POSTGRADUATE REPORT

1990

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CANBERRA INSTITUTE OF THE ARTS

The Postgraduate Exhibition is the
collection of the results in
the last two years.
At
the same time,
it is the starting point.

-- Ars longa, vita brevis --

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Acknowledgement

I can still remember vividly the day I arrived in Canberra in February 1988. It was a warm day, but incredibly hot to a person like me who had just come from the northern hemisphere in the midst of winter.
Since that day, I have been trying to create new ideas and materialise them in glass pieces for two years, and now I am very glad to be able to feel that my post-graduate course at Canberra School of Art is being completed quite fruitfully.
But I would like to stress here that nothing would have been achieved without the assistance of many people.

Firstly, I would like to thank Mr. Klaus Moje, who gave me an opportunity to study under his supervision and provided guidance and direction. I am also grateful to Miss Elizabeth McClure for her instruction in glass blowing.

I am deeply indebted to Ms Elizabeth Kelly, who always assisted me when I blew glass. Many thanks to the other colleagues at the Glass Department for their support. I am also indebted to staff at Ceramic Department for allowing me to use the equipment.

I would also like to record my appreciation of the assistance of Mr Peter Faulkner, who made plinths for me.
My thanks also go to Mr Hanh Tran who took photos of my pieces for two years, and to Mr Mitsuru Ando for his assistance in typing this report.

I would like to express my gratitude to Liesbet and Tony Shiel, who made my life in Canberra very comfortable and enjoyable from the beginning.

And finally, I wish to thank my husband Kazuhiko, who allowed me to study here and has always encouraged me to continue my work. I can only hope that at least one of my pieces in 2 years may serve as evidence that his understanding, patience, and encouragement were not in vain.

AESTHETIC OBJECTIVES

In this section, I would like to outline the concept and influences which have affected the aesthetic aspect of my work.

As glass often conjures up images of a heavy, sharp and hard material, people have not recognised other characteristics of glass. For the last six years I have been considering ways of changing this fixed perception towards a softer, delicate and more flexible image of glass. These ideas occurred to me from observing fabrics, such as traditional Japanese Kimonos, African folk costumes and traditional European lace, the qualities of which I have attempted to draw from glass.

For the last 2 years, I have considered whether I could express more fragile, sensitive and delicate images in my pieces.

In my search for ways of expressing these qualities I came across some images of a beautiful woman, a lace scarf waving around her neck in the breeze.

My immediate response was that of excitement. The image was so strong and significant for me, as it epitomized the very delicacy and fragility I had wished to portray. Seeing the potential to use the notion of these more linear qualities of the fabric and adding these to my existing work, which was more involved with other surface qualities of fabric, inspired me to commence a new series of work; I associated these linear qualities in lace to the characteristics of light and refraction in glass.

I have already begun to explore techniques which allow me to express these characteristics. By using patterns of line and dot and plane I can express and control colour and the flow of light.

Aspects of colour are also very important to me. Japanese colour has qualities which distinguish it from the colours of other countries. That is to say, dampness in the air restricts the way colours are perceived in Japan. The light there is different from countries like Australia and the United States because both of these countries have a relatively dry atmospheric environment.

Before coming to Australia I had an opportunity to live in the United States. The sudden change of my living environment, from the damp atmosphere where I had grown up, to the dry air of North America, gave me a heightened awareness of the brightness of colours there. The intensity of light and of bright colours in the U.S.A. and Australia has given me a totally different perception of colour. Although, at first I did not realise this would be so significant to my work, it continues to be a major part of it.

Another major tuning point for me has been in encountering an ancient cage cup[1] or "Diatretum" as it is sometimes known. Since I saw some pieces of the cage glass, delicacy and sensitivity of glass began to develop from 2 dimensions into 3 dimensions[2]. Although it fascinated me very much, the "Cage Glass" as it seemed to me reflected the fixed images of glass - heaviness, sharpness, and hardness. Therefore I began to look for alternative ways to express the potential images of glass. It has been extremely challenging for me as there are so many new aspects involved, both technically and aesthetically.

In the working process, I have found that as far as I am concerned, making pieces continuously, instead of waiting for ideas to form, not only improves techniques but also inspires new ideas and refines them.

Each piece consists of colour, shape and structure. Each must be perfect, but it is not enough. Each must enhance each other's aesthetic quality and be in harmony. It is only then that the piece can be regarded as successful.

At the early stages in making lace cage pieces, my thoughts had been occupied with the lace part. But I gradually realised that harmony of the three parts (inner form, lace cage and struts) determines the beauty of a piece. Since then I have always kept this in mind in designing a piece.

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[1] See the photo at the end of this section.
[2] See the photos 2-6 in Working Process in 1988.

Speaking of colour and shape, I have preferred simpleness. Complex shape or strong colour is impressive, but sometimes may destroy the harmonious beauty. Therefore I have tried to synthesise simple colour and simple shape into a piece of a sophisticated beauty.

A Roman cage-cup, or diatretum (4c. AD)
Height: 12 cm

It is thought that it was made from a single blown-glass blank in which the network of circles surrounding the body was produced by an undercutting technique.

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TECHNICAL OBJECTIVES

In this section, I would like to describe how the technical aspects of my work have been developed during the 2 years of my postgraduate course.

After 6 years of making glass pieces by fusing technique, 3 years ago I saw the possibilities of combining fusing with other techniques .

A Roman cage cup inspired an idea of making a glass cage consisting of finer lines of glass by fusing and Pate de Verre technique. One of the most difficult problems I faced was to determine how the inner form and the outer cage could be connected.

