DOCUMENT RESUME

ED 023 355 24 HE 000 043

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A College-Level Art Curriculum in Glass. Final Report.

Miami Univ., Coral Gables, Fla.
Spons Agency - Office of Education (DHEW), Washington, D.C. Bureau of Research.
Report No - P-5-516-65
Bureau No - BR-5-8304
Pub Date Feb 68
Contract - OEC-2-6-058304-1146
Note - 54p.
EDRS Price MF - $0.25 HC - $2.80
Descriptors - Architecture, *Art Education, *Art Materials, Arts Centers, Exhibits, *Glass, *Higher Education, Painting, Sculpture, Summer Institutes, Teaching
Identifiers - Italy, *Murano Glass Center, Venice

In order to compile information to be used as a basis for developing a curriculum for teaching glass as an art material on the college level, glass experts, artists and centers in 12 nations were visited. It was clear that the US lags far behind other countries in teaching glass, in using it as a subject for art exhibitions and using it creatively in architecture, sculpture and painting. Not only is the neglect of this medium unfortunate because of artistic needs but also because there are few skilled American technicians to preserve or enhance this area of endeavor. Although glass is prized for the permanence of its color and transparency, there have been obstacles to its widespread use. These could be overcome and educational needs could be met if federal, foundation and industrial support could be made available for (1) the establishment of a free national glass experimental and informational center (2) the collection of teaching materials (3) teaching labs for glass artists and (4) international exhibitions on glass art. Federal aid should be channeled either through a new university or through universities in the Southwestern area to take advantage of existing native cottage-industry efforts. A model curriculum is presented, and a 5-year federally supported program is recommended (effective 1968) for a complete summer school of glass in Murano, Italy where artists, teachers and architects can be trained quickly and economically. (JS)

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By Robert Willson

University of Miami

Coral Gables, Florida

February 1968

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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HEALTH, EDUCATION, AND WELFARE

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CONTENTS

## SUMMARY

Within the long-range purpose of compiling for the first time in history a written body of knowledge of the material, glass, which would be suitable for independent use by the creative artists, this specific project seeks to accomplish its preliminary objectives within the teaching area. A world-wide survey was made of a representative cross-section of glass schools, artists who use glass, writers on glass, and selected commercial glass factories to secure the experience on which to make the report.

The text suggests that this research offers to the cultural world community - through education - the means for a practical realization of a new and fantastic art field in the future use of glass. It speaks in terms and areas of a technique, a material (glass), and a philosophical approach.

The many contacts made during the study indicate the widespread explosion of interest in glass as an art medium in the last ten years in all parts of the world. Hope is held out that a proper combination of specialized education, reporting of scientific experience, and seeking of artistic quality today could change the course of current use of art materials and then could usher in a truly brilliant age of glass art.

Significance is properly attached to the two driving forces behind the artist's interest in glass: (1)the fascination of real transparency, and (2) the emotional reaction to true color as is seen when light passes through glass. The permanency of glass color and transparency is noted.

An ideal curriculum of courses for teaching glass as an art material on the college level has been written and is attached (Appendix A). It includes the steps needed to make available to a creative artist, who usually works alone as a free individual, the information and training he needs to use the fabric of glass as freely as he would any other art material such as clay,bronze,wood,marble,oil,or watercolor.

The report emphasizes the obvious psychological blocks which have existed for centuries in the use of glass by artists: (1) a fear of breakage, (2) a lack of technical knowledge, and (3) a lack of a specialized place to work. To overcome these problems,and the educational needs shown in this report, suggestions are made for (1) a free national glass experimental and informational center, (2) teaching-art

labs available to glass artists, (3) a series of subsidized textbooks, and (4) properly-sponsored international exhibitions of glass art on various levels.

Note is made of the fact that the United States lags considerably behind other areas (Italy, Sweden, England, Czechoslovakia) in the teaching of glass as an art material, in its use as a subject for art exhibitions, and in its creative use in sculpture, painting, and architecture. The question is raised whether the nation can long afford this lag or vacuum in teaching, not only because of authentic art needs, but also because of the factor of having available in this country a body of knowledgable technicians to preserve an area of skill and fact. Leadership is suggested as being of value and need to the nation.

Tribute is paid to the many individual artists, teachers, writers, museum curators, and glass workers all over the world who have zeal in spreading the idea of glass as a material for fine art. The survey of the cottage-industry glass of Arkansas, Oklahoma, and the Texas-Mexican border is pertinent to this interest.

Judgements are made on the basis of evaluations within the viewpoint of a practising glass sculptor. Interest in all cases is in the creative rather than the artisan or craft uses. Educational processes are sought to aid this viewpoint.

If followed, the recommendations made in the report would posit a new field of art and an advance in human knowledge. It is suggested that glass may well become the most effective, most permanent, and most exciting art material of the future. The fulfillment of this design could have important aesthetic results for many generations, and it is a proper work for the government of a nation with the educational facilities of the United States. It could be the first major innovation in art since ancient man perfected painting, sculpture, and decoration.

The report points out the importance of channelling government aid either through a new university (to avoid entrenched ideas in art), or through universities in the Southwestern cottage-industry area (Texas, Oklahoma, Arkansas) to take advantage of the native efforts starting there.

The report is optimistic that progress will come if government aid is used with intelligence and care. It is suggested that a single basic support salary might be enough to spark a renaissance.

For immediate action, a 5-year support program is asked, effective 1968, for a complete summer school of glass in Murano (Venice), Italy. The school is believed to be the quickest, the most economical, and by far the most effective way to train a group of teachers, artists, and architects, and thus to introduce the desired body of knowledge into the American society.

# PROBLEMS AND BACKGROUND

Glass has been a potential material for creative expression ever since its discovery some 6000 years ago in Egypt. In the early ages it was laborously carved like quartz crystal, or it was given a simple molten form such as a bead or a face. However the most valuable art uses of glass appeared after the invention of man's first glass containers, the core wares, in 18th Dynasty Egypt.

An art history of glass includes that most important human creative result, the windows of Chartres Cathedral, as well as many authentic masterpieces through the ages. The brief outline below emphasizes those eras which had special art interest. (See Appendix B. for a more detailed outline.)

1. Egyptian - probable discovery of glass by 4000 BC; core ware in 18th Dynasty.
2. Iranian- note the "Head of a Prince", glass paste, 5th. C., BC.
3. Roman- invention of glass blowing 1st. C., BC; cameo carving.
4. Byzantine- glass wall mosaics 400-1400 AD; Ravenna, Constantinople, Daphni.
5. Islamic- mosque lamps, decorative approach, 8-14th. C.
6. Gothic- stained glass windows, 12-16th. C; Chartres.
7. Venetian- since 11th. C.
8. Art Nouveau- an artistic rebellion, 1850-1911; Tiffany, Carder, Gallé, Lalique, Daum, Marinot.
9. Contemporary- experimentation, art history, book publication on glass, individualism, architecture.

It is worthwhile to note the specialized appeal that glass has for the artist. Chiefly the fascination of the glass fabric depends on the two art factors of transparency and of the living color of light as seen passing through colored glass. Aesthetically the transparency of glass is specifically different from that of other materials such as plastic. The visual effect of light through glass is vibrant, and it is sensitive to the energy level of the light source in a manner which has value and stimulation for both the artist and the viewer.

Colors as seen through tinted glass may be said to be the only true hues available to the artist in any material.

Colored light could be contrasted to the relatively dead pigment reflections from oil paint, lacquer, watercolor, or plastic.

Of significance to the artist is the fact that color in glass is permanent, lasting milleniums. It does not fade, and no other art material has this color security. Such a characteristic may in time lead to a revolution in the reproduction of historical paintings to preserve their color and vitality for posterity. And it may show the way to new-type materials to be used by the painter as well as the sculptor; true permanency is possible through glass products.

These statements, and the modern experimental attitude in art, account for a part of the spreading desire of artists to use glass as an art material, to express themselves with this fabric. There has been a genuine explosion of excitement about glass by artists throughout the world. It has accelerated in the decade since World War II, leading to many attempts to discover ways of using glass. The very fact that so many of these efforts have failed or been channeled away through lack of knowledge is one cause for this report.

The artistic significance of the interest in glass by creative artists has been smothered under many magazine articles about "the noble and ancient craft." Exhibitions of sincere sculptural and painting efforts in glass have been lost in craft shows where "glass blowing" and "made by hand" was more of a criteria than aesthetic quality. It is only within the present decade that exhibitions have been consciously devoted to glass as sculpture or as painting. (See XXII International Exhibit of Glass Sculpture, Venice, Summer, 1967).

The difference between the craft and the art of glass is basic to an understanding of this report. Most workmen or craftsmen in the glass industry - whether in Venice, Italy or Milton, West Virginia or Ft. Smith, Arkansas - are experienced and efficient in their work. Those who reach the respected rank of "maestro" have a mystic as well as a technical knowledge of the molten glass; they are a true race apart. Yet these men invariably are without any particular drive in the creative sense. They are interested in the sculptural result and do appreciate it, but they do not think in the terms of the inventor or the creator.

Rarely does the maestro of glass produce an art work without the close leadership and control of an artist. The maestro, with all his knowledge and experience, becomes a tool of the artist when creative work is desired. While all major glass art has tended to be a team effort, with the artist taking more or less of a direct part according to his manual abilities, it is to be noted that no glass art is produced without the artist. Such teams grow close together over a period of years as the members learn to understand and anticipate eachother.

The artist can not have arrived at the skill and knowledge of a craftsman. He must in fact depend on the craftsman-maestro for technical guidance, warnings of stress in the glass, and physical aid as the sculpture or painting progresses. Few artists can spare the years (10) it takes to become a maestro of glass, especially since he knows that such mastery does not improve the art result of his glass work.

