

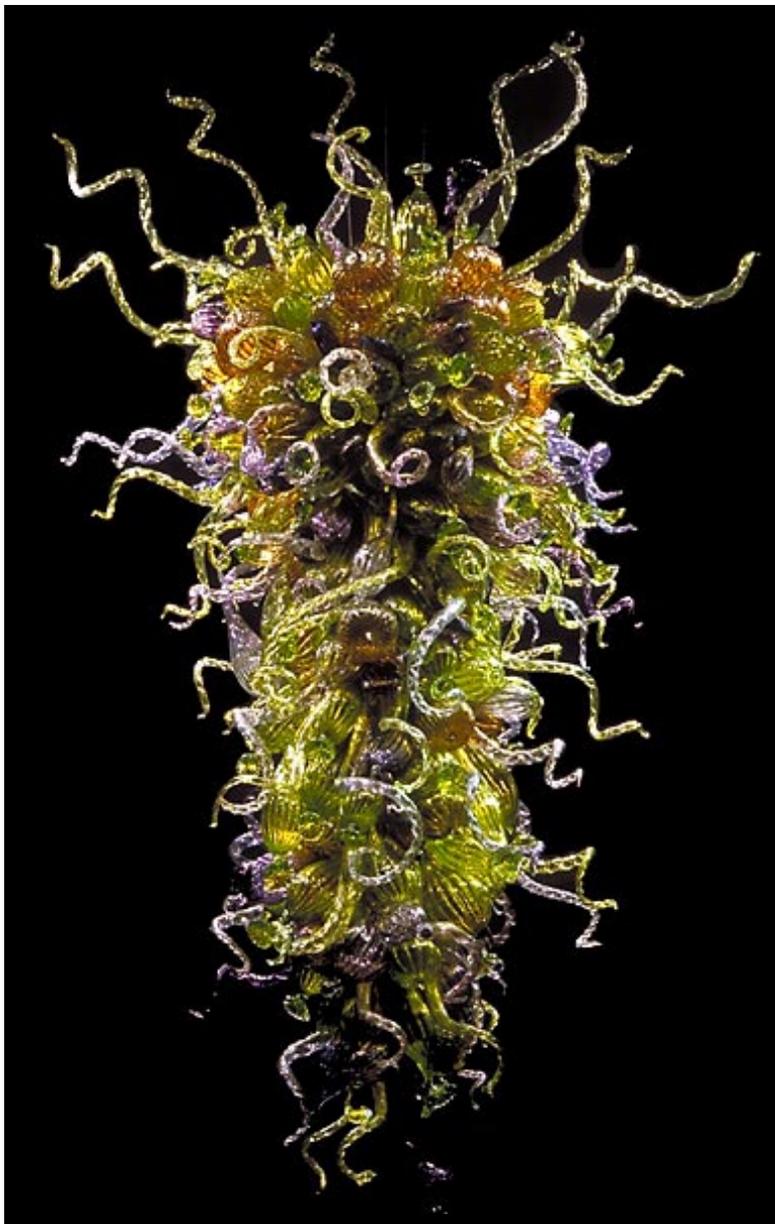


KALAMAZOO INSTITUTE OF ARTS

Chihuly

Chihuly in Kalamazoo

September 25, 2005 – January 1, 2006



A Resource Guide for Educators

Ways to use this Educator's Guide:

- Give students a preview of the Chihuly exhibition before their museum visit.
- Use the information and activities to make curriculum connections in your lesson plans.
- Give copies to chaperones for use during the visit.

Dale Chihuly, *Amethyst and Amber Chandelier*, 2000, 10.7' x 5.8', Palm Desert, California

Kalamazoo Institute of Arts • 314 S. Park St. • Kalamazoo, MI • 269/349-7775 • www.kiarts.org

Chihuly in Kalamazoo: A Resource Guide for Educators
was created by the
Kalamazoo Institute of Arts
Museum Education Department
in consultation with Chihuly Studios.

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Big Ideas to Think About!

Observing, discussing and interpreting contemporary works of art instructs our understanding of our society and culture.

Looking at art objects increases visual literacy and the ability to articulate meaning.

PREPARING FOR YOUR CHIHULY VISIT

We look forward to welcoming your group to the Kalamazoo Institute of Arts for *Chihuly in Kalamazoo*. Please read the following information in preparation for your visit. As the galleries will be crowded with visitors, we ask that all schools follow these guidelines to ensure a smooth and successful museum experience.

NAME TAGS Included with your confirmation is a set of colored nametags for students, teachers and chaperones. Please divide your class into groups before arrival. Typically, each classroom will be divided into 2 groups of 10-15 students each. Your tour confirmation will note the number of small groups needed. Assign each group a color. Use large, bold lettering for each nametag.

CHAPERONES One adult is required for every small group. Please share the enclosed *How to be a Great Chaperone* handout with your chaperones. We ask that you discourage parent chaperones from bringing toddlers and small children. It is often distracting and makes it harder for them to assist when needed.

