art are as old as art itself. And flowers, with their varying beauty, are frequently a favorite subject. It is difficult to imagine that objects as delicate and graceful as flowers can be beautifully depicted in glass, a material often thought of as cold, sterile, and rigid. But glass artists are able to recreate the elegance of flowers in this challenging medium using varying techniques. *Garden of Glass* explores several of these methods, including lampwork, acid etching, enameling, millefiori, intaglio and mold blowing.

**Cameo Glass**

Cameo glass is a type of glass featuring designs in relief created through a reduction process. Each cameo glass piece starts out with two or more contrasting colors of glass, one on top of the other. The outer layer(s) are removed by any combination of acid etching, carving, wheel cutting, or engraving. This process reveals the underlying color(s). Cameo carving is an ancient technique used by the Egyptians and Romans, but it was revived during the nineteenth century, most notably by English and French glass houses. English cameo glass often features figural and classical imagery, including individuals from Greek and Roman mythology. French cameo glass is more likely to depict the organic lines and subject matter indicative of the Art Nouveau movement.
**Enameling**

**Enameling** is the process of decorating the surface of glass with colors, called enamels. Enamels are usually made from a mixture of finely powdered colored glass and metallic oxides that are suspended in a liquid medium. The liquid color is usually applied to the surface of glass with a very fine brush, and can depict figures, scenes, and inscriptions. Once the enamel is applied to the piece of glass, the piece is exposed to a low-temperature firing, which causes the liquid medium to burn away and also creates a bond between the applied color and the glass, making the enamel a relatively permanent feature of the finished piece.

**Gilding**

Decorating the surface of glassware with gold leaf, gold paint or gold dust is called *gilding*. The gold is usually suspended in a liquid medium and is painted onto the surface of the glass. Two methods of gilding are honey gilding and mercuric gilding. In honey gilding, honey is the liquid medium in which the gold is suspended. Low-temperature firing causes the honey to burn away and the remaining gold to fix to the surface of the glass. Honey gilding produces a dull but rich effect. Mercuric gilding is done by applying an amalgam of mercury and gold to the surface of glass. A firing will cause the mercury to evaporate, leaving behind the applied gold with a thin, metallic brassy appearance. The gilding created by both methods can be burnished to create a brilliant shine. Mercuric gilding is a very dangerous process that is rarely used in the present day because of the highly toxic mercury fumes that are created during the firing. Gilding closely resembles *enameling*, although enameling features finely powdered, colored glass suspended in a medium that burns away during firing.
**Floriform Vessels**

Floriform vessels suggest flowers with their very shapes. Although some are more detailed than others, they are generally created not to represent a specific flower species, but to suggest a general form. While some examples simply showcase the shapes that can be created by the glass artist, others also utilize different colors of glass to imitate the petals, sepals and stems of delicate blossoms.

**Millefiori**

Millefiori (literally, “a thousand flowers”) is a method of decorating glass using slices of colored glass canes. Canes are groupings of multi-colored, thin rods that are fused together by heating to form patterns that can be seen in cross section. The slices of canes can be fused together in patterns and cased in clear glass, as in millefiori paperweights, or they can be applied to the surface of glass pieces and marvered (pressed into the existing piece) to create a smooth, patterned surface, often resembling flowers.

**Lampwork**

Lampwork is the technique of manipulating rods or tubes of glass into shapes by heating them with a flame. While early lampwork was done at the flame of a lamp, most artists now use gas burners, and consequently, the term torchwork is also used for the technique. The hot glass can be drawn out, pinched with tongs or shaped in other ways to form flowers, fruit, animals, or any number of objects, limited only by the artist’s skill and imagination.
**Pressed Glass**

Pressed glass is formed by placing a gather of molten glass into a mold and then inserting a plunger into the mold. The pressure of the plunger forces the hot glass into the nooks and crevices of the mold. Unlike mold blown glass, in which the interior of the vessel mimics the mold, mold pressing enables the exterior and interior of the resulting vessel to have shapes independent of each other.

Pressed glass was first developed in the United States during the 1820s and 1830s and was a much more cost effective way to mass-produce glass objects than hand-blowing or mold-pressing. Early pressed glass mimicked the forms of brilliant cut glass, and enabled the middle-class to have beautiful pieces of glass for a fraction of the cost.

**Intaglio**

Intaglio is a specialized form of engraving in which a design is cut below the surface of glass, creating the illusion of elevated designs. This process creates designs that are sunken, instead of protruding from the surface, and in fact is sometimes called “hollow relief.” Intaglio can be used with layered, contrasting colors of glass to expose the hidden layer. In this treatment, the intaglio process is the opposite of cameo, because the design is depicted in the exposed portions of the inner layer, rather than in the remaining portions of the outer layer.