At the first stage, I attempted to make the whole piece only by blowing technique. It turned out that it required a high degree of skill. Then I tried to attach the fused inner part to the blown outer part with bits[1]. But this technique proved to have a limitation, making the outer lace part into a particular shape. These experimental methods revealed that something else must connect the inner and the outer part together.

I then found that struts could solve the problem. I was also aware of the necessity of a mould on which the struts had to be fixed. It was also important that the mould, placed between the two parts, could be removed afterwards.

When I reached this stage, I found it necessary to research each of the three parts - inner form, outer lace, struts - of which a lace cage piece consists. The details of the research will be shown below. Furthermore, other factors, such as the working process and compatibility of glasses had to be considered, so that the three parts could be made into a piece. A conversation with an artist who specialised in glass blowing led me to develop the use of glass canes for the struts.

In the working process of my first year, I fused struts with the outer part first, and then blew the inner part. This method created problems, which made it difficult to pay full

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[1] bit: A small gob of glass.
As for the piece using this technique, see the photo 1 in Working Process in 1988.

attention to the design. I had not yet reached the stage where I could consider coordination of the three parts. Although there were still numerous things to be improved, I was convinced that my basic idea as a whole was going in the right direction.

In my second year, I discovered the appropriate recipe for a mould, and I also changed the order of blowing and fusing. I blew the inner part and attached struts to it at the same time, and then fused the lace cage with the struts. This development made it easier for me to shape both the inner and the outer parts, which resulted in improvement in the proportion of the three parts.

Several months ago, I found it possible to make the inner form by the Pate de Verre technique instead of blowing. By this technique, I could shape the inner form easier, and create a piece of a different character. At the time of writing this report, I have not yet fully researched this method. This is one of the subjects I will continue to work on.

There is a saying that "Technique is cheap". Indeed the mere pursuit of technique can not create art. Nevertheless, technical developments can sometimes enhance the quality of work toward a state of perfection. I have been happy to develop new ideas and improve them so that they may help me express my aesthetic ideas in my pieces.

In the 2 years of my postgraduate work, a great variety of experiments, tests, and improvements have been made in regard to materials and technical aspects. I shall itemize them in the following pages.

1. CAGE

a) Type of glass
b) Preparation of base glass - methods of crushing, grinding, etc.
c) Grading of glass
d) Colouring agents
   -- types of colouring agents
   -- Proportion
   -- Compatibility, devitrification
e) Methods of application
f) Firing time and temperature

2, SEPARATING STRUTS

a) Type of glass
b) Colouring methods
c) Methods of manufacturing
d) Cutting
e) Fixing and application
f) Compatibility

3. INNER FORM

a) Type of glass
b) Colouring methods
c) Methods of manufacturing, eg. blown, slumped, fused, moulded, etc.
d) Firing and annealing cycles
e) Compatibility

4. MOULDS

a) Type of material
b) Methods of manufacturing

5. METHOD OF ASSEMBLING THE THREE PARTS

a) Blowing
b) Slumping and fusing
c) Blowing and fusing
d) Pate de Verre

6. FINISHING

a) Sandblast
b) Diamond saw

7. KILN TYPE

a) Top-fired
b) Side-fired

8. FIRING SCHEDULE

a) Size of kiln
b) Type of glass
c) Type of technique - blowing, fusing

RESEARCH REPORT

The researches I have made for this project wil be described according to the following categories.

Glass

1. Type of glass
   - 1.1 Inner form
   - 1.2 Separating struts
   - 1.3 Outer lace cage
2. Compatibility
3. Method of preparation

Mould

1. Material
2. Quality
3. Method of preparation
4. Removal of mould

Kiln

1. Type of kiln
2. Kiln procedures
3. Firing schedules
4. Annealing

Adhesive

1. Material
2. Method of preparation
3. Method of application

Glass

1. Type of glass

The process of making lace cage pieces has evolved into three parts, each requiring a different manufacturing process. Therefore the suitability of the glass to each of these has been tested separately.

1.1 Inner form

[Blown]

I have tested i) School furnace glass, ii) School furnace glass with powdered colour outside and iii) School furnace glass with colouring rods.

i) School furnace glass

In 1988 the school furnace glass was a mixture of Crown Corning Cullet[1] with a batch[2] by the school recipe. In 1989 it was a mixture of the school batch recipe with lead.

The recipe of Corning Cullet is unknown. The1989 Batch contains 3% Lead.

a) Composition

1988	1989	
Silica	Sand	72.16 %
soda Ash	Soda Ash	13.48 %
whitining	Sodium Nitrate	1.63 %
Sodium Nitrate	Calcite	4.22 %
Potassium Nitrate	Potash	4.24 %
Aluminium Oxide	Lead Biscillate	3.50 %
Borax	Nepheline Suenite	1.01 %
Antimony Oxide	Antimony Trioxide	0.36 %
Manganese Oxide	Borax	1.05 %

[1] Melted batch glass that has been cooled and can be any remelted waste or scrap glass.
[2] The mixture of raw chemicals in specific proportion that are to be melted into glass.

b) Temperature Chart

	1988	1989
Melting Temperature	1360 °C	1300 °C
Slumping Temperature	560	500
Fusing Temperature	800--820	760--780
Annealing Temperature	520	480

c) Clarity

	1988	1989
	Light Green	Almost clear

ii) School furnace glass with powder colour outside

I have used various types of colouring agent including
body stains, overglazes, glass enamels and coloured glass powder.