PRE-VISIT PREPARATION A successful museum visit starts well before the students board the bus. Please take the time to review the **Museum Manners** with your students. The information and activities in this packet will also prepare your students well for their Chihuly visit. This type of advance preparation helps students be less distracted by the novelty of a new environment. They will also feel more secure when they know what to expect and what will be expected of them.

ARRIVAL Please arrive at the South St. entrance at least five minutes before the tour is to begin. Please have students organized into their tour groups. Students should remain on the bus until a docent or KIA staff member escorts them into the museum. Each group will be assigned a docent and dismissed into the galleries.

LATE ARRIVALS Please call the KIA receptionist at 269/349-7775 if you will be late. As groups may be scheduled back to back, a late arrival will shorten your visit. Docents wait no more than 20 minutes for late arrivals. After that time, we reserve the right to cancel your tour.

COATS AND BACKPACKS Coats, backpacks, umbrellas, etc. are not permitted in the galleries. We suggest groups leave these items on the bus.

TRANSPORTATION All groups must arrange their own transportation. The confirmation contains directions and information on parking.

PHOTOGRAPHY Flash photography is permitted in the *Chihuly in Kalamazoo* exhibition.

DEPARTURE Because of back to back bookings, groups need to depart the museum immediately following their tour. Please discourage your students from bringing money as the Gallery Shop will not be included as a part of the visit.

MUSEUM MANNERS

How museum rules help protect the art.

- Do not touch any of the art because it is fragile and the oils on your fingertips (even if your hands look clean) will make the work of art dirty. If everyone touched, the art would be ruined, and no one would be able to enjoy it. We want it to last as long as possible.
- Please walk in the museum. We do not want you or the art to get hurt.
- Use quiet voices during your tour; other people are trying to enjoy their visit too.
- Stay with your group. Be ready to look carefully and think about what you see. Your docent will ask you to share your ideas about the works of art.
- Gum, food and drinks are not allowed in the galleries because spills could damage the works of art.

HOW TO BE A GREAT CHAPERONE!

To be a great chaperone, you don't need any special knowledge—just common sense and a willingness to jump in and get involved. Here are a few tips to help make your visit successful:



- Introduce yourself to your group and your museum docent (tour guide).
- Stay with your group during the tour and assist as requested by your docent.
- Understand and help remind students of the KIA's Museum Manners (see below).

What happens during a KIA tour?

Classes tour the museum in small groups of 10-15 students. Each group is led by a museum docent, a specially trained volunteer tour guide. Docents use questions and discussion to encourage students to look at and think about selected works of art during the tour. As tours move through the museum, chaperones help keep their group together. They remind students of their Museum Manners if needed and are good role models during the tour. Chaperones are ready to help the docent if asked.

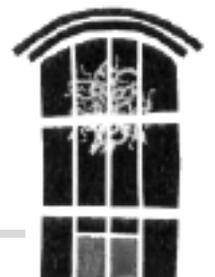
Thank you!

Thanks for being part of your group's *Chibuby in Kalamazoo* guided tour. Your participation will help make your school's visit to the Kalamazoo Institute of Arts fun and educational. We invite you and your family to visit the KIA again!



MUSEUM MANNERS

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CHIHULY'S SERIES

***Chihuly in Kalamazoo* features artworks that span the artist's successful career. This information will introduce students to the types of objects they will encounter in the exhibition.**

Baskets

Native American woven baskets, with their simple lines and soft, uneven forms were the inspiration for this early series. Begun in 1977, the artist recognized that he could create new shapes and forms by accepting the effects of gravity. Delicate and asymmetrical, the baskets are a blown bubble sometimes surrounded by glass threads wrapped around the outside, which provide color and texture. The *Basket* series was the first where Chihuly used a "lip wrap", a contrasting color to delineate the edge of the vessel.



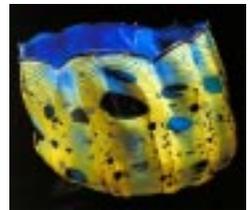
Ikebana (Ee-key-bah-nah)

Inspired by his trips to Japan, Chihuly's *Ikebana* series pays homage to the ancient Japanese tradition of flower arranging. Adapting large pieces from his Venetian series, Chihuly added elongated stems and blossoms to create these graceful and elegant sculptures.



Macchia (Mock'kee-uh)

The *Macchia* series (1981) developed from the artist's desire to explore different color combinations, eventually using all 300 colors available. Each work is speckled with color which comes from rolling the molten glass in smaller shards of colored glass during the blowing process. Notice the interior and exteriors are different; they are separated by a layer of white opaque glass. Chihuly didn't know what to call this series so he asked his friend Italo Scanga for the Italian word for "spotted", which is 'macchia'. *Macchias* are often installed together on pedestals in groupings called "*Macchia Forests*".



Persians

The title '*Persian*' reflects the fusion of Persian, Byzantine and other eastern ideas with the western styles that Chihuly observed while working at the Venini factory in Venice. With their wavy lines, brightly colored "bodywraps" and unusual shapes, this series was an exploration of new glass forms. *Persians* are recognized by their delicately fluted edges and stripes of color. They are often displayed as wall installations or resting on a clear glass ceiling. Visitors are enveloped by color and light in a transformed space.