Most glass artists are more concerned with keeping control of the team at any moment of the work in order to arrive at the desired result, than with an attempt to do the work of better craftsmen at any step therein. The concept is the vital component.

Perhaps a comparison could be made with some relevance. The potter who works on a wheel hours each day has skills which may be beyond the usual ceramic sculptor, but it is the latter who gives the clay material its real value in art. Likewise, the craftsman who blows glass professionally has abilities that no sculptor may reasonably learn, and his skill must be called upon to help the artist produce his work.

Along with the artist-sculptor-painter and the professional glass maestro-craftsman, a third type of person has become interested in glass today and may have important effects on its use. This person could be labelled the amateur glass craftsman and is usually found in the ranks of the college craft or art teachers. He delights in the physical play with glass and tries to produce those works which one person can finish alone, without helpers. Although most of this work is technically unskilled or even intentionally crude, these workers have the taste and training to give the rough glass a design quality. This amateur is the modern hybrid, the so-called artist-craftsman. He is obviously limited in the size, complexity, and control of sculptural attempts, so most of his products are variations of blown bottles and not the main subject of this report.

Credit and respect must be given to the college teachers for their ability to arouse enthusiasm for glass. These dedicated educators have been able to use small furnaces, ceramic kilns, remelt glass, and pure determination to help awaken a generation of art students and craftsmen to the potential which is in glass. Already from these students are appearing individuals who wish to go into pure glass sculpture and are seeking means to experiment further with it.

The interest of the college teachers and students makes evident the need for major aid to a glass movement. Professional maestros and glass craftsmen are already rare, and further mechanization may effectively eliminate them. Factories even in Italy are finding the replacement of old workers more and more difficult.

Some priority should be given to saving the experience and knowledge of the glass maestros. It will require

unusual recording and publishing ventures at this time,before it is too late. The knowledge must be carefully studied , then explained in detail and made available to future artists in such a clear manner that it can be understood easily,and thus recovered by non-technical persons.

It is ironic that the growth of the use of art glass in small studios,schools,and craft factories throughout the world may be the only step to keep alive the maestros themselves. If glass factories mechanize completely - as they may be forced to do - the maestro may find his only employment in art glass; there will be nowhere else for him to go.

An important step in any consideration of glass for teaching, art,or crafts is to recognize the reasons why artists through the ages,despite their strong desire to do so,have not been able to use glass as freely as they did any other material. Although one cause in the past has been the obvious efforts of craftsmen in the glass centers to guard their secrets as commercial assets and to keep the individual artists from competing, the main reasons why glass was not more used have been psychological.

Four factors in the general attitude toward glass are pertinent here. They are described below.

1. The fear of breakage has colored all ideas about glass, and has been a major deterrent to its use. The inexperienced artist, in ancient times as well as today, saw that glass could break while cooling and thus before it could be sold. The more the artist tried to break away from the simple blown shape, the oftener the glass broke. Patrons who lived in a rough age knew that glass could not survive many mobs or orgies.

Contemporary knowledge of chemistry and physics has solved some of the problems. Glass can be made durable,tougher, or even shock and break proof; and in controlled lehrs the stresses of cooling can be eliminated. Factories and some colleges in the position to have proper equipment and technical advice can handle the problems of major glass sculpture today. However,this does not materially help the individual artist working in his own shop - and this is where most of the art must be produced. Obviously there is a need for sources for instruction and supplies,and publication of handbooks usable by all levels of personnel.

Modern living in fragile houses crammed with breakable light bulbs,television sets,dinnerware,and flimsy furniture has removed the immediacy of breakage as a point of consideration in sales. Given an age of peace and order, glass breakage will not be an important block.

2.Another block to the use of glass in art has been the real lack of technical information available outside the

trade. Modern research and experimentation has made the information possible,but it has not been published in a usable form for the independent artist.

3.The lack of first-hand experience with the hot glass has been a further block in the way of starting creative work in the fabric. Most artists saw that the disciplines of becoming a professional craftsman were too costly in time (10 years) and in attitude (routine workmanship) to be considered. The need was for a chance to sample the craft and the techniques involved,then to be able to direct the professional craftsmen, just as an architect directs his workers. Only in recent years has it become possible for the artist to make the trial of the fabric.

4.In the past the buying public has considered glass only as a material for useful objects: the window,the vase, the dish, the toy animal,or the lampwork curiosity at the tourist center. Glasswork has been considered a craft,not an art. Patrons of art have not seen enough glass art to accept it as sculpture or painting as such. Only in recent years have art historians progressed to the point of realizing that the glass windows of Chartres Cathedral likely represent the finest body of painting man ever developed. Further exhibitions and publications will develop the fine art acceptance.

Despite these psychological blocks to the free use of glass as an art form, there is undoubtedly a renaissance of interest in glass as art all over the world today. There seems to be no way at present to secure a listing of the many artists who are working,internationally,in glass. The travels done on this research indicated that the interest is major rather than minor.

In the United States a few names are important to this study. Although this is a new country, the Art Nouveau period was ably represented in glass by Louis Tiffany and Frederick Carder,both of whom combined technical and artistic knowledge. It is to be regretted that the shops established by these men could not have been continued as free experiments for several generations.

After World War II many college craft classes and individual craftsmen experimented with sagging sheet glass into molds as a fusing technique. Michael Higgins,at the University of Georgia, carried this type of work further than most others,and in time he went into commercial production. His glass interest was continued at Georgia by Earl McCutcheon. Sag mold work has been done even in grade school classes for some years. Probably nothing above the craft level has been accomplished in this technique,due not to the technique itself, but to its source in craft rather than fine art groups.

An unusual and a valuable trend in glass is shown in the cottage-industry glass houses which have grown up in Arkansas, Oklahoma, Colorado, and along the Texas-Mexican border. For the most part these glass plants are small and are operated by the members of one family: blowing, repairs, mixing of glass batches from old cullet glass, packing the product, and sales. The Mexican versions are somewhat larger and are operated more like commercial factories; they hire some outside help, designate maestros, and imitate the Venetian colors and styles. The products are generally blown utensils, glasses, vases, and tourist junk. Most of the plants are operated by a rule-of-thumb technique rather than by exact knowledge. The owners rely heavily on their own experience to solve problems. Most of the owners learned the trade by working an average of 3 years for a neighbor who had such a plant.

Despite the lack of almost any trace of art quality in these houses, the experience being gained by these workers is worth further study. That they are able to make a living in the United States in this manner should afford some guides to the growth and survival of artists' studios in glass. The American cottage-industry in glass should be examined in detail and published promptly.

Many individuals have contributed to the new interest in glass in America. The most important developments seem to have come through the personality and the skill of Dominick Labino. This leader retired from the position of director of research at Johns-Manville Fiberglas in Ohio, with 51 patents to his credit, and devoted himself to a life of experimenting with art glass in his own glass plant. He has the scientific knowledge, the craftsman's ability, and the art awareness that has made him the key factor in the modern American art glass movement. He developed a portable glass furnace, an inexpensive lehr, remelt glass formulas, and techniques which have placed glass blowing within the reach of college classes and individual art studios. Rarely has there been such a combination of the right qualities in one man. (Reference is made to Frederick Carder and Louis Tiffany). If he could be persuaded to publish his own manuals, formulas, and guides, he would influence glass teaching and art for generations.

The ideas of Dominick Labino have been spread widely, by a host of enthusiastic college teachers and museum personnel. Considerable credit should be given to the colorful leadership of Harvey Littleton, of the University of Wisconsin; his zeal has made the Labino techniques known even in Europe. A valuable series of seminars has been held at the Toledo Museum of Art under the experimental direction of Rudolf M. Riefstahl, the Curator of Decorative Arts.

Most college-level teaching situations using the Labino ideas have remained on the craft level because the blowing has

produced chiefly a profusion of bottles,as seen in the more recent craft shows. The use of the similar fiberglas material may have added to the sameness. Some of the bottle products exhibit exquisite taste and design qualities and occasionally reach sculptural impact. Their chief value,though, may be in awakening students to the potentials of glass as a material.

Although few glass sculptors will have access to the facilities of a glass factory as does Joel Myers,glass designer for Blenko Glass Company in West Virginia, his working methods may offer a more flexible approach to glass. Usually he works alone, as does Labino, but he uses the original glass from the floor of the big plant,producing after hours with the glass remaining in the tanks. He has tried a wide range of techniques and may be expected to tc lead in future experiments with art glass in America. Myers and Labino seem to be the two chief source workers at present.

Work in glass by an artist with a maestro and a team of helpers has not been done much in the United States because of obvious technical and economic restrictions here. Union narrowness and insurance demands have caused most American plants to exclude working artists from the floor. As a result, glass sculptors usually work in European plants (as does the author of this report) where conditions welcome and promote creative work on any level of complexity desired. At present there is no place in the United States where major glass sculptures may be made by individual artists under their own guidance and control.

It may be well to note that designing for glass is not within the scope of this report. Any person,artist or not, may commission an idea or drawing and have it executed by a glass plant,perhaps even in the United States. The result in this case will tend to be a manufactured item without the needed freedom of an individual created piece. The artist must be present at the making of the work and must do those parts he can handle well and must at all moments be in control of the emphasis and shape used. There is no short cut to this direct participation and control.

Painting on glass has tended to be somewhat different from sculptural products. It is best seen in the United States as stained or slab glass windows in architectural uses, and most of these works are done by shops from detailed designs by the artists. There are many excellent architectural glass shops here,incldng such as Eric Erikson,Henry Lee Willet,Roger Darricarrere,Robert Sowers,and others. Although painting on glass has not been done in contemporary times with much of the real power of Gothic cathedral glass, the modern color use has been of merit. The psychological effect of color has been understood and handled with confidence.

