

ART

Why do artists make art with GLASS?

Line, shape, color, texture, and space are all visual art elements that can be explored in glass. Glass is the ordinary functional jars we use every day or the exquisite goblets of Kings. It can be solid or fragile, sharp or smooth. It can transform light and can be shaped and used in infinite creative ways.

What are some of the challenges in making art with GLASS?

Safety! When glass is hot, you can manipulate it in many ways, but you cannot touch it! Chemicals used to make glass can be toxic. It takes expensive, specialized equipment in order to melt glass. Hot shops are few and far between. The technical skill required to make an artistic idea come to life in glass can take years to develop.

SCIENCE

Where does GLASS come from?

Sand (known as silica) is the main ingredient in glass. A recipe of chemical ingredients (called batch) is melted ---which ingredients depends on how the glass will be formed and what colors and amount of transparency it will have. Glass is melted in specially designed furnaces—here it is being melted at 2150° Fahrenheit. Volcanos produce glass naturally.

What are the physical properties of GLASS?

Glass can be a liquid or a solid. Glass expands and contracts as it is heated and cooled. Hot glass can be formed by stretching, blowing, pouring, casting, fusing, slumping and pressing. Cold glass can be cut, ground, engraved, etched or polished. Glass can reflect, bend/refract and transmit light.

HISTORY

How old is GLASS? Glass can last forever. It is believed that the first glass was made 5000 years ago. Glassblowing began more around 2000 years ago in the Middle East and quickly spread. Many utilitarian objects were produced in Northern Europe while the ornate glass of Venice was the favorite of royalty. Glassmaking was America's first industry--established in Jamestown, Virginia in 1609.



GLASS blowing

A team effort requiring awareness, trust, and communication:

Gaffer The leader of the glassblowing team—the most trusted and experienced member.

1st Assistant/Pole turner Reheats, rotates the blowpipe: follows every movement and direction of the gaffer. Has years of experience.

2nd Assistant/Starter Does the initial gather of hot glass and starts the glass piece. Shields the gaffer, torches, brings bits and wraps, bench-blows.

3rd Assistant/Bit or Puntty Boy/Girl Entry level position--Does starts and gathers, opens furnace doors, runs errands, clean out pipes, sweeps.

ART of the Studio Glass Movement

The Golden Age of Glass is NOW. Ancient glass working techniques have been brought out of glass factories from all over the world and are in the hands of artists.

The CREATIVE Process

An artist:

Conceptualizes or forms an idea

Gathers information through memory, research, or reflection

Develops skills and techniques to effectively express an idea

Organizes visual elements in a composition

Reflects, refines, and presents a work of art

- Visit the Museum of Glass at 1801 Dock Street, Tacoma, Washington www.museumofglass.org
- Creatively fuse disciplines in the classroom with our Mobile Hot Shop Curriculum
- Become a partner in our Science of Art Program
- **For more information, please contact:** Britta Echte, Science of Art Coordinator (253) 284-2137 bechte@museumofglass.org