Putti Sealife

Inspired by Art Deco glass figures made in Venetian glass factories, Chihuly's *Putti* figures are actually intricate glass stoppers perched atop other forms. Putto is the Italian word for "little boy". Putti (poo' tee) is the plural form. Putti figures are seen often in Renaissance and Baroque art as chubby winged creatures. Today, we associate this character with Cupid, the Roman god of love. Chihuly doesn't usually create figures in glass but during a collaboration with two Italian glass masters, Pino Signoretto and Lino Tagliapietra, he devised a design that would allow each master to contribute a part of the final sculpture.



Seaforms

The *Seaform* series developed from Chihuly's *Baskets*. While experimenting with the ribbed molds which make the walls of the *Baskets* more firm, the objects began to take on sea-like shapes. Dale Chihuly has always lived by the ocean, so creating *Seaforms* combines two of his loves: glass and the sea. These forms have irregular shapes and vary widely in size and color.



CHIHULY'S INSTALLATIONS

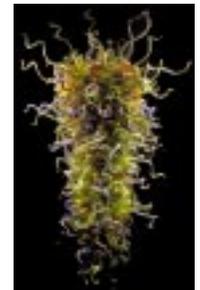
Boats

Chihuly developed this new type of installation following his time in Finland for the *Chihuly Over Venice* project. While floating glass down a river, Chihuly asked the local children to catch the pieces and put them in their boats. Chihuly liked how the glass looked gathered in these simple wooden vessels and has continued to explore the *Boat* installation ever since.



Chandeliers

Chihuly started his *Chandelier* series in 1992. A feat of engineering to install, these *Chandeliers* can be up to 27 feet long, be comprised of more than 1300 pieces of glass and weigh thousands of pounds! Attached to an internal steel armature, each piece is a striking work of art by itself, whether it is round and bulbous or long and curving. Although a *Chandelier* is not lit from within, the pieces create an intricate, pulsating composition of color and light.



Drawings

Energetic and colorful, Dale Chihuly uses drawings to organize and plan his artworks and as a form of communication between himself and his team of glassblowers. But even before Chihuly was leading other artists to produce his glass creations, he enjoyed drawing and these works were an essential part of his artistic process. Whether using markers, chalk, pencils or more recently, acrylic paints in squeeze bottles, Chihuly works quickly to get his ideas down on paper. Two installations of drawings are featured in the exhibition, including a group of acrylic paintings on plexiglas, illuminated from behind by natural light.



Gardens/Fiori (Fee-or-ee)

Dale Chihuly grew up in a modest home surrounded by bountiful gardens. He believes that gardens have influenced his sense of color and interest in organic forms. Chihuly combined his love of gardens and glass when he juxtaposed his forms with the botanical collections at the Garfield Park Conservatory in Chicago in 2001. After seeing how well glass and plants look together, he decided to make gardens of glass.



Reeds

The first *Reeds* were made in 1995, while Chihuly was in Nuutajarvi, Finland. Also called spears, these forms are created when one glassblower blows the gather of glass on the blow-pipe while being raised up on a mechanical lift. At the same time, another person on the ground pulls on the glass to create these long, graceful forms. Some *Reeds* are more than 10 feet long!



Sconces

Sconces are comprised of glass pieces originally meant for *Chandeliers* that are attached to armatures that project from the wall. These smaller but whimsical sculptures are often clustered together in response to the specific environment.



Tower

After the *Chihuly Over Venice* project in 1995-96, Chihuly realized he could make a completely new type of sculpture by turning his *Chandeliers* upside down! Constructed from hundreds of pieces of glass attached to a steel base support, *Towers* allow Chihuly to install large dramatic sculptures in spaces that would not support the weight of a *Chandelier*. Like the *Chandeliers*, a *Tower's* glass pieces are many different lengths and shapes that project outward, creating vibrating waves of color and light.

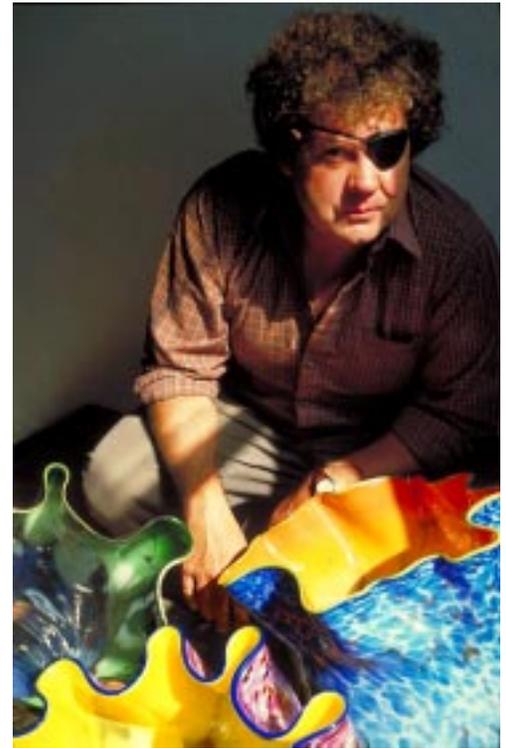


WHO IS DALE CHIHULY?