Body stains

These are usually used for surface decoration of ceramic. Firing temperature is normally higher than glass powder.
They are premixed chemicals, i.e. metallic oxides etc.

methods of use

See Working Process in 1989 (p. 38).

advantages

can create new colours
can be fired at low temperature

Overglazes

A material composed of finely ground glass of specific composition and

applied to the prefused surface of glass to prevent devitrification[1] and to produce a very glassy surface. It is generally applied as a powder or suspended in a spray medium.

method of use

See Working Process in 1989 (p. 38).

advantages

strong colour

clearer colour

Glass enamels

A substance composed of finely ground coloured or clear glass which is available either as a powder or as a suspension in liquid medium.

method of use

See Working Process in 1989 (p. 38).

advantages

strong colour

available in small quantities in powder

Coloured glass powder

These are made from Kugler[2] and Zimmermann[3] coloured glass rods, which are used to colour blown glass.

method of use

See Working Process in 1989 (p. 38).

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[1] Crystal formation in glass.

[2] The glass manufacturing company in West Germany.

[3] The glass manufacturing company in West Germany.

advantages

clear colour

any colour can be mixed

can be fired at low temperature

iii) School furnace glass with colouring rods

I have used various types of colouring rods made by Kugler, Zimmermann, and Wiesenthalhutte.

Most of the colouring rods have a relatively high lead content which allows expansion of approximately 2-3 x 10-7 cm/cm °C without danger of damaging results.

method of use

See Working Process in 1989 (p. 38).

advantages

very bright colour

[Fused]

i) School furnace glass

See 1.1 for details.

ii) School furnace glass with powder colour outside

See 1.1 for details.

iii) Bullseye sheet glass

Commercial sheet glass made in U.S.A. This glass is costly, and it takes time to crush and powder it.

a) Composition

Commercial soda glass, recipe unknown

b) Temperature chart

Melting Temperature	840--870 °C
Slumping Temperature	640--740 °C
Fusing Temperature	760--840 °C
Annealing Temperature	480 °C (6.3 mm thick)

c) Viscosity

Low

1.2. Separating struts

[Blown]

i) School furnace glass

See 1.1 for details.

ii) School furnace glass with powder colour outside

See 1.1 for details.

iii) Solid colouring rods

See 1.1 for details.

[Commercial cane preformed]

This commercial cane[1] is made in Italy. Trade name is Bachetta. Unfortunately, this cane is not compatible with other glasses.

[1] A rod of glass usually thin.

1.3 Outer lace cage

[Fused]

i) School furnace glass

See 1.1 for details.

ii) School furnace glass with powder colour

See 1.1 for details.

iii) Bullseye

See 1.1 for details.

2. Compatibility

Compatibility is the characteristic of glasses that allows them to be fused together and, after proper cooling to room temperature, have no undue stresses that will lead to fracturing.

The following table will show some of the variables affecting compatibility. The results are dependent on colour proportion.

	Furnace "88	Furnace"89	Bullseye	Kugler	Zimmermann
Furnace"88	O	O	*	O	O
Furnace"89	O	O	*	O	O
Bullseye	*	*	O	*	*
Kugler	O	O	*	O	*
Zimmermann	O	O	*	*	O

O = Compatible
* = Not always compatible

3. Method of preparation

See Working Process in 1988 (pp. 22-23).

Mould

1. Material

Luto, Plaster, Silica China clay, Alumina, Mouldable Ceramic Fiber Frax (pulp), and Ceramic Fiber Frax (paper).

2. Quality

The following six recipes have been tested.

(a)

Luto	20%
Plaster	40%
Silica	20%
Alumina Hydrate	20%

results: easy to make particular forms

strong before firing, but difficult to remove after firing

(b)

Silica	50%
Plaster	50%

results: same as (a)

(c) Mouldable Ceramic Fiber Frax

This ceramic fiber mouldable mix is characterised by wet adhesion to steel refractories and other ceramic fiber materials.

LDS Mouldable is a sticky putty-like, ready-to-use product, with almost zero drying shrinkage.

results: easy to make particular forms
strong before firing, but impossible to remove after firing

(d) Ceramic Fiber Frax paper

This is an Alumina silicate fiber paper, specially manufactured to optimize thermal insulating characteristics. It is supplied in thickness from 1 to 3 mm. I have used 3 mm and 1.6 mm.

results: easy to make particular forms
weak after firing, but easy to remove

(e) Used Fiber Frax

Fiber Frax paper can be used again and again after the mould is removed. I have mixed the used Fiber Frax with CMC (glue) and water until it becomes like dough.

results: easier than (d) to make particular forms
weak after firing, but easy to remove

(f) Recycled Fiber Frax and Fiber Glass

As all the previous materials showed weakness after firing, I have put a sheet of fiber glass between the layers of the fiber frax (d) for reinforcement.

results: as easy as (e) to make particular forms and remove afterwards
stronger than (e) after firing
strong enough to hold inner form (blown part)

3. Method of preparation

See Working Process in 1988 (p. 25) and 1989 (pp. 30-31).

4. Removal of mould

See Working Process in 1989 (p. 47).

Kiln

1. Type of Kiln

Electric kilns may have heating elements located either on the inside top of the kiln (top-fired) or around the inside walls of the kiln (side-fired).

[Top-fired]

A kiln with heating elements on the top is called "top-fired".
This kiln radiates heat downward from the elements over the entire surface of the glass on the shelf. Every part of the glass receives a similar quantity of heat at the same time. Therefore, since no temperature differences exist in the glass from the centre to the outer perimeter, the expansion of the glass is uniform. This allows for a faster initial heat-up of the glass without cracking.