Direct painting on glass by the artist himself is rare.

Again, the condition is due to a lack of information and understanding of what is possible in the material. The fine glass paintings done by Angelo Barovier in Murano have not had equals in America. This is another area in great need of proper exhibitions by museums to explain its potential.

The special work of John Burton of California in lamp working is to be noted. Although his attention has been concentrated chiefly on bottle forms, strongly influenced by the classic world, he has become ever more abstract and experimental with the bottles. His technique is a proper tool for small glass sculpture. The appearance of his new book on technique should give a starting point for this area.

Despite the renaissance of interest in glass, information about the educational use of the material does not exist. Textbooks and instructional material is lacking. Trained teachers are not available for any comprehensive program. There is no body of collected data on courses needed, equipment available, content, costs, type of students likely, use of graduates, or realistic results. Aesthetic evaluations of the material in educational use have not been thought of. Usable publication is limited.

The impression is held that glass teaching today is being done in isolated pockets without reasonable awareness of progress made elsewhere. This condition may be due both to the late interest in glass, and to the fact that most teachers only know and teach a single specialty.

A balanced program for glass training in colleges should be sought as a means of correlating the many fragments of information which are beginning to appear. A comprehensive teaching system is a necessity at this time. Writing and publication for teachers and artists alike should have priority. A national center for glass information seems the only solution that will be helpful in any acceptable period of time. Until some such center is established, glass as an art seems destined for a slow growth indeed, and mostly not in the United States.

To secure for the United States the teachers and artists with the knowledge and experience to initiate college and individual studios, a quick method of teaching is suggested by means of an immediate summer school in Murano, Italy. Nowhere else does such a mass of equipment and knowledge exist. The result of such a summer school would be to give America a body of trained personnel of impressive value.

## METHODS

The author and his advisors on this project felt that a worthwhile correlation of opinion on glass teaching could be obtained only if enough individual contacts and visits were completed to gather a wide variety of viewpoints so that statements could be made on a basis of authentic first-hand experience. Ideally, it was agreed that a full committee of artists, teachers, and technicians would observe more and therefore make a better-rounded report than would an individual. But the low budget of the project precluded travel or reporting by more than one person. In this case the researcher was a college art teacher, an international exhibitor as a glass sculptor, and an artist with factual experience in glass, ceramics, and design. He was already acquainted with workers and artists in glass in both America and Europe.

Because no salary was involved for the project, most of the research was done in the summer months and during college vacations. Some few contacts were missed due to the summer dates but not enough to be vital. Correspondence was carried on as widely as possible though it was not of value in securing information.

This study involved a basic routine of personal visits by the investigator to schools, organizations, factories, glass artists, glass craftsmen, glass authorities, glass historians and writers, museums, and areas which seemed promising for the collecting of information about the potential teaching of glass as an art on the college level. The current fragmentation of knowledge about glass teaching, the lack of educational writings on the subject, the confusion regarding methods and aims, and the poor record of exhibitions in the art side of this field - all suggested the need of an over-all view which might suggest general directions for future teaching research.

Reliance was placed on personal discussions rather than on an attempt to collect the usual survey patterns through forms or written questionaires. It was believed that the type of practical artists, craftsmen, and businessmen interviewed would not have the time or the interest to fill out educational forms, and might in fact become uncooperative to such an approach. Observations in the course of this research indicated the truth of the assumptions that artistic

workers dislike participation in mass statistical sampling.

The most practical approach toward getting information from artisans was as an insider in the work, one who had proved his sympathy as a colleague. It seemed true that a single artist, with an exhibition record of his own, was welcome in all cases. It is likely that a committee, though more knowledgeable than an individual, would have seen less in many cases because of the formality involved and the physical problem of caring for it.

Discussions, ideas, techniques, and all information made available to the researcher became chiefly material for evaluation against a very general background of aesthetic judgement, technical application to the artist, and art-educational uses. It was most valuable at all times to be able to compare observations with processes as known in the ancient glass center at Murano,Venezia,Italia. In actual practice, Murano was made the check-point for each segment of study and was used as a standard of measurement.

To indicate only a sampling of the rich advisement on which the investigator could draw in Murano, it may be pointed out that there were available on a friendly basis ancient glass houses and their families, maestros, museum directors,noted writers on glass, and hundreds of craftsmen,salesmen,officials, art teachers, artists, and art students.

The following lists of visits and contacts made by the researcher delineate rather clearly the broadness of the scope of the survey. From these sources as interpreted by the author have come the results,conclusions,and recommendations which are included later in the report. Future researchers may wish to go into more detail at any of these sites.

The lists were selected from continuing discussions with individual artists, from available reading in the art, craft,archaeology,and travel magazines, and in particular after seeking advice from the following:

National Museum of Glass,Murano,Dr.Giovanni Mariacher, Director and author.
Correr Museum,Venice,Dr.Giovanni Mariacher,Director.
Istituto Veneto per il Lavoro,Venice,Dr.Astone Gasparetto, Director and author.
Corning Museum of Glass,N.Y.,Paul Perrot,Director and author, and Kenneth Wilson,Curator and author.
La Fucina degli Angeli,Venice,Egidio Costantini,Director.
The Museum of Modern Art for glass.
Illinois State Museum,Springfield,C.Clay Aldridge, Curator of Art.
World Craft Council,N.Y.,Mrs.George W.Patch,Secretary.
Royal College of Art,London, R.Stennett-Willson,Chairman of Art and author.
Fratelli Toso,Mfg.,Murano,Ermanno Toso,owner.

Pilkington Bros.Ltd.,London,England.
Sven M.Sternfeldt,Architectural Adviser
Alfredo Barbini,Mfg.,Murano,Alfredo Barbini,owner and Maestro.

It was felt that it would be impossible to secure a more knowledgeable group of advisors at any time anywhere in the world, formally or informally. These advisors were in touch with all available areas of glass experiment and activity. They made it possible to plan needed visits and appointments.

The detail list of major contacts may be consulted in Appendix E. Some travel was curtailed by the rise of costs during the time of the contract, but no essential contact was missed. Information was collected from all possible sources. Much of the material would suggest future study in depth and publication.

# RESULTS AND FINDINGS

The result of this research is to concentrate within one span of study by one individual the experience needed to write with confidence the attached curriculum of glass courses (Appendix A) for a college art department. Of more importance,perhaps, it furnishes the physical guide lines for judging the value of this training for the creative artist.

Information which seems to have pertinent value for the study is indicated in sections below. Of course these general results have little meaning unless viewed with the conclusions and recommendations which follow them.

## The Future of Art

Any experiment with an art material such as glass invariably will move into an inquiry on the future of art itself and its materials as vehicles. There are segments of the critical professions which already say that painting , because of slow and non-permanent techniques, will become an anachronism. Invariably critical thought shifts to the idea that color and light may form the arts of the future,both painting and sculpture. The scientific age of the future will have other values. Perhaps the power of color will be central to all art of the future.

Glass is the art of color,for it is the best technique for presenting and capturing pure color,or colored light. It has a permanency of milleniums and an undoubted attraction to artists and craftsmen.

Color is a psychological medium which is poorly understood today. As man the artist begins to sense its power and to have visions of what he could do with it, he will need a material to work with. Glass may be the answer to the painter,the sculptor,and the architect of tomorrow. The many brilliant uses of glass by architects today, and the hesitant starting of its use by sculptors and painters, is likely no more than a sampling of what is to come.

## The Art and the Craft

Glass has a history as a craft rather than an art and the distinction is unfortunately accepted by the buying public, to the detriment of contemporary attempts to use it directly as sculpture or painting. It will prove of aid to the artist, the craftsman, the teacher, the museum, and the patron if some understanding of the two terms is possible.

In Venice today the shops are full of glass utensils and routine tourist figurines - the glass craft. The many craftsmen in Venice and Murano do not think of themselves as artists. They are craftsmen and like it that way. To be creative in glass is not particularly exciting to them, speaking as a group. As one glass blower said to the researcher: "I don't see how you think up all those sculpture ideas. That is too hard. It would hurt my head. Anyway, it's too chancy."

In many of these same Venetian tourist shops can be found, usually high on a back shelf, rare creative and original pieces of glass. These do not sell as well and thus are placed behind the more gaudy ware. Yet they indicate another type of mind working with the material; the inquirer, the experimenter, the artist.

There is, of course, a vital difference between the intent of a man who makes a glass ornament to sell to the tourist, and the man who makes a glass sculpture for the sole sake of the sculptural result. It is not to be said that the art is better than the craft, or the opposite. Neither is better or worse. But they are different, in different worlds of meaning, and have in common only the material.

It is felt by many that the craft and the art should not be taught together, nor exhibited in the same show. Juries in recent large ceramic shows, for example, have criticized the showing of sculpture with the pottery. There was a belief that the craftsman, under such competition, became precious without selection; and the artist became a merchant. Neither improved.

The fact that the great Chinese potters, who were craftsmen, made utensils which had the quality of sculpture, is the exception which points up the usual level of most crafts. Even these were the result of a design heritage of unusual artistic drive.

This report takes no interest in the craft of glass except in so far as its techniques are to be used for creative sculpture and painting in glass. Concern is with teaching glass in a manner to help the artist, not the craftsman. There are enough glass craftsmen; there are too few glass artists for the good of our cultural life.

## The Predominance of Europe

It is evident, on the basis of the travel, interviews, observations, reading, and experiments of this study, that an artist who wants to learn the most about the use of glass as a fine art must go to Europe. The centuries of the use of glass have not failed to leave their mark in the great glass art works, the collections, the craftsmen in many centers, and of late the rich feeling for contemporary design and creative sculpture in the material.