Born in Tacoma, Washington in 1941, Dale Chihuly (Cha-hoo-lee) has been working with glass since the mid-1960s. At the University of Wisconsin, he studied glassblowing with Harvey K. Littleton, founder of the American Studio Glass movement. Littleton introduced glass as an expressive medium. At the Rhode Island School of Design, Chihuly continued to hone his glassblowing skills and later established RISD's glass program. In 1968, Chihuly was awarded a Fulbright scholarship to study with the renowned glass masters at the Venini factory in Venice, Italy. While in Venice, Chihuly observed teams of glassblowers. This experience would have a great impact on his work and artistic process later on.

In 1971, Chihuly co-founded the Pilchuck Glass School, located just north of Seattle, Washington. Under his direction, the school quickly gained an international reputation for elevating glass from a craft to a fine art. The team approach to glassblowing that Chihuly learned in Venice is the method that is still used at Pilchuck today. In 1979, Chihuly began to have other people blow glass under his direction, following a body surfing accident where he dislocated his shoulder. He had previously lost sight in his left eye in a 1976 car accident which also affected his depth perception, making it difficult for him to blow glass with the team. To actualize his designs, Chihuly leads a team of highly skilled artists who must collaborate and cooperate to create the final product. To communicate his ideas, Chihuly creates large, colorful and gestural drawings which have evolved into works of art that have their own importance.

Chihuly's style continues to evolve as he is constantly inspired to create new forms and push the physical limits of the glass medium. He works in series, meaning that he designs many sculptures that are variations of a single theme (*Persians*, *Seaforms*, *Baskets*, etc.) before moving on to another concept. While Chihuly is internationally acclaimed for his use of vibrant colors and forms inspired by nature, he is most recognized for his innovative large-scale installations like *Chandeliers*, *Boats* and *Towers*. These sculptures are always site-specific: consideration of each space is part of his artistic process and vision.



BIG IDEAS TO REMEMBER

- Teamwork
- Influences: Organic forms, Native American art, Venetian glass forms, Textiles, Water and Light
- Uses fire, gravity, heat and centrifugal force as his main tools to shape glass
- Creates in series
- Vibrant colors, natural forms
- Large scale installations are site-specific

My work, to this day, revolves around a simple set of circumstances: fire, molten glass, human breath, spontaneity, centrifugal force and gravity.

–Dale Chihuly

THE HISTORY OF GLASS

Glassmaking dates back thousands of years. At first, glass was made by nature—extreme heat from volcanoes fused silica or sand together to create obsidian (natural glass). It is not really known how humans figured out the process for making glass. It is believed that it began in Western Asia and developed from the procedure for smelting copper. Glass foundries in Egypt date back to 1000 BCE where glass was made by either casting, core forming or cutting. All three of these processes were time consuming and so glass was considered a luxury item, as valuable as gold.

During the time of the Roman Empire which conquered most of Europe as well as some of Asia and Africa, glass production spread. It especially flourished in Western Asia (Persia, Byzantium and Syria). After the Roman Empire crumbled, glass items fell out of favor until the 12th and 13th centuries when interest in stained glass windows soared. By the end of the 13th century, Venice had become a major glass center, a tradition that continues today. It was also around this time that blown glass objects began to appear in Europe, although it is believed that the process of glassblowing was invented much earlier by the Phoenicians.

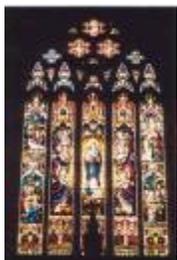
Practical uses for glass have continued to develop over the years. In the 15th century, glass was used for lenses in eyeglasses, telescopes and microscopes. By the 17th century, glass mirrors were all the rage, and in the 19th century, glass windowpanes and bottles were commonplace. Glass was not considered as an artistic medium again until the late 19th and early 20th centuries when Louis Comfort Tiffany designed lamps, mosaics, windows, and jewelry created from colored glass. Each unique item was produced in a factory under Tiffany's supervision and became the newest must-have item among the rich upper classes. But even though the uses of glass have changed over time, the basic ingredients and methods of working with glass have remained the same.

THE AMERICAN STUDIO GLASS MOVEMENT

Before the 1960s, glass production of any significant volume took place in large factories that could accommodate the equipment required to create the high temperatures needed to melt glass. A glass designer had to rely on those factory glassworkers to execute their designs. In 1962, Dominick Labino of the Johns-Manville Fiber Glass Corporation in Toledo, Ohio developed a glass marble that when combined with the other basic glass ingredients, allowed the glass to melt at a lower temperature. This discovery allowed individuals to use a standard ceramic kiln as a glass furnace, which could fit in any artist's studio. Soon after, an artist named Harvey Littleton taught a glass workshop in Toledo on using glass as an expressive artistic material. Quickly, small artist-run glass studios popped up all over the U.S. The American Studio Glass Movement was born. Dale Chihuly and many other contemporary artists learned from these earlier artists and have continued to develop glass as a fine art medium.

Glass Through the Ages

Glass as Art



Stained Glass Window



Eyeglasses



Mirror



Glass Bottle



Tiffany Lamp



Dale Chihuly, *Blue Violet Persian Set with Pine Lip Wrap*, 1992

THE SCIENCE OF GLASS

What is Glass?