Hot Shop Glossary

Annealer An insulated box, similar to an electric kiln, designed to cool glass slowly at a specified rate. If hot glass is cooled too quickly, the stress on the glass will cause it to be unstable and through time cause it to break. **Batch** A mixture of the basic components of glass (silica, soda, or potash and lime). When heated to its melting point, approximately 2400°F, the mixture becomes glass. **Bits** Small amounts of molten glass on the end of a punty that are brought by an assistant and applied to another hot glass form. **Block** A wooden tool that is kept wet and used to shape glass. **Blowing** The process of creating objects from hot glass. The hot glass is gathered on a blowpipe. As the object is formed the blower and/or assistants blow through the pipe creating a bubble that can take many shapes. **Blowpipe** An iron or stainless steel tube shaped for blowing glass. **Box** Another term for Annealer. **Bubble (Seeds)** Small pockets of air that form when gas is trapped in hot glass. Bubbles can be formed either intentionally during the working of the object or accidentally during the gathering or melting process. **Cap** Air is blown into the pipe and quickly closed off at the end of the blowpipe with the blower's thumb so that the hot air expands within the hot glass and/or keeps the glass from collapsing. **Casting** The process of pouring hot glass into molds of various materials, the simplest being sand. Casting can also be done from the kiln, where the glass starts in a cold state then melted into plaster/silica molds. **Charge** Shoveling batch into a furnace to melt the glass into its workable form. **Check** A crack in glass caused by improper annealing and/or compatibility of the glass and color. **Cold Shop** A workshop with equipment to grind, polish, engrave and/or cut glass and/or to add surface details to finished glass pieces. **Cullet** Cooled, glass pieces that have been previously melted and that will be recycled. **Dip** Gathering hot glass from the furnace with a blowpipe or punty. **Etching** Creating a surface design by cutting the surface of finished glass with a tool or by applying of acid. **Flameworking** The process of using a torch to heat up rods or tubes of glass that will be manipulated into different shapes. Also called lampworking. **Furnace** Equipment used for melting batch and keeping glass at a constant temperature. The temperature of the furnace ranges from 2150°F working temperature to 2400°F charging temperature. **Fusing** Heating pieces of glass until they bond. This process is achieved within an annealer. **Gather** Also called a dip. The process of collecting molten glass from the furnace on a pipe, punty or gathering iron. **Gathering iron** A long rod with a large ball at the gathering end used to gather hot glass from the furnace, usually for the hot casting process. **Glory Hole** A heavily insulated cylinder, kept between 2100°F and 2300°F, which is used to reheat hot glass as it is being formed and manipulated in the Hot Shop. **Heat Shields** Protective devices that protect the glassblowing team from excessive heat coming from the glass as it is being worked and from other hot shop equipment, such as the glory holes. **Hot Shop** A workshop where molten glass is blown, cast or manipulated. **Jacks** Bladed tools used by glassblowers to shape molten glass. They come in various shapes and sizes to accommodate the work being made. **Laminate** Joining two pieces of glass by using heat or an adhesive. **Lampworking** Another term for flameworking. **Lip** The rim of a vessel. **Lip wrap** A thread of glass which is applied to the mouth of a vessel with a punty. **Marver** A large, flat surface on which hot glass is rolled when it is attached to a blowpipe or punty. **Melt** A term used loosely to describe the process of heating materials to make glass or to recycle glass. **Mold** A form used for creating specific shapes with molten glass. Hot glass can be poured or blown into a mold. **Optic Mold** An open mold with a textured interior into which a parison of hot glass is blown to create patterns in glass. **Paddle** A wooden board with a handle that can be used to shield the gaffer from excessive heat or to smooth or flatten hot glass. **Parison** A partially inflated gather of hot glass on the end of a blowpipe. **Pipe** Another name for blowpipe. A stainless steel or iron tube on which hot glass is gathered and through which the glass is blown. **Pipe Cooler** A device used to cool the shaft of the blowpipe after a gather. The pipe is placed across an open barrel of cool water; the water is pumped over the shaft of the pipe until it is cool enough to handle. **Pole turner** A member of the glassblowing team who turns the blowpipe as hot glass is being blown or manipulated. **Pontil or Punty** A metal rod that is used to gather a small amount of hot glass, which is then transferred to the object or used to transfer the object making it possible to work the other end. **Pot** The container in the furnace in which batch is melted. Also known as a crucible. **Prunt** A small bit of hot glass applied as decoration. **Pyrometer** Special thermometer used to measure high temperatures in hot shop furnaces, annealers/kilns and other equipment. **Respirator** A face mask used to filter out harmful airborne particles. **Sandcast** Pouring hot glass into a mold made of casting sand. **Seeds** Very small air bubbles found in molten glass. **Shard** A small piece of colored glass that can be melted into a hot glass piece for decoration. **Shield** A paddle used to protect a gaffer or other member of the team from excessive heat. **Slump** Heating glass so that it softens and changes shape without becoming molten. **Stippling** Tapping the surface of a hot glass object several times with a tool to produce a decorative finish. **Thermal Shock** This occurs when glass experiences an extreme change in temperature, either a drastic increase or decrease. This will cause an inconsistency in the structure of the glass, creating instability and eventually cracking the glass. **Thread** Strand of hot glass that can be applied to a rotating parison to create a pattern or surface decoration. **Transfer** Attaching one piece of hot glass to another, usually using a punty and breaking it free from its original pipe or punty, enabling the glass artist to work the other end. **Tweezers** Tong-like tool used to grab or manipulate hot glass. **Wax** Beeswax, which is most commonly used, is applied to the blades of the jacks to prevent scratching or marking the surface of the hot glass. **Wrap** A strand of hot glass applied to a vessel. **Yoke** A metal stand on which blowers rest their pipes or punties while re-heating glass in the glory hole allowing for easy rotation.

Visual Art Glossary

2-D or two-dimensional An object that is flat—having height and width. **3-D or three-dimensional** An object that has height, width and depth and can be viewed from multiple points of view. **Abstract** A work of art exaggerating or simplifying real forms that may or may not be recognizable. **Balance** Equalization of elements in a work of art. **Color** What the eye sees when a wavelength of light is reflected from a surface. **Contrast** Opposite visual arts qualities placed side by side (e.g., light against dark, heavy against light, textured against smooth, etc.) to create visual interest. **Composition** The organization of parts or elements in a work of art. **Emphasis** Use of contrasts (color, size, shapes) to place greater attention on specific parts of a work of art. **Form** A three-dimensional object that has height, width and depth. **Installation** An art work especially arranged and constructed for an exhibit or space—sometimes forming an environment where variables of light, sound and perception of space are manipulated by the artist. **Line** A mark made with a tool or material across a surface. **Opaque** A material that absorbs or reflects light, not allowing light to pass through it. **Pattern** Repeating sequence of lines, shapes or colors. **Relief** A type of sculpture or surface in which forms project from a flat background. **Rhythm** Movement in art created through repetition of elements. **Sculpture** A three-dimensional work of art. **Shape** A 2-dimensional enclosed space. **Space** The area above, below, around, and within a work of art. **Symmetrical/formal balance** A type of balance that results when both sides of an artwork are the same or mirror one another. **Technique** Methods of working with art materials to create artwork. **Texture** Real or implied tactile characteristics of a surface. **Translucent** A material that transmits light in diffused directions distorting its path. **Transparent** A material that transmits light in straight lines without distorting images. **Unity** Wholeness, all elements belonging together in a work of art. **Value** Lightness or darkness of an area of color or tone. **Variety** Diverse elements used together to create visual interest in a work of art. **Vessel** A container.

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