[Side-fired]

A kiln with heating elements around the side is called "side-fired".
This kiln has the advantage of being capable of firing several shelves at one time.

2. Kiln procedures

The choice of the type of kilns partly depends on the shape of the piece. I prefer to use top-fired kilns for flat work, and side-fired kilns for three-dimensional pieces.

Before firing, kiln shelves are coated with kiln wash so that glass may not stick to them. I prefer Bullseye's pre-mixed kiln wash, but a mixture of china clay, alumina hydrate and water can also be used.

Great care must be taken in positioning the pieces as it can greatly affect the result.

The kiln is then programmed to the required schedule. Care must be taken to note whether vents are open or closed, at all times during the firing procedure.

3. Firing schedules

See Working Process in 1988 (p. 27) and 1989 (p. 46) for the sample schedules.

4. Annealing

The controlled cooling of glass to achieve the desired final distribution and amount of stress[1] in glass when it has reached room temperature. The annealing process is made up of two stages: anneal soak and anneal cool.

Annealing varies depending on size, thickness and complexity of the work.

[1] Condition of tension or compression in glass.

Adhesive

I have used an icing gun to make fine lines of glass for the lace part. As the glass has to be creamy and sticky so that it can get through the nozzle, I have found it essential to mix something with the powder of glass.

1. Material

I have tested three materials, with results as follows:

Honey	---	some colour changes (chemical reaction?)
PVC (wood glue)	---	dries too fast

CMC (Polycel): Normally used for wall-papering and as starch for laundry. Application of this glue in Pate de Verre has been introduced to Australia.

--- smooth through the nozzle
burnt out after firing

Other wall-paper pastes have shown similar results, but CMC is smoother.

2. Method of preparation

See Working Process in 1988 (pp. 23-24).

3. Method of application

See Working Process in 1988 (p. 24).

WORKING PROCESS IN 1988

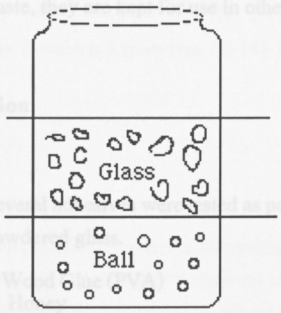
1. Glass preparation

1. The glass to be used at the beginning is raw cullet.
   It is the broken glass which has been taken hot from the furnace and quenched into water.

2. When the glass is ladled or gathered[1] from the furnace into the water, it is important that the water be kept cold, because this causes the glass to break into finer particles and means that it takes less time to powder the glass when Ball Milling at a later stage -- reducing the time from half a day to a few hours.

Glass Grading

The Cullet is then placed in a Ballmill in these proportions.

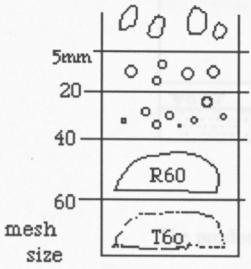


1/3 Glass

1/3 porcelain milling balls

[1] gather: to dip and rotate either a blow pipe or punty in the molten glass to accumlate.

This is then milled dry for 2.5-3 hours in order to break it down to fine grain or powdered glass.



Where necessary the glass is sieved through various mesh sizes, from 5x5 mm to 60 mesh, in order to separate glass into suitable sizes.

R = Retained
T = Through

I have found the glass which comes through the 60 mesh sieve is the most suitable for the lace glass.
Although the particles retained on the sieve above 60 are not used for paste, they are kept for use in other processes.

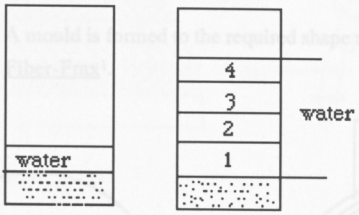
2. Glue preparation

Several adhesives were tested as possible blenders for mixing with the powdered glass.

-- Wood Glue (PVA)
-- Honey
-- Paper glue (water soluble)
-- C. M. C. (Carboxy Methyl Cellulose)

See Research report (p. 21) for the results.
C.M.C ("Polycel") proved to be the most convenient and easy to use.

Method of mixing



Add an equal amount of water to the glue and leave overnight. Then add water 4 times the volume, and leave one more night.

The product can be made and kept for later use.

3. Colouring agents

I have used various types of colouring agent including coloured glass powders, body stains, glaze stains, glass enamels, ceramic enamels and chemicals.

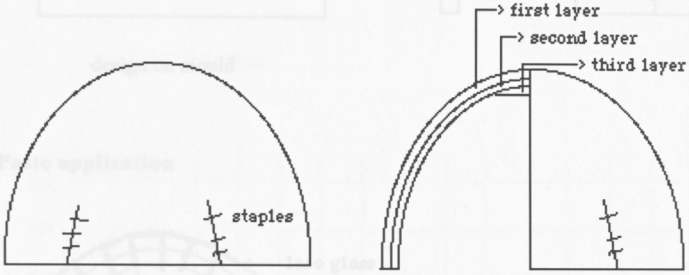
See Research Report (pp. 12-14) for details.

4. Glass paste

The powdered glass, the colouring agents, and the glue, which are already prepared, are then mixed together.
The powdered glass can be mixed dry with the colouring agent, or they can be added to the glue at the same time.
Sometimes, where necessary, water is added until the correct consistency is achieved. Usually it is mixed until it is fairly stiff, like whipped cream.

5. Making the mould

A mould is formed to the required shape using ceramic fiber paper Fiber-Frax[1].