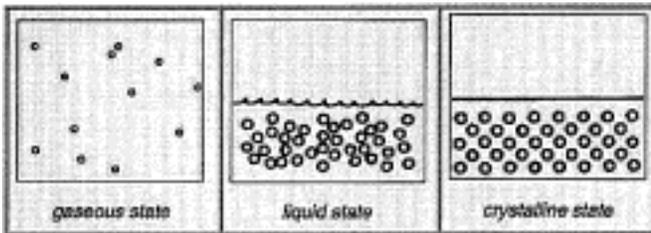
Glass is typically made from three types of materials: formers, fluxes and stabilizers. **Formers** are the main ingredient, making up the largest portion of the mixture. The silica found in sand or quartz is the most common former. **Fluxes** lower the temperature at which the Former will melt. Soda ash (sodium carbonate) and potash (potassium carbonate) are the common fluxes. **Stabilizers** combine with the formers and fluxes to keep the finished glass from crumbling or falling apart. Calcium carbonate (lime) is the most frequently used stabilizer. These three ingredients are mixed together in a tank and heated at high temperature (around 2300°Fahrenheit) until the mixture reaches the consistency of honey). This mixture is called a **batch**. At this point, the molten glass can be cast, blown or shaped.

Batch of Glass=Former (sand) + Flux (ash) + Stabilizer (lime) + Heat (2100-2300°F)

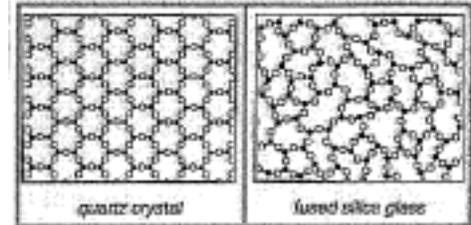
Liquid or solid?

Glass is a unique substance. It is a homogeneous material with a random, non-crystalline (liquid-like) molecular structure. When it is cool, it is hard, yet breakable because it does not have the crystalline molecular structure required for a solid. Glass is categorized as the fourth state of matter. This vitreous or “glassy state” combines the rigidity of crystals with the random molecular structure of liquids. In other words, cooled glass is rigid like a solid but its random atomic structure is characteristic of a liquid.

Three Classical States of Matter



Structure of Glass



Glasses also differ from crystalline solids in that they do not have distinct melting points. Since the bonds in glass are irregular, they break over a range of temperatures when it is heated. As the bonds break, the glass becomes more viscous (liquid) and workable. **Working Point** is the level of viscosity at which the glass is suitable for shaping and forming.

Properties of Glass

- Mechanical-Glass is strong and hard but elastic.
- Chemical-It is corrosion resistant, meaning that it is affected by few chemicals and resists most acids.
- Thermal-Modified glass can withstand intense heat or cold, as well as sudden temperature changes. It also absorbs heat and retains it rather than conduct it.
- Optical-It can reflect, bend, transmit and absorb light.
- Electrical-Glass strongly resists electric current (insulating) and it stores electricity efficiently.

How is glass colored?

The basic process described above produces clear glass. To make colored glass, metal oxides must be added to the batch. The following oxides produce the following colors:

Copper.....Turquoise
Manganese.....Purple
Chrome.....Green

Cobalt.....Blue
Cadmium & Gold.....Ruby Red
Uranium.....Yellow

GLASSBLOWING 101

History of Glassblowing

It is believed that glassblowing was invented by the Phoenicians. Phoenicia was part of the Roman Empire and would be located in modern Lebanon today. Phoenician glass workers discovered that an object could be formed by gathering molten glass on the end of a hollow tube, or blowpipe, and inflating it like a bubble. This glass bubble could be blown into a hollow mold to form it or be freely shaped with simple tools. Glass objects could now be mass produced, making them more commonplace.

The main tools of the glassblower are the Blowpipe and the Bench as well as metal and wooden tools used for shaping. Glass artists sometimes even use wet newspaper to shape their forms! Metal tools like Jacks are made of iron or steel. Wooden tools are carved from hard woods like apple, cherry or mahogany. Wooden tools have to be kept wet to prevent them from burning and to keep the hot glass from sticking. The moisture in the wood plus the intense heat of the molten glass form a cushion of steam on which the glass floats.

Bench



Blowpipe



Jacks



Wood Blocks



Shaping Glass with Wet Newspaper



How to Blow Glass

Step 1 Mix sand, sodium carbonate and lime in a tank, or melting pot. This mixture is called a **batch**. It becomes a very thick liquid when it is heated to 2150°F. It takes quite a while for the glass to become liquid—Chihuly's hotshop put their batch in a tank to melt overnight.



Step 2 When the batch is ready, the glassblower or **gaffer** dips a **blowpipe** into the tank to get a **gather** or gob of glass.



Step 3 The gaffer twists the blowpipe while blowing into it. The gaffer's breath expands the molten glass into a **bubble**.