Note should be made that in several instances, particularly in England, praise was given to the free experiments in glass blowing in American colleges and even some copying of the Labino technique was done. This attitude was found chiefly as a revolt against the too-tight control of local craftsmen over the efforts of teachers to experiment outside the usual techniques of the trade.

The impact of ancient collections of great art in a country should not be underestimated, especially when such material is a national heritage. This condition would not exist in the United States, in general, because of the newness of the nation. Yet in Europe, in the material of glass, there are exceptional treasures - perhaps including the greatest of mankind's creative production in Chartres Cathedral - such as the Gothic inheritance of glass in many cathedrals; the collections at the museums in Naples, Venice, Murano, Florence, Paris, Athens, London, and Amsterdam; and the modern use of glass seen in new architecture from Finland to Spain.

Museum exhibitions of glass in Europe are reflecting the long history of the use of the material in art. A mature attitude toward glass as art is seen in such shows as the Leerdam outdoor glass fair, the Ravenna international exhibit of modern glass mosaics, and the plans for the rehabilitation of the Murano glass museum. More specifically noteworthy is the effort of Egidio Costantini, of Venice, in his shows of glass sculpture by artists such as Pablo Picasso, Jean Arp, Jean Cocteau, Max Ernst, Tamaki, Fernand Leger, Robert Willson, Le Corbusier, and Raimond Dauphin, and in his establishment of a "museum of modern art" for glass at his gallery, La Fucina degli Angeli, Venice.

The concentration of craft schools and the communities of glass craftsmen around various centers in Europe is an attraction to the creative artist. A painter or a sculptor will seek out the technical help he needs to translate his ideas into any material, and the availability of glass can be a decisive factor.

Of all glass centers in the world, Murano (Venice), Italy, is most interesting to the artist, or the teacher. This old city represents the true inherited tradition of glass, it preserves the techniques and crafts of the material, and it maintains the potential for future creative expression

at any possible level of vision.

Murano allows a creative artist more freedom for his art and his experimentation than any other site noted in this research. Part of this situation is due to the valid artistic inheritance of the Italians of the area, and part is because Murano has escaped the union and insurance prohibitions of the Americans, the closed shops of the English, the desperate need to train technicans of the Egyptians, the over-stylization of the Scandinavians, and the business approach of the Germans and French. Murano has remained a pleasant place to work with an open mind for the ideas of an artist. Perhaps all judgements on the teaching of glass should start in Murano.

The teaching of glass in Murano (Venice) itself is revealing. Schools as such have not been important. The craftsmen have learned their trade as apprentices in the factories, and the better ones have become maestros because of excellence on the bench. The process from beginner (sometimes at age 10) to maestro could take from 8 to 20 years, and of course only the few best made it.

An experimental school, Scuola Serale di Disegno, to teach the glass craftsmen of Murano design died a natural death. Only in 1968 was the idea of teaching glass in the venerable Venetian Academy of Art made a reality by its president, Renzo Camerino, the owner of a glass plant.

During the past decade, Murano has exhibited two faces. One was the tourist junk glass facade, the money crop. The other was the occasional art work in glass which showed up in museum exhibitions or special collections. Much of the design of the finer glass came from the families of the owners of the glass plants. Often the sons of the owners were trained in contemporary art or architecture schools, and their influence became the artistic lifeblood of the essentially commercial glass community.

That the better minds of the glass community are keenly interested in the fine art side of glass, and want to promote it, is shown by two movements. One is the local organization called Muran Nova, composed chiefly of younger businessmen, who sought to set up conditions to attract foreign artists. They stated that they felt the presence of working artists would help restore the design reputation of the Venetian glass and perhaps improve on the quality of the tourist products. The other movement relates to the exhibitions and promotions of Egidio Costantini for glass sculpture. His work has been backed by a group of sponsors international in scope.

Important individual design contributions to a modern improvement in art glass in Venice was made by the late Paolo Venini of Venini company, by Ercole and Angelo Barovier of Barovier & Toso, by Alfredo Barbini, by Ermanno and Renato Toso

of Fratelli Toso, and by many others. No amount of sophistication seems beyond the powers of the traditional craftsmen of Murano when working with artists. Most work in Murano is done with the artist directing his own team on the floor. True creative work is not possible if drawings are turned over to the team for execution second hand. Glass art will always require the direct participation of the artist, or an interpretation by someone of equal talent.

In Germany, the small studio of Erwin Eisch at Frauenau furnished a study example of the development of the craft of glass blowing in the art direction. Through the traditional process of blowing thousands of forms, Eisch seeks new forms and design effects.

The State School for Glass at Zwiesel, Germany, was a model of organization. Courses and work were offered in design, blowing, tooling, etching, sandblasting, lampworking, and casting glass. Furnaces were kept going with master craftsmen on hand to develop the designs of the students. A small exhibition gallery presented the finest work of the students in the best contemporary museum technique. This is the most complete school studied. It trained the present director of the Cairo glass school.

In Holland, the Leerdam glass factory represented a variety of ideas, a museum of glass history, a school for both craftsmen and artists, and major exhibitions of glass as art. In addition it served as the center for a talented group of designers and glass sculptors who have influenced glass ideas and teaching in that country. One of the Leerdam associates, Sybren Valkema, is now assistant principal of the Amsterdam Institute of Applied Arts, and in a position to carry on further educational experiments in a new building.

The early French interest in glass sculpture shown by the Art Nouveau artists such as Daum, Lalique, Galle, and Marinot did not continue. More exciting is the modern use of painted windows and slab glass in both new and old churches. The work of the painter, Fernand Leger, at the Audincourt church and at the Leger Museum in Biot, is important for further study.

Scandinavian contributions to modern glass design are well known since the last war. But for the purposes of this study, chief interest was in the system of using artists as free designers in the factories in the Kalmar, Sweden glass area. The factories of Boda Bruks, Kosta, and Orrefors have shown the value of bringing the creative artist into the commercial plant. The further results of the influence of these artists on others in their own country and in other countries could have educational significance. It is an apprenticeship on the art level rather than the craft.

Perhaps the most logical training program was found in Cairo. Students were pre-selected carefully, studied both in the University of Cairo and in the trade school of Dar Elsalam, and could go into the industrial glass plants for employment. The initial art training part of the program was under the painter, Professor M.F.Alfi, at the University. Few art results may be expected from the training for some years because of the urgent need for technicians by the Egyptian economy.

In England were found the best college glass art departments of anywhere in the world. A broader approach to the various techniques of using glass was used than in any other country, and there was a full understanding of the potential of glass as a material for either sculpture or painting. The art departments at the Birmingham College of Art and Design, the Royal College of Art in London, and the Foley College of Art at Stourbridge deserve extensive study. The chief weaknesses of the system are the lack of enough direct contact with the molten glass by the student (due to the master craftsman type of unionism), the poor facilities for exhibits of glass in England, and the economic system which can not absorb glass artists.

In general the artist will find it easier to work in glass in Europe than in America. The traditions are in his favor, and he is less bothered by unions, insurance problems, and college requirements. The resulting work is more likely to be understood in terms of fine art.

## The USA College Glass Movement

During the past decade, the colleges in the US have experienced an explosion of interest ir the teaching of glass in craft and art departments. Earlier work was helped by the sag-glass experiments of Michael Higgins, and later glass blowing by the inventions and studies of Dominick Labino. Teaching of glass was encouraged by the successes of leaders such as Earl McCutchen of Georgia and Harvey Littleton of Wisconsin. The writing on stained glass by Robert Sowers was an incentive of value.

Some of the schools where glass has been taught are as follows:

1. Alfred University - batch glass, regular courses, full time glass instructor; possible MFA in glass in future.
2. Bowling Green U.- fibre glass melt, occasional course.
3. Kent State U.- fibre glass melt, occasional course.
4. Ohio U.- occasional seminar, using fibre glass.
5. U.of Wisconsin- fibre glass melt, strong emphasis on blowing, regular courses and major.
6. U.of California- fibre glass melt, strong emphasis, regular courses, also grinding equipment.
7. San Jose State U.-fibre glass melt, strong emphasis.

8. Toledo Museum of Art- fibre glass melt, occasional seminar and course in blowing.
9. U. Georgia- glass batch melt, sag-glass, occasional course.
10. U. Miami- occasional experimental study, no regular courses.
11. Penland School of Crafts- summer course in fibre glass melt.
12. Haystack School of Crafts- summer course, fibre glass melt.
13. Rhode Island School of Design- fibre glass melt, occasional courses, some graduate level.
14. Southern Illinois U.- fibre glass, occasional.

The college glass movement is generally based on the Labino ideas of remelting glass and working singly at a small furnace. Very little is being done to teach glass as a material for the artist and few courses are offered in the many other techniques besides blowing. To date, it is a craft movement. Larger and more complex sculptural works are largely missing due to the limitations of the methods.

Most of the college courses represent the personal directions of individual teachers, rather than a program of all the uses of glass in the field of art. No college seems to have the funds to maintain a true glass art department.

## The Cottage Glass Industry in the US

There has grown up in the central states a group of small one-family glass plants, operated by relatively untrained craftsmen on a rule-of-thumb basis. The original impetus for the movement was probably the hand blown glass section of the Radiant Glass Compnay, Ft. Smith, Arkansas, about 1945. From this workshop came the craftsmen who spread out over Arkansas, Oklahoma, and now to Texas and Colorado.

Some of the plants may be listed as: Becraft of the Ozarks, Scott Depot Glass Company, George's Glass Co, Sooner Glass, O'Hickory Glass, Spiro Glass, Salisaw Glass, Panama Glass, Joe Hammon, and Don Jones.

The technique is chiefly that of remelting glass bottles, with an occasional addition of batch mix, and blowing of clear glass with colored inserts. The shapes are traditional glasses, vases, pitchers, paperweights, simple animals, and the horn of plenty. Sales are absorbed in the tourist shops of surrounding states.