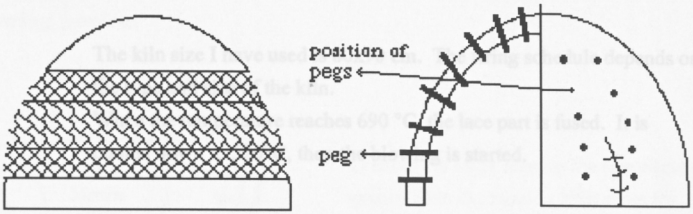


1. For preparation, Fiber Frax is soaked in water for about 1 hour. Wet Fiber Frax is easier to shape.
2. It is held in shape with metal staples.
   2 layers give the appropriate space on the side, and 3 or 4 on the bottom of the form.

6. Design application

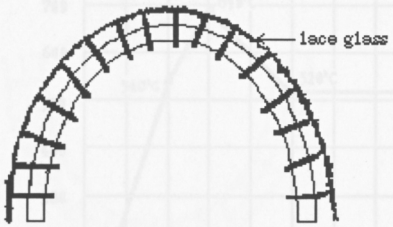
Before the application of the glass to the mould, the design is drawn onto the fiber with pencil and the positions of the glass pegs are marked. The pegs are then pierced through the mould.

[1] See Research Report (p. 18) for details.



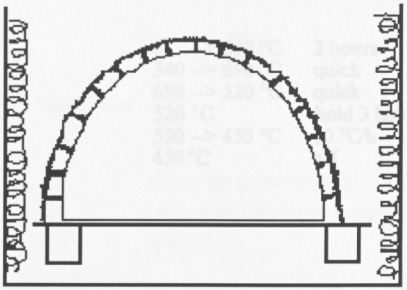
design on mould

7. Paste application



With a nozzle such as an icing gun, the paste is drawn onto the pattern over the ceramic fiber mould.

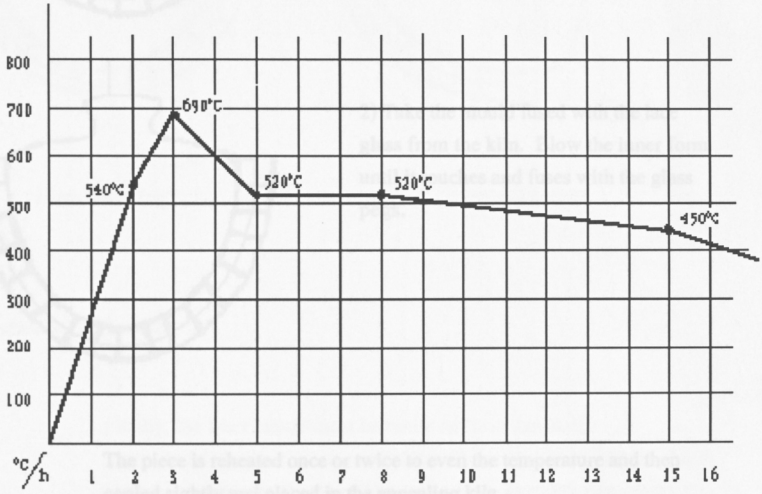
8. Firing



The lace cage is then fired in the kiln and heated in preparation for the blowing of the inner form at the same time. The fiber mould and the lace glass are placed upside down in the kiln so that the base of the cage may not be damaged.

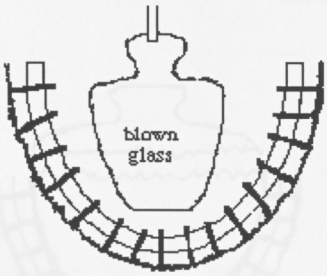
The kiln size I have used is 80x90 cm. The firing schedule depends on the type and size of the kiln.
When the temperature reaches 690 °C, the lace part is fused. It is cooled down to 520°C, then the blowing is started.

Firing Schedule

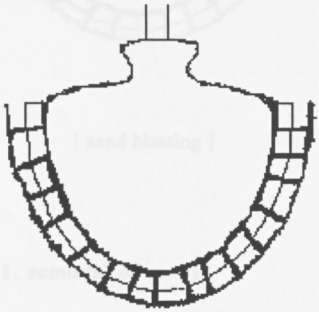


0	--> 540 °C	2 hours
540	--> 690 °C	quick
690	--> 520 °C	quick
520 °C		hold 3 hours
520	--> 450 °C	10 °C/h
450 °C		off

9. Blowing process



1) Blow the inner form to the size slightly smaller than the mould. Heat glass for the final blowing.



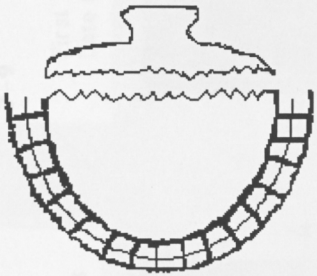
2) Take the mould fused with the lace glass from the kiln. Blow the inner form until it touches and fuses with the glass pegs.

The piece is reheated once or twice to even the temperature and then cooled sightly and placed in the annealing kiln.

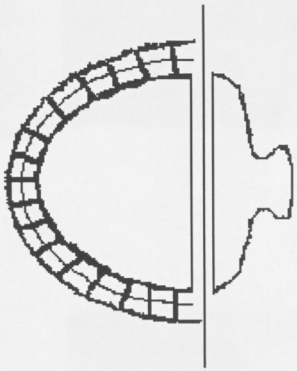
10. Finishing

When the piece is removed from the annealer, the overblown glass is cut and finished with a diamond saw or a sandblaster to the desired effect.