Step 4 To keep the glass warm so it can be shaped, the gaffer moves the piece in and out of a **gloryhole**, or reheating furnace. If it cools too quickly, it becomes brittle and it could break. The gaffer can also reheat individual sections with a blow torch.



Step 5 The gaffer and other workers use tools like **jacks** to shape the hot glass into interesting forms.



Step 6 When the piece is finished, it is cut from the blowpipe and placed in an **annealing oven**. This special oven heats to high temperatures and then gradually cools the glass which helps keep it from breaking.



EDUCATIONAL ACTIVITIES AND CURRICULUM CONNECTIONS

Visual Arts

- What is a series? As a class, make a series of artworks using the same theme but with varied forms. Example: a series of bowls in the same form but with different colors, different sizes. See Chihuly's series of *Seaforms* or *Baskets* for inspiration.
- Draw a design for a piece that you would like Chihuly and his team to make. Be sure to draw with bold, sweeping gestures and bright colors.
- Create your own Chihuly-style vessel using plastic containers. Use paint pens to add color to the surface and add forms such as flowers, tubes, ribbons, etc. for exterior ornamentation.
- Make a *Tower* from balloons. Divide into small cooperative learning groups/teams and assign jobs (designer, blower and armature engineer). Work out a design and plan for making the tower. Construct an armature, blow up balloons and tie them to the armature to make your sculpture. This could also be done with plastic containers.
- Teamwork is an important part of Chihuly's work. Divide students into teams and have them design a sculpture. Be sure they consider issues of color, texture, light and size. Have them create a painting of their design.
- Check out the art lesson plan at www.DickBlick.com—*Classroom Chihuly: Nested Glass Sculpture*.
- Research other glass artists of the American Studio Glass Movement and find examples of their work. How does their work compare with Dale Chihuly?
- People Magazine called Dale Chihuly, “the most famous glass artist since Tiffany”. Compare the work of Dale Chihuly with that of Louis Comfort Tiffany. What are the similarities and differences in their glass works? What about their process and the purposes of their art? Why are each so popular?
- Have students draw a picture of their favorite artwork from the *Chihuly in Kalamazoo* exhibition. Be sure to draw with big sweeping strokes and bright colors, like Chihuly.
- Make a Macchia-like Watercolor: Look at the Macchia series and discuss their characteristics. Using watercolor paper, wet the paper with water and while wet, apply as many colors as possible using the tip of the brush. Let dry and layer with more wet colors until only small white spots of the paper are showing. This could also be done on plexiglass, using transparent colors (Pebeo Vitrea or Plaid Glass paints). Then create a drawing installation for your school by connecting the drawings in long horizontal rows.
- Macchia-inspired Fused Glass:
 1. Cut two matching pieces of glass to a desired shape, one opaque and one transparent.
 2. Between fabric or in a heavy paper bag, crush many colors of glass with a hammer.
 3. Place crushed pieces of glass on top of the opaque piece of glass.
 4. Place transparent piece on top of crushed glass layer and fuse.**Make sure the glass you choose has a similar COE (coefficient of expansion)

Michigan Curriculum Benchmarks

Analyze, describe and evaluate works of art.
Arts Education Content Standard 3

Understand, analyze and describe the arts in their historical, social and cultural context.
Arts Education Content Standard 4

Recognize, analyze and describe connections among the arts, between the arts and other disciplines and between the arts and everyday life.
Arts Education Content Standard 5

Check out www.delphiglass.com/teach. Look for “Free Lesson Plans” to get instructions on Fusing Glass in a Kiln.

Language Arts

- Introduce Chihuly and his art using examples from the Chihuly website, videos or books. Develop a list of descriptive words about his glass pieces. Assign each student a word and to look for works of art that best illustrates that word. Sample words: clear, opaque, hard, shiny, dull, smooth, rough, thin, thick, solid, fragile, colorful, sparkling, asymmetrical, symmetrical, funny, etc.

- Write a cinquain (a five-line poem) about an artwork in the *Chihuly in Kalamazoo* exhibition. The cinquain format is as follows:

Line 1: one noun that describes the work of art;

Line 2: two adjectives that describe the previous noun;

Line 3: three verbs that reflect what is going on in the work of art selected;

Line 4: a four-word phrase that describes the noun in the first line

Line 5: a noun that is another word for the noun in the first line.

- Pretend that you are an art critic and write about a particular artwork that you enjoyed in the exhibition, or about the exhibition itself. Art critics usually include four parts in their reviews: description, analysis, interpretation and evaluation.

- Pretend that you are a TV or newspaper reporter doing a story on the *Chihuly in Kalamazoo* exhibition. Include information about the artist, how the exhibition came to Kalamazoo, and interview other students about what they thought about the exhibition.

- Write a descriptive label about your favorite work in the exhibition. Include artist, title, date, description of the work and why you liked it.

Michigan Curriculum Benchmarks

Focus on meaning and communication as they listen, speak, view, read and write in personal, social, occupational and civic contexts.

English Language Arts Content Standard 3

Demonstrate, analyze, and reflect upon the skills and processes used to communicate through listening, speaking, viewing, reading and writing.

English Language Arts Content Standard 7

Develop and apply personal, shared and academic criteria for the enjoyment, appreciation and evaluation of their own and others' oral, written and visual texts.