While the skills and the design ability of these craftsmen are not significant, it is of exceptional interest thatthe cottage-type glass houses exist at all and are able to sell all they make. This is the only indigenous glass movement in America and may have some answers for artists who seek to maintain completely independent studios. The entire movement needs close study.

A version of the cottage glass industry has started, during the past 2 years, along the Texas border in Mexico. Apparently this group of small glass plants derives from Venetian influences, rather than from the Arkansas source. The owners have been able to learn enough technique to make a remelt glass, and seek to copy the colors and styles of the worst tourist glass from Venice.

Reference should be made to the one-family small glass plants which still exist in the Near East. The investigator visited one such plant in Cairo. The family of El-Tahhan had lived on the same spot for 400 years, according to local belief. Today they remelt bottles and fire with wooden blocks from furniture factories, to form a crude glass of obvious Byzantine descent. These plants also have much to teach the artist who would work alone.

## Equipment

The artist who wishes to do major work in glass - sculpture or painting - must to date go to a working factory and use the furnaces, teams, chemists, and shops provided there. Perhaps this is the only answer, now or in the future, if an artist wishes to avail himself of a full range of potential.

The new furnaces of Labino, the Byzantine clay ovens, and the Arkansas home plants are all adaptations of a complex organization to a one-man use. These are effective for their intended use, yet they do not allow the art products that can be obtained, for example, in a Murano glass factory. Complexity may not be desired on a particular individual work of art, but complexity of possibility is a necessity.

Discussions with manufacturers of furnaces, such as Sismey & Linforth Ltd., seemed to indicate that a furnace could be made for the individual artist which might allow major glass work. The furnace could be portable and would be used for the clear crystal glass; colors would be available in small one-gallon crucibles which would heat rapidly. Thus any combination of colors could be available without lengthy waits.

Colleges with occasional courses in glass are very limited by the cost of the equipment and the maintainance of it in operation. Unless larger and more complete shops are used, college-level teaching may be doomed to a craft or hobby level.

It will be found useful, in plans for a college glass shop, to consider the number of days work can be done outdoors. The location of the shop with reference to openings and light may become important when it is in use.

A complete glass art department would require considerable space, with labs for furnaces, blowing, casting, pressing, finishing, grinding, polishing, etching, enamelling, staining, and forming into sculpture, windows, and paintings. No American college even approaches this type of offering.

## Teachers of Glass

In Europe, the usual teacher of glass has a stronger technical background than his American colleague. This factor provides a better-rounded program of courses, yet tends to slant the student toward industrial uses of his knowledge. In America most glass teaching is done by art-trained craftsmen. Such direction, in time, should produce perhaps a better taste level. However, this has not been the case yet. European glass art seems on a higher level than American in all areas, technical and artistic.

Ideally, the director of a glass program should be basically an artist. In all cases, he must have competant technical aid or his direction will become amateurish. Glass is a material which requires exactness in its handling or it breaks. Despite its great flexibility as an art material, it must have skill and knowledge in its use, even for art.

In the glass teaching field, as in all art teaching, some concern should be felt ethically for the increasing tendency of colleges to require advanced degrees for their art teachers. The amount of experience required for an artist to mature, and the technical practice needed in glass, both indicate that there can be little time for an advanced degree of the accredited type now offered. Degree requirements can mean the consequent elimination from faculties of the most creative and the more inventive producers, artists or craftsmen.

In glass, and art, it is hoped that future teaching may be done by the professionals, not by the amateurs who hold degrees. It may be necessary to allow the academic person to decide on the value of the training, but it will be a serious loss to society if teaching is done by those not quite the best. The full promise of art in higher education could be blunted and even perverted.

## Exhibitions

Because the public thinks too much that glass is a craft rather than an art, and because there is great need for further stimulation and information about glass as a fine art, there is a vital need for many major exhibitions on the subject in our museums. Intelligent and adult shows have been lacking. Rewards to the artists have not been enough.

The admirable effort of the Corning Museum of Glass to train museum personnel from other museums, through valued scholarships, is noted. Some of the recent exhibitions of glass at Corning, and at museums where Corning scholars have worked, have indicated the pleasures and rewards in serious glass display.

La Fucina degli Angeli in Venice, the Glass Museum in Murano (the new plans), and the Leger Museum in Biot,France, are further examples of value. Of equal effectiveness, as art exhibitions, are the permanent installations of glass at Audincourt, Assy, Coventry, and Metz. The Gothic heritage churches continue to amaze us through their intellectual and emotional statement.

## General Patterns

No matter what personal interpretations are placed on it, any survey of glass art will indicate that great art in glass will happen only when the finer artists are attracted to work in the material under the proper conditions. Today these conditions are found best at Murano,Italy, with strong glass movements appearing in Germany, France, Holland, Egypt, the Scandinavias, and the English colleges. In the USA, art teaching - or perhaps architectural teaching - seems on the verge of making important steps into the field of glass teaching. An increase in the number of trained and experienced teachers and artists in America would materially strengthen this tendency.

It is found that the average artist does not know enough detail factual technique to approach glass successfully. The teaching of the future should be slanted to give him this skill and knowledge, and then to give him some independence in working with the fabric. Publications and equipped centers or glass shops are needed.

This first survey tends more to point to needs for further studies rather than to solve specific problems. However, the correlation of a mass of material has made it possible to suggest with confidence the proper glass courses which should be taught on the college level.

# CONCLUSIONS

This study involved much greater travel, many more contacts, and the collection of massive amounts of information not previously expected. As a result, the report is a summary of an area of operations, and is more of a suggestion for further study projects in many directions than a definitive answer in any single aspect, except that of a curriculum.

Certain conclusions seem self-evident and may be refined and stated as follows:

1. In the last decade there has been a world wide growth of interest in glass as a fine art material. It is seen in architecture to best effect in the chapels of France and Germany. As sculpture, it has been shown best at La Fucina degli Angeli in Venice.

2. This period has also seen an explosive new interest in glass blowing as a craft, especially on the campuses of US colleges.

3. To meet the new demands on glass, the teaching of glass techniques has been expanded. The most comprehensive programs for using glass are taught in European schools. American schools have concentrated more on the craft of glass blowing.

4. Despite the great need, there is no school in the world which teaches all aspects of glass as a fine art material, on a level high enough to attract the best artists. Such a school is needed and could become a world center for glass art.

5. There is vital need for important exhibitions of glass as art, both to educate the art world, and to encourage the artists now working in glass.

6. There is a desperate need for publication of technical and artistic data on glass, suitable for use by artists under the conditions of their creative work.

7. There is real need for work labs, or factories, where artists may go to work in glass with all the facilities of a major producer. Important art is not likely to be made successfully in small or ill-equipped studios.

8. The amount of research, experimentation, financing, and study involved in setting up an ideal or complete teaching lab for glass is too much to expect of any single college, indicating that industry, government, or foundation aid and support is a necessity for this work.

9. Our knowledge of the present uses and the future potential of glass as an art material is enough to plot a precise curriculum for teaching glass on the college level. It is believed that exact courses and their content can be specified at this time ( see Appendix A) although much experimentation remains to be done.

10. It is felt that America, as a nation, can not afford to not preserve all facets of the glass skills for whatever future need may arise, and it can not agree to teach less than other countries. American students should have the option of securing top quality teaching in glass on the broadest possible base, within this country.

11. Glass may well become a major material for the use of the artist and the architect in this century, with exemplary economic and aesthetic values far beyond any foreseeable research or study costs. American industry, in many areas, should be called upon to help finance this type of aesthetic progress.

12. There is an immediate need for the training of a basic group of teachers and artists in glass, to take their place in the active cultural life of the USA. Their impact will be to solve many of the problems raised in this research, by creating a sound and educated demand for solutions. A quick-training program for the next 5 summers is suggested.

# RECOMMENDATIONS

This survey has been made with the aid of a contract from the U.S.Office of Education. Therefore it is proper that certain suggestions be made to that agency to help it make some use of the material in a practical way.

It is possible for an official agency to promote ideas, attract uncommitted support, even to start cultural movements, in a manner which smaller units of society may not effect. Thus it is recommended to the Office of Education that it:

1.Accept the attached college level curriculum in art glass teaching (Appendix A) as an outline of an area of knowledge which should be made available to American students and artists, and that it seek means to promote it.

2.Select a college architecture or art department to serve as a pilot in the development of the above curriculum and promote all possible outside aid for the program from industry, foundations,and private sources. It is suggested that a state university within the cottage-industry-glass area of Arkansas-Oklahoma-Texas would be most suitable; or otherwise a new department in a new state university in the South where weather conditions allow major outdoor work most of the year.

3.Encourage prompt and worthy publication of the books, demonstration films, and slide collections which are needed by artists and teachers in the glass movement.(Appendix C).

4.Promote and distribute nationally and internationally a series of mature, definitive, adult exhibitions of glass as a fine art (not as a craft).

5.Establish a summer school of glass art in Murano,Italy, effective the summer of 1968, for an intensive training program of American teachers and artists. These trainees will bring back to America the ideas needed to develop properly a glass art here. It is recommended as the quickest, most economical,and most efficient way to make a start.

6.After observing the summer school in Murano for 5 summers, consolidate all information and proposals to that date, and establish on a permanent basis a professorship of glass in a selected college (No.2 above),with the specified duties of correlating glass educational ideas, advising the Office of Education of ways it can help, seeking grants from industry and foundations, and promoting the publication of material of interest to the artist and teacher of glass as an art material. (An alternative to the professorship would be a consultant within the Office of Education.)

## APPENDIX A

## CURRICULUM DATA

A curriculum of college-level courses for a complete or model program of teaching glass as an art material; a sub-departmental arrangement suitable for unlimited undergraduate work, which may be extended into graduate levels by further specialization in any of the techniques or historical areas; for Architecture, Art, or Art Education departments.