Overblown glass



[sand blasting]



[diamond saw]

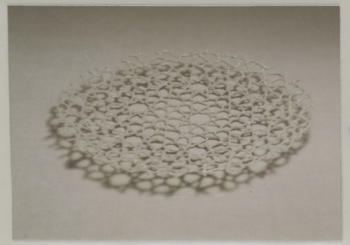
11. removal of mould

Finally, the fiber mould must be removed from the piece.
The mould is soaked in water, then the fiber structure is loosened, and can be scraped out of the openings of the lace cage with fine tools (such as dentists' tools).

1-3

First experimental pieces
Early first semester of 1988

1



2

3

4-6

Lace parts improved
Mid first semester of 1988

4

5

6

7-9

First lace cage pieces
Late first semester of 1988

7

8

9

10-12

Lace cage parts improved
Second semester of 1988

10

11

12

13-15

Form improved
First semester of 1989

13

14

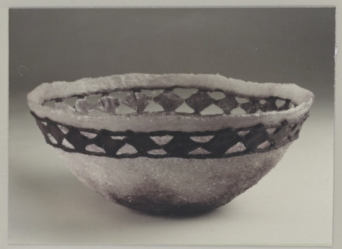
15

16-18

Other Pate de Verre pieces
1988, 1989

16

17



18

WORKING PROCESS IN 1989

1. - 4. The processes are the same as in 1988.

5. Making the mould

1) Use the ceramic mould designed by myself.

2) Heat the fiber frax up to around 650°C to burn out chemicals.

3) Blend the fiber frax with water and CMC.

4) Cover inside of mould with aluminum foil.

5) Stick (3) on inside of mould.
6) Mat fiber glass sheet on (5).
7) Stick the second layer as (5).

8) Dry mould out at 100-120°C for 18-26 hours.
Do not heat over 150°C, or mould will become weak and smell bad.

9) Take fiber mould out of ceramic mould.

10) Draw design with metallic marker onto fiber mould.

11) Mark positions of glass pegs with marker.

12) Drill holes for glass pegs. Mask and safety glasses must be worn during this process.

13) Pierce glass pegs through fiber mould.

6. Process of making canes

1) Gather molten glass from furnace on a punty[1] pipe.

2) Roll gather on marver[2] to chill glass and center it. Then marver on coloured glass powder until glass pick it up.

---

[1] A solid steel gathering rod to which glass is attached for holding during fire polishing or finishing.
[2] A flat surface on which a gather of glass is rolled, shaped and cooled.

3) Pull up glass with tweezer[1].

4) If doing (3) alone, hook tip of glass on something like a nail.

[1] A device with which molten glass is pulled and twisted.

5) Pull more to desired thickness.

6) Cut in several pieces with a file[1].

[1] Tool for cutting glass, or for knocking glass off a pipe.

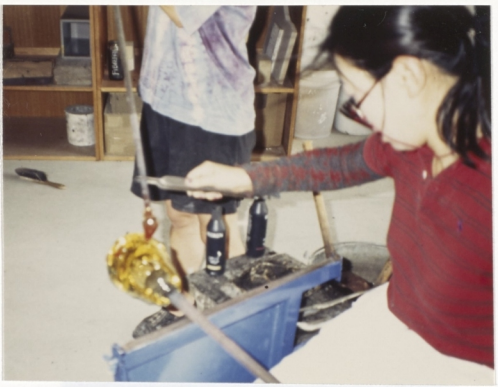
7. Blowing process

1) Gather molten glass from furnace on blow pipe[1]. Blow first bubble into gather.

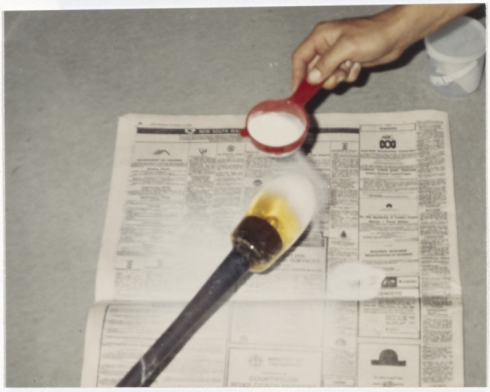
2) Make second gather over bubble.

3) Chill and shape glass on wet newspaper. Center bubble. A block[2] can replace the newspaper.

[1] A hollow metal tube used for gathering and blowing glass.
[2] Half round wooden mould used to center the glass.



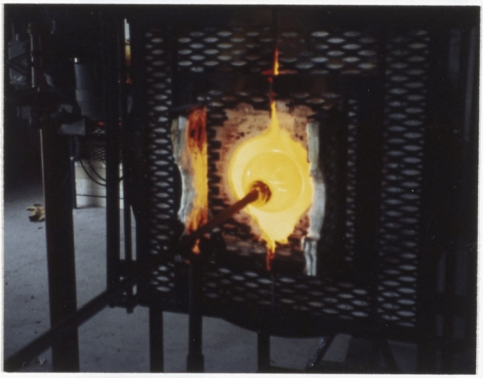
4) After second gathering, attach heated coloured rod on bubble for design of inner form.



5) Depending on design, replace coloured rod with coloured powder for process (4).

6) Repeat heating and reblowing bubble.

7) Neck bubble with jack[1].



8) Heat bubble in Glory hole and reblow to size of mould.

[1] A tool used to put a neck or crease in a piece.

9) Take mould from kiln.

10) Get bubble hot and bring into mould.

11) Blow bubble in mould until it touches glass pegs. At this point bubble is fused with pegs.