English Language Arts Content Standard 12

Social Studies

- Research the History of Glass, including the Studio Glass Movement in the United States. Create an illustrated timeline by dividing the class into groups by period in history: Ancient, Roman Empire, Dark Ages, Medieval, Victorian, 20th Century, Future. Highlight how glass is used throughout the ages.

- Map Chihuly's travels to major glassmaking sites throughout the world. They include: Venice, Italy; Novy Bor, Czech Republic; Waterford, Ireland; Nuutajarvi, Finland; Monterrey, Mexico; and Niijima, Japan.

- Discuss how we use glass in our daily lives (drinking, eating, cooking, containers, protection from weather, help us see, reflect the world, change or make light). Students can even draw examples of these glass objects. Discuss functional glass vs. non-functional glass.

- Read and reflect on why glass was considered a precious material in ancient times. How has our attitude about glass changed today? What kinds of glass do we consider precious today?

- Research American factory glassmaking in the 19th century. Look at and discuss the process, types of jobs and experience required, working conditions, salary and issues of child labor. Read excerpt "Down in Southern New Jersey they make glass." from Carl Sandberg's 1904 book, *In Reckless Ecstasy*.

Michigan Curriculum Benchmarks

Understand how the past informs present events and activities.

Social Studies Strand 1-Historical Perspective

Content Standard 1-Time and Chronology, Content Standard 2-Comprehending the Past, Content Standard 3-Analyzing and Interpreting the Past

Knowledge of Geography enables the study of diverse cultures and their global impact.

Social Studies Strand 2-Geographic Perspective

Content Standard 1-Diversity of People, Places and Cultures, Content Standard 2-Human/Environment Interaction

Science

- Research the various properties/components of glass. How have glass ingredients been adapted to create glass for special purposes? What are the differences between glass like Pyrex or tempered glass? What are each used for? Research other uses for glass like test tubes, glass for space travel and fiber optics.
- Research how colors are added to glass and what minerals give glass its distinctive colors.
- Research the temperature ranges at which glass melts. Compare the melting point to the following substances: ice, gold, steel, plastic. Make a chart illustrating your findings.
- Find photographs of jellyfish, sea anemones, Portuguese-man-of-wars and sea urchins and compare them with Chihuly's *Putti Sealife*. What aspects of sea life did Chihuly capture in glass?
- Glass is defined as a "supercooled liquid." What does that mean? Are there any other supercooled liquids?
- Watch a video of Chihuly and his assistants making glass. Gravity and centrifugal force are part of their creative process. What are each of these forces and how do they use them? What are other examples of centrifugal force?

Michigan Curriculum Benchmarks

Analyze how science is related to and affects other areas in society.

Science Strand 1-Reflecting on Scientific Knowledge, Content Standard 1

Measure and Describe the world around us. Investigate, describe and analyze ways in which matter changes.

Science Strand 4-Using Scientific Knowledge in Physical Science Content Standard 1-Matter and Energy, Content Standard 2-Changes in Matter

Recognize and describe different types of earth materials and how rocks and minerals are formed.

Science Strand 5-Using Scientific Knowledge in Earth Science

Classroom Activity: Sam Scholes Fudge (from the The Corning Museum of Glass)

Properly made, fudge is a soft solid (like glass), consisting of sugar in a microcrystalline condition, bonded by a matrix of highly viscous syrup.

Raw Materials (Ingredients)

Sucrose (Sugar)	3 cups
Chocolate	3 oz.
Lac Bovis (whole milk)	1 cup
Glyceryl Butyrate (butter)	1/2 oz.
Vanilla Extract	1 tsp.

Procedure

1. Measure sugar, chocolate and milk into a suitable stew pan and place it over a moderate fire. Mix with a large wooden spoon, and stir frequently as the mixture heats and boils. Stirring at the cooling stage promotes homogeneity and prevents sticking to the pan. As boiling continues, the viscosity of the liquid increases. Cooking is complete when some of the chocolate liquid is dropped into cold water and it becomes a ball.
2. Remove pan from heat. Melt butter around the inside surface of the pan and over the liquid. This procedure covers any stray sugar crystals that might "seed" the melt and induce premature crystallization. Set the pan in a larger pan filled with cold water.
3. While the fudge is cooling, butter a large cake tin or plate. When the fudge is just warm to touch, add the vanilla and stir vigorously. If the mixture becomes too cold, it may be warmed until the pan is warm to the touch. Stirring is continued until crystallization is so far advanced that the mass can only with difficulty be removed and spread on the buttered plate. It will form a layer about 1 inch deep, covering a 9 in. circle. Cut into squares before it is completely set.