### BACKGROUND COURSES

It is suggested that these three courses be required of the student before he goes into specialized creative work in the lab. Each course is listed for 3 semester hours of value,one semester. After having these courses, a student is more adaptable, has a wider view, and seems to progress faster than one who goes directly into art attempts without this preliminary study.

GLASS 1. A survey of all practical techniques (for using the material of glass for fine arts.) Includes definitions, demonstrations, exhibits of samples, movies, slides, textbooks and photos. Suggested techniques to be presented are: molten tooling, batch glass blowing, remelt glass blowing, lampwork and beads, painting on glass (cold,enamel,stain), leaded glass construction, slab glass and concrete construction, casting (and mold materials), glass paste, carving (chisels), engraving (diamond point, copper wheel, abrasives, John Hutton techniques,polishing), metallic drawing and plating, sandblasting, etching, fusion, and sag molds. Includes a study of equipment,tools,furnaces,lehrs,fuels, and formulae needed with each technique.

GLASS 2. A survey of the history of glass, with emphasis on its art use, 5000 BC to the present; texts, charts, films, slides, photos, museum collections.

GLASS 3. The museum and glass. Exhibits of glass, handling, preserving, educational aids, public demonstrations, inter-disciplinary arrangements, architectural uses.

### LAB COURSES

Because the art use of glass should have a wide technical base, and because so many students do not recognize their own tendency toward a certain technique until it is tried, it is suggested that a school offer all the techniques for which it can afford teachers,

labs and equipment. Each course or technique listed below may be offered with good results for 4 semesters ideally if desired, as the student will progress on his past experience. It is hoped that each student will be guided into more than one technique, for exploration. Each course is indicated for 3 semester hours of credit, which is a variable.

GLASS 4. Molten tooling of glass. The sculptural approach. Work from both the batch melt and the fibreglass remelt furnaces. Colors, stamping, trailing, elongating, individual and team approaches.

GLASS 5. Blowing glass. Work from both batch and remelt furnaces. Use of drawings and of free abstract approaches. Values of bottle and globe forms. Colors, trailing, elongation, combination, stamping, prunting.

GLASS 6. Lampwork. Use of torch to remelt and form glass. Beads, sculpture, painting approach, trailing.

GLASS 7. Painting as a glass technique. Use of fired and cold paints. Enamels, stains, additions, fusions. Surface. Installation problems. Transparency and opacity.

GLASS 8. Leaded glass construction. Stained glass windows (see Glass 7); free-standing sculptural forms. Soldering techniques; lead came casting and forming.

GLASS 9. Slab glass construction. Supports. Concrete, metal, wood. Reinforcing. Windows, walls, remelt molds, sculptural form (see Glass 16).

GLASS 10. Casting glass. Molds, materials, glass. Limitations of size and cooling. Paste, molten, fusing.

GLASS 11. Paste glass. Free forming, molding. Beads. Painting and sculptural uses.

GLASS 12. Carving glass. A sculptural approach. Use of hammer and chisels. Abrasives.

GLASS 13. Engraving glass. Diamond point, copper wheel, abrasive, John Hutton techniques, polishing. Textures.

GLASS 14. Sandblasting glass. Shields. Relief and round sculpture. Acid dip, polishing.

GLASS 15. Etching glass. Hydrofluoric acid. Relief and round. Depth perception in glass. Colors.

GLASS 16. Sag mold glass. Relief and round sculptural forms. Molds, matching, connectors. Mounting.

GLASS 17. Fusing glass. Firing and plastics. Addition. Reinforcement. Architectural uses. Relief and round.

GLASS 18. Metallic application to glass. Drawing on glass with permanent metals, and its architectural application. Plating. Melting unions.

GLASS X. Experimental approaches. Courses set aside for advanced students, suitable for research on graduate level problems, for important creative production, and for teaching or methods studies. Use of such courses will depend on the presence of advanced teachers and equipment.

## RELATED COURSES

A major glass program may be strengthened by requiring other courses which may be offered within the university. The following areas should be studied for possible courses considered of supplemental value:

1. Architecture: uses of art materials such as clay, glass, enamel; history of glass uses.
2. Art: sculptural form, composition, color theory, drawing.
3. Archaeology: particularly ancient areas where glass was made.
4. Art history: especially Egyptian, Roman, Byzantine, Islamic, and Chinese.

Engineering courses in glass have not been considered in this study as they rarely involve the art uses of the glass material. The mechanical structure of furnaces and the chemistry of formulae are not within the usual need, adaptability, or experience of the creative artist. It is recommended that, for safety, proper engineering advice be asked. Glass formulae, for example, can be EXPLOSIVE and DANGEROUS in untrained hands; just as are gas furnaces.

## IDEAL FACULTY

The staff needed in any program will obviously depend on the number and types of courses offered, the equipment available, the number of students, and the finances. Aside from these local considerations, a faculty may be outlined in order of importance to the program and in priority of selection.

1. Director. Preferably an active sculptor with a sympathy for the modelling processes. In a small program, he would serve as the actual teacher of techniques he knows, and he might handle historical lectures. In a large program, he would find his time taken up with the routine of personnel and equopment. In all cases, his artistic orientation is a necessity for making decisions.

2. Technical supervisor. Ideally he would know furnace maintenance, batch and chemistry control, and act as the blowing instructor. Some of the master craftsmen in Europe fit this description. It is a most difficult post to fill.

3. Glass art history lecturer. These lectures make the difference between a trade and an art school. Enthusiasm for glass and color would be a help. In a small program, it is useful if he can handle design and museum display courses.

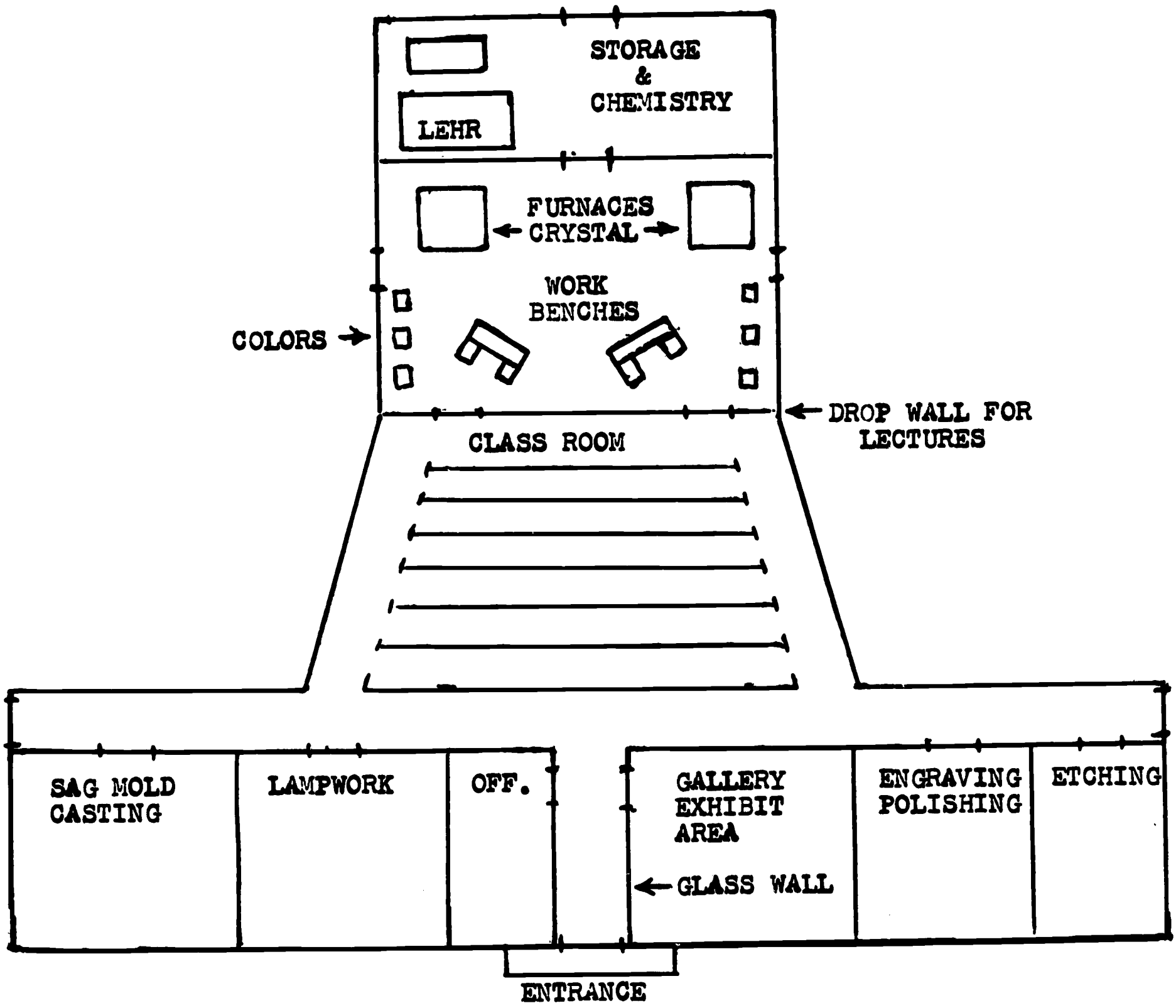
4. Designer. To teach art composition, sculptural form, display theory, and museum exhibitions (if curator not available.)

5. Museum curator. If the program is large enough to have the services of a gallery or museum and its staff, it will find that the work of its students and faculty will assume much greater meaning, with effective contacts between the school and the public. A most valuable aid.