12) Bubble is still hot. Wait until bubble is settled (1-2 minutes).

13) Score neck line with wet file.

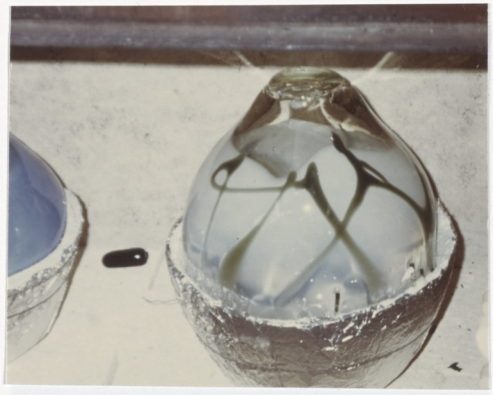
14) Put piece in annealing kiln, and knock off from pipe.

15) Cool piece gradually in annealing kiln.

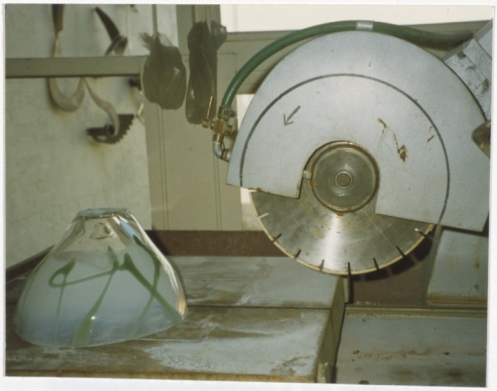
Going for beer[1] after the successful blowing.

[1] Water should take place of beer if a piece is broken. I prefer Swan Lager and Victorian Bitter.

8. Cutting

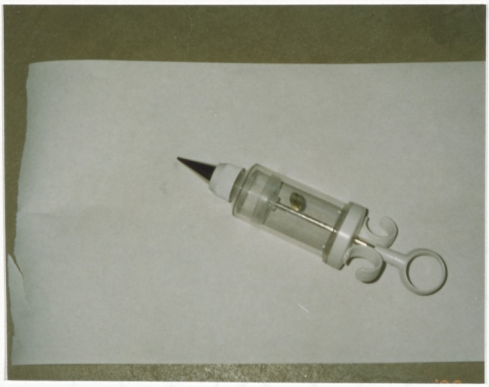


1) Cut overblown glass with diamond saw[1].
2) Grind edge to finished surface.

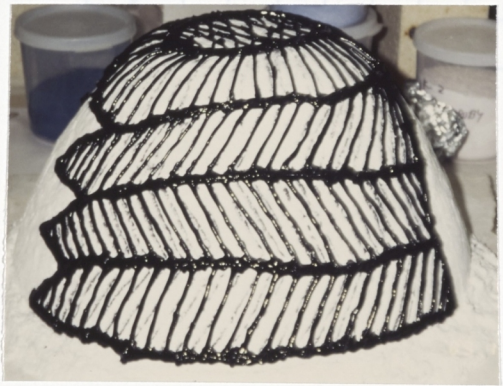


[1] The diamond glass saw is usually a diamond impregnated blade that is water lubricated and mounted on a table saw.

9. Pasting



1) Use a nozzle such as an icing gun.

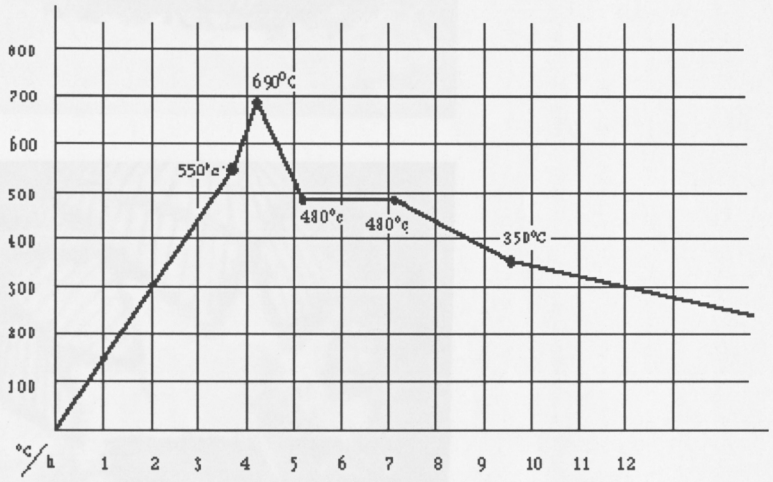


2) Pipe the paste onto the design on the fiber mould.

10. Firing

Place fiber mould and lace glass upside down in the kiln and fire it. The kiln size is 80 x 90 cm, or 60 x 80 cm.

Firing Schedule

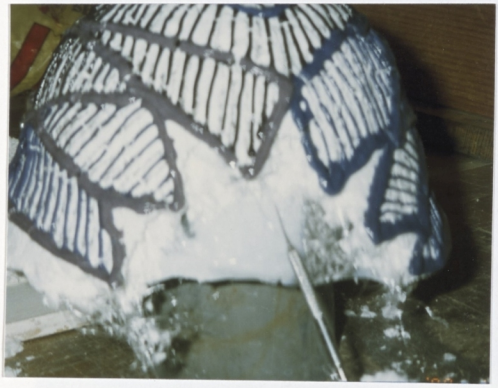


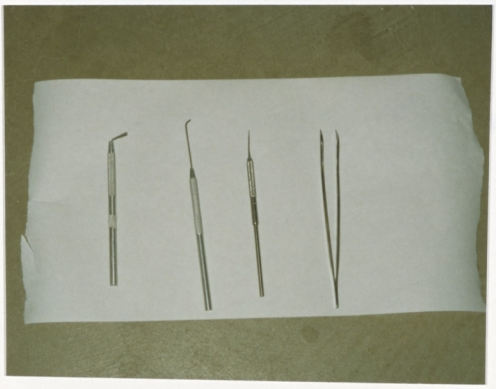
0 --> 550 °C	150 °C/h
550 --> 690 °C	quick
690 --> 480 °C	quick
480 °C	hold 2 hours
480 --> 350 °C	50 °C/h
350 °C	off

11. Finishing

1) Remove fiber mould from piece. Firstly soak mould in water, then scrape it out.