GLOSSARY

Annealing	A cooling process used to strengthen glass; glass is put in what is called an annealing oven, where it slowly cools; the process takes from 12-72 hours.
Batch	The raw materials of silica (sand), lime or other chemicals that are melted to make glass.
Bench	A bench with extended arms upon which the gaffer rests the blowpipe as it is rolled back and forth to shape the glass. The constant motion keeps the hot glass from sagging.
Blowpipe	A hollow metal tube of iron or steel used by the gaffer to blow glass. A blowpipe is usually 4 to 5 feet long, wider and slightly flared at the gathering end. Size and weight differ according to the objects being made.
Body wrap	Chihuly's term for the strip of color applied to the body of a piece.
Casting	Forming glass in a mold.
Core Forming	Gathering molten glass around a core supported by a rod. After the glass forms around the core, the object is removed from the rod and annealed. After annealing, the core is removed by scraping.
Cutting	Glass is removed from the surface of an object by grinding it with a rotating wheel made of stone, wood, or metal and an abrasive suspended in liquid.
Gaffer	Person who is responsible for the final forming and quality of the finished glass product; head glassmaker.
Gather	A mass of molten glass that is scooped up on the end of a blowpipe.
Homogeneous	Uniform in structure or composition throughout.
Hotshop	Name of the space where glass is blown.
Ikebana	A form of Japanese flower arranging that emphasizes form and balance.
Installation	An artwork whose size and shape is defined by the space in which it is seen.
Jimmies	Small bits of colored glass added to the exterior of the glass object while it is being blown.
Lip wrap	The defining line of color that is applied to the edge of some of Chihuly's series of art works, such as his <i>Baskets</i> and <i>Macchia</i> .
Melting point	Temperature at which a solid becomes liquid.
Mold	A form (usually made of metal or wood) used to give shape to molten glass.
Pontil Rod	A solid rod smaller in diameter but about the same length as the blowpipe. It is used to add small amounts or 'bits' of glass for handles or decorations and to hold an object after it has been removed from the blowpipe.
Viscosity	Resistance of a liquid to flow.
Working point	Viscosity at which glass is suitable for working or forming.

RESOURCES

Books and videos on Chihuly are also
on sale at the
KIA Museum Shop!

Available at the Mary and Edwin Meader Fine Arts Library-KIA

Chihuly in Kalamazoo Glass Works Kits for Classroom Teachers

Kits on loan from the Museum of Fine Arts, St. Petersburg are available for check-out. Each kit has information on the history of glass, the evolution of glass as an art form and its multi-functionality. Books, videos, and artifacts are included. Kits are available for 1 week and are free for groups that have booked a Chihuly tour.

Books on Chihuly

- Chihuly, Dale: *Chibuly: Form from Fire*, NK 5198.C43 A4, 1993
Chibuly: Gardens and Glass, NK 5198.C43 G37, 2002
Chibuly: The George R. Stroemple Collection, NK 5198.C43 A4, 1997
Chibuly in Jerusalem 2000, NK 5198.C43 A4, 2000
Chibuly over Venice, NK 5198.C43 A4, 1996
Chibuly Projects, NK 5198.C43 A4, 2000
Venetians, NK 5198.C43 A4, 1989
Chibuly: Color, Glass and Form, NK 5198.C53
Chibuly's Pendletons and Their Influence on His Work, NK 5198.C43 A4, 2000
- Kuspit, Donald B. *Chibuly*, NK 5198.C43 K87, 1997
- Oldknow, Tina *Pilchuck: A Glass School*, NK 5112.O43, 1996

Videos

- Chibuly Atlantis*, 1999
Chibuly Nijima Float Project, 1999
Chibuly: River of Glass, 1999
Chibuly: Jerusalem 2000
Chibuly: Working with Lino Tagliapietra, 1999
- Chibuly in Action*, 1999
Chibuly Over Venice, 1996
Chibuly: Working with Pino Signoretto, 1999
Dale Chibuly Installations, 1992

Books on History of Glass/Terminology/Techniques

- Frantz, Susanne K. *Contemporary Glass*, NK 5110.F74, 1989 (also video)
- Kulasiewicz, Frank *Glassblowing*, NK 5104.K84, 1974
- Layton, Peter *Glass Art*, NK 5110.L38, 1996
- Littleton, Harvey *Glassblowing: A Search for Form*, NK 5198.L4, 1980
- Zerwick, Chloe *A Short History of Glass*, NK 5106.Z47, 1990

Juvenile Fiction/Nonfiction-available at the Kalamazoo Public Library-Central Branch

- Carlisle, Madelyn *Find Out About Glass*, 1972.
Text and photos explain the process of turning raw materials into molten glass.
- Geslin, Campbell *Elena's Serenade*, 2004.
A young Mexican girl travels to Monterrey to learn glassblowing. But girls can't be glassblowers. Or can they?
- Mackel, Kathy *Alien in a Bottle*, 2004.
A teenager employs the assistance of two aliens to help him win a scholarship to become a glassblower.
- McDonald, Megan *Shadows in the Glasshouse*, 2000. (American Girl Series)
While working as a servant for a Jamestown Glassmaker in 1621, Merry uncovers a case of sabotage.

Websites

<http://www.chihuly.com>

Extensive biographical information, bibliography, photographs of glass pieces and installations, videos and essays by various art historians.

<http://www.cmog.org>

Website for the Corning Museum of Glass-excellent resource on glass and glassmaking, pdf files can be downloaded for free.

http://www.museumofglass.org/s99_home.jsp-Create your own glass vessel at this interactive site.