6. Additional lab specialists. Within the scope of the program, it is helpful to use specialists to teach such courses as etching, engraving, sandblasting, blowing, casting, stained glass, etc. Experience in this case is always of greater value than education or academic approach. These men teach skills, not the art use of them, and should not be expected to do both. Schools located near glass factories may secure part-time or night course instruction from highly-trained technicians, often to greater value than fewer full-time teachers.

## BASIC PLAN FOR A GLASS DEPARTMENT

A suggested floor plan for a teaching and demonstration area for art glass. Attention should be paid to safety exits, noise levels, ventilation, and control of visitors. A library is not included in these plans.



## APPENDIX B

### SOME REFERENCE POINTS IN THE ART HISTORY OF GLASS

1. Natural glass forms: obsidian, tektite, fulgurite, rock crystal.
   Primitive use.

2. The discovery of how to make glass, Egypt or the Ancient
   Near East, c.4000 BC. Beads, carving.

3. The invention of the first glass container, core ware,
   Egypt, 18th. Dynasty, 1450 BC. Mosaic, sculpture.

4. Cameo glass, relief carving, Rome, 1st C. AD.
   The Portland Vase.
   The invention of glass blowing.

5. The Head of a Prince, glass paste, Iran, 500 AD.

6. Byzantine glass mosaics, 400-1400 AD.
   Ravenna, Constantinople, Daphni.

7. The Gothic stained glass windows, 1200 AD.
   Chartres Cathedral, Bourges Cathedral, Sainte Chapelle.

8. Venice, the art center since the 12th. C.

9. Art Nouveau, an artists' revolt, 1850-1910.
   Tiffany, Carder.
   Gallé, Lalique.

10. Contemporary glass.
    Architecture - Assy, Audincourt, Metz, Orient.
    Sculpture- La Fucina degli Angeli group.
    Painting- Barovier and experiments. Leger. Rouault.

11. The future.
    Technical knowledge and freedom.
    Availability of work shops.
    Museum sophistication and knowledge.

## APPENDIX C

## REQUISITE PUBLICATIONS

A suggested list of textbooks, glass histories, and educational material which is needed today in the teaching of glass and in the education of the public on the nature of glass as an art material.

1. An art history of glass, fully illustrated, an art book, following sculptural and painterly values rather than containers or crafts.

2. A general book on the glass techniques which can be available to the artist, clearly illustrated, introductory.

3. Catalogs of major "theme" exhibitions of glass art. Important contributions to be kept in print permanently, or as long as they have value. Selected from international sources.

4. More individual monographs and working philosophies of individual artists, of the type published in these two new books:

   Burton, John, Glass, Chilton, Phila., 1967.

   Labino, Dominick, Visual Art in Glass, Wm. Brown, Dubuque, Iowa, 1968. (Announced.)

5. Color films, color slide sets, and photographs to illustrate the above books, exhibitions, and ideas; to be kept in print permanently.

## APPENDIX D

## A SELECTED GLASS BIBLIOGRAPHY

### GENERAL SOURCES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## APPENDIX E

## A LIST OF WORKING CONTACTS

In general the order is chronological although national and area groupings are followed for sake of clarity. More then one visit to a place (Venice,London) is not listed separately.

### PRELIMINARY

1. Reference committee of advisors, listed under Methods.

2. Reference National Scholarship held by the author at Corning Museum of Glass: contacts renewed, readings, notes for future studies in technique, art, and teaching.

3. Reference seven years of minor class experiments with glass at the University of Miami;no furnace or equipment.

4. Reference First World Crafts Congress, New York, Columbia University: Joel Myers, Harvey Littleton, John Burton, Kenneth Wilson, Earl McCutchen, Erwin Eisch; International Seminar on Glass; exhibitions; demonstrations.

5. Special consultations:
   Prof. David Durst, Chairman, Art Dept., Univ. of Arkansas.
   C. Clay Aldridge, Director, El Paso Art Museum, Texas,
   (later Curator of Art, Illinois State Museum).

### ENGLAND

1. Foley College of Art, Stourbridge.
   Irene Stevens, Senior Lecturer, Glass.
   Eric Hilton, light and glass experiments, architecture.
   George Elliott, blowing experiments.
   Allen Dohnal, technical director, blowing.
   Jack Waldron, sculptor, glass blowing in forms.
   John Rees, stained glass.
   Donald Burt, ceramics.

2. Birmingham Area.
   College of Art and Design.
   New Department of experimental glass, Eric Hilton.
   Sismey & Linforth Ltd., glass furnace engineers.
   Discussions on portable glass furnaces.
   New Coventry Cathedral, Coventry.
   Wall of glass, engraved by John Hutton.
   Architectural slab and leaded glass.
   Glass mosaics in chapel, Steven Sykes.

Nave windows by Geoffrey Clark, Keith New, and
Lawrence Lee of Royal College of Art.
Holy Trinity Church, Coventry, rainbow window color study.
Stratford-on-Avon.
Shakespeare Foundation, windows by John Hutton.

3. Liverpool Area.
Pilkington Bros. Ltd., glass mfg., St. Helens.
B. T. Tinling, group public relations.
Display of glass art in architectural use.
Pilkington Glass Museum, St. Helens.
D. E. Hogan, Curator.
E. Owen, organizer, retiring curator.
New Anglican Cathedral, Liverpool.
Baroque glass windows.
New Catholic Cathedral, Liverpool.
Slab glass and concrete.
Chester Cathedral, Chester.
New West Window, 1961, by Carter Shapland.

4. Salisbury Cathedral, Salisbury. Gothic and later windows.

5. Canterbury Cathedral, Canterbury. Windows, restorations.

6. Glass Manufacturers Federation, London.
Cyril Weedon, London, Public Information.
Discussion of trip, schools, artists.

7. Pilkington Bros. Ltd., headquarters, London.
J. C. Perkins, London Manager.
Sven M. Sternfeldt, architectural advisor.

8. R. Stennett-Willson, Hamstead, London.
Former head, glass dept., Royal College of Art.
Plans for model glass factory in King's Lynn.
Portable furnaces, use by artists.
Sales of glass; European glass artists.
Author, The Beauty of Modern Glass.

9. Whitefriars: James Powell & Sons Ltd., Middlesex, London.
W. J. Wilson, manager, chief designer, author.
Experiments, slab glass, fusions.

10. Studio, John Hutton, London.
Demonstration of grinding-engraving panels.
Coventry wall, techniques.
Ottowa Archives Building, work in studio.

11. Royal College of Art, Kensington Gore, London.
Brian Knight, design.
Stained Glass Department.
Lawrence Lee, head. Architectural works in progress.
John Stevens, visiting artist, glass experiments.
Roy Youngs, technical instructor, slab glass.
Keith New, visiting instructor; work on Coventry.

Industrial Glass Department (Blowing,art).
R.Stennett-Willson, former head.
Michael Harris, head, experimental studies.
William Heaton, technical instructor, master craftsman.
John Hutton,visiting instructor.
Student exam exhibitions.

12. Central School of Arts & Crafts, Southhampton Row,London.
Thomas Fairs,head,stained glass, glass mosaics.

13. Wimbledon School of Art, Wimbledon,London.
Charles de Vic Carey,head,stained glass.

14. Arts Council of Great Britain, St.James's,London.
Exhibition, catalog, "Modern Stained Glass",1961

15. Craft Center of Great Britain,Hay Hill,London. No glass.

16. British Museum: major glass collections and studies.
Photographic and color slide service.

17. Victoria & Albert Museum,Kensington,London.
Major glass collections.
Hugh Wakefield,author 19th Cent. British Glass.
R.J.Charleston, keeper of dept.of glass, author, editor the Faber monographs on glass.

## ITALY

1. Milan.
Prof.E.W.Burger,carved glass sculpture.
International Design Triennial; display.
Milan Cathedral,windows,treasury,Gothic.

2. Ravenna.
Glass mosaic school: Istituto Statale d'Arte per il Mosaico. Prof.Antonio Rocchi,director.
Byzantine glass mosaics: churches,museums.
Reference: First International Mosaic Exhibition, contemporary,1959,National Museum.

3. Florence.
Empoli village,commercial green glass.
The Baptistery, Byzantine glass mosaics.
Windows in Cathedral and museums.
Gothic and Renaissance examples.

4. Rome.
ENAPI- Ente Nazionale Artigianato Piccole Industrie.
State craft organizations;reference Venice.
Museums: glass collections, mosaics.
Shops: Italian glass outlets,export,tourist.

5. Venice, (Venezia).
The glass sales industry.
Shops, displays, tourists, guided tours to Murano.
Glass craft demonstrations for tourists.
Individual bead makers (see bead factory, Murano).
Museums.
Museo Correr, Dr. Giovanni Mariacher, director,
author Italian Blown Glass.
La Fucina degli Angeli - the museum of modern art
in glass - Egidio Costantini, director.
Ca'Pesaro, Dr. Guido Perocco, director.
Exhibition, modern glass sculpture, 1967.
Istituto Veneto per il Lavoro, Dr. Astone Gasparetto,
director and author of Il Vetro di Murano.
Regional craft museum, craft schools.
Gallery: Opera Bevilacqua la Masa, San Marco.
The Venetian Art Institute.
Dr. Renzo Camerino, president and glass plant owner.
Plans: future glass training center.
Scuola Statale d'Arte (State School of Art).
Prof. Alberto Payer, director.
Prof. Arrigo Furini, sculptor.
Glass mosaics, engraving, enamel, design. Etc.
The Venice Biennale.
Venetian Glass Section, and awards.
Renato Toso, first prize winner, 1964 and 1966.
Cini Foundation, San Giorgio, photo files.
Jean Ramseyar, director of art school.