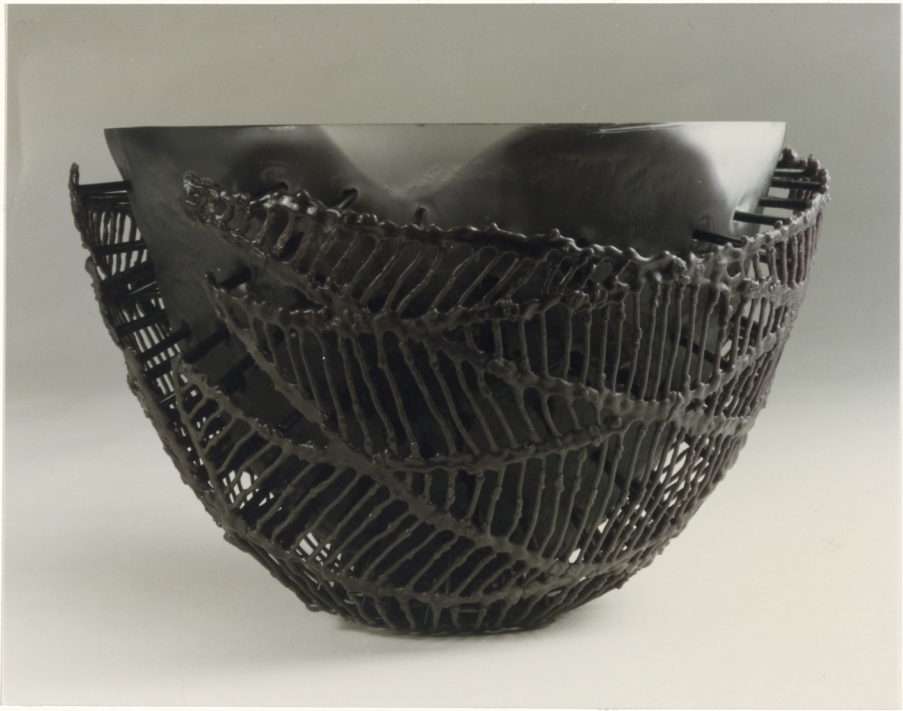
2) Grind surface by sand blasting.





3) Dentists' tools for scraping.

"LACE CAGE"



Hand Blown, Pate de Verre, sandblasted
Height 21cm Diameter 31cm

Colouring agents

inner form	opaque black K-95
separating struts	opaque black K-95
outer cage	opaque purple rose-special Z-99

K: Kugler
Z: Zimmermann

"LACE CAGE"

Hand Blown, Pate de Verre, sandblasted
Height 21cm Diameter 32cm

Colouring agents

inner form	opal white K-62 transparent light blue K-221
separating struts	opaque dutch blue K-84 opaque dark blue Z-97
outer cage	transparent light blue K-221

APPENDICES

Curriculum Vitae

Name
Etsuko Nishi

Born
July 3, 1955 Kobe, JAPAN

Education
1988-1990 Post Graduate Diploma, Canberra school of Art, Australia
1983-1985, 87 Pilchuck Glass School, U.S.A.
1981-1983 Pratt Fine Arts, Seattle, U.S.A.
1974-1978 Bachelor of Arts majoring in Pedagogy and Aesthetics, Japan

Group Exhibition
1989 "AUSGLASS1989 " Meat Market, Melbourne
1988 "Japanese Studio Glass" Tokyo, Japan
1988 "National Studio Glass" Wagga Wagga City Art Gallery, N.S.W.
1988 "International Studio Glass" Kanazawa, Japan
1987 "Studio Glass" Hagi Gallery, Kyoto, Japan
1987 "Studio Glass" HELLER Gallery, New York, U.S.A.
1987 "Contemporary Japanese Glass '87" D'Erlien Gallery, Milwaukee, U.S.A.
1986 "National Glass" Downey Museum, Los Angeles, U.S.A.
1985 "Glass International" Rouen Museum, Rouen, France
1985 "Fragile Art of 9" Apea Gallery, Tokyo, Japan
1985 "Studio Glass" Tokyo, Japan

Solo Exhibition
1988 "Fabric into Glass '88" Matsuya Gallery, Tokyo, Japan
1988 "Fabric into Glass '88" Fox' Gem, Seattle, U.S.A.
1987 "Fabric into Glass '87" Gee Gallery, Tokyo, Japan
1986 "St. Valentine's Day" Fire Works Gallery, Seattle, U.S.A.

Collections
The Glass Museum, Ebeltoft, Denmark
The Rouen Museum, Rouen, France

Publications
"New Glass Review 10" The Corning Museum of Glass, New York, U.S.A.
Weekly Asahi "Young Artist" 1989 Japan
Women's Magazine "Artist's Profile" 1989 Japan
The Asahi (newspaper) "Profile" 1988 Japan

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