**Mold Blown Glass**

Mold blown glass is formed by placing a parison (bubble) of molten glass into a mold while it is still attached to the pontil, and blowing the glass inside the mold. The exterior of the glass vessel takes on the shape and decorations on the inside of the mold, as well as any color that may have been previously deposited inside the mold. This process can also be done with a machine that fills the parison with air while it is inside the mold. Mold blown glass was largely replaced during the mid-1800s with much more economical pressed glass.
Acid Cutback Glass

Acid cutback is a specialized type of cameo glass developed at the Steuben Glass Works in Corning, New York during the late 1920s. Acid cutback features two contrasting layers of glass (but sometimes one layer only), usually in a bold, geometric pattern, without the three-dimensionality and depth of field present in the more traditional French and English cameo.

The acid cutback decoration is created by transferring a pattern to the surface of the finished piece of glass and then applying an acid-resistant coating that follows the pattern. The portions of the glass not protected by the acid-resistant coating are removed through acid etching when the surface of the piece is exposed to hydrofluoric acid. Acid cutback pieces were only produced by Steuben from approximately 1927 until around 1934.

Intarsia

Frederick Carder, co-founder and head designer of the Steuben Glass Works called Intarsia his greatest achievement in artistic glass. Intarsia glass was created using several steps. First a gather of clear glass was cased by an outer layer of colored glass. Portions of the outside, colored layer of glass were removed in a pre-determined pattern using acid etching. The piece was then dipped in a third, clear layer of glass, sandwiching the colored pattern between the two clear layers, and the piece was then reheated and blown into the desired shape, stretching the pattern and giving it a transparent look. Because the process was so complicated and difficult, there was only one gaffer (highly skilled glass artist), Johnny Jansson, at the Steuben factory who could successfully create the pieces. This difficulty also meant that production lasted only a very short time during the late 1920s, and fewer than 100 pieces are known to exist.
**Paperweight Technique**

A vessel that includes decoration suspended in a clear gather of glass and then surrounded by a clear casing is said to be made with the **paperweight technique**. The technique was developed by Louis Comfort Tiffany ca. 1900 and is similar to that used in forming glass paperweights, but was used to make vases, bowls, lamp bases, and other types of vessels. Often, the decorations encased in the vessels incorporated **millefiori** designs, but also used other glass inlay techniques. The clear casing of each piece creates a great depth which is often compared to an underwater view. Tiffany used the designs of these vessels to express his love of nature, and of flowers in particular. The morning glory design, created by millefiori, is one of the most well-known paperweight vessel motifs.

**Applied Decoration**

Heated glass elements that are added to the surface of an object after it is formed are called **applied decoration**. The applied decoration can be created using many different techniques, such as trailing hot glass along the surface to form **floriform** designs, or attaching heated **lampworked** pieces to the surface. **Matsu-no-ke** is a glass design created by Frederick Carder during his time as a designer at Stevens & Williams during the 1880s and revived by him at the Steuben Glass Works during the 1920s, where he was the co-founder and lead designer. Matsu-no-ke features clear, Japanese-stylized blossoms applied to a vessel of contrasting color. Applied decorations can also be stamped after their application, or marvered (pressed by rolling) into the object’s exterior to form a smooth surface. A blob of glass that is applied to a glass object is known as a **prunt**. Prunts are often found on the exposed undersides of glass objects, and are used to camouflage the pontil mark that is left when a blown glass object is removed from the pontil rod.
**Acid Etching**
Decoration on the surface of glass created by the application of hydrofluoric acid is called **acid etching**. The decorative pattern is created by covering a finished piece of glass with an acid resistant material (usually a wax), and using a sharp tool to remove areas of the coating. When the piece of glass is exposed to the acid, the portions not covered by the acid material are partially corroded, leaving behind impressions that can vary from a satin mat finish to a deeper, rougher effect. Acid etching can be used to create definition in a single color of glass, as well as in the making of **acid cutback glass** and **cameo glass**.

**Engraving**
*Engraving* is the process of decorating glass by cutting into its surface using a sharp implement such as a rotating wheel with a blade of copper, or a diamond-tipped hand tool. The process usually begins with the transfer of the intended pattern to the surface of the piece of glass with India ink or some other method of marking. The engraver then produces the final design by following the pattern and removing small amounts of glass where indicated. Just as in **acid etching**, engraving can be used to create definition in a single color of glass, or to remove an outer layer of glass of one color to reveal the contrasting color below, creating a **cameo** or **intaglio** effect.