6. Murano (Venice).
Stazione Sperimental del Vetro. National.
Dr. V. Gottardi, director.
Dr. Gianfranco Paoletti, chemistry.
Technical experiments; research.
Not applicable to local problems.
Some working maestros of note:
Alfredo Barbini.
Livio Seguso.
Licio Zuffi.
Rosin Loredano. Etc.
Glass factories studied:
Fratelli Toso, Barovier & Toso, Venini,
Alfredo Barbini, Ferro & Lazzarini,
Moro G. Murano (later Antico Forno San Marco),
Mazzega, Salviati, Vistosi.
Engraving: S.A.L.I.R.; Francesco Andolfato.
Bead factory: Gianni Moretti.
Experimental glass design teaching: Scuola Serale di
Disegno (formerly Angelo Barovier school).
Muran Nova, Associazione Civica; Giovanni Moro.
Unions, apprentice system, communists, strikes, new labor.
Byzantine glass mosaic factory: Melloni & Moretti.
Murano national Museum of Glass, rebuilding.

## FRANCE

1. Chartres.
   - Chartres Cathedral, Gothic glass.
   - L'Eglise Saint-Jean Baptiste, modern glass.
   - Gabriel Loire stained glass studio.

2. Assy.
   - Notre-Dame de Toute Grace, Novarina, architect.
   - Contemporary glass and glass mosaics: Rouault, Leger, Chagall, Bazaine, Bercot.

3. South France.
   - Vence- Matisse chapel, contemporary glass.
   - Biot- Musee Leger, glass windows, glass mosaics.
   - Saint-Paul-Fondation M.& E. Maeght, contemporary arch. use.
   - Nimes- the Roman glass collection, Archaeol. Museum.
   - Carcassonne- Cathedral glass.
   - Limoges- Saint-Michel-des-Lions, the enamel technique on glass with white base.

4. East France.
   - Sermizelles- Notre-Dame D'Orient, chapel, modern slab glass.
   - Ronchamp- Notre-Dame du Haut, church, by LeCorbusier.
   - Audincourt- L'Église du Sacré-Coeur, church, Leger and Bazaine, modern glass.
   - Nancy- Cristallerie Daum, mfg., Michel Daum.

5. North France.
   - Metz- The Cathedral, old and modern glass experiments.
     - Eglise Sainte-Therese, contemporary cement and slab glass, by Nicolas Untersteller; arch. M. Expert.
   - Amiens- Cathedral, Gothic glass.
     - L'Eglise Saint-Honore, contemporary glass.
   - Rheims- Cathedral of Notre Dame.
     - Museum of ancient crafts, Hotel Le Vergeur.
     - Studio Jacques Simon, Chagall glass.
   - Claireau- School of crafts, Centre National des Ateliers Educatifs.

Paris.
- Federation des Chambres Syndicales de L'Industrie du Verre.
- Institut Pedagogique of Ministere de l'Education Nationale.
- College d'Enseignement Industriel de Verre.
- Cathedral de Notre Dame, modern glass window replacements.
- St.-Gobain Glass Co., center of documentation.
- Lalique Crystal exhibition.
- Church of Saint-Denis, early glass experiments.
- UNESCO, art and craft.
- Federation du Verre, society of mfgs.
- Museums, collections of glass: Cluny, Louvre, etc.

## BELGIUM

Bruxelles.
- Federation de l'Industrie du Verre.
- Service des Missions et Accueil, de la Direction d'Administration de l'Information et des Relations culturelles.
- l'Ecole Nationale d'Architecture et des Arts Decoratifs.
- Belgian Chamber of Commerce.

Others.
- Marcinelle- Glass classes of Raymond Chambon.
- Gent- St.Lukes Monastary,Frere Urbain.
- Leige- Val-Saint-Lambert,mfg.
  - Curtius Museum,Baar Glass Collection.
- Charleroi- Future Experimental Glass Station and Technical Museum.

## HOLLAND

Leerdam.
- Royal Leerdam,Glasfabriek.
- Leerdam Glass Museum.
- Former glass school at Royal Leerdam factory.

Amsterdam.
- Institute of Applied Arts,new building including glass.
- Netherlands Inst.for Handcrafts & Techniques.
- Glasindustrie van Tetterode.
  - Tour of architectural uses of van Tetterode glass.
  - Christus Koning Kerk,Utrecht.
- Rijksmuseum,collection historical glass.
- Boekmanstichting Kunstsociologisch Studiecentrum.
  - (Center for the Sociological Study of the Arts)
- Rosenthal Studio-Haus.

## GERMANY

Cologne.
- Glass in the new churches and chapels,windows and mosaics.
- The Cathedral of Cologne.
- Collection,historical glass,Romano-Germanic Museum.

Munich.
- Collections in National Museum and Neue Sammlung.
- Stained glass studios,Zettler and Mayersche Hof-Kunstandstalt.

Zwiesel.
- Staatliche Fachschule fur Glasindustrie, classes,exhibits.
- Fachschule fuer Glasblaeser,for glassblowers.

Frauenau.
- Erwin Eisch studio,art glass.
- Eisch glass factory.

## AUSTRIA

Kufstein.
Tiroler Glashuette (Claus Riedel), mfg.

Salzburg.
Gottfried Hollwarth, glass windows and sculpture.

Innsbruck.
Collection, Tiroler Landesmuseum Ferdinandeum.

## GREECE

Athens.
National Craft Organization, Export Promotion Bureau.
Byzantine Museum, glass collection.
Mati Company outlet, glass from northern Greece.

Piraeus.
The Chemical Products Factory.

## EGYPT

Cairo.
The National University of Cairo.
The Rector.
Professor of Glass.
Visits to glass classes.
National Cairo Glass Center, Dar Elsalam.
The Director, German training.
Demonstration classes, inspection.
General Director, Foreign Cultural Relations, Ministry of Higher Education.
National Egyptian Museum, glass collections.
The Byzantine Museum, glass collections.
El-Tahhan, a Byzantine glass furnace survival.
The American University in Cairo, ceramics, glass.
The Museum of Modern Art, closed.

## YUGOSLAVIA

Zagreb.
Akademski Slikar, staff contacted in Venice.

## FINLAND

Helsinki.
Finnish Design Center.
Industrial Art Institute.
Glass companies: Arabia, Karhula-Iittala.

Richimaki.(Riihimaki)
Glass works: Riihimaen Lasi.
Richimaki State Glass Museum.

SWEDEN

Stockholm.
Konstfackskola (Arts and Crafts School),and Svensk Form.
NK,Nordiska Kompaniet,displays.
Konsthantverkarna,permanent exhibition,Swedish Craftsmen's Guild.
Museums,collections.

Kalmar.
Kalmar Konstmuseum,glass exhibitions.
Boda Bruks,Glass factory,studios,displays,experiments.
Kosta,Orrefors,Glass factories.

MEXICO

Mexico City.
National Museum of Popular Arts.
Francisco y Camilo Avalos S.de R.L., mfg.

Taxco.
Ceramica de Taxco,glass experiments,Felix Tissot.

Ciudad Juarez.(Across from El Paso,Texas)
Museo de Artesania Nacional, and sales department.
Inco Glass Factory.
Cristales de Chihuahua,other local factories.

UNITED STATES OF AMERICA

Arkansas.
Ft.Smith- Becraft Glass Co.,cottage industry glass.

Oklahoma.
Cedars- Scott Depot Glass Co.,cottage industry glass.
George's Glass Plant,cottage industry glass.
Salisaw- Salisaw Glass Co.,cottage industry.
Spiro- Sooner Glass Co.,cottage industry glass.

Colorado.
Durango- Joe Hammons Glass Plant,cottage industry glass.
Colorado Springs- Joe Jones Glass Co.,cottage glass.

West Virginia.
Milton- Blenko Glass Co.,design and training program.
Scott Depot-Hamon Glass Co.

Ohio.

Grand Rapids- Dominick Labino experimental labs.
Toledo- Toledo Art Museum, collections, national seminars, modern glass craft exhibit.
Cleveland- Cleveland Art Museum, glass collections.
Ohio University at Athens- lab for occasional glass blowing. Dean Seigfred American glass collection, lab discussion.

New York.

Corning- Corning Glass Co., research labs, inspections, educational conference.
Museum of Glass, technical meeting.
Steuben Glass Co., techniques.
Corning Educational Foundation. museum support.
New York- Museums, glass collections.
Corning Glass Co., display and design sections.
World Crafts Council.
American Craftsmen's Council, America House outlet, Museum of Contemporary Crafts.

Individuals.

Dominick Labino, Grand Rapids, Ohio.
Joel Myers, Blenko Glass, Milton West Virginia.
Paul N. Perrot, director, Corning Museum of Glass, N.Y.
Kenneth M. Wilson, curator, Corning Museum of Glass, N.Y.
Peter Schwelling, glass engraver, Corning, N.Y.
R.V. Harrington, research, Corning Glass Works, N.Y.
Robert Brill, research, Corning Glass Works, N.Y.
Maurice Heaton, West Nyack, N.Y.
Michael Higgins, Chicago, Ill.
Earl McCutchen, Univ. of Georgia, Athens, Ga.
Henry Lee Willet, Phila., Pa.
D. Erik Erikson, Roselle Park, N.J.
John Burton, Santa Barbara, California.
Robert Sowers, N.Y., N.Y.
Marvin Lipofsky, Univ. of Calif., Berkeley, Cal.
Paul Gardner, curator, Glass and Ceramics, Smithsonian, Washington, D.C.
Clay Aldridge, curator, Illinois State Museum, Springfield, Ill.
Edris Eckhardt, Cleveland, Ohio.
Harvey Littleton, Univ. of Wisconsin, Madison, Wisc.
Earl C. Seigfred, Ohio University, Athens, Ohio.
Mrs. George W. Patch, World Crafts Council, N.Y.
H.T. Rams, studio, Orco Inc, San Antonio, Texas
Lists from glass seminars